Junos® OS

Interfaces Feature Guide for Security Devices

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Junos® OS Interfaces Feature Guide for Security Devices

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

YEAR 2000 NOTICE

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

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About the Documentation

Documentation and Release Notes

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

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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 xxviii defines the text and syntax conventions used in this guide.

Table 2: Text and Syntax Conventions

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

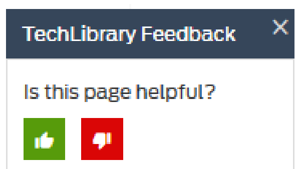
Table 2: Text and Syntax Conventions (continued)

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

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 Juniper Care or Partner Support Services 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/.
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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:

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

Creating a Service Request with JTAC

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

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

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

PART 1

Overview

CHAPTER 1

Introduction to Interfaces

Understanding Interfaces

Interfaces act as a doorway through which traffic enters and exits a device. Juniper Networks devices support a variety of interface types:

- Network interfaces—Networking interfaces primarily provide traffic connectivity.
- Services interfaces—Services interfaces manipulate traffic before it is delivered to its destination.
- Special interfaces—Special interfaces include management interfaces, the loopback interface, and the discard interface.

Each type of interface uses a particular medium to transmit data. The physical wires and Data Link Layer protocols used by a medium determine how traffic is sent. To configure and monitor interfaces, you need to understand their media characteristics, as well as physical and logical properties such as IP addressing, link-layer protocols, and link encapsulation.

NOTE: Most interfaces are configurable, but some internally generated interfaces are not configurable.

Related Documentation

- Interface Naming Conventions on page 8

- Understanding Interface Logical Properties on page 19
- Understanding Interface Physical Properties on page 35
- Understanding the Data Link Layer on page 10

Network Interfaces

All Juniper Networks devices use network interfaces to make physical connections to other devices. A connection takes place along media-specific physical wires through an I/O card (IOC) in the SRX Series Services Gateway. Networking interfaces primarily provide traffic connectivity.

You must configure each network interface before it can operate on the device. Configuring an interface can define both the physical properties of the link and the logical properties of a logical interface on the link.

Table 3 on page 4 describes network interfaces that are available on SRX Series devices.

Table 3: Network Interfaces

Interface Name	Description
ae	Aggregated Ethernet interface. See "Understanding Aggregated Ethernet Interfaces" on page 275.
at	ATM-over-ADSL or ATM-over-SHDSL WAN interface.
cl	Physical interface for the 3G wireless modem or LTE Mini-PIM. See "Understanding the 3G Wireless Modem Physical Interface" on page 572 and "LTE Mini-PIM Overview" on page 541. Starting with Junos OS Release 15.1X49-D100, SRX320, SRX340, SRX345, and SRX550HM devices support the LTE interface. The dialer interface is used for initiating wireless WAN connections over LTE networks.
dl	Dialer interface for initiating USB modem or wireless WAN connections. See "USB Modem Interface Overview" on page 587 and "LTE Mini-PIM Overview" on page 541.
e1	E1 (also called DS1) WAN interface. See "Understanding T1 and E1 Interfaces" on page 61.
e3	E3 (also called DS3) WAN interface. See "Understanding T3 and E3 Interfaces" on page 69.
fe	Fast Ethernet interface. See "Understanding Ethernet Interfaces" on page 255.
ge	Gigabit Ethernet interface. See "Understanding Ethernet Interfaces" on page 255.
pt	VDSL2 interface. See "Example: Configuring VDSL2 Interfaces (Detail)" on page 222.
reth	For chassis cluster configurations only, redundant Ethernet interface. See "Understanding Ethernet Interfaces" on page 255.
se	Serial interface (either RS-232, RS-422/499, RS-530, V.35, or X.21). See "Serial Interfaces Overview" on page 615.
t1	T1 (also called DS1) WAN interface. See "Understanding T1 and E1 Interfaces" on page 61.

Table 3: Network Interfaces (continued)

Interface Name	Description
t3	T3 (also called DS3) WAN interface. See "Understanding T3 and E3 Interfaces" on page 69.
wx	WXC Integrated Services Module (ISM 200) interface for WAN acceleration. See the WXC Integrated Services Module Installation and Configuration.
xe	10-Gigabit Ethernet interface. See "Understanding the 2-Port 10-Gigabit Ethernet XPIM" on page 324.

NOTE: The affected interfaces are these: ATM-over-ADSL or ATM-over-SHDSL (**at**) interface, dialer interface (**dl**), E1 (also called DS1) WAN interface, E3 (also called DS3) WAN interface, VDSL2 interface (**pt**), serial interface (**se**), T1 (also called DS1) WAN interface, T3 (also called DS3) WAN interface. However, starting from Junos OS Release 15.1X49-D40 and onwards, SRX300, SRX320, SRX340, SRX345, and SRX550HM devices support VDSL2 (**pt**), serial (**se**), T1 (**t1**) , and E1 (**e1**) interfaces.

Release History Table

Release	Description
15.1X49-D100	Starting with Junos OS Release 15.1X49-D100, SRX320, SRX340, SRX345, and SRX550HM devices support the LTE interface. The dialer interface is used for initiating wireless WAN connections over LTE networks.

Related Documentation

- Understanding Interfaces on page 3
- Services Interfaces on page 5
- Special Interfaces on page 8

Services Interfaces

Services interfaces provide specific capabilities for manipulating traffic before it is delivered to its destination. On Juniper Networks M Series and T Series routing platforms, individual services such as IP-over-IP encapsulation, link services such as multilink protocols, adaptive services such as stateful firewall filters and NAT, and sampling and logging capabilities are implemented by services Physical Interface Cards (PICs). On SRX Series devices, services processing is handled by the Services Processing Card (SPC).

Although the same Junos OS image supports the services features across all routing platforms, on SRX Series devices, services interfaces are not associated with a physical interface. To configure services on these devices, you configure one or more internal interfaces by specifying slot **0**, interface carrier **0**, and port **0**—for example, **gr-0/0/0** for GRE.

Table 4 on page 6 describes services interfaces that you can configure on SRX Series Services Gateways.

Table 4: Configurable Services Interfaces

Interface Name	Description
gr-0/0/0	Configurable generic routing encapsulation (GRE) interface. GRE allows the encapsulation of one routing protocol inside another routing protocol. Packets are routed to this internal interface, where they are first encapsulated with a GRE packet and then sent. You can create multiple instances of this interface for forwarding encapsulated data to multiple destination addresses by using the default interface as the parent and creating extensions, for example, gr-0/0/0.1, gr-0/0/0.2, and so on. The GRE interface is an internal interface only and is not associated with a physical interface. It is used only for processing GRE traffic. See the Junos OS Services Interfaces Library for Routing Devices for information about tunnel services.
ip-0/0/0	Configurable IP-over-IP encapsulation (IP-IP tunnel) interface. IP tunneling allows the encapsulation of one IP packet inside another IP packet. With IP routing, you can route IP packets directly to a particular address or route the IP packets to an internal interface where they are encapsulated inside an IP-IP tunnel and forwarded to the encapsulating packet's destination address. You can create multiple instances of this interface for forwarding IP-IP tunnel data to multiple destination addresses by using the default interface as the parent and creating extensions, for example, ip-0/0/0.1, ip-0/0/0.2, and so on. The IP-IP interface is an internal interface only and is not associated with a physical interface. It is used only for processing IP-IP tunnel traffic. See the Junos OS Services Interfaces Library for Routing Devices for information about tunnel services.
lsq-0/0/0	Configurable link services queuing interface. Link services include the multilink services MLPPP, MLFR, and Compressed Real-Time Transport Protocol (CRTP). Packets are routed to this internal interface for link bundling or compression. The link services interface is an internal interface only and is not associated with a physical interface. You must configure the interface for it to perform multilink services. NOTE: The ls-0/0/0 interface has been deprecated. All multiclass multilink features supported by ls-0/0/0 are now supported by lsq-0/0/0.
lt-0/0/0	Configurable logical tunnel interface that interconnects logical systems on SRX Series devices. See the *Logical Systems and Tenant Systems Feature Guide for Security Devices*.
pp0	Configurable PPPoE encapsulation interface. PPP packets being routed in an Ethernet network use PPPoE encapsulation. Packets are routed to this internal interface for PPPoE encapsulation. The PPPoE encapsulation interface is an internal interface only and is not associated with a physical interface. You must configure the interface for it to forward PPPoE traffic. See "Understanding Point-to-Point Protocol over Ethernet" on page 429.

Table 4: Configurable Services Interfaces (continued)

Interface Name	Description
ppd0	Protocol Independent Multicast (PIM) de-encapsulation interface. In PIM sparse mode, the first-hop routing platform encapsulates packets destined for the rendezvous point device. The packets are encapsulated with a unicast header and are forwarded through a unicast tunnel to the rendezvous point. The rendezvous point then de-encapsulates the packets and transmits them through its multicast tree. Within a device, packets are routed to this internal interface for de-encapsulation. The PIM de-encapsulation interface is an internal interface only and is not associated with a physical interface. You must configure PIM with the **[edit protocol pim]** hierarchy to perform PIM de-encapsulation. Use the **show pim interfaces** command to check the status of ppd0 interface.
ppe0	Protocol Independent Multicast (PIM) encapsulation interface. In PIM sparse mode, the first-hop routing platform encapsulates packets destined for the rendezvous point device. The packets are encapsulated with a unicast header and are forwarded through a unicast tunnel to the rendezvous point. The rendezvous point then de-encapsulates the packets and transmits them through its multicast tree. Within a device, packets are routed to this internal interface for encapsulation. The PIM encapsulation interface is an internal interface only and is not associated with a physical interface. You must configure PIM with the **[edit protocol pim]** hierarchy to perform PIM encapsulation.
st0	Secure tunnel interface used for IPSec VPNs. See the *IPsec VPN Feature Guide for Security Devices*.
umd0	Configurable USB modem physical interface. This interface is detected when a USB modem is connected to the USB port on the device. See "USB Modem Configuration Overview" on page 590.

Table 5 on page 7 describes non-configurable services interfaces for SRX Series Services Gateways.

Table 5: Non-Configurable Services Interfaces

Interface Name	Description
gre	Internally generated Generic Routing Encapsulation (GRE) interface created by Junos OS to handle GRE traffic. It is not a configurable interface.
ipip	Internally generated IP-over-IP interface created by Junos OS to handle IP tunnel traffic. It is not a configurable interface.
lsi	Internally generated link services interface created by Junos OS to handle multilink services like MLPPP, MLFR, and CRTP. It is not a configurable interface.
pc-*pim*/0/0	Internally configured interface used by the system as a control path between the WXC Integrated Services Module and the Routing Engine. It is not a configurable interface. See the WX and WXC Series.
pimd	Internally generated Protocol Independent Multicast (PIM) de-encapsulation interface created by Junos OS to handle PIM de-encapsulation. It is not a configurable interface.

Table 5: Non-Configurable Services Interfaces (continued)

Interface Name	Description
pime	Internally generated Protocol Independent Multicast (PIM) encapsulation interface created by Junos OS to handle PIM encapsulation. It is not a configurable interface.
tap	Internally generated interface created by Junos OS to monitor and record traffic during passive monitoring. Packets discarded by the Packet Forwarding Engine are placed on this interface. It is not a configurable interface.

Related Documentation

- Junos Services Interfaces Configuration
- Understanding Interfaces on page 3
- Network Interfaces on page 4
- Special Interfaces on page 8

Special Interfaces

Special interfaces include management interfaces, which are primarily intended for accessing the device remotely, the loopback interface, which has several uses depending on the particular Junos OS feature being configured, and the discard interface.

Table 6 on page 8 describes special interfaces for SRX Series Services Gateways.

Table 6: Special Interfaces

Interface Name	Description
fxp0, fxp1	On SRX Series devices, the fxp0 management interface is a dedicated port located on the Routing Engine.
lo0	Loopback address. The loopback address has several uses, depending on the particular Junos feature being configured.
dsc	Discard interface.

Related Documentation

- Understanding Interfaces on page 3
- Network Interfaces on page 4
- Services Interfaces on page 5

Interface Naming Conventions

Each device interface has a unique name that follows a naming convention. If you are familiar with Juniper Networks M Series and T Series routing platforms, be aware that device interface names are similar to but not identical to the interface names on those routing platforms.

The unique name of each network interface identifies its type and location and indicates whether it is a physical interface or an optional logical unit created on a physical interface.

- The name of each network interface has the following format to identify the physical device that corresponds to a single physical network connector:

  type-slot/pim-or-ioc/port

- Network interfaces that are fractionalized into time slots include a channel number in the name, preceded by a colon (:):

  type-slot/pim-or-ioc/port:***channel***

- Each logical interface has an additional logical unit identifier, preceded by a period (.):

  type-slot/pim-or-ioc/port:<*channel*>*.unit*

The parts of an interface name are summarized in Table 7 on page 9.

Table 7: Network Interface Names

Name Part	Meaning	Possible Values
type	Type of network medium that can connect to this interface.	ae, at, ei, e3, fe, fxp0, fxp1, ge, lo0, lsq, lt, ppo, pt, sto, t1, t3, xe, and so on.
slot	Number of the chassis slot in which a PIM or IOC is installed.	SRX5600 and SRX5800 devices: The slot number begins at **0** and increases as follows from left to right, bottom to top: • SRX5600 device—Slots 0 to 5 • SRX5800 device—Slots 0 to 5, 7 to 11 SRX3400 and SRX3600 devices: The Switch Fabric Board (SFB) is always **0**. Slot numbers increase as follows from top to bottom, left to right: • SRX3400 devce—Slots 0 to 4 • SRX3600 device—Slots 0 to 6 • SRX4600 device—Slots 0 to 6
pim-or-ioc	Number of the PIM or IOC on which the physical interface is located.	SRX5600 and SRX5800 devices: For 40-port Gigabit Ethernet IOCs or 4-port 10-Gigabit Ethernet IOCs, this number can be **0, 1**, **2**, or **3**. SRX3400, SRX3600, and SRX 4600 devices: This number is always **0**. Only one IOC can be installed in a slot.

Table 7: Network Interface Names (continued)

Name Part	Meaning	Possible Values
port	Number of the port on a PIM or IOC on which the physical interface is located.	On SRX5600 and SRX5800 devices: • For 40-port Gigabit Ethernet IOCs, this number begins at **0** and increases from left to right to a maximum of **9**. • For 4-port 10-Gigabit Ethernet IOCs, this number is always **0**. On SRX3400, SRX3600, and SRX 4600 devices: • For the SFB built-in copper Gigabit Ethernet ports, this number begins at **0** and increases from top to bottom, left to right, to a maximum of **7**. For the SFB built-in fiber Gigabit Ethernet ports, this number begins at **8** and increases from left to right to a maximum of **11**. • For 16-port Gigabit Ethernet IOCs, this number begins at **0** to a maximum of **15**. • For 2-port 10-Gigabit Ethernet IOCs, this number is **0** or **1**. Port numbers appear on the PIM or IOC faceplate.
channel	Number of the channel (time slot) on a fractional or channelized T1 or E1 interface.	• On an E1 interface, a value from **1** through **31**. The **1** time slot is reserved. • On a T1 interface, a value from **1** through **24**.
unit	Number of the logical interface created on a physical interface.	A value from **0** through **16384**. If no logical interface number is specified, unit **0** is the default, but must be explicitly configured. In addition to user-configured interfaces, there are some logical interfaces that are created dynamically. Hence, for Junos OS, the maximum limit for configuring logical interfaces is 2,62,143 (user configured and dynamically created). Based on performance, for each platform, the maximum number of logical interfaces supported can vary.

NOTE: **Platform support depends on the Junos OS release in your installation.**

Related Documentation

- Understanding Interfaces on page 3

Understanding the Data Link Layer

The Data Link Layer is Layer 2 in the Open Systems Interconnection (OSI) model. The Data Link Layer is responsible for transmitting data across a physical network link. Each physical medium has link-layer specifications for network and link-layer protocol characteristics such as physical addressing, network topology, error notification, frame sequencing, and flow control.

Physical Addressing

Physical addressing is different from network addressing. Network addresses differentiate between nodes or devices in a network, allowing traffic to be routed or switched through the network. In contrast, physical addressing identifies devices at the link-layer level, differentiating between individual devices on the same physical medium. The primary form of physical addressing is the media access control (MAC) address.

Network Topology

Network topology specifications identify how devices are linked in a network. Some media allow devices to be connected by a bus topology, while others require a ring topology. The bus topology is used by Ethernet technologies, which are supported on Juniper Networks devices.

Error Notification

The Data Link Layer provides error notifications that alert higher layer protocols that an error has occurred on the physical link. Examples of link-level errors include the loss of a signal, the loss of a clocking signal across serial connections, or the loss of the remote endpoint on a T1 or T3 link.

Frame Sequencing

The frame sequencing capabilities of the Data Link Layer allow frames that are transmitted out of sequence to be reordered on the receiving end of a transmission. The integrity of the packet can then be verified by means of the bits in the Layer 2 header, which is transmitted along with the data payload.

Flow Control

Flow control within the Data Link Layer allows receiving devices on a link to detect congestion and notify their upstream and downstream neighbors. The neighbor devices relay the congestion information to their higher layer protocols so that the flow of traffic can be altered or rerouted.

Data Link Sublayers

The Data Link Layer is divided into two sublayers: logical link control (LLC) and media access control (MAC). The LLC sublayer manages communications between devices over a single link of a network. This sublayer supports fields in link-layer frames that enable multiple higher layer protocols to share a single physical link.

The MAC sublayer governs protocol access to the physical network medium. Through the MAC addresses that are typically assigned to all ports on a device, multiple devices on the same physical link can uniquely identify one another at the Data Link Layer. MAC addresses are used in addition to the network addresses that are typically configured manually on ports within a network.

MAC Addressing

A MAC address is the serial number permanently stored in a device adapter to uniquely identify the device. MAC addresses operate at the Data Link Layer, while IP addresses operate at the Network Layer. The IP address of a device can change as the device is moved around a network to different IP subnets, but the MAC address remains the same, because it is physically tied to the device.

Within an IP network, devices match each MAC address to its corresponding configured IP address by means of the Address Resolution Protocol (ARP). ARP maintains a table with a mapping for each MAC address in the network.

Most Layer 2 networks use one of three primary numbering spaces—MAC-48, EUI-48 (extended unique identifier), and EUI-64—which are all globally unique. MAC-48 and EUI-48 spaces each use 48-bit addresses, and EUI-64 spaces use a 64-bit addresses, but all three use the same numbering format. MAC-48 addresses identify network hardware, and EUI-48 addresses identify other devices and software.

The Ethernet and ATM technologies supported on devices use the MAC-48 address space. IPv6 uses the EUI-64 address space.

MAC-48 addresses are the most commonly used MAC addresses in most networks. These addresses are 12-digit hexadecimal numbers (48 bits in length) that typically appear in one of the following formats:

- ***MM:MM:MM:SS:SS:SS***
- ***MM-MM-MM-SS-SS-SS***

The first three octets (***MM:MM:MM*** or ***MM-MM-MM***) are the ID number of the hardware manufacturer. Manufacturer ID numbers are assigned by the Institute of Electrical and Electronics Engineers (IEEE). The last three octets (***SS:SS:SS*** or ***SS-SS-SS***) make up the serial number for the device, which is assigned by the manufacturer. For example, an Ethernet interface card might have a MAC address of **00:05:85:c1:a6:a0**.

Related Documentation

- Understanding Interfaces on page 3

Understanding GRE Keepalive Time

Generic routing encapsulation (GRE) tunnel interfaces do not have a built-in mechanism for detecting when a tunnel is down. You can enable keepalive messages to serve as the detection mechanism.

Keepalive times are only configurable for the ATM-over-ADSL interface, which is no longer supported on SRX300, SRX320, SRX340, SRX345, and SRX550HM starting in Junos OS Release 15.1X49-D10. Keepalive times are enabled by default for other interfaces.

Keepalives can be configured on the physical or on the logical interface. If configured on the physical interface, keepalives are sent on all logical interfaces that are part of the physical interface. If configured on a individual logical interface, keepalives are only sent to that logical interface. In addition to configuring a keepalive, you must configure the hold time.

You can configure the keepalives on a generic routing encapsulation (GRE) tunnel interface by including both the **keepalive-time** statement and the **hold-time** statement at the **[edit protocols oam gre-tunnel interface *interface-name*]** hierarchy level.

NOTE: For proper operation of keepalives on a GRE interface, you must also include the family inet statement at the [edit interfaces *interface-name* unit *unit*] hierarchy level. If you do not include this statement, the interface is marked as down.

Related Documentation

- *Configuring GRE Keepalive Time*
- *keepalive-time*
- *hold-time*

Configuring GRE Keepalive Time

Keepalive times are only configurable for the ATM-over-ADSL interface, which is no longer supported on SRX300, SRX320, SRX340, SRX345, and SRX550HM starting in Junos OS Release 15.1X49-D10.

Configuring Keepalive Time and Hold time for a GRE Tunnel Interface

You can configure the keepalives on a generic routing encapsulation (GRE) tunnel interface by including both the **keepalive-time** statement and the **hold-time** statement at the **[edit protocols oam gre-tunnel interface *interface-name*]** hierarchy level.

NOTE: For proper operation of keepalives on a GRE interface, you must also include the family inet statement at the [edit interfaces *interface-name* unit *unit*] hierarchy level. If you do not include this statement, the interface is marked as down.

To configure a GRE tunnel interface:

1. Configure the GRE tunnel interface at **[edit interfaces *interface-name* unit *unit-number*]** hierarchy level, where the interface name is gr-x/y/z, and the family is set as **inet**.

   ```
   user@host# set interfaces interface-name unit unit-number family family-name
   ```

2. Configure the rest of the GRE tunnel interface options based on requirement.

To configure keepalive time for a GRE tunnel interface:

1. Configure the Operation, Administration, and Maintenance (OAM) protocol at the **[edit protocols]** hierarchy level for the GRE tunnel interface.

   ```
   [edit]
   user@host# edit protocols oam
   ```

2. Configure the GRE tunnel interface option for OAM protocol.

   ```
   [edit protocols oam]
   user@host# edit gre-tunnel interface interface-name
   ```

3. Configure the keepalive time from 1 through 50 seconds for the GRE tunnel interface.

   ```
   [edit protocols oam gre-tunnel interface interface-name]
   user@host# set keepalive-time seconds
   ```

4. Configure the hold time from 5 through 250 seconds. Note that the hold time must be at least twice the keepalive time.

   ```
   [edit protocols oam gre-tunnel interface interface-name]
   user@host# set hold-time seconds
   ```


Display GRE Keepalive Time Configuration

Purpose Display the configured keepalive time value as 10 and hold time value as 30 on a GRE tunnel interface (for example, gr-1/1/10.1):

Action To display the configured values on the GRE tunnel interface, run the **show oam gre-tunnel** command at the **[edit protocols]** hierarchy level:

```
[edit protocols]
user@host# show oam gre-tunnel
  interface gr-1/1/10.1 {
    keepalive-time 10;
    hold-time 30;
  }
```

Display Keepalive Time Information on a GRE Tunnel Interface

Purpose Display the current status information of a GRE tunnel interface when keepalive time and hold time parameters are configured on it and when the hold time expires.

Action To verify the current status information on a GRE tunnel interface (for example, gr-3/3/0.3), run the **show interfaces gr-3/3/0.3 terse** and **show interfaces gr-3/3/0.3 extensive** operational commands.

show interfaces gr-3/3/0.3 terse

user@host> **show interfaces gr-3/3/0.3 terse**

```
                                      Interface               Admin Link Proto
 Local                  Remote

                                      gr-3/3/0.3              up    up   inet
 200.1.3.1/24

                                      mpls
```

show interfaces gr-3/3/0.3 extensive

user@host> **show interfaces gr-3/3/0.3 extensive**

```
Logical interface gr-3/3/0.3 (Index 73) (SNMP ifIndex 594) (Generation 900)
                                            Flags: Point-To-Point SNMP-Traps
0x4000 IP-Header 10.1.19.11:10.1.19.12:47:df:64:0000000000000000 Encapsulation:
GRE-NULL
                                            Gre keepalives configured: On, Gre
keepalives adjacency state: down

^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^
```



```
                                             Traffic statistics:
                      Input  bytes  :            15629992
                      Output bytes  :            15912273
                      Input  packets:              243813
                      Output packets:              179476
                      Local statistics:
                      Input  bytes  :            15322586
                      Output bytes  :            15621359
                      Input  packets:              238890
                      Output packets:              174767
                      Transit statistics:
                      Input  bytes  :              307406                    0
bps
                      Output bytes  :              290914                    0
bps
                      Input  packets:                4923                    0
pps
                      Output packets:                4709                    0
pps
                      Protocol inet, MTU: 1476, Generation: 1564, Route table: 0

                      Flags: Sendbcast-pkt-to-re
                      Addresses, Flags: Dest-route-down Is-Preferred Is-Primary
                        ^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^
                        Destination: 200.1.3/24, Local: 200.1.3.1, Broadcast:
200.1.3.255, Generation: 1366
                        Protocol mpls, MTU: 1464, Maximum labels: 3, Generation:
 1565, Route table: 0
```


NOTE:
When the hold time expires:

- The GRE tunnel will stay up even though the interface cannot send or receive traffic.
- The **Link** status will be **Up** and the **Gre keepalives adjacency state** will be **Down**.

Meaning The current status information of a GRE tunnel interface with keepalive time and hold time parameters is displayed as expected when the hold time expires.

Related Documentation

- Understanding GRE Keepalive Time on page 13

SRX4600 LED Scheme Overview

LEDs on the interface cards display the status of the ports. In SRX4600 gateways, there are four port LEDs per port. Each port provides an individual status LED with two states signaled by the color/LED state: OFF and SOLID GREEN.

The following port LED display modes are defined:

Table 8: Port LED State for SFP+

State	LED 1 – 4 (starting from left)
Default (power on, with or without Transceiver)	Off
Link Up	Solid Green for 10G
Link Down or Fault	Off
Admin Disable/Down	Off

Table 9: Port LED State for QSFP

State	LED 1 – 4 (starting from left)
Default (power on, with or without Transceiver)	Off
Link Up in 40G mode	LED-1 Solid Green
Link Up in 4x10G mode	Corresponding LED Solid Green
Link Down or Fault in 40G mode	Off

Table 9: Port LED State for QSFP (continued)

State	LED 1 – 4 (starting from left)
Link Down or Fault in 4x10G mode	Corresponding LED OFF
Admin Disable/Down in 40G mode	Off
Admin Disable/Down in 4x10G mode	Corresponding LED OFF

Table 10: Port LED State for QSFP28

State	LED 1 – 4 (starting from left)
Default (power on, with or without Transceiver)	Off
Link Up in 100G mode	LED-1 Solid Green
Link Down or Fault in 100G mode	Off
Admin Disable/Down in 100G mode	Off

Related Documentation

- Supported Active Physical Rate-Selectable Ports to Prevent Oversubscription on SRX4600 Gateway on page 55

CHAPTER 2

Configuring Interface Logical Properties

Understanding Interface Logical Properties

The logical properties of an interface are the characteristics that do not apply to the physical interface or the wires connected to it. Logical properties include:

- Protocol families running on the interface (including any protocol-specific MTUs)
- IP address or addresses associated with the interface. A logical interface can be configured with an IPv6 address, IPv4 address, or both. The IP specification requires a unique address on every interface of each system attached to an IP network, so that traffic can be correctly routed. Individual hosts such as home computers must have a single IP address assigned. Devices must have a unique IP address for every interface.
- Virtual LAN (VLAN) tagging
- Any firewall filters or routing policies that are operating on the interface

Related Documentation

- Understanding Interfaces on page 3
- Understanding Protocol Families on page 20
- Understanding IPv6 Address Space, Addressing, Address Format, and Address Types on page 24
- Understanding Virtual LANs on page 43

Understanding Protocol Families

A protocol family is a group of logical properties within an interface configuration. Protocol families include all the protocols that make up a protocol suite. To use a protocol within a particular suite, you must configure the entire protocol family as a logical property for an interface. The protocol families include common and not-so-common protocol suites.

This topic contains the following sections:

Common Protocol Suites

Junos OS protocol families include the following common protocol suites:

- Inet—Supports IP protocol traffic, including OSPF, BGP, and Internet Control Message Protocol (ICMP).
- Inet6—Supports IPv6 protocol traffic, including RIP for IPv6 (RIPng), IS-IS, and BGP.
- ISO—Supports IS-IS traffic.
- MPLS—Supports MPLS.

NOTE: **Junos OS security features are flow-based—meaning the device sets up a flow to examine the traffic. Flow-based processing is not supported for ISO or MPLS protocol families.**

Other Protocol Suites

In addition to the common protocol suites, Junos protocol families sometimes use the following protocol suites:

- **ccc**—Circuit cross-connect (CCC).
- **mlfr-uni-nni**—Multilink Frame Relay (MLFR) FRF.16 user-to-network network-to-network (UNI NNI).
- **mlfr-end-to-end**—Multilink Frame Relay end-to-end.
- **mlppp**—Multilink Point-to-Point Protocol.
- **tcc**—Translational cross-connect (TCC).
- **tnp**—Trivial Network Protocol. This Juniper Networks proprietary protocol provides communication between the Routing Engine and the device's packet forwarding components. Junos OS automatically configures this protocol family on the device's internal interfaces only.

Related Documentation

- Understanding Interface Logical Properties on page 19

Understanding IPv4 Addressing

IPv4 addresses are 32-bit numbers that are typically displayed in dotted decimal notation. A 32-bit address contains two primary parts: the network prefix and the host number.

All hosts within a single network share the same network address. Each host also has an address that uniquely identifies it. Depending on the scope of the network and the type of device, the address is either globally or locally unique. Devices that are visible to users outside the network (webservers, for example) must have a globally unique IP address. Devices that are visible only within the network must have locally unique IP addresses.

IP addresses are assigned by a central numbering authority called the Internet Assigned Numbers Authority (IANA). IANA ensures that addresses are globally unique where needed and has a large address space reserved for use by devices not visible outside their own networks.

This topic contains the following sections:

IPv4 Classful Addressing

To provide flexibility in the number of addresses distributed to networks of different sizes, 4-octet (32-bit) IP addresses were originally divided into three different categories or classes: class A, class B, and class C. Each address class specifies a different number of bits for its network prefix and host number:

- Class A addresses use only the first byte (octet) to specify the network prefix, leaving 3 bytes to define individual host numbers.
- Class B addresses use the first 2 bytes to specify the network prefix, leaving 2 bytes to define host addresses.
- Class C addresses use the first 3 bytes to specify the network prefix, leaving only the last byte to identify hosts.

In binary format, with an **x** representing each bit in the host number, the three address classes can be represented as follows:

```
00000000 xxxxxxxx xxxxxxxx xxxxxxxx (Class A)
00000000 00000000 xxxxxxxx xxxxxxxx (Class B)
00000000 00000000 00000000 xxxxxxxx (Class C)
```

Because each bit (**x**) in a host number can have a 0 or 1 value, each represents a power of 2. For example, if only 3 bits are available for specifying the host number, only the following host numbers are possible:

```
111 110 101 100 011 010 001 000
```

In each IP address class, the number of host-number bits raised to the power of 2 indicates how many host numbers can be created for a particular network prefix. Class A addresses have 2^{24} (or 16,777,216) possible host numbers, class B addresses have 2^{16} (or 65,536) host numbers, and class C addresses have 2^{8} (or 256) possible host numbers.

IPv4 Dotted Decimal Notation

The 32-bit IPv4 addresses are most often expressed in dotted decimal notation, in which each octet (or byte) is treated as a separate number. Within an octet, the rightmost bit represents 2^{0} (or 1), increasing to the left until the first bit in the octet is 2^{7} (or 128). Following are IP addresses in binary format and their dotted decimal equivalents:

```
11010000 01100010 11000000 10101010 = 208.98.192.170
01110110 00001111 11110000 01010101 = 118.15.240.85
00110011 11001100 00111100 00111011 = 51.204.60.59
```

IPv4 Subnetting

Because of the physical and architectural limitations on the size of networks, you often must break large networks into smaller subnetworks. Within a network, each wire or ring requires its own network number and identifying subnet address.

Figure 1 on page 22 shows two subnets in a network.

Figure 1: Subnets in a Network

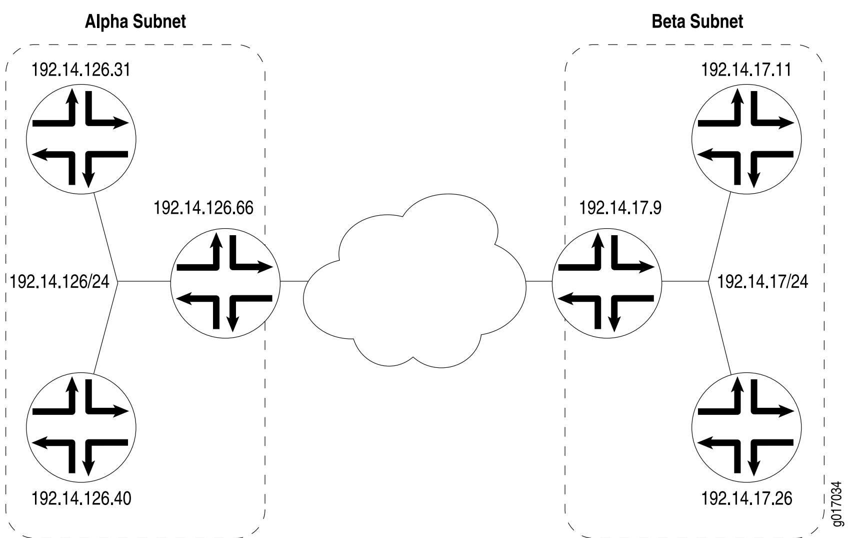


Figure 1 on page 22 shows three devices connected to one subnet and three more devices connected to a second subnet. Collectively, the six devices and two subnets make up the larger network. In this example, the network is assigned the network prefix **192.14.0.0**, a class B address. Each device has an IP address that falls within this network prefix.

In addition to sharing a network prefix (the first two octets), the devices on each subnet share a third octet. The third octet identifies the subnet. All devices on a subnet must have the same subnet address. In this case, the alpha subnet has the IP address **192.14.126.0** and the beta subnet has the IP address **192.14.17.0**.

The subnet address **192.14.17.0** can be represented as follows in binary notation:

```
11000000 . 00001110 . 00010001 . xxxxxxxx
```

Because the first 24 bits in the 32-bit address identify the subnet, the last 8 bits are not significant. To indicate the subnet, the address is written as **192.14.17.0/24** (or just **192.14.17/24**). The **/24** is the subnet mask (sometimes shown as **255.255.255.0**).

IPv4 Variable-Length Subnet Masks

Traditionally, subnets were divided by address class. Subnets had either 8, 16, or 24 significant bits, corresponding to 2^{24}, 2^{16}, or 2^{8} possible hosts. As a result, an entire /16 subnet had to be allocated for a network that required only 400 addresses, wasting 65,136 (2^{16} – 400 = 65,136) addresses.

To help allocate address spaces more efficiently, variable-length subnet masks (VLSMs) were introduced. Using VLSM, network architects can allocate more precisely the number of addresses required for a particular subnet.

For example, suppose a network with the prefix **192.14.17/24** is divided into two smaller subnets, one consisting of 18 devices and the other of 46 devices.

To accommodate 18 devices, the first subnet must have 2^{5} (32) host numbers. Having 5 bits assigned to the host number leaves 27 bits of the 32-bit address for the subnet. The IP address of the first subnet is therefore **192.14.17.128/27**, or the following in binary notation:

```
11000000 . 00001110 . 00010001 . 100xxxxx
```

The subnet mask includes 27 significant digits.

To create the second subnet of 46 devices, the network must accommodate 2^{6} (64) host numbers. The IP address of the second subnet is **192.14.17.64/26**, or

```
11000000 . 00001110 . 00010001 . 01xxxxxx
```

By assigning address bits within the larger **/24** subnet mask, you create two smaller subnets that use the allocated address space more efficiently.

Related Documentation

- Understanding Interface Logical Properties on page 19
- Understanding IPv6 Address Space, Addressing, Address Format, and Address Types on page 24

Understanding IPv6 Address Space, Addressing, Address Format, and Address Types

Understanding IP Version 6 (IPv6)

The ongoing expansive growth of the Internet and the need to provide IP addresses to accommodate it—to support increasing numbers of new users, computer networks, Internet-enabled devices, and new and improved applications for collaboration and communication—is escalating the emergent use of a new IP protocol. IPv6, with its robust architecture, was designed to satisfy these current and anticipated near future requirements.

IP version 4 (IPv4) is widely used throughout the world today for the Internet, intranets, and private networks. IPv6 builds upon the functionality and structure of IPv4 in the following ways:

- Provides a simplified and enhanced packet header to allow for more efficient routing.
- Improves support for mobile phones and other mobile computing devices.
- Enforces increased, mandatory data security through IPsec (which was originally designed for it).
- Provides more extensive quality-of-service (QoS) support.

IPv6 addresses consist of 128 bits, instead of 32 bits, and include a scope field that identifies the type of application suitable for the address. IPv6 does not support broadcast addresses, but instead uses multicast addresses for broadcast. In addition, IPv6 defines a new type of address called anycast.

Understanding IPv6 Address Types and How Junos OS for SRX Series Services Gateway Uses Them

IP version 6 (IPv6) includes the following types of addresses:

- Unicast

  A unicast address specifies an identifier for a single interface to which packets are delivered. Under IPv6, the vast majority of Internet traffic is foreseen to be unicast, and it is for this reason that the largest assigned block of the IPv6 address space is dedicated to unicast addressing. Unicast addresses include all addresses other than loopback, multicast, link-local-unicast, and unspecified.

  For SRX Series devices, the flow module supports the following kinds of IPv6 unicast packets:

  - Pass-through unicast traffic, including traffic from and to virtual routers. The device transmits pass-through traffic according to its routing table.

  - Host-inbound traffic from and to devices directly connected to SRX Series interfaces. For example, host-inbound traffic includes logging, routing protocol, and management types of traffic. The flow module sends these unicast packets to the Routing Engine and receives them from it. Traffic is processed by the Routing Engine instead of by the flow module, based on routing protocols defined for the Routing Engine.

    The flow module supports all routing and management protocols that run on the Routing Engine. Some examples are OSPFv3, RIPng, TELNET, and SSH.

- Multicast

  A multicast address specifies an identifier for a set of interfaces that typically belong to different nodes. It is identified by a value of 0xFF. IPv6 multicast addresses are distinguished from unicast addresses by the value of the high-order octet of the addresses.

  The devices support only host-inbound and host-outbound multicast traffic. Host inbound traffic includes logging, routing protocols, management traffic, and so on.

- Anycast

  An anycast address specifies an identifier for a set of interfaces that typically belong to different nodes. A packet with an anycast address is delivered to the nearest node, according to routing protocol rules.

  There is no difference between anycast addresses and unicast addresses except for the subnet-router address. For an anycast subnet-router address, the low order bits, typically 64 or more, are zero. Anycast addresses are taken from the unicast address space.

  The flow module treats anycast packets in the same way as it handles unicast packets. If an anycast packet is intended for the device, it is treated as host-inbound traffic, and it delivers it to the protocol stack which continues processing it.

IPv6 Address Scope

Unicast and multicast IPv6 addresses support address scoping, which identifies the application suitable for the address.

Unicast addresses support global address scope and two types of local address scope:

- Link-local unicast addresses—Used only on a single network link. The first 10 bits of the prefix identify the address as a link-local address. Link-local addresses cannot be used outside the link.
- Site-local unicast addresses—Used only within a site or intranet. A site consists of multiple network links. Site-local addresses identify nodes inside the intranet and cannot be used outside the site.

Multicast addresses support 16 different types of address scope, including node, link, site, organization, and global scope. A 4-bit field in the prefix identifies the address scope.

IPv6 Address Structure

Unicast addresses identify a single interface. Each unicast address consists of ***n*** bits for the prefix, and 128 – ***n*** bits for the interface ID.

Multicast addresses identify a set of interfaces. Each multicast address consists of the first 8 bits of all 1s, a 4-bit flags field, a 4-bit scope field, and a 112-bit group ID:

```
11111111 | flgs | scop | group ID
```

The first octet of 1s identifies the address as a multicast address. The flags field identifies whether the multicast address is a well-known address or a transient multicast address. The scope field identifies the scope of the multicast address. The 112-bit group ID identifies the multicast group.

Similar to multicast addresses, anycast addresses identify a set of interfaces. However, packets are sent to only one of the interfaces, not to all interfaces. Anycast addresses are allocated from the normal unicast address space and cannot be distinguished from a unicast address in format. Therefore, each member of an anycast group must be configured to recognize certain addresses as anycast addresses.

Understanding IPv6 Address Space, Addressing, and Address Types

Addressing is the area where most of the differences between IP version 4 (IPv4) and IPv6 exist, but the changes are largely about the ways in which addresses are implemented and used. IPv6 has a vastly larger address space than the impending exhausted IPv4 address space. IPv6 increases the size of the IP address from the 32 bits that compose an IPv4 address to 128 bits. Each extra bit given to an address doubles the size of the address space.

IPv4 has been extended using techniques such as Network Address Translation (NAT), which allows for ranges of private addresses to be represented by a single public address, and temporary address assignment. Although useful, these techniques fall short of the requirements of novel applications and environments such as emerging wireless technologies, always-on environments, and Internet-based consumer appliances.

In addition to the increased address space, IPv6 addresses differ from IPv4 addresses in the following ways:

- Includes a scope field that identifies the type of application that the address pertains to
- Does not support broadcast addresses, but instead uses multicast addresses to broadcast a packet
- Defines a new type of address, called anycast

Understanding IPv6 Address Format

All IPv6 addresses are 128 bits long, written as 8 sections of 16 bits each. They are expressed in hexadecimal representation, so the sections range from 0 to FFFF. Sections are delimited by colons, and leading zeroes in each section may be omitted. If two or more consecutive sections have all zeroes, they can be collapsed to a double colon.

IPv6 addresses consist of 8 groups of 16-bit hexadecimal values separated by colons (:). IPv6 addresses have the following format:

```
aaaa:aaaa:aaaa:aaaa:aaaa:aaaa:aaaa:aaaa
```

Each **aaaa** is a 16-bit hexadecimal value, and each **a** is a 4-bit hexadecimal value. Following is a sample IPv6 address:

```
3FFE:0000:0000:0001:0200:F8FF:FE75:50DF
```

You can omit the leading zeros of each 16-bit group, as follows:

```
3FFE:0:0:1:200:F8FF:FE75:50DF
```

You can compress 16-bit groups of zeros to double colons (::) as shown in the following example, but only once per address:

```
3FFE::1:200:F8FF:FE75:50DF
```

An IPv6 address prefix is a combination of an IPv6 prefix (address) and a prefix length. The prefix takes the form *ipv6-prefix/prefix-length* and represents a block of address space (or a network). The *ipv6-prefix* variable follows general IPv6 addressing rules. The */prefix-length* variable is a decimal value that indicates the number of contiguous, higher-order bits of the address that make up the network portion of the address. For example, 10FA:6604:8136:6502::/64 is a possible IPv6 prefix.

For more information on the text representation of IPv6 addresses and address prefixes, see RFC 4291, *IP Version 6 Addressing Architecture*.

Limitations

SRX300, SRX320, SRX340, SRX345, and SRX550HM devices have the following limitations:

- Changes in source AS and destination AS are not immediately reflected in exported flows.
- IPv6 traffic transiting over IPv4 based IP over IP tunnel (for example, IPv6-over-IPv4 using ip-x/x/x interface) is not supported.

Related Documentation

- *About the IPv6 Basic Packet Header*
- *Understanding IPv6 Packet Header Extensions*

Configuring the inet6 IPv6 Protocol Family

In configuration commands, the protocol family for IPv6 is named **inet6**. In the configuration hierarchy, instances of **inet6** are parallel to instances of **inet**, the protocol family for IPv4. In general, you configure **inet6** settings and specify IPv6 addresses in parallel to **inet** settings and IPv4 addresses.

NOTE: On SRX Series devices, on configuring identical IPs on a single interface, you will not see a warning message; instead, you will see a syslog message.

The following example shows the CLI commands you use to configure an IPv6 address for an interface:

```
[edit]
user@host# show interfaces
```

```
ge-0/0/0 {
    unit 0 {
        family inet {
            address 10.100.37.178/24;
        }
    }
}
```

```
[edit]
user@host# set interfaces ge-0/0/0 unit 0 family ?
```

```
Possible completions:
+ apply-groups         Groups from which to inherit configuration data
+ apply-groups-except  Don't inherit configuration data from these groups
> ccc                  Circuit cross-connect parameters
> ethernet-switching   Ethernet switching parameters
> inet                 IPv4 parameters
> inet6                IPv6 protocol parameters
> iso                  OSI ISO protocol parameters
> mpls                 MPLS protocol parameters
> tcc                  Translational cross-connect parameters
> vpls                 Virtual private LAN service parameters
```

```
[edit]
user@host# set interfaces ge-0/0/0 unit 0 family inet6 address 8d8d:8d01::1/64
user@host# show interfaces
```

```
ge-0/0/0 {
    unit 0 {
        family inet {
            address 10.100.37.178/24;
        }
        family inet6 {
            address 8d8d:8d01::1/64;
        }
    }
}
```


Related Documentation

- Understanding IPv6 Address Space, Addressing, Address Format, and Address Types on page 24
- *Enabling Flow-Based Processing for IPv6 Traffic*

Understanding IPv6 Support VDSL2 Interfaces

SRX300, SRX320, SRX340, SRX345, and SRX550HM devices support IPv6 on the following DSL encapsulations:

- ATM physical interface encapsulations
  - atm-pvc
  - ethernet-over-atm
- ATM logical interface encapsulations
  - atm-snap
  - atm-ppp-vc-mux
  - atm-nlpid
  - atm-cisco-nlpid
  - atm-ppp-llc
  - ether-over-atm-llc

NOTE: **The encapsulation types atm-vc-mux and ppp-over-ether-over-atm-llc do not include IPv6 support.**

To configure IPv6 addresses on DSL interfaces in ATM or PTM mode, include the family protocol type as **inet6** at the [**edit interfaces**] hierarchy level.

Related Documentation

- Understanding Interface Logical Properties on page 19

Example: Configuring the IPv6 Address on an ADSL Interface

This example shows how to configure the IPv6 address on an ADSL interface.

Requirements

Before you begin, configure network interfaces as necessary. See "Understanding Ethernet Interfaces" on page 255.

Overview

In this example, you specify the following configuration parameters:

- Encapsulation type: Ethernet over ATM on DSL logical interface
- ATM virtual path identifier (VPI): 2
- Encapsulation type: Ethernet over ATM on DSL logical interface
- Encapsulation type for the ATM-for-ADSL logical unit: Ethernet over ATM LLC
- ATM virtual channel (VCI): 2.118
- IPv6 address and prefix: 13:13::1/64

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, copy and paste the commands into the CLI at the **[edit]** hierarchy level, and then enter **commit** from configuration mode.

```
set interfaces at-1/0/0 encapsulation ethernet-over-atm
set interfaces at-1/0/0 atm-options vpi 2
set interfaces at-1/0/0 unit 0 encapsulation ether-over-atm-llc
set interfaces at-1/0/0 unit 0 vci 2.118
set interfaces at-1/0/0 unit 0 family inet6 address 13:13::1/64
```

Step-by-Step Procedure

To configure the IPv6 address on an ADSL interface:

1. Configure the encapsulation type.

   ```
   [edit]
   user@host# set interfaces at-1/0/0 encapsulation ethernet-over-atm
   ```

2. Specify the annex type.

   ```
   [edit]
   user@host# set interfaces at-1/0/0 atm-options vpi 2
   ```

3. Configure the encapsulation for the logical unit.

   ```
   [edit]
   user@host# set interfaces at-1/0/0 unit 0 encapsulation ether-over-atm-llc
   ```


4. Configure the VCI value.

```
[edit]
user@host# set interfaces at-1/0/0 unit 0 vci 2.118
```

5. Configure family protocol type and assign an IPv6 address.

```
[edit]
user@host# set interfaces at-1/0/0 unit 0 family inet6 address 13:13::1/64
```

Results From configuration mode, confirm your configuration by entering the **show interfaces at-1/0/0** command. If the output does not display the intended configuration, repeat the configuration instructions in this example to correct it.

```
[edit]
user@host# show interfaces at-1/0/0
encapsulation ethernet-over-atm;
atm-options {
  vpi 2;
}
unit 0 {
  encapsulation ether-over-atm-llc;
  vci 2.118;
  family inet6 {
    address 13:13::1/64;
  }
}
```

If you done configuring the device, enter **commit** from configuration mode.

Verification

Confirm that the configuration is working properly.

Verifying ADSL Interface Properties

Purpose Verify that the ADSL interface properties are configured properly.

Action From operational mode, enter the **show ipv6 neighbors** command. The output shows a summary of interface information.

```
user@host> show ipv6 neighbors
IPv6 Address     Linklayer Address   State       Exp Rtr Secure  Interface
   10:1::2           00:00:0a:00:00:00   reachable   17   yes  no     reth0.0

   13:13::1          00:19:e2:4b:61:83   stale       1197 yes  no     at-1/0/0.0

   12:12::2          00:19:e2:4b:61:83   stale       1188 yes  no     at-3/0/0.0
```

Meaning The **IPv6 Address** field displays the configured IPv6 address on the interface.

Related Documentation

- Understanding Interfaces on page 3
- Configuring the inet6 IPv6 Protocol Family on page 28
- show ipv6 neighbors on page 913
- clear ipv6 neighbors on page 753

Understanding MAC Limiting on Layer 3 Routing Interfaces

Overview

The MAC limiting feature provides a mechanism for limiting MAC addresses on devices that are connected to a Layer 3 routed Gigabit Ethernet (GE), Fast Ethernet (FE), or 10 Gigabit Ethernet (XE) interface. With MAC filters, you can allow traffic with specific source MAC. Software-based MAC limiting is supported. MAC limiting is applicable only on interfaces with plain Ethernet or VLAN tagged encapsulation.

Both the physical interface level **source-address-filter** and logical interface level **accept-source-mac** configurations are supported on SRX100, SRX210, SRX220, SRX240, SRX300, SRX320, SRX340, and SRX650 devices. (Platform support depends on the Junos OS release in your installation.) The following considerations apply when you configure the **source-address-filter** and **accept-source-mac** statements:

- If only the logical level **accept-source-mac** statement is configured, traffic from only those configured MAC addresses will be allowed on the logical interface.
- If only the physical interface level **source-address-filter** statement is configured, the physical interface's *allowed* MAC addresses are also considered the *allowed* addresses for all the logical interfaces belonging to the physical interface. Incoming packets from any other source MAC addresses are dropped.
- If the physical interface level **source-address-filter** is configured under **gigether-options** (or **fastether-options**) and **accept-source-mac** is configured for one or more of its logical interfaces or VLANs, the allowed list of addresses is a combination of MAC addresses specified in both the statements. For logical interfaces and VLANs where the **accept-source-mac** statement is not configured, the physical interface's *allowed* list of addresses is considered.

You can configure an interface to receive packets from specific MAC addresses. To do this, specify the MAC addresses in the **source-address-filter** or **accept-source-mac** statements:

- **Logical level MAC filter configuration on an untagged interface**


```
ge-0/0/10 {
   unit 0 {
      accept-source-mac {
         mac-address 00:22:33:44:55:66;
         mac-address 00:26:88:e9:a3:01;
      }
      family inet {
         address 60.60.60.1/24;
      }
   }
}
```

- Physical level MAC filter configuration on an untagged interface

```
ge-0/0/10 {
   gigether-options {
      source-address-filter {
         00:55:55:55:55:66;
         00:26:88:e9:a3:01;
      }
   }
   unit 0 {
      family inet {
         address 60.60.60.1/24;
      }
   }
}
```

- Physical and logical level MAC filter configurations on a tagged interface

```
ge-0/0/10 {
   vlan-tagging;
   gigether-options {
      source-address-filter {
         00:26:88:e9:a3:01;
      }
   }
   unit 0 {
      vlan-id 40;
      accept-source-mac {
         mac-address 00:22:33:44:55:66;
      }
      family inet {
         address 40.40.40.1/24;
      }
   }
   unit 1 {
      vlan-id 60;
      accept-source-mac {
         mac-address 00:55:55:55:55:66;
      }
      family inet {
         address 60.60.60.1/24;
      }
```

```
  }
}
```

NOTE: On untagged Gigabit Ethernet interfaces, you must not configure the **source-address-filter** and the **accept-source-mac** statements simultaneously. If these statements are configured for the same interfaces at the same time, an error message appears. However, in the case of tagged VLANs, both these statements can be configured simultaneously, if no identical MAC addresses are specified.

Limitations

The following limitations apply to MAC limiting support on Layer 3 routed GE, FE, or XE interfaces:

- You can configure only 32 MAC addresses per device.
- Only software-based MAC filtering is supported. Software-based MAC filtering impacts performance. The performance impact is proportional to the number of MAC addresses configured.
- MAC- based policer or rate limiting is not supported.
- You cannot configure broadcast or multicast address in the source-address-filter statement.
- MAC filtering is not supported on Aggregated Ethernet (AE), Fabric Ethernet, Point-to-Point Protocol over Ethernet (PPPoE), Routed VLAN interface (RVI), or VLAN interfaces.

  MAC filtering is not supported on chassis clusters.

Related Documentation

- Understanding Interface Logical Properties on page 19

CHAPTER 3

Understanding Interface Physical Properties

Understanding Interface Physical Properties

The physical properties of a network interface are the characteristics associated with the physical link that affect the transmission of either link-layer signals or the data across the links. Physical properties include clocking properties, transmission properties, such as the maximum transmission unit (MTU), and encapsulation methods, such as point-to-point and Frame Relay encapsulation.

The default property values for an interface are usually sufficient to successfully enable a bidirectional link. However, if you configure a set of physical properties on an interface, those same properties must be set on all adjacent interfaces to which a direct connection is made.

Table 11 on page 35 summarizes some key physical properties of device interfaces.

Table 11: Interface Physical Properties

Physical Property	Description
bert-error-rate	Bit error rate (BER). The error rate specifies the number of bit errors in a particular bit error rate test (BERT) period required to generate a BERT error condition. See "Understanding Bit Error Rate Testing" on page 37.
bert-period	Bit error rate test (BERT) time period over which bit errors are sampled. See "Understanding Bit Error Rate Testing" on page 37.
chap	Challenge Handshake Authentication Protocol (CHAP). Specifying **chap** enables CHAP authentication on the interface. See "Understanding CHAP Authentication on a PPPoE Interface" on page 447.

Table 11: Interface Physical Properties (continued)

Physical Property	Description
clocking	Clock source for the link. Clocking can be provided by the local system (internal) or a remote endpoint on the link (external). By default, all interfaces use the internal clocking mode. If an interface is configured to accept an external clock source, one adjacent interface must be configured to act as a clock source. Under this configuration, the interface operates in a loop timing mode, in which the clocking signal is unique for that individual network segment or loop. See "Understanding Interface Clocking" on page 37.
description	A user-defined text description of the interface, often used to describe the interface's purpose.
disable	Administratively disables the interface.
encapsulation	Type of encapsulation on the interface. Common encapsulation types include PPP, Frame Relay, Cisco HDLC, and PPP over Ethernet (PPPoE). See "Understanding Physical Encapsulation on an Interface" on page 401.
fcs	Frame check sequence (FCS). FCS is an error-detection scheme that appends parity bits to a digital signal and uses decoding algorithms that detect errors in the received digital signal.
mtu	Maximum transmission unit (MTU) size. MTU is the largest size packet or frame, specified in bytes or octets, that can be sent in a packet-based or frame-based network. The TCP uses MTU to determine the maximum size of each packet in any transmission. You can adjust the MTU values at the physical interfaces by using the following command: **set interface *interface-name* mtu *mtu-value*** Sometimes there is a need to reduce the MTU values on interfaces to match the host tap interface MTU otherwise packets are dropped. You can adjust the MTU values by setting the **mtu** option of the **set interfaces [fxp0 | em0 | fab0 | fab1]** command to a value between 256 and 9192. Example: `user@host# set interfaces em0 mtu 1400` The supported range for configuring an MTU packet size is 256 through 9192 bytes. However, all interfaces do not support 9192 bytes. For more information on the supported interfaces, see "MTU Default and Maximum Values" on page 39.
no-keepalives	Disabling of keepalive messages across a physical link. A keepalive message is sent between network devices to indicate that they are still active. Keepalives help determine whether the interface is operating correctly. Except for ATM-over-ADSL interfaces, all interfaces use keepalives by default.
pap	Password Authentication Protocol (PAP). Specifying **pap** enables PAP authentication on the interface. See "Understanding CHAP Authentication on a PPPoE Interface" on page 447.
payload-scrambler	Scrambling of traffic transmitted out the interface. Payload scrambling randomizes the data payload of transmitted packets. Scrambling eliminates nonvariable bit patterns (strings of all 1s or all 0s) that generate link-layer errors across some physical links.

Related Documentation

- Understanding Interfaces on page 3
- Understanding Bit Error Rate Testing on page 37

Understanding Bit Error Rate Testing

In telecommunication transmission, the bit error rate (BER) is the percentage of bits that have errors compared to the total number of bits received in a transmission, usually expressed as 10 to a negative power. For example, a transmission with a BER of 10^{-6} received 1 errored bit in 1,000,000 bits transmitted. The BER indicates how often a packet or other data unit must be retransmitted because of an error. If the BER is too high, a slower data rate might improve the overall transmission time for a given amount of data if it reduces the BER and thereby lowers the number of resent packets.

A bit error rate test (BERT) is a procedure or device that measures the BER for a given transmission. You can configure a device to act as a BERT device by configuring the interface with a bit error rate and a testing period. When the interface receives a BERT request from a BER tester, it generates a response in a well-known BERT pattern. The initiating device checks the BERT-patterned response to determine the number of bit errors.

Related Documentation

- Understanding Interface Physical Properties on page 35

Understanding Interface Clocking

Clocking determines how individual routing nodes or entire networks sample transmitted data. As streams of information are received by a device in a network, a clock source specifies when to sample the data. In asynchronous networks, the clock source is derived locally, and synchronous networks use a central, external clock source. Interface clocking indicates whether the device uses asynchronous or synchronous clocking.

NOTE: Because truly synchronous networks are difficult to design and maintain, most synchronous networks are really plesiochronous networks. In a plesiochronous network, different timing regions are controlled by local clocks that are synchronized (with very narrow constraints). Such networks approach synchronicity and are generally known as synchronous networks.

Most networks are designed to operate as asynchronous networks. Each device generates its own clock signal, or devices use clocks from more than one clock source. The clocks within the network are not synchronized to a single clock source. By default, devices generate their own clock signals to send and receive traffic.

The system clock allows the device to sample (or detect) and transmit data being received and transmitted through its interfaces. Clocking enables the device to detect and transmit the 0s and 1s that make up digital traffic through the interface. Failure to detect the bits within a data flow results in dropped traffic.

Short-term fluctuations in the clock signal are known as *clock jitter*. Long-term variations in the signal are known as *clock wander*.

Asynchronous clocking can either derive the clock signal from the data stream or transmit the clocking signal explicitly.

This topic contains the following sections:

- Data Stream Clocking on page 38
- Explicit Clocking Signal Transmission on page 38

Data Stream Clocking

Common in T1 links, data stream clocking occurs when separate clock signals are not transmitted within the network. Instead, devices must extract the clock signal from the data stream. As bits are transmitted across the network, each bit has a time slot of 648 nanoseconds. Within a time slot, pulses are transmitted with alternating voltage peaks and drops. The receiving device uses the period of alternating voltages to determine the clock rate for the data stream.

Explicit Clocking Signal Transmission

Clock signals that are shared by hosts across a data link must be transmitted by one or both endpoints on the link. In a serial connection, for example, one host operates as a clock master and the other operates as a clock slave. The clock master internally generates a clock signal that is transmitted across the data link. The clock slave receives the clock signal and uses its period to determine when to sample data and how to transmit data across the link.

This type of clock signal controls only the connection on which it is active and is not visible to the rest of the network. An explicit clock signal does not control how other devices or even other interfaces on the same device sample or transmit data.

Related Documentation

- Understanding Interface Physical Properties on page 35

Understanding Frame Check Sequences

All packets or frames within a network can be damaged by crosstalk or interference in the network's physical wires. The frame check sequence (FCS) is an extra field in each transmitted frame that can be analyzed to determine if errors have occurred. The FCS uses cyclic redundancy checks (CRCs), checksums, and two-dimensional parity bits to detect errors in the transmitted frames.

This topic contains the following sections:

- Cyclic Redundancy Checks and Checksums on page 39
- Two-Dimensional Parity on page 39

Cyclic Redundancy Checks and Checksums

On a link that uses CRCs for frame checking, the data source uses a predefined polynomial algorithm to calculate a CRC number from the data it is transmitting. The result is included in the FCS field of the frame and transmitted with the data. On the receiving end, the destination host performs the same calculation on the data it receives.

If the result of the second calculation matches the contents of the FCS field, the packet was sent and received without bit errors. If the values do not match, an FCS error is generated, the frame is discarded and the originating host is notified of the error.

Checksums function similarly to CRCs, but use a different algorithm.

Two-Dimensional Parity

On a link that uses two-dimensional parity bits for frame checking, the sending and receiving hosts examine each frame in the total packet transmission and create a parity byte that is evaluated to detect transmission errors.

For example, a host can create the parity byte for the following frame sequence by summing up each column (each bit position in the frame) and keeping only the least-significant bit:

```
Frame 1       0 1 0 1 0 0 1
Frame 2       1 1 0 1 0 0 1
Frame 3       1 0 1 1 1 1 0
Frame 4       0 0 0 1 1 1 0
Frame 5       0 1 1 0 1 0 0
Frame 6       1 0 1 1 1 1 1

Parity Byte   1 1 1 1 0 1 1
```

If the sum of the bit values in a bit position is even, the parity bit for the position is 0. If the sum is odd, the parity bit is 1. This method is called even parity. Matching parity bytes on the originating and receiving hosts indicate that the packet was received without error.

Related Documentation

- Understanding Interface Physical Properties on page 35

MTU Default and Maximum Values

The MTU values are by default without any MTU configurations. If the MTU value is set, then the formula **IFF MTU (IP MTU) = IFD MTU (Media MTU) – L2 Overhead** is applicable. See Table 12 on page 40 for default MTU values.

NOTE: For ATM MLPPP irrespective of UIFD MTU, the IP MTU is always 1500 because the IP MTU calculation is based on the LSQ interface. Even if you configure the LSQ family MTU, the IP MTU value cannot exceed 1504.

Table 12 on page 40 lists MTU values for the SRX Series Services Gateways Physical Interface Modules (PIMs).

Table 12: MTU Values for the SRX Series Services Gateways PIMs

PIM	Default Media MTU (Bytes)	Maximum MTU (Bytes)	Default IP MTU (Bytes)
1-Port Gigabit Ethernet Small Form-Factor Pluggable (SFP) Mini-PIM	1514	9010	1500
1-Port Small Form-Factor Pluggable (SFP) Mini-PIM	1514	1518	1500
DOCSIS Mini-PIM	1504	1504	1500
Serial Mini-PIM	1504	2000	1500
T1/E1 Mini-PIM	1504	2000	1500
Dual CT1/E1 GPIM	1504	9000	1500
Quad CT1/E1 GPIM	1504	9000	1500
2-Port 10- Gigabit Ethernet XPIM	1514	9192	1500
16-Port Gigabit Ethernet XPIM	1514	9192	1500
24-Port Gigabit Ethernet XPIM	1514	9192	1500
ADSL2+ Mini-PIM (Encapsulation)			
atm-snap	1512	1512	1504
atm-vcmux	1512	1512	1512
atm-nlpid	1512	1512	1508
atm-cisco-nlpid	1512	1512	1510
ether-over-atm-llc	1512	1512	1488
atm-ppp-llc	1512	1512	1506
atm-ppp-vcmux	1512	1512	1510
atm-mlppp-llc	1512	1512	1500
ppp-over-ether-over-atm-llc	1512	1512	1480

Table 12: MTU Values for the SRX Series Services Gateways PIMs (continued)

PIM	Default Media MTU (Bytes)	Maximum MTU (Bytes)	Default IP MTU (Bytes)
VDSL- Mini-PIM AT mode (Encapsulation)			
atm-snap	1514	1514	1506
atm-vcmux	1514	1514	1514
atm-nlpid	1514	1514	1510
atm-cisco-nlpid	1514	1514	1512
ether-over-atm-llc	1514	1524	1490
atm-ppp-llc	1514	1514	1508
atm-ppp-vcmux	1514	1514	1512
atm-mlppp-llc	1514	1514	1500
ppp-over-ether-over-atm-llc	1514	1514	1482
VDSL- Mini-PIM PT mode	1514	1514	1500
G.SHDSL Mini-PIM AT mode (Encapsulation)			
atm-snap	4482	4482	4470
atm-vcmux	4482	4482	4470
atm-nlpid	4482	4482	4470
atm-cisco-nlpid	4482	4482	4470
ether-over-atm-llc	4482	4482	1500
atm-ppp-llc	4482	4482	4476
atm-ppp-vcmux	4482	4482	4480
atm-mlppp-llc	4482	4482	1500
ppp-over-ether-over-atm-llc	4482	4482	1492

Table 12: MTU Values for the SRX Series Services Gateways PIMs (continued)

PIM	Default Media MTU (Bytes)	Maximum MTU (Bytes)	Default IP MTU (Bytes)
G.SHDSL Mini-PIM PT mode	1514	1514	1500

Related Documentation

- Understanding Interface Physical Properties on page 35

Understanding Jumbo Frames Support for Ethernet Interfaces

SRX Series devices support jumbo frames up to 9192 bytes.

Jumbo frames are Ethernet frames with more than 1500 bytes of payload (maximum transmission unit [MTU]). Jumbo frames can carry up to 9000 bytes of payload.

You configure jumbo frames at the physical interface by using the following command:

set interface *interface-name* mtu *mtu-value*

Example:

```
user@host# set interfaces ge-0/0/0 mtu 9192
```

The supported range for configuring an MTU packet size is 256 through 9192 bytes. However, all interfaces do not support 9192 bytes. For more information on the supported interfaces, see "MTU Default and Maximum Values" on page 39.

Related Documentation

- MTU Default and Maximum Values on page 39

CHAPTER 4

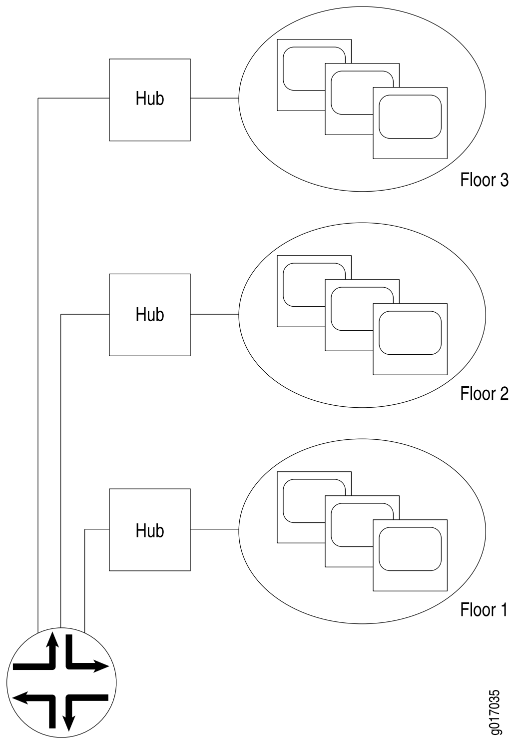
Configuring VLAN Tagging

Understanding Virtual LANs

A LAN is a single broadcast domain. When traffic is broadcast, all hosts within the LAN receive the broadcast traffic. A LAN is determined by the physical connectivity of devices within the domain.

Within a traditional LAN, hosts are connected by a hub or repeater that propagates any incoming traffic throughout the network. Each host and its connecting hubs or repeaters make up a LAN segment. LAN segments are connected through switches and bridges to form the broadcast domain of the LAN. Figure 2 on page 44 shows a typical LAN topology.

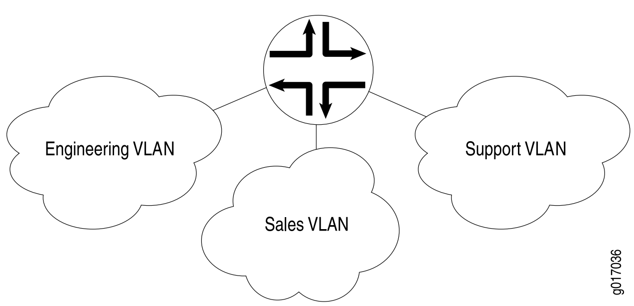
Figure 2: Typical LAN



Virtual LANs (VLANs) allow network architects to segment LANs into different broadcast domains based on logical groupings. Because the groupings are logical, the broadcast domains are not determined by the physical connectivity of the devices in the network. Hosts can be grouped according to a logical function, to limit the traffic broadcast within the VLAN to only the devices for which the traffic is intended.

Suppose a corporate network has three major organizations: engineering, sales, and support. Using VLAN tagging, hosts within each organization can be tagged with a different VLAN identifier. Traffic sent to the broadcast domain is then checked against the VLAN identifier and broadcast to only the devices in the appropriate VLAN. Figure 3 on page 44 shows a typical VLAN topology.

Figure 3: Typical VLAN



Related Documentation

- Understanding Interface Logical Properties on page 19

- *MPLS Applications Feature Guide*

VLAN IDs and Ethernet Interface Types Supported on the SRX Series Devices

Table 13 on page 45 lists VLAN ID range by interface type supported on SRX Series devices:

Table 13: VLAN ID Range by Interface Type Supported on the SRX Series Devices

Interface Type	Interface Type VLAN ID Range
2-Port 10-Gigabit Ethernet	1 through 4094
10-Gigabit Ethernet	1 through 4094
16-Port Gigabit Ethernet	1 through 4094
24-Port Gigabit Ethernet	1 through 4094
Aggregated Ethernet for Fast Ethernet	1 through 1023
Aggregate Ethernet for Gigabit Ethernet	1 through 4094
Gigabit Ethernet	1 through 4094
Management and internal Ethernet interfaces	1 through 1023

NOTE: On SRX210, SRX220, SRX240, SRX320, and SRX340 devices, on 1-GE SFP Mini-PIM, the VLAN ID 4093 falls under the reserved VLAN address range. (Platform support depends on the Junos OS release in your installation.) Because of this, you will not be able to configure VLAN ID from this range.

Related Documentation

- Understanding Interface Physical Properties on page 35

Configuring VLAN Tagging

You can configure SRX300, SRX320, SRX340, SRX345, and SRX550HM devices to receive and forward single-tag frames, dual-tag frames, or a mixture of single-tag and dual-tag frames.

See Table 14 on page 45 for flexible VLANs.

Table 14: Flexible VLANs

Number of Tags	VLAN ID
0 (Untagged)	Native

Table 14: Flexible VLANs (continued)

Number of Tags	VLAN ID
1 (Tagged)	Single
2 (Dual tagged)	Dual

This topic includes the following sections:

Configuring Single-Tag Framing

To configure a device to receive and forward single-tag frames with 802.1Q VLAN tags, include the **vlan-tagging** statement at the **[edit interfaces *interface-name*]** hierarchy level:

```
[edit interfaces interface-name]
vlan-tagging;
```

NOTE: SRX5400, SRX5600, and SRX5800 only support single-tag framing.

Configuring Dual Tagging

To configure the device to receive and forward dual-tag frames with 802.1Q VLAN tags, include the **flexible-vlan-tagging** statement at the **[edit interfaces *interface-name*]** hierarchy level:

```
[edit interfaces interface-name]
flexible-vlan-tagging;
```

Configuring Mixed Tagging

Mixed tagging is supported on ethernet interfaces of SRX300, SRX320, SRX340, SRX345, and SRX550HM devices. Mixed tagging lets you configure two logical interfaces on the same Ethernet port, one with single-tag framing and one with dual-tag framing.

To configure mixed tagging, include the **flexible-vlan-tagging** statement at the **[edit interfaces ge-*fpc/pic/port*]** hierarchy level. You must also include the **vlan-tags** statement with **inner** and **outer** options or the **vlan-id** statement at the **[edit interfaces ge-*fpc/pic/port* unit *logical-unit-number*]** hierarchy level:

```
[edit interfaces ge-fpc/pic/port]
flexible-vlan-tagging;
unit logical-unit-number {
   vlan-id number;
```



```
    family family {
        address address;
    }
}
unit logical-unit-number {
    vlan-tags inner tpid.vlan-id outer tpid.vlan-id;
    family family {
        address address;
    }
}
```

NOTE: When you configure the physical interface MTU for mixed tagging, you must increase the MTU to 4 bytes more than the MTU value you would configure for a standard VLAN-tagged interface.

For example, if the MTU value is configured to be 1018 on a VLAN-tagged interface, then the MTU value on a flexible VLAN tagged interface must be 1022—4 bytes more. The additional 4 bytes accommodates the future addition of a stacked VLAN tag configuration on the same physical interface.

The following example configures mixed tagging. Dual-tag and single-tag logical interfaces are under the same physical interface:

```
[edit interfaces ge-0/2/0]
flexible-vlan-tagging;
unit 0 {
    vlan-id 232;
    family inet {
        address 10.66.1.2/30;
    }
}
unit 1 {
    vlan-tags outer 0x8100.222 inner 0x8100.221;
    family inet {
        address 10.66.1.2/30;
    }
}
```

Configuring Mixed Tagging Support for Untagged Packets

You can configure mixed tagging support for untagged packets on a port. Untagged packets are accepted on the same mixed VLAN-tagged port. To accept untagged packets, include the **native-vlan-id** statement and the **flexible-vlan-tagging** statement at the **[edit interfaces *interface-name*]** hierarchy level:

```
[edit interfaces ge-fpc/pic/port]
flexible-vlan-tagging;
native-vlan-id number;
```


NOTE: The **flexible-vlan-tagging** is supported only with either no encapsulation or VPLS VLAN encapsulation.

The logical interface on which untagged packets are to be received must be configured with the same native VLAN ID as that configured on the physical interface. 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.

The following example configures untagged packets to be mapped to logical unit number 0:

```
[edit interfaces ge-0/2/0]
flexible-vlan-tagging;
native-vlan-id 232;
unit 0 {
   vlan-id 232;
   family inet {
      address 10.66.1.2/30;
   }
}
unit 1 {
   vlan-tags outer 0x8100.222 inner 0x8100.221;
   family inet {
      address 10.66.1.2/30;
   }
}
```

Related Documentation

- Understanding Virtual LANs on page 43

CHAPTER 5

Rate-Selectability

SRX4600 Gateway Rate-Selectability Overview

The maximum amount of data that can be transmitted through a port at any given second either by a network device or by a component of the network device (such as a line card) is known as the port speed. Port speed is measured in kilobits per second (Kbps), gigabits per second (Gbps), and terabytes per second (Tbps). If a port can be configured to support both single and multiple speeds, the port is known as a rate-selectable port. Because the port is part of a network device (router or switch) or a network component (such as MPC, MIC) the component is known as a rate-selectable component. Rate selectability enables you to configure different port speeds at the port level or at the PIC level.

The SRX4600 has four rate-selectable ports (referred to as PIC 0 ports of FPC 1) that can be configured as 100-Gigabit Ethernet ports or 40-Gigabit Ethernet ports, or each port can be configured as four 10-Gigabit Ethernet ports (by using a breakout cable). The SRX4600 also has eight 10-Gigabit Ethernet ports (referred to as PIC 1 ports of FPC 1). The four rate-selectable ports supports QSFP28/QSFP+ transceivers, whereas the eight 10-Gigabit Ethernet ports supports SFP+ transceivers. Knowing the exact details of the port speeds for the PICs helps you to choose the speeds to configure on the ports or on the PICs. You can view the port speeds of the PIC by executing *show chassis pic* command. For more information, see *SRX4600 Services Gateway Overview* and "Supported Active Physical Rate-Selectable Ports to Prevent Oversubscription on SRX4600 Gateway" on page 55.

NOTE: **By default, the two PICs of FPC 1, PIC 0 operate at 40-Gbps speed and PIC 1 operate at 10-Gbps speed.**

The SRX4600 supports two types of rate selectability configuration options:

- PIC Level Configuration: To configure all ports to operate at the same speed, you configure rate selectability at the PIC level.

- Port Level Configuration: To configure different port speeds for each port, you configure rate selectability at the port level, in which case only the ports that are configured are enabled.

To configure all ports to operate at the same speed, configure rate selectability at the PIC level, in which case you cannot configure the speed of individual ports. To configure rate selectability at the PIC level, use the *pic-mode* statement and specify the port speed. To configure different port speeds for each port, configure rate selectability at the port level, in which case only the ports that are configured are enabled. To configure rate selectability at the port level, use the *speed* statement to specify the speed of individual ports.

The examples below show the sample CLI command output of the port speed capability of the 4-port PIC 0 with QSFP+ transceivers and the 8-port PIC 1 with SFP+ transceivers on the SRX4600.

```
user@router> show chassis pic fpc-slot 1 pic-slot 0
...
Port Speed Information:

  Port  Capable Port Speeds
  0     4x10GE, 40GE, 100GE
  1     4x10GE, 40GE, 100GE
  2     4x10GE, 40GE, 100GE
  3     4x10GE, 40GE, 100GE
...
user@router> show chassis pic fpc-slot 1 pic-slot 1
...
Port Speed Information:

  Port  Capable Port Speeds
  0     10GE
  1     10GE
  2     10GE
  3     10GE
  4     10GE
  5     10GE
  6     10GE
  7     10GE
...
```

Table 15 on page 51 summarizes the rate selectability of the SRX4600 Services Gateway.

Table 15: Rate Selectability of SRX4600 Services Gateway

PIC	Port Number	Port Speed Supported
PIC 0 (FPC 1)	0–3	100-Gigabit Ethernet 40-Gigabit Ethernet 4x10-Gigabit Ethernet NOTE: • Default port speed is 40 Gigabit Ethernet. • You can configure one or all four 10-Gigabit Ethernet or 100-Gigabit Ethernet port operating at 10-Gigabit Ethernet mode to operate in 1-Gigabit Ethernet mode.
PIC 1 (FPC 1)	0–7	10 Gigabit Ethernet You can configure one or all 10-Gigabit Ethernet ports operating at 10-Gigabit Ethernet mode to operate in 1-Gigabit Ethernet mode.

The SRX4600 Services Gateway supports three different PIC types—8-port 10-Gigabit Ethernet PIC, 4-port 40-Gigabit or 100-Gigabit Ethernet PIC, and 4-port 10-Gigabit Ethernet PIC (in a chassis cluster). Starting in Junos OS Release 18.1R1, SRX4600 supports 1-Gbps port speed on the default 10-Gbps ports on its 8-port PICs and on two dedicated chassis cluster control ports on the 4-port chassis cluster PICs. Out of the four ports on the 10-Gigabit Ethernet PIC in a chassis cluster, two ports are fabric ports and the other two ports are chassis cluster control ports. The two fabric ports do not support 1-Gbps speed. Only the two control ports of the chassis cluster support a port speed of 1 Gbps.

1-Gbps speed is only supported in non-autonegotiation mode.

To configure 1-Gbps port speed:

- On the 8-port 10-Gigabit Ethernet PIC, use the **set interfaces *intf-name* gigether-options speed *1g*** command and commit the configuration. Refer speed (Gigabit Ethernet interface) for more details.
- On chassis cluster control interfaces (on a 4-port 10-Gigabit Ethernet PIC), use the **set chassis cluster control-port speed *1g*** command. Refer speed (Chassis Cluster) for more details.

  You must reboot the device for the changed configuration to take effect.

NOTE:

- The interface name prefix must be xe.
- Only the eight ports on PIC 1 of FPC 1 support 1-Gigabit Ethernet mode. The ports on PIC 0 of FPC 1 only support 100-Gigabit Ethernet, 40-Gigabit Ethernet, 4x10-Gigabit Ethernet mode and not 1-Gigabit Ethernet mode.
- The rate selectability at PIC level and port level does not support 1-Gbps speed. But you can configure the port configured at 10-Gbps speed to operate at 1-Gbps speed at Gigabit Ethernet interface level using speed (Gigabit Ethernet interface) and speed (Chassis Cluster) configuration statements respectively.
- The 1-Gbps operation mode is only supported in non-autonegotiation mode. If autonegotiation mode is enabled by default at the remote end, then you must disable it.
- Copper SFP is not supported on SRX4600 devices.

To view the speed configured for the interface, execute the **show interfaces extensive** command. The **Speed Configuration** output parameter in the command output indicates the current operation speed of the interface. If the interface is configured with 1-Gbps speed, then **Speed Configuration** displays **1G**; if the interface is configured with 10-Gbps speed, **Speed Configuration** displays **AUTO**.

For example:

```
user@router > show interfaces xe-1/1/0 extensive
Physical interface: xe-1/1/0, Enabled, Physical link is Down
  Interface index: 151, SNMP ifIndex: 613, Generation: 154
  Link-level type: Ethernet, MTU: 1514, MRU: 1522, 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,
  Speed Configuration: 1G
...
```

In this example, the **Speed Configuration** output parameter displays **1G**, which means the operation speed of xe-1/1/0 interface is 1-Gbps speed.

User-Configurable Rate Selectability of SRX4600 Services Gateway

You can also configure rate selectability on SRX4600 gateways.

NOTE: Only the Interface that is already operating at 10-Gigabit Ethernet mode can be configured to operate at 1-Gigabit Ethernet mode.

Table 16 on page 53 summarizes the user-configurable rate selectability of SRX4600 gateways.

Table 16: Rate Selectability of SRX4600 Gateways

Port Speed Configuration on PIC 0 (Gbps)	Port Speed Configuration on PIC 1 (Gbps)
100	0 Configure the number of active ports to 0
10	10
40	0 Configure the number of active ports to 0

NOTE: The SRX4600 does not support heterogeneous mode. That is, in PIC mode if 40-Gbps or 100-Gbps speed is configured on PIC 0, then the *number-of-ports* on PIC 1 must be configured to 0 only.

Maximum number of 10/40/100GE ports Configurable at PIC and Port Mode

Following table summarizes the maximum number of 10/40/100 Gigabit Ethernet ports per PIC configurable at PIC and port levels:

Table 17: Maximum number of 10/40/100 Gigabit Ethernet ports Configurable at PIC and Port Level

Maximum Ports	Maximum Ports configurable at PIC Mode (on both PIC0 and PIC1)	Maximum Ports Configurable at Port Mode (on both PIC0 and PIC1)
10 Gigabit Ethernet Ports	24 Which means 16 ports from PIC 0 and 8 Ports from PIC 1.	20 Which means 12 ports from PIC 0 and eight ports from PIC 1.
40 Gigabit Ethernet Ports	4 Only four ports from PIC 0 as PIC 1 supports only 10 Gbps Speed.	4
100 Gigabit Ethernet Ports	4 Only four ports from PIC 0 as PIC 1 supports only 10 Gbps speed.	4

Port Configuration - PIC Level

On PIC 0, if each of the four ports is configured to operate at 100-Gbps speed, then you must configure all the 8 ports at PIC 1 to 0 (using *number-of-ports* statement). On PIC 0, if ports 0, 1, and 2 are set to 100-Gbps, and port 3 is set to 10-Gbps or 40-Gbps, then you should configure all the 8 ports at PIC 1 to 0 (using **number-of-ports** statement), and so on

NOTE: Only the Interface that is already operating at 10GE mode can be configured to operate at 1GE mode.

Configuring 40-Gigabit Ethernet ports to 4X10-Gigabit Ethernet using Breakout Cables

On SRX4600 Services Gateway, Slot 1 PIC 0 comes up with the default setting of 4X40-Gigabit Ethernet ports. Starting in Junos OS Release 18.1R1, you can configure the 40 Gigabit Ethernet port to 4X10-Gigabit Ethernet mode by plugging in QSFPP-4X10-Gigabit Ethernet optics connecting with 4x10-Gigabit Ethernet breakout cables. You use QSFP+ transceivers to connect the 40-Gbps (default speed) port to the breakout cable, which connects to four SFP+ transceivers at the other end thus converting that port into four 10-Gbps interfaces).

In 4X10-Gigabit Ethernet mode, the interface naming convention for 10-Gigabit Ethernet interface is as follows:

Interface Type	Interface Convention (MPC Slot: x, PIC Slot: y, Port: z)
4x10-Gigabit Ethernet	xe-x/y/z:0 xe-x/y/z:1 xe-x/y/z:2 xe-x/y/z:3 For example, when 40-Gigabit Ethernet port et-1/0/0 is converted to 4x10-Gigabit Ethernet ports, the naming convention of 10-Gigabit Ethernet port is: xe-1/0/0:0 xe-1/0/0:1 xe-1/0/0:2 xe-1/0/0:3

NOTE:

- The 40-Gigabit Ethernet ports that are converted to four 10-Gigabit Ethernet ports cannot be configured to 1-Gbps speed.
- The SRX4600 Gateway supports 40-Gigabit Ethernet breakouts only in PIC mode.

  For example:

  In PIC mode, to configure all 40-Gigabit Ethernet ports of PIC 0, execute the following configuration statement:

  set chassis fpc *1* pic *0* pic-mode *10G*

  In PIC mode, to set only the first two 40-Gigabit Ethernet ports, execute the following configuration statement:

  set chassis fpc *1* pic *0* pic-mode *10G* number-of-ports *2*

  This configuration sets only the first two ports of 40-Gigabit Ethernet port and leaves the last two ports disabled, that means the last two ports cannot be used as 40-Gigabit Ethernet ports after this configuration.

  After you commit the configuration, for the new configuration to take effect, you must reboot the device or chassis cluster.

Release History Table

Release	Description
18.1R1	Starting in Junos OS Release 18.1R1, SRX4600 supports 1-Gbps port speed on the default 10-Gbps ports on its 8-port PICs and on two dedicated chassis cluster control ports on the 4-port chassis cluster PICs.

Related Documentation

- Supported Active Physical Rate-Selectable Ports to Prevent Oversubscription on SRX4600 Gateway on page 55
- *speed*
- *show chassis pic*
- *number-of-ports*
- *pic-mode*

Supported Active Physical Rate-Selectable Ports to Prevent Oversubscription on SRX4600 Gateway

The maximum capacity of an SRX4600 gateway is 400 Gbps, which cannot be oversubscribed. In SRX4600, the network ports are available in two groups (referred to as PICs), with restrictions around the number and type of ports that can be configured without oversubscribtion.

Starting in Junos OS Release 17.4R1, SRX4600 gateways support rate selectability to prevent oversubscription of the Packet Forwarding Engine bandwidth. The SRX4600 Packet Forwarding Engine has four 100-Gigabit Ethernet QSFP28 ports (referred to as PIC 0 ports) and eight 10-Gigabit Ethernet ports (referred to as PIC 1 ports). Each of the PIC 0 ports can be used as either a 100-Gigabit Ethernet QSFP28 port or a 40-Gigabit Ethernet QSFPP port, or they can be configured as four 10-Gigabit Ethernet ports (using a breakout cable).

If you configure rate selectability at the PIC level, all the ports supporting that port speed are enabled by default. This can lead to oversubscription in certain cases. To prevent the oversubscription, you can configure the number of active ports that operate at the configured speed by using the **number-of-ports** ***number-of-active-physical-ports*** configuration statement. Additionally, interfaces are created only for the active ports. For more information on supported port modes, see SRX4600 Gateway Rate-Selectability Overview

NOTE:

- You cannot configure the number of active ports when you configure rate selectability at the port level.

Invalid Port Configuration

You must try to avoid configuring ports that can lead to oversubscription.

Following is an example of an invalid configuration:

```
4x100GE + 8X10GE
```

If you try to commit an invalid configuration, the configuration gets committed, but the port is not activated. This is because Junos OS allows you to configure a port before a line card is inserted. You will get an error message in the output of the *show chassis alarms* command and also in the log messages.

Configuring Active Ports on SRX4600 Gateway with Rate Selectability

Table 18 on page 57 summarizes the active ports with *number-of-ports* configured but without any rate selectability configuration for an SRX4600 gateway. Because there is no rate selectability configured, the default speed is used in these cases.

Table 18: Active Physical Ports on the SRX4600 Gateway for Configuring Rate Selectability at PIC level

PIC	Number of Ports (number-of-ports Statement)	Active Ports		
		PIC Level 10-Gigabit Ethernet Profile	PIC Level 40-Gigabit Ethernet Profile	PIC Level 100-Gigabit Ethernet Profile
PIC 0	0	-	-	-
	1	0	-	-
	2	0, 1	-	-
	3	0, 1, 2	-	-
	4	0, 1, 2, 3	-	-
PIC 1	0	-	-	-
	1	0	-	-
	2	0, 1	-	-
	3	0, 1, 2	-	-
	4	0, 1, 2, 3	-	-
	5	0, 1, 2, 3, 4	-	-
	6	0, 1, 2, 3, 4, 5	-	-
	7	0, 1, 2, 3, 4, 5 ,6	-	-
	8	0, 1, 2, 3, 4, 5, 6, 7	-	-

Table 19 on page 57 summarizes the active ports without *number-of-ports* configured but with rate selectability at PIC-level configuration for an SRX4600 gateway.

Table 19: Without number-of-ports But with Rate Selectability at PIC Level for SRX4600 Gateway

PIC	Active Ports		
	PIC-Level 10-Gigabit Ethernet	PIC-Level 40-Gigabit Ethernet	PIC-Level 100-Gigabit Ethernet
PIC 0	0-3	0-3	0-3
PIC 1	0-7	-	-

Table 20 on page 58 summarizes the active ports with *number-of-ports* configured and rate selectability at PIC-level configuration for an SRX4600 gateway.

Table 20: With number-of-ports Rate Selectability at PIC level for SRX4600 Gateway

PIC	Number of Ports (number-of-ports Statement)	Active Ports		
		PIC-Level 10-Gigabit Ethernet	PIC-Level 40-Gigabit Ethernet	PIC-Level 100-Gigabit Ethernet
PIC 0	0	-	-	-
	1	0	0	0
	2	0, 1	0, 1	0, 1
	3	0, 1, 2	0, 1, 2	0, 1, 2
	4	0, 1, 2, 3	0, 1, 2, 3	0, 1, 2, 3
PIC 1	0	-	-	-
	1	0	-	-
	2	0, 1	-	-
	3	0, 1, 2	-	-
	4	0, 1, 2, 3	-	-
	5	0, 1, 2, 3, 4	-	-
	6	0, 1, 2, 3, 4, 5	-	-
	7	0, 1, 2, 3, 4, 5 ,6	-	-
	8	0, 1, 2, 3, 4, 5, 6, 7	-	-

Related Documentation

- SRX4600 LED Scheme Overview on page 17

PART 2

Configuring DS1 Interfaces

CHAPTER 6

Configuring DS1 Interfaces

Understanding T1 and E1 Interfaces

T1 and E1 are equivalent digital data transmission formats that carry DS1 signals. T1 and E1 lines can be interconnected for international use.

This topic contains the following sections:

T1 Overview

T1 is a digital data transmission medium capable of handling 24 simultaneous connections running at a combined 1.544 Mbps. T1 combines these 24 separate connections, called channels or time slots, onto a single link. T1 is also called DS1.

The T1 data stream is broken into frames. Each frame consists of a single framing bit and 24 8-bit channels, totaling 193 bits per T1 frame. Frames are transmitted 8,000 times per second, at a data transmission rate of 1.544 Mbps (8,000 x 193 = 1.544 Mbps).

As each frame is received and processed, the data in each 8-bit channel is maintained with the channel data from previous frames, enabling T1 traffic to be separated into 24 separate flows across a single medium. For example, in the following set of 4-channel frames (without a framing bit), the data in channel 1 consists of the first octet of each frame, the data in channel 2 consists of the second octet of each frame, and so on:

```
          Chan. 1   Chan. 2   Chan. 3   Chan. 4
Frame 1  [10001100][00110001][11111000][10101010]
```

```
Frame 2   [11100101][01110110][10001000][11001010]
Frame 3   [00010100][00101111][11000001][00000001]
```

E1 Overview

E1 is the European format for DS1 digital transmission. E1 links are similar to T1 links except that they carry signals at 2.048 Mbps. Each signal has 32 channels, and each channel transmits at 64 Kbps. E1 links have higher bandwidth than T1 links because it does not reserve one bit for overhead. Whereas, T1 links use 1 bit in each channel for overhead.

T1 and E1 Signals

T1 and E1 interfaces consist of two pairs of wires—a transmit data pair and a receive data pair. Clock signals, which determine when the transmitted data is sampled, are embedded in the T1 and E1 transmissions.

Typical digital signals operate by sending either zeros (0s) or ones (1s), which are usually represented by the absence or presence of a voltage on the line. The receiving device need only detect the presence of the voltage on the line at the particular sampling edge to determine whether the signal is 0 or 1. T1 and E1, however, use bipolar electrical pulses. Signals are represented by no voltage (0), positive voltage (1), or negative voltage (1). The bipolar signal allows T1 and E1 receivers to detect error conditions in the line, depending on the type of encoding that is being used.

Encoding

The following are common T1 and E1 encoding techniques:

- Alternate mark inversion (AMI)—T1 and E1
- Bipolar with 8-zero substitution (B8ZS)—T1 only
- High-density bipolar 3 code (HDB3)—E1 only

AMI Encoding

AMI encoding forces the 1s signals on a T1 or E1 line to alternate between positive and negative voltages for each successive 1 transmission, as in this sample data transmission:

```
1 1 0 1 0 1 0 1
+ - 0 + 0 - 0 +
```

When AMI encoding is used, a data transmission with a long sequence of 0s has no voltage transitions on the line. In other words, voice transmission does not use AMI encoding because it never encounters the “long string of zeroes” problem. In this situation, devices have difficulty maintaining clock synchronization, because they rely on the voltage fluctuations to constantly synchronize with the transmitting clock. To counter this effect, the number of consecutive 0s in a data stream is restricted to 15. This restriction is called the 1s density requirement, because it requires a certain number of 1s for every 15 0s that are transmitted.

On an AMI-encoded line, two consecutive pulses of the same polarity—either positive or negative—are called a bipolar violation (BPV), which is generally flagged as an error.

B8ZS and HDB3 Encoding

Neither B8ZS nor HDB3 encoding restricts the number of 0s that can be transmitted on a line. Instead, these encoding methods detect sequences of 0s and substitute bit patterns for the sequences to provide the signal oscillations required to maintain timing on the link.

The B8ZS encoding method for T1 lines detects sequences of eight consecutive 0 transmissions and substitutes a pattern of two consecutive BPVs (11110000). Because the receiving end uses the same encoding, it detects the BPVs as 0s substitutions, and no BPV error is flagged. A single BPV, which does not match the 11110000 substitution bit sequence is likely to generate an error, depending on the configuration of the device.

B8ZS uses bipolar violations to synchronize devices, a solution that does not require the use of extra bits, which means a T1 circuit using B8ZS can use the full 64 Kbps for each channel for data.

The HDB3 encoding method for E1 lines detects sequences of four consecutive 0 transmissions and substitutes a single BPV (1100). Similar to B8ZS encoding, the receiving device detects the 0s substitutions and does not generate a BPV error.

T1 and E1 Framing

T1 interfaces uses extended superframe (ESF). E1 interfaces use G.704 framing or G.704 with no CRC4 framing, or can be in unframed mode.

ESF Framing for T1

ESF extends the D4 superframe from 12 frames to 24 frames. By expanding the size of the superframe, ESF increases the number of bits in the superframe framing pattern from 12 to 24. The extra bits are used for frame synchronization, error detection, and maintenance communications through the facilities data link (FDL).

The ESF pattern for synchronization bits is 001011. Only the framing bits from frames 4, 8, 12, 16, 20, and 24 in the superframe sequence are used to create the synchronization pattern.

The framing bits from frames 2, 6, 10, 14, 18, and 22 are used to pass a CRC code for each superframe block. The CRC code verifies the integrity of the received superframe and detects bit errors with a CRC6 algorithm.

The framing bits for frames 1, 3, 5, 7, 9, 11, 13, 15, 17, 19, 21, and 23 are used for the data link channel. These 12 bits enable the operators at the network control center to query the remote equipment for information about the performance of the link.

T1 and E1 Loopback Signals

The control signal on a T1 or E1 link is the loopback signal. Using the loopback signal, the operators at the network control center can force the device at the remote end of a link to retransmit its received signals back onto the transmit path. The transmitting device can then verify that the received signals match the transmitted signals, to perform end-to-end checking on the link.

Two loopback signals are used to perform the end-to-end testing:

- The loop-up command signal sets the link into loopback mode, with the following command pattern:

```
...100001000010000100...
```

- The loop-down signal returns the link to its normal mode, with the following command pattern:

```
...100100100100100100...
```

While the link is in loopback mode, the operator can insert test equipment onto the line to test its operation.

Related Documentation

- Example: Configuring a T1 Interface on page 64

Example: Configuring a T1 Interface

This example shows how to complete the initial configuration on a T1 interface.

Requirements

Before you begin, install a PIM, connect the interface cables to the ports, and power on the device. See the *Getting Started Guide* for your device.

Overview

This example describes the initial configuration that you must complete on each network interface. In this example, you configure the t1-1/0/0 interface as follows:

- You create the basic configuration for the new interface by setting the encapsulation type to ppp. You can enter additional values for physical interface properties as needed.
- You set the logical interface to 0. Note that the logical unit number can range from 0 through 16,384. You can enter additional values for properties you need to configure on the logical interface, such as logical encapsulation or protocol family.

Configuration

CLI Quick Configuration

To quickly configure this example, copy the following command, paste it into a text file, remove any line breaks, change any details necessary to match your network configuration, copy and paste the command into the CLI at the **[edit]** hierarchy level, and then enter commit from configuration mode.

```
set interfaces t1-1/0/0 encapsulation ppp unit 0
```

Step-by-Step Procedure

The following example requires you to navigate various levels in the configuration hierarchy. For instructions on how to do that, see *Using the CLI Editor in Configuration Mode*.

To configure a T1 interface:

1. Create the interface.

   ```
   [edit]
   user@host# edit interfaces t1-1/0/0
   ```

2. Create the basic configuration for the new interface.

   ```
   [edit interfaces t1-1/0/0]
   user@host# set encapsulation ppp
   ```

3. Add logical interfaces.

   ```
   [edit interfaces t1-1/0/0]
   user@host# set unit 0
   ```

Results

From configuration mode, confirm your configuration by entering the **show interfaces** command. If the output does not display the intended configuration, repeat the configuration instructions in this example to correct it.

For brevity, this **show interfaces** command output includes only the configuration that is relevant to this example. Any other configuration on the system has been replaced with ellipses (...).

```
[edit]
  ...
  t1-1/0/0 {
  encapsulation ppp;
  unit 0;
}
```

If you are done configuring the device, enter **commit** from configuration mode.

Verification

Confirm that the configuration is working properly.

Verifying the Link State of All Interfaces

Purpose By using the ping tool on each peer address in the network, verify that all interfaces on the device are operational.

Action For each interface on the device:

1. In the J-Web interface, select **Troubleshoot>Ping Host**.
2. In the Remote Host box, type the address of the interface for which you want to verify the link state.
3. Click **Start**. The output appears on a separate page.

```
PING 10.10.10.10 : 56 data bytes
64 bytes from 10.10.10.10: icmp_seq=0 ttl=255 time=0.382 ms
64 bytes from 10.10.10.10: icmp_seq=1 ttl=255 time=0.266 ms
```

If the interface is operational, it generates an ICMP response. If this response is received, the round-trip time, in milliseconds, is listed in the time field.

Verifying Interface Properties

Purpose Verify that the interface properties are correct.

Action From the operational mode, enter the **show interfaces detail** command.

The output shows a summary of interface information. Verify the following information:

- The physical interface is Enabled. If the interface is shown as Disabled, do one of the following:
  - In the CLI configuration editor, delete the **disable** statement at the [edit interfaces t1-1/0/0] level of the configuration hierarchy.
  - In the J-Web configuration editor, clear the **Disable** check box on the Interfaces> t1-1/0/0 page.
- The physical link is Up. A link state of Down indicates a problem with the interface module, interface port, or physical connection (link-layer errors).

- The Last Flapped time is an expected value. It indicates the last time the physical interface became unavailable and then available again. Unexpected flapping indicates likely link-layer errors.
- The traffic statistics reflect expected input and output rates. Verify that the number of input and output bytes and packets matches expected throughput for the physical interface. To clear the statistics and see only new changes, use the **clear interfaces statistics t1-1/0/0** command.

Related Documentation

- Understanding T1 and E1 Interfaces on page 61
- Example: Deleting a T1 Interface on page 67

Example: Deleting a T1 Interface

This example shows how to delete a T1 interface.

Requirements

No special configuration beyond device initialization is required before configuring an interface.

Overview

In this example, you delete the t1-1/0/0 interface.

NOTE: **Performing this action removes the interface from the software configuration and disables it. Network interfaces remain physically present, and their identifiers continue to appear on the J-Web pages.**

Configuration

Step-by-Step Procedure

To delete a T1 interface:

1. Specify the interface you want to delete.

```
[edit interfaces]
user@host# delete t1-1/0/0
```

2. If you are done configuring the device, commit the configuration.

```
[edit interfaces]
```

```
user@host# commit
```

Verification

To verify the configuration is working properly, enter the **show interfaces** command.

Related Documentation

- Understanding T1 and E1 Interfaces on page 61
- Example: Configuring a T1 Interface on page 64

CHAPTER 7

Configuring DS3 Interfaces

Understanding T3 and E3 Interfaces

T3 is a high-speed data-transmission medium formed by multiplexing 28 DS1 signals into seven separate DS2 signals, and combining the DS2 signals into a single DS3 signal. T3 links operate at 43.736 Mbps. T3 is also called DS3.

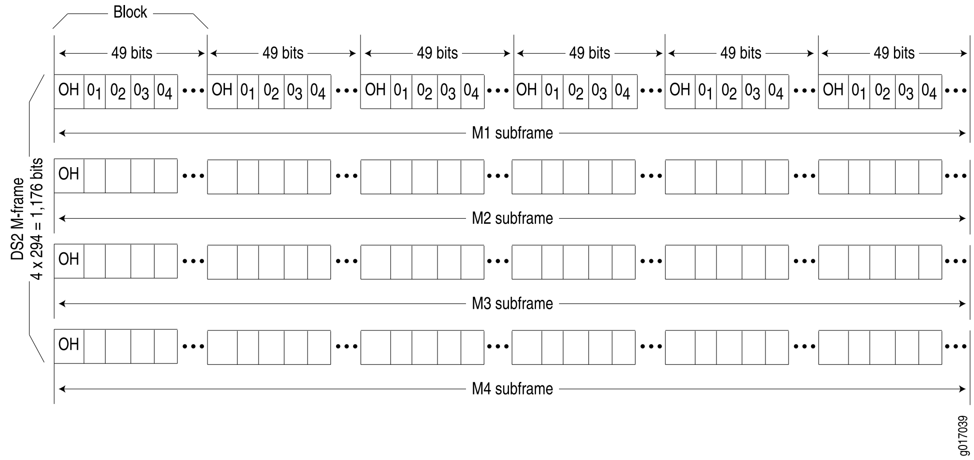
E3 is the equivalent European transmission format. E3 links are similar to T3 (DS3) links, but carry signals at 34.368 Mbps. Each signal has 16 E1 channels, and each channel transmits at 2.048 Mbps. E3 links use all 8 bits of a channel, whereas T3 links use 1 bit in each channel for overhead.

Multiplexing DS1 Signals

Four DS1 signals combine to form a single DS2 signal. The four DS1 signals form a single DS2 M-frame, which includes subframes M1 through M4. Each subframe has six 49-bit blocks, for a total of 294 bits per subframe. The first bit in each block is a DS2 overhead (OH) bit. The remaining 48 bits are DS1 information bits.

Figure 4 on page 70 shows the DS2 M-frame format.

Figure 4: DS2 M-Frame Format



The four DS2 subframes are not four DS1 channels. Instead, the DS1 data bits within the subframes are formed by data interleaved from the DS1 channels. The 0_n values designate time slots devoted to DS1 inputs as part of the bit-by-bit interleaving process. After every 48 DS1 information bits (12 bits from each signal), a DS2 OH bit is inserted to indicate the start of a subframe.

DS2 Bit Stuffing

Because the four DS1 signals are asynchronous signals, they might operate at different line rates. To synchronize the asynchronous streams, the multiplexers on the line use bit stuffing.

A DS2 connection requires a nominal transmit rate of 6.304 Mbps. However, because multiplexers increase the overall output rate to the intermediate rate of 6.312 Mbps, the output rate is higher than individual input rates on DS1 signals. The extra bandwidth is used to stuff the incoming DS1 signals with extra bits until the output rate of each signal equals the increased intermediate rate. These stuffed bits are inserted at fixed locations in the DS2 M-frame. When DS2 frames are received and the signal is demultiplexed, the stuffing bits are identified and removed.

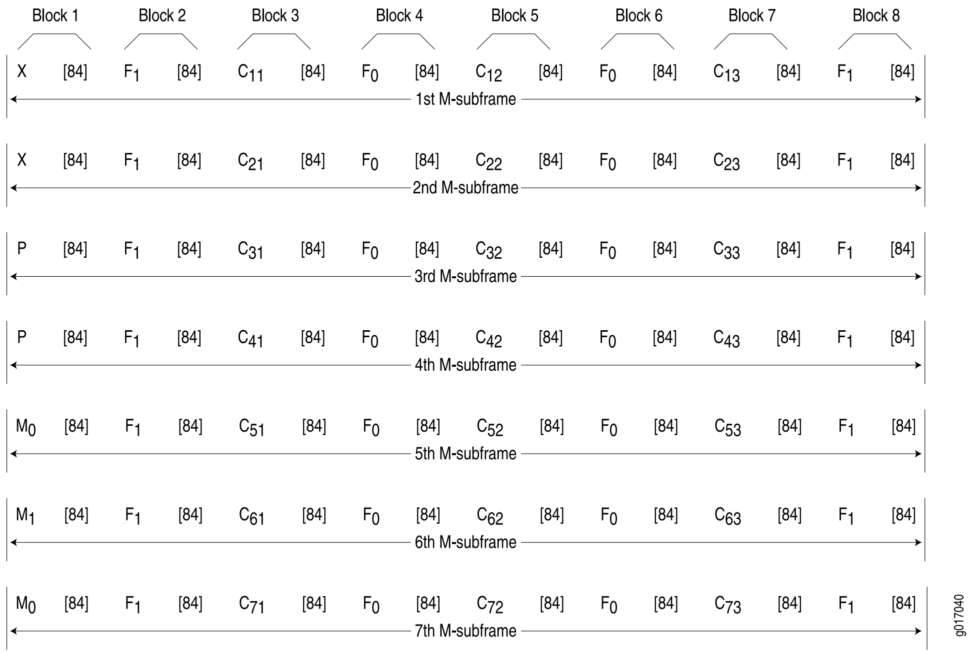
DS3 Framing

A set of four DS1 signals is multiplexed into seven DS2 signals, which are multiplexed into a single DS3 signal. The multiplexing occurs just as with DS1-to-DS2 multiplexing. The resulting DS3 signal uses either the standard M13 asynchronous framing format or the C-bit parity framing format. Although the two framing formats differ in their use of control and message bits, the basic frame structures are identical. The DS3 frame structures are shown in Figure 5 on page 71 and Figure 6 on page 72.

M13 Asynchronous Framing

A DS3 M-frame includes seven subframes, formed by DS2 data bits interleaved from the seven multiplexed DS2 signals. Each subframe has eight 85-bit blocks—a DS3 OH bit plus 84 data bits. The meaning of an OH bit depends on the block it precedes. Standard DS3 M13 asynchronous framing format is shown in Figure 5 on page 71.

Figure 5: DS3 M13 Frame Format



A DS3 M13 M-frame contains the following types of OH bits:

- Framing bits (F-bits)—Make up a frame alignment signal that synchronizes DS3 subframes. Each DS3 frame contains 28 F-bits (4 bits per subframe). F-bits are located at the beginning of blocks 2, 4, 6, and 8 of each subframe. When combined, the frame alignment pattern for each subframe is 1001. The pattern can be examined to detect bit errors in the transmission.
- Multiframing bits (M-bits)—Make up a multiframe alignment signal that synchronizes the M-frames in a DS3 signal. Each DS3 frame contains 3 M-bits, which are located at the beginning of subframes 5, 6, and 7. When combined, the multiframe alignment patter for each M-frame is 010.
- Bit stuffing control bits (C-bits)—Serve as bit stuffing indicators for each DS2 input. For example, C_{11}, C_{12}, and C_{13} are indicators for DS2 input 1. Their values indicate whether DS3 bit stuffing has occurred at the multiplexer. If the three C-bits in a subframe are all 0s, no stuffing was performed for the DS2 input. If the three C-bits are all 1s, stuffing was performed.
- Message bits (X-bits)—Used by DS3 transmitters to embed asynchronous in-service messages in the data transmission. Each DS3 frame contains 2 X-bits, which are located at the beginning of subframes 1 and 2. Within an DS3 M-frame, both X-bits must be identical.
- Parity bits (P-bits)—Compute parity over all but 1 bit of the M-frame. (The first X-bit is not included.) Each DS3 frame contains 2 P-bits, which are located at the beginning of subframes 3 and 4. Both P-bits must be identical.

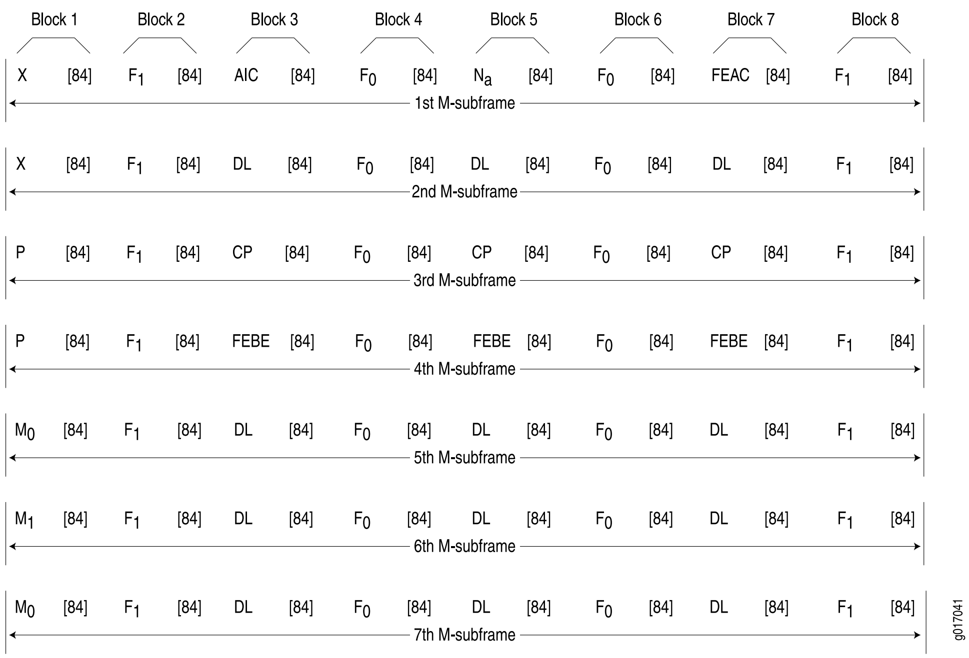
  If the previous DS3 frame contained an odd number of 1s, both P-bits are set to 1. If the previous DS3 contained an even number of 1s, both P-bits are set to 0. If, on the receiving side, the number of 1s for a given frame does not match the P-bits in the following frame, it indicates one or more bit errors in the transmission.

C-Bit Parity Framing

In M13 framing, every C-bit in a DS3 frame is used for bit stuffing. However, because multiplexers first use bit stuffing when multiplexing DS1 signals into DS2 signals, the incoming DS2 signals are already synchronized. Therefore, the bit stuffing that occurs when DS2 signals are multiplexed is redundant.

C-bit parity framing format redefines the function of C-bits and X-bits, using them to monitor end-to-end path performance and provide in-band data links. The C-bit parity framing structure is shown in Figure 6 on page 72.

Figure 6: DS3 C-Bit Parity Framing



In C-bit parity framing, the X-bits transmit error conditions from the far end of the link to the near end. If no error conditions exist, both X-bits are set to 1. If an out-of-frame (OOF) or alarm indication signal (AIS) error is detected, both X-bits are set to 0 in the upstream direction for 1 second to notify the other end of the link about the condition.

The C-bits that control bit stuffing in M13 frames are typically used in the following ways by C-bit parity framing:

- Application identification channel (AIC)—The first C-bit in the first subframe identifies the type of DS3 framing used. A value of 1 indicates that C-bit parity framing is in use.
- N_a—A reserved network application bit.
- Far-end alarm and control (FEAC) channel—The third C-bit in the first subframe is used for the FEAC channel. In normal transmissions, the FEAC C-bit transmits all 1s.

When an alarm condition is present, the FEAC C-bit transmits a code word in the format **0*xxxxxxx* 11111111**, in which ***x*** can be either 1 or 0. Bits are transmitted from right to left.

Table 21 on page 73 lists some C-bit code words and the alarm or status condition indicated.

Table 21: FEAC C-Bit Condition Indicators

Alarm or Status Condition	C-Bit Code Word
DS3 equipment failure requires immediate attention.	**00110010 11111111**
DS3 equipment failure occurred—such as suspended, not activated, or unavailable service—that is non-service-affecting.	**00011110 11111111**
DS3 loss of signal.	**00011100 11111111**
DS3 out of frame.	**00000000 11111111**
DS3 alarm indication signal (AIS) received.	**00101100 11111111**
DS3 idle received.	**00110100 11111111**
Common equipment failure occurred that is non-service-affecting.	**00011101 11111111**
Multiple DS1 loss of signal.	**00101010 11111111**
DS1 equipment failure occurred that requires immediate attention.	**00001010 11111111**
DS1 equipment failure occurred that is non-service-affecting.	**00000110 11111111**
Single DS1 loss of signal.	**00111100 11111111**

- Data links—The 12 C-bits in subframes 2, 5, 6, and 7 are data link (DL) bits for applications and terminal-to-terminal path maintenance.
- DS3 parity—The 3 C-bits in the third subframe are DS3 parity C-bits (also called CP-bits). When a DS3 frame is transmitted, the sending device sets the CP-bits to the same value as the P-bits. When the receiving device processes the frame, it calculates the parity of the M-frame and compares this value to the parity in the CP-bits of the following M-frame. If no bit errors have occurred, the two values are typically the same.
- Far–end block errors (FEBEs)—The 3 C-bits in the fourth subframe make up the far-end block error (FEBE) bits. If a framing or parity error is detected in an incoming M-frame (via the CP-bits), the receiving device generates a C-bit parity error and sends an error notification to the transmitting (far-end) device. If an error is generated, the FEBE bits are set to 000. If no error occurred, the bits are set to 111.

Related Documentation

- Example: Configuring a T3 Interface on page 74
- Example: Deleting a T3 Interface on page 76

Example: Configuring a T3 Interface

This example shows how to complete the initial configuration on a T3 interface.

- Requirements on page 74
- Overview on page 74
- Configuration on page 74
- Verification on page 75

Requirements

Before you begin, install a PIM, connect the interface cables to the ports, and power on the device. See the *Getting Started Guide* for your device.

Overview

This example describes the initial configuration that you must complete on each network interface. In this example, you configure the t3-1/0/0 interface as follows:

- You create the basic configuration for the new interface by setting the encapsulation type to ppp. You can enter additional values for physical interface properties as needed.
- You set the logical interface to 0. Note that the logical unit number can range from 0 to 16,384. You can enter additional values for properties you need to configure on the logical interface, such as logical encapsulation or protocol family.

Configuration

CLI Quick Configuration

To quickly configure this example, copy the following command, paste it into a text file, remove any line breaks, change any details necessary to match your network configuration, copy and paste the command into the CLI at the **[edit]** hierarchy level, and then enter commit from configuration mode.

```
set interfaces t3-1/0/0 encapsulation ppp unit 0
```

Step-by-Step Procedure

The following example requires you to navigate various levels in the configuration hierarchy. For instructions on how to do that, see *Using the CLI Editor in Configuration Mode*.

To configure a T3 interface:

1. Create the interface.

```
[edit]
user@host# edit interfaces t3-1/0/0
```


2. Create the basic configuration for the new interface.

```
[edit interfaces t3-1/0/0]
user@host# set encapsulation ppp
```

3. Add logical interfaces.

```
[edit interfaces t3-1/0/0]
user@host# set unit 0
```

Results From configuration mode, confirm your configuration by entering the **show interfaces** command. If the output does not display the intended configuration, repeat the configuration instructions in this example to correct it.

For brevity, this **show interfaces** command output includes only the configuration that is relevant to this example. Any other configuration on the system has been replaced with ellipses (...).

```
[edit]
  ...
  t3-1/0/0 {
  encapsulation ppp;
  unit 0;
}
```

If you are done configuring the device, enter **commit** from configuration mode.

Verification

Confirm that the configuration is working properly.

- Verifying the Link State of All Interfaces on page 75
- Verifying Interface Properties on page 76

Verifying the Link State of All Interfaces

Purpose By using the ping tool on each peer address in the network, verify that all interfaces on the device are operational.

Action For each interface on the device:

1. In the J-Web interface, select **Troubleshoot>Ping Host**.
2. In the Remote Host box, type the address of the interface for which you want to verify the link state.

3. Click **Start**. The output appears on a separate page.

```
PING 10.10.10.10 : 56 data bytes
64 bytes from 10.10.10.10: icmp_seq=0 ttl=255 time=0.382 ms
64 bytes from 10.10.10.10: icmp_seq=1 ttl=255 time=0.266 ms
```

If the interface is operational, it generates an ICMP response. If this response is received, the round-trip time in milliseconds is listed in the time field.

Verifying Interface Properties

Purpose Verify that the interface properties are correct.

Action From the operational mode, enter the **show interfaces detail** command.

The output shows a summary of interface information. Verify the following information:

- The physical interface is Enabled. If the interface is shown as Disabled, do one of the following:
  - In the CLI configuration editor, delete the **disable** statement at the [edit interfaces t3-1/0/0] level of the configuration hierarchy.
  - In the J-Web configuration editor, clear the **Disable** check box on the Interfaces> t3-1/0/0 page.
- The physical link is Up. A link state of Down indicates a problem with the interface module, interface port, or physical connection (link-layer errors).
- The Last Flapped time is an expected value. It indicates the last time the physical interface became unavailable and then available again. Unexpected flapping indicates likely link-layer errors.
- The traffic statistics reflect expected input and output rates. Verify that the number of input and output bytes and packets matches expected throughput for the physical interface. To clear the statistics and see only new changes, use the **clear interfaces statistics t3-1/0/0** command.

Related Documentation

- Understanding T3 and E3 Interfaces on page 69
- Example: Deleting a T3 Interface on page 76

Example: Deleting a T3 Interface

This example shows how to delete a T3 interface.

- Requirements on page 77
- Overview on page 77

Requirements

No special configuration beyond device initialization is required before configuring an interface.

Overview

In this example, you delete the t3-1/0/0 interface.

NOTE: **Performing this action removes the interface from the software configuration and disables it. Network interfaces remain physically present, and their identifiers continue to appear on the J-Web pages.**

Configuration

Step-by-Step Procedure

To delete a T3 interface:

1. Specify the interface you want to delete.

```
[edit interfaces]
user@host# delete t3-1/0/0
```

2. If you are done configuring the device, commit the configuration.

```
[edit interfaces]
user@host# commit
```

Verification

To verify the configuration is working properly, enter the **show interfaces** command.

Related Documentation

- Understanding T3 and E3 Interfaces on page 69
- Example: Configuring a T3 Interface on page 74

CHAPTER 8

Configuring DS3 Interfaces

Understanding T3 and E3 Interfaces

T3 is a high-speed data-transmission medium formed by multiplexing 28 DS1 signals into seven separate DS2 signals, and combining the DS2 signals into a single DS3 signal. T3 links operate at 43.736 Mbps. T3 is also called DS3.

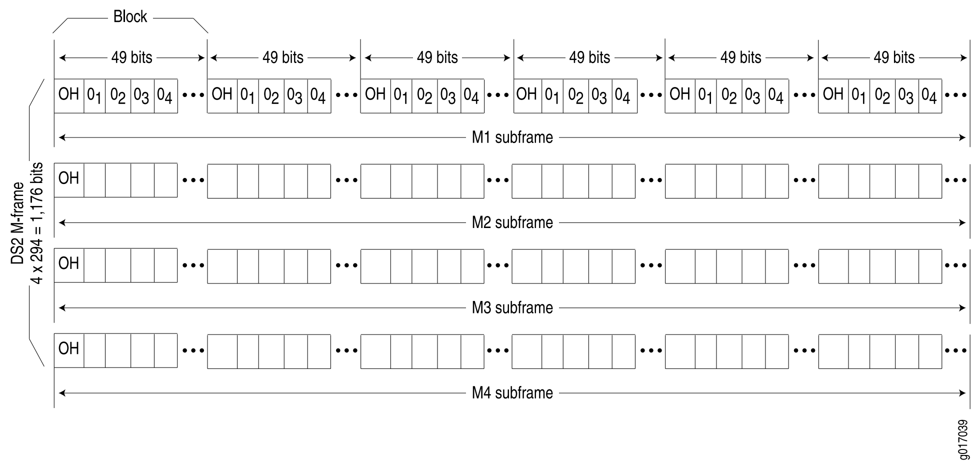
E3 is the equivalent European transmission format. E3 links are similar to T3 (DS3) links, but carry signals at 34.368 Mbps. Each signal has 16 E1 channels, and each channel transmits at 2.048 Mbps. E3 links use all 8 bits of a channel, whereas T3 links use 1 bit in each channel for overhead.

Multiplexing DS1 Signals

Four DS1 signals combine to form a single DS2 signal. The four DS1 signals form a single DS2 M-frame, which includes subframes M1 through M4. Each subframe has six 49-bit blocks, for a total of 294 bits per subframe. The first bit in each block is a DS2 overhead (OH) bit. The remaining 48 bits are DS1 information bits.

Figure 4 on page 70 shows the DS2 M-frame format.

Figure 7: DS2 M-Frame Format



The four DS2 subframes are not four DS1 channels. Instead, the DS1 data bits within the subframes are formed by data interleaved from the DS1 channels. The 0_n values designate time slots devoted to DS1 inputs as part of the bit-by-bit interleaving process. After every 48 DS1 information bits (12 bits from each signal), a DS2 OH bit is inserted to indicate the start of a subframe.

DS2 Bit Stuffing

Because the four DS1 signals are asynchronous signals, they might operate at different line rates. To synchronize the asynchronous streams, the multiplexers on the line use bit stuffing.

A DS2 connection requires a nominal transmit rate of 6.304 Mbps. However, because multiplexers increase the overall output rate to the intermediate rate of 6.312 Mbps, the output rate is higher than individual input rates on DS1 signals. The extra bandwidth is used to stuff the incoming DS1 signals with extra bits until the output rate of each signal equals the increased intermediate rate. These stuffed bits are inserted at fixed locations in the DS2 M-frame. When DS2 frames are received and the signal is demultiplexed, the stuffing bits are identified and removed.

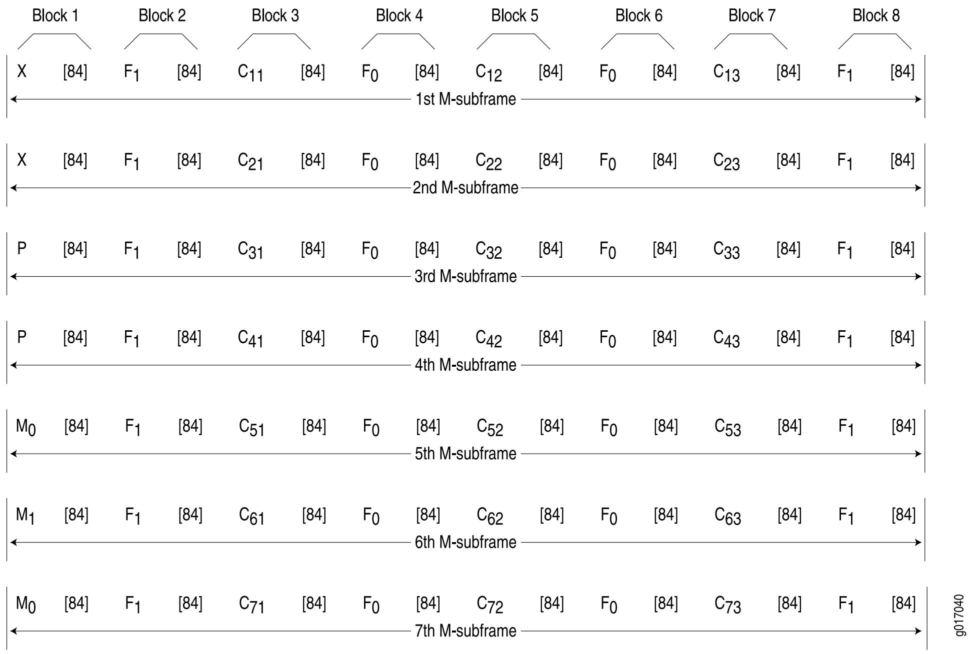
DS3 Framing

A set of four DS1 signals is multiplexed into seven DS2 signals, which are multiplexed into a single DS3 signal. The multiplexing occurs just as with DS1-to-DS2 multiplexing. The resulting DS3 signal uses either the standard M13 asynchronous framing format or the C-bit parity framing format. Although the two framing formats differ in their use of control and message bits, the basic frame structures are identical. The DS3 frame structures are shown in Figure 5 on page 71 and Figure 6 on page 72.

M13 Asynchronous Framing

A DS3 M-frame includes seven subframes, formed by DS2 data bits interleaved from the seven multiplexed DS2 signals. Each subframe has eight 85-bit blocks—a DS3 OH bit plus 84 data bits. The meaning of an OH bit depends on the block it precedes. Standard DS3 M13 asynchronous framing format is shown in Figure 5 on page 71.

Figure 8: DS3 M13 Frame Format



A DS3 M13 M-frame contains the following types of OH bits:

- Framing bits (F-bits)—Make up a frame alignment signal that synchronizes DS3 subframes. Each DS3 frame contains 28 F-bits (4 bits per subframe). F-bits are located at the beginning of blocks 2, 4, 6, and 8 of each subframe. When combined, the frame alignment pattern for each subframe is 1001. The pattern can be examined to detect bit errors in the transmission.
- Multiframing bits (M-bits)—Make up a multiframe alignment signal that synchronizes the M-frames in a DS3 signal. Each DS3 frame contains 3 M-bits, which are located at the beginning of subframes 5, 6, and 7. When combined, the multiframe alignment patter for each M-frame is 010.
- Bit stuffing control bits (C-bits)—Serve as bit stuffing indicators for each DS2 input. For example, C_{11}, C_{12}, and C_{13} are indicators for DS2 input 1. Their values indicate whether DS3 bit stuffing has occurred at the multiplexer. If the three C-bits in a subframe are all 0s, no stuffing was performed for the DS2 input. If the three C-bits are all 1s, stuffing was performed.
- Message bits (X-bits)—Used by DS3 transmitters to embed asynchronous in-service messages in the data transmission. Each DS3 frame contains 2 X-bits, which are located at the beginning of subframes 1 and 2. Within an DS3 M-frame, both X-bits must be identical.
- Parity bits (P-bits)—Compute parity over all but 1 bit of the M-frame. (The first X-bit is not included.) Each DS3 frame contains 2 P-bits, which are located at the beginning of subframes 3 and 4. Both P-bits must be identical.

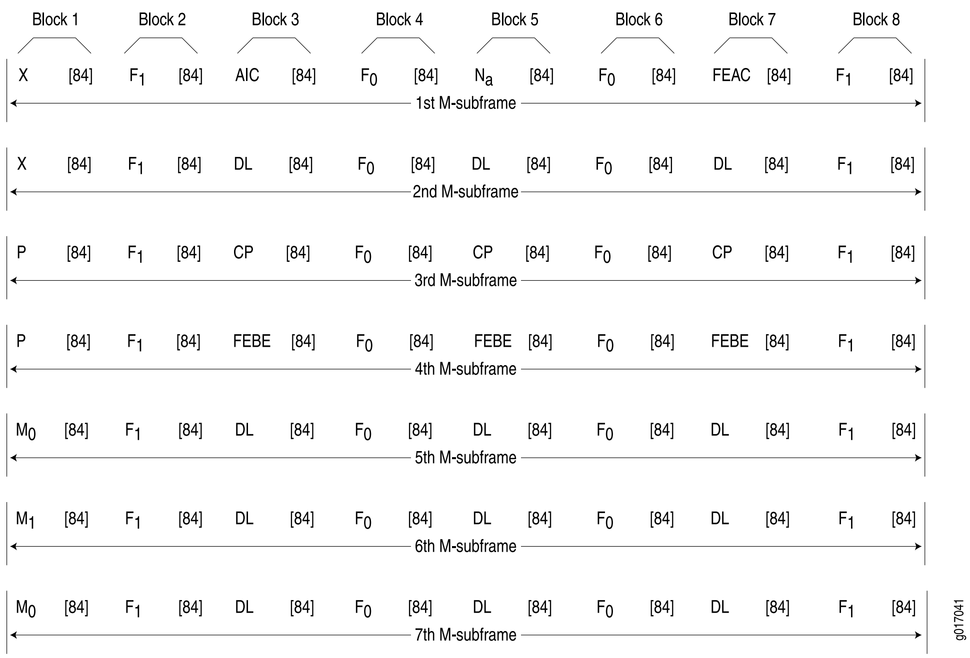
  If the previous DS3 frame contained an odd number of 1s, both P-bits are set to 1. If the previous DS3 contained an even number of 1s, both P-bits are set to 0. If, on the receiving side, the number of 1s for a given frame does not match the P-bits in the following frame, it indicates one or more bit errors in the transmission.

C-Bit Parity Framing

In M13 framing, every C-bit in a DS3 frame is used for bit stuffing. However, because multiplexers first use bit stuffing when multiplexing DS1 signals into DS2 signals, the incoming DS2 signals are already synchronized. Therefore, the bit stuffing that occurs when DS2 signals are multiplexed is redundant.

C-bit parity framing format redefines the function of C-bits and X-bits, using them to monitor end-to-end path performance and provide in-band data links. The C-bit parity framing structure is shown in Figure 6 on page 72.

Figure 9: DS3 C-Bit Parity Framing



In C-bit parity framing, the X-bits transmit error conditions from the far end of the link to the near end. If no error conditions exist, both X-bits are set to 1. If an out-of-frame (OOF) or alarm indication signal (AIS) error is detected, both X-bits are set to 0 in the upstream direction for 1 second to notify the other end of the link about the condition.

The C-bits that control bit stuffing in M13 frames are typically used in the following ways by C-bit parity framing:

- Application identification channel (AIC)—The first C-bit in the first subframe identifies the type of DS3 framing used. A value of 1 indicates that C-bit parity framing is in use.
- N_a—A reserved network application bit.
- Far-end alarm and control (FEAC) channel—The third C-bit in the first subframe is used for the FEAC channel. In normal transmissions, the FEAC C-bit transmits all 1s.

When an alarm condition is present, the FEAC C-bit transmits a code word in the format **0*xxxxxxx* 11111111**, in which ***x*** can be either 1 or 0. Bits are transmitted from right to left.

Table 21 on page 73 lists some C-bit code words and the alarm or status condition indicated.

Table 22: FEAC C-Bit Condition Indicators

Alarm or Status Condition	C-Bit Code Word
DS3 equipment failure requires immediate attention.	**00110010 11111111**
DS3 equipment failure occurred—such as suspended, not activated, or unavailable service—that is non-service-affecting.	**00011110 11111111**
DS3 loss of signal.	**00011100 11111111**
DS3 out of frame.	**00000000 11111111**
DS3 alarm indication signal (AIS) received.	**00101100 11111111**
DS3 idle received.	**00110100 11111111**
Common equipment failure occurred that is non-service-affecting.	**00011101 11111111**
Multiple DS1 loss of signal.	**00101010 11111111**
DS1 equipment failure occurred that requires immediate attention.	**00001010 11111111**
DS1 equipment failure occurred that is non-service-affecting.	**00000110 11111111**
Single DS1 loss of signal.	**00111100 11111111**

- Data links—The 12 C-bits in subframes 2, 5, 6, and 7 are data link (DL) bits for applications and terminal-to-terminal path maintenance.
- DS3 parity—The 3 C-bits in the third subframe are DS3 parity C-bits (also called CP-bits). When a DS3 frame is transmitted, the sending device sets the CP-bits to the same value as the P-bits. When the receiving device processes the frame, it calculates the parity of the M-frame and compares this value to the parity in the CP-bits of the following M-frame. If no bit errors have occurred, the two values are typically the same.
- Far–end block errors (FEBEs)—The 3 C-bits in the fourth subframe make up the far-end block error (FEBE) bits. If a framing or parity error is detected in an incoming M-frame (via the CP-bits), the receiving device generates a C-bit parity error and sends an error notification to the transmitting (far-end) device. If an error is generated, the FEBE bits are set to 000. If no error occurred, the bits are set to 111.

Related Documentation

- Example: Configuring a T3 Interface on page 74
- Example: Deleting a T3 Interface on page 76

Example: Configuring a T3 Interface

This example shows how to complete the initial configuration on a T3 interface.

Requirements

Before you begin, install a PIM, connect the interface cables to the ports, and power on the device. See the *Getting Started Guide* for your device.

Overview

This example describes the initial configuration that you must complete on each network interface. In this example, you configure the t3-1/0/0 interface as follows:

- You create the basic configuration for the new interface by setting the encapsulation type to ppp. You can enter additional values for physical interface properties as needed.
- You set the logical interface to 0. Note that the logical unit number can range from 0 to 16,384. You can enter additional values for properties you need to configure on the logical interface, such as logical encapsulation or protocol family.

Configuration

CLI Quick Configuration

To quickly configure this example, copy the following command, paste it into a text file, remove any line breaks, change any details necessary to match your network configuration, copy and paste the command into the CLI at the **[edit]** hierarchy level, and then enter commit from configuration mode.

```
set interfaces t3-1/0/0 encapsulation ppp unit 0
```

Step-by-Step Procedure

The following example requires you to navigate various levels in the configuration hierarchy. For instructions on how to do that, see *Using the CLI Editor in Configuration Mode*.

To configure a T3 interface:

1. Create the interface.

```
[edit]
user@host# edit interfaces t3-1/0/0
```


2. Create the basic configuration for the new interface.

```
[edit interfaces t3-1/0/0]
user@host# set encapsulation ppp
```

3. Add logical interfaces.

```
[edit interfaces t3-1/0/0]
user@host# set unit 0
```

Results From configuration mode, confirm your configuration by entering the **show interfaces** command. If the output does not display the intended configuration, repeat the configuration instructions in this example to correct it.

For brevity, this **show interfaces** command output includes only the configuration that is relevant to this example. Any other configuration on the system has been replaced with ellipses (...).

```
[edit]
  ...
  t3-1/0/0 {
  encapsulation ppp;
  unit 0;
}
```

If you are done configuring the device, enter **commit** from configuration mode.

Verification

Confirm that the configuration is working properly.

- Verifying the Link State of All Interfaces on page 85
- Verifying Interface Properties on page 86

Verifying the Link State of All Interfaces

Purpose By using the ping tool on each peer address in the network, verify that all interfaces on the device are operational.

Action For each interface on the device:

1. In the J-Web interface, select **Troubleshoot>Ping Host**.

2. In the Remote Host box, type the address of the interface for which you want to verify the link state.

3. Click **Start**. The output appears on a separate page.

```
PING 10.10.10.10 : 56 data bytes
64 bytes from 10.10.10.10: icmp_seq=0 ttl=255 time=0.382 ms
64 bytes from 10.10.10.10: icmp_seq=1 ttl=255 time=0.266 ms
```

If the interface is operational, it generates an ICMP response. If this response is received, the round-trip time in milliseconds is listed in the time field.

Verifying Interface Properties

Purpose Verify that the interface properties are correct.

Action From the operational mode, enter the **show interfaces detail** command.

The output shows a summary of interface information. Verify the following information:

- The physical interface is Enabled. If the interface is shown as Disabled, do one of the following:
  - In the CLI configuration editor, delete the **disable** statement at the [edit interfaces t3-1/0/0] level of the configuration hierarchy.
  - In the J-Web configuration editor, clear the **Disable** check box on the Interfaces> t3-1/0/0 page.
- The physical link is Up. A link state of Down indicates a problem with the interface module, interface port, or physical connection (link-layer errors).
- The Last Flapped time is an expected value. It indicates the last time the physical interface became unavailable and then available again. Unexpected flapping indicates likely link-layer errors.
- The traffic statistics reflect expected input and output rates. Verify that the number of input and output bytes and packets matches expected throughput for the physical interface. To clear the statistics and see only new changes, use the **clear interfaces statistics t3-1/0/0** command.

Related Documentation

- Understanding T3 and E3 Interfaces on page 69
- Example: Deleting a T3 Interface on page 76

Example: Deleting a T3 Interface

This example shows how to delete a T3 interface.

- Requirements on page 87
- Overview on page 87

Requirements

No special configuration beyond device initialization is required before configuring an interface.

Overview

In this example, you delete the t3-1/0/0 interface.

NOTE: **Performing this action removes the interface from the software configuration and disables it. Network interfaces remain physically present, and their identifiers continue to appear on the J-Web pages.**

Configuration

Step-by-Step Procedure

To delete a T3 interface:

1. Specify the interface you want to delete.

```
[edit interfaces]
user@host# delete t3-1/0/0
```

2. If you are done configuring the device, commit the configuration.

```
[edit interfaces]
user@host# commit
```

Verification

To verify the configuration is working properly, enter the **show interfaces** command.

Related Documentation

- Understanding T3 and E3 Interfaces on page 69
- Example: Configuring a T3 Interface on page 74

CHAPTER 9

Configuring 1-Port Clear Channel DS3/E3 GPIM

Understanding the 1-Port Clear Channel DS3/E3 GPIM

The 1-Port Clear Channel DS3/E3 Gigabit-Backplane Physical Interface Module (GPIM) for the device functions as a clear channel interface that can support full-duplex DS3 (T3) or E3 line rates of 44.796 or 34.368 Mbps, respectively. The DS3/E3 interface is a popular high-bandwidth WAN interface for large enterprise branch locations that enables high-quality voice, video, and data applications with reduced latency. The GPIM device does not support channelization, but it supports a subrate DS3/E3 configuration.

NOTE: **Starting in Junos OS Release 15.1X49-D10, the 1-Port Clear Channel DS3/E3 interface is no longer supported on SRX650 devices.**

This topic includes the following sections:

Supported Features

The clear channel implementation provides such features as subrate and scrambling options used by major DSU vendors. The following key features are available depending on the interface and mode selections:

- Framed and unframed DS3 (default) and E3 port modes
- Support for frame relay, point-to-point, and HDLC serial encapsulation protocols
- Support for popular vendor algorithms for subrate and payload scrambling
- Support for generation and detection of loopback control codes (line-loopback activate and deactivate) and FEAC codes
- External and internal clocking support
- Support for DS3 and E3 network alarms
- Support for chassis clusters
- Support for anti-counterfeit check
- Loopback (local, remote, and payload) and BERT/PRBS/QRSS diagnostics support
- MTU size of 4474 bytes (default) and 9192 bytes (maximum)

Interface Naming

The following format represents the 1-Port Clear Channel DS3/E3 GPIM interface names:

```
type-fpc/pic/port
```

where:

- *type*—Media type (T3 or E3)
- *fpc*—Number of the Flexible PIC Concentrator (FPC) card on which the physical interface is located
- *pic*—Number of the PIC on which the physical interface is located
- *port*—Specific port on the PIC

Examples: **t3-1/0/0** and **e3-2/0/0**

Physical Interface Settings

The 1-Port Clear Channel DS3/E3 GPIM supports IP configurations. Using the CLI, you can configure the 1-Port Clear Channel DS3/E3 GPIM to operate in either DS3 or E3 mode. By default, at installation the physical interface, t3-x/y/z, is enabled on the GPIM port operating in DS3 mode with T3 framing.

You can reset the mode of the physical interface to E3 using the **edit chassis** command:

```
[edit]
user@host# set chassis fpc 1 pic 0 port 0 framing e3
```

Logical Interface Settings

The logical interface for the device is determined by setting the **t3-options** or **e3-options** of the **edit interfaces** command.

You can specify the MTU size for the GPIM interface. Junos OS supports an MTU value of 4474 bytes for the default value or up to 9192 bytes for maximum jumbo GPIM implementations.

Table 23 on page 91 identifies network interface specifications for DS3 or E3 modes.

Table 23: 1-Port Clear Channel DS3/E3 GPIM Interface Options

Description	DS3 Mode	E3 Mode
Network Interface Specifications		
Line encoding	B3ZS	HDB3
Framing	• C-bit parity (default) • M23	G.751 (default)
Subrate and scrambling	Vendor algorithms supported: • Adtran • Digital Link • Kentrox • Larscom • Verilink	Vendor algorithms supported: • Digital Link • Kentrox
Network alarms	Supported in accordance with the ANSI specification: • Loss of signal (LOS) • Out of frame (OOF) • Loss of frame (LOF) • Alarm identification Signal (AIS) • Remote defect identification (RDI)	Supported in accordance with the ITU-T specification: • Loss of signal (LOS) • Out of frame (OOF) • Alarm identification signal (AIS) • Remote defect identification (RDI) • Phase- locked loop (PLL)
Error counters	Incremented during a periodic 1-second polling routine: • Line code violations (LCV) • P-bit code violations (PCV) • C-bit code violations (CCV) • Line errored seconds (LES) • P-bit errored seconds (PES) • C-bit errored seconds (CES) • Severely errored framing seconds (SEFS) • P-bit severely errored seconds (PSES) • C-bit severely errored seconds (CSES) • Unavailable seconds (UAS)	Incremented during a periodic 1-second polling routine: • Frame alignment error (FAE) • Bipolar coding violations (BCV) • Excessive zeros (EXZ) • Line code violations (LCV) • Line errored seconds (LES) • Severely errored framing seconds (SEFS) • Unavailable seconds (UAS)
HDLC Features		
MTU	Default (4474 bytes) or maximum jumbo (up to 9192 bytes)	Default (4474 bytes) or maximum jumbo (up to 9192 bytes)

Table 23: 1-Port Clear Channel DS3/E3 GPIM Interface Options (continued)

Description	DS3 Mode	E3 Mode
Shared flag	Supported	Supported
Idle flag/fill (0x7e or all ones)	Supported	Supported
Counters	Runts, giants	Runts, giants

Release History Table

Release	Description
15.1X49-D10	Starting in Junos OS Release 15.1X49-D10, the 1-Port Clear Channel DS3/E3 interface is no longer supported on SRX650 devices.

Related Documentation

- Interface Naming Conventions on page 8

Example: Configuring the 1-Port Clear-Channel DS3/E3 GPIM for M23 Mapping Mode

The following example configures the GPIM in DS3 with M23 mapping mode. Note that M23 mapping does not provide C-bit parity.

NOTE: **Starting in Junos OS Release 15.1X49-D10, the 1-Port Clear Channel DS3/E3 interface is no longer supported on SRX650 devices.**

Requirements

Before you begin:

- Install the device as specified in the *SRX Series Services Physical Interface Modules Hardware Guide*.

Overview

This example configures the basic T3 interface and modifies the framing to M23 mode without C-bit parity.

Configuration

Step-by-Step Procedure

To configure the GPIM:

1. Verify the installation, location, and status of the GPIM. In this example, the GPIM is installed in slot 8/PIC 0 and is currently online.

   ```
   user@host> show chassis fpc pic-status
   ```

   ```
   Slot 0 Online FPC
      PIC 0 Online 4x GE Base PIC
   Slot 2 Offline FPC
   Slot 5 Offline FPC
   Slot 6 Online FPC
      PIC 0 Online 4x CT1E1 gPIM
   Slot 7 Offline FPC
   Slot 8 Online FPC
      PIC 0 Online 1x CLR CH T3/E3
   ```

2. Set the IP address for the logical interface.

   ```
   [edit]
   user@host# set interfaces t3-8/0/0 unit 0 family inet address interface
     192.107.1.230/24
   ```

3. Set the MTU value to 9018.

   ```
   [edit]
   user@host# set interfaces t3-8/0/0 unit 0 family inet mtu 9018
   ```

4. Set the framing mode.

   ```
   [edit]
   user@host# set interfaces t3-8/0/0 t3-options m23
   ```

5. Disable C-bit parity for M23 mode.

   ```
   [edit]
   user@host# set interfaces t3-8/0/0 t3-options no-cbit-parity
   ```

6. If you are done configuring the device, commit the configuration.

   ```
   [edit]
   user@host# commit
   ```

7. To verify the configuration for your device, enter the following operational command:

   ```
   user@host> show interfaces t3-8/0/0 extensive
   ```

Release History Table

Release	Description
15.1X49-D10	Starting in Junos OS Release 15.1X49-D10, the 1-Port Clear Channel DS3/E3 interface is no longer supported on SRX650 devices.

Related Documentation

- Understanding the 1-Port Clear Channel DS3/E3 GPIM on page 89

Example: Configuring the 1-Port Clear-Channel DS3/E3 GPIM for DS3 Port Mode

This example configures the GPIM in the DS3 (T3) operation mode.

NOTE: **Starting in Junos OS Release 15.1X49-D10, the 1-Port Clear Channel DS3/E3 interface is no longer supported on SRX650 devices.**

- Requirements on page 94
- Overview on page 94
- Configuration on page 94

Requirements

Before you begin:

- Install the device as specified in the *SRX Series Services Physical Interface Modules Hardware Guide*.

Overview

This example configures the basic T3 interface and modifies the framing to C-bit parity mode.

Configuration

Step-by-Step Procedure

To configure the GPIM:

1. Verify the installation, location, and status of the GPIM. In this example, the GPIM is installed in slot 8/PIC 0 and is currently online.

   ```
   user@host> show chassis fpc pic-status
   ```

   ```
   Slot 0 Online FPC
      PIC 0 Online 4x GE Base PIC
   Slot 2 Offline FPC
   Slot 5 Offline FPC
   Slot 6 Online FPC
      PIC 0 Online 4x CT1E1 gPIM
   Slot 7 Offline FPC
   ```

```
Slot 8 Online FPC
   PIC 0 Online 1x CLR CH T3/E3
```

2. Set the IP address for the logical interface.

```
[edit]
user@host# set interfaces t3-8/0/0 unit 0 family inet address interface
  192.107.1.230/24
```

3. Set the MTU value to 9018.

```
[edit]
user@host# set interfaces t3-8/0/0 unit 0 family inet mtu 9018
```

4. Set the framing mode.

```
[edit]
user@host# set interfaces t3-8/0/0 t3-options cbit-parity
```

5. Enable the unframed DS3 mode.

```
[edit]
user@host# set interfaces t3-8/0/0 t3-options unframed
```

6. If you are done configuring the device, commit the configuration.

```
[edit]
user@host# commit
```

7. To verify the configuration for your device, enter the following operational command:

```
user@host> show interfaces t3-8/0/0 extensive
```

Release History Table

Release	Description
15.1X49-D10	Starting in Junos OS Release 15.1X49-D10, the 1-Port Clear Channel DS3/E3 interface is no longer supported on SRX650 devices.

Related Documentation

- Understanding the 1-Port Clear Channel DS3/E3 GPIM on page 89

Example: Configuring the 1-Port Clear Channel DS3/E3 GPIM for E3 Port Mode

This example modifies the default configuration for an E3 environment.

Requirements

Before you begin:

- Install the device as specified in the *SRX Series Services Physical Interface Modules Hardware Guide*.

Overview

This example configures the basic E3 interface.

Configuration

Step-by-Step Procedure

To configure the GPIM in E3 framing:

1. Verify the installation, location, and status of the GPIM. In this example, the GPIM is installed in slot 8/PIC 0 and is currently online.

   ```
   user@host> show chassis fpc pic-status
   ```

   ```
   Slot 0 Online FPC
      PIC 0 Online 4x GE Base PIC
   Slot 2 Offline FPC
   Slot 5 Offline FPC
   Slot 6 Online FPC
      PIC 0 Online 4x CT1E1 gPIM
   Slot 7 Offline FPC
   Slot 8 Online FPC
      PIC 0 Online 1x CLR CH T3/E3
   ```

2. Change to E3 port mode.

   ```
   [edit]
   user@host# set chassis fpc 8 pic 0 port 0 framing e3
   ```

3. Reset the MTU value to 3474.

   ```
   [edit]
   user@host# set interfaces e3-8/0/0 unit 0 family inet mtu 3474
   ```

4. Enable the unframed mode.


```
[edit]
user@host# set interfaces e3-8/0/0 e3-options unframed
```

5. If you are done configuring the device, commit the configuration.

```
[edit]
user@host# commit
```

6. To verify the configuration for your device, enter the following operational command:

```
user@host> show interfaces e3-8/0/0 extensive
```

Related Documentation

- Understanding the 1-Port Clear Channel DS3/E3 GPIM on page 89

PART 3

Configuring DSL Interfaces

CHAPTER 10

Configuring ADSL Interfaces

ADSL Interface Overview

Selected Juniper Networks security devices support DSL features including ATM-over-ADSL and ATM-over-SHDSL interfaces.

NOTE: Payload loopback functionality is not supported on ATM-over-SHDSL interfaces.

Asymmetric digital subscriber line (ADSL) technology is part of the *x*DSL family of modem technologies that use existing twisted-pair telephone lines to transport high-bandwidth data. ADSL lines connect service provider networks and customer sites over the "last mile" of the network—the loop between the service provider and the customer site.

ADSL transmission is asymmetric because the downstream bandwidth is typically greater than the upstream bandwidth. The typical bandwidths of ADSL, ADSL2, and ADSL2+ circuits are defined in Table 24 on page 101.

Table 24: Standard Bandwidths of DSL Operating Modes

Operating Modes	Upstream	Downstream
ADSL	800 Kbps—1Mbps	8 Mbps
ADSL2	1—1.5 Mbps	12—14 Mbps
ADSL2+	1—1.5 Mbps	24—25 Mbps

Table 24: Standard Bandwidths of DSL Operating Modes (continued)

Operating Modes	Upstream	Downstream
ADSL2+ Annex M	2.5—3 Mbps	25 Mbps

ADSL, ADSL2, and ADSL2+ support the following standards:

- For Annex A:
  - ITU G.992.1 (ADSL)
- For Annex A only:
  - ANSI T1.413 Issue II
  - ITU G.992.3 (ADSL2)
  - ITU G.992.5 (ADSL2+)
- For Annex M:
  - ITU G.992.3 (ADSL2)
  - ITU G.992.5 (ADSL2+)
- For Annex B:
  - ITU G.992.1 (ADSL)
  - ITU G.992.3 (ADSL2)
  - ITU G.992.5 (ADSL2+)
- For Annex B only
  - ETSI TS 101 388 V1.3

The ADSL Mini-PIM facilitates a maximum of 10 virtual circuits on supported security devices.

Supported security devices with Mini-PIMs can use PPP over Ethernet over ATM (PPPoEoA) and PPP over ATM (PPPoA) to connect through ADSL lines only.

ADSL Systems

ADSL links run across twisted-pair telephone wires. When ADSL modems are connected to each end of a telephone wire, a dual-purpose ADSL circuit can be created. Once established, the circuit can transmit lower-frequency voice traffic and higher-frequency data traffic.

To accommodate both types of traffic, ADSL modems are connected to plain old telephone service (POTS) splitters that filter out the lower-bandwidth voice traffic and the higher-bandwidth data traffic. The voice traffic can be directed as normal telephone voice traffic. The data traffic is directed to the ADSL modem, which is typically connected to the data network.

ADSL2 and ADSL2+

The ADSL2 and ADSL2+ standards were adopted by the ITU in July 2002. ADSL2 improves the data rate and reach performance, diagnostics, standby mode, and interoperability of ADSL modems.

ADSL2+ doubles the possible downstream data bandwidth, enabling rates of 20 Mbps on telephone lines shorter than 5000 feet (1.5 km).

ADSL2 uses seamless rate adaptation (SRA) to change the data rate of a connection during operation with no interruptions or bit errors. The ADSL2 transceiver detects changes in channel conditions—for example, the failure of another transceiver in a multicarrier link—and sends a message to the transmitter to initiate a data rate change. The message includes data transmission parameters such as the number of bits modulated and the power on each channel. When the transmitter receives the information, it transitions to the new transmission rate.

ATM CoS Support

Certain class-of-service (CoS) components for Asynchronous Transmission Mode (ATM) are provided to control data transfer, especially for time-sensitive voice packets. The ADSL Mini-PIM on the SRX210 device provides extended ATM CoS functionality to provide cells across the network. You can define bandwidth utilization, which consists of either a constant rate or a peak cell rate, with sustained cell rate and burst tolerance. By default, unspecified bit rate (UBR) is used because the bandwidth utilization is unlimited.

The following ATM traffic shaping features are supported:

Constant bit rate (CBR)	CBR is the service category for traffic with rigorous timing requirements like voice and certain types of video. CBR traffic needs a constant cell transmission rate throughout the duration of the connection.
Variable bit rate non-real - time (VBR-NRT)	VBR-NRT is intended for sources such as data transfer, which do not have strict time or delay requirements. VBR-NRT is suitable for packet data transfers.
Unspecified bit rate (UBR)	UBR is ATM's best-effort service, which does not provide any CoS guarantees. This is suitable for noncritical applications that can tolerate or quickly adjust to loss of cells.

The ability of a network to guarantee class of service depends on the way in which the source generates cells and also on the availability of network resources. The connection contract between the user and the network thus contains information about the way in which traffic is generated by the source.

A set of traffic descriptors is specified for this purpose. The network provides the class of service for the cells that do not violate these specifications. The following are the traffic descriptors specified for an ATM network:

- Peak cell rate (PCR)—Top rate at which traffic can burst.
- Sustained cell rate (SCR)—Normal traffic rate averaged over time.

- Maximum burst size (MBS)—The maximum burst size that can be sent at the peak rate.
- Cell delay variation tolerance (CDVT)—Allows the user to delay the traffic for a particular time duration in microseconds to follow a rhythmic pattern.

For traffic that does not require the ability to periodically burst to a higher rate, you can specify a CBR. You can configure VBR-NRT for ATM interfaces, which supports VBR data traffic with average and peak traffic parameters. VBR-NRT is scheduled with a lower priority and with a larger sustained cell rate (SCR) limit, allowing it to recover bandwidth if it falls behind.

On SRX300, SRX320, SRX340, SRX345, and SRX550HM devices, the ATM interface takes more than 5 minutes to come up when CPE is configured in ANSI-DMT mode and CO is configured in automode. This occurs only with ALU 7300 DSLAM, due to limitation in current firmware version running on the ADSL Mini-PIM.

Related Documentation

- Understanding Point-to-Point Protocol over Ethernet on page 429
- ADSL and SHDSL Interfaces Configuration Overview on page 104
- Example: Configuring ATM-over-ADSL Network Interfaces on page 129
- Example: Configuring ATM-over-SHDSL Network Interfaces on page 108
- Example: Configuring CHAP on DSL Interfaces on page 120
- Example: Configuring MLPPP-over-ADSL Interfaces on page 114

ADSL and SHDSL Interfaces Configuration Overview

An SRX Series device with an ADSL interface supports LFI through an MLPPP.

NOTE: **Currently, Junos OS supports bundling of only one xDSL link under bundle interface.**

To support MLPPP encapsulation and the family mlppp on the ADSL interface on an SRX Series device, you enable an existing Junos OS CLI.

To establish an ADSL link between network devices, you must use some intermediate connections. First, use an RJ-11 cable to connect the CPE (for example, an SRX Series device) to a DSLAM patch panel to form an ADSL link. Then use OC3 or DS3 to connect the DSLAM to M Series or E Series devices to form an ATM backbone.

You can configure the following properties for the ADSL and SHDSL interfaces:

- Physical properties
- Logical properties

You can configure the following physical properties for the interface:

- ATM virtual path identifier (VPI) options for the interface—for example, at-2/0/0:
  - ATM VPI—A number from 0 through 255—for example, 25.
  - Operation, Maintenance, and Administration (OAM) F5 loopback cell thresholds ("liveness") on ATM virtual circuits. The range is from 1 through 255, and the default is 5 cells.
    - Down count—Number of consecutive OAM loopback cells an ATM virtual circuit must lose to be identified as unavailable—for example, 200.
    - Up count—Number of consecutive OAM loopback cells an ATM virtual interface must receive to be identified as operational—for example, 200.
  - OAM period—Interval, in seconds, at which OAM cells are transmitted on ATM virtual circuits—for example, 100. The range is from 1 through 900 seconds.
  - Configure CBR for the interface—for example, at-1/0/0.
    - CBR—Range from 33,000 through 1,199,920
    - CDVT—Range from 1 through 9,999
  - Configure VBR for the interface—for example, at-1/0/0.
    - MBS—Range from 33,000 through 1,199,920
    - CDVT—Range from 1 through 9,999
    - PCR—Range from 33,000 through 1,199,920
    - SCR—Range from 33,000 through 1,199,920
- Type of DSL operating mode for the ATM-over-ADSL and ATM-over-SHDSL interfaces—for example, auto:

  Annex A (used in North American network implementations) and Annex B (used in European network implementations) support the following operating modes:

  - **auto**—Configures the ADSL interface to autonegotiate settings with the DSLAM located at the central office. For Annex A, the ADSL interface trains in either ANSI T1.413 Issue II mode or ITU G.992.1 mode. For Annex B, the ADSL interface trains in ITU G.992.1 mode. For the SHDSL interface, the line rate is available only in two-wire mode and is the default value.
  - **itu-dmt**—Configures the ADSL interface to train in ITU G.992.1 mode.
  - **192** Kbps or higher—Speed of transmission of data on the SHDSL connection. For the SHDSL interface, in the four-wire mode, the default line rate is 4,608 Kbps.

  Annex A supports the following operating modes:

  - **adsl2plus**—Configures the ADSL interface to train in ITU G.992.5 mode. You can configure this mode only when it is supported on the DSLAM.
  - **itu-dmt-bis**—Configures the ADSL interface to train in ITU G.992.3 mode. You can configure this mode only when it is supported on the DSLAM.
  - **ansi-dmt**—Configures the ADSL interface to train in the ANSI T1.413 Issue II mode.

Annex B supports the following operating modes:

- **etsi**—Configures the ADSL line to train in the ETSI TS 101 388 V1.3.1 mode.
- **itu-annexb-ur2**—Configures the ADSL line to train in the G.992.1 Deutsche Telekom UR-2 mode.
- **itu-annexb-non-ur2**—Configures the ADSL line to train in the G.992.1 Non-UR-2 mode.

- Loopback option for testing the SHDSL connection integrity–for example, local loopback.

  The following values are available:

  - **local**—Used for testing the SHDSL equipment with local network devices.
  - **payload**—Used to command the remote configuration to send back the received payload.
  - **remote**—Used to test SHDSL with a remote network configuration.

- Signal-to-noise ratio (SNR) margin—for example, 5 dB for either or both of the following thresholds:

  - **current**—Line trains at higher than current noise margin plus SNR threshold. The range is from 0 to 10 dB. The default value is 0.
  - **snext**—Line trains at higher than self-near-end crosstalk (SNEXT) threshold. The default value is **disabled**.

  Setting the SNR creates a more stable SHDSL connection by making the line train at a SNR margin higher than the threshold. If any external noise below the threshold is applied to the line, the line remains stable. You can also disable the SNR margin thresholds.

- Encapsulation type—for example, ethernet-over-atm:

  - **atm-pvc**—ATM permanent virtual circuits is the default encapsulation for ATM-over-ADSL and ATM-over-SHDSL interfaces.

    For PPP over ATM (PPPoA)-over-ADSL and over-SHDSL interfaces, use this type of encapsulation.

  - **ethernet-over-atm**—Ethernet over ATM encapsulation.

    For PPP over Ethernet (PPPoE) over ATM-over-ADSL and ATM-over-SHDSLinterfaces that carry IPv4 traffic, use this type of encapsulation.

You can configure the following logical properties for the interface:

- Logical interface. Set a value from 0 through 16,385—for example, 3. Add other values if required by your network.
- Configure encapsulation for the ATM-for-ADSL or ATM-for-SHDSL logical unit—for example, atm-nlpid.

The following encapsulations are supported on the ATM-over-ADSL and ATM-over-SHDSL interfaces that use inet (IP) protocols only:

- **atm-vc-mux**—Use ATM virtual circuit multiplex encapsulation.
- **atm-nlpid**—Use ATM network layer protocol identifier (NLPID) encapsulation.
- **atm-cisco-nlpid**—Use Cisco NLPID encapsulation.
- **ether-over-atm-llc**—For interfaces that carry IPv4 traffic, use Ethernet over LLC encapsulation. You cannot configure multipoint interfaces if you use this type of encapsulation.

The following encapsulations are supported on the ATM-over-ADSL or ATM-over-SHDSL for PPP-over-ATM (PPPoA) interfaces only.

- **atm-ppp-llc**—AAL5 logical link control (LLC) encapsulation.
- **atm-ppp-vc-mux**—Use AAL5 multiplex encapsulation.

Other encapsulation types supported on the ATM-over-ADSL and ATM-over-SHDSL interfaces are:

- **ppp-over-ether-over-atm-llc**—Use PPP over Ethernet over ATM LLC encapsulation. When you use this encapsulation type, you cannot configure the interface address. Instead you configure the interface address on the PPP interface.
- **atm-snap**—Use ATM subnetwork attachment point (SNAP) encapsulation.

- OAM options for the ATM virtual circuits:
  - OAM F5 loopback cell thresholds ("liveness") on ATM virtual circuits. The range is from 1 through 255, and the default is 5 cells.
    - Down count—Number of consecutive OAM loopback cells an ATM virtual circuit must lose to be identified as unavailable—for example, 200.
    - Up count—Number of consecutive OAM loopback cells an ATM virtual interface must receive to be identified as operational—for example, 200.
  - OAM period—Interval, in seconds, at which OAM cells are transmitted on ATM virtual circuits—for example, 100. The range is from 1 through 900 seconds.
- Family protocol type—for example, inet. Commands vary depending on the protocol type.
- ATM VCI options for the interface:
  - ATM VCI type—vci
  - ATM VCI value—A number from 0 through 4,089—for example, 35—with VCIs 0 through 31 reserved.

Related Documentation

- Understanding Point-to-Point Protocol over Ethernet on page 429.
- ADSL Interface Overview on page 101

- Example: Configuring ATM-over-ADSL Network Interfaces on page 129
- Example: Configuring ATM-over-SHDSL Network Interfaces on page 108
- Example: Configuring CHAP on DSL Interfaces on page 120
- Example: Configuring MLPPP-over-ADSL Interfaces on page 114

Example: Configuring ATM-over-SHDSL Network Interfaces

This example shows how to configure ATM-over-SHDSL network interfaces.

Requirements

Before you begin:

- Configure network interfaces as necessary. See "Understanding Ethernet Interfaces" on page 255.
- Configure PPPoE encapsulation on an Ethernet interface or on an ATM-over-ADSL interface. See "Understanding Point-to-Point Protocol over Ethernet" on page 429.

Overview

In this example, you set the ATM-over-SHDSL mode on the G.SHDSL interface, if required. You create an interface called at-2/0/0 and configure the physical properties for the interface. You configure the encapsulation type and annex type. You specify the SHDSL line rate for the ATM-over-SHDSL interface and the loopback address for testing the SHDSL connection integrity. Then you configure the SNR margin, set the logical interface, and configure the encapsulation for the ATM-over-SHDSL logical unit.

Additionally, you configure the OAM liveness values for an ATM virtual circuit and set the OAM period, Finally, you add the family protocol type inet and configure the VCI value.

Configuration

CLI Quick Configuration

To quickly configure this example, copy the following command, paste it into a text file, remove any line breaks, change any details necessary to match your network configuration, copy and paste the command into the CLI at the **[edit]** hierarchy level, and then enter **commit** from configuration mode.

```
set chassis fpc 6 pic 0 shdsl pic-mode 1-port-atm
set interfaces at-2/0/0 atm-options vpi 25 oam-liveness up-count 200 down-count 200
set interfaces at-2/0/0 atm-options vpi 25 oam-period 100
set interfaces at-2/0/0 encapsulation ethernet-over-atm shdsl-options annex annex-a
set interfaces at-2/0/0 encapsulation ethernet-over-atm shdsl-options line-rate auto
```



```
set interfaces at-2/0/0 encapsulation ethernet-over-atm shdsl-options loopback local
set interfaces at-2/0/0 encapsulation ethernet-over-atm shdsl-options snr-margin
   current 5 snext 5
set interfaces at-2/0/0 unit 3 encapsulation atm-nlpid
set interfaces at-2/0/0 unit 3 oam-liveness up-count 200 down-count 200
set interfaces at-2/0/0 unit 3 oam-period 100
set interfaces at-2/0/0 unit 3 oam-period 100
set interfaces at-2/0/0 unit 3 vci 35
```

Step-by-Step Procedure

The following example requires you to navigate various levels in the configuration hierarchy. For instructions on how to do that, see *Using the CLI Editor in Configuration Mode* in the *CLI User Guide*.

To configure ATM-over-SHDSL network interfaces for the device:

1. Set the ATM-over-SHDSL mode on the G.SHDSL interface.

   ```
   [edit]
   user@host# set chassis fpc 6 pic 0 shdsl pic-mode 1-port-atm
   ```

2. Create an interface.

   ```
   [edit]
   user@host# edit interfaces at-2/0/0
   ```

3. Configure the physical properties for the interface.

   ```
   [edit interfaces at-2/0/0]
   user@host# set atm-options vpi 25
   user@host# set atm-options vpi 25 oam-liveness up-count 200 down-count 200
   user@host# set atm-options vpi 25 oam-period 100
   ```

4. Configure the encapsulation type.

   ```
   [edit interfaces at-2/0/0]
   user@host# set encapsulation ethernet-over-atm
   ```

5. Set the annex type.

   ```
   [edit]
   user@host# edit interfaces at-2/0/0 shdsl-options
   user@host# set annex annex-a
   ```

6. Configure the SHDSL line rate.

   ```
   [edit interfaces at-2/0/0 shdsl-options]
   user@host# set line-rate auto
   ```

7. Configure the loopback option for testing the SHDSL connection integrity.

```
[edit interfaces at-2/0/0 shdsl-options]
user@host# set loopback local
```

8. Configure the signal-to-noise ration margin.

```
[edit interfaces at-2/0/0 shdsl-options]
user@host# set snr-margin current 5
user@host# set snr-margin snext5
```

9. Configure the logical interface.

```
[edit]
user@host# edit interfaces at-2/0/0 unit 3
```

10. Configure the encapsulation for the logical unit.

```
[edit interfaces at-2/0/0 unit 3]
user@host# set encapsulation atm-nlpid
```

11. Configure the OAM liveness values for an ATM virtual circuit

```
[edit interfaces at-2/0/0 unit 3]
user@host# set oam-liveness up-count 200 down-count 200
```

12. Configure the OAM period.

```
[edit interfaces at-2/0/0 unit 3]
user@host# set oam-period 100
```

13. Add the Family protocol type.

```
[edit interfaces at-2/0/0 unit 3]
user@host# set family inet
```

14. Configure the VCI value.

```
[edit interfaces at-2/0/0 unit 3]
user@host# set vci 35
```

Results From configuration mode, confirm your configuration by entering the **show interfaces at-2/0/0** command. If the output does not display the intended configuration, repeat the configuration instructions in this example to correct it.


```
[edit]
  user@host# show interfaces at-2/0/0
  encapsulation ethernet-over-atm;
  atm-options {
  vpi 25 {
    oam-period 100;
    oam-liveness {
  up-count 200;
  down-count 200;
    }
  }
  }
}
  shdsl-options {
    annex annex-a;
    line-rate auto;
  loopback local;
    snr-margin {
      current 5
      snext 5;
      }
    }
    unit 3 {
      encapsulation atm-nlpid;
      vci 35;
      oam-period 100;
        oam-liveness {
        up-count 200;
      down-count 200;
      }
      family inet;
    }
```

If you are done configuring the device, enter **commit** from configuration mode.

Verification

Confirm that the configuration is working properly.

Verifying an ATM-over-SHDSL Configuration

Purpose Verify that the interface properties are correct.

Action From operational mode, enter the **show interfaces at-2/0/0 extensive** command.

user@host> **show interfaces at-2/0/0 extensive**

```
Physical interface: at-2/0/0, Enabled, Physical link is Up
  Interface index: 141, SNMP ifIndex: 23, Generation: 48
  Link-level type: ATM-PVC, MTU: 4482, Clocking: Internal, ADSL mode, Speed: ADSL,

  Loopback: None
  Device flags   : Present Running
  Link flags     : None
```

```
  CoS queues     : 8 supported
  Hold-times     : Up 0 ms, Down 0 ms
  Current address: 00:05:85:c7:44:3c
  Last flapped   : 2005-05-16 05:54:41 PDT (00:41:42 ago)
  Statistics last cleared: Never
  Traffic statistics:
   Input  bytes  :                4520                    0 bps
   Output bytes  :               39250                    0 bps
   Input  packets:                  71                    0 pps
   Output packets:                1309                    0 pps
  Input errors:
    Errors: 0, Drops: 0, Invalid VCs: 0, Framing errors: 0, Policed discards: 0,

    L3 incompletes: 0, L2 channel errors: 1, L2 mismatch timeouts: 0, Resource
errors: 0
  Output errors:
    Carrier transitions: 3, Errors: 0, Drops: 0, Aged packets: 0, MTU errors: 0,

    Resource errors: 0
  Queue counters:       Queued packets  Transmitted packets      Dropped packets

    0 best-effort                    4                    4                    0

    1 expedited-fo                   0                    0                    0

    2 assured-forw                   0                    0                    0

    3 network-cont                2340                 2340                    0

  SHDSL  alarms   : None
  SHDSL  defects  : None
  SHDSL media:            Seconds        Count  State
    LOSD                  239206            2  OK
    LOSW                  239208            1  OK
    ES                         3            1  OK
    SES                        0            0  OK
    UAS                        3            1  OK

  SHDSL status:
    Line termination  :STU-R
  Annex     :Annex B
  Line Mode    :2-wire
  Modem Status   :Data
  Last fail code  :0
  Framer mode   :ATM
  Dying Gasp    :Enabled
  Chipset version  :1
  Firmware version  :R3.0
  SHDSL Statistics:
   Loop Attenuation (dB)   :0.600
 Transmit power (dB)     :8.5
 Receiver gain (dB)    :21.420
 SNR sampling (dB)     :39.3690
 Bit rate  (kbps)     :2304
 Bit error rate      :0
 CRC errors       :0
 SEGA errors       :1
 LOSW errors       :0
 Received cells      :1155429
 Transmitted cells     :1891375
```



```
HEC errors       :0
Cell drop       :0
```

The output shows a summary of interface information. Verify the following information:

- The physical interface is enabled. If the interface is shown as disabled, do either of the following:
  - In the CLI configuration editor, delete the **disable** statement at the [edit interfaces*interface-name*] level of the configuration hierarchy.
  - In the J-Web configuration editor, clear the **Disable** check box on the Interfaces page (Interfaces>*interface-name*).
- The physical link is up. A link state of down indicates a problem with the interface module, interface port, or physical connection (link-layer errors).
- The last flapped time is an expected value. The last flapped time indicates the last time the physical interface became unavailable and then available again. Unexpected flapping indicates likely link-layer errors.
- The traffic statistics reflect expected input and output rates. Verify that the number of inbound and outbound bytes and packets matches expected throughput for the physical interface. To clear the statistics and see only new changes, use the **clear interfaces statistics *interface-name*** command.
- No SHDSL alarms and defects appear that can render the interface unable to pass packets. When a defect persists for a certain amount of time, it is promoted to an alarm.
  - **LOS**—Loss of signal. No signal was detected on the line.
  - **LOSW**—Loss of sync word. A message ID was sent.
  - **Power status**—A power failure has occurred.
  - **LOSD**—Loss of signal was detected at the remote application interface.
  - **ES**—Errored seconds. One or more cyclic redundancy check (CRC) anomalies were detected.
  - **SES**—Severely errored seconds. At least 50 CRC anomalies were detected.
  - **UAS**—Unavailable seconds. An interval has occurred during which one or more LOSW defects were detected.

Examine the SHDSL interface status:

- **Line termination**—SHDSL transceiver unit–remote (STU–R). (Only customer premises equipment is supported.)
- **Annex**—Either Annex A or Annex B. Annex A is supported in North America, and Annex B is supported in Europe.
- **Line mode**—SHDSL mode configured on the G.SHDSL interface pair, either two-wire or four-wire.

- **Modem status**—Data. Sending or receiving data.
- **Last fail code**—Code for the last interface failure.
- **Framer mode** —ATM Framer mode of the underlying interface.
- **Chipset version**—Version number of the chipset on the interface
- **Firmware version**—Version number of the firmware on the interface.

Examine the operational statistics for a SHDSL interface.

- **Loop attenuation (dB)**—Reduction in signal strength measured in decibels.
- **Transmit power (dB)**—Amount of SHDSL usage in %.
- **Receiver gain (dB)**—Maximum extraneous signal allowed without causing the output to deviate from an acceptable level.
- **SNR sampling (dB)**—Signal-to-noise ratio at a receiver point in decibels.
- **Bit rate (kbps)**—Data transfer speed on the SHDSL interface.
- **CRC errors**—Number of cyclic redundancy check errors.
- **SEGA errors**—Number of segment anomaly errors. A regenerator operating on a segment received corrupted data.
- **LOSW errors**—Number of loss of signal defect errors. Three or more consecutively received frames contained one or more errors in the framing bits.
- **Received cells**—Number of cells received through the interface.
- **Transmitted cells**—Number of cells sent through the interface.
- **HEC errors**—Number of header error checksum errors.
- **Cell drop**—Number of dropped cells on the interface.

Related Documentation

- Understanding Interfaces on page 3
- ADSL Interface Overview on page 101
- ADSL and SHDSL Interfaces Configuration Overview on page 104
- Example: Configuring CHAP on DSL Interfaces on page 120

Example: Configuring MLPPP-over-ADSL Interfaces

This example shows how to configure MLPPP on an ADSL interface.

Requirements

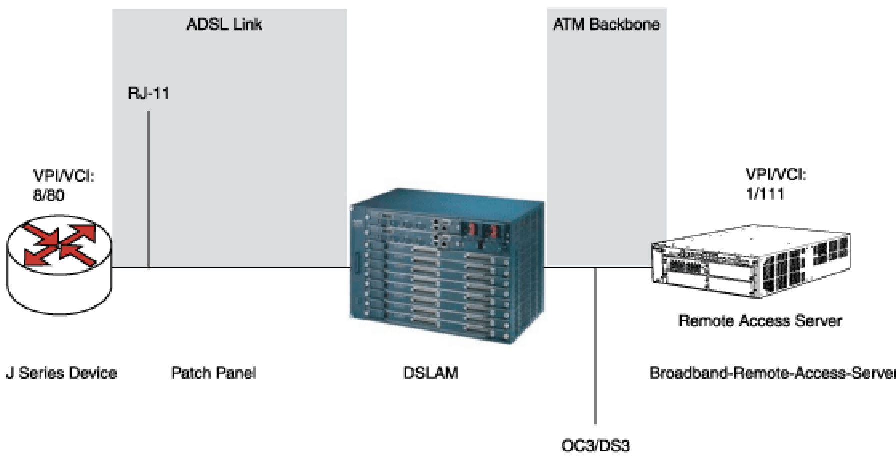
Before you begin, configure network interfaces as necessary. See “Understanding Ethernet Interfaces” on page 255.

Overview

In this example, you set the encapsulation as atm-mlppp-llc for the interface at-5/0/0. You then configure the family MLPPP bundle as lsq-0/0/0.1.

Figure 10 on page 115 shows a typical example of MLPPP-over-ADSL end-to-end connectivity.

Figure 10: MLPPP-over-ADSL Interface



Configuration

Step-by-Step Procedure

The following example requires you to navigate various levels in the configuration hierarchy. For instructions on how to do that, see *Using the CLI Editor in Configuration Mode* .

To configure MLPPP on an ADSL interface:

1. Configure an interface.

```
[edit]
user@host# edit interfaces at-5/0/0 unit 0
```

2. Set the MLPPP encapsulation.

```
[edit interfaces at-5/0/0 unit 0]
user@host# set encapsulation atm-mlppp-llc
```

3. Specify the family MLPPP.

```
[edit interfaces at-5/0/0 unit 0]
```



```
user@host# set family mlppp bundle lsq-0/0/0.1
```

4. If you are done configuring the device, commit the configuration.

```
[edit]
user@host# commit
```

Verification

To verify the configuration is working properly, enter the **show interfaces at-5/0/0** command.

Related Documentation

- Understanding Interfaces on page 3
- ADSL Interface Overview on page 101
- ADSL and SHDSL Interfaces Configuration Overview on page 104

Example: Configuring the DHCP Client on ADSL Interface

This example shows how to configure DHCP client on ADSL or SHDSL or VDSL2 interface (when VDSL2 interface is configured to operate in ADSL fallback mode).

Requirements

Before you begin:

- Review the overview section on DHCP client. See *Understanding DHCP Client Operation*
- Establish basic connectivity. See the Quick Start for your device.
- Configure network interfaces as necessary. See "Example: Creating an Ethernet Interface" on page 261.

Overview

In this example, you configure the ATM interface as **at-1/0/0**. You then set the logical interface to unit 0 and specify the family protocol type as inet. Finally, you configure the DHCP client.

Configuration

CLI Quick Configuration

To quickly configure this example, copy the following command, paste it into a text file, remove any line breaks, change any details necessary to match your network configuration,

copy and paste the command into the CLI at the **[edit]** hierarchy level, and then enter **commit** from configuration mode.

```
set interfaces at-1/0/0 encapsulation ethernet-over-atm
set interfaces at-1/0/0 atm-options vpi 2
set interfaces at-1/0/0 dsl-options operating-mode auto
set interfaces at-1/0/0 unit 0
set interfaces at-1/0/0 unit 0 encapsulation ether-over-atm-llc
set interfaces at-1/0/0 unit 0 vci 2.122
set interfaces at-1/0/0 unit 0 family inet
set interfaces at-1/0/0 unit 0 family inet dhcp
```

Step-by-Step Procedure

To configure DHCP client on ADSL interfaces:

1. Set the encapsulation mode.

   ```
   [edit]
   user@host# set interfaces at-1/0/0 encapsulation ethernet-over-atm
   ```

2. Configure the ATM VPI option.

   ```
   [edit]
   user@host# set interfaces at-1/0/0 atm-options vpi 2
   ```

3. Set operating mode.

   ```
   [edit]
   user@host# set interfaces at-1/0/0 dsl-options operating-mode auto
   ```

4. Set the logical interface.

   ```
   [edit]
   user@host# set interfaces at-1/0/0 unit 0
   ```

5. Set the encapsulation mode for logical interface.

   ```
   [edit]
   user@host# set interfaces at-1/0/0 unit 0 encapsulation ether-over-atm-llc
   ```

6. Set the ATM VCI option.

   ```
   [edit]
   user@host# set interfaces at-1/0/0 unit 0 vci 2.122
   ```

7. Specify the family protocol type.

   ```
   [edit]
   ```

```
user@host# set interfaces at-1/0/0 unit 0 family inet
```

8. Configure the DHCP client.

```
[edit]
user@host# set interfaces at-1/0/0 unit 0 family inet dhcp
```

9. Set the DHCP client identifier as a ASCII or hexadecimal value (optional):

   Use hexadecimal if the client identifier is a MAC address—for example, 00:0a:12:00:12:12.

```
[edit]
user@host# set interfaces at-1/0/0 unit 0 family inet dhcp client-identifier
  00:0a:12:00:12:12
```

10. Set the DHCP lease time in seconds—for example, 86400 (24 hours). The range is 60 through 2147483647 seconds (optional).

```
[edit]
user@host# set interfaces at-1/0/0 unit 0 family inet dhcp lease-time 86400
```

11. Define the number of attempts allowed to retransmit a DHCP packet (optional)—for example, 6

    The range is 0 through 6. The default is 4 times.

```
[edit]
user@host# set interfaces at-1/0/0 unit 0 family inet dhcp retransmission-attempt
  6
```

12. Define the interval, in seconds, allowed between retransmission attempts (optional)—for example, 5.

    The range is 4 through 64. The default is 4 seconds.

```
[edit]
user@host# set interfaces at-1/0/0 unit 0 family inet dhcp retransmission-interval
  5
```

13. Set the IPv4 address of the preferred DHCP server (optional)—for example, 10.1.1.1.

```
[edit]
user@host# set interfaces at-1/0/0 unit 0 family inet dhcp server-address 10.1.1.1
```

14. Set the vendor class ID for the DHCP client (optional)—for example, ether.

```
[edit]
user@host# set interfaces at-0/0/1 unit 0 family inet dhcp vendor-id ether
```

Results From configuration mode, confirm your configuration by entering the **show interfaces at-1/0/0** command. If the output does not display the intended configuration, repeat the configuration instructions in this example to correct it.

```
[edit]
user@host# show interfaces at-1/0/0
encapsulation ethernet-over-atm;
atm-options {
  vpi 2;
}
dsl-options {
  operating-mode auto;
}
unit 0 {
  encapsulation ether-over-atm-llc;
  vci 2.122;
  family inet {
    dhcp {
      client-identifier ascii 00:0a:12:00:12:12;
      lease-time 86400;
      retransmission-attempt 6;
      retransmission-interval 5;
      server-address 10.1.1.1;
    }
  }
}
```

If you are done configuring the device, enter **commit** from configuration mode.

Verification

Confirm that the configuration is working properly.

- Verifying the DHCP Configuration on page 119
- Verify Interface Status on page 120

Verifying the DHCP Configuration

Purpose Verify that the DHCP options are configured properly.

Action Verify the DHCP configuration by using the **run show system services dhcp client** command.

user@host# run show system services dhcp client

```
Logical Interface name         at-1/0/0.0
        Hardware address        00:1f:12:e4:71:38
        Client status           bound
```

```
        Address obtained        10.40.1.2
        Update server           disabled
        Lease obtained at       2011-05-03 04:58:10 PDT
        Lease expires at        2011-05-04 04:58:10 PDT

DHCP options:
    Name: server-identifier, Value: 10.40.1.1
    Code: 1, Type: ip-address, Value: 255.255.255.0
    Name: name-server, Value: [ 192.168.5.68, 192.168.60.131, 172.17.28.100,
172.17.28.101 ]
    Name: domain-name, Value: englab.juniper.net
```

Verify Interface Status

Purpose Verify the interface status and check traffic statistics.

Action Verify interface status by using the **show interface terse** command and test end-to-end data path connectivity by sending the ping packets to the remote end IP address.

user@host# run show interfaces at-1/0/0 terse

```
Interface               Admin Link Proto    Local                 Remote
at-1/0/0                up    up
at-1/0/0.0              up    up   inet     10.40.1.2/24
at-1/0/0.32767          up    up
```

user@host# run ping 10.40.1.1 count 100 rapid

```
PING 10.40.1.1 (10.40.1.1): 56 data bytes
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
--- 10.40.1.1 ping statistics ---
100 packets transmitted, 100 packets received, 0% packet loss
round-trip min/avg/max/stddev = 20.086/26.404/61.723/6.194 ms
```

Related Documentation

- *DHCP Server Configuration Overview*
-

Example: Configuring CHAP on DSL Interfaces

This example shows how to configure CHAP on either the ATM-over-ADSL or the ATM-over-SHDSL interface.

Requirements

Before you begin, configure network interfaces as necessary. See "Understanding Ethernet Interfaces" on page 255.

Overview

In this example, you specify the CHAP access profile and create an interface called at-3/0/0. You configure CHAP on either the ATM-over-ADSL or the ATM-over-SHDSL interface and specify a unique profile name called A-ppp-client containing a client list and access parameters. You then specify a unique hostname called A-at-3/0/0.0 to be used in CHAP. Finally, you set the passive option to handle incoming CHAP packets.

Configuration

CLI Quick Configuration

To quickly configure this example, copy the following command, paste it into a text file, remove any line breaks, change any details necessary to match your network configuration, copy and paste the command into the CLI at the **[edit]** hierarchy level, and then enter **commit** from configuration mode.

```
set access profile A-ppp-client client client1 chap-secret my-secret
set interfaces at-3/0/0 unit 0 ppp-options chap access-profile A-ppp-client local-name
  A-at-3/0/0.0 passive
```

Step-by-Step Procedure

The following example requires you to navigate various levels in the configuration hierarchy. For instructions on how to do that, see *Using the CLI Editor in Configuration Mode*.

To configure CHAP on either the ATM-over-ADSL or the ATM-over-SHDSL interface:

1. Define a CHAP access profile.

   ```
   [edit]
   user@host# set access profile A-ppp-client client client1 chap-secret my-secret
   ```

2. Create an interface.

   ```
   [edit]
   user@host# edit interfaces at-3/0/0 unit 0
   ```

3. Configure CHAP and specify a unique profile name.

   ```
   [edit interfaces at-3/0/0 unit 0]
   user@host# set ppp-options chap access-profile A-ppp-client
   ```

4. Specify a unique hostname.

   ```
   [edit interfaces at-3/0/0 unit 0]
   ```



```
user@host# set ppp-options chap local-name A-at-3/0/0.0
```

5. Set the option to handle incoming CHAP packets only.

```
[edit interfaces at-3/0/0 unit 0]
user@host# set ppp-options chap passive
```

Results From configuration mode, confirm your configuration by entering the **show access profile A-ppp-client** and **show interfaces at-3/0/0** commands. If the output does not display the intended configuration, repeat the configuration instructions in this example to correct it.

```
[edit]
  user@host# show access profile A-ppp-client
client client1 chap-secret "$9$ikPQtu1Sre0BclMW-dk.P5QnApB"; ## SECRET-DATA
[edit]
  user@host# show interfaces at-3/0/0
  unit 0 {
  ppp-options {
  chap {
    access-profile A-ppp-client;
    local-name A-at-3/0/0.0;
    passive;
  }
  }
}
```

If you are done configuring the device, enter **commit** from configuration mode.

Verification

Confirm that the configuration is working properly.

- Verifying ADSL Interface Properties on page 122
- Verifying a PPPoA Configuration for an ATM-over-ADSL Interface on page 125
- Verifying an ATM-over-SHDSL Configuration on page 125

Verifying ADSL Interface Properties

Purpose Verify that the ADSL interface properties are enabled.

Action From operational mode, enter the **show interfaces at-3/0/0 extensive** command.

`user@host>` **show interfaces at-3/0/0 extensive**

```
Physical interface: at-3/0/0, Enabled, Physical link is Up
  Interface index: 141, SNMP ifIndex: 49, Generation: 142
  Link-level type: ATM-PVC, MTU: 4482, Clocking: Internal, ADSL mode,
  Speed: ADSL, Loopback: None
```



```
   Device flags   : Present Running
   Link flags     : None
   CoS queues     : 8 supported, 8 maximum usable queues
   Hold-times     : Up 0 ms, Down 0 ms
   Current address: 00:05:85:c3:17:f4
   Last flapped   : 2008-06-26 23:11:09 PDT (01:41:30 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, Invalid VCs: 0, Framing errors: 0,Policed discards: 0,
 L3 incompletes: 0, L2 channelerrors: 0, L2 mismatch timeouts: 0,
     Resource errors: 0
   Output errors:
     Carrier transitions: 3, Errors: 0, Drops: 0, Aged packets: 0, MTU errors:
0, Resource errors: 0
   ADSL  alarms   : None
   ADSL  defects  : None
   ADSL media:            Seconds        Count State
    LOF                       1            1  OK
    LOS                       1            1  OK
    LOM                       0            0  OK
    LOP                       0            0  OK
    LOCDI                     0            0  OK
    LOCDNI                    0            0  OK
   ADSL status:
     Modem status  : Showtime (Adsl2plus)
     DSL mode      :     Auto    Annex A
     Last fail code: None
     Subfunction   : 0x00
     Seconds in showtime : 6093
   ADSL Chipset Information:              ATU-R                ATU-C
     Vendor Country :                      0x0f                 0xb5
     Vendor ID      :                      STMI                 IFTN
     Vendor Specific:                      0x0000              0x70de
   ADSL Statistics:                       ATU-R                ATU-C
     Attenuation (dB)        :              0.0                  0.0
     Capacity used(%)        :              100                  92
     Noise margin(dB)        :              7.5                  9.0
     Output power (dBm)      :             10.0                 12.5
                                  Interleave       Fast  Interleave        Fast

     Bit rate (kbps)   :                   0      24465          0        1016

     CRC               :                    0          0           0         0
     FEC               :                    0          0           0         0

     HEC               :                    0          0           0         0

     Received cells    :                    0         49
     Transmitted cells :                    0          0
   ATM status:
     HCS state:     Hunt
     LOC      :       OK
  ATM Statistics:
    Uncorrectable HCS errors: 0, Correctable HCS errors: 0,Tx cell FIFO overruns:
 0,Rx cell FIFO overruns: 0,Rx cell FIFO underruns: 0,
```

```
    Input cell count: 49, Output cell count: 0,Output idle cell count: 0,Output
VC queue drops: 0Input no buffers: 0, Input length errors: 0,
    Input timeouts: 0, Input invalid VCs: 0, Input bad CRCs: 0, Input OAM cell
no buffers: 0

  Packet Forwarding Engine configuration:
     Destination slot: 1
     Direction : Output
     CoS transmit queue               Bandwidth              Buffer  Priority
 Limit
                              %            bps     %           usec
     0 best-effort           95        7600000    95              0       low
  none
     3 network-control        5         400000     5              0       low
  none



     But for ADSL MiniPim TI chipset does not send  ADSL Chipset
     Information. Also Adsl minipim does not send any alarms. So we can't
     show alarm stats for minipim. So following information will not be
     displayed in Minipim case.

     ADSL  alarms   : None
     ADSL  defects  : None
     ADSL media:            Seconds        Count State
     LOF                      1            1  OK
     LOS                      1            1  OK
     LOM                      0            0  OK
     LOP                      0            0  OK
     LOCDI                    0            0  OK
     LOCDNI                   0            0  OK

    ADSL Chipset Information:               ATU-R      ATU-C
      Vendor Country :                       0x0f       0xb5
      Vendor ID      :                       STMI       IFTN
      Vendor Specific:                       0x0000     0x70de
```

The output shows a summary of interface information. Verify the following information:

- The physical interface is Enabled. If the interface is shown as Disabled, do either of the following:
  - In the CLI configuration editor, delete the **disable** statement at the [edit interfaces *interface-name*] level of the configuration hierarchy.
  - In the J-Web configuration editor, clear the **Disable** check box on the Interfaces page (Interfaces>*interface-name*).
- The physical link is up. A link state of dDown indicates a problem with the interface module, interface port, or physical connection (link-layer errors).
- The last flapped time is an expected value. It indicates the last time the physical interface became unavailable and then available again. Unexpected flapping indicates likely link-layer errors.
- The traffic statistics reflect expected input and output rates. Verify that the number of inbound and outbound bytes and packets matches expected throughput for the

physical interface. To clear the statistics and see only new changes, use the **clear interfaces statistics *interface-name*** command.

- No ADSL alarms and defects appear that can render the interface unable to pass packets. When a defect persists for a certain amount of time, it is promoted to an alarm. The following are ADSL-specific alarms:
  - **LOCDI**—Loss of cell delineation for interleaved channel
  - **LOCDNI**—Loss of cell delineation for noninterleaved channel
  - **LOF**—Loss of frame
  - **LOM**—Loss of multiframe
  - **LOP**—Loss of power
  - **LOS**—Loss of signal

Examine the operational statistics for an ADSL interface. Statistics in the ATU-R (ADSL transceiver unit–remote) column are for the near end. Statistics in the ATU-C (ADSL transceiver unit–central office) column are for the far end.

- **Attenuation (dB)**—Reduction in signal strength measured in decibels.
- **Capacity used (%)**—Amount of ADSL usage in %.
- **Noise margin (dB)**—Maximum extraneous signal allowed without causing the output to deviate from an acceptable level.
- **Output power (dBm)**—Amount of power used by the ADSL interface.
- **Bit rate (kbps)**—Data transfer speed on the ADSL interface.

Verifying a PPPoA Configuration for an ATM-over-ADSL Interface

Purpose Verify that the PPPoA configuration for an ATM-over-ADSL interface is correct.

Action From operational mode, enter the **show interfaces at-3/0/0** and the **show access** commands.

Verifying an ATM-over-SHDSL Configuration

Purpose Verify that the interface properties are correct.

Action From operational mode, enter the **show interfaces at-3/0/0 extensive** command.

`user@host>` **show interfaces at-3/0/0 extensive**

```
Physical interface: at-3/0/0, Enabled, Physical link is Up
  Interface index: 141, SNMP ifIndex: 23, Generation: 48
  Link-level type: ATM-PVC, MTU: 4482, Clocking: Internal, ADSL mode, Speed: ADSL,

  Loopback: None
```

```
  Device flags   : Present Running
  Link flags     : None
  CoS queues     : 8 supported
  Hold-times     : Up 0 ms, Down 0 ms
  Current address: 00:05:85:c7:44:3c
  Last flapped   : 2005-05-16 05:54:41 PDT (00:41:42 ago)
  Statistics last cleared: Never
  Traffic statistics:
   Input  bytes  :                 4520                    0 bps
   Output bytes  :                39250                    0 bps
   Input  packets:                   71                    0 pps
   Output packets:                 1309                    0 pps
  Input errors:
    Errors: 0, Drops: 0, Invalid VCs: 0, Framing errors: 0, Policed discards: 0,

    L3 incompletes: 0, L2 channel errors: 1, L2 mismatch timeouts: 0, Resource
errors: 0
  Output errors:
    Carrier transitions: 3, Errors: 0, Drops: 0, Aged packets: 0, MTU errors: 0,

    Resource errors: 0
  Queue counters:       Queued packets  Transmitted packets      Dropped packets

    0 best-effort                    4                    4                    0

    1 expedited-fo                   0                    0                    0

    2 assured-forw                   0                    0                    0

    3 network-cont                2340                 2340                    0

  SHDSL  alarms   : None
  SHDSL  defects  : None
  SHDSL media:            Seconds        Count  State
    LOSD                  239206            2  OK
    LOSW                  239208            1  OK
    ES                         3            1  OK
    SES                        0            0  OK
    UAS                        3            1  OK

  SHDSL status:
    Line termination  :STU-R
  Annex     :Annex B
  Line Mode    :2-wire
  Modem Status   :Data
  Last fail code  :0
  Framer mode   :ATM
  Dying Gasp    :Enabled
  Chipset version  :1
  Firmware version  :R3.0
  SHDSL Statistics:
   Loop Attenuation (dB)   :0.600
 Transmit power (dB)     :8.5
 Receiver gain (dB)    :21.420
 SNR sampling (dB)     :39.3690
 Bit rate  (kbps)     :2304
 Bit error rate      :0
 CRC errors       :0
 SEGA errors       :1
 LOSW errors       :0
```



```
Received cells      :1155429
Transmitted cells     :1891375
HEC errors       :0
Cell drop       :0
```

The output shows a summary of interface information. Verify the following information:

- The physical interface is enabled. If the interface is shown as disabled, do either of the following:
  - In the CLI configuration editor, delete the **disable** statement at the [edit interfaces *interface-name*] level of the configuration hierarchy.
  - In the J-Web configuration editor, clear the **Disable** check box on the Interfaces page (Interfaces>*interface-name*).
- The physical link is up. A link state of down indicates a problem with the interface module, interface port, or physical connection (link-layer errors).
- The last flapped time is an expected value. It indicates the last time the physical interface became unavailable and then available again. Unexpected flapping indicates likely link-layer errors.
- The traffic statistics reflect expected input and output rates. Verify that the number of inbound and outbound bytes and packets matches expected throughput for the physical interface. To clear the statistics and see only new changes, use the **clear interfaces statistics *interface-name*** command.
- No SHDSL alarms and defects appear that can render the interface unable to pass packets. When a defect persists for a certain amount of time, it is promoted to an alarm.
  - **LOS**—Loss of signal. No signal was detected on the line.
  - **LOSW**—Loss of sync word. A message ID was sent.
  - **Power status**—A power failure has occurred.
  - **LOSD**—Loss of signal was detected at the remote application interface.
  - **ES**—Errored seconds. One or more cyclic redundancy check (CRC) anomalies were detected.
  - **SES**—Severely errored seconds. At least 50 CRC anomalies were detected.
  - **UAS**—Unavailable seconds. An interval has occurred during which one or more LOSW defects were detected.

Examine the SHDSL interface status:

- **Line termination**—SHDSL transceiver unit–remote (STU–R). (Only customer premises equipment is supported.)
- **Annex**—Either Annex A or Annex B. Annex A is supported in North America, and Annex B is supported in Europe.

- **Line mode**—SHDSL mode configured on the G.SHDSL interface pair, either two-wire or four-wire.
- **Modem Status**—Data. Sending or receiving data.
- **Last fail code**—Code for the last interface failure.
- **Framer mode**—Framer mode of the underlying interface: ATM.
- **Dying gasp**—Ability of a device that has lost power to send a message informing the attached DSL access multiplexer (DSLAM) that it is about to go offline.
- **Chipset version**—Version number of the chipset on the interface
- **Firmware version**—Version number of the firmware on the interface.

Examine the operational statistics for a SHDSL interface.

- **Loop attenuation (dB)**—Reduction in signal strength measured in decibels.
- **Transmit power (dB)**—Amount of SHDSL usage in %.
- **Receiver gain (dB)**—Maximum extraneous signal allowed without causing the output to deviate from an acceptable level.
- **SNR sampling (dB)**—Signal-to-noise ratio at a receiver point in decibels.
- **Bit rate (kbps)**—Data transfer speed on the SHDSL interface.
- **CRC errors**—Number of cyclic redundancy check errors.
- **SEGA errors**—Number of segment anomaly errors. A regenerator operating on a segment received corrupted data.
- **LOSW errors**—Number of loss of signal defect errors. Three or more consecutively received frames contained one or more errors in the framing bits.
- **Received cells**—Number of cells received through the interface.
- **Transmitted cells**—Number of cells sent through the interface.
- **HEC errors**—Number of header error checksum errors.
- **Cell drop**—Number of dropped cells on the interface.

Related Documentation

- Understanding Interfaces on page 3
- ADSL Interface Overview on page 101
- ADSL and SHDSL Interfaces Configuration Overview on page 104
- Example: Configuring MLPPP-over-ADSL Interfaces on page 114

Example: Configuring ATM-over-ADSL Network Interfaces

This example shows how to configure ATM-over-ADSL network interfaces for the devices.

Requirements

Before you begin:

- Configure network interfaces as necessary. See "Understanding Ethernet Interfaces" on page 255.
- Configure PPPoE encapsulation on an Ethernet interface or on an ATM-over-ADSL interface. See "Understanding Point-to-Point Protocol over Ethernet" on page 429.

Overview

This example shows how to use devices with ADSL Annex A or Annex B PIMs to send network traffic through a point-to-point connection to a DSLAM. Within the example, you set the DSL operating mode type to auto so that the ADSL interface will autonegotiate settings with the DSLAM.

The example shows how to create an ATM interface called at-2/0/0. The values for the interface's physical properties are kept relatively low—the ATM VPI is set to 25; both the OAM down count and up count are set to 200 cells; the OAM period is set to 100 seconds.

The example also shows how to set traffic shaping values on the ATM interface to support CoS. CBR is enabled in order to stabilize the cell transmission rate throughout the duration of the connection. Additionally, the VBR peak is set to 33,000 for data packet transfers.

Within the example, you set the encapsulation mode to ethernet-over-atm to support PPP over Ethernet IPv4 traffic. You also configure a logical interface (unit 3). The logical interface uses ATM NLPID encapsulation. As with the physical interface, the OAM down count and up count are set to 200 cells on the logical interface and the OAM period is set to 100 seconds. The family protocol is set to inet and the VCI is set to 35.

NOTE: On SRX300, SRX320, SRX340, SRX345, and SRX550HM devices, the ATM interface takes more than 5 minutes to come up when CPE is configured in ANSI-DMT mode and CO is configured in automode. This occurs only with ALU 7300 DSLAM, due to limitation in current firmware version running on the ADSL Mini-PIM.

Configuration

CLI Quick Configuration

To quickly configure this example, copy the following command, paste it into a text file, remove any line breaks, change any details necessary to match your network configuration, copy and paste the command into the CLI at the **[edit]** hierarchy level, and then enter **commit** from configuration mode.

```
set interfaces at-2/0/0 atm-options vpi 25 oam-liveness up-count 200 down-count 200
set interfaces at-2/0/0 atm-options vpi 25 oam-period 100
set interfaces at-1/0/0 unit 0 shaping cbr
set interfaces at-1/0/0 unit 0 shaping vbr peak 33000
set interfaces at-1/0/0 dsl-options operating-mode auto
set interfaces at-1/0/0 encapsulation ethernet-over-atm
set interfaces at-1/0/0 unit 3 encapsulation atm-nlpid oam-liveness up-count 200
  down-count 200
set interfaces at-1/0/0 unit 3 oam-period 100
set interfaces at-1/0/0 unit 3 family inet
set interfaces at-1/0/0 unit 3 vci 35
```

Step-by-Step Procedure

The following example requires you to navigate various levels in the configuration hierarchy. For instructions on how to do that, see *Using the CLI Editor in Configuration Mode*.

To configure ATM-over-ADSL network interfaces for the devices:

1. Create an ATM interface.

```
[edit]
user@host# edit interfaces at-2/0/0
```

2. Configure the physical properties for the ATM interface.

```
[edit interfaces at-2/0/0]
user@host# set atm-options vpi 25
user@host# set atm-options vpi 25 oam-liveness up-count 200 down-count 200
user@host# set atm-options vpi 25 oam-period 100
```

3. Specify the CBR value and VBR value for the Ethernet interface.

```
[edit]
user@host# edit interfaces at-1/0/0 unit 0
user@host# set shaping cbr
user@host# set shaping vbr peak 33000
```

4. Set the DSL operating mode type.

```
[edit interfaces at-1/0/0.0]
user@host# set dsl-options operating-mode auto
```


5. Configure the encapsulation type.

```
[edit interfaces at-1/0/0]
user@host# set encapsulation ethernet-over-atm
```

6. Configure the encapsulation for the logical unit.

```
[edit interfaces at-1/0/0 unit 3]
user@host# set encapsulation atm-nlpid
```

7. Configure the OAM liveness values for an ATM virtual circuit.

```
[edit interfaces at-1/0/0 unit 3]
user@host# set oam-liveness up-count 200 down-count 200
```

8. Specify the OAM period.

```
[edit interfaces at-1/0/0 unit 3]
user@host# set oam-period 100
```

9. Set the family protocol type.

```
[edit interfaces at-1/0/0 unit 3]
user@host# set family inet
```

10. Configure the VCI value.

```
[edit interfaces at-1/0/0 unit 3]
user@host# set vci 35
```

Results From configuration mode, confirm your configuration by entering the **show interfaces at-1/0/0** and **show interfaces at-2/0/0** commands. If the output does not display the intended configuration, repeat the configuration instructions in this example to correct it.

```
[edit]
  user@host# show interfaces at-1/0/0
encapsulation ethernet-over-atm;
  dsl-options {
    operating-mode auto;
  }
  unit 0 {
    shaping {
    vbr peak 33k;
    burst
    }
```

```
  }
    unit 3 {
      encapsulation atm-nlpid;
      vci 35;
    oam-period 100;
      oam-liveness {
        up-count 200;
      down-count 200;
        }
          family inet;
        }
      [edit]
        user@host show interfaces at-2/0/0
        atm-options {
        vpi 25 {
          oam-period 100;
          oam-liveness {
        up-count 200;
        down-count 200
          }
        }
      }
```

If you are done configuring the device, enter **commit** from configuration mode.

Verification

Confirm that the configuration is working properly.

- Verifying the ADSL Interface Properties on page 132
- Verifying a PPPoA Configuration for an ATM-over-ADSL Interface on page 135

Verifying the ADSL Interface Properties

Purpose Verify that the interface properties are correct.

Action From operational mode, enter the **show interfaces at-1/0/0 extensive** command.

user@host> **show interfaces at-1/0/0 extensive**

```
Physical interface: at-1/0/0, Enabled, Physical link is Up
  Interface index: 141, SNMP ifIndex: 49, Generation: 142
  Link-level type: ATM-PVC, MTU: 4482, Clocking: Internal, ADSL mode,
  Speed: ADSL, Loopback: None
  Device flags   : Present Running
  Link flags     : None
  CoS queues     : 8 supported, 8 maximum usable queues
  Hold-times     : Up 0 ms, Down 0 ms
  Current address: 00:05:85:c3:17:f4
  Last flapped   : 2008-06-26 23:11:09 PDT (01:41:30 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, Invalid VCs: 0, Framing errors: 0,Policed discards: 0,
 L3 incompletes: 0, L2 channelerrors: 0, L2 mismatch timeouts: 0,
     Resource errors: 0
   Output errors:
     Carrier transitions: 3, Errors: 0, Drops: 0, Aged packets: 0, MTU errors:
0, Resource errors: 0
   ADSL  alarms   : None
   ADSL  defects  : None
   ADSL media:            Seconds        Count State
    LOF                       1            1  OK
    LOS                       1            1  OK
    LOM                       0            0  OK
    LOP                       0            0  OK
    LOCDI                     0            0  OK
    LOCDNI                    0            0  OK
   ADSL status:
     Modem status  : Showtime (Adsl2plus)
     DSL mode      :     Auto    Annex A
     Last fail code: None
     Subfunction   : 0x00
     Seconds in showtime : 6093
   ADSL Chipset Information:               ATU-R                ATU-C
     Vendor Country :                       0x0f                 0xb5
     Vendor ID      :                       STMI                IFTN
     Vendor Specific:                       0x0000              0x70de
   ADSL Statistics:                        ATU-R                ATU-C
     Attenuation (dB)        :               0.0                  0.0
     Capacity used(%)        :               100                  92
     Noise margin(dB)        :               7.5                  9.0
     Output power (dBm)      :              10.0                  12.5
                                 Interleave       Fast  Interleave        Fast

     Bit rate (kbps)   :                  0      24465          0        1016

     CRC               :                  0          0           0         0
     FEC               :                  0          0           0         0

     HEC               :                  0          0           0         0

     Received cells    :                  0         49
     Transmitted cells :                  0          0
   ATM status:
     HCS state:     Hunt
     LOC      :       OK
  ATM Statistics:
    Uncorrectable HCS errors: 0, Correctable HCS errors: 0,Tx cell FIFO overruns:
 0,Rx cell FIFO overruns: 0,Rx cell FIFO underruns: 0,
    Input cell count: 49, Output cell count: 0,Output idle cell count: 0,Output
VC queue drops: 0Input no buffers: 0, Input length errors: 0,
    Input timeouts: 0, Input invalid VCs: 0, Input bad CRCs: 0, Input OAM cell
no buffers: 0

  Packet Forwarding Engine configuration:
     Destination slot: 1
     Direction : Output
     CoS transmit queue               Bandwidth              Buffer  Priority
 Limit
```

```
                              %            bps     %           usec
   0 best-effort             95        7600000    95              0       low
none
   3 network-control          5         400000     5              0       low
none



   But for ADSL MiniPim TI chipset does not send  ADSL Chipset
   Information. Also Adsl minipim does not send any alarms. So we can't
   show alarm stats for minipim. So following information will not be
   displayed in Minipim case.

   ADSL  alarms   : None
   ADSL  defects  : None
   ADSL media:            Seconds        Count State
   LOF                       1             1  OK
   LOS                       1             1  OK
   LOM                       0             0  OK
   LOP                       0             0  OK
   LOCDI                     0             0  OK
   LOCDNI                    0             0  OK

  ADSL Chipset Information:               ATU-R      ATU-C
    Vendor Country :                       0x0f       0xb5
    Vendor ID      :                       STMI       IFTN
    Vendor Specific:                       0x0000     0x70de
```

The output shows a summary of interface information. Verify the following information:

- The physical interface is enabled. If the interface is shown as disabled, do either of the following:
  - In the CLI, delete the **disable** statement at the [edit interfaces *interface-name*] level of the configuration hierarchy.
  - In J-Web, clear the **Disable** check box on the Interfaces page (Interfaces>*interface-name*).
- The physical link is up. A link state of down indicates a problem with the interface module, interface port, or physical connection (link-layer errors).
- The last flapped time is an expected value. It indicates the last time the physical interface became unavailable and then available again. Unexpected flapping indicates likely link-layer errors.
- The traffic statistics reflect expected input and output rates. Verify that the number of inbound and outbound bytes and packets matches expected throughput for the physical interface. To clear the statistics and see only new changes, use the **clear interfaces statistics *interface-name*** command.
- No ADSL alarms and defects appear that can render the interface unable to pass packets. When a defect persists for a certain amount of time, it is promoted to an alarm. The following are ADSL-specific alarms:

- **LOCDI**—Loss of cell delineation for interleaved channel.
- **LOCDNI**—Loss of cell delineation for noninterleaved channel.
- **LOF**—Loss of frame.
- **LOM**—Loss of multiframe.
- **LOP**—Loss of power.
- **LOS**—Loss of signal.

Examine the operational statistics for an ADSL interface. Statistics in the ATU-R (ADSL transceiver unit–remote) column are for the near end. Statistics in the ATU-C (ADSL transceiver unit–central office) column are for the far end.

- **Attenuation (dB)**—Reduction in signal strength .
- **Capacity used (%)**—Amount of ADSL usage.
- **Noise margin (dB)**—Maximum extraneous signal allowed without causing the output to deviate from an acceptable level.
- **Output power (dBm)**—Amount of power used by the ADSL interface.
- **Bit rate (kbps)**—Data transfer speed on the ADSL interface.

Verifying a PPPoA Configuration for an ATM-over-ADSL Interface

Purpose Verify that the PPPoA configuration for an ATM-over-ADSL interface is correct.

Action From operational mode, enter the **show interfaces at-1/0/0** and the **show access** commands.

Related Documentation

- Understanding Interfaces on page 3
- ADSL Interface Overview on page 101
- ADSL and SHDSL Interfaces Configuration Overview on page 104
- Example: Configuring ATM-over-SHDSL Network Interfaces on page 108
- Example: Configuring MLPPP-over-ADSL Interfaces on page 114

CHAPTER 11

Configuring G.SHDSL Interfaces

SHDSL Interface Overview

Symmetric high-speed DSL (SHDSL) interfaces on some SRX Series devices support an SHDSL multirate technology for data transfer between a single customer premises equipment (CPE) subscriber and a central office (CO). ITU-T G.991.2 is the official standard for describing SHDSL, also known as G.SHDSL.

Unlike ADSL, which delivers more bandwidth downstream than available upstream, SHDSL is symmetrical and delivers a bandwidth of up to 2.3 Mbps in both directions. Because business applications require high-speed digital transportation methods, SHDSL is becoming very popular and gaining wide acceptance in the industry. Additionally, SHDSL is compatible with ADSL and therefore causes very little, if any, interference between cables.

SHDSL is deployed on a network in much the same manner as ADSL.

SHDSL interfaces support Packet Transfer Mode (PTM). In PTM, packets (IP, PPP, Ethernet, MPLS, and so on) are transported over DSL links as an alternative to using Asynchronous Transfer Mode (ATM). PTM is based on the Ethernet in the First Mile (EFM) IEEE 802.3ah standard.

NOTE: **Starting in Junos OS Release 15.1X49-D10 SHDSL interfaces are no longer supported on SRX300, SRX320, SRX340, SRX345, and SRX550HM devices.**

Release History Table

Release	Description
15.1X49-D10	Starting in Junos OS Release 15.1X49-D10 SHDSL interfaces are no longer supported on SRX300, SRX320, SRX340, SRX345, and SRX550HM devices.

Related Documentation

- G.SHDSL Mini-PIM Overview on page 138
- G.SHDSL Mini-PIM Configuration Overview on page 140
- Example: Configuring the G.SHDSL Interface on page 142
- Example: Configuring the G.SHDSL Interface on SRX Series Devices on page 150
- Example: Configuring the G.SHDSL Interface in EFM Mode on page 163

G.SHDSL Mini-PIM Overview

Starting in Junos OS Release 15.1X49-D10 SHDSL interfaces are no longer supported on SRX300, SRX320, SRX340, SRX345, and SRX550HM devices.

The G.SHDSL Mini-Physical Interface Module (Mini-PIM) provides the physical connection to DSL network media types.

The G.SHDSL Mini-PIM provides the following Asynchronous Transfer Mode (ATM) key features:

- 2-wire (4-port 2-wire) mode, 4-wire (2-port 4-wire) mode, and 8-wire (1-port 8-wire) mode support
- Virtual circuits (VC) per Mini-PIM (10 maximum including OAM VC)
- ATM-over-G.SHDSL framing
- ATM OAM support
- Maximum MTU size of 9180 bytes
- Noise margin support
- Point-to-Point Protocol over ATM and PPPoE over ATM encapsulation support
- Local loopback mode support
- Dying gasp support

The G.SHDSL Mini-PIM provides extended ATM CoS functionality to cells across the network. You can define bandwidth utilization, which consists of either a constant rate or a peak cell rate, with sustained cell rate and burst tolerance. By default, unspecified bit rate (UBR) is used because the bandwidth utilization is unlimited.

The following ATM traffic shaping features are supported:

- **Constant bit rate (CBR)**—CBR is the service category for traffic with rigorous timing requirements like voice and certain types of video. CBR traffic needs a constant cell transmission rate throughout the duration of the connection.
- **Variable bit rate, non-real-time (VBR-NRT)**—VBR-NRT is intended for sources such as data transfer, which do not have strict time or delay requirements. VBR-NRT is suitable for packet data transfers.
- **Variable bit rate, real-time (VBR-RT)**—VBR-RT is intended for sources such as data transfer, which takes place in real time. VBR-RT requires access to time slots at a rate that can vary significantly from time to time.

Table 25 on page 139 displays the traffic descriptors specified for an ATM network.

Table 25: Traffic Descriptors

Traffic Descriptors	Description
Peak cell rate (PCR)	Maximum rate at which traffic can burst.
Sustained cell rate (SCR)	Normal traffic rate averaged over time.
Maximum burst size (MBS)	Maximum burst size that can be sent at the peak rate.

The G.SHDSL Mini-PIM provides the following Packet Transfer Mode (PTM) Ethernet in the First Mile (EFM) key features:

- EFM PIC mode support
- Maximum MTU size of 1514 bytes
- PPPoE encapsulation support
- Local loopback mode support
- Chassis cluster mode support
- Dying gasp support
- IPv6 support
- VLAN over EFM support

The following four annexes are supported on the G.SHDSL Mini-PIM in both ATM and PTM EFM modes:

- Annex A
- Annex B
- Annex F
- Annex G

Operating Modes and Line Rates of the G.SHDSL Mini-PIM

The G.SHDSL Mini-PIM supports 2-wire (4-port 2-wire) mode, 4-wire (2-port 4-wire) mode, 8-wire (1-port 8-wire) mode, and EFM mode. The default operating mode is 2x 4-wire for this G.SHDSL Mini-PIM. G.SHDSL is supported on all SRX210, SRX220, SRX240, and SRX550 devices using the symmetrical WAN speeds shown in Table 26 on page 140.

Table 26: Symmetrical WAN Speeds

Modes	Symmetrical WAN Speed Using Annex A and B	Symmetrical WAN Speed Using Annex F and G
2-wire	2.3 Mbps	From 768 Kbps to 5.696 Mbps
4-wire	4.6 Mbps	From 1.536 Mbps to 11.392 Mbps
8-wire	9.2 Mbps	From 3.072 Mbps to 22.784 Mbps
EFM mode	2.3 Mbps	From 768 Kbps to 5.696 Mbps
NOTE: A maximum of 16 Mbps is supported on SRX210, SRX220, SRX240, and SRX550 devices.		

Release History Table

Release	Description
15.1X49-D10	Starting in Junos OS Release 15.1X49-D10 SHDSL interfaces are no longer supported on SRX300, SRX320, SRX340, SRX345, and SRX550HM devices.

Related Documentation

- Understanding Interfaces on page 3
- SHDSL Interface Overview on page 137
- G.SHDSL Mini-PIM Configuration Overview on page 140
- Example: Configuring the G.SHDSL Interface on page 142
- Example: Configuring the G.SHDSL Interface on SRX Series Devices on page 150
- Example: Configuring the G.SHDSL Interface in EFM Mode on page 163

G.SHDSL Mini-PIM Configuration Overview

NOTE: **Starting in Junos OS Release 15.1X49-D10 SHDSL interfaces are no longer supported on SRX300, SRX320, SRX340, SRX345, and SRX550HM devices.**

Specify the wire mode on the G.SHDSL interface using one of the following options:

- 1-port-atm—Configures an 8-wire (1-port, 8-wire) wire mode.
- 2-port-atm—Configures a 4-wire (2-port, 4-wire) wire mode.
- 4-port-atm—Configures a 2-wire (4-port, 2-wire) wire mode.
- efm—Configures an efm (1-port, 2-wire) wire mode.

NOTE: The default wire mode is 4-wire (2-port, 4-wire).

Specify the annex type using one of the following options:

- Annex A
- Annex B
- Annex F
- Annex G

NOTE: The default annex type is auto.

Specify the SHDSL line rate (speed of transmission of data on the SHDSL connection) using one of the following values:

- **auto**—Automatically selects a line rate.
- **value**—Selects a value between 192 kbps and 22,784 kbps.

NOTE: The default line rate is auto.

Specify the encapsulation type using one of the following values:

NOTE: The pt interface does not require encapsulation types.

The at interface encapsulation types are as follows:

- **atm-pvc**—ATM permanent virtual circuits is the default encapsulation for ATM-over-SHDSL interfaces. For PPP over ATM (PPPoA) over SHDSL interfaces, use this type of encapsulation. Use this type of encapsulation if you are using ATM DSLAM.
- **ethernet-over-atm**—Ethernet over ATM encapsulation. For PPP over Ethernet (PPPoE) over ATM-over-SHDSL interfaces that carry IPv4 traffic, use this type of encapsulation. Use this type of encapsulation if you are using IP DSLAM.

Configure the encapsulation type using one of the following values:

- **atm-cisco-nlpid**—Cisco NLPID encapsulation.
- **atm-mlppp-llc**—ATM MLPPP over AAL5/LLC encapsulation.
- **atm-nlpid**—ATM Network Layer protocol identifier (NLPID) encapsulation.
- **atm-ppp-llc**—AAL5 logical link control (LLC) encapsulation.
- **atm-ppp-vc-mux**—AAL5 multiplex encapsulation.
- **atm-vc-mux**—ATM virtual circuit multiplex encapsulation.
- **atm-snap**—ATM subnetwork attachment point (SNAP) encapsulation.
- **ether-over-atm-llc**—For interfaces that carry IPv4 traffic, use Ethernet over LLC encapsulation. You cannot configure multipoint interfaces if you use this type of encapsulation.
- **ppp-over-ether-over-atm-llc**—PPP over Ethernet over ATM LLC encapsulation. When you use this encapsulation type, you cannot configure the interface address. Instead you configure the interface address on the PPP interface.

Release History Table

Release	Description
15.1X49-D10	Starting in Junos OS Release 15.1X49-D10 SHDSL interfaces are no longer supported on SRX300, SRX320, SRX340, SRX345, and SRX550HM devices.

Related Documentation

- Understanding Interfaces on page 3
- SHDSL Interface Overview on page 137
- G.SHDSL Mini-PIM Overview on page 138
- Example: Configuring the G.SHDSL Interface on page 142
- Example: Configuring the G.SHDSL Interface on SRX Series Devices on page 150
- Example: Configuring the G.SHDSL Interface in EFM Mode on page 163

Example: Configuring the G.SHDSL Interface

This example shows how to configure the G.SHDSL interface.

NOTE: **Starting in Junos OS Release 15.1X49-D10 SHDSL interfaces are no longer supported on SRX300, SRX320, SRX340, SRX345, and SRX550HM devices.**

- Requirements on page 143
- Overview on page 143

Requirements

Before you begin, configure network interfaces as necessary. See “Understanding Ethernet Interfaces” on page 255.

Overview

In this example, you specify the wire mode called 2-port-atm and create an interface called at-1/0/0. You then specify the annex type as annex-a and set the line rate to auto. Then you specify the encapsulation type as ethernet-over-atm and define a logical unit as unit 3 that you connect to this physical G.SHDSL interface. You can set a value from 0 through 7. Finally, you configure the encapsulation type as ether-over-atm-llc.

Configuration

CLI Quick Configuration

To quickly configure this example, copy the following command, paste it into a text file, remove any line breaks, change any details necessary to match your network configuration, copy and paste the command into the CLI at the **[edit]** hierarchy level, and then enter **commit** from configuration mode.

```
set chassis fpc 1 pic 0 shdsl pic-mode 2-port-atm
set interfaces at-1/0/0 shdsl-options annex annex-a line-rate auto
set interfaces at-1/0/0 encapsulation ethernet-over-atm
set interfaces at-1/0/0 unit 3 encapsulation ether-over-atm-llc
```

Step-by-Step Procedure

The following example requires you to navigate various levels in the configuration hierarchy. For instructions on how to do that, see *Using the CLI Editor in Configuration Mode*.

To configure the G.SHDSL interface:

1. Specify the wire mode.

   ```
   [edit]
   user@host# set chassis fpc 1 pic 0 shdsl pic-mode 2-port-atm
   ```

   NOTE: For configuring the G.SHDSL interface in chassis cluster mode, provide the node id also. For example, to configure an shdsl 2 port pic-mode in chassis cluster mode for the fpc slot 1 on the node 0, use the following command:

   set chassis node 0 fpc 1 pic 0 shdsl pic-mode 2-port-atm

2. Create an interface.

```
[edit]
user@host# edit interfaces at-1/0/0 shdsl-options
```

3. Specify the annex type.

```
[edit interfaces at-1/0/0 shdsl-options]
user@host# set annex annex-a
```

4. Configure the line rate.

```
[edit interfaces at-1/0/0 shdsl-options]
user@host# set line-rate auto
```

5. Specify the encapsulation type.

```
[edit interfaces at-1/0/0]
user@host# set encapsulation ethernet-over-atm
```

6. Define one or more logical units.

```
[edit interfaces at-1/0/0]
user@host# edit unit 3
```

7. Configure the encapsulation type.

```
[edit interfaces at-1/0/0 unit 3]
user@host# set encapsulation ether-over-atm-llc
```

Results From configuration mode, confirm your configuration by entering the **show interfaces at-1/0/0** and **show chassis fpc 1** commands. If the output does not display the intended configuration, repeat the configuration instructions in this example to correct it.

```
[edit]
  user@host# show interfaces at-1/0/0
  encapsulation ethernet-over-atm;
  shdsl-options {
    annex annex-a;
    line-rate auto;
  }
    unit 3 {
      encapsulation ether-over-atm-llc;
    }
  [edit]
    user@host# show chassis fpc 1
    pic 0 {
    shdsl {
```



```
    pic-mode 2-port-atm;
  }
}
```

If you are done configuring the device, enter **commit** from configuration mode.

Verification

Confirm that the configuration is working properly.

Verifying G.SHDSL Interface Properties

Purpose Verify that the G.SHDSL interface properties are configured properly.

Action From operational mode, enter the **show interfaces at-1/0/0 extensive** command.

`user@host>` **show interfaces at-1/0/0 extensive**

Four-wire mode for interface at-1/0/0:

```
Physical interface: at-1/0/0, Enabled, Physical link is Up

  Interface index: 146, SNMP ifIndex: 139, Generation: 329
  Link-level type: ATM-PVC, MTU: 1496, Clocking: Internal, Speed: SHDSL(4-wire)

  Speed: SHDSL(4-wire), Loopback: None
  Device flags   : Present Running
  Link flags     : None
 CoS queues     : 8 supported, 8 maximum usable queues
  Hold-times     : Up 0 ms, Down 0 ms
  Current address: 00:24:dc:01:cf:a0
  Last flapped   : 2009-09-24 00:19:03 PDT (00:00:54 ago)
  Statistics last cleared: 2009-09-24 00:18:24 PDT (00:01:33 ago)
  Traffic statistics:
   Input  bytes  :                 125                    0 bps
   Output bytes  :                  96                    0 bps
   Input  packets:                   2                    0 pps
   Output packets:                   1                    0 pps
  Input errors:

    Errors: 0, Drops: 0, Invalid VCs: 0, Framing errors: 0, Policed discards: 0,
 L3 incompletes: 0, L2 channel errors: 0, L2 mismatch timeouts: 0,    Resource
errors: 0

  Output errors:
    Carrier transitions: 1, Errors: 0, Drops: 0, Aged packets: 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                   1                    1                    0

    1 expedited-fo                  0                    0                    0
    2 assured-forw                  0                    0                    0


    3 network-cont                  0                    0                    0
```



```
  SHDSL alarms   : None
  SHDSL defects  : None
  SHDSL media:            Seconds       Count  State
    LINE1_LOSD                 32           0  OK
    LINE1_LOSW                 37           0  OK
    LINE2_LOSD                 32           0  OK
    LINE2_LOSW                 37           0  OK
   ES                         37
    SES                        37
    UAS                        48
  SHDSL status:
    Line  termination      : STU-R
    Annex                  : Annex B
    Line mode              : 4-wire
    Modem status           : Data
    Bit rate (kbps)        : 4608
    Last fail mode         : No failure (0x00)
    Framer mode            : ATM
    Dying gasp             : Enabled
    Framer sync status     : In sync
    Chipset version        : 00
  SHDSL statistics:
    Loop attenuation (dB)  : 0.0
    Transmit power (dBm)   : 0.0
    Receiver gain (dB)     : -inf
    SNR sampling (dB)      : inf
    CRC errors             : 0
    SEGA errors            : 0
    LOSW errors            : 0
    Received cells         : 0
    Transmitted cells      : 0
    HEC errors             : 0
    Cell drop              : 0
  Packet Forwarding Engine configuration:
    Destination slot: 1
  CoS information:
    Direction : Output
    CoS transmit queue               Bandwidth               Buffer Priority
Limit
                            %            bps     %            usec
    0 best-effort          95        4377600    95               0      low
none
    3 network-control       5         230400     5               0      low
none


  Logical interface at-1/0/0.0 (Index 76) (SNMP ifIndex 133) (Generation 402)
    Flags: Point-To-Multipoint SNMP-Traps 0x0 Encapsulation: Ether-over-ATM-LLC
    Traffic statistics:
     Input  bytes  :                 125
     Output bytes  :                 116
     Input  packets:                   2
     Output packets:                   1
    Local statistics:
     Input  bytes  :                 125
     Output bytes  :                 116
     Input  packets:                   2
     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
   Security: Zone: Null
   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: 1468, Generation: 322, Route table: 0
     Flags: None
     Addresses, Flags: Is-Preferred Is-Primary
      Destination: 17.1.1/24, Local: 17.1.1.1, Broadcast: 17.1.1.255, Generation:
496
   VCI 1.70
     Flags: Active, Multicast
     Total down time: 0 sec, Last down: Never
     ATM per-VC transmit statistics:
      Tail queue packet drops: 0
     Traffic statistics:
      Input  bytes  :                   0
      Output bytes  :                   0
      Input  packets:                   0
      Output packets:                   0


 Logical interface at-1/0/0.32767 (Index 77) (SNMP ifIndex 141) (Generation 403)

   Flags: Point-To-Multipoint No-Multicast SNMP-Traps 0x0 Encapsulation: ATM-VCMUX
```

```
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
Security: Zone: Null
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
VCI 1.4
  Flags: Active
  Total down time: 0 sec, Last down: Never
  ATM per-VC transmit statistics:
   Tail queue packet drops: 0
  Traffic statistics:
   Input  bytes  :                   0
   Output bytes  :                   0
   Input  packets:                   0
   Output packets:                   0
```

The output shows a summary of interface information. Verify the following information:

- The physical interface is enabled. If the interface is shown as disabled, do either of the following:
  - In the CLI configuration editor, delete the **disable** statement at the [edit interfaces*interface-name*] level of the configuration hierarchy.
  - In the J-Web configuration editor, clear the **Disable** check box on the Interfaces page (Interfaces>*interface-name*).
- The physical link is up. A link state of down indicates a problem with the interface module, interface port, or physical connection (link-layer errors).
- The last flapped time is an expected value. The last flapped time indicates the last time the physical interface became unavailable and then available again. Unexpected flapping indicates likely link-layer errors.
- The traffic statistics reflect expected input and output rates. Verify that the number of inbound and outbound bytes and packets matches expected throughput for the physical interface. To clear the statistics and see only new changes, use the **clear interfaces statistics *interface-name*** command.
- No SHDSL alarms and defects appear that can render the interface unable to pass packets. When a defect persists for a certain amount of time, it is promoted to an alarm.
  - **LOS**—Loss of signal. No signal was detected on the line.
  - **LOSW**—Loss of sync word. A message ID was sent.
  - **Power status**—A power failure has occurred.
  - **LOSD**—Loss of signal was detected at the remote application interface.
  - **ES**—Errored seconds. One or more cyclic redundancy check (CRC) anomalies were detected.
  - **SES**—Severely errored seconds. At least 50 CRC anomalies were detected.
  - **UAS**—Unavailable seconds. An interval has occurred during which one or more LOSW defects were detected.

Examine the SHDSL interface status:

- **Line termination**—SHDSL transceiver unit–remote (STU–R). (Only customer premises equipment is supported.)
- **Annex**—Either Annex A or Annex B. Annex A is supported in North America, and Annex B is supported in Europe.
- **Line mode**—SHDSL mode configured on the G.SHDSL interface pair, either two-wire or four-wire.
- **Modem status**—Data. Sending or receiving data.
- **Bit rate (kbps)**—Data transfer speed on the SHDSL interface.

- **Last fail code**—Code for the last interface failure.
- **Framer mode** —ATM framer mode of the underlying interface.
- **Dying gasp**—Ability of a device that has lost power to send a message informing the attached DSLAM that it is about to go offline.
- **Chipset version**—Version number of the chipset on the interface

Examine the operational statistics for a SHDSL interface.

- **Loop attenuation (dB)**—Reduction in signal strength.
- **Transmit power (dB)**—Amount of SHDSL.
- **Receiver gain (dB)**—Maximum extraneous signal allowed without causing the output to deviate from an acceptable level.
- **SNR sampling (dB)**—Signal-to-noise ratio at a receiver point.
- **CRC errors**—Number of cyclic redundancy check errors.
- **SEGA errors**—Number of segment anomaly errors. A regenerator operating on a segment received corrupted data.
- **LOSW errors**—Number of loss of signal defect errors. Three or more consecutively received frames contained one or more errors in the framing bits.
- **Received cells**—Number of cells received through the interface.
- **Transmitted cells**—Number of cells sent through the interface.
- **HEC errors**—Number of header error checksum errors.
- **Cell drop**—Number of dropped cells on the interface.

Release History Table

Release	Description
15.1X49-D10	Starting in Junos OS Release 15.1X49-D10 SHDSL interfaces are no longer supported on SRX300, SRX320, SRX340, SRX345, and SRX550HM devices.

Related Documentation

- Understanding Interfaces on page 3
- SHDSL Interface Overview on page 137
- G.SHDSL Mini-PIM Overview on page 138
- G.SHDSL Mini-PIM Configuration Overview on page 140
- Example: Configuring the G.SHDSL Interface on SRX Series Devices on page 150

Example: Configuring the G.SHDSL Interface on SRX Series Devices

This example shows how to configure the G.SHDSL interface on SRX Series devices.

NOTE: Starting in Junos OS Release 15.1X49-D10 SHDSL interfaces are no longer supported on SRX300, SRX320, SRX340, SRX345, and SRX550HM devices.

Requirements

Before you begin:

- Configure the network interfaces as necessary. See "Understanding Ethernet Interfaces" on page 255.
- Install the G.SHDSL Mini-PIM in the first slot of the SRX210 chassis.
- Connect the SRX210 device to a DSLAM (IP DSLAM and ATM DSLAM).

NOTE: This example uses an SRX210 Services Gateway. The information is also applicable to the SRX220 and SRX240 devices.

Overview

Figure 11 on page 151 shows the topology for the G.SHDSL Mini-PIM operating in 2X4-wire mode.

Figure 11: G.SHDSL Mini-PIM Operating in 2X4-Wire Mode

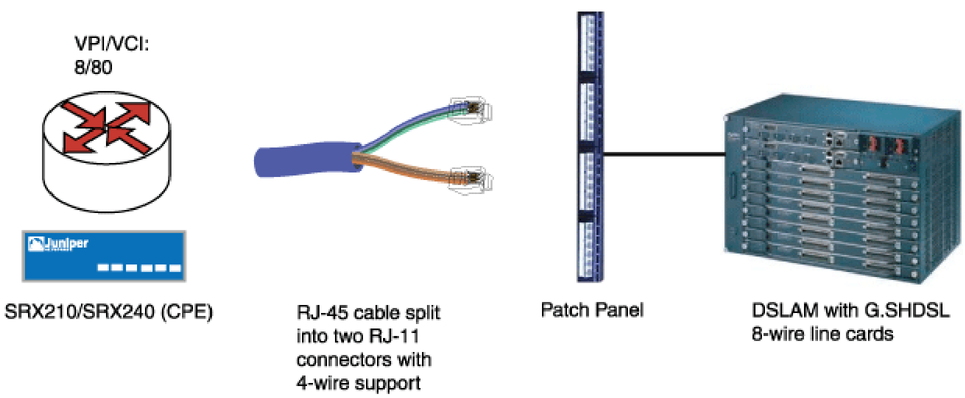


Figure 12 on page 152 shows the topology for the G.SHDSL Mini-PIM operating in 4X2-wire mode.

Figure 12: G.SHDSL Mini-PIM Operating in 4X2-Wire Mode

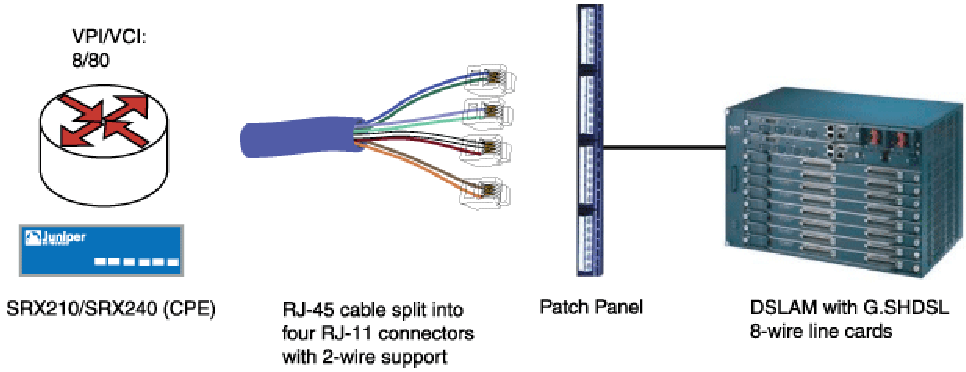
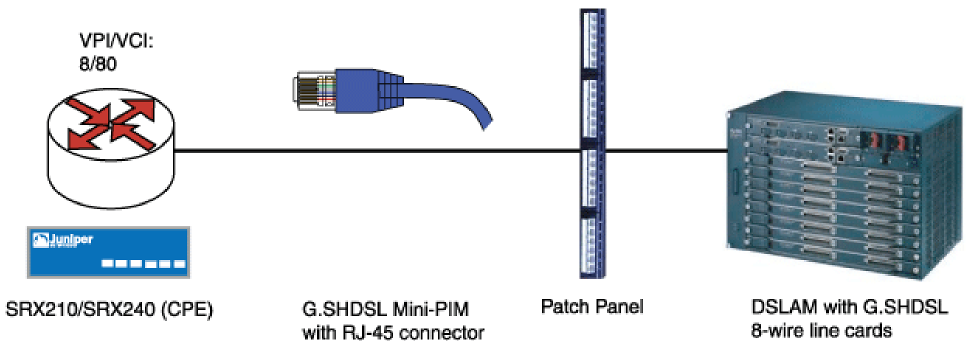


Figure 13 on page 152 shows the topology for the G.SHDSL Mini-PIM operating in 1X8-wire mode.

Figure 13: G.SHDSL Mini-PIM Operating in 1X8-Wire Mode



Determine the operating wire mode (2-wire, 4-wire, or 8-wire) and corresponding CLI code listed in Table 27 on page 152.

Table 27: Operating Wire Modes

Wire Mode Configuration	CLI Code
2x4-wire Configuration	**set chassis fpc 1 pic 0 shdsl pic-mode 2-port-atm** NOTE: The 2x4-wire configuration is the default configuration and behavior.
4x2-wire Configuration	**set chassis fpc 1 pic 0 shdsl pic-mode 4-port-atm**
1x8-wire Configuration	**set chassis fpc 1 pic 0 shdsl pic-mode 1-port-atm**

NOTE: When the wire mode is set to 8-wire, one physical interface (IFD) is created. Similarly for 4-wire mode and 2-wire mode, two IFDs and four IFDs are created, respectively.

In this example, you first configure a basic G.SHDSL interface. You set the operation wire mode to 2-port-atm, the line rate to 4096, and the annex type to annex-a.

You then configure the G.SHDSL interface when the device is connected to an IP DSLAM. You set the type of encapsulation to ethernet-over-atm and the ATM VPI option to 0. Then you set the type of encapsulation on the G.SHDSL logical interface as ether-over-atm-llc and configure the ATM VCI option to 0.60. Also, you set the interface address for the logical interface to 1.1.1.1/24.

Then you configure the G.SHDSL interface when the device is connected to an ATM DSLAM. You set the type of encapsulation to atm-pvc and the ATM VPI to 0. Then you set the type of encapsulation on the G.SHDSL logical interface to atm-snap and the ATM VCI to 0.65. Also, you set the interface address for the logical interface to 2.1.1.1/24

Next you configure PPPoE over ATM for the G.SHDSL Interface. You then set the ATM VPI to 0 and set the type of encapsulation to ppp-over-ether-over-atm-llc. You specify a PPPoE interface with the PAP access profile, local-name, and local-password. Then you configure the passive option to handle incoming PAP packets and set the logical interface as the underlying interface for the PPPoE session to at-1/0/0.0. Also, you set the number of seconds to 120 to wait before reconnecting after a PPPoE session is terminated. (The range is 1 through 4,294,967,295 seconds.) You then specify the logical interface as the client for the PPPoE interface and obtain an IP address by negotiation with the remote end.

Finally, you configure PPPoA over ATM for the G.SHDSL Interface. You set the type of encapsulation to atm-pvc and the ATM VPI to 0. You then set the type of encapsulation for PPP over ATM adaptation layer 5 (AAL5) logical link control (LLC) on the logical interface and set the ATM VCI to 122. You configure the PPPoA interface with the CHAP access profile as juniper and set the local-name for the CHAP interface to srx-210. Finally, you obtain an IP address by negotiation with the remote end.

Configuration

Configuring a Basic G.SHDSL Interface

CLI Quick Configuration

To quickly configure this example, copy the following command, paste it into a text file, remove any line breaks, change any details necessary to match your network configuration, copy and paste the command into the CLI at the **[edit]** hierarchy level, and then enter **commit** from configuration mode.

```
set chassis fpc 1 pic 0 shdsl pic-mode 2-port-atm
set interfaces at-1/0/0 shdsl-options line-rate 4096 annex annex-a
```


Step-by-Step Procedure

The following example requires you to navigate various levels in the configuration hierarchy. For instructions on how to do that, see *Using the CLI Editor in Configuration Mode*.

To quickly configure a basic G.SHDSL interface:

1. Select the operating wire mode.

   ```
   [edit]
   user@host# set chassis fpc 1 pic 0 shdsl pic-mode 2-port-atm
   ```

2. Create an interface and set options.

   ```
   [edit]
   user@host# edit interfaces at-1/0/0 shdsl-options
   ```

3. Configure the line rates.

   ```
   [edit interfaces at-1/0/0 shdsl-options]
   user@host# set line-rate 4096
   ```

4. Set the annex type.

   ```
   [edit interfaces at-1/0/0 shdsl-options]
   user@host# set annex annex-a
   ```

Results

From configuration mode, confirm your configuration by entering the **show interfaces at-1/0/0** and **show chassis fpc 1** commands. If the output does not display the intended configuration, repeat the configuration instructions in this example to correct it.

```
[edit]
  user@host# show interfaces at-1/0/0
shdsl-options {
  annex annex-a;
    line-rate 4096;
  }
  [edit]
    user@host# show chassis fpc 1
  pic 0 {
    shdsl {
      pic-mode 2-port-atm;
      }
    }
```

If you are done configuring the device, enter **commit** from configuration mode.

Configuring a G.SHDSL Interface When Connected to an IP DSLAM

CLI Quick Configuration

To quickly configure this example, copy the following command, paste it into a text file, remove any line breaks, change any details necessary to match your network configuration, copy and paste the command into the CLI at the **[edit]** hierarchy level, and then enter **commit** from configuration mode.

```
set interfaces at-1/0/0 encapsulation ethernet-over-atm
set interfaces at-1/0/0 atm-options vpi 0
set interfaces at-1/0/0 unit 0 encapsulation ether-over-atm-llc vci 0.60
set interfaces at-1/0/0 unit 0 family inet address 1.1.1.1/24
```

Step-by-Step Procedure

The following example requires you to navigate various levels in the configuration hierarchy. For instructions on how to do that, see *Using the CLI Editor in Configuration Mode*.

To configure the G.SHDSL interface on an SRX210 device when the device is connected to an IP DSLAM:

1. Create an interface.

   ```
   [edit]
   user@host# edit interfaces at-1/0/0
   ```

2. Specify the type of encapsulation.

   ```
   [edit interfaces at-1/0/0]
   user@host# set encapsulation ethernet-over-atm
   ```

3. Configure the ATM VPI option.

   ```
   [edit interfaces at-1/0/0]
   user@host# set atm-options vpi 0
   ```

4. Specify the type of encapsulation for logical interface.

   ```
   [edit interfaces at-1/0/0 ]
   user@host# edit unit 0
   user@host# set encapsulation ether-over-atm-llc
   ```

5. Configure the ATM VCI options for the logical interface.

   ```
   [edit interfaces at-1/0/0 unit 0]
   user@host# set vci 0.60
   ```

6. Configure the interface address.

```
[edit interfaces at-1/0/0 unit 0]
user@host# set family inet address 1.1.1.1/24
```

Results

From configuration mode, confirm your configuration by entering the **show interfaces at-1/0/0** command. If the output does not display the intended configuration, repeat the configuration instructions in this example to correct it.

```
[edit]
  user@host# show interfaces at-1/0/0
encapsulation ethernet-over-atm;
  atm-options {
    vpi 0;
  }
    unit 0 {
      encapsulation ether-over-atm-llc;
      vci 0.60;
    family inet {
      address 1.1.1.1/24;
        }
      }
```

If you are done configuring the device, enter **commit** from configuration mode.

Configuring a G.SHDSL Interface When Connected to an ATM DSLAM

CLI Quick Configuration

To quickly configure this example, copy the following command, paste it into a text file, remove any line breaks, change any details necessary to match your network configuration, copy and paste the command into the CLI at the **[edit]** hierarchy level, and then enter **commit** from configuration mode.

```
set interfaces at-1/0/0 encapsulation atm-pvc atm-options vpi 0
set interfaces at-1/0/0 unit 0 encapsulation atm-snap vci 0.65
set interfaces at-1/0/0 unit 0 family inet address 2.1.1.1/24
```

Step-by-Step Procedure

The following example requires you to navigate various levels in the configuration hierarchy. For instructions on how to do that, see *Using the CLI Editor in Configuration Mode*.

To configure the G.SHDSL interface on an SRX210 device when the device is connected to an ATM DSLAM:

1. Create an interface.

   ```
   [edit]
   user@host# edit interfaces at-1/0/0
   ```

2. Specify the type of encapsulation.


```
[edit interfaces at-1/0/0]
user@host# set encapsulation atm-pvc
```

3. Configure the ATM VPI option.

```
[edit interfaces at-1/0/0]
user@host# set atm-options vpi 0
```

4. Specify the type of encapsulation for the logical interface.

```
[edit interfaces at-1/0/0]
user@host# edit unit 0
user@host# set encapsulation atm-snap
```

5. Configure the ATM VCI option.

```
[edit interfaces at-1/0/0 unit 0]
user@host# set vci 0.65
```

6. Configure the interface address.

```
[edit interfaces at-1/0/0 unit 0]
user@host# set family inet address 2.1.1.1/24
```

Results From configuration mode, confirm your configuration by entering the **show interfaces at-1/0/0** command. If the output does not display the intended configuration, repeat the configuration instructions in this example to correct it.

```
[edit]
  user@host# show interfaces at-1/0/0
encapsulation atm-pvc;
  atm-options {
    vpi 0;
  }
    unit 0 {
      encapsulation atm-snap;
      vci 0.65;
      family inet {
        address 2.1.1.1/24
      }
    }
```

If you are done configuring the device, enter **commit** from configuration mode.

Configuring PPPoE over ATM for the G.SHDSL Interface

CLI Quick Configuration

To quickly configure this example, copy the following command, paste it into a text file, remove any line breaks, change any details necessary to match your network configuration, copy and paste the command into the CLI at the **[edit]** hierarchy level, and then enter **commit** from configuration mode.

```
set interfaces at-1/0/0 encapsulation ethernet-over-atm atm-options vpi 0
set interfaces at-1/0/0 unit 0 encapsulation ppp-over-ether-over-atm-llc vci 0.35
set interfaces pp0 unit 0 ppp-options pap access-profile pap_prof local-name srx-210
set interfaces pp0 unit 0 ppp-options pap local-password
  "$9$0tLw1SeN-woJDSr-wY2GU69Cp1RSre"
set interfaces pp0 unit 0 ppp-options pap passive
set interfaces pp0 unit 0 pppoe-options underlying-interface at-1/0/0.0
set interfaces pp0 unit 0 pppoe-options auto-reconnect 120 client
set interfaces pp0 unit 0 family inet negotiate-address
```

Step-by-Step Procedure

The following example requires you to navigate various levels in the configuration hierarchy. For instructions on how to do that, see *Using the CLI Editor in Configuration Mode*.

To configure PPPoE over ATM on the G.SHDSL interface:

1. Create an interface.

```
[edit]
user@host# edit interfaces at-1/0/0
```

2. Specify the type of encapsulation.

```
[edit interfaces at-1/0/0]
user@host# set encapsulation ethernet-over-atm
```

3. Configure the ATM VPI option.

```
[edit interfaces at-1/0/0]
user@host# set atm-options vpi 0
```

4. Specify the type of encapsulation on the logical interface.

```
[edit interfaces at-1/0/0]
user@host# edit unit 0
user@host# set encapsulation ppp-over-ether-over-atm-llc
```

5. Configure the ATM VCI option.

```
[edit interfaces at-1/0/0 unit 0]
```

```
user@host# set vci 0.35
```

6. Configure a PPPoE interface with the PAP access profile.

```
[edit]
user@host# edit interfaces pp0 unit 0 ppp-options pap
user@host# set access-profile pap_prof
```

7. Configure a local-name for the PAP interface.

```
[edit interfaces pp0 unit 0 ppp-options pap]
user@host# set local-name srx-210
```

8. Configure a local-password for the PAP interface.

```
[edit interfaces pp0 unit 0 ppp-options pap]
user@host# set local-password "$9$0tLw1SeN-woJDSr-wY2GU69Cp1RSre"
```

9. Set the passive option to handle incoming PAP packets.

```
[edit interfaces pp0 unit 0 ppp-options pap]
user@host# set passive
```

10. Specify the logical interface as the underlying interface for the PPPoE session.

```
[edit]
user@host# edit interfaces pp0 unit 0 pppoe-options
user@host# set underlying-interface at-1/0/0.0
```

11. Specify the number of seconds.

```
[edit interfaces pp0 unit 0 pppoe-options]
user@host# set auto-reconnect 120
```

12. Set the logical interface as the client for the PPPoE interface.

```
[edit interfaces pp0 unit 0 pppoe-options]
user@host# set client
```

13. Obtain an IP address by negotiation with the remote end.

```
[edit]
user@host# edit interfaces pp0 unit 0
user@host# set family inet negotiate-address
```


Results

From configuration mode, confirm your configuration by entering the **show interfaces at-1/0/0** and **show interfaces pp0** commands. If the output does not display the intended configuration, repeat the configuration instructions in this example to correct it.

```
[edit]
  user@host# show interfaces at-1/0/0
encapsulation ethernet-over-atm;
  atm-options {
    vpi 0;
  }
    unit 0 {
      encapsulation ppp-over-ether-over-atm-llc;
      vci 0.35;
    }
  [edit]
    user@host# show interfaces pp0
  unit 0 {
    ppp-options {
      pap {
      access-profile pap_prof;
    local-name srx-210;
      local-password "$9$0tLw1SeN-woJDSr-wY2GU69Cp1RSre";
        passive;
        }
      }
        pppoe-options {
          underlying-interface at-1/0/0.0;
          auto-reconnect 120;
          client;
          }
          family inet {
            negotiate-address;
          }
        }
```

If you are done configuring the device, enter **commit** from configuration mode.

Configuring PPPoA over ATM for the G.SHDSL Interface

CLI Quick Configuration

To quickly configure this example, copy the following command, paste it into a text file, remove any line breaks, change any details necessary to match your network configuration, copy and paste the command into the CLI at the **[edit]** hierarchy level, and then enter **commit** from configuration mode.

```
set interfaces at-1/0/0 encapsulation atm-pvc atm-options vpi 0
set interfaces at-1/0/0 unit 0 encapsulation atm-ppp-llc vci 1.122
set interfaces at-1/0/0 unit 0 ppp-options chap access-profile juniper local-name srx-210
set interfaces at-1/0/0 unit 0 family inet negotiate-address
```


Step-by-Step Procedure

The following example requires you to navigate various levels in the configuration hierarchy. For instructions on how to do that, see *Using the CLI Editor in Configuration Mode*.

To configure PPPoA over ATM on the G.SHDSL interface:

1. Create an interface.

```
[edit]
user@host# edit interfaces at-1/0/0
```

2. Specify the type of encapsulation.

```
[edit interfaces at-1/0/0]
user@host# set encapsulation atm-pvc
```

3. Configure the ATM VPI option.

```
[edit interfaces at-1/0/0]
user@host# set atm-options vpi 0
```

4. Specify the type of encapsulation on the G.SHDSL logical interface.

```
[edit]
user@host# edit interfaces at-1/0/0 unit 0
user@host# set encapsulation atm-ppp-llc
```

5. Configure the ATM VCI option.

```
[edit interfaces at-1/0/0 unit 0]
user@host# set vci 1.122
```

6. Configure a PPPoA interface with the CHAP access profile.

```
[edit]
user@host# edit interfaces at-1/0/0 unit 0 ppp-options chap
user@host# set access-profile juniper
```

7. Configure a local name for the CHAP interface.

```
[edit interfaces at-1/0/0 unit 0 ppp-options chap]
user@host# set local-name srx-210
```

8. Obtain an IP address by negotiation with the remote end.

```
[edit]
user@host# edit interfaces at-1/0/0 unit 0
```

```
user@host# set family inet negotiate-address
```

Results From configuration mode, confirm your configuration by entering the **show interfaces at-1/0/0** command. If the output does not display the intended configuration, repeat the configuration instructions in this example to correct it.

```
[edit]
  user@host# show interfaces at-1/0/0
encapsulation atm-pvc;
  atm-options {
    vpi 0;
  }
    unit 0 {
      encapsulation atm-ppp-llc;
      vci 1.122;
    ppp-options {
      chap {
        access-profile juniper;
        local-name srx-210;
        }
        }
        family inet {
          negotiate-address;
        }
      }
```

If you are done configuring the device, enter **commit** from configuration mode.

Verification

Confirm that the configuration is working properly.

Verifying G.SHDSL Interface Properties

Purpose Verify that the G.SHDSL interface properties are configured properly.

Action From operational mode, enter the **show interfaces at-1/0/0 extensive** command.

Release History Table

Release	Description
15.1X49-D10	Starting in Junos OS Release 15.1X49-D10 SHDSL interfaces are no longer supported on SRX300, SRX320, SRX340, SRX345, and SRX550HM devices.

Related Documentation

- Understanding Interfaces on page 3
- SHDSL Interface Overview on page 137

Example: Configuring the G.SHDSL Interface in EFM Mode

This example shows how to configure the G.SHDSL interface in Ethernet in the First Mile (EFM) mode on an SRX210 device, but it applies to the SRX220, SRX240, and SRX550 devices as well.

NOTE: **Starting in Junos OS Release 15.1X49-D10 SHDSL interfaces are no longer supported on SRX300, SRX320, SRX340, SRX345, and SRX550HM devices.**

Requirements

This example uses the following hardware and software components:

- An SRX210 device
- Junos OS Release 12.1X44-D10 or later

Before you begin:

- Configure the network interfaces as necessary. See "Understanding Ethernet Interfaces" on page 255.
- Install the G.SHDSL Mini-PIM in the first slot of the SRX210 chassis.
- Connect the SRX210 device to an EFM supported IP DSLAM.

Overview and Topology

In this example, you first configure a basic G.SHDSL interface by setting the operation wire mode to efm, the line rate to auto, and the annex type to annex-auto.

You then configure the G.SHDSL interface when the device is connected to an EFM IP DSLAM. You set the logical interface to 10.10.10.1/24.

Next you configure PPPoE for the G.SHDSL Interface. Configure the encapsulation as ppp-over-ether under unit 0 of pt-1/0/0 interface. You specify a PPPoE interface with the PAP access profile, local name, and local password. Then you configure the passive option to handle incoming PAP packets and set the logical interface as the underlying interface for the PPPoE session to pt-1/0/0.0. Also, you set the number of seconds to 120 to wait before reconnecting after a PPPoE session is terminated. (The range is 1 through 4,294,967,295 seconds.) Finally, you specify the logical interface as the client for the PPPoE interface and obtain an IP address by negotiation with the remote end.

Figure 14 on page 164 shows the topology for the G.SHDSL Mini-PIM operating in EFM mode.

Figure 14: G.SHDSL Mini-PIM Operating in EFM Mode

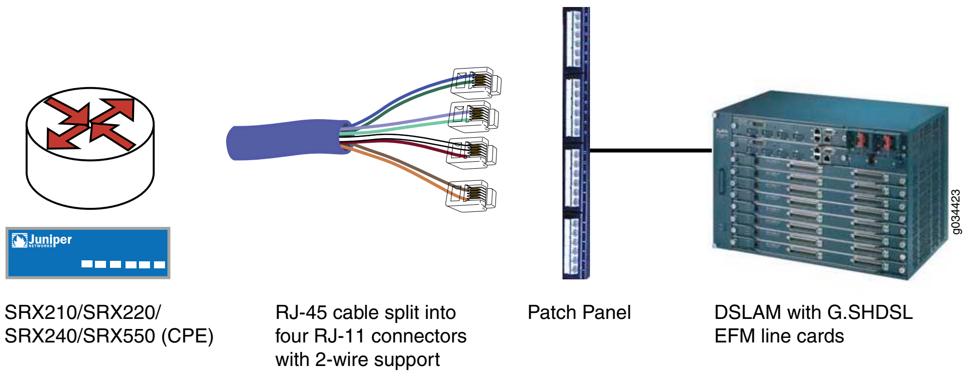


Table 28 on page 164 lists the operating wire mode for EFM and its corresponding CLI code.

Table 28: Operating Wire Mode for EFM

Wire Mode Configuration	CLI Code
EFM Configuration	**set chassis fpc 1 pic 0 shdsl pic-mode efm**

NOTE: When PIC mode is set to EFM, an interface called pt-1/0/0 is created.

Configuration

- Configuring a Basic G.SHDSL Interface in EFM PIC Mode on page 164
- Configuring PPPoE and VLAN for the G.SHDSL EFM Interface on page 166

Configuring a Basic G.SHDSL Interface in EFM PIC Mode

CLI Quick Configuration

To quickly configure this example, copy the following command, paste it into a text file, remove any line breaks, change any details necessary to match your network configuration, copy and paste the command into the CLI at the **[edit]** hierarchy level, and then enter **commit** from configuration mode.

```
set chassis fpc 1 pic 0 shdsl pic-mode efm
set interfaces pt-1/0/0 shdsl-options annex annex-g
set interfaces pt-1/0/0 shdsl-options line-rate 5696
set interfaces pt-1/0/0 unit 0 family inet address 10.10.10.1/24
```


Step-by-Step Procedure

The following example requires you to navigate various levels in the configuration hierarchy. For instructions on how to do that, see *Using the CLI Editor in Configuration Mode*.

To configure a basic G.SHDSL interface:

1. Specify the PIC mode.

```
[edit]
user@host# set chassis fpc 1 pic 0 shdsl pic-mode efm
```

> NOTE: When configuring the G.SHDSL interface in chassis cluster mode, include the node ID. For example, to configure the G.SHDSL interface (operating in EFM PIC mode) in chassis cluster mode for fpc slot 1 on node 0, use the following command:
>
> **set chassis node 0 fpc 1 pic 0 shdsl pic-mode efm**

2. Configure the IP address.

```
[edit]
user@host# set interfaces pt-1/0/0 unit 0 family inet address 10.10.10.1/24
```

> NOTE: By default, annex mode and line rate are set to auto. If you have to configure annex mode (annex-g) and line rate (5696 Kbps), follow Steps 3, 4, and 5.

3. Configure SHDSL options.

```
[edit]
user@host# set interfaces pt-1/0/0 shdsl-options
```

4. Specify the annex type.

```
[edit interfaces pt-1/0/0 shdsl-options]
user@host# set annex annex-g
```

5. Configure the line rate.

```
[edit interfaces pt-1/0/0 shdsl-options]
user@host# set line-rate 5696
```


Results From configuration mode, confirm your configuration by entering the **show interfaces pt-1/0/0** and **show chassis fpc 1** commands. If the output does not display the intended configuration, repeat the configuration instructions in this example to correct it.

```
[edit]
  user@host# show interfaces pt-1/0/0
  shdsl-options {
    annex annex-g;
    line-rate 5696;
  }
    unit 0 {
      family inet {
        address 10.10.10.1/24;
      }
    }
  [edit]
    user@host# show chassis fpc 1
    pic 0 {
    shdsl {
  pic-mode efm;
  }
}
```

If you are done configuring the device, enter **commit** from configuration mode.

Configuring PPPoE and VLAN for the G.SHDSL EFM Interface

CLI Quick Configuration To quickly configure this example, copy the following command, paste it into a text file, remove any line breaks, change any details necessary to match your network configuration, copy and paste the command into the CLI at the **[edit]** hierarchy level, and then enter **commit** from configuration mode.

NOTE: In this configuration, we use PAP as the authentication mechanism. If Broadband Remote Access Server (BRAS) uses CHAP, PAP configuration should be replaced with CHAP.

```
set interfaces pt-1/0/0 unit 0 encapsulation ppp-over-ether
set interfaces pp0 unit 0 ppp-options pap access-profile pap_prof local-name srx-210
set interfaces pp0 unit 0 ppp-options pap local-password
  "$9$0tLw1SeN-woJDSr-wY2GU69Cp1RSre"
set interfaces pp0 unit 0 ppp-options pap passive
set interfaces pp0 unit 0 pppoe-options underlying-interface pt-1/0/0.0
set interfaces pp0 unit 0 pppoe-options auto-reconnect 120 client
set interfaces pp0 unit 0 family inet negotiate-address
```


Step-by-Step Procedure

The following example requires you to navigate various levels in the configuration hierarchy. For instructions on how to do that, see *Using the CLI Editor in Configuration Mode*.

To configure PPPoE for the G.SHDSL EFM Interface:

1. Create an interface.

```
[edit]
user@host# set interfaces pt-1/0/0
```

2. Specify the type of encapsulation.

```
[edit interfaces pt-1/0/0]
user@host# set unit 0
user@host# set encapsulation ppp-over-ether
```

3. Configure a PPPoE interface with the PAP access profile.

```
[edit]
user@host# set interfaces pp0 unit 0 ppp-options pap
user@host# set access-profile pap_prof
```

4. Configure a local name for the PAP interface.

```
[edit interfaces pp0 unit 0 ppp-options pap]
user@host# set local-name srx-210
```

5. Configure a local password for the PAP interface.

```
[edit interfaces pp0 unit 0 ppp-options pap]
user@host# set local-password "$9$0tLw1SeN-woJDSr-wY2GU69Cp1RSre"
```

6. Set the passive option to handle incoming PAP packets.

```
[edit interfaces pp0 unit 0 ppp-options pap]
user@host# set passive
```

7. Specify the logical interface as the underlying interface for the PPPoE session.

```
[edit]
user@host# set interfaces pp0 unit 0 pppoe-options
user@host# set underlying-interface pt-1/0/0.0
```

8. Specify the number of seconds.

```
[edit interfaces pp0 unit 0 pppoe-options]
```



```
user@host# set auto-reconnect 120
```

9. Set the logical interface as the client for the PPPoE interface.

```
[edit interfaces pp0 unit 0 pppoe-options]
user@host# set client
```

10. Obtain an IP address by negotiation with the remote end.

```
[edit interfaces]
user@host# set pp0 unit 0 family inet negotiate-address
```

11. Configure VLAN on EFM.

```
[edit interfaces]
user@host# set pt-1/0/0 vlan-tagging
```

12. Specify the VLAN ID.

```
[edit interfaces]
user@host# set pt-1/0/0 unit 0 vlan-id 99
```

Results From configuration mode, confirm your configuration by entering the **show interfaces pt-1/0/0** and **show interfaces pp0** commands. If the output does not display the intended configuration, repeat the configuration instructions in this example to correct it.

```
[edit]
user@host# show interfaces pt-1/0/0
vlan-tagging;
unit 0 {
  encapsulation ppp-over-ether;
  vlan-id 99;
}
[edit]
user@host# show interfaces pp0
unit 0 {
  ppp-options {
    pap {
      access-profile pap_prof;
      local-name srx-210;
      local-password "$9$0tLw1SeN-woJDSr-wY2GU69Cp1RSre";
      passive;
    }
  }
  pppoe-options {
    underlying-interface pt-1/0/0.0;
    auto-reconnect 120;
```



```
    client;
  }
  family inet {
    negotiate-address;
  }
}
```

If you are done configuring the device, enter **commit** from configuration mode.

Verification

Verifying G.SHDSL Interface Properties

Purpose Verify that the G.SHDSL interface properties are configured properly.

Action From operational mode, enter the **show interfaces pt-1/0/0 extensive** command.

`user@host>` **show interfaces pt-1/0/0 extensive**

EFM mode for interface pt-1/0/0:

```
Physical interface: pt-1/0/0, Enabled, Physical link is Up
  Interface index: 158, SNMP ifIndex: 575, Generation: 277
  Link-level type: Ethernet, MTU: 1514, Speed: SHDSL(8-Wire)
  Device flags   : Present Running
  Link flags     : None
  CoS queues     : 8 supported, 8 maximum usable queues
  Hold-times     : Up 0 ms, Down 0 ms
  Current address: 78:fe:3d:60:2f:99
  Last flapped   : 2012-10-11 00:03:13 PDT (00:28:57 ago)
  Statistics last cleared: 2012-10-11 00:32:05 PDT (00:00:05 ago)
  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, Invalid VCs: 0, Framing errors: 0, Policed discards: 0,
 L3 incompletes: 0, L2 channel errors: 0, L2 mismatch timeouts: 0, Resource errors:
 0
  Output errors:
    Carrier transitions: 0, Errors: 0, Drops: 0, Aged packets: 0, MTU errors: 0,
 Resource errors: 0
  EFM Group Statistics:
    Type                 : EFM bond
    Active Pairs         : 4
    Bit rate (in Kbps)   : 22784
  Line Pair  0  : Up
    Active alarms  : None
    Active defects : None
    SHDSL media:      Seconds   Count   State
      ES                    0
      SES                   0
      UAS                   0
    SHDSL status:
      Line  termination      : STU-R
```

```
    Annex                : Annex G
    Line mode            : 2-wire
    Modem status         : Data
    Bit rate (kbps)      : 5696
    Last fail mode       : No failure (0x00)
    Framer mode          : EFM
    PAF Status           : Active
    Dying gasp           : Enabled
    Framer sync status   : In sync
  SHDSL statistics:
    Loop attenuation (dB)  : 0.0
    Transmit power (dBm)   : 14.0
    SNR sampling (dB)      : 14.0000
    CRC errors             : 2
    SEGA errors            : 0
    LOSW errors            : 0
Line Pair  1  : Up
  Active alarms  : None
  Active defects : None
  SHDSL media:      Seconds   Count   State
    ES                    0
    SES                   0
    UAS                   0
  SHDSL status:
    Line  termination      : STU-R
    Annex                  : Annex G
    Line mode              : 2-wire
    Modem status           : Data
    Bit rate (kbps)        : 5696
    Last fail mode         : No failure (0x00)
    Framer mode            : EFM
    PAF Status             : Active
    Dying gasp             : Enabled
    Framer sync status     : In sync
  SHDSL statistics:
    Loop attenuation (dB)  : 0.0
    Transmit power (dBm)   : 14.0
    SNR sampling (dB)      : 19.0000
    CRC errors             : 0
    SEGA errors            : 0
    LOSW errors            : 0
Line Pair  2  : Up
  Active alarms  : None
  Active defects : None
  SHDSL media:      Seconds   Count   State
    ES                    0
    SES                   0
    UAS                   0
  SHDSL status:
    Line  termination      : STU-R
    Annex                  : Annex G
    Line mode              : 2-wire
    Modem status           : Data
    Bit rate (kbps)        : 5696
    Last fail mode         : No failure (0x00)
    Framer mode            : EFM
    PAF Status             : Active
    Dying gasp             : Enabled
    Framer sync status     : In sync
  SHDSL statistics:
```

```
      Loop attenuation (dB)  : 0.0
      Transmit power (dBm)   : 14.0
      SNR sampling (dB)      : 14.0000
      CRC errors             : 0
      SEGA errors            : 0
      LOSW errors            : 0
  Line Pair  3  : Up
    Active alarms  : None
    Active defects : None
    SHDSL media:      Seconds   Count   State
      ES                  0
      SES                 0
      UAS                 0
    SHDSL status:
      Line  termination      : STU-R
      Annex                  : Annex G
      Line mode              : 2-wire
      Modem status           : Data
      Bit rate (kbps)        : 5696
      Last fail mode         : No failure (0x00)
      Framer mode            : EFM
      PAF Status             : Active
      Dying gasp             : Enabled
      Framer sync status     : In sync
    SHDSL statistics:
      Loop attenuation (dB)  : 1.0
      Transmit power (dBm)   : 14.0
      SNR sampling (dB)      : 18.0000
      CRC errors             : 0
      SEGA errors            : 0
      LOSW errors            : 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        21644800    95              0      low
none
    3 network-control         5         1139200     5              0      low
none
```

Meaning The output shows a summary of interface information. Verify the following information:

- The physical interface is enabled. If the interface is shown as disabled, do either of the following:
  - In the CLI configuration editor, delete the **disable** statement at the [edit interfaces*interface-name*] level of the configuration hierarchy.
  - In the J-Web configuration editor, clear the **Disable** check box on the Interfaces page (Interfaces>*interface-name*).
- The physical link is up. A link state of down indicates a problem with the interface module, interface port, or physical connection (link-layer errors).

- The last flapped time is an expected value. The last flapped time indicates the last time the physical interface became unavailable and then available again. Unexpected flapping indicates likely link-layer errors.
- The traffic statistics reflect expected input and output rates. Verify that the number of inbound and outbound bytes and packets matches expected throughput for the physical interface. To clear the statistics and see only new changes, use the **clear interfaces statistics *interface-name*** command.
- The following information is displayed for each line pair:

  No SHDSL alarms and defects appear that can render the interface unable to pass packets. When a defect persists for a certain amount of time, it is promoted to an alarm.

  - **LOSW**—Loss of sync word. A message ID was sent.
  - **LOSD**—Loss of signal was detected at the remote application interface.
  - **ES**—Errored seconds. One or more cyclic redundancy check (CRC) anomalies were detected.
  - **SES**—Severely errored seconds. At least 50 CRC anomalies were detected.
  - **UAS**—Unavailable seconds. An interval has occurred during which one or more LOSW defects were detected.

Examine the SHDSL interface status:

- **Line termination**—SHDSL transceiver unit–remote (STU–R). (Only customer premises equipment is supported.)
- **Annex**—Either Annex A or Annex B. Annex A is supported in North America, and Annex B is supported in Europe.
- **Line mode**—SHDSL mode configured on the G.SHDSL interface pair, and it should be two-wire.
- **Modem status**—Data. Sending or receiving data.
- **Bit rate (kbps)**—Data transfer speed on the SHDSL interface.
- **Last fail code**—Code for the last interface failure.
- **Framer mode**—ATM framer mode of the underlying interface.
- **PAF Status**—Either Active/Inactive depending upon whether link added to EFM group or not.
-

Examine the operational statistics for a SHDSL interface.

- **Loop attenuation (dB)**—Reduction in signal strength.
- **Transmit power (dB)**—Amount of SHDSL.
- **SNR sampling (dB)**—Signal-to-noise ratio at a receiver point.
- **CRC errors**—Number of cyclic redundancy check errors.

- **SEGA errors**—Number of segment anomaly errors. A regenerator operating on a segment received corrupted data.
- **LOSW errors**—Number of loss of signal defect errors. Three or more consecutively received frames contained one or more errors in the framing bits.

Release History Table

Release	Description
15.1X49-D10	Starting in Junos OS Release 15.1X49-D10 SHDSL interfaces are no longer supported on SRX300, SRX320, SRX340, SRX345, and SRX550HM devices.

Related Documentation

- SHDSL Interface Overview on page 137
- G.SHDSL Mini-PIM Overview on page 138
- G.SHDSL Mini-PIM Configuration Overview on page 140
- Example: Configuring the G.SHDSL Interface on page 142
- Example: Configuring the G.SHDSL Interface on SRX Series Devices on page 150

CHAPTER 12

Configuring VDSL2 Interfaces

VDSL2 Interface Technology Overview

Very-high-bit-rate digital subscriber line (VDSL) technology is part of the xDSL family of modem technologies that provide faster data transmission over a single flat untwisted or twisted pair of copper wires. The VDSL lines connect service provider networks and customer sites to provide high bandwidth applications (triple-play services) such as high-speed Internet access, telephone services like VoIP, high-definition TV (HDTV), and interactive gaming services over a single connection.

VDSL2 is an enhancement to G.993.1 (VDSL) and permits the transmission of asymmetric (half-duplex) and symmetric (full-duplex) aggregate data rates up to 100 Mbps on short copper loops using a bandwidth up to 30 MHz. The VDSL2 technology is based on the ITU-T G.993.2 (VDSL2) standard, which is the International Telecommunication Union standard describing a data transmission method for VDSL2 transceivers.

The VDSL2 uses discrete multitone (DMT) modulation. DMT is a method of separating a digital subscriber line signal so that the usable frequency range is separated into 256 frequency bands (or channels) of 4.3125 KHz each. The DMT uses the Fast Fourier Transform (FFT) algorithm for demodulation or modulation for increased speed.

VDSL2 interface supports Packet Transfer Mode (PTM). The PTM mode transports packets (IP, PPP, Ethernet, MPLS, and so on) over DSL links as an alternative to using Asynchronous Transfer Mode (ATM). PTM is based on the Ethernet in the First Mile (EFM) IEEE802.3ah standard.

VDSL2 provides backward compatibility with ADSL, ADSL2, and ADSL2+ because this technology is based on both the VDSL1-DMT and ADSL2/ADSL2+ recommendations.

VDSL2 Vectoring Overview

Starting in Junos OS Release 15.1X49-D50, VDSL2 vectoring is supported. Vectoring is a transmission method that employs the coordination of line signals that reduce crosstalk levels and improve performance. It is based on the concept of noise cancellation, like noise-cancelling headphones. The ITU-T G.993.5 standard, "Self-FEXT Cancellation (Vectoring) for Use with VDSL2 Transceivers," also known as G.vector, describes vectoring for VDSL2.

The scope of Recommendation ITU-T G.993.5 is specifically limited to the self-FEXT (far-end crosstalk) cancellation in the downstream and upstream directions. The FEXT generated by a group of near-end transceivers and interfering with the far-end transceivers of that same group is canceled. This cancellation takes place between VDSL2 transceivers, not necessarily of the same profile.

Release History Table

Release	Description
15.1X49-D50	Starting in Junos OS Release 15.1X49-D50, VDSL2 vectoring is supported.

Related Documentation

- VDSL2 Network Deployment Topology on page 176
- VDSL2 Interface Support on SRX Series Devices on page 178
- Example: Configuring VDSL2 Interfaces (Basic) on page 216
- Example: Configuring VDSL2 Interfaces (Detail) on page 222

VDSL2 Network Deployment Topology

In standard telephone cables of copper wires, voice signals use only a fraction of the available bandwidth. Like any other DSL technology, the VDSL2 technology utilizes the remaining capacity to carry the data and multimedia on the wire without interrupting the line's ability to carry voice signals.

This example depicts the typical VDSL2 network topology deployed using SRX Series Services Gateways.

A VDSL2 link between network devices is set up as follows:

1. Connect an end-user device such as a LAN, hub, or PC through an Ethernet interface to the customer premises equipment (CPE) (for example, an SRX Series device).
2. Connect the CPE to a DSLAM.

3. The VDSL2 interface uses either Gigabit Ethernet or fiber as second mile to connect to the Broadband Remote Access Server (B-RAS) as shown in Figure 15 on page 177.

4. The ADSL interface uses either Gigabit Ethernet (in case of IP DSLAM] as the "second mile" to connect to the B-RAS or OC3/DS3 ATM as the second mile to connect the B-RAS as shown in Figure 16 on page 177.

NOTE: The VDSL2 technology is backward compatible with ADSL. VDSL2 provides an ADSL interface in an ATM DSLAM topology and provides a VDSL2 interface in an IP or VDSL DSLAM topology.

The DSLAM accepts connections from many customers and aggregates them to a single, high-capacity connection to the Internet.

Figure 15 on page 177 shows a typical VDSL2 network topology.

Figure 15: Typical VDSL2 End-to-End Connectivity and Topology Diagram

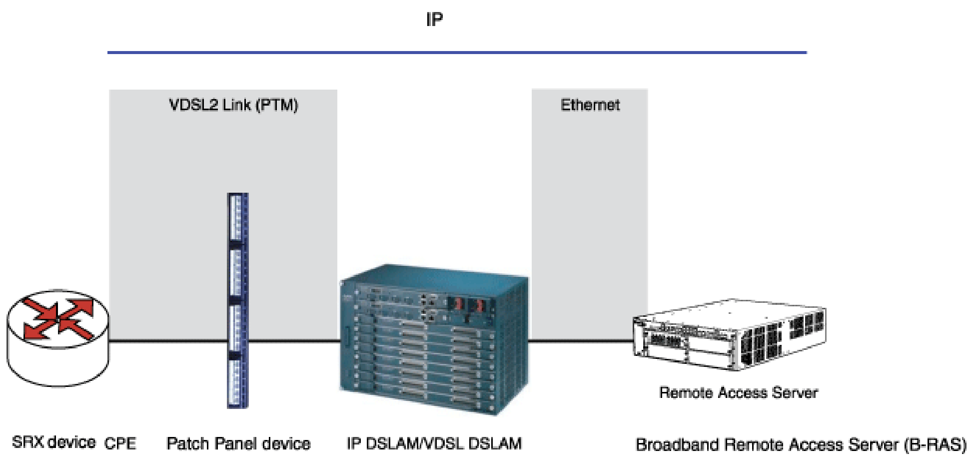
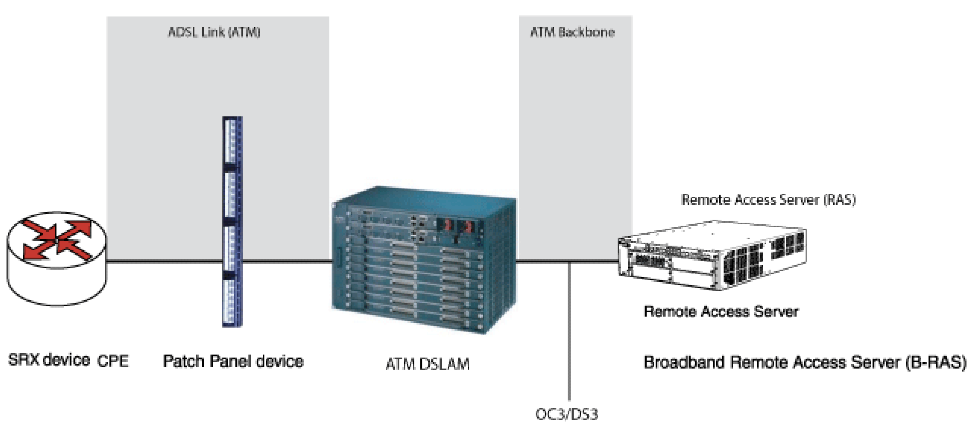


Figure 16 on page 177 shows a backward-compatible ADSL topology using ATM DSLAM.

Figure 16: Backward-Compatible ADSL Topology (ATM DSLAM)



Related Documentation

- VDSL2 Interface Technology Overview on page 175
- VDSL2 Interface Support on SRX Series Devices on page 178
- Example: Configuring VDSL2 Interfaces (Basic) on page 216
- Example: Configuring VDSL2 Interfaces (Detail) on page 222

VDSL2 Interface Support on SRX Series Devices

The VDSL2 interface is supported on the SRX Series devices listed in Table 29 on page 178. (Platform support depends on the Junos OS release in your installation.)

Table 29: VDSL2 Annex A and Annex B Features

Features	POTS
Devices	Integrated VDSL Module (SRX110-POTS) VDSL Mini-PIM (SRX210, SRX220, SRX240, SRX320, SRX340)
Supported Bandplans	997/998
Supported standards	ITU-T G.993.2 and ITU-T G.993.5 (VDSL2)
Used in	North American network implementations and European network implementations
ADSL backward compatibility	ADSL G992.5-A (ADSL Annex A)

* ADSL Annex B support is not available on VDSL2 Mini-PIMs.

VDSL2 Interface Compatibility with ADSL Interfaces

VDSL2 interfaces on SRX Series devices are backward compatible with most ADSL interface standards. The VDSL2 interface uses Ethernet in the First Mile (EFM) mode or Packet Transfer Mode (PTM) and uses the named interface pt-1/0/0. In ADSL fallback mode, VDSL2 operates on the ATM encapsulation interface in the first mile and uses the named interface at-1/0/0.

NOTE:

- The VDSL2 interface has backward compatibility with ADSL/ADSL2/ADSL2+. The VDSL2 interface is represented by the pt interface when configured to function as VDSL2, and the ADSL interface is represented by the at interface when configured to function as ADSL.
- On VDSL2 interfaces, by default the pt-1/0/0 interface is created when there is no configuration already created for either the pt-1/0/0 or the at-1/0/0 interface.

  NOTE: It requires around 60 seconds to switch from VDSL2 to ADSL or from ADSL to VDSL2 operating modes.

Table 30 on page 179 lists VDSL2 operating modes and their backward compatibility with ADSL interface standards.

Table 30: VDLS2 Operating Mode Backward Compatibility with ADSL

ADSL Annex Type	Operating Modes	Description
ADSL Annex A operating in POTS mode (ADSL modes for Annex A only)	auto	Configures the ADSL interface to autonegotiate settings with the DSLAM located at the central office. For Annex A, the ADSL interface uses either ANSI T1.413 Issue II mode or ITU G.992.1 mode. NOTE: Automatic (auto) operating mode does not work when the DSLAM located at the central office is operating at ADSL2+ Annex M mode.
	ansi-dmt	Configures the ADSL interface to use ANSI T1.413 Issue II mode.
	itu-dmt	Configures the ADSL interface to use ITU G.992.1 mode.
	itu-dmt-bis	Configures the ADSL interface to use ITU G.992.3 mode. You can configure this mode only when it is supported on the DSLAM.
	adsl2plus	Configures the ADSL interface to use ITU G.992.5 mode. You can configure this mode only when it is supported on the DSLAM.

Table 30: VDLS2 Operating Mode Backward Compatibility with ADSL (continued)

ADSL Annex Type	Operating Modes	Description
ADSL Annex B operating in ISDN mode (ADSL modes for Annex B only)	auto	Configures the ADSL interface to autonegotiate settings with the DSLAM located at the central office. For Annex B, the ADSL interface trains in ITU G.992.1 mode.
	itu-dmt	Configures the ADSL interface to use ITU G.992.1 mode.
	itu-dmt-bis	Configures the ADSL interface to use ITU G.992.3 mode. You can configure this mode only when it is supported on the DSLAM.
	adsl2plus	Configures the ADSL interface to use ITU G.992.5 mode. You can configure this mode only when it is supported on the DSLAM.
	itu-annexb-ur2	Configures the ADSL line to use G.992.1 Deutsche Telekom UR-2 mode.

NOTE: On SRX210, SRX220, and SRX240 devices, every time the VDSL2 Mini-PIM is restarted in the ADSL mode, the first packet passing through the Mini-PIM is dropped.

VDSL2 Interfaces Supported Profiles

A profile is a table that contains a list of preconfigured VDSL2 settings. Table 31 on page 180 lists the different profiles supported on the VDSL2 interfaces and their properties.

Table 31: Supported Profiles on the VDSL2 Interfaces

Profiles	Data Rate
8a	50
8b	50
8c	50
8d	50
12a	68
12b	68
17a	100
Auto	Negotiated (based on operating mode)

VDSL2 Interfaces Supported Features

The following features are supported on the VDSL2 interfaces:

- ADSL/ADSL2/ADSL2+ backward compatibility with Annex A, Annex M support
- PTM or EFM (802.3ah) support
- Operation, Administration, and Maintenance (OAM) support for ADSL/ADSL2/ADSL2+ mode
- ATM quality of service (QoS) (supported only when the VDSL2 Mini-PIM is operating in ADSL2 mode)
- Multilink Point-to-Point Protocol (MLPPP) (supported only when the VDSL2 Mini-PIM is operating in ADSL2 mode)
- MTU size of 1514 bytes (maximum) in VDSL2 mode and 1496 bytes in ADSL mode.
- Support for maximum of 10 permanent virtual connections (PVCs) (only in ADSL/ADSL2/ADSL2+ mode)
- Dying gasp support (ADSL and VDSL2 mode)

NOTE: On SRX210 or SRX320 devices with VDLS2, ATM CoS VBR-related functionality cannot be tested.

Related Documentation

- VDSL2 Interface Technology Overview on page 175
- VDSL2 Network Deployment Topology on page 176
- Example: Configuring VDSL2 Interfaces (Basic) on page 216
- Example: Configuring VDSL2 Interfaces (Detail) on page 222

Example: Configuring VDSL2 Interfaces in ADSL Mode (Basic)

This example shows how to configure the integrated VDSL2 interfaces for SRX320 (Annex B) in ADSL backward compatible mode.

Requirements

Before you begin:

- Set up and perform initial configuration on the SRX Series devices.
- Connect the SRX320 device to a DSLAM

- Establish basic connectivity. See the *Quick Start Guide* for your device for factory default settings.
- On VDSL2 interfaces, by default the pt-1/0/0 interface is created when there is no configuration already created for either the pt-1/0/0 or the at-1/0/0 interface. You can switch to ADSL mode by just configuring at-1/0/0. If the configurations are already created for pt-1/0/0 or at-1/0/0, then you need to deactivate pt-1/0/0 before you create at-1/0/0 or deactivate at-1/0/0 to create pt-1/0/0.
- Make sure that you have deleted the previous configurations on pt-1/0/0 and pp0.

Overview

In this example, you create a VDSL2 interface called **pt-1/0/0**, specify the type of encapsulation, and set the VDSL2 profile to auto.

Configuration

CLI Quick Configuration

To quickly configure this example, copy the following command, paste it into a text file, remove any line breaks, change any details necessary to match your network configuration, copy and paste the command into the CLI at the **[edit]** hierarchy level, and then enter **commit** from configuration mode.

```
set interfaces fe-0/0/3 unit 0 family inet address 10.10.10.1/24
set interfaces at-1/0/0 atm-options vpi 0
set interfaces at-1/0/0 dsl-options operating-mode auto
set interfaces at-1/0/0 unit 0 vci 0.33
```

Step-by-Step Procedure

To configure the VDSL2 interfaces for the SRX320 in ADSL backward compatible mode:

1. Set operating mode.

   ```
   [edit]
   user@host# user@host# set interfaces at-1/0/0 dsl-options operating-mode auto
   ```

2. Configure the ATM VPI option

   ```
   [edit]
   user@host# set interfaces at-1/0/0 atm-options vpi 0
   ```

3. Set the ATM VCI option.

   ```
   [edit]
   user@host# set interfaces at-1/0/0 unit 0 vci 0.33
   ```

4. Configure the IP address for the interface.

   ```
   [edit]
   user@host# set interfaces fe-0/0/3 unit 0 family inet address 10.10.10.1/24
   ```


Results From configuration mode, confirm your configuration by entering the **show interfaces at-1/0/0** command. If the output does not display the intended configuration, repeat the configuration instructions in this example to correct it.

If you are done configuring the device, enter **commit** from configuration mode.

Verifying the Configuration

Confirm that the configuration is working properly.

Verifying the Configuration

Purpose Verify the command output.

Action From operational mode, enter the **show interfaces at-1/0/0 extensive** command.

```
Physical interface: at-1/0/0, Enabled, Physical link is Up
  Interface index: 148, SNMP ifIndex: 513, Generation: 175
  Link-level type: ATM-PVC, MTU: 1496, Clocking: Internal, ADSL mode,
  Speed: ADSL2+
  Speed: 1573kbps, Loopback: None
  Device flags   : Present Running
  Link flags     : None
  CoS queues     : 8 supported, 8 maximum usable queues
  Hold-times     : Up 0 ms, Down 0 ms
  Current address: 00:1f:12:e4:df:20
  Last flapped   : 2011-05-25 05:58:32 PDT (00:02:54 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, Invalid VCs: 0, Framing errors: 0, Policed discards: 0,

    L3 incompletes: 0, L2 channel errors: 0, L2 mismatch timeouts: 0,
    Resource errors: 0
  Output errors:
    Carrier transitions: 1, Errors: 0, Drops: 0, Aged packets: 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
  ADSL  alarms   : None
  ADSL  defects  : None
  ADSL media:             Seconds       Count  State
    LOF                        55           0  OK
    LOS                        55           0  OK
    LOM                         0           0  OK
    LOP                         0           0  OK
    LOCDI                       0           0  OK
    LOCDNI                     55           0  OK
  ADSL status:
    Modem status  : Showtime (Adsl2plus)
    DSL mode      :     Auto  Annex B    Last fail code: None
    Subfunction   : 0x00
    Seconds in showtime : 173
  ADSL Chipset Information:              ATU-R                 ATU-C
    Vendor Country :                      0xb5                  0xb5
    Vendor ID      :                      BDCM                  BDCM
    Vendor Specific:                    0x9385                0x9395
  ADSL Statistics:                       ATU-R                 ATU-C
    Attenuation (dB)         :             1.5                   0.0
    Capacity used (%)        :               0                     0
    Noise margin (dB)        :             8.5                   9.0
    Output power (dBm)       :             6.5                   9.0

                                 Interleave       Fast  Interleave       Fast
    Bit rate (kbps)   :               24681          0        1573          0
    CRC               :                   0          0           0          0
    FEC               :                   0          0           0          0
    HEC               :                   0          0           0          0
    Received cells    :           278817900          0
    Transmitted cells :                   0          0
  ATM status:
    HCS state:     Hunt
    LOC      :       OK
  ATM Statistics:
    Uncorrectable HCS errors: 0, Correctable HCS errors: 0,
    Tx cell FIFO overruns: 0, Rx cell FIFO overruns: 0,
    Rx cell FIFO underruns: 0, Input cell count: 0, Output cell count: 0,
    Output idle cell count: 0, Output VC queue drops: 0, Input no buffers: 0,
    Input length errors: 0, Input timeouts: 0, Input invalid VCs: 0,
    Input bad CRCs: 0, Input OAM cell no buffers: 0
  Packet Forwarding Engine configuration:
    Destination slot: 1
  CoS information:
    Direction : Output
    CoS transmit queue               Bandwidth               Buffer Priority
Limit
                           %             bps     %           usec
    0 best-effort         95         1494350    95              0      low
none
    3 network-control      5           78650     5              0      low
none

  Logical interface at-1/0/0.0 (Index 73) (SNMP ifIndex 533) (Generation 157)
    Flags: Point-To-Point SNMP-Traps 0x0 Encapsulation: ATM-SNAP
    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: HOST
   Allowed host-inbound traffic : any-service bfd bgp dvmrp igmp ldp msdp nhrp
   ospf pgm pim rip 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 :     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
   VCI 0.33
     Flags: Active
     Total down time: 0 sec, Last down: Never
     ATM per-VC transmit statistics:
      Tail queue packet drops: 0
     Traffic statistics:
      Input  bytes  :                 0
      Output bytes  :                 0
      Input  packets:                 0
      Output packets:                 0

 Logical interface at-1/0/0.32767 (Index 74) (SNMP ifIndex 534)
```

```
(Generation 158)
  Flags: Point-To-Multipoint No-Multicast SNMP-Traps 0x0
  Encapsulation: ATM-VCMUX
  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
  Security: Zone: HOST
  Allowed host-inbound traffic : any-service bfd bgp dvmrp igmp ldp msdp nhrp
  ospf pgm pim rip 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 :      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
  VCI 0.4
    Flags: Active
    Total down time: 0 sec, Last down: Never
    ATM per-VC transmit statistics:
     Tail queue packet drops: 0
    Traffic statistics:
     Input  bytes  :                   0
     Output bytes  :                   0
     Input  packets:                   0
     Output packets:                   0
```


The output shows a summary of VDSL2 interface. Verify the following information:

- Status of interface at-1/0/0 is displayed as **Physical link is Up**.
- Modem status is displayed as **Showtime (Adsl2plus)**.
- Time in seconds during which the interface stayed up is displayed as **Seconds** in showtime.
- ADSL profile of the DSLAM is displayed as **Annex B**.

Related Documentation

- Understanding Interfaces on page 3
- VDSL2 Interface Technology Overview on page 175
- Example: Configuring VDSL2 Interfaces (Detail) on page 222
- Example: Configuring VDSL2 Interfaces in ADSL Mode (Detail) on page 187

Example: Configuring VDSL2 Interfaces in ADSL Mode (Detail)

This example shows how to configure ADSL Interfaces for SRX Series devices.

This example uses VDSL2 Mini-PIM installed on SRX320 devices. The information is also applicable to SRX340 devices (with VDSL2 Mini-PIMs).

Requirements

Before you begin:

- Install Junos OS Release 10.1 or later for the SRX Series devices.
- Set up and perform initial configuration on the SRX Series device. See *Quick Start Guide* of your device for factory default settings.
- Install the VDSL2 Mini-PIM on the SRX320 device chassis.
- Ensure that the SRX320 device is connected to a DSLAM that supports VDSL2-to-ADSL fallback.

Overview

In this example, you configure the ADSL interface for end-to-end data path. Then you configure PPPoA on the at-1/0/0 interface with a negotiated IP address and either PAP authentication or CHAP authentication. You also configure a static IP address and an unnumbered IP address (and either PAP authentication or CHAP authentication) for PPPoA on the at-1/0/0 interface.

Finally, you configure PPPoE on the at-1/0/0 interface with a negotiated IP address and either PAP authentication or CHAP authentication.

Configuration

Configuring the ADSL Interface for End-to-End Data Path

CLI Quick Configuration

To quickly configure this example, copy the following command, paste it into a text file, remove any line breaks, change any details necessary to match your network configuration, copy and paste the command into the CLI at the **[edit]** hierarchy level, and then enter **commit** from configuration mode.

```
set interfaces at-1/0/0 encapsulation atm-pvc atm-options vpi 2
set interfaces at-1/0/0 dsl-options operating-mode itu-dmt
set interfaces at-1/0/0 unit 0 encapsulation atm-snap vci 2.119 family inet address
  10.10.10.1/24
```

Step-by-Step Procedure

To configure the ADSL interface for end-to-end data path:

1. Delete any previous configurations.

```
[edit]
user@host# delete interfaces at-1/0/0
```

2. Specify the basic configuration for the ADSL interface.

```
[edit]
user@host# set interfaces at-1/0/0 encapsulation atm-pvc
user@host# set interfaces at-1/0/0 atm-options vpi 2
```



```
user@host# set interfaces at-1/0/0 dsl-options operating-mode itu-dmt
user@host# set interfaces at-1/0/0 unit 0 encapsulation atm-snap
user@host# set interfaces at-1/0/0 unit 0 vci 2.119
user@host# set interfaces at-1/0/0 unit 0 family inet address 10.10.10.1/24
```

Results From configuration mode, confirm your configuration by entering the **show interfaces at-1/0/0** command. If the output does not display the intended configuration, repeat the configuration instructions in this example to correct it.

```
[edit]
  user@host# show interfaces at-1/0/0
  encapsulation atm-pvc;
  atm-options {
  vpi 2;
}
  dsl-options {
    operating-mode itu-dmt;
    }
    encapsulation atm-snap;
      vci 2.119;
      family inet {
    address 10.10.10.1/24;
    }
  }
```

If you are done configuring the device, enter **commit** from configuration mode.

Configuring PPPoA on the at-1/0/0 Interface with Negotiated IP and PAP Authentication

CLI Quick Configuration To quickly configure this example, copy the following command, paste it into a text file, remove any line breaks, change any details necessary to match your network configuration, copy and paste the command into the CLI at the **[edit]** hierarchy level, and then enter **commit** from configuration mode.

```
set interfaces at-1/0/0 encapsulation atm-pvc atm-options vpi 2
set interfaces at-1/0/0 dsl-options operating-mode auto
set interfaces at-1/0/0 unit 0 encapsulation atm-ppp-llc vci 2.119
set interfaces at-1/0/0 unit 0 ppp-options pap access-profile jnpr local-name locky
  local-password india
set interfaces at-1/0/0 unit 0 family inet negotiate-address
set access profile jnpr client sringeri pap-password india
```

Step-by-Step Procedure To configure PPPoA on the at-1/0/0 interface with negotiated IP and PAP authentication:

1. Configure encapsulation and ATM options.

```
[edit]
user@host# set interfaces at-1/0/0 encapsulation atm-pvc
```

```
user@host# set interfaces at-1/0/0 atm-options vpi 2
user@host# set interfaces at-1/0/0 dsl-options operating-mode auto
user@host# set interfaces at-1/0/0 unit 0 encapsulation atm-ppp-llc
user@host# set interfaces at-1/0/0 unit 0 vci 2.119
```

2. Specify PPP options.

```
[edit]
user@host# set interfaces at-1/0/0 unit 0 ppp-options pap access-profile jnpr
user@host# set interfaces at-1/0/0 unit 0 ppp-options pap local-name locky
user@host# set interfaces at-1/0/0 unit 0 ppp-options pap local-password india
```

3. Configure the negotiated IP address.

```
[edit]
user@host# set interfaces at-1/0/0 unit 0 family inet negotiate-address
```

4. Configure the access profile.

```
[edit]
user@host# set access profile jnpr client sringeri pap-password india
```

Results From configuration mode, confirm your configuration by entering the **show interfaces at-1/0/0** and **show access profile jnpr** commands. If the output does not display the intended configuration, repeat the configuration instructions in this example to correct it.

```
[edit]
  user@host# show interfaces at-1/0/0
encapsulation atm-pvc;
atm-options {
  vpi 2;
}
dsl-options {
  operating-mode auto;
}
  unit 0 {
    encapsulation atm-ppp-llc;
    vci 2.119;
    ppp-options {
  pap {
    access-profile jnpr;
      local-name locky;
      local-password "$9$tm/auBEx7V2gJevWx"; ## SECRET-DATA
      }
    }
    family inet {
      negotiate-address;
```

```
        }
      }
    [edit]
      user@host# show access profile jnpr
    client sringeri pap-password "$9$FoPYn9peK8N-wRhSe"; ## SECRET-DATA
```

If you are done configuring the device, enter **commit** from configuration mode.

Configuring PPPoA on the at-1/0/0 Interface with Negotiated IP and CHAP Authentication

CLI Quick Configuration

To quickly configure this example, copy the following command, paste it into a text file, remove any line breaks, change any details necessary to match your network configuration, copy and paste the command into the CLI at the **[edit]** hierarchy level, and then enter **commit** from configuration mode.

```
set interfaces at-1/0/0 encapsulation atm-pvc atm-options vpi 2
set interfaces at-1/0/0 unit 0 encapsulation atm-ppp-llc vci 2.119
set interfaces at-1/0/0 unit 0 ppp-options chap access-profile jnpr local-name locky
set interfaces at-1/0/0 unit 0 family inet negotiate-address
set access profile jnpr client sringeri chap-secret india
```

Step-by-Step Procedure

To configure PPPoA on the at-1/0/0 interface with negotiated IP and CHAP Authentication:

1. Configure encapsulation and ATM options.

```
[edit]
user@host# set interfaces at-1/0/0 encapsulation atm-pvc
user@host# set interfaces at-1/0/0 atm-options vpi 2
user@host# set interfaces at-1/0/0 unit 0 encapsulation atm-ppp-llc
user@host# set interfaces at-1/0/0 unit 0 vci 2.119
```

2. Specify PPP options.

```
[edit]
user@host# set interfaces at-1/0/0 unit 0 ppp-options chap access-profile jnpr
user@host# set interfaces at-1/0/0 unit 0 ppp-options chap local-name locky
```

3. Configure the negotiated IP address.

```
[edit]
user@host# set interfaces at-1/0/0 unit 0 family inet negotiate-address
```

4. Configure the access profile.

```
[edit]
user@host# set access profile jnpr client sringeri chap-secret india
```

Results From configuration mode, confirm your configuration by entering the **show interfaces at-1/0/0** and **show access profile jnpr** commands. If the output does not display the intended configuration, repeat the configuration instructions in this example to correct it.

```
[edit]
  user@host# show interfaces at-1/0/0
encapsulation atm-pvc;
  atm-options {
    vpi 2;
  }
    unit 0 {
      encapsulation atm-ppp-llc;
      vci 2.119;
      ppp-options {
    chap {
      access-profile jnpr;
        local-name locky;
        }
      }
      family inet {
        negotiate-address;
        }
      }
    [edit]
      user@host# show access profile jnpr
    client sringeri chap-secret "$9$qm5FIRSKvLAp0I"; ## SECRET-DATA
```

If you are done configuring the device, enter **commit** from configuration mode.

Configuring PPPoA on the at-1/0/0 Interface with Static IP and PAP Authentication

CLI Quick Configuration To quickly configure this example, copy the following command, paste it into a text file, remove any line breaks, change any details necessary to match your network configuration, copy and paste the command into the CLI at the **[edit]** hierarchy level, and then enter **commit** from configuration mode.

```
set interfaces at-1/0/0 encapsulation atm-pvc atm-options vpi 2
set interfaces at-1/0/0 unit 0 encapsulation atm-ppp-llc vci 2.119
set interfaces at-1/0/0 unit 0 ppp-options pap access-profile jnpr local-name locky
  local-password india
set interfaces at-1/0/0 unit 0 family inet address 100.100.100.1/24
set access profile jnpr client sringeri pap-password india
```

Step-by-Step Procedure To configure PPPoA on the at-1/0/0 interface with static IP and PAP authentication:

1. Configure encapsulation and ATM options.

```
[edit]
user@host# set interfaces at-1/0/0 encapsulation atm-pvc
```



```
user@host# set interfaces at-1/0/0 atm-options vpi 2
user@host# set interfaces at-1/0/0 unit 0 encapsulation atm-ppp-llc
user@host# set interfaces at-1/0/0 unit 0 vci 2.119
```

2. Specify PPP options.

```
[edit]
user@host# set interfaces at-1/0/0 unit 0 ppp-options pap access-profile jnpr
user@host# set interfaces at-1/0/0 unit 0 ppp-options pap local-name locky
user@host# set interfaces at-1/0/0 unit 0 ppp-options pap local-password india
```

3. Configure the negotiated IP address.

```
[edit]
user@host# set interfaces at-1/0/0 unit 0 family inet address 100.100.100.1/24
```

4. Configure the access profile.

```
[edit]
user@host# set access profile jnpr client sringeri pap-password india
```

Results From configuration mode, confirm your configuration by entering the **show interfaces at-1/0/0** and **show access profile jnpr** commands. If the output does not display the intended configuration, repeat the configuration instructions in this example to correct it.

```
[edit]
  user@host# show interfaces at-1/0/0
encapsulation atm-pvc;
atm-options {
  vpi 2;
}
  unit 0 {
    encapsulation atm-ppp-llc;
    vci 2.119;
    ppp-options {
  pap {
    access-profile jnpr;
      local-name locky;
      local-password "$9$GoDHmtpBhclFn/t"; ## SECRET-DATA
      }
    }
    family inet {
      address 100.100.100.1/24;
      }
    }
  [edit]
    user@host# show access profile jnpr
```

```
client sringeri pap-password "$9$p87c01h7Nbg4ZKM87"; ## SECRET-DATA
```

If you are done configuring the device, enter **commit** from configuration mode.

Configuring PPPoA on the at-1/0/0 Interface with Static IP and CHAP Authentication

CLI Quick Configuration

To quickly configure this example, copy the following command, paste it into a text file, remove any line breaks, change any details necessary to match your network configuration, copy and paste the command into the CLI at the **[edit]** hierarchy level, and then enter **commit** from configuration mode.

```
set interfaces at-1/0/0 encapsulation atm-pvc atm-options vpi 2
set interfaces at-1/0/0 unit 0 encapsulation atm-ppp-llc vci 2.119
set interfaces at-1/0/0 unit 0 ppp-options chap access-profile jnpr local-name locky
set interfaces at-1/0/0 unit 0 family inet address 100.100.100.1/24
set access profile jnpr client sringeri chap-secret india
```

Step-by-Step Procedure

To configure PPPoA on the at-1/0/0 interface with static IP and CHAP authentication:

1. Configure encapsulation and ATM options.

```
[edit]
user@host# set interfaces at-1/0/0 encapsulation atm-pvc
user@host# set interfaces at-1/0/0 atm-options vpi 2
user@host# set interfaces at-1/0/0 unit 0 encapsulation atm-ppp-llc
user@host# set interfaces at-1/0/0 unit 0 vci 2.119
```

2. Specify PPP options.

```
[edit]
user@host# set interfaces at-1/0/0 unit 0 ppp-options chap access-profile jnpr
user@host# set interfaces at-1/0/0 unit 0 ppp-options chap local-name locky
```

3. Configure the negotiated IP address.

```
[edit]
user@host# set interfaces at-1/0/0 unit 0 family inet address 100.100.100.1/24
```

4. Configure the access profile.

```
[edit]
user@host# set access profile jnpr client sringeri chap-secret india
```

Results

From configuration mode, confirm your configuration by entering the **show interfaces at-1/0/0** and **show access profile jnpr** commands. If the output does not display the intended configuration, repeat the configuration instructions in this example to correct it.

```
[edit]
  user@host# show interfaces at-1/0/0
encapsulation atm-pvc;
  atm-options {
    vpi 2;
  }
  unit 0 {
    encapsulation atm-ppp-llc;
    vci 2.119;
  ppp-options {
    chap {
      access-profile jnpr;
      local-name locky;
      }
    }
  family inet {
    address 100.100.100.1/24;
    }
  }
  [edit]
    user@host# show access profile jnpr
  client sringeri chap-secret "$9$mfQnEhrMWxp0BE"; ## SECRET-DATA
```

If you are done configuring the device, enter **commit** from configuration mode.

Configuring PPPoA on the at-1/0/0 Interface with Unnumbered IP and PAP Authentication

CLI Quick Configuration

To quickly configure this example, copy the following command, paste it into a text file, remove any line breaks, change any details necessary to match your network configuration, copy and paste the command into the CLI at the **[edit]** hierarchy level, and then enter **commit** from configuration mode.

```
set interfaces at-1/0/0 encapsulation atm-pvc atm-options vpi 2
set interfaces at-1/0/0 dsl-options operating-mode auto
set interfaces at-1/0/0 unit 0 encapsulation atm-ppp-llc vci 2.119
set interfaces at-1/0/0 unit 0 ppp-options pap access-profile jnpr local-name locky
  local-password india
set interfaces at-1/0/0 unit 0 family inet unnumbered-address lo0.0 destination
  100.100.100.6
set interfaces lo0 unit 0 family inet address 100.100.100.20/32
set access profile jnpr client sringeri pap-password india
```

Step-by-Step Procedure

To configure PPPoA on the at-1/0/0 interface with unnumbered IP and PAP authentication:

1. Configure encapsulation and ATM options.


```
[edit]
user@host# set interfaces at-1/0/0 encapsulation atm-pvc
user@host# set interfaces at-1/0/0 atm-options vpi 2
user@host# set interfaces at-1/0/0 dsl-options operating-mode auto
user@host# set interfaces at-1/0/0 unit 0 encapsulation atm-ppp-llc
user@host# set interfaces at-1/0/0 unit 0 vci 2.119
```

2. Specify PPP options.

```
[edit]
user@host# set interfaces at-1/0/0 unit 0 ppp-options pap access-profile jnpr
user@host# set interfaces at-1/0/0 unit 0 ppp-options pap local-name locky
user@host# set interfaces at-1/0/0 unit 0 ppp-options pap local-password india
```

3. Configure the IP address, unnumbered IP address, and destination IP address.

```
[edit]
user@host# set interfaces at-1/0/0 unit 0 family inet unnumbered-address lo0.0
user@host# set interfaces at-1/0/0 unit 0 family inet unnumbered-address
  destination 100.100.100.6
user@host# set interfaces lo0 unit 0 family inet address 100.100.100.20/32
```

4. Configure the access profile.

```
[edit]
user@host# set access profile jnpr client sringeri pap-password india
```

Results From configuration mode, confirm your configuration by entering the **show interfaces at-1/0/0**, **show interfaces lo0**, and **show access profile jnpr** commands. If the output does not display the intended configuration, repeat the configuration instructions in this example to correct it.

```
[edit]
  user@host# show interfaces at-1/0/0
encapsulation atm-pvc;
  atm-options {
    vpi 2;
  }
  dsl-options {
    operating-mode auto;
  }
unit 0 {
  encapsulation atm-ppp-llc;
  vci 2.119;
  ppp-options {
pap {
  access-profile jnpr;
    local-name locky;
```



```
    local-password "$9$LA7x-wHkPzF/aZUH"; ## SECRET-DATA
    }
  }
  family inet {
    unnumbered-address lo0.0 destination 100.100.100.6;
    }
  }
  [edit]
    user@host# show interfaces lo0
  unit 0 {
  family inet {
    address 100.100.100.20/32;
    }
  }
  [edit]
    user@host# show access profile jnpr
  client sringeri pap-password "$9$1mSRclbwgZGiLxNb"; ## SECRET-DATA
```

If you are done configuring the device, enter **commit** from configuration mode.

Configuring PPPoA on the at-1/0/0 Interface with Unnumbered IP and CHAP Authentication

CLI Quick Configuration

To quickly configure this example, copy the following command, paste it into a text file, remove any line breaks, change any details necessary to match your network configuration, copy and paste the command into the CLI at the **[edit]** hierarchy level, and then enter **commit** from configuration mode.

```
set interfaces at-1/0/0 encapsulation atm-pvc atm-options vpi 2
set interfaces at-1/0/0 unit 0 encapsulation atm-ppp-llc vci 2.119
set interfaces at-1/0/0 unit 0 ppp-options chap access-profile jnpr local-name locky
set interfaces at-1/0/0 unit 0 family inet unnumbered-address lo0.0 destination
  100.100.100.6
set interfaces lo0 unit 0 family inet address 100.100.100.10/32
set access profile jnpr client sringeri chap-secret india
```

Step-by-Step Procedure

To configure PPPoA on the at-1/0/0 interface with unnumbered IP and CHAP authentication:

1. Configure encapsulation and ATM-options.

```
[edit]
user@host# set interfaces at-1/0/0 encapsulation atm-pvc
user@host# set interfaces at-1/0/0 atm-options vpi 2
user@host# set interfaces at-1/0/0 unit 0 encapsulation atm-ppp-llc
user@host# set interfaces at-1/0/0 unit 0 vci 2.119
```

2. Specify the PPP-options.

```
[edit]
```

```
user@host# set interfaces at-1/0/0 unit 0 ppp-options chap access-profile jnpr
user@host# set interfaces at-1/0/0 unit 0 ppp-options chap local-name locky
```

3. Configure the IP address, unnumbered IP address, and destination IP address.

```
[edit]
user@host# set interfaces at-1/0/0 unit 0 family inet unnumbered-address lo0.0
user@host# set interfaces at-1/0/0 unit 0 family inet unnumbered-address
  destination 100.100.100.6
user@host# set interfaces lo0 unit 0 family inet address 100.100.100.10/32
```

4. Configure the access profile.

```
[edit]
user@host# set access profile jnpr client sringeri chap-secret india
```

Results From configuration mode, confirm your configuration by entering the **show interfaces at-1/0/0**, **show interfaces lo0**, and **show access profile jnpr** commands. If the output does not display the intended configuration, repeat the configuration instructions in this example to correct it.

```
[edit]
  user@host# show interfaces at-1/0/0
show interfaces at-1/0/0
  atm-options {
    vpi 2;
  }
  unit 0 {
    encapsulation atm-ppp-llc;
    vci 2.119;
    ppp-options {
  chap {
    access-profile jnpr;
      local-name locky;
      }
    }
  family inet {
    unnumbered-address lo0.0 destination 100.100.100.6;
    }
  }
  [edit]
    user@host# show interfaces lo0
  unit 0 {
    family inet {
      address 100.100.100.10/32;
      }
    }
  [edit]
    user@host# show access profile jnpr
  client sringeri chap-secret "$9$.PT3REyvMXtuOR"; ## SECRET-DATA
```


If you are done configuring the device, enter **commit** from configuration mode.

Configuring PPPoE over ATM on the at-1/0/0 Interface with Negotiated IP and PAP Authentication

CLI Quick Configuration

To quickly configure this example, copy the following command, paste it into a text file, remove any line breaks, change any details necessary to match your network configuration, copy and paste the command into the CLI at the **[edit]** hierarchy level, and then enter **commit** from configuration mode.

```
set interfaces at-1/0/0 encapsulation ethernet-over-atm atm-options vpi 2
set interfaces at-1/0/0 unit 0 vci 2.119 encapsulation ppp-over-ether-over-atm-llc
set interfaces pp0 unit 0 ppp-options pap access-profile my_prf local-name purple
   local-password <password> passive
set interfaces pp0 unit 0 pppoe-options underlying-interface at-1/0/0.0 auto-reconnect
   120 client
set interfaces pp0 unit 0 family inet negotiate-address
set access profile my_prf authentication-order password
set access profile my_prf
```

Step-by-Step Procedure

To configure PPPoE over ATM on the at-1/0/0 interface with negotiated IP and PAP authentication:

1. Configure encapsulation and ATM options.

```
[edit]
user@host# set interfaces at-1/0/0 encapsulation ethernet-over-atm
user@host# set interfaces at-1/0/0 atm-options vpi 2
user@host# set interfaces at-1/0/0 unit 0 vci 2.119
user@host# set interfaces at-1/0/0 unit 0 encapsulation
   ppp-over-ether-over-atm-llc
```

2. Specify PPP options.

```
[edit]
user@host# set interfaces pp0 unit 0 ppp-options pap access-profile my_prf
user@host# set interfaces pp0 unit 0 ppp-options pap local-name purple
user@host# set interfaces pp0 unit 0 ppp-options pap local-password <password>
user@host# set interfaces pp0 unit 0 ppp-options pap passive
```

3. Specify PPPoE options.

```
[edit]
user@host# set interfaces pp0 unit 0 pppoe-options underlying-interface at-1/0/0.0
user@host# set interfaces pp0 unit 0 pppoe-options auto-reconnect 120
user@host# set interfaces pp0 unit 0 pppoe-options client
```

4. Configure the negotiated IP address.

```
[edit]
user@host# set interfaces pp0 unit 0 family inet negotiate-address
```

5. Configure the access profile.

```
[edit]
user@host# set access profile my_prf authentication-order password
user@host# set access profile my_prf
```

Results From configuration mode, confirm your configuration by entering the **set access profile my_prf**, **show access profile my_prf**, and **show interfaces pp0** commands. If the output does not display the intended configuration, repeat the configuration instructions in this example to correct it.

```
[edit]
  user@host# show interfaces at-1/0/0
encapsulation ethernet-over-atm;
  atm-options {
    vpi 2;
  }
  unit 0 {
    encapsulation ppp-over-ether-over-atm-llc;
    vci 2.119;
  }
  [edit]
    user@host# show access profile my_prf
  authentication-order password;
  [edit]
    user@host# show interfaces pp0
    unit 0 {
    ppp-options {
  pap {
    access-profile my_prf;
      local-name purple;
      local-password "$9$YkgoZTQn9CuZU69A0hcdbsYoGikP"; ## SECRET-DATA
      passive;
      }
    }
      pppoe-options {
        underlying-interface at-1/0/0.0;
        auto-reconnect 120;
        client;
      }
        family inet {
          negotiate-address;
          }
        }
```

If you are done configuring the device, enter **commit** from configuration mode.

Configuring PPPoE over ATM on the at-1/0/0 Interface with Negotiated IP and CHAP Authentication

CLI Quick Configuration

To quickly configure this example, copy the following command, paste it into a text file, remove any line breaks, change any details necessary to match your network configuration, copy and paste the command into the CLI at the **[edit]** hierarchy level, and then enter **commit** from configuration mode.

```
set interfaces at-1/0/0 encapsulation ethernet-over-atm atm-options vpi 2
set interfaces at-1/0/0 unit 0 vci 2.119 encapsulation ppp-over-ether-over-atm-llc
set interfaces pp0 unit 0 ppp-options chap default-chap-secret <password> local-name
   purple passive
set interfaces pp0 unit 0 pppoe-options underlying-interface at-1/0/0.0 auto-reconnect
   120 client
set interfaces pp0 unit 0 family inet negotiate-address
```

Step-by-Step Procedure

To configure PPPoE over ATM on the at-1/0/0 interface with negotiated IP and CHAP authentication:

1. Configure encapsulation and ATM options.

```
[edit]
user@host# set interfaces at-1/0/0 encapsulation ethernet-over-atm
user@host# set interfaces at-1/0/0 atm-options vpi 2
user@host# set interfaces at-1/0/0 unit 0 vci 2.119
user@host# set interfaces at-1/0/0 unit 0 encapsulation
   ppp-over-ether-over-atm-llc
```

2. Specify PPP options.

```
[edit]
user@host# set interfaces pp0 unit 0 ppp-options chap default-chap-secret
   <password>
user@host# set interfaces pp0 unit 0 ppp-options chap local-name purple
user@host# set interfaces pp0 unit 0 ppp-options chap passive
```

3. Specify PPPoE options.

```
[edit]
user@host# set interfaces pp0 unit 0 pppoe-options underlying-interface at-1/0/0.0
user@host# set interfaces pp0 unit 0 pppoe-options auto-reconnect 120
user@host# set interfaces pp0 unit 0 pppoe-options client
```

4. Configure the negotiated IP address.

```
[edit]
user@host# set interfaces pp0 unit 0 family inet negotiate-address
```

Results From configuration mode, confirm your configuration by entering the **show interfaces at-1/0/0** and **show interfaces pp0** commands. If the output does not display the intended configuration, repeat the configuration instructions in this example to correct it.

```
[edit]
  user@host# show interfaces at-1/0/0
encapsulation ethernet-over-atm;
  atm-options {
    vpi 2;
  }
    unit 0 {
      encapsulation ppp-over-ether-over-atm-llc;
      vci 2.119;
    }
    [edit]
      user@host# show interfaces pp0
      unit 0 {
    ppp-options {
      chap {
        default-chap-secret "$9$QQCIFn9cSeMWx9AKM87sYmfTQnCuOR"; ##
          SECRET-D ATA
      local-name purple;
        passive;
          }
        }
        pppoe-options {
          underlying-interface at-1/0/0.0;
          auto-reconnect 120;
          client;
        }
        family inet {
          negotiate-address;
          }
        }
```

If you are done configuring the device, enter **commit** from configuration mode.

Verification

Confirm that the configuration is working properly.

Verifying the ADSL Interface for End-to-End Data Path

Purpose Verify the interface status and traffic statistics.

Action From operational mode, enter the **show interface at-1/0/0 terse** and **show interfaces at-1/0/0** commands.

user@host> **show interfaces at-1/0/0 terse**

```
 Interface                Admin Link  Proto    Local                  Remote
   at-1/0/0                 up    up
   at-1/0/0.0               up    up    inet     10.10.10.1/24
   at-1/0/0.32767           up    up

[edit]
user@host# run ping 10.10.10.2 count 1000 rapid
PING 10.10.10.2 (10.10.10.2): 56 data bytes

!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
--- 10.10.10.2 ping statistics ---
1000 packets transmitted, 1000 packets received, 0% packet loss
round-trip min/avg/max/stddev = 7.141/9.356/58.347/3.940 ms

[edit]
user@host#
```

user@host> **show interfaces at-1/0/0**

```
Physical interface: at-1/0/0, Enabled, Physical link is Up
  Interface index: 146, SNMP ifIndex: 504
  Link-level type: ATM-PVC, MTU: 1496, Clocking: Internal, ADSL mode,
  Speed: ADSL
  Speed: 832kbps, Loopback: None
  Device flags   : Present Running
  Link flags     : None
  CoS queues     : 8 supported, 8 maximum usable queues
  Current address: 00:b1:7e:85:84:ff
  Last flapped   : 2009-10-28 02:14:45 PDT (00:09:54 ago)
  Input rate     : 0 bps (0 pps)
  Output rate    : 0 bps (0 pps)
  ADSL  alarms   : None
  ADSL  defects  : None
  ADSL status:
    Modem status  : Showtime (Itu-dmt)
    DSL mode      :  Itu-dmt    Annex A
    Last fail code: None
```



```
  Subfunction   : 0x00
  Seconds in showtime : 596

 Logical interface at-1/0/0.0 (Index 69) (SNMP ifIndex 523)
   Flags: Point-To-Point SNMP-Traps 0x0 Encapsulation: ATM-SNAP
   Input packets : 1000
   Output packets: 1000
   Security: Zone: Null
   Protocol inet, MTU: 1456
     Flags: None
     Addresses, Flags: Is-Preferred Is-Primary
       Destination: 10.10.10/24, Local: 10.10.10.1, Broadcast: 10.10.10.255
   VCI 2.119
     Flags: Active
     Total down time: 0 sec, Last down: Never
       Input packets : 1000
       Output packets: 1000

 Logical interface at-1/0/0.32767 (Index 70) (SNMP ifIndex 525)
   Flags: Point-To-Multipoint No-Multicast SNMP-Traps 0x0
   Encapsulation: ATM-VCMUX
   Input packets : 0
   Output packets: 0
   Security: Zone: Null
   VCI 2.4
     Flags: Active
     Total down time: 0 sec, Last down: Never
       Input packets : 0
       Output packets: 0
```

Verifying PPPoA on the at-1/0/0 Interface with Negotiated IP and PAP Authentication

Purpose Verify the interface status and end-to-end data path connectivity.

Action From operational mode, enter the **show interfaces at-1/0/0** and **show interfaces at-1/0/0 terse** commands.

user@host> **show interfaces at-1/0/0**

```
Physical interface: at-1/0/0, Enabled, Physical link is Up
 Interface index: 146, SNMP ifIndex: 504
 Link-level type: ATM-PVC, MTU: 1496, Clocking: Internal, ADSL mode, Speed: ADSL

 Speed: 832kbps, Loopback: None
 Device flags   : Present Running
 Link flags     : None
 CoS queues     : 8 supported, 8 maximum usable queues
 Current address: 00:b1:7e:85:84:ff
 Last flapped   : 2009-10-28 02:39:14 PDT (00:09:29 ago)
 Input rate     : 0 bps (0 pps)
 Output rate    : 80 bps (0 pps)
 ADSL  alarms   : None
 ADSL  defects  : None
 ADSL status:
   Modem status  : Showtime (Itu-dmt)
```



```
    DSL mode      :     Auto    Annex A
    Last fail code: None
    Subfunction   : 0x00
    Seconds in showtime : 571

  Logical interface at-1/0/0.0 (Index 69) (SNMP ifIndex 523)
    Flags: Point-To-Point SNMP-Traps 0x0 Encapsulation: ATM-PPP-LLC
    Input packets : 2
    Output packets: 2
  Keepalive settings: Interval 10 seconds, Up-count 1, Down-count 3
  Keepalive: Input: 8 (00:00:01 ago), Output: 9 (00:00:03 ago)
  LCP state: Opened
  NCP state: inet: Opened, inet6: Not-configured, iso: Not-configured, mpls:
Not-configured
  CHAP state: Closed
  PAP state: Success
    Security: Zone: Null
    Protocol inet, MTU: 1486
      Flags: Negotiate-Address
      Addresses, Flags: Kernel Is-Preferred Is-Primary
        Destination: 100.100.100.6, Local: 100.100.100.1
    VCI 2.119
      Flags: Active
      Total down time: 0 sec, Last down: Never
        Input packets : 2
        Output packets: 2

  Logical interface at-1/0/0.32767 (Index 70) (SNMP ifIndex 525)
   Flags: Point-To-Multipoint No-Multicast SNMP-Traps 0x0 Encapsulation: ATM-VCMUX

    Input packets : 0
    Output packets: 0
    Security: Zone: Null
    VCI 2.4
      Flags: Active
      Total down time: 0 sec, Last down: Never
        Input packets : 0
        Output packets: 0
```

user@host> **show interfaces at-1/0/0 terse**

```
Interface               Admin Link Proto    Local                 Remote
at-1/0/0                up    up
at-1/0/0.0             up    up   inet     100.100.100.1       --> 100.100.100.6
at-1/0/0.32767          up    up

[edit]
user@host# run ping 100.100.100.6 count 100 rapid
PING 100.100.100.6 (100.100.100.6): 56 data bytes

!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
--- 100.100.100.6 ping statistics ---
100 packets transmitted, 100 packets received, 0% packet loss
round-trip min/avg/max/stddev = 7.056/8.501/14.194/1.787 ms
```

Verifying PPPoA on the at-1/0/0 Interface with Negotiated IP and CHAP Authentication

Purpose Verify the interface output and end-to-end data path connectivity.

Action From operational mode, enter the **show interfaces at-1/0/0** and **show interfaces at-1/0/0 terse** commands.

user@host> **show interfaces at-1/0/0**

```
Physical interface: at-1/0/0, Enabled, Physical link is Up
  Interface index: 146, SNMP ifIndex: 504
  Link-level type: ATM-PVC, MTU: 1496, Clocking: Internal, ADSL mode, Speed: ADSL

  Speed: 832kbps, Loopback: None
  Device flags   : Present Running
  Link flags     : None
  CoS queues     : 8 supported, 8 maximum usable queues
  Current address: 00:b1:7e:85:84:ff
  Last flapped   : 2009-10-28 02:39:14 PDT (00:01:37 ago)
  Input rate     : 0 bps (0 pps)
  Output rate    : 80 bps (0 pps)
  ADSL  alarms   : None
  ADSL  defects  : None
  ADSL status:
    Modem status  : Showtime (Itu-dmt)
    DSL mode      :     Auto    Annex A
    Last fail code: None
    Subfunction   : 0x00
    Seconds in showtime : 97

  Logical interface at-1/0/0.0 (Index 71) (SNMP ifIndex 523)
    Flags: Point-To-Point SNMP-Traps 0x0 Encapsulation: ATM-PPP-LLC
    Input packets : 26
    Output packets: 29
  Keepalive settings: Interval 10 seconds, Up-count 1, Down-count 3
  Keepalive: Input: 10 (00:00:02 ago), Output: 8 (00:00:06 ago)
  LCP state: Opened
  NCP state: inet: Opened, inet6: Not-configured, iso: Not-configured, mpls:
Not-configured
  CHAP state: Success
  PAP state: Closed
    Security: Zone: Null
    Protocol inet, MTU: 1486
      Flags: Negotiate-Address
      Addresses, Flags: Kernel Is-Preferred Is-Primary
        Destination: 100.100.100.6, Local: 100.100.100.1
    VCI 2.119
      Flags: Active
      Total down time: 0 sec, Last down: Never
        Input packets : 26
        Output packets: 29

  Logical interface at-1/0/0.32767 (Index 70) (SNMP ifIndex 525)
   Flags: Point-To-Multipoint No-Multicast SNMP-Traps 0x0 Encapsulation: ATM-VCMUX

    Input packets : 0
    Output packets: 0
```



```
  Security: Zone: Null
  VCI 2.4
    Flags: Active
    Total down time: 0 sec, Last down: Never
      Input packets : 0
      Output packets: 0
```

user@host> **show interfaces at-1/0/0 terse**

```
Interface               Admin Link Proto    Local                 Remote
 at-1/0/0                up    up
 at-1/0/0.0             up    up   inet     100.100.100.1      --> 100.100.100.6
at-1/0/0.32767          up    up

[edit]
user@host# run ping 100.100.100.6 count 100 rapid
PING 100.100.100.6 (100.100.100.6): 56 data bytes

!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
--- 100.100.100.6 ping statistics ---
100 packets transmitted, 100 packets received, 0% packet loss
round-trip min/avg/max/stddev = 7.231/9.167/58.852/5.716 ms
```

Verifying PPPoA on the at-1/0/0 Interface with Static IP and PAP Authentication

Purpose Verify the interface status and end-to-end data path testing.

Action From operational mode, enter the **show interfaces at-1/0/0** and **show interfaces at-1/0/0 terse** commands.

user@host> **show interfaces at-1/0/0**

```
Physical interface: at-1/0/0, Enabled, Physical link is Up
  Interface index: 146, SNMP ifIndex: 504
  Link-level type: ATM-PVC, MTU: 1496, Clocking: Internal, ADSL mode, Speed: ADSL

  Speed: 832kbps, Loopback: None
  Device flags   : Present Running
  Link flags     : None
  CoS queues     : 8 supported, 8 maximum usable queues
  Current address: 00:b1:7e:85:84:ff
  Last flapped   : 2009-10-28 22:18:50 PDT (00:10:26 ago)
  Input rate     : 0 bps (0 pps)
  Output rate    : 80 bps (0 pps)
  ADSL  alarms   : None
  ADSL  defects  : None
  ADSL status:
    Modem status  : Showtime (Itu-dmt)
    DSL mode      :     Auto    Annex A
    Last fail code: None
    Subfunction   : 0x00
    Seconds in showtime : 624

  Logical interface at-1/0/0.0 (Index 73) (SNMP ifIndex 523)
    Flags: Point-To-Point SNMP-Traps 0x0 Encapsulation: ATM-PPP-LLC
    Input packets : 28
```

```
    Output packets: 29
  Keepalive settings: Interval 10 seconds, Up-count 1, Down-count 3
  Keepalive: Input: 2 (00:00:01 ago), Output: 1 (00:00:09 ago)
  LCP state: Opened
  NCP state: inet: Opened, inet6: Not-configured, iso: Not-configured, mpls:
Not-configured
  CHAP state: Closed
  PAP state: Success
    Security: Zone: HOST
    Allowed host-inbound traffic : any-service bfd bgp dvmrp igmp ldp msdp nhrp
ospf pgm pim rip router-discovery rsvp sap vrrp
    Protocol inet, MTU: 1486
      Flags: None
      Addresses, Flags: Is-Preferred Is-Primary
        Destination: 100.100.100/24, Local: 100.100.100.10, Broadcast:
100.100.100.255
    VCI 2.119
      Flags: Active
      Total down time: 0 sec, Last down: Never
        Input packets : 28
        Output packets: 29

  Logical interface at-1/0/0.32767 (Index 72) (SNMP ifIndex 525)
    Flags: Point-To-Multipoint No-Multicast SNMP-Traps 0x0 Encapsulation: ATM-VCMUX

    Input packets : 0
    Output packets: 0
    Security: Zone: HOST
    Allowed host-inbound traffic : any-service bfd bgp dvmrp igmp ldp msdp nhrp
ospf pgm pim rip router-discovery rsvp sap vrrp
    VCI 2.4
      Flags: Active
      Total down time: 0 sec, Last down: Never
        Input packets : 0
        Output packets: 0
```

user@host> **show interfaces at-1/0/0 terse**

```
Interface               Admin Link Proto    Local                 Remote
at-1/0/0                up    up
at-1/0/0.0              up    up   inet     100.100.100.10/24
at-1/0/0.32767          up    up

[edit]
user@host# run ping 100.100.100.6 count 100 rapid
PING 100.100.100.6 (100.100.100.6): 56 data bytes

!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
--- 100.100.100.6 ping statistics ---
100 packets transmitted, 100 packets received, 0% packet loss
round-trip min/avg/max/stddev = 7.698/10.296/61.622/5.856 ms
```

Verifying PPPoA on the at-1/0/0 Interface with Static IP and CHAP Authentication

Purpose Verify the interface status and end-to-end data path testing.

Action From operational mode, enter the **show interfaces at-1/0/0** and **show interfaces at-1/0/0 terse** commands.

user@host> **show interfaces at-1/0/0**

```
Physical interface: at-1/0/0, Enabled, Physical link is Up
  Interface index: 146, SNMP ifIndex: 504
  Link-level type: ATM-PVC, MTU: 1496, Clocking: Internal, ADSL mode, Speed: ADSL

  Speed: 832kbps, Loopback: None
  Device flags   : Present Running
  Link flags     : None
  CoS queues     : 8 supported, 8 maximum usable queues
  Current address: 00:b1:7e:85:84:ff
  Last flapped   : 2009-10-28 22:18:50 PDT (00:05:17 ago)
  Input rate     : 0 bps (0 pps)
  Output rate    : 0 bps (0 pps)
  ADSL  alarms   : None
  ADSL  defects  : None
  ADSL status:
    Modem status  : Showtime (Itu-dmt)
    DSL mode      :     Auto    Annex A
    Last fail code: None
    Subfunction   : 0x00
    Seconds in showtime : 316

  Logical interface at-1/0/0.0 (Index 71) (SNMP ifIndex 523)
    Flags: Point-To-Point SNMP-Traps 0x0 Encapsulation: ATM-PPP-LLC
    Input packets : 46
    Output packets: 88
  Keepalive settings: Interval 10 seconds, Up-count 1, Down-count 3
  Keepalive: Input: 18 (00:00:04 ago), Output: 17 (00:00:08 ago)
  LCP state: Opened
  NCP state: inet: Opened, inet6: Not-configured, iso: Not-configured, mpls:
Not-configured
  CHAP state: Success
  PAP state: Closed
    Security: Zone: HOST
    Allowed host-inbound traffic : any-service bfd bgp dvmrp igmp ldp msdp nhrp
ospf pgm pim rip router-discovery rsvp sap vrrp
    Protocol inet, MTU: 1486
      Flags: None
      Addresses, Flags: Is-Preferred Is-Primary
        Destination: 100.100.100/24, Local: 100.100.100.1, Broadcast:
100.100.100.255
    VCI 2.119
      Flags: Active
      Total down time: 0 sec, Last down: Never
        Input packets : 46
        Output packets: 88

  Logical interface at-1/0/0.32767 (Index 72) (SNMP ifIndex 525)
   Flags: Point-To-Multipoint No-Multicast SNMP-Traps 0x0 Encapsulation: ATM-VCMUX

    Input packets : 0
    Output packets: 0
    Security: Zone: HOST
    Allowed host-inbound traffic : any-service bfd bgp dvmrp igmp ldp msdp nhrp
ospf pgm pim rip router-discovery rsvp sap vrrp
    VCI 2.4
      Flags: Active
```



```
     Total down time: 0 sec, Last down: Never
       Input packets : 0
       Output packets: 0
```

user@host> **show interfaces at-1/0/0 terse**

```
Interface               Admin Link Proto    Local                 Remote
at-1/0/0                up    up
at-1/0/0.0              up    up   inet     100.100.100.1/24
at-1/0/0.32767          up    up

[edit]
user@host# run ping 100.100.100.6 count 100 rapid
PING 100.100.100.6 (100.100.100.6): 56 data bytes


!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
--- 100.100.100.6 ping statistics ---
100 packets transmitted, 100 packets received, 0% packet loss
round-trip min/avg/max/stddev = 7.787/9.300/15.081/2.023 ms
```

Verifying PPPoA on the at-1/0/0 Interface with Unnumbered IP and PAP Authentication

Purpose Verify the interface status and end-to-end data path testing.

Action From operational mode, enter the **show interfaces at-1/0/0** and **show interfaces at-1/0/0 terse** commands.

user@host> **show interfaces at-1/0/0**

```
Physical interface: at-1/0/0, Enabled, Physical link is Up
  Interface index: 146, SNMP ifIndex: 504
  Link-level type: ATM-PVC, MTU: 1496, Clocking: Internal, ADSL mode, Speed: ADSL

  Speed: 832kbps, Loopback: None
  Device flags   : Present Running
  Link flags     : None
  CoS queues     : 8 supported, 8 maximum usable queues
  Current address: 00:b1:7e:85:84:ff
  Last flapped   : 2009-10-28 22:18:50 PDT (00:19:19 ago)
  Input rate     : 0 bps (0 pps)
  Output rate    : 0 bps (0 pps)
  ADSL  alarms   : None
  ADSL  defects  : None
  ADSL status:
    Modem status  : Showtime (Itu-dmt)
    DSL mode      :     Auto    Annex A
    Last fail code: None
    Subfunction   : 0x00
    Seconds in showtime : 1158

  Logical interface at-1/0/0.0 (Index 73) (SNMP ifIndex 523)
    Flags: Point-To-Point SNMP-Traps 0x0 Encapsulation: ATM-PPP-LLC
    Input packets : 441
```

```
    Output packets: 342
  Keepalive settings: Interval 10 seconds, Up-count 1, Down-count 3
  Keepalive: Input: 53 (00:00:06 ago), Output: 55 (00:00:05 ago)
  LCP state: Opened
  NCP state: inet: Opened, inet6: Not-configured, iso: Not-configured, mpls:
Not-configured
  CHAP state: Closed
  PAP state: Success
    Security: Zone: HOST
    Allowed host-inbound traffic : any-service bfd bgp dvmrp igmp ldp msdp nhrp
ospf pgm pim rip router-discovery rsvp sap vrrp
    Protocol inet, MTU: 1486
      Flags: None
      Addresses, Flags: Is-Preferred Is-Primary
        Destination: 100.100.100/24, Local: 100.100.100.20, Broadcast:
100.100.100.255
    VCI 2.119
      Flags: Active
      Total down time: 0 sec, Last down: Never
        Input packets : 441
        Output packets: 342

  Logical interface at-1/0/0.32767 (Index 72) (SNMP ifIndex 525)
   Flags: Point-To-Multipoint No-Multicast SNMP-Traps 0x0 Encapsulation: ATM-VCMUX

    Input packets : 0
    Output packets: 0
    Security: Zone: HOST
    Allowed host-inbound traffic : any-service bfd bgp dvmrp igmp ldp msdp nhrp
ospf pgm pim rip router-discovery rsvp sap vrrp
    VCI 2.4
      Flags: Active
      Total down time: 0 sec, Last down: Never
        Input packets : 0
        Output packets: 0
```

`user@host>` **show interfaces at-1/0/0 terse**

```
user@host# run show interfaces at-1/0/0 terse
Interface               Admin Link Proto    Local                 Remote
at-1/0/0                up    up
at-1/0/0.0             up    up   inet     100.100.100.20      --> 100.100.100.6
at-1/0/0.32767          up    up

[edit]
user@host# run ping 100.100.100.6 count 100 rapid
PING 100.100.100.6 (100.100.100.6): 56 data bytes


!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
--- 100.100.100.6 ping statistics ---
100 packets transmitted, 100 packets received, 0% packet loss
round-trip min/avg/max/stddev = 7.917/10.164/56.428/5.340 ms
```

Verifying PPPoA on the at-1/0/0 Interface with Unnumbered IP and CHAP Authentication

Purpose Verify the interface status and end-to-end data path connectivity.

Action From operational mode, enter the **show interfaces at-1/0/0** and **show interfaces at-1/0/0 terse** commands.

`user@host>` **show interfaces at-1/0/0**

```
Physical interface: at-1/0/0, Enabled, Physical link is Up
  Interface index: 146, SNMP ifIndex: 504
  Link-level type: ATM-PVC, MTU: 1496, Clocking: Internal, ADSL mode, Speed: ADSL

  Speed: 832kbps, Loopback: None
  Device flags   : Present Running
  Link flags     : None
  CoS queues     : 8 supported, 8 maximum usable queues
  Current address: 00:b1:7e:85:84:ff
  Last flapped   : 2009-10-28 22:18:50 PDT (00:37:35 ago)
  Input rate     : 0 bps (0 pps)
  Output rate    : 0 bps (0 pps)
  ADSL  alarms   : None
  ADSL  defects  : None
  ADSL status:
    Modem status  : Showtime (Itu-dmt)
    DSL mode      :     Auto    Annex A
    Last fail code: None
    Subfunction   : 0x00
    Seconds in showtime : 2253

  Logical interface at-1/0/0.0 (Index 71) (SNMP ifIndex 523)
    Flags: Point-To-Point SNMP-Traps 0x0 Encapsulation: ATM-PPP-LLC
    Input packets : 36
    Output packets: 35
  Keepalive settings: Interval 10 seconds, Up-count 1, Down-count 3
  Keepalive: Input: 12 (00:00:07 ago), Output: 13 (00:00:05 ago)
  LCP state: Opened
  NCP state: inet: Opened, inet6: Not-configured, iso: Not-configured, mpls:
Not-configured
  CHAP state: Success
  PAP state: Closed
    Security: Zone: HOST
    Allowed host-inbound traffic : any-service bfd bgp dvmrp igmp ldp msdp nhrp
ospf pgm pim rip router-discovery rsvp sap vrrp
    Protocol inet, MTU: 1486
      Flags: None
      Addresses, Flags: Is-Preferred Is-Primary
        Destination: 100.100.100.6, Local: 100.100.100.10
    VCI 2.119
      Flags: Active
      Total down time: 0 sec, Last down: Never
        Input packets : 36
        Output packets: 35

  Logical interface at-1/0/0.32767 (Index 72) (SNMP ifIndex 525)
   Flags: Point-To-Multipoint No-Multicast SNMP-Traps 0x0 Encapsulation: ATM-VCMUX
```

```
    Input packets : 0
    Output packets: 0
    Security: Zone: HOST
    Allowed host-inbound traffic : any-service bfd bgp dvmrp igmp ldp msdp nhrp
ospf pgm pim rip router-discovery rsvp sap vrrp
    VCI 2.4
      Flags: Active
      Total down time: 0 sec, Last down: Never
        Input packets : 0
        Output packets: 0
```

user@host> **show interfaces at-1/0/0 terse**

```
Interface               Admin Link Proto    Local                 Remote
at-1/0/0                up    up
at-1/0/0.0             up    up   inet     100.100.100.10      --> 100.100.100.6
at-1/0/0.32767          up    up

[edit]
user@host# run ping 100.100.100.6 count 100 rapid
PING 100.100.100.6 (100.100.100.6): 56 data bytes

!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
--- 100.100.100.6 ping statistics ---
100 packets transmitted, 100 packets received, 0% packet loss
round-trip min/avg/max/stddev = 7.881/9.046/15.136/1.697 ms
```

Verifying PPPoE over ATM on the at-1/0/0 Interface with Negotiated IP and PAP Authentication

Purpose Verify the interface status and end-to-end data path connectivity

Action From operational mode, enter the **show interfaces pp0** and **show interfaces at-1/0/0 terse** commands.

user@host> **show interfaces pp0**

```
Physical interface: pp0, Enabled, Physical link is Up
  Interface index: 128, SNMP ifIndex: 510
  Type: PPPoE, Link-level type: PPPoE, MTU: 1532
  Device flags   : Present Running
  Interface flags: Point-To-Point SNMP-Traps
  Link type      : Full-Duplex
  Link flags     : None
    Input packets : 0
    Output packets: 0

  Logical interface pp0.0 (Index 72) (SNMP ifIndex 526)
    Flags: Point-To-Point SNMP-Traps 0x0 Encapsulation: PPPoE
    PPPoE:
      State: SessionUp, Session ID: 63,
      Session AC name: belur, Remote MAC address: 00:90:1a:41:03:c5,
      Configured AC name: None, Service name: None,
      Auto-reconnect timeout: 120 seconds, Idle timeout: Never,
      Underlying interface: at-1/0/0.0 (Index 71)
```

```
    Input packets : 464
    Output packets: 241
  Keepalive settings: Interval 10 seconds, Up-count 1, Down-count 3
  Keepalive: Input: 1 (00:39:51 ago), Output: 225 (00:00:08 ago)
  LCP state: Opened
  NCP state: inet: Opened, inet6: Not-configured, iso: Not-configured, mpls:
  Not-configured
  CHAP state: Closed
  PAP state: Success
    Security: Zone: Null
    Protocol inet, MTU: 1456
      Flags: Negotiate-Address
      Addresses, Flags: Kernel Is-Preferred Is-Primary
        Destination: 12.12.12.1, Local: 12.12.12.15
```

user@host> **show interfaces at-1/0/0 terse**

```
user@host# run show interfaces at-1/0/0 terse
Interface               Admin Link Proto    Local                 Remote
at-1/0/0                up    up
at-1/0/0.0              up    up
at-1/0/0.32767          up    up

[edit]
user@host# run show interfaces pp0 terse
Interface               Admin Link Proto    Local                 Remote
pp0                     up    up
pp0.0                   up    up   inet     12.12.12.15         --> 12.12.12.1

[edit]
user@host# run ping 12.12.12.1 count 100 rapid
PING 12.12.12.1 (12.12.12.1): 56 data bytes

!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
--- 12.12.12.1 ping statistics ---
100 packets transmitted, 100 packets received, 0% packet loss
round-trip min/avg/max/stddev = 9.369/10.590/16.716/1.660 ms
```

Verifying PPPoE over ATM on the at-1/0/0 Interface with Negotiated IP and CHAP Authentication

Purpose Verify the interface status and end-to-end data path connectivity

Action From operational mode, enter the **show interfaces pp0** and **show interfaces at-1/0/0 terse** commands.

user@host> **show interfaces pp0**

```
Physical interface: pp0, Enabled, Physical link is Up
  Interface index: 128, SNMP ifIndex: 510
  Type: PPPoE, Link-level type: PPPoE, MTU: 1532
  Device flags   : Present Running
  Interface flags: Point-To-Point SNMP-Traps
  Link type      : Full-Duplex
  Link flags     : None
```

```
    Input packets : 0
    Output packets: 0

  Logical interface pp0.0 (Index 70) (SNMP ifIndex 526)
    Flags: Point-To-Point SNMP-Traps 0x0 Encapsulation: PPPoE
    PPPoE:
      State: SessionUp, Session ID: 64,
      Session AC name: belur, Remote MAC address: 00:90:1a:41:03:c5,
      Configured AC name: None, Service name: None,
      Auto-reconnect timeout: 120 seconds, Idle timeout: Never,
      Underlying interface: at-1/0/0.0 (Index 71)
    Input packets : 14
    Output packets: 13
  Keepalive settings: Interval 10 seconds, Up-count 1, Down-count 3
  Keepalive: Input: 0 (never), Output: 7 (00:00:08 ago)
  LCP state: Opened
  NCP state: inet: Opened, inet6: Not-configured, iso: Not-configured, mpls:
Not-configured
  CHAP state: Success
  PAP state: Closed
    Security: Zone: Null
    Protocol inet, MTU: 1456
      Flags: Negotiate-Address
      Addresses, Flags: Kernel Is-Preferred Is-Primary
        Destination: 12.12.12.1, Local: 12.12.12.16
```

user@host> **show interfaces at-1/0/0 terse**

```
Interface                Admin Link Proto    Local                 Remote
at-1/0/0                 up    up
at-1/0/0.0               up    up
at-1/0/0.32767           up    up

[edit]
user@host# run show interfaces pp0 terse
Interface                Admin Link Proto    Local                 Remote
pp0                      up    up
pp0.0                    up    up   inet     12.12.12.16         --> 12.12.12.1

[edit]
user@host# run ping 12.12.12.1 count 1000 rapid

!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
--- 12.12.12.1 ping statistics ---
1000 packets transmitted, 1000 packets received, 0% packet loss
round-trip min/avg/max/stddev = 8.748/10.461/21.386/1.915 ms

[edit]
user@host#
```

Related Documentation

- VDSL2 Interface Technology Overview on page 175
- Example: Configuring VDSL2 Interfaces (Basic) on page 216
- Example: Configuring VDSL2 Interfaces (Detail) on page 222

Example: Configuring VDSL2 Interfaces (Basic)

This example shows how to configure the VDSL2 interfaces for SRX110, SRX210, SRX220, SRX240, SRX320, and SRX340 devices. (Platform support depends on the Junos OS release in your installation.)

Requirements

Before you begin:

- Establish basic connectivity. See the *Quick Start Guide* for your device for factory default settings.
- Configure network interfaces as necessary. See "Example: Creating an Ethernet Interface" on page 261.

Overview

In this example, you create a VDSL2 interface called **pt-1/0/0** and set the VDSL2 profile to auto.

Configuration

CLI Quick Configuration

To quickly configure this example, copy the following command, paste it into a text file, remove any line breaks, change any details necessary to match your network configuration, copy and paste the command into the CLI at the **[edit]** hierarchy level, and then enter **commit** from configuration mode.

```
set interfaces pt-1/0/0 vdsl-options vdsl-profile auto
set interfaces pt-1/0/0 vlan-tagging
set interfaces pt-1/0/0 unit 0 vlan-id 100
```

Step-by-Step Procedure

To configure the VDSL2 interfaces for the SRX110, SRX210, SRX240, SRX320, and SRX340 devices and enable VLAN tagging:

1. Create an interface.

   ```
   [edit]
   user@host# edit interfaces pt-1/0/0
   ```

2. Set the type of VDSL2 profile.

   ```
   [edit interfaces pt-1/0/0]
   ```



```
user@host# set vdsl-options vdsl-profile auto
```

3. Specify the logical unit to connect to this physical VDSL2 interface.

```
[edit interfaces pt-1/0/0]
user@host# set unit 0
```

4. Specify the family protocol type.

```
[edit interfaces pt-1/0/0]
user@host# set unit 0 family inet address 100.100.100.1/24
```

5. To enable VLAN tagging on the pt interface.

```
[edit interfaces pt-1/0/0]
user@host# set interface pt-1/0/0 vlan-tagging
```

6. Specify the value of the VLAN ID to be configured.

```
[edit interfaces pt-1/0/0]
user@host# set interface pt-1/0/0 unit 0 vlan-id 100
```

NOTE: This feature is supported only on the pt interface, and the range of VLANs that can be configured is 0 to 4093.

Results From configuration mode, confirm your configuration by entering the **show interfaces pt-1/0/0** command. If the output does not display the intended configuration, repeat the configuration instructions in this example to correct it.

```
[edit]
  user@host# show interfaces pt-1/0/0
vdsl-options {
vdsl-profile auto;
}
unit 0 {
  Family inet {
    address 100.100.100.1/24;
}
```

NOTE: When VLAN tagging is configured, the intended output is:

```
[edit]
  user@host# show interfaces pt-1/0/0
  vlan-tagging;
vdsl-options {
vdsl-profile auto;
}
unit 0 {
  vlan-id 100;
    Family inet {
    address 100.100.100.1/24;
}
```

If you are done configuring the device, enter **commit** from configuration mode.

Verifying the Configuration

Confirm that the configuration is working properly.

- Displaying the Configuration for VDSL2 Interface (When Connected to the DSLAM Operating in Annex A Mode) on page 218
- Displaying the Configuration for VDSL2 Interface (When Connected to the DSLAM Operating in Annex B Mode) on page 221

Displaying the Configuration for VDSL2 Interface (When Connected to the DSLAM Operating in Annex A Mode)

Purpose Verify the command output.

Action From operational mode, enter the **show interfaces pt-1/0/0** command.

```
Physical interface: pt-1/0/0, Enabled, Physical link is Up
 Interface index: 146, SNMP ifIndex: 524, Generation: 149
 Type: PTM, Link-level type: Ethernet, MTU: 1496, VDSL mode, Speed:    45440kbps

 Speed: VDSL2
 Device flags : Present Running
 Link flags : None
 CoS queues : 8 supported, 8 maximum usable queues
 Hold-times : Up 0 ms, Down 0 ms
 Current address: 00:b1:7e:85:84:ff
 Last flapped : 2009-10-18 11:56:50 PDT (12:32:49 ago)
 Statistics last cleared: 2009-10-19 00:29:37 PDT (00:00:02 ago)
 Traffic statistics:
  Input bytes : 22438962 97070256 bps
  Output bytes : 10866024 43334088 bps
  Input packets: 15141 8187 pps
  Output packets: 7332 3655 pps
Input errors:
```



```
   Errors: 0, Drops: 0, Policed discards: 0, L3 incompletes: 0,
   L2 channel errors: 0, L2 mismatch timeouts: 0, Resource errors: 0
 Output errors:
  Carrier transitions: 0, Errors: 0, Drops: 0, Aged packets: 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 6759 6760 0
    1 expedited-fo 0 0 0
    2 assured-forw 0 0 0
    3 network-cont 0 0 0
VDSL alarms : None
VDSL defects : None
VDSL media: Seconds Count State
   LOF 0 0 OK
   LOS 0 0 OK
   LOM 0 0 OK
   LOP 0 0 OK
   LOCDI 0 0 OK
   LOCDNI 0 0 OK
VDSL status:
  Modem status : Showtime (Profile-17a)
  VDSL profile : Profile-17a Annex A
  Last fail code: None
  Subfunction : 0x00
  Seconds in showtime : 45171
VDSL Chipset Information: VTU-R VTU-C
 Vendor Country : 0xb5 0xb5
  Vendor ID : BDCM BDCM
  Vendor Specific: 0x9385 0x9385
VDSL Statistics: VTU-R VTU-C
  Attenuation (dB) : 0.0 0.0
  Capacity used (%) : 0 0
  Noise margin (dB) : 20.0 20.0
  Output power (dBm) : 6.0 12.0
                      Interleave Fast Interleave Fast
  Bit rate (kbps) :     100004     0    45440       0
  CRC :                 0          0    0           0
 FEC :                  0          0    0            0
 HEC :                  0          0    0            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       43168000   95       0      low
none
   3 network-control    5        2272000    5        0       low
none
Logical interface pt-1/0/0.0 (Index 71) (SNMP ifIndex 525) (Generation 136)
    Flags: SNMP-Traps Encapsulation: ENET2
    Traffic statistics:
      Input bytes :  23789064
      Output bytes :  10866024
      Input packets:   16052
      Output packets:   7332
    Local statistics:
      Input bytes : 0
```

```
      Output bytes : 0
      Input packets: 0
      Output packets: 0
    Transit statistics:
      Input bytes :  23789064  97070256 bps
      Output bytes :  10866024  43334088 bps
      Input packets:  16052  8187 pps
       Output packets:  7332   3655 pps
     Security: Zone: Null
     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: 1482, Generation: 169, Route table: 0
      Flags: None
      Addresses, Flags: Is-Preferred Is-Primary

   Destination: 10.10.10/24, Local: 10.10.10.1, Broadcast:  10.10.10.255,
Generation: 158
```

The output shows a summary of VDSL2 interface. Verify the following information:

- Status of interface pt-1/0/0 is displayed as Physical link is Up.
- Modem status is displayed as Showtime (Profile-17a).
- Time in seconds during which the interface stayed up is displayed as Seconds in showtime.
- Annex A indicates VDSL profile of the DSLAM connected at other end.

Displaying the Configuration for VDSL2 Interface (When Connected to the DSLAM Operating in Annex B Mode)

Purpose Verify the command output.

Action From operational mode, enter the **show interfaces pt-1/0/0** command.

```
Physical interface: pt-1/0/0, Enabled, Physical link is Up
  Interface index: 148, SNMP ifIndex: 536, Generation: 238
  Type: PTM, Link-level type: Ethernet, MTU: 1514, VDSL mode, Speed: 45439kbps
  Speed: VDSL2
  Device flags   : Present Running
  Link flags     : None
  CoS queues     : 8 supported, 8 maximum usable queues
  Hold-times     : Up 0 ms, Down 0 ms
  Current address: 00:1f:12:e4:df:20
  Last flapped   : 2011-05-13 07:34:33 PDT (00:46:33 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
  Input errors:
    Errors: 0, Drops: 0, Policed discards: 0, L3 incompletes: 0, L2 channel errors:
 0, L2 mismatch timeouts: 0, Resource errors: 0
  Output errors:
    Carrier transitions: 3, Errors: 0, Drops: 0, Aged packets: 0, MTU errors: 0,
 Resource errors: 0
  VDSL  alarms   : None
  VDSL  defects  : None
  VDSL media:            Seconds       Count  State
    LOF                      177           0  OK
    LOS                      177           0  OK
    LOM                        0           0  OK
    LOP                        0           0  OK
    LOCDI                      0           0  OK
    LOCDNI                   177           0  OK
  VDSL status:
    Modem status   : Showtime (Profile-17a)
    VDSL profile   :    Auto   Annex B
    Last fail code: None
    Subfunction    : 0x00
   Seconds in showtime : 2794  VDSL Chipset Information:               VTU-R
              VTU-C
    Vendor Country :                    0xb5                   0xb5
    Vendor ID      :                    BDCM                   BDCM
    Vendor Specific:                  0x9385                 0x9395
  VDSL Statistics:                     VTU-R                  VTU-C
    Attenuation (dB)       :             0.0                    0.0
    Capacity used (%)      :               0                      0
    Noise margin (dB)      :            18.5                    9.5
    Output power (dBm)     :            14.5                    3.0

                                  Interleave        Fast  Interleave        Fast
    Bit rate (kbps)    :              100015           0       45439           0
    CRC                :                   0           0           0           0
```

```
    FEC              :                     0          0           0          0
    HEC              :                     0          0           0          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        43167050    95              0        low
none
    3 network-control         5         2271950     5              0        low
none
```

The output shows a summary of the VDSL2 interface. Verify the following information:

- Status of interface pt-1/0/0 is displayed as Physical link is Up.
- Modem status is displayed as Showtime (Profile-17a).
- Time in seconds during which the interface stayed up is displayed as Seconds in showtime.
- Annex B indicates the VDSL profile of the DSLAM connected at other end.

Related Documentation

- Understanding Interfaces on page 3
- VDSL2 Interface Technology Overview on page 175
- Example: Configuring VDSL2 Interfaces (Detail) on page 222
- Example: Configuring VDSL2 Interfaces in ADSL Mode (Detail) on page 187

Example: Configuring VDSL2 Interfaces (Detail)

This example shows how to configure VDSL2 interfaces on SRX Series Services Gateways.

This example uses VDSL2 Mini-PIM installed on SRX210 and SRX320 devices. The information is also applicable to SRX110 (integrated VDSL2), SRX220, SRX240, and SRX320 devices (with VDSL2 Mini-PIMs). (Platform support depends on the Junos OS release in your installation.)

Requirements

Before you begin:

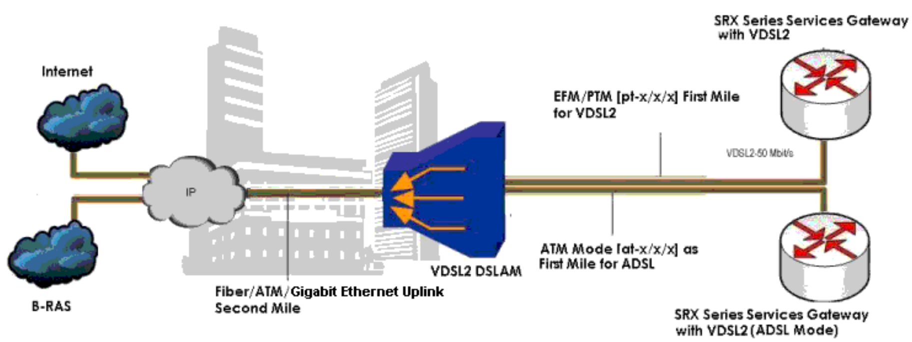
- Install Junos OS Release 10.1 or later on the SRX Series devices.
- Establish basic connectivity and set up and perform initial configuration. See the *Quick Start Guide* for your device for factory default settings.
- Install the VDSL2 Mini-PIM on the SRX210 or SRX320 device chassis.
- Connect the SRX210 or SRX320 device to a DSLAM.
- On VDSL2 Mini-PIMs, by default the **pt-1/0/0** interface is created when there is no configuration already created for either the **pt-1/0/0** or the **at-1/0/0** interface. You can switch to ADSL mode by just configuring **at-1/0/0**. If the configurations are already created for **pt-1/0/0** or **at-1/0/0**, then you need to deactivate **pt-1/0/0** before you create **at-1/0/0** or deactivate **at-1/0/0** to create **pt-1/0/0**.
- Make sure that you have deleted the previous configurations on **pt-1/0/0** and **pp0**.

Overview

This example uses SRX210 or SRX320 devices. The information is also applicable to SRX240 and SRX340 devices.

Figure 17 on page 223 shows typical SRX Series devices with VDSL2 Mini-PIM network connections.

Figure 17: SRX Series Device with VDSL2 Mini-PIMs in an End-to-End Deployment Scenario



In this example, you begin a new configuration on a VDSL2 Mini-PIM. You first deactivate previous interfaces and delete any old configuration from the device. Then you set the interfaces with the VDSL profile and the Layer 3 configuration for the end-to-end data path.

You then configure the PPPoE on the pt-1/0/0 interface with a static IP address or CHAP authentication. You configure PPPoE on the pt-1/0/0 interface with unnumbered IP address (PAP authentication or CHAP authentication).

Finally, you configure PPPoE on the pt-1/0/0 interface with negotiated IP address (PAP authentication or CHAP authentication).

Configuration

Beginning a New Configuration on a VDSL2 Mini-PIM

CLI Quick Configuration

To quickly configure this example, copy the following command, paste it into a text file, remove any line breaks, change any details necessary to match your network configuration, copy and paste the command into the CLI at the **[edit]** hierarchy level, and then enter **commit** from configuration mode.

```
[edit]
deactivate interface pt-1/0/0
deactivate interface at-1/0/0
delete interface pt-1/0/0
delete interface pp0
```

Step-by-Step Procedure

To begin a new configuration on a VDSL2 Mini-PIM:

1. Deactivate any previous interfaces.

```
[edit]
user@host# deactivate interface pt-1/0/0
user@host# deactivate interface at-1/0/0
```

2. Delete any old configurations.

```
[edit]
user@host# delete interface pt-1/0/0
user@host# delete interface pp0
```

3. If you are done configuring the device, commit the configuration.

```
[edit]
```



```
user@host# commit
```

Results

From configuration mode, confirm your configuration by entering the **show chassis fpc** command. If the output does not display the intended configuration, repeat the configuration instructions in this example to correct it.

```
user@host# run show chassis fpc
Temp CPU Utilization (%) Memory Utilization
(%)
Slot State (C) Total Interrupt DRAM (MB) Heap Buffer
0 Online -------------------- CPU less FPC --------------------
1 Online -------------------- CPU less FPC --------------------
```

If you are done configuring the device, enter **commit** from configuration mode.

Configuring the VDSL2 Mini-PIM for End-to-End Data Path

CLI Quick Configuration

To quickly configure this example, copy the following command, paste it into a text file, remove any line breaks, change any details necessary to match your network configuration, copy and paste the command into the CLI at the **[edit]** hierarchy level, and then enter **commit** from configuration mode.

```
set interfaces pt-1/0/0 vdsl-options vdsl-profile 17a
set interfaces pt-1/0/0 unit 0 family inet address 11.11.11.1/24
```

Step-by-Step Procedure

To configure the VDSL2 Mini-PIM for end-to-end data path:

1. Configure the interfaces with the VDSL profile and the Layer 3 configuration for end-to-end data path.

   ```
   [edit]
   user@host# set interfaces pt-1/0/0 vdsl-options vdsl-profile 17a
   user@host# set interfaces pt-1/0/0 unit 0 family inet address 11.11.11.1/24
   ```

2. If you are done configuring the device, commit the configuration.

   ```
   [edit]
   user@host# commit
   ```

Results

From configuration mode, confirm your configuration by entering the **show interfaces pt-1/0/0** command. If the output does not display the intended configuration, repeat the configuration instructions in this example to correct it.

```
[edit]
```



```
user@host# show interfaces pt-1/0/0
vdsl-options {
vdsl-profile 17a;
  }
unit 0 {
family inet {
  address 11.11.11.1/24;
}
}
```

If you are done configuring the device, enter **commit** from configuration mode.

Configuring PPPoE on the pt-1/0/0 Interface with a Static IP Address

CLI Quick Configuration

To quickly configure this example, copy the following command, paste it into a text file, remove any line breaks, change any details necessary to match your network configuration, copy and paste the command into the CLI at the **[edit]** hierarchy level, and then enter **commit** from configuration mode.

```
user@host# set interfaces pt-1/0/0 vdsl-options vdsl-profile 17a
user@host# set interfaces pt-1/0/0 unit 0 encapsulation ppp-over-ether
user@host# set interfaces pp0 unit 0 ppp-options pap access-profile pap_prof local-name
  locky local-password india passive
user@host# set interfaces pp0 unit 0 pppoe-options underlying-interface pt-1/0/0.0
  auto-reconnect 120 client
user@host# set interfaces pp0 unit 0 family inet address 10.1.1.6/24
user@host# set access profile pap_prof authentication-order password client cuttack
  pap-password india
```

NOTE: To configure VLAN tagging while configuring PPPoE on the pt-1/0/0 interface with

- Static IP address
- Static IP address (CHAP authentication)
- Unnumbered IP address (PAP Authentication)
- Unnumbered IP address (CHAP Authentication)
- Negotiated IP address (PAP Authentication)
- Negotiated IP address (CHAP Authentication)

the following commands must be included at **[edit]** hierarchy level:

```
set interfaces pt-1/0/0 vlan-tagging
set interfaces pt-1/0/0 unit 0 vlan-id 100
```


Step-by-Step Procedure

To configure the PPPoE on the pt-1/0/0 interface with a static IP address:

1. Configure the VDSL options and encapsulation for the interface.

```
[edit]
user@host# set interfaces pt-1/0/0 vdsl-options vdsl-profile 17a
user@host# set interfaces pt-1/0/0 unit 0 encapsulation ppp-over-ether
```

2. Configure the PPP options for the interface.

```
[edit]
user@host# set interfaces pp0 unit 0 ppp-options pap access-profile pap_prof
user@host# set interfaces pp0 unit 0 ppp-options pap local-name locky
user@host# set interfaces pp0 unit 0 ppp-options pap local-password india
user@host# set interfaces pp0 unit 0 ppp-options pap passive
```

3. Configure the PPPoE options for the interface.

```
[edit]
user@host# set interfaces pp0 unit 0 pppoe-options underlying-interface pt-1/0/0.0
user@host# set interfaces pp0 unit 0 pppoe-options auto-reconnect 120
user@host# set interfaces pp0 unit 0 pppoe-options client
```

4. Configure the IP address for the interface.

```
[edit]
user@host# set interfaces pp0 unit 0 family inet address 10.1.1.6/24
```

5. Configure the access profile for the interface.

```
[edit]
user@host# set access profile pap_prof authentication-order password
user@host# set access profile pap_prof client cuttack pap-password india
```

Results

From configuration mode, confirm your configuration by entering the **show interfaces pp0**, **show interfaces pt-1/0/0** and **show access profile pap_prof** commands. If the output does not display the intended configuration, repeat the configuration instructions in this example to correct it.

```
[edit]
   user@host# show interfaces pp0
unit 0 {
ppp-options {
   pap {
access-profile pap_prof;
local-name locky;
   local-password "$ABC123"; ## SECRET-DATA
passive;
```

```
}
  }
pppoe-options {
underlying-interface pt-1/0/0.0;
  auto-reconnect 120;
client;
}
  family inet {
address 10.1.1.6/24;
}
}
[edit]
  user@host# show interfaces pt-1/0/0
vdsl-options {
vdsl-profile 17a;
  }
unit 0 {
encapsulation ppp-over-ether;
}
[edit]
  user@host# show access profile pap_prof
authentication-order password;
client cuttack pap-password "$ABC123"; ## SECRET-DATA
```

If you are done configuring the device, enter **commit** from configuration mode.

Configuring PPPoE on the pt-1/0/0 Interface with a Static IP Address (CHAP Authentication)

CLI Quick Configuration

To quickly configure this example, copy the following command, paste it into a text file, remove any line breaks, change any details necessary to match your network configuration, copy and paste the command into the CLI at the **[edit]** hierarchy level, and then enter **commit** from configuration mode.

```
user@host# set interfaces pt-1/0/0 vdsl-options vdsl-profile 17a
user@host# set interfaces pt-1/0/0 unit 0 encapsulation ppp-over-ether
user@host# set interfaces pp0 unit 0 ppp-options chap default-chap-secret india
  local-name locky passive
user@host# set interfaces pp0 unit 0 pppoe-options underlying-interface pt-1/0/0.0
  auto-reconnect 120 client
user@host# set interfaces pp0 unit 0 family inet address 10.1.1.6/24
```

Step-by-Step Procedure

To configure the PPPoE on the pt-1/0/0 interface with a static IP address (CHAP authentication):

1. Configure the VDSL options and encapsulation for the interface.

```
[edit]
user@host# set interfaces pt-1/0/0 vdsl-options vdsl-profile 17a
user@host# set interfaces pt-1/0/0 unit 0 encapsulation ppp-over-ether
```


2. Configure the PPP options for the interface.

```
[edit]
user@host# set interfaces pp0 unit 0 ppp-options chap default-chap-secret india
user@host# set interfaces pp0 unit 0 ppp-options chap local-name locky
user@host# set interfaces pp0 unit 0 ppp-options chap passive
```

3. Configure the PPPoE options for the interface.

```
[edit]
user@host# set interfaces pp0 unit 0 pppoe-options underlying-interface pt-1/0/0.0
user@host# set interfaces pp0 unit 0 pppoe-options auto-reconnect 120
user@host# set interfaces pp0 unit 0 pppoe-options client
```

4. Configure the IP address for the interface.

```
[edit]
user@host# set interfaces pp0 unit 0 family inet address 10.1.1.6/24
```

Results From configuration mode, confirm your configuration by entering the **show interfaces pt-1/0/0** and **show interfaces pp0** commands. If the output does not display the intended configuration, repeat the configuration instructions in this example to correct it.

```
[edit]
  user@host# show interfaces pt-1/0/0
vdsl-options {
vdsl-profile 17a;
  }
unit 0 {
encapsulation ppp-over-ether;
}
[edit]
  user@host# show interfaces pp0
unit 0 {
ppp-options {
  chap {
default-chap-secret "$ABC123"; ## SECRET-DATA
local-name locky;
  passive;
}
}
  pppoe-options {
underlying-interface pt-1/0/0.0;
auto-reconnect 120;
  client;
}
family inet {
  address 10.1.1.6/24;
}
}
```

If you are done configuring the device, enter **commit** from configuration mode.

Configuring PPPoE on the pt-x/x/x Interface with Unnumbered IP (PAP Authentication)

CLI Quick Configuration

To quickly configure this example, copy the following command, paste it into a text file, remove any line breaks, change any details necessary to match your network configuration, copy and paste the command into the CLI at the **[edit]** hierarchy level, and then enter **commit** from configuration mode.

```
user@host# set interfaces pt-1/0/0 vdsl-options vdsl-profile 17a
user@host# set interfaces pt-1/0/0 unit 0 encapsulation ppp-over-ether
user@host# set interfaces lo0 unit 0 family inet address 10.1.1.24/32
user@host# set interfaces pp0 unit 0 ppp-options pap access-profile pap_prof local-name
   locky local-password india passive
user@host# set interfaces pp0 unit 0 pppoe-options underlying-interface pt-1/0/0.0
   auto-reconnect 120 client
user@host# set interfaces pp0 unit 0 family inet unnumbered-address lo0.0 destination
   10.1.1.1
user@host# set access profile pap_prof authentication-order password client cuttack
   pap-password india
```

Step-by-Step Procedure

To configure PPPoE on the pt-1/0/0 interface with unnumbered IP (PAP authentication):

1. Configure the VDSL options and encapsulation for the interface.

   ```
   [edit]
   user@host# set interfaces pt-1/0/0 vdsl-options vdsl-profile 17a
   user@host# set interfaces pt-1/0/0 unit 0 encapsulation ppp-over-ether
   ```

2. Configure the IP address for the interface.

   ```
   [edit]
   user@host# set interfaces lo0 unit 0 family inet address 10.1.1.24/32
   ```

3. Configure the PPP options for the interface.

   ```
   [edit]
   user@host# set interfaces pp0 unit 0 ppp-options pap access-profile pap_prof
   user@host# set interfaces pp0 unit 0 ppp-options pap local-name locky
   user@host# set interfaces pp0 unit 0 ppp-options pap local-password india
   user@host# set interfaces pp0 unit 0 ppp-options pap passive
   ```

4. Configure the PPPoE options for the interface.

   ```
   [edit]
   user@host# set interfaces pp0 unit 0 pppoe-options underlying-interface pt-1/0/0.0
   user@host# set interfaces pp0 unit 0 pppoe-options auto-reconnect 120
   user@host# set interfaces pp0 unit 0 pppoe-options client
   ```

5. Configure the unnumbered address and destination for the interface.

```
[edit]
user@host# set interfaces pp0 unit 0 family inet unnumbered-address lo0.0
user@host# set interfaces pp0 unit 0 family inet unnumbered-address destination
   10.1.1.1
```

6. Configure the access profile for the interface.

```
[edit]
user@host# set access profile pap_prof authentication-order password
user@host# set access profile pap_prof client cuttack pap-password india
```

Results From configuration mode, confirm your configuration by entering the **show interfaces lo0**, **show interfaces pt-1/0/0**, and **show interfaces pp0** commands. If the output does not display the intended configuration, repeat the configuration instructions in this example to correct it.

```
[edit]
   user@host# show interfaces lo0
unit 0 {
family inet {
   address 10.1.1.24/32;
   }
}
[edit]
   user@host# show interfaces pt-1/0/0
vdsl-options {
vdsl-profile 17a;
   }
unit 0 {
encapsulation ppp-over-ether;
}
[edit]
   user@host# show interfaces pp0
unit 0 {
ppp-options {
   pap {
access-profile pap_prof;
local-name locky;
   local-password "$ABC123"; ## SECRET-DATA
passive;
}
   }
pppoe-options {
underlying-interface pt-1/0/0.0;
   auto-reconnect 120;
client;
}
   family inet {
unnumbered-address lo0.0 destination 10.1.1.1;
```

```
}
}
```

If you are done configuring the device, enter **commit** from configuration mode.

Configuring PPPoE on the pt-1/0/0 Interface with Unnumbered IP (CHAP Authentication)

CLI Quick Configuration

To quickly configure this example, copy the following command, paste it into a text file, remove any line breaks, change any details necessary to match your network configuration, copy and paste the command into the CLI at the **[edit]** hierarchy level, and then enter **commit** from configuration mode.

```
user@host# set interfaces pt-1/0/0 vdsl-options vdsl-profile 17a
user@host# set interfaces pt-1/0/0 unit 0 encapsulation ppp-over-ether
user@host# set interfaces lo0 unit 0 family inet address 10.1.1.24/32
user@host# set interfaces pp0 unit 0 ppp-options chap default-chap-secret india
  local-name locky passive
user@host# set interfaces pp0 unit 0 pppoe-options underlying-interface pt-1/0/0.0
  auto-reconnect 120 client
user@host# set interfaces pp0 unit 0 family inet unnumbered-address lo0.0 destination
  10.1.1.1
```

Step-by-Step Procedure

To configure PPPoE on the pt-1/0/0 interface with unnumbered IP (CHAP authentication):

1. Configure the VDSL options and encapsulation for the interface.

   ```
   [edit]
   user@host# set interfaces pt-1/0/0 vdsl-options vdsl-profile 17a
   user@host# set interfaces pt-1/0/0 unit 0 encapsulation ppp-over-ether
   ```

2. Configure the IP address for the interface.

   ```
   [edit]
   user@host# set interfaces lo0 unit 0 family inet address 10.1.1.24/32
   ```

3. Configure the PPP options for the interface.

   ```
   [edit]
   user@host# set interfaces pp0 unit 0 ppp-options chap default-chap-secret india
   user@host# set interfaces pp0 unit 0 ppp-options chap local-name locky
   user@host# set interfaces pp0 unit 0 ppp-options chap passive
   ```

4. Configure the PPPoE options for the interface.

   ```
   [edit]
   user@host# set interfaces pp0 unit 0 pppoe-options underlying-interface pt-1/0/0.0
   user@host# set interfaces pp0 unit 0 pppoe-options auto-reconnect 120
   ```



```
user@host# set interfaces pp0 unit 0 pppoe-options client
```

5. Configure the unnumbered address and destination for the interface.

```
[edit]
user@host# set interfaces pp0 unit 0 family inet unnumbered-address lo0.0
user@host# set interfaces pp0 unit 0 family inet unnumbered-address destination
   10.1.1.1
```

Results From configuration mode, confirm your configuration by entering the **show interfaces pp0**, **show interfaces pt-1/0/0**, and **show interfaces lo0** commands. If the output does not display the intended configuration, repeat the configuration instructions in this example to correct it.

```
[edit]
   user@host# show interfaces pp0
unit 0 {
ppp-options {
   chap {
default-chap-secret "$ABC123"; ## SECRET-DATA
local-name locky;
   passive;
}
}
   pppoe-options {
underlying-interface pt-1/0/0.0;
auto-reconnect 120;
   client;
}
family inet {
   unnumbered-address lo0.0 destination 10.1.1.1;
   }
}
[edit]
   user@host# show interfaces pt-1/0/0
vdsl-options {
vdsl-profile 17a;
   }
unit 0 {
encapsulation ppp-over-ether;
}
[edit]
   user@host# show interfaces lo0
unit 0 {
family inet {
   address 10.1.1.24/32;
}
}
```

If you are done configuring the device, enter **commit** from configuration mode.

Configuring PPPoE on the pt-1/0/0 Interface with Negotiated IP (PAP Authentication)

CLI Quick Configuration

To quickly configure this example, copy the following command, paste it into a text file, remove any line breaks, change any details necessary to match your network configuration, copy and paste the command into the CLI at the **[edit]** hierarchy level, and then enter **commit** from configuration mode.

```
user@host# set interfaces pt-1/0/0 vdsl-options vdsl-profile 17a
user@host# set interfaces pt-1/0/0 unit 0 encapsulation ppp-over-ether
user@host# set interfaces pp0 unit 0 ppp-options pap access-profile my_prf local-name
  purple local-password <password> passive
user@host# set interfaces pp0 unit 0 pppoe-options underlying-interface pt-1/0/0.0
  auto-reconnect 120 client
user@host# set interfaces pp0 unit 0 family inet negotiate-address
user@host# set access profile my_prf authentication-order password
user@host# set access profile my_prf
```

Step-by-Step Procedure

To configure PPPoE on the pt-1/0/0 interface with negotiated IP (PAP authentication):

1. Configure the VDSL options and encapsulation for the interface.

```
[edit]
user@host# set interfaces pt-1/0/0 vdsl-options vdsl-profile 17a
user@host# set interfaces pt-1/0/0 unit 0 encapsulation ppp-over-ether
```

2. Configure the PPP options for the interface.

```
[edit]
user@host# set interfaces pp0 unit 0 ppp-options pap access-profile my_prf
user@host# set interfaces pp0 unit 0 ppp-options pap local-name purple
user@host# set interfaces pp0 unit 0 ppp-options pap local-password <password>
user@host# set interfaces pp0 unit 0 ppp-options pap passive
```

3. Configure the PPPoE options for the interface.

```
[edit]
user@host# set interfaces pp0 unit 0 pppoe-options underlying-interface pt-1/0/0.0
user@host# set interfaces pp0 unit 0 pppoe-options auto-reconnect 120
user@host# set interfaces pp0 unit 0 pppoe-options client
```

4. Configure the negotiated IP address for the interface.

```
[edit]
user@host# set interfaces pp0 unit 0 family inet negotiate-address
```

5. Configure the access profile for the interface.


```
[edit]
user@host# set access profile my_prf authentication-order password
user@host# set access profile my_prf
```

Results From configuration mode, confirm your configuration by entering the **show interfaces pt-1/0/0**, **show interfaces pp0**, and **show access profile my_prf** commands. If the output does not display the intended configuration, repeat the configuration instructions in this example to correct it.

```
[edit]
  user@host# show interfaces pt-1/0/0
vdsl-options {
vdsl-profile 17a;
  }
unit 0 {
encapsulation ppp-over-ether;
}
[edit]
  user@host# show interfaces pp0
unit 0 {
ppp-options {
  pap {
access-profile my_prf;
local-name purple;
  local-password "$ABC123"; ## SECRET-DATA
passive;
}
  }
pppoe-options {
underlying-interface pt-1/0/0.0;
  auto-reconnect 120;
client;
}
  family inet {
negotiate-address;
}
}
[edit]
  user@host# show access profile my_prf
authentication-order password;
```

If you are done configuring the device, enter **commit** from configuration mode.

Configuring PPPoE on the pt-1/0/0 Interface with Negotiated IP (CHAP Authentication)

CLI Quick Configuration To quickly configure this example, copy the following command, paste it into a text file, remove any line breaks, change any details necessary to match your network configuration, copy and paste the command into the CLI at the **[edit]** hierarchy level, and then enter **commit** from configuration mode.


```
user@host# set interfaces pt-1/0/0 vdsl-options vdsl-profile 17a
user@host# set interfaces pt-1/0/0 unit 0 encapsulation ppp-over-ether
user@host# set interfaces pp0 unit 0 ppp-options chap default-chap-secret <password>
   local-name purple passive
user@host# set interfaces pp0 unit 0 pppoe-options underlying-interface pt-1/0/0.0
   auto-reconnect 120 client
user@host# set interfaces pp0 unit 0 family inet negotiate-address
```

Step-by-Step Procedure

To configure PPPoE on the pt-1/0/0 interface with negotiated IP (CHAP authentication):

1. Configure the VDSL options and encapsulation for the interface.

```
[edit]
user@host# set interfaces pt-1/0/0 vdsl-options vdsl-profile 17a
user@host# set interfaces pt-1/0/0 unit 0 encapsulation ppp-over-ether
```

2. Configure the PPP options for the interface.

```
[edit]
user@host# set interfaces pp0 unit 0 ppp-options chap default-chap-secret
   <password>
user@host# set interfaces pp0 unit 0 ppp-options chap local-name purple
user@host# set interfaces pp0 unit 0 ppp-options chap passive
```

3. Configure the PPPoE options for the interface.

```
[edit]
user@host# set interfaces pp0 unit 0 pppoe-options underlying-interface pt-1/0/0.0
user@host# set interfaces pp0 unit 0 pppoe-options auto-reconnect 120
user@host# set interfaces pp0 unit 0 pppoe-options client
```

4. Configure the negotiated IP address for the interface.

```
[edit]
user@host# set interfaces pp0 unit 0 family inet negotiate-address
```

Results

From configuration mode, confirm your configuration by entering the **show interfaces pp0** and **show interfaces pt-1/0/0**commands. If the output does not display the intended configuration, repeat the configuration instructions in this example to correct it.

```
[edit]
   user@host# show interfaces pp0
unit 0 {
ppp-options {
   chap {
default-chap-secret "$ABC123"; ## SECRET-DATA
local-name purple;
```



```
  passive;
}
}
  pppoe-options {
underlying-interface pt-1/0/0.0;
auto-reconnect 120;
  client;
}
family inet {
  negotiate-address;
  }
}
[edit]
  user@host# show interfaces pt-1/0/0
vdsl-options {
vdsl-profile 17a;
  }
unit 0 {
encapsulation ppp-over-ether;
}
```

If you are done configuring the device, enter **commit** from configuration mode.

Verification

Confirm that the configuration is working properly.

Verifying the Configuration

Purpose Verify the FPC status and the command output.

Action

1. Verify the FPC status by entering the **show chassis fpc** command. The output should display FPC status as online.


```
user@host# run show chassis fpc
Temp CPU Utilization (%) Memory Utilization
(%)
Slot State (C) Total Interrupt DRAM (MB) Heap Buffer
0 Online -------------------- CPU less FPC --------------------
1 Online -------------------- CPU less FPC --------------------
```

NOTE: The VDSL2 Mini-PIM is installed in the first slot of the SRX320 device chassis; therefore, the FPC used here is fpc 1. For SRX340 devices, the FPC used will be fpc 1, fpc 2, fpc 3, or fpc 4.

2. Enter **run show interface pt-1/0/0** and verify the following information in the command output:

   - Status of interface pt-1/0/0 is displayed as physical link is up.
   - Modem status is displayed as Showtime (Profile-17a).
   - Time in seconds during which the interface stayed up is displayed as Seconds in Showtime.
   - VDSL profile of DSLAM is displayed as Auto Annex A.

```
Physical interface: pt-1/0/0, Enabled, Physical link is Up
 Interface index: 146, SNMP ifIndex: 524, Generation: 149
 Type: PTM, Link-level type: Ethernet, MTU: 1496, VDSL mode, Speed:    45440kbps

 Speed: VDSL2
 Device flags : Present Running
 Link flags : None
 CoS queues : 8 supported, 8 maximum usable queues
 Hold-times : Up 0 ms, Down 0 ms
 Current address: 00:b1:7e:85:84:ff
 Last flapped : 2009-10-18 11:56:50 PDT (12:32:49 ago)
 Statistics last cleared: 2009-10-19 00:29:37 PDT (00:00:02 ago)
 Traffic statistics:
  Input bytes : 22438962 97070256 bps
  Output bytes : 10866024 43334088 bps
  Input packets: 15141 8187 pps
  Output packets: 7332 3655 pps
Input errors:
   Errors: 0, Drops: 0, Policed discards: 0, L3 incompletes: 0,
   L2 channel errors: 0, L2 mismatch timeouts: 0, Resource errors: 0
 Output errors:
  Carrier transitions: 0, Errors: 0, Drops: 0, Aged packets: 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 6759 6760 0
    1 expedited-fo 0 0 0
    2 assured-forw 0 0 0
```



```
    3 network-cont 0 0 0
VDSL alarms : None
VDSL defects : None
VDSL media: Seconds Count State
   LOF 0 0 OK
   LOS 0 0 OK
   LOM 0 0 OK
   LOP 0 0 OK
   LOCDI 0 0 OK
   LOCDNI 0 0 OK
VDSL status:
  Modem status : Showtime (Profile-17a)
  VDSL profile : Profile-17a Annex A
  Last fail code: None
  Subfunction : 0x00
  Seconds in showtime : 45171
VDSL Chipset Information: VTU-R VTU-C
 Vendor Country : 0xb5 0xb5
  Vendor ID : BDCM BDCM
  Vendor Specific: 0x9385 0x9385
VDSL Statistics: VTU-R VTU-C
  Attenuation (dB) : 0.0 0.0
  Capacity used (%) : 0 0
  Noise margin (dB) : 20.0 20.0
  Output power (dBm) : 6.0 12.0
                      Interleave Fast Interleave Fast
  Bit rate (kbps) :     100004     0    45440       0
  CRC :                 0          0    0           0
 FEC :                  0          0    0            0
 HEC :                  0          0    0            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       43168000   95       0      low
none
   3 network-control    5        2272000    5        0       low
none
Logical interface pt-1/0/0.0 (Index 71) (SNMP ifIndex 525) (Generation 136)
    Flags: SNMP-Traps Encapsulation: ENET2
    Traffic statistics:
      Input bytes :  23789064
      Output bytes :  10866024
      Input packets:   16052
      Output packets:   7332
    Local statistics:
      Input bytes : 0
      Output bytes : 0
      Input packets: 0
      Output packets: 0
    Transit statistics:
      Input bytes :  23789064  97070256 bps
      Output bytes :  10866024  43334088 bps
      Input packets:  16052  8187 pps
       Output packets:  7332   3655 pps
     Security: Zone: Null
     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: 1482, Generation: 169, Route table: 0
      Flags: None
      Addresses, Flags: Is-Preferred Is-Primary

   Destination: 10.10.10/24, Local: 10.10.10.1, Broadcast:  10.10.10.255,
Generation: 158
```

Verifying the VDSL2 Mini-PIM for End-to-End Data Path

Purpose Verify the interface status and check traffic statistics.

Action

1. Verify interface status by using the **show interface terse** command and test end-to-end data path connectivity by sending the ping packets to the remote end IP address.

```
user@host# run show interfaces pt-1/0/0 terse
Interface                Admin Link Proto    Local                 Remote
pt-1/0/0                 up    up
pt-1/0/0.0               up    up   inet     11.11.11.1/24

[edit]
user@host# run ping 11.11.11.2 count 1000 rapid
PING 11.11.11.2 (11.11.11.2): 56 data bytes
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
```



```
- 11.11.11.2 ping statistics ---
1000 packets transmitted, 1000 packets received, 0% packet loss
round-trip min/avg/max/stddev = 16.109/17.711/28.591/2.026 ms
```

2. Verify the VDSL2 interface configuration and check the traffic statistics.

```
user@host# run show interfaces pt-1/0/0 extensive
Physical interface: pt-1/0/0, Enabled, Physical link is Up
  Interface index: 146, SNMP ifIndex: 524, Generation: 197
  Type: PTM, Link-level type: Ethernet, MTU: 1496, VDSL mode, Speed: 45440kbps

  Speed: VDSL2
  Device flags   : Present Running
  Link flags     : None
  CoS queues     : 8 supported, 8 maximum usable queues
  Hold-times     : Up 0 ms, Down 0 ms
  Current address: 00:b1:7e:85:84:ff
  Last flapped   : 2009-10-28 00:36:29 PDT (00:12:03 ago)
  Statistics last cleared: 2009-10-28 00:47:56 PDT (00:00:36 ago)
  Traffic statistics:
   Input  bytes  :                84000                    0 bps
   Output bytes  :               138000                    0 bps
   Input  packets:                 1000                    0 pps
   Output packets:                 1000                    0 pps
  Input errors:
    Errors: 0, Drops: 0, Policed discards: 0, L3 incompletes: 0, L2 channel
errors: 0, L2 mismatch timeouts: 0, Resource errors: 0
  Output errors:
    Carrier transitions: 0, Errors: 0, Drops: 0, Aged packets: 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                1000                 1000
  0
    1 expedited-fo                  0                    0
  0
    2 assured-forw                  0                    0
  0
    3 network-cont                  0                    0
  0
  VDSL  alarms   : None
  VDSL  defects  : None
  VDSL media:            Seconds        Count  State
    LOF                        0            0  OK
    LOS                        0            0  OK
    LOM                        0            0  OK
    LOP                        0            0  OK
    LOCDI                      0            0  OK
    LOCDNI                     0            0  OK
  VDSL status:
    Modem status  : Showtime (Profile-17a)
    VDSL profile  : Profile-17a Annex A
    Last fail code: None
    Subfunction   : 0x00
    Seconds in showtime : 723
  VDSL Chipset Information:              VTU-R                  VTU-C
    Vendor Country :                      0xb5                   0xb5
    Vendor ID      :                      BDCM                   BDCM
```

```
    Vendor Specific:                     0x9385                0x9385
  VDSL Statistics:                        VTU-R                 VTU-C
    Attenuation (dB)        :               0.0                   0.0
    Capacity used (%)       :                 0                     0
    Noise margin (dB)       :              16.0                  20.0
    Output power (dBm)      :               5.0                  13.0

                              Interleave       Fast  Interleave       Fast

    Bit rate (kbps)   :              100004         0       45440
0
    CRC               :                   0         0           0
0
    FEC               :                   0         0           0
0
    HEC               :                   0         0           0
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       43168000    95               0      low
   none
    3 network-control        5        2272000     5               0      low
   none

  Logical interface pt-1/0/0.0 (Index 72) (SNMP ifIndex 521) (Generation 158)

    Flags: SNMP-Traps Encapsulation: ENET2
    Traffic statistics:
     Input  bytes  :              84000
     Output bytes  :              98000
     Input  packets:               1000
     Output packets:               1000
    Local statistics:
     Input  bytes  :              84000
     Output bytes  :              98000
     Input  packets:               1000
     Output packets:               1000
    Transit statistics:
     Input  bytes  :                  0                    0 bps
     Output bytes  :                  0                    0 bps
     Input  packets:                  0                    0 pps
     Output packets:                  0                    0 pps
    Security: Zone: Null
    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: 1482, Generation: 169, Route table: 0
      Flags: None
      Addresses, Flags: Is-Preferred Is-Primary
        Destination: 11.11.11/24, Local: 11.11.11.1, Broadcast: 11.11.11.255,
 Generation: 189
```

Verifying PPPoE on the pt-1/0/0 Interface with a Static IP Address

Purpose Verify the interface output and the end-to-end data path.

Action

1. Verify the interface output.

```
user@host# run show interfaces pp0
Physical interface: pp0, Enabled, Physical link is Up
  Interface index: 128, SNMP ifIndex: 510
  Type: PPPoE, Link-level type: PPPoE, MTU: 1532
  Device flags   : Present Running
  Interface flags: Point-To-Point SNMP-Traps
  Link type      : Full-Duplex
  Link flags     : None
    Input packets : 0
    Output packets: 0

  Logical interface pp0.0 (Index 71) (SNMP ifIndex 522)
    Flags: Hardware-Down Point-To-Point SNMP-Traps 0x0 Encapsulation: PPPoE
    PPPoE:
      State: SessionDown, Session ID: None,
      Configured AC name: None, Service name: None,
      Auto-reconnect timeout: 120 seconds, Idle timeout: Never,
      Underlying interface: pt-1/0/0.0 (Index 69)
    Input packets : 57
    Output packets: 56
  Keepalive settings: Interval 10 seconds, Up-count 1, Down-count 3
  Keepalive: Input: 22 (00:00:40 ago), Output: 25 (00:00:04 ago)
  LCP state: Down
```

```
  NCP state: inet: Down, inet6: Not-configured, iso: Not-configured, mpls:
Not-configured
  CHAP state: Closed
  PAP state: Closed
    Security: Zone: Null
    Protocol inet, MTU: 1492
      Flags: Protocol-Down
      Addresses, Flags: Dest-route-down Is-Preferred Is-Primary
        Destination: 10.1.1/24, Local: 10.1.1.6
```

2. Verify the end-to-end data path on the interface.

```
user@host# run show interfaces pt-1/0/0 terse
Interface               Admin Link Proto    Local                 Remote
pt-1/0/0                up    up
pt-1/0/0.0              up    up

[edit]
user@host# run show interfaces pp0 terse
Interface               Admin Link Proto    Local                 Remote
pp0                     up    up
pp0.0                   up    up   inet     10.1.1.6/24

[edit]
user@host# run ping 10.1.1.1 count 100 rapid
PING 10.1.1.1 (10.1.1.1): 56 data bytes
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
- 10.1.1.1 ping statistics ---
100 packets transmitted, 100 packets received, 0% packet loss
round-trip min/avg/max/stddev = 14.669/15.649/21.655/1.740 ms
```

Verifying PPPoE on the pt-1/0/0 Interface with a Static IP Address (CHAP Authentication)

Purpose Verify the interface status and check the end-to-end data path connectivity.

Action 1. Verify the interface status.

```
user@host# run show interfaces pp0
Physical interface: pp0, Enabled, Physical link is Up
  Interface index: 128, SNMP ifIndex: 510
  Type: PPPoE, Link-level type: PPPoE, MTU: 1532
  Device flags   : Present Running
  Interface flags: Point-To-Point SNMP-Traps
  Link type      : Full-Duplex
  Link flags     : None
    Input packets : 0
    Output packets: 0

  Logical interface pp0.0 (Index 70) (SNMP ifIndex 522)
    Flags: Point-To-Point SNMP-Traps 0x0 Encapsulation: PPPoE
    PPPoE:
      State: SessionUp, Session ID: 31,
```



```
      Session AC name: cuttack, Remote MAC address: 00:03:6c:c8:8c:55,
      Configured AC name: None, Service name: None,
      Auto-reconnect timeout: 120 seconds, Idle timeout: Never,
      Underlying interface: pt-1/0/0.0 (Index 69)
    Input packets : 12
    Output packets: 10
  Keepalive settings: Interval 10 seconds, Up-count 1, Down-count 3
  Keepalive: Input: 1 (00:00:08 ago), Output: 0 (never)
  LCP state: Opened
  NCP state: inet: Opened, inet6: Not-configured, iso: Not-configured, mpls:
Not-configured
  CHAP state: Success
  PAP state: Closed
    Security: Zone: Null
    Protocol inet, MTU: 1492
      Flags: None
      Addresses, Flags: Is-Preferred Is-Primary
        Destination: 10.1.1/24, Local: 10.1.1.6
```

2. Verify the interface and check the end-to-end data path connectivity.

```
user@host# run show interfaces pt-1/0/0 terse
Interface               Admin Link Proto    Local                 Remote
pt-1/0/0                up    up
pt-1/0/0.0              up    up

[edit]
user@host# run show interfaces pp0 terse
Interface               Admin Link Proto    Local                 Remote
pp0                     up    up
pp0.0                   up    up   inet     10.1.1.6/24

[edit]
user@host# run ping 10.1.1.1 count 100 rapid
PING 10.1.1.1 (10.1.1.1): 56 data bytes

!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
--- 10.1.1.1 ping statistics ---
100 packets transmitted, 100 packets received, 0% packet loss
round-trip min/avg/max/stddev = 14.608/15.466/25.939/1.779 ms
```

Verifying PPPoE on the pt-1/0/0 Interface with Unnumbered IP (PAP Authentication)

Purpose Verify the interface status and the end-to-end data path testing.

Action 1. Verify the interface status.

```
user@host# run show interfaces pp0
Physical interface: pp0, Enabled, Physical link is Up
  Interface index: 128, SNMP ifIndex: 510
  Type: PPPoE, Link-level type: PPPoE, MTU: 1532
  Device flags   : Present Running
  Interface flags: Point-To-Point SNMP-Traps
```



```
  Link type      : Full-Duplex
  Link flags     : None
    Input packets : 0
    Output packets: 0

  Logical interface pp0.0 (Index 72) (SNMP ifIndex 522)
    Flags: Point-To-Point SNMP-Traps 0x0 Encapsulation: PPPoE
    PPPoE:
      State: SessionUp, Session ID: 33,
      Session AC name: cuttack, Remote MAC address: 00:03:6c:c8:8c:55,
      Configured AC name: None, Service name: None,
      Auto-reconnect timeout: 120 seconds, Idle timeout: Never,
      Underlying interface: pt-1/0/0.0 (Index 69)
    Input packets : 22
    Output packets: 20
  Keepalive settings: Interval 10 seconds, Up-count 1, Down-count 3
  Keepalive: Input: 1 (00:00:08 ago), Output: 0 (never)
  LCP state: Opened
  NCP state: inet: Opened, inet6: Not-configured, iso: Not-configured, mpls:
Not-configured
  CHAP state: Closed
  PAP state: Success
    Security: Zone: Null
    Protocol inet, MTU: 1492
      Flags: None
      Addresses, Flags: Is-Preferred Is-Primary
        Destination: 10.1.1.1, Local: 10.1.1.24
```

2. Verify the end-to-end data path testing.

```
user@host# run show interfaces pt-1/0/0 terse
Interface               Admin Link Proto    Local                 Remote
pt-1/0/0                up    up
pt-1/0/0.0              up    up

[edit]
user@host# run show interfaces pp0 terse
Interface               Admin Link Proto    Local                 Remote
pp0                     up    up
pp0.0                   up    up   inet     10.1.1.24           --> 10.1.1.1

[edit]
user@host# run ping 10.1.1.1 count 100 rapid
PING 10.1.1.1 (10.1.1.1): 56 data bytes
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
--- 10.1.1.1 ping statistics ---
100 packets transmitted, 100 packets received, 0% packet loss
round-trip min/avg/max/stddev = 14.584/15.503/21.204/1.528 ms
```

Verifying PPPoE on the pt-1/0/0 Interface with Unnumbered IP (CHAP Authentication)

Purpose Verify the interface status and end-to-end data path testing on the PPPoE interface.

Action 1. Verify the interface status.


```
user@host# run show interfaces pp0
Physical interface: pp0, Enabled, Physical link is Up
  Interface index: 128, SNMP ifIndex: 510
  Type: PPPoE, Link-level type: PPPoE, MTU: 1532
  Device flags   : Present Running
  Interface flags: Point-To-Point SNMP-Traps
  Link type      : Full-Duplex
  Link flags     : None
    Input packets : 0
    Output packets: 0

  Logical interface pp0.0 (Index 70) (SNMP ifIndex 522)
    Flags: Point-To-Point SNMP-Traps 0x0 Encapsulation: PPPoE
    PPPoE:
      State: SessionUp, Session ID: 35,
      Session AC name: cuttack, Remote MAC address: 00:03:6c:c8:8c:55,
      Configured AC name: None, Service name: None,
      Auto-reconnect timeout: 120 seconds, Idle timeout: Never,
      Underlying interface: pt-1/0/0.0 (Index 69)
    Input packets : 25
    Output packets: 22
  Keepalive settings: Interval 10 seconds, Up-count 1, Down-count 3
  Keepalive: Input: 2 (00:00:10 ago), Output: 2 (00:00:02 ago)
  LCP state: Opened
  NCP state: inet: Opened, inet6: Not-configured, iso: Not-configured, mpls:
Not-configured
  CHAP state: Success
  PAP state: Closed
    Security: Zone: Null
    Protocol inet, MTU: 1492
      Flags: None
      Addresses, Flags: Is-Preferred Is-Primary
        Destination: 10.1.1.1, Local: 10.1.1.24
```

2. Verify the end-to-end data path testing on the PPPoE interface.

```
user@host# run show interfaces pt-1/0/0 terse
Interface              Admin Link Proto    Local                 Remote
pt-1/0/0               up    up
pt-1/0/0.0             up    up

[edit]
user@host# run show interfaces pp0 terse
Interface              Admin Link Proto    Local                 Remote
pp0                    up    up
pp0.0                  up    up   inet     10.1.1.24           --> 10.1.1.1

[edit]
user@host# run ping 10.1.1.1 count 100 rapid
PING 10.1.1.1 (10.1.1.1): 56 data bytes
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
-- 10.1.1.1 ping statistics ---
100 packets transmitted, 100 packets received, 0% packet loss
round-trip min/avg/max/stddev = 14.585/16.025/22.354/2.019 ms
```

Verifying PPPoE on the pt-1/0/0 Interface with Negotiated IP (PAP Authentication)

Purpose Verify the PPPoE interface status and the end-to-end data path connectivity.

Action

1. Verify the PPPoE interface status.

```
user@host# run show interfaces pp0
Physical interface: pp0, Enabled, Physical link is Up
  Interface index: 128, SNMP ifIndex: 510
  Type: PPPoE, Link-level type: PPPoE, MTU: 1532
  Device flags   : Present Running
  Interface flags: Point-To-Point SNMP-Traps
  Link type      : Full-Duplex
  Link flags     : None
    Input packets : 0
    Output packets: 0

  Logical interface pp0.0 (Index 72) (SNMP ifIndex 522)
    Flags: Point-To-Point SNMP-Traps 0x0 Encapsulation: PPPoE
    PPPoE:
      State: SessionUp, Session ID: 4,
      Session AC name: belur, Remote MAC address: 00:90:1a:43:18:d1,
      Configured AC name: None, Service name: None,
      Auto-reconnect timeout: 120 seconds, Idle timeout: Never,
      Underlying interface: pt-1/0/0.0 (Index 69)
    Input packets : 18
    Output packets: 18
  Keepalive settings: Interval 10 seconds, Up-count 1, Down-count 3
  Keepalive: Input: 0 (never), Output: 11 (00:00:01 ago)
  LCP state: Opened
  NCP state: inet: Opened, inet6: Not-configured, iso: Not-configured, mpls:
Not-configured
  CHAP state: Closed
  PAP state: Success
    Security: Zone: Null
    Protocol inet, MTU: 1474
      Flags: Negotiate-Address
      Addresses, Flags: Kernel Is-Preferred Is-Primary
        Destination: 12.12.12.1, Local: 12.12.12.11
```

2. Verify the end-to-end data path connectivity.

```
user@host# run show interfaces pt-1/0/0 terse
Interface               Admin Link Proto    Local                 Remote
pt-1/0/0                up    up
pt-1/0/0.0              up    up

[edit]
user@host# run show interfaces pp0 terse
Interface               Admin Link Proto    Local                 Remote
pp0                     up    up
pp0.0                  up    up   inet     12.12.12.11        --> 12.12.12.1

[edit]
user@host# run ping 12.12.12.1 count 100 rapid
```



```
PING 12.12.12.1 (12.12.12.1): 56 data bytes
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
--- 12.12.12.1 ping statistics ---
100 packets transmitted, 100 packets received, 0% packet loss
round-trip min/avg/max/stddev = 16.223/17.692/24.359/2.292 ms
```

Verifying PPPoE on the pt-1/0/0 Interface with Negotiated IP (CHAP Authentication)

Purpose Verify the interface status and the end-to-end data path connectivity.

Action

1. Verifying the interface status.

```
user@host# run show interfaces pp0
Physical interface: pp0, Enabled, Physical link is Up
  Interface index: 128, SNMP ifIndex: 510
  Type: PPPoE, Link-level type: PPPoE, MTU: 1532
  Device flags   : Present Running
  Interface flags: Point-To-Point SNMP-Traps
  Link type      : Full-Duplex
  Link flags     : None
    Input packets : 0
    Output packets: 0

  Logical interface pp0.0 (Index 70) (SNMP ifIndex 522)
    Flags: Point-To-Point SNMP-Traps 0x0 Encapsulation: PPPoE
    PPPoE:
      State: SessionUp, Session ID: 8,
      Session AC name: belur, Remote MAC address: 00:90:1a:43:18:d1,
      Configured AC name: None, Service name: None,
      Auto-reconnect timeout: 120 seconds, Idle timeout: Never,
      Underlying interface: pt-1/0/0.0 (Index 69)
    Input packets : 12
    Output packets: 11
  Keepalive settings: Interval 10 seconds, Up-count 1, Down-count 3
  Keepalive: Input: 0 (never), Output: 4 (00:00:03 ago)
  LCP state: Opened
  NCP state: inet: Opened, inet6: Not-configured, iso: Not-configured, mpls:
Not-configured
  CHAP state: Success
  PAP state: Closed
    Security: Zone: Null
    Protocol inet, MTU: 1474
      Flags: Negotiate-Address
      Addresses, Flags: Kernel Is-Preferred Is-Primary
        Destination: 12.12.12.1, Local: 12.12.12.12
```

2. Verify the end-to-end data path connectivity.

```
user@host# run show interfaces pt-1/0/0 terse
Interface               Admin Link Proto    Local                 Remote
pt-1/0/0                up    up
pt-1/0/0.0              up    up
```

```
[edit]
user@host# run show interfaces pp0 terse
Interface               Admin Link Proto    Local                 Remote
pp0                     up    up
pp0.0                   up    up   inet     12.12.12.12         --> 12.12.12.1

[edit]
user@host# run ping 12.12.12.1 count 100 rapid
PING 12.12.12.1 (12.12.12.1): 56 data bytes
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
--- 12.12.12.1 ping statistics ---
100 packets transmitted, 100 packets received, 0% packet loss
round-trip min/avg/max/stddev = 16.168/17.452/23.299/2.016 ms
```

Related Documentation

- VDSL2 Interface Technology Overview on page 175
- Example: Configuring VDSL2 Interfaces (Basic) on page 216
- Example: Configuring VDSL2 Interfaces in ADSL Mode (Detail) on page 187

Upgrading the VDSL PIC Firmware

Starting in Junos OS Release 15.51x49-D50, you can upgrade the VDSL PIC firmware on SRX320, SRX340, and SRX345 devices. This topic shows how to perform the upgrade.

Before you begin:

Check the current firmware version of the VDSL PIC.

`user@host>` **show system firmware**

```
    Part Type Tag Current Available Status version
    FPC 1
    PIC 0 VDSLBCM 10 2.10.0 OK
    Routing Engine 0 RE BIOS 0 2.0 OK
    Routing Engine 0 RE BIOS Backup 1 2.0 OK
    Routing Engine 0 RE FPGA 14 1.0.0 OK
```

This section describes the step-by-step procedure to upgrade VDSL PIC firmware.

1. Mount or copy the firmware package to the SRX Series device.

   If the file has been obtained from JTAC, use FTP or SCP to load the firmware file on the device. Save the file in the **/var/tmp** directory.

2. Upgrade the firmware on the SRX Series device.

   To install the firmware package on the device and make it available for upgrading, use the following command:

   user@host> request system software add no-copy no-validate jfirmware-srxsme-11.4R2.7-signed.tgz

3. To check if the firmware package is available on the SRX Series device, use the following command:

   user@host> show version

   Hostname: user

   Model: srx210h

   JUNOS Software Release [12.1I20120123_0941]

   JUNOS Firmware Software Suite [11.4R2.7]

4. To verify the VDSL PIM slot, use the following command:

   user@host> show chassis hardware

5. To initiate a firmware upgrade, use the following command:

   user@host> request system firmware upgrade pic fpc-slot <no.> pic-slot 0 tag 10

6. To check the status of the upgraded firmware, use the following command:

   `user@host>` **show system firmware**

```
Part Type Tag Current Available Status version
FPC 1
PIC 0 VDSLBCM 10 2.10.0 2.11.0
Routing Engine 0 RE BIOS 0 2.0 OK
Routing Engine 0 RE BIOS Backup 1 2.0 OK
Routing Engine 0 RE FPGA 14 203.0.113.45.0.0 OK
```

7. To enable the upgraded firmware, restart the FPC slot in which the VDSL PIM is installed.

   user@host> restart fpc <no.>

   FPC 1 restarted

8. To verify the firmware upgrade is complete, use the following command:

   `user@host>` **show system firmware**

```
Part Type Tag Current Available Status version
FPC 1
PIC 0 VDSLBCM 10 2.11.0 2.11.0 OK
Routing Engine 0 RE BIOS 0 2.0 OK
Routing Engine 0 RE BIOS Backup 1 2.0 OK
Routing Engine 0 RE FPGA 14 203.0.113.45.0.0 OK
```

Release History Table

Release	Description
15.1X49-D50	Starting in Junos OS Release 15.51x49-D50, you can upgrade the VDSL PIC firmware on SRX320, SRX340, and SRX345 devices.

PART 4

Configuring Ethernet Interfaces

CHAPTER 13

Performing Initial Configuration on Ethernet Interfaces

Understanding Ethernet Interfaces

Ethernet is a Layer 2 technology that operates in a shared bus topology. Ethernet supports broadcast transmission, uses best-effort delivery, and has distributed access control. Ethernet is a point-to-multipoint technology.

In a shared bus topology, all devices connect to a single, shared physical link through which all data transmissions are sent. All traffic is broadcast so that all devices within the topology receive every transmission. The devices within a single Ethernet topology make up a broadcast domain.

Ethernet uses best-effort delivery to broadcast traffic. The physical hardware provides no information to the sender about whether the traffic was received. If the receiving host is offline, traffic to the host is lost. Although the Ethernet data link protocol does not inform the sender about lost packets, higher layer protocols such as TCP/IP might provide this type of notification.

This topic contains the following sections:

- Collision Domains and LAN Segments on page 257
- Broadcast Domains on page 258
- Ethernet Frames on page 258

Ethernet Access Control and Transmission

Ethernet's access control is distributed because Ethernet has no central mechanism that grants access to the physical medium within the network. Instead, Ethernet uses carrier-sense multiple access with collision detection (CSMA/CD). Because multiple devices on an Ethernet network can access the physical medium, or wire, simultaneously, each device must determine whether the physical medium is in use. Each host listens on the wire to determine if a message is being transmitted. If it detects no transmission, the host begins transmitting its own data.

The length of each transmission is determined by fixed Ethernet packet sizes. By fixing the length of each transmission and enforcing a minimum idle time between transmissions, Ethernet ensures that no pair of communicating devices on the network can monopolize the wire and block others from sending and receiving traffic.

Collisions and Detection

When a device on an Ethernet network begins transmitting data, the data takes a finite amount of time to reach all hosts on the network. Because of this delay, or latency, in transmitting traffic, a device might detect an idle state on the wire just as another device initially begins its transmission. As a result, two devices might send traffic across a single wire at the same time. When the two electrical signals collide, they become scrambled so that both transmissions are effectively lost.

Collision Detection

To handle collisions, Ethernet devices monitor the link while they are transmitting data. The monitoring process is known as collision detection. If a device detects a foreign signal while it is transmitting, it terminates the transmission and attempts to transmit again only after detecting an idle state on the wire. Collisions continue to occur if two colliding devices both wait the same amount of time before retransmitting. To avoid this condition, Ethernet devices use a binary exponential backoff algorithm.

Backoff Algorithm

With the binary exponential backoff algorithm, each device that sends a colliding transmission randomly selects a value within a range. The value represents the number of transmission times that the device must wait before retransmitting its data. If another collision occurs, the range of values is doubled and retransmission takes place again. Each time a collision occurs, the range of values doubles, to reduce the likelihood that two hosts on the same network can select the same retransmission time. Table 32 on page 256 shows collision rounds up to round 10.

Table 32: Collision Backoff Algorithm Rounds

Round	Size of Set	Elements in the Set
1	2	{0,1}

Table 32: Collision Backoff Algorithm Rounds (continued)

Round	Size of Set	Elements in the Set
2	4	{0,1,2,3}
3	8	{0,1,2,3,...,7}
4	16	{0,1,2,3,4,...,15}
5	32	{0,1,2,3,4,5,...,31}
6	64	{0,1,2,3,4,5,6,...,63}
7	128	{0,1,2,3,4,5,6,7,...,127}
8	256	{0,1,2,3,4,5,6,7,8,...,255}
9	512	{0,1,2,3,4,5,6,7,8,9,...,511}
10	1024	{0,1,2,3,4,5,6,7,8,9,10,...,1023}

Collision Domains and LAN Segments

Collisions are confined to a physical wire over which data is broadcast. Because the physical wires are subject to signal collisions, individual LAN segments are known as *collision domains*. Although the physical limitations on the length of an Ethernet cable restrict the length of a LAN segment, multiple collision domains can be interconnected by repeaters, bridges, and switches.

Repeaters

Repeaters are electronic devices that act on analog signals. Repeaters relay all electronic signals from one wire to another. A single repeater can double the distance between two devices on an Ethernet network. However, the Ethernet specification restricts the number of repeaters between any two devices on an Ethernet network to two, because collision detection with latencies increases in complexity as the wire length and number of repeaters increase.

Bridges and Switches

Bridges and switches combine LAN segments into a single Ethernet network by using multiple ports to connect the physical wires in each segment. Although bridges and switches are fundamentally the same, bridges generally provide more management and more interface ports. As Ethernet packets flow through a bridge, the bridge tracks the source MAC address of the packets and stores the addresses and their associated input ports in an interface table. As it receives subsequent packets, the bridge examines its interface table and takes one of the following actions:

- If the destination address does not match an address in the interface table, the bridge transmits the packet to all hosts on the network using the Ethernet broadcast address.

- If the destination address maps to the port through which the packet was received, the bridge or switch discards the packet. Because the other devices on the LAN segment also received the packet, the bridge does not need to retransmit it.
- If the destination address maps to a port other than the one through which the packet was received, the bridge transmits the packet through the appropriate port to the corresponding LAN segment.

Broadcast Domains

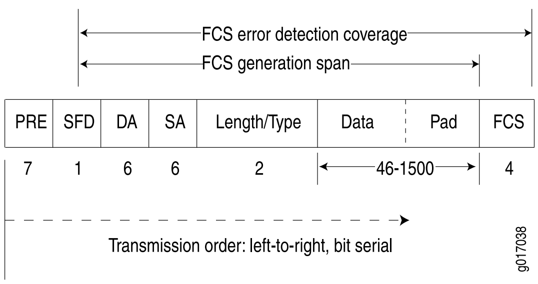
The combination of all the LAN segments within an Ethernet network is called a *broadcast domain*. In the absence of any signaling devices such as a repeater, bridge, or switch, the broadcast domain is simply the physical wire that makes up the connections in the network. If a bridge or switch is used, the broadcast domain consists of the entire LAN.

NOTE: **On SRX300, SRX320, SRX340, SRX345, and SRX550HM devices, the subnet directed broadcast feature is not supported.**

Ethernet Frames

Data is transmitted through an Ethernet network in frames. The frames are of variable length, ranging from 64 octets to 1518 octets, including the header, payload, and cyclic redundancy check (CRC) value. Figure 18 on page 258 shows the Ethernet frame format.

Figure 18: Ethernet Frame Format



Ethernet frames have the following fields:

- The preamble (PRE) field is 7 octets of alternating 0s and 1s. The predictable format in the preamble allows receiving interfaces to synchronize themselves to the data being sent. The preamble is followed by a 1-octet start-of-frame delimiter (SFD).
- The destination address (DA) and source address (SA) fields contain the 6-octet (48-bit) MAC addresses for the destination and source ports on the network. These Layer 2 addresses uniquely identify the devices on the LAN.
- The Length/Type field is a 2-octet field that either indicates the length of the frame's data field or identifies the protocol stack associated with the frame. Here are some common frame types:
  - AppleTalk—**0x809B**
  - AppleTalk ARP—**0x80F3**

  - DECnet—**0x6003**
  - IP—**0x0800**
  - IPX—**0x8137**
  - Loopback—**0x9000**
  - XNS—**0x0600**

- The Data field contains the packet payload.
- The frame check sequence (FCS) is a 4-octet field that contains the calculated CRC value. This value is calculated by the originating host and appended to the frame. When it receives the frames, the receiving host calculates the CRC and checks it against this appended value to verify the integrity of the received frame.

NOTE: On SRX650 devices, MAC pause frame and FCS error frame counters are not supported for the interfaces ge-0/0/0 through ge-0/0/3. (Platform support depends on the Junos OS Release in your installation.)

Related Documentation

- Understanding Interfaces on page 3
- Example: Creating an Ethernet Interface on page 261
- Example: Deleting an Ethernet Interface on page 262
- Understanding Static ARP Entries on Ethernet Interfaces on page 259
- Understanding Promiscuous Mode on Ethernet Interface on page 259

Understanding Static ARP Entries on Ethernet Interfaces

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.

Related Documentation

- Understanding Ethernet Interfaces on page 255
- Example: Configuring Static ARP Entries on Ethernet Interfaces on page 263

Understanding Promiscuous Mode on Ethernet Interface

When promiscuous mode is enabled on a Layer 3 Ethernet interface, all packets received on the interface are sent to the central point or Services Processing Unit (SPU) regardless of the destination MAC address of the packet. You can also enable promiscuous mode on chassis cluster redundant Ethernet interfaces and aggregated Ethernet interfaces. If you enable promiscuous mode on a redundant Ethernet interface, promiscuous mode is then enabled on any child physical interfaces. If you enable promiscuous mode on an aggregated Ethernet interface, promiscuous mode is then enabled on all member interfaces.

Understanding Promiscuous Mode on the SRX5K-MPC

The promiscuous mode function is supported on 1-Gigabit, 10-Gigabit, 40-Gigabit, and 100-Gigabit Ethernet interfaces on the I/O cards (IOCs) and the SRX5000 line Module Port Concentrator (SRX5K-MPC).

When promiscuous mode is enabled on a Layer 3 Ethernet interface, all packets received on the interface are sent to the central point or to the Services Processing Unit (SPU) regardless of the destination MAC address of the packet.

By default, an interface enables MAC filtering. You can configure promiscuous mode on the interface to disable MAC filtering. When you delete the promiscuous mode configuration, the interface will perform MAC filtering again.

You can change the MAC address of an interface even when the interface is operating in promiscuous mode. When the interface is operating in normal mode again, the MAC filtering function on the IOC uses the new MAC address to filter the packets.

You can also enable promiscuous mode on chassis cluster redundant Ethernet interfaces and aggregated Ethernet interfaces. If you enable promiscuous mode on a redundant Ethernet interface, promiscuous mode is then enabled on any child physical interfaces. If you enable promiscuous mode on an aggregated Ethernet interface, promiscuous mode is then enabled on all member interfaces.

Related Documentation

- Understanding Ethernet Interfaces on page 255
- Enabling and Disabling Promiscuous Mode on Ethernet Interfaces (CLI Procedure) on page 267
- Example: Configuring Promiscuous Mode on the SRX5K-MPC on page 267

Understanding Port Mirroring on SRX Devices

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

Port mirroring is used to send a copy of all the packets or only the sampled packets seen on a port to a network monitoring connection. You can mirror the packets either on the incoming port (ingress port mirroring) or the outgoing port (egress port mirroring).

NOTE: Port mirroring is supported only on the SRX devices with the following I/O cards:

- SRX1K-SYSIO-GE
- SRX1K-SYSIO-XGE
- SRX3K-SFB-12GE
- SRX3K-2XGE-XFP
- SRX5K-FPC-IOC Flex I/O

On SRX devices, all packets passing through the **mirrored** port are copied and sent to the specified **mirror-to** port. These ports must be on the same Broadcom chipset in the I/O cards.

NOTE: On SRX devices, port mirroring works on physical interfaces only.

Related Documentation

- Configuring Port Mirroring on SRX Devices on page 271

Example: Creating an Ethernet Interface

This example shows how to create an Ethernet interface.

- Requirements on page 261
- Overview on page 261
- Configuration on page 261

Requirements

No special configuration beyond device initialization is required before configuring an interface.

Overview

In this example, you create the ge-1/0/0 Ethernet interface and set the logical interface to 0. The logical unit number can range from 0 to 16,384. You can also add values for properties that you need to configure on the logical interface, such as logical encapsulation or protocol family.

Configuration

Step-by-Step Procedure

To configure an Ethernet interface:

1. Create the Ethernet interface and set the logical interface.

```
[edit]
```



```
user@host# edit interfaces ge-1/0/0 unit 0
```

2. If you are done configuring the device, commit the configuration.

```
[edit]
user@host# commit
```

Verification

Purpose Verify if the configuration is working properly after creating the interface.

Action From operational mode, enter the **show interfaces** command.

Related Documentation

- Understanding Ethernet Interfaces on page 255
- Example: Deleting an Ethernet Interface on page 262

Example: Deleting an Ethernet Interface

This example shows how to delete an Ethernet interface.

Requirements

No special configuration beyond device initialization is required before configuring an interface.

Overview

In this example, you delete the ge-1/0/0 interface.

NOTE: Performing this action removes the interface from the software configuration and disables it. Network interfaces remain physically present, and their identifiers continue to appear on J-Web pages.

Configuration

Step-by-Step Procedure To delete an Ethernet interface:

1. Specify the interface you want to delete.


```
[edit]
user@host# delete interfaces ge-1/0/0
```

2. If you are done configuring the device, commit the configuration.

```
[edit]
user@host# commit
```

Verification

Purpose Verify if the configuration is working properly after deleting the interface.

Action From operational mode, enter the **show interfaces** command.

Related Documentation

- Understanding Ethernet Interfaces on page 255
- Example: Creating an Ethernet Interface on page 261

Example: Configuring Static ARP Entries on Ethernet Interfaces

Requirements

No special configuration beyond device initialization is required before creating an interface.

Overview

In this example, you configure a static ARP entry on the logical unit 0 of the ge-0/0/3 Gigabit Ethernet interface. The entry consists of the interface's IP address (10.1.1.1/24) and the corresponding MAC address of a node on the same Ethernet subnet (00:ff:85:7f:78:03). The example also configures the device to reply to ARP requests from the node using the publish option.

Configuration

CLI Quick Configuration

To quickly configure this example, copy the following command, paste it into a text file, remove any line breaks, change any details necessary to match your network configuration, copy and paste the command into the CLI at the **[edit]** hierarchy level, and then enter **commit** from configuration mode.

```
set interfaces ge-0/0/3 unit 0 family inet address 10.1.1.1/24 arp 10.1.1.3 mac
  00:ff:85:7f:78:03
set interfaces ge-0/0/3 unit 0 family inet address 10.1.1.1/24 arp 10.1.1.3 publish
```

Step-by-Step Procedure

The following example requires you to navigate various levels in the configuration hierarchy. For instructions on how to do that, see *Using the CLI Editor in Configuration Mode*.

To configure a static ARP entry on an Ethernet interface:

1. Create the Gigabit Ethernet interface.

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

2. Configure a static ARP entry.

   ```
   [edit interfaces ge-0/0/3]
   user@host# edit unit 0 family inet address 10.1.1.1/24
   ```

3. Set the IP address of the subnet node and the corresponding MAC address.

   ```
   [edit interfaces ge-0/0/3 unit 0 family inet address 10.1.1.1/24]
   user@host# set arp 10.1.1.3 mac 00:ff:85:7f:78:03 publish
   ```

Results

From configuration mode, confirm your configuration by entering the **show interfaces ge-0/0/3** command. If the output does not display the intended configuration, repeat the configuration instructions in this example to correct it.

```
[edit]
user@host#show interfaces ge-0/0/3
unit 0 {
  family inet {
    address 10.1.1.1/24 {
      arp 10.1.1.3 mac 00:ff:85:7f:78:03 publish;
    }
  }
}
```

If you are done configuring the device, enter **commit** from configuration mode.

Verification

Confirm that the configuration is working properly.

- Verifying Static ARP Configurations on page 265
- Verifying the Link State of All Interfaces on page 265
- Verifying Interface Properties on page 265

Verifying Static ARP Configurations

Purpose Verify the IP address and MAC (hardware) address of the node.

Action From operational mode, enter the **show interfaces ge-0/0/3** command.

Verifying the Link State of All Interfaces

Purpose Verify that all interfaces on the device are operational using the ping tool on each peer address in the network.

Action For each interface on the device:

1. In the J-Web interface, select **Troubleshoot>Ping Host**.
2. In the Remote Host box, type the address of the interface for which you want to verify the link state.
3. Click **Start**. The output appears on a separate page.

```
PING 10.1.1.3 : 56 data bytes
64 bytes from 10.1.1.3: icmp_seq=0 ttl=255 time=0.382 ms
64 bytes from 10.1.1.3: icmp_seq=1 ttl=255 time=0.266 ms
```

If the interface is operational, it generates an ICMP response. If this response is received, the round-trip time in milliseconds is listed in the time field..

Verifying Interface Properties

Purpose Verify that the interface properties are correct.

Action From operational mode, enter the **show interfaces detail** command.

user@host> **show interfaces detail**

```
Physical interface: ge-0/0/3, Enabled, Physical link is Up
  Interface index: 134, SNMP ifIndex: 27, Generation: 17
```



```
Link-level type: Ethernet, MTU: 1514, Speed: 100mbps, Loopback: Disabled,
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: 00:90:69:87:44:9d, Hardware address: 00:90:69:87:44:9d
Last flapped   : 2004-08-25 15:42:30 PDT (4w5d 22:49 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
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
```

The output shows a summary of interface information. Verify the following information:

- The physical interface is Enabled. If the interface is shown as Disabled, do one of the following:
  - In the CLI configuration editor, delete the **disable** statement at the [edit interfaces ge-0/0/3] level of the configuration hierarchy.
  - In the J-Web configuration editor, clear the **Disable** check box on the Interfaces> ge-0/0/3 page.
- The physical link is Up. A link state of Down indicates a problem with the interface module, interface port, or physical connection (link-layer errors).
- The Last Flapped time is an expected value. The Last Flapped time indicates the last time the physical interface became unavailable and then available again. Unexpected flapping indicates likely link-layer errors.
- The traffic statistics reflect expected input and output rates. Verify that the number of inbound and outbound bytes and packets matches expected throughput for the physical interface. To clear the statistics and see only new changes, use the **clear interfaces statistics ge-0/0/3** command.

Related Documentation

- Understanding Static ARP Entries on Ethernet Interfaces on page 259

Enabling and Disabling Promiscuous Mode on Ethernet Interfaces (CLI Procedure)

To enable promiscuous mode on an interface:

```
user@host# set interfaces interface-name promiscuous-mode
```

To disable promiscuous mode on an interface:

```
user@host# delete interfaces interface-name promiscuous-mode
```

Related Documentation

- Understanding Promiscuous Mode on Ethernet Interface on page 259
- Understanding Ethernet Interfaces on page 255

Example: Configuring Promiscuous Mode on the SRX5K-MPC

This example shows how to configure promiscuous mode on an SRX5K-MPC interface in an SRX5600 to disable MAC address filtering.

Requirements

This example uses the following hardware and software components:

- An SRX5600 with an SRX5K-MPC that includes a 100-Gigabit Ethernet CFP transceiver
- Junos OS Release 12.1X47-D10 or later

No special configuration beyond device initialization is required before configuring this feature.

Overview

By default, the interfaces on an SRX5K-MPC have MAC address filtering enabled. In this example, you configure promiscuous mode on an interface to disable MAC address filtering. Then you delete promiscuous mode to reenable MAC address filtering on the interface.

Configuration

Configuring Promiscuous Mode on an Interface

CLI Quick Configuration

To quickly configure this example, copy the following command, paste it into a text file, remove any line breaks, change any details necessary to match your network configuration, copy and paste the command into the CLI at the **[edit]** hierarchy level, and then enter **commit** from configuration mode.

```
set interfaces et-4/0/0 unit 0 family inet address 10.1.1.1/24
set interfaces et-4/0/0 promiscuous-mode
```

Step-by-Step Procedure

The following example requires you to navigate various levels in the configuration hierarchy. For instructions on how to do that, see the Junos OS CLI User Guide.

To configure promiscuous mode:

1. Configure the ingress interface.

```
[edit interfaces]
user@host# set et-4/0/0 unit 0 family inet address 10.1.1.1/24
```

2. Enable promiscuous mode on the interface.

```
[edit interfaces]
user@host# set et-4/0/0 promiscuous-mode
```

Results

From configuration mode, confirm your configuration by entering the **show** command. If the output does not display the intended configuration, repeat the configuration instructions in this example to correct it.

```
[edit]
user@host# show interfaces
et-4/0/0 {
  promiscuous-mode;
  unit 0 {
    family inet {
      address 10.1.1.1/24;
    }
  }
}
```

If you are done configuring the device, enter **commit** from configuration mode.

Disabling Promiscuous Mode on an Interface

CLI Quick Configuration

To quickly configure this example, copy the following command, paste it into a text file, remove any line breaks, change any details necessary to match your network configuration, copy and paste the command into the CLI at the **[edit]** hierarchy level, and then enter **commit** from configuration mode.

```
user@host# delete interfaces et-4/0/0 promiscuous-mode
```

Step-by-Step Procedure

To disable promiscuous mode:

1. Disable promiscuous mode on the interface.

```
[edit]
user@host# delete interfaces et-4/0/0 promiscuous-mode
```

Verification

Confirm that the configuration is working properly.

- Verifying That Promiscuous Mode Is Enabled on the SRX5K-MPC on page 269
- Verifying the Status of Promiscuous Mode on page 270
- Verifying That Promiscuous Mode Is Disabled on page 270

Verifying That Promiscuous Mode Is Enabled on the SRX5K-MPC

Purpose Verify that promiscuous mode is enabled on the interface.

Action From operational mode, enter the **show interfaces** command.

```
user@host> show interfaces
```

```
Physical interface: et-4/0/0, Enabled, Physical link is Up
  Interface index: 137, SNMP ifIndex: 511
  Link-level type: Ethernet, MTU: 1518, Speed: 100Gbps, Loopback: Disabled,
  Source filtering: Disabled, Flow control: Enabled
  Device flags   : Present Running
  Interface flags: Promiscuous SNMP-Traps Internal: 0x4000
  CoS queues     : 8 supported, 8 maximum usable queues
  Current address: 2c:21:72:3a:05:28, Hardware address: 2c:21:72:3a:05:28
  Last flapped   : 2014-01-17 14:44:53 PST (5d 06:30 ago)
  Input rate     : 0 bps (0 pps)
  Output rate    : 0 bps (0 pps)
  Active alarms  : None
  Active defects : None
  PCS statistics                      Seconds
    Bit errors                             0
    Errored blocks                         0

  Logical interface et-4/0/0.0 (Index 71) (SNMP ifIndex 513)
    Flags: SNMP-Traps 0x4000 VLAN-Tag [ 0x8100.1351 ]  Encapsulation: ENET2
    Input packets : 0
    Output packets: 0
    Security: Zone: HOST
    Allowed host-inbound traffic : any-service bfd bgp dvmrp igmp ldp msdp nhrp
    ospf pgm pim rip router-discovery rsvp sap vrrp
    Protocol inet, MTU: 1500
      Flags: Sendbcast-pkt-to-re
      Addresses, Flags: Is-Preferred Is-Primary
        Destination: 122.122.122/24, Local: 122.122.122.1,
        Broadcast: 122.122.122.255
    Protocol multiservice, MTU: Unlimited
      Flags: Is-Primary

  Logical interface et-4/0/0.32767 (Index 72) (SNMP ifIndex 517)
    Flags: SNMP-Traps 0x4004000 VLAN-Tag [ 0x0000.0 ]  Encapsulation: ENET2
```

```
  Input packets : 0
  Output packets: 0
  Security: Zone: HOST
  Allowed host-inbound traffic : any-service bfd bgp dvmrp igmp ldp msdp nhrp
  ospf pgm pim rip router-discovery rsvp sap vrrp
  Protocol multiservice, MTU: Unlimited
    Flags: None
```

Meaning The **Interface flags: Promiscuous** field shows that promiscuous mode is enabled on the interface.

Verifying the Status of Promiscuous Mode

Purpose Verify that promiscuous mode works on the **et-4/0/0** interface.

Action Send traffic into the **et-4/0/0** interface with a MAC address that is different from the interface MAC address and turn on promiscuous mode.

From operational mode, enter the **monitor interface traffic** command.

```
user@host> monitor interface traffic
```

```
Interface     Link  Input packets        (pps)     Output packets      (pps)
gr-0/0/0       Up              0          (0)                  0         (0)
ip-0/0/0       Up              0          (0)                  0         (0)
lt-0/0/0       Up              0          (0)                  0         (0)
xe-1/2/0     Down              0          (0)                  0         (0)
xe-1/2/1     Down              0          (0)                  0         (0)
xe-1/2/2     Down              0          (0)                  0         (0)
xe-1/2/3     Down              0          (0)                  0         (0)
xe-1/2/4     Down              0          (0)                  0         (0)
xe-1/2/5     Down              0          (0)                  0         (0)
xe-1/2/6     Down              0          (0)                  0         (0)
xe-1/2/7     Down              0          (0)                  0         (0)
xe-1/2/8     Down              0          (0)                  0         (0)
xe-1/2/9     Down              0          (0)                  0         (0)
et-4/0/0       Up        4403996     (100002)                  0         (0)
et-4/2/0       Up              3          (0)            4403924     (99997)
avs0           Up              0          (0)                  0         (0)
avs1           Up              0          (0)                  0         (0)
dsc            Up              0                               0
em0            Up          15965                           14056
```

Meaning The **input packets** and **pps** fields show that traffic is passing through the **et-4/0/0** interface as expected after promiscuous mode is enabled.

Verifying That Promiscuous Mode Is Disabled

Purpose Verify that disabled promiscuous mode works on the **et-4/0/0** interface.

Action Send traffic into the **et-4/0/0** interface with a MAC address that is different from the interface MAC address and turn off promiscuous mode.

From operational mode, enter the **monitor interface traffic** command.

```
user@host> monitor interface traffic
```

```
Interface     Link  Input packets        (pps)     Output packets      (pps)
gr-0/0/0        Up              0          (0)                  0        (0)
ip-0/0/0        Up              0          (0)                  0        (0)
lt-0/0/0        Up              0          (0)                  0        (0)
xe-1/2/0      Down              0          (0)                  0        (0)
xe-1/2/1      Down              0          (0)                  0        (0)
xe-1/2/2      Down              0          (0)                  0        (0)
xe-1/2/3      Down              0          (0)                  0        (0)
xe-1/2/4      Down              0          (0)                  0        (0)
xe-1/2/5      Down              0          (0)                  0        (0)
xe-1/2/6      Down              0          (0)                  0        (0)
xe-1/2/7      Down              0          (0)                  0        (0)
xe-1/2/8      Down              0          (0)                  0        (0)
xe-1/2/9      Down              0          (0)                  0        (0)
et-4/0/0        Up       11505495          (0)                  0        (0)
et-4/2/0        Up              6          (0)           11505425        (0)
avs0            Up              0          (0)                  0        (0)
avs1            Up              0          (0)                  0        (0)
dsc             Up              0                               0
em0             Up          37964                           31739
```

Meaning The **pps** field shows that the traffic is not passing through the **et-4/0/0** interface after promiscuous mode is disabled.

Related Documentation

- Understanding Promiscuous Mode on Ethernet Interface on page 259
- Enabling and Disabling Promiscuous Mode on Ethernet Interfaces (CLI Procedure) on page 267

Configuring Port Mirroring on SRX Devices

To configure port mirroring on an SRX device, you must first configure the **forwarding-options** and **interfaces** at the **[edit]** hierarchy level.

You must configure the **forwarding-options** statement to define an instance of the **mirror-to** port for port mirroring and also configure the interface to be mirrored.

NOTE: The mirrored port and the mirror-to port must be under the same Broadcom chipset in a I/O card.

To configure port mirroring:

1. Specify the **rate** and **run-length** at the **[edit forwarding-options port-mirroring input]** hierarchy level:

   NOTE:
   - **rate**: Ratio of packets to be sampled (1 out of *N*) (1 through 65535)
   - **run-length**: Number of samples after initial trigger (0 through 20)

   ```
   [edit]
     forwarding-options
       port-mirroring {
           input {
             rate number;
             run-length number;
           }
         }
   ```

2. To send the copies of the packet to the **mirror-to** port, include the **interface *intf-name*** statement at the **[edit forwarding-options port-mirroring family any output]** hierarchy level.

   ```
   output {
     interface intf-name;
   }
   ```

   NOTE: Port mirroring on SRX devices uses **family any** to transfer the **mirror-to** port information to the Packet Forwarding Engine (PFE). The mirroring engine copies all the packets from **mirrored** port to the **mirror-to** port.

NOTE: You can configure an **instance** clause to specify multiple **mirror-to** ports.

To mirror an interface, include the **port-mirror-instance** statement at the **[edit interface mirrored-intf-name]** hierarchy level.

The mirrored interface is configured with an instance name, defined in the **forwarding-options**. The **mirrored** port and the **mirror-to** port are linked through that instance.

```
instance {
   inst-name {
      input {
         rate number;
         run-length number;
      }
      family any {
         output {
            interface intf-name;
         }
      }
   }
}
interfaces
      mirrored-intf-name {
         port-mirror-instance instance-name;
      }
```

NOTE: Port mirroring on SRX devices does not differentiate the traffic direction, but mirrors the ingress and egress samples together.

A sample configuration for port mirroring is shown below:

```
mirror port ge-1/0/2 to port ge-1/0/9.0
forwarding-options
   port-mirroring {
      input {
         rate 1;
         run-length 10;
      }
      family any {
         output {
            interface ge-1/0/9.0;
         }
      }
      instance {
         inst1 {
            input {
               rate 1;
```



```
                run-length 10;
            }
            family any {
                output {
                    interface ge-1/0/9.0;
                }
            }
        }
    }
interfaces {
    ge-1/0/2 {
        port-mirror-instance inst1;
    }
}
```

Related Documentation

Understanding Port Mirroring on SRX Devices on page 260

CHAPTER 14

Configuring Aggregated Ethernet Interfaces

Understanding Aggregated Ethernet Interfaces

Link aggregation of Ethernet interfaces is defined in the IEEE 802.3ad standard. Junos OS implementation of 802.3ad balances traffic across the member links within an aggregated Ethernet bundle based on Layer 3 information carried in the packet, Layer 4 information carried in the packet, or both, or based on session ID data. (The session ID data has higher precedence than the Layer 3 or 4 information.) This implementation uses the same load-balancing algorithm used for per-packet load balancing.

Aggregated Ethernet interfaces can be Layer 3 interfaces (VLAN-tagged or untagged) and Layer 2 interfaces.

NOTE: This topic is specific to the SRX3000 and SRX5000 line devices. For information about link aggregation for other SRX Series devices, see the *Ethernet Switching Feature Guide*.

This topic contains the following sections:

LAGs

You can combine multiple physical Ethernet ports to form a logical point-to-point link, known as a link aggregation group (LAG) or bundle, such that a media access control (MAC) client can treat the LAG as if it were a single link. Support for LAGs based on IEEE 802.3ad makes it possible to aggregate physical interface links on your device. LAGs provide increased interface bandwidth and link availability by linking physical ports and load-balancing traffic crossing the combined interface. For the LAG to operate correctly, it is necessary to coordinate the two end systems connected by the LAG, either manually or automatically.

Internally, a LAG is a virtual interface presented on SRX3000 and SRX5000 line devices or on any system (consisting of devices such as routers and switches) supporting 802.3ad link aggregation. Externally, a LAG corresponds to a bundle of physical Ethernet links connected between an SRX3000 or SRX5000 line device and another system capable of link aggregation. This bundle of physical links is a virtual link.

Follow these guidelines for aggregated Ethernet support for the SRX3000 and SRX5000 lines:

- The devices support a maximum of 16 physical interfaces per single aggregated Ethernet bundle.
- Aggregated Ethernet interfaces can use interfaces from the same or different Flexible PIC Concentrators (FPCs) and PICs.
- On the aggregated bundle, capabilities such as MAC accounting, VLAN rewrites, and VLAN queuing are available.

LACP

Junos OS supports the Link Aggregation Control Protocol (LACP), which is a subcomponent of IEEE 802.3ad. LACP provides additional functionality for LAGs.

Starting with Junos OS Release 15.1X49-D40, LACP is supported on Layer 2 transparent mode in addition to existing support on Layer 3 mode. For information about link aggregation for other SRX Series devices, see the *Ethernet Switching Feature Guide*.

LACP provides a standardized means for exchanging information between partner (remote or far-end of the link) systems on a link. This exchange allows their link aggregation control instances to reach agreement on the identity of the LAG to which the link belongs, and then to move the link to that LAG. This exchange also enables the transmission and reception processes for the link to function in an orderly manner.

For example, when LACP is not enabled, a local LAG might attempt to transmit packets to a remote individual interface, which causes the communication to fail. (An individual interface is a nonaggregatable interface.) 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.

You configure an aggregated Ethernet virtual link by specifying the link number as a physical device. Then you associate a set of ports that have the same speed and are in full-duplex mode. The physical ports can be 100-megabit Ethernet, 1-Gigabit Ethernet, and 10-Gigabit Ethernet.

When configuring LACP, follow these guidelines:

- LACP does not support automatic configuration on SRX3000 and SRX5000 line devices, but partner systems are allowed to perform automatic configuration. When an SRX3000 or SRX5000 line device is connected to a fully 802.3ad-compliant partner system, static configuration of LAGs is initiated on the SRX3000 and SRX5000 line device side, and static configuration is not needed on the partner side.
- When an SRX3000 or SRX5000 line device is connected to a Juniper Networks MX Series router, static configuration of LAGs is needed at both the actor (local or near-end of the link) and partner systems.
- Although the LACP functions on the SRX3000 and SRX5000 line devices are similar to the LACP features on Juniper Networks MX Series routers, the following LACP features on MX Series routers are not supported on SRX3000 and SRX5000 line devices: link protection, system priority, and port priority for aggregated Ethernet interfaces. Instead, SRX3000 and SRX5000 line devices provide active/standby support with redundant Ethernet interface LAGs in chassis cluster deployments.

LACP is supported in standalone deployments, where aggregated Ethernet interfaces are supported, and in chassis cluster deployments, where aggregated Ethernet interfaces and redundant Ethernet interfaces are supported simultaneously.

Release History Table

Release	Description
15.1X49-D40	Starting with Junos OS Release 15.1X49-D40, LACP is supported on Layer 2 transparent mode in addition to existing support on Layer 3 mode.

Related Documentation

- Understanding Ethernet Interfaces on page 255
- Aggregated Ethernet Interfaces Configuration Overview on page 278
- Understanding LACP on Standalone Devices on page 291
- Understanding LACP on Chassis Clusters on page 298
- Understanding VLAN Tagging for Aggregated Ethernet Interfaces on page 289

- Understanding Promiscuous Mode for Aggregated Ethernet Interfaces on page 289

Aggregated Ethernet Interfaces Configuration Overview

NOTE: This topic is specific to the SRX3000 and SRX5000 line devices.

To configure an aggregated Ethernet interface:

1. Set the number of aggregated Ethernet interfaces on the device. See “Example: Configuring the Number of Aggregated Ethernet Interfaces on a Device” on page 279.
2. Associate a physical interface with the aggregated Ethernet interface. See “Example: Associating Physical Interfaces with Aggregated Ethernet Interfaces” on page 281.
3. (Optional) Set the required link speed for all the interfaces included in the bundle. See “Example: Configuring Aggregated Ethernet Link Speed” on page 282.
4. (Optional) Configure the minimum number of links that must be up for the bundle as a whole to be labeled as up. See “Example: Configuring Aggregated Ethernet Minimum Links” on page 284.
5. (Optional) Enable or disable VLAN tagging. See “Understanding VLAN Tagging for Aggregated Ethernet Interfaces” on page 289.
6. (Optional) Enable promiscuous mode. See “Understanding Promiscuous Mode for Aggregated Ethernet Interfaces” on page 289.

Related Documentation

- *Ethernet Switching Feature Guide*
- Understanding Aggregated Ethernet Interfaces on page 275
- Example: Configuring Link Aggregation Control Protocol (CLI Procedure) on page 292
- Example: Configuring LACP on Chassis Clusters on page 300

Understanding the Aggregated Ethernet Interfaces Device Count

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. Once you set the device count, the system creates that number of empty aggregated Ethernet interfaces. A globally unique MAC address is assigned to every aggregated Ethernet interface. More aggregated Ethernet interfaces can be created by increasing the parameter.

The maximum number of aggregated devices you can configure is 128. The aggregated interfaces are numbered from ae0 through ae127.

Similarly, you can permanently remove an aggregated Ethernet interface from the device configuration by deleting it from the device count. When you reduce the device count, only the aggregated Ethernet interface objects at the end of the list are removed, leaving the newly specified number of interfaces. That is, if you set the device count to 10 and then reduce it to 6, the system removes the last 4 interface objects from the list.

WARNING: **Be aware that this approach deletes the aggregated Ethernet interface and *all* of its objects from the device configuration.**

Related Documentation

- Understanding Aggregated Ethernet Interfaces on page 275
- Example: Configuring the Number of Aggregated Ethernet Interfaces on a Device on page 279
- Example: Deleting Aggregated Ethernet Interfaces on page 285

Example: Configuring the Number of Aggregated Ethernet Interfaces on a Device

This example shows how to configure the number of aggregated Ethernet interfaces on a device.

Requirements

No special configuration beyond device initialization is required before configuring an interface.

Overview

In this example, you create two aggregate Ethernet interfaces, thereby enabling all the interfaces that you need for your configuration in one step.

Configuration

Step-by-Step Procedure

To configure the number of aggregated Ethernet interfaces on a device:

1. Set the number of aggregated Ethernet interfaces.

```
[edit]
user@host# set chassis aggregated-devices ethernet device-count 2
```

2. If you are done configuring the device, commit the configuration.

```
[edit]
user@host# commit
```

Verification

To verify the configuration is working properly, enter the **show chassis aggregated-devices** command.

Related Documentation

- Understanding the Aggregated Ethernet Interfaces Device Count on page 278
- Aggregated Ethernet Interfaces Configuration Overview on page 278
- Example: Deleting Aggregated Ethernet Interfaces on page 285
- Verifying Aggregated Ethernet Interfaces on page 287

Understanding Physical Interfaces for Aggregated Ethernet Interfaces

You associate a physical interface with an aggregated Ethernet interface. Doing so associates the physical child links with the logical aggregated parent interface to form a link aggregation group (LAG). You must also specify the constituent physical links by including the **802.3ad** configuration statement.

A physical interface can be added to any aggregated Ethernet interface as long as all member links have the same link speed and the maximum number of member links does not exceed 16. The aggregated Ethernet interface instance number ae*x* can be from 0 through 127, for a total of 128 aggregated interfaces.

NOTE:

- If you specify (on purpose or accidentally) that a link already associated with an aggregated Ethernet interface be associated with another aggregated Ethernet interface, the link is removed from the previous interface (there is no need for you to explicitly delete it) and it is added to the other one.
- On SRX300, SRX320, SRX340, SRX345, and SRX550M devices, when you create an aggregated interface with two or more ports and if a link in the bundle goes down, the traffic forwarded through the same link will be rerouted two seconds later. This causes an outage for the traffic being sent to the link until reroute is complete.

Related Documentation

- Understanding Aggregated Ethernet Interfaces on page 275
- Example: Associating Physical Interfaces with Aggregated Ethernet Interfaces on page 281

Example: Associating Physical Interfaces with Aggregated Ethernet Interfaces

This example shows how to associate physical interfaces with aggregated Ethernet interfaces.

Requirements

Before you begin, set the number of aggregated Ethernet interfaces on the device. See "Example: Configuring the Number of Aggregated Ethernet Interfaces on a Device" on page 279.

Overview

In this example, you associate the physical child link of the ge-1/0/0 and ge-2/0/0 physical interfaces with the logical aggregate parent, ae0, thereby creating a LAG. Similarly, you create a LAG that associate the ge-3/0/0, ge-3/0/1, and ge-4/0/1 physical interfaces with the ae1 aggregated Ethernet interface.

Configuration

Step-by-Step Procedure

To associate physical interfaces with aggregated Ethernet interfaces:

1. Create the first LAG.

```
[edit]
user@host# set interfaces ge-1/0/0 gigether-options 802.3ad ae0
user@host# set interfaces ge-2/0/0 gigether-options 802.3ad ae0
```

2. Create the second LAG.

```
[edit]
user@host# set interfaces ge-3/0/0 gigether-options 802.3ad ae1
user@host# set interfaces ge-3/0/1 gigether-options 802.3ad ae1
user@host# sset interfaces ge-4/0/0 gigether-options 802.3ad ae1
```

3. If you are done configuring the device, commit the configuration.

```
[edit]
user@host# commit
```

Verification

To verify the configuration is working properly, enter the **show interfaces** command.

Related Documentation

- Understanding Physical Interfaces for Aggregated Ethernet Interfaces on page 280
- Aggregated Ethernet Interfaces Configuration Overview on page 278
- Verifying Aggregated Ethernet Interfaces on page 287

Understanding Aggregated Ethernet Interface Link Speed

On aggregated Ethernet interfaces, you can set the required link speed for all interfaces included in the bundle. All interfaces that make up a bundle must be the same speed. If you include in the aggregated Ethernet interface an individual link that has a speed different from the speed you specify in the **link-speed** parameter, an error message will be logged.

The speed value is specified 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 SRX3000 and SRX5000 line devices can have one of the following speed values:

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

Related Documentation

- Understanding Aggregated Ethernet Interfaces on page 275
- Example: Configuring Aggregated Ethernet Link Speed on page 282
- Understanding Minimum Links for Aggregated Ethernet Interfaces on page 283

Example: Configuring Aggregated Ethernet Link Speed

This example shows how to configure the aggregated Ethernet link speed.

- Requirements on page 282
- Overview on page 283
- Configuration on page 283
- Verification on page 283

Requirements

Before you begin:

- Add the aggregated Ethernet interfaces using the device count. See “Example: Configuring the Number of Aggregated Ethernet Interfaces on a Device” on page 279.
- Associate physical interfaces with the aggregated Ethernet Interfaces. See “Example: Associating Physical Interfaces with Aggregated Ethernet Interfaces” on page 281.

Overview

In this example, you set the required link speed for all interfaces included in the bundle to 10 Gbps. All interfaces that make up a bundle must be the same speed.

Configuration

Step-by-Step Procedure

To configure the aggregated Ethernet link speed:

1. Set the link speed.

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

2. If you are done configuring the device, commit the configuration.

```
[edit]
user@host# commit
```

Verification

To verify the configuration is working properly, enter the **show interfaces** command.

Related Documentation

- Understanding Aggregated Ethernet Interface Link Speed on page 282
- Aggregated Ethernet Interfaces Configuration Overview on page 278
- Verifying Aggregated Ethernet Interfaces on page 287

Understanding Minimum Links for Aggregated Ethernet Interfaces

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 as up. By default, only one link must be up for the bundle to be labeled as up.

On SRX1000, SRX3000, and SRX5000 line devices, the valid range for the 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 as up.

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

Related Documentation

- Understanding Aggregated Ethernet Interfaces on page 275
- Example: Configuring Aggregated Ethernet Minimum Links on page 284
- Understanding Aggregated Ethernet Interface Link Speed on page 282

Example: Configuring Aggregated Ethernet Minimum Links

This example shows how to configure the minimum number of links on an aggregated Ethernet interface that must be up for the bundle as a whole to be labeled as up.

Requirements

Before you begin:

- Add the aggregated Ethernet interfaces using the device count. See "Example: Configuring the Number of Aggregated Ethernet Interfaces on a Device" on page 279.
- Associate physical interfaces with the aggregated Ethernet Interfaces. See "Example: Associating Physical Interfaces with Aggregated Ethernet Interfaces" on page 281.
- Configure the aggregated Ethernet link speed. See "Example: Configuring Aggregated Ethernet Link Speed" on page 282.

Overview

In this example, you specify that on interface ae0 at least eight links must be up for the bundle as a whole to be labeled as up.

Configuration

Step-by-Step Procedure

To configure the minimum number of links on an aggregated Ethernet interface:

1. Set the minimum number of links.

```
[edit]
user@host# set interfaces ae0 aggregated-ether-options minimum-links 8
```

2. If you are done configuring the device, commit the configuration.

```
[edit]
user@host# commit
```

Verification

To verify the configuration is working properly, enter the **show interfaces** command.

Related Documentation

- Understanding Aggregated Ethernet Interface Link Speed on page 282
- Aggregated Ethernet Interfaces Configuration Overview on page 278

Understanding Aggregated Ethernet Interface Removal

You can delete an aggregated Ethernet interface from the interface configuration. Junos OS removes the configuration statements related to **ae*x*** and sets this interface to the down state. The deleted aggregated Ethernet interface still exists, but it becomes an empty interface.

Related Documentation

- Understanding Aggregated Ethernet Interfaces on page 275
- Example: Deleting Aggregated Ethernet Interfaces on page 285
- Example: Deleting Aggregated Ethernet Interface Contents on page 286

Example: Deleting Aggregated Ethernet Interfaces

This example shows how to delete aggregated Ethernet interfaces using the device count.

Requirements

Before you begin, set the number of aggregated Ethernet interfaces on the device. See "Example: Configuring the Number of Aggregated Ethernet Interfaces on a Device" on page 279.

Overview

This example shows how to clean up unused aggregated Ethernet interfaces. In this example, you reduce the number of interfaces from 10 to 6, thereby removing the last 4 interfaces from the interface object list.

Configuration

Step-by-Step Procedure

To delete an interface:

1. Set the number of aggregated Ethernet interfaces.

```
[edit]
user@host# delete chassis aggregated-devices ethernet device-count 6
```

2. If you are done configuring the device, commit the configuration.

```
[edit]
user@host# commit
```


Verification

To verify the configuration is working properly, enter the **show chassis aggregated-devices** command.

Related Documentation

- Aggregated Ethernet Interfaces Configuration Overview on page 278
- Example: Deleting Aggregated Ethernet Interface Contents on page 286
- Verifying Aggregated Ethernet Interfaces on page 287

Example: Deleting Aggregated Ethernet Interface Contents

This example shows how to delete the contents of an aggregated Ethernet interface.

Requirements

Before you begin:

- Set the number of aggregated Ethernet interfaces on the device. See “Example: Configuring the Number of Aggregated Ethernet Interfaces on a Device” on page 279.
- Associate a physical interface with the aggregated Ethernet interface. See “Example: Associating Physical Interfaces with Aggregated Ethernet Interfaces” on page 281.
- Set the required link speed for all the interfaces included in the bundle. See “Example: Configuring Aggregated Ethernet Link Speed” on page 282.
- Configure the minimum number of links that must be up for the bundle as a whole to be labeled as up. See “Example: Configuring Aggregated Ethernet Minimum Links” on page 284.

Overview

In this example, you delete the contents of the ae4 aggregated Ethernet interface, which sets it to the down state.

Configuration

Step-by-Step Procedure

To delete the contents of an aggregated Ethernet interface:

1. Delete the interface.

   ```
   [edit]
   user@host# delete interfaces ae4
   ```


2. If you are done configuring the device, commit the configuration.

```
[edit]
user@host# commit
```

Verification

To verify the configuration is working properly, enter the **show interfaces** command.

Related Documentation

- Aggregated Ethernet Interfaces Configuration Overview on page 278
- Example: Deleting Aggregated Ethernet Interfaces on page 285
- Verifying Aggregated Ethernet Interfaces on page 287

Verifying Aggregated Ethernet Interfaces

- Verifying Aggregated Ethernet Interfaces (terse) on page 287
- Verifying Aggregated Ethernet Interfaces (extensive) on page 288

Verifying Aggregated Ethernet Interfaces (terse)

Purpose Display status information in terse (concise) format for aggregated Ethernet interfaces.

Action From operational mode, enter the **show interfaces ae0 terse** command.

```
user@host> show interfaces ae0 terse
ge-2/0/0.0              up    up   aenet    --> ae0.0
ge-2/0/0.32767          up    up   aenet    --> ae0.32767
ge-2/0/1.0              up    up   aenet    --> ae0.0
ge-2/0/1.32767          up    up   aenet    --> ae0.32767
ae0                     up    up
ae0.0                   up    up   bridge
ae0.32767               up    up   multiservice
```

The output shows the bundle relationship for the aggregated Ethernet interface and the overall status of the interface, including the following information:

- The link aggregation control PDUs run on the .0 child logical interfaces for the untagged aggregated Ethernet interface.
- The link aggregation control PDUs run on the .32767 child logical interfaces for the VLAN-tagged aggregated Ethernet interface.
- The .32767 logical interface is created for the parent link and all child links.

See Also

- Verifying Aggregated Ethernet Interfaces (extensive) on page 288
- Understanding Aggregated Ethernet Interfaces on page 275

- Aggregated Ethernet Interfaces Configuration Overview on page 278

Verifying Aggregated Ethernet Interfaces (extensive)

Purpose Display status information and statistics in extensive (detailed) format for aggregated Ethernet interfaces.

Action From operational mode, enter the **show interfaces ae0 extensive** command.

user@host> **show interfaces ae0 extensive**

```
Physical interface: ae0, Enabled, Physical link is Up
  ...
  Logical interface ae0.0 (Index 67) (SNMP ifIndex 628) (Generation 134)
    ...
    LACP info:        Role     System             System      Port     Port  Port

                            priority          identifier  priority  number   key

      ge-5/0/0.0     Actor         127  00:1f:12:8c:af:c0       127     832     1

      ge-5/0/0.0   Partner         127  00:1f:12:8f:d7:c0       127     640     1

      ge-5/0/1.0     Actor         127  00:1f:12:8c:af:c0       127     833     1

      ge-5/0/1.0   Partner         127  00:1f:12:8f:d7:c0       127     641     1

    LACP Statistics:       LACP Rx     LACP Tx   Unknown Rx   Illegal Rx
      ge-5/0/0.0             12830        7090            0            0
      ge-5/0/1.0             10304        4786            0            0
    ...
  Logical interface ae0.32767 (Index 70) (SNMP ifIndex 630) (Generation 135)
    ...
    LACP info:        Role     System             System      Port     Port  Port

                            priority          identifier  priority  number   key

      ge-5/0/0.32767    Actor      127 00:1f:12:8c:af:c0       127     832     1

      ge-5/0/0.32767  Partner      127 00:1f:12:8f:d7:c0       127     640     1

      ge-5/0/1.32767    Actor      127 00:1f:12:8c:af:c0       127     833     1

      ge-5/0/1.32767  Partner      127 00:1f:12:8f:d7:c0       127     641     1

    LACP Statistics:       LACP Rx     LACP Tx   Unknown Rx   Illegal Rx
      ge-5/0/0.32767         12830        7090            0            0
      ge-5/0/1.32767         10304        4786            0            0
   ...
```

The output shows detailed aggregated Ethernet interface information. This portion of the output shows LACP information and LACP statistics for each logical aggregated Ethernet interface.

See Also

- Verifying Aggregated Ethernet Interfaces (terse) on page 287
- Understanding Aggregated Ethernet Interfaces on page 275
- Aggregated Ethernet Interfaces Configuration Overview on page 278

Related Documentation

- Aggregated Ethernet Interfaces Configuration Overview on page 278

Understanding VLAN Tagging for Aggregated Ethernet Interfaces

Aggregated Ethernet interfaces can be either VLAN-tagged or untagged, with LACP enabled or disabled. Aggregated Ethernet interfaces on the SRX3000 and SRX5000 lines support the configuration of **native-vlan-id**, which consists of the following configuration statements:

- **inner-tag-protocol-id**
- **inner-vlan-id**
- **pop-pop**
- **pop-swap**
- **push-push**
- **swap-push**
- **swap-swap**

Related Documentation

- Understanding Aggregated Ethernet Interfaces on page 275
- Aggregated Ethernet Interfaces Configuration Overview on page 278

Understanding Promiscuous Mode for Aggregated Ethernet Interfaces

You can enable promiscuous mode on aggregated Ethernet interfaces. When promiscuous mode is enabled on a Layer 3 Ethernet interface, all packets received on the interface are sent to the central point or Services Processing Unit (SPU) regardless of the destination MAC address of the packet. If you enable promiscuous mode on an aggregated Ethernet interface, promiscuous mode is then enabled on all member interfaces.

Related Documentation

- Understanding Aggregated Ethernet Interfaces on page 275
- Aggregated Ethernet Interfaces Configuration Overview on page 278

CHAPTER 15

Configuring Link Aggregation Control Protocol

Understanding LACP on Standalone Devices

Link Aggregation Control Protocol (LACP) provides a standardized means for exchanging information between partner systems on a link. Within LACP, the local end of a child link is known as the actor and the remote end of the link is known as the partner.

LACP is enabled on an aggregated Ethernet interface by setting the mode to either passive or active. However, to initiate the transmission of link aggregation control protocol data units (PDUs) and response link aggregation control PDUs, you must enable LACP at both the local and remote ends of the links, and one end must be active:

- Active mode—If either the actor or partner is active, they exchange link aggregation control PDUs. The actor sends link aggregation control PDUs to its protocol partner that convey what the actor knows about its own state and that of the partner's state.
- Passive mode—If the actor and partner are both in passive mode, they do not exchange link aggregation control PDUs. As a result, the aggregated Ethernet links do not come up. In passive transmission mode, links send out link aggregation control PDUs only when they receive them from the remote end of the same link.

By default, the actor and partner transmit link aggregation control PDUs every second. 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.

You configure the interval at which the interfaces on the remote side of the link transmit link aggregation control PDUs by configuring the **periodic** statement on the interfaces on the local side. It is the configuration on the local side that specifies the behavior of the remote side. That is, the remote side transmits link aggregation control PDUs at the specified interval. The interval can be **fast** (every second) or **slow** (every 30 seconds).

NOTE: Starting with Junos OS Release 15.1X49-D40, LACP is supported in Layer 2 transparent mode in addition to existing support in Layer 3 mode.

Related Documentation

- Understanding Aggregated Ethernet Interfaces on page 275
- Understanding LACP on Chassis Clusters on page 298
- Example: Configuring Link Aggregation Control Protocol (CLI Procedure) on page 292

Example: Configuring Link Aggregation Control Protocol (CLI Procedure)

This example shows how to configure LACP.

Requirements

This example uses an SRX Series device.

Before you begin:

- Determine which interfaces to use and verify that they are in switch mode. See *Understanding VLANs*.

Overview

In this example, for aggregated Ethernet interfaces, you configure the Link Aggregation Control Protocol (LACP). LACP is one method of bundling several physical interfaces to form one logical interface.

Configuration

CLI Quick Configuration

To quickly configure this section of the example, copy the following commands, paste them into a text file, remove any line breaks, change any details necessary to match your network configuration, copy and paste the commands into the CLI at the **[edit]** hierarchy level, and then enter **commit** from configuration mode.

```
set interfaces ge-0/0/6 ether-options 802.3ad ae0
set interfaces ge-0/0/7 ether-options 802.3ad ae0
set interfaces ae0 vlan-tagging
set interfaces ae0 aggregated-ether-options lacp active periodic fast
set interfaces ae0 unit 0 family ethernet-switching interface-mode trunk
set vlan vlan1000 vlan-id 1000
set interfaces ae0 unit 0 family ethernet-switching vlan members vlan1000
```

Step-by-Step Procedure

The following example requires you to navigate various levels in the configuration hierarchy. For instructions on how to do that, see *Using the CLI Editor in Configuration Mode* in the *CLI User Guide*.

To configure LACP:

1. Configure the interfaces for ae0.

   ```
   [edit ]
   user@host# set interfaces ge-0/0/6 ether-options 802.3ad ae0
   user@host# set interfaces ge-0/0/7 ether-options 802.3ad ae0
   ```

2. Configure ae0 interface for vlan tagging.

   ```
   [edit ]
   user@host# set interfaces ae0 vlan-tagging
   ```

3. Configure LACP for ae0 and configure periodic transmission of LACP packets.

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

4. Configure ae0 as a trunk port.

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

5. Configure the VLAN.

   ```
   [edit ]
   user@host# set vlan vlan1000 vlan-id 1000
   ```

6. Add the ae0 interface to the VLAN.

   ```
   [edit ]
   ```

```
user@host# set interfaces ae0 unit 0 family ethernet-switching vlan members
  vlan1000
```

7. If you are done configuring the device, commit the configuration.

```
[edit ]
user@host# commit
```

Results From configuration mode, confirm your configuration by entering the **show interfaces** command. If the output does not display the intended configuration, repeat the configuration instructions in this example to correct it.

```
[edit]
user@host# show interfaces
ge-0/0/6 {
  ether-options {
    802.3ad ae0;
  }
}
ge-0/0/7 {
  ether-options {
    802.3ad ae0;
  }
}
ae0 {
  vlan- tagging;
  aggregated-ether-options {
    lacp {
      active;
      periodic fast;
    }
  }
  unit 0 {
    family ethernet-switching {
      interface-mode trunk;
      vlan {
        members vlan1000;
      }
    }
  }
}
```

Verification

Verifying LACP Statistics

Purpose Display LACP statistics for aggregated Ethernet interfaces.

Action From operational mode, enter the **show lacp statistics interfaces ae0** command.

```
user@host> show lacp statistics interfaces ae0
Aggregated interface: ae0
    LACP Statistics:       LACP Rx     LACP Tx   Unknown Rx   Illegal Rx
      ge-0/0/6                1352        2035            0            0
      ge-0/0/7                1352        2056            0            0
```

Meaning The output shows LACP statistics for each physical interface associated with the aggregated Ethernet interface, such as the following:

- The LACP received counter that increments for each normal hello packet received
- The number of LACP transmit packet errors logged
- The number of unrecognized packet errors logged
- The number of invalid packets received

Use the following command to clear the statistics and see only new changes:

```
user@host# clear lacp statistics interfaces ae0
```

Verifying LACP Aggregated Ethernet Interfaces

Purpose Display LACP status information for aggregated Ethernet interfaces.

Action From operational mode, enter the **show lacp interfaces ae0** command.

```
user@host> show lacp interfaces ae0
Aggregated interface: ae0
    LACP state:       Role   Exp   Def  Dist  Col  Syn  Aggr  Timeout  Activity
      ge-0/0/6       Actor    No    No   Yes  Yes  Yes   Yes     Fast    Active
      ge-0/0/6     Partner    No    No   Yes  Yes  Yes   Yes     Fast   Passive

      ge-0/0/7       Actor    No    No   Yes  Yes  Yes   Yes     Fast    Active
      ge-0/0/7     Partner    No    No   Yes  Yes  Yes   Yes     Fast   Passive

    LACP protocol:        Receive State  Transmit State          Mux State
      ge-0/0/6                  Current   Fast periodic Collecting distributing
      ge-0/0/7                  Current   Fast periodic Collecting distributing
```

Meaning The output shows aggregated Ethernet interface information, including the following information:

- The LACP state—Indicates whether the link in the bundle is an actor (local or near-end of the link) or a partner (remote or far-end of the link).
- The LACP mode—Indicates whether both ends of the aggregated Ethernet interface are enabled (active or passive)—at least one end of the bundle must be active.
- The periodic link aggregation control PDU transmit rate.
- The LACP protocol state—Indicates the link is up if it is collecting and distributing packets.

Related Documentation

- *Understanding Link Aggregation Control Protocol*
- *Ethernet Ports Switching Overview for Security Devices*

Verifying LACP on Standalone Devices

Verifying LACP Statistics

Purpose Display LACP statistics for aggregated Ethernet interfaces.

Action From operational mode, enter the **show lacp statistics interfaces ae0** command.

```
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
```

The output shows LACP statistics for each physical interface associated with the aggregated Ethernet interface, such as the following:

- The LACP received counter that increments for each normal hello
- The number of LACP transmit packet errors logged
- The number of unrecognized packet errors logged
- The number of invalid packets received

Use the following command to clear the statistics and see only new changes:

```
user@host# clear lacp statistics interfaces ae0
```

See Also

- Understanding LACP on Standalone Devices on page 291

- Example: Configuring Link Aggregation Control Protocol (CLI Procedure) on page 292

Verifying LACP Aggregated Ethernet Interfaces

Purpose Display LACP status information for aggregated Ethernet interfaces.

Action From operational mode, enter the **show lacp interfaces ae0** command.

user@host> **show lacp interfaces ae0**

```
Aggregated interface: ae0
    LACP state:       Role   Exp   Def  Dist  Col  Syn  Aggr  Timeout  Activity
      ge-2/0/0       Actor    No    No   Yes  Yes  Yes   Yes     Fast    Active
      ge-2/0/0     Partner    No    No   Yes  Yes  Yes   Yes     Fast    Active
      ge-2/0/1       Actor    No    No   Yes  Yes  Yes   Yes     Fast    Active
      ge-2/0/1     Partner    No    No   Yes  Yes  Yes   Yes     Fast    Active
      ge-2/2/0       Actor    No    No   Yes  Yes  Yes   Yes     Fast    Active
      ge-2/2/0     Partner    No    No   Yes  Yes  Yes   Yes     Fast    Active
      ge-2/2/1       Actor    No    No   Yes  Yes  Yes   Yes     Fast    Active
      ge-2/2/1     Partner    No    No   Yes  Yes  Yes   Yes     Fast    Active
    LACP protocol:        Receive State  Transmit State          Mux State
      ge-2/0/0                  Current   Fast periodic Collecting distributing
      ge-2/0/1                  Current   Fast periodic Collecting distributing
      ge-2/2/0                  Current   Fast periodic Collecting distributing
      ge-2/2/1                  Current   Fast periodic Collecting distributing
```

The output shows aggregated Ethernet interface information, including the following information:

- The LACP state—Indicates whether the link in the bundle is an actor (local or near-end of the link) or a partner (remote or far-end of the link).
- The LACP mode—Indicates whether both ends of the aggregated Ethernet interface are enabled (active or passive)—at least one end of the bundle must be active.
- The periodic link aggregation control PDU transmit rate.
- The LACP protocol state—Indicates the link is up ifit is collecting and distributing packets.

See Also

- Verifying LACP on Redundant Ethernet Interfaces on page 303

Related Documentation

- Example: Configuring Link Aggregation Control Protocol (CLI Procedure) on page 292
- Verifying LACP on Redundant Ethernet Interfaces on page 303

Understanding LACP on Chassis Clusters

You can combine multiple physical Ethernet ports to form a logical point-to-point link, known as a link aggregation group (LAG) or bundle, such that a media access control (MAC) client can treat the LAG as if it were a single link.

LAGs can be established across nodes in a chassis cluster to provide increased interface bandwidth and link availability.

The Link Aggregation Control Protocol (LACP) provides additional functionality for LAGs. LACP is supported in standalone deployments, where aggregated Ethernet interfaces are supported, and in chassis cluster deployments, where aggregated Ethernet interfaces and redundant Ethernet interfaces are supported simultaneously.

You configure LACP on a redundant Ethernet interface by setting the LACP mode for the parent link with the **lacp** statement. The LACP mode can be off (the default), active, or passive.

This topic contains the following sections:

Chassis Cluster Redundant Ethernet Interface Link Aggregation Groups

A redundant Ethernet interface has active and standby links located on two nodes in a chassis cluster. All active links are located on one node, and all standby links are located on the other node. You can configure up to eight active links and eight standby links per node.

When at least two physical child interface links from each node are included in a redundant Ethernet interface configuration, the interfaces are combined within the redundant Ethernet interface to form a redundant Ethernet interface LAG.

Having multiple active redundant Ethernet interface links reduces the possibility of failover. For example, when an active link is out of service, all traffic on this link is distributed to other active redundant Ethernet interface links, instead of triggering a redundant Ethernet active/standby failover.

Aggregated Ethernet interfaces, known as local LAGs, are also supported on either node of a chassis cluster but cannot be added to redundant Ethernet interfaces. Likewise, any child interface of an existing local LAG cannot be added to a redundant Ethernet interface, and vice versa. The total maximum number of combined individual node LAG interfaces (ae) and redundant Ethernet (reth) interfaces per cluster is 128.

However, aggregated Ethernet interfaces and redundant Ethernet interfaces can coexist, because the functionality of a redundant Ethernet interface relies on the Junos OS aggregated Ethernet framework.

For more information, see *Understanding Chassis Cluster Redundant Ethernet Interface Link Aggregation Groups*.

Minimum Links

Redundant Ethernet interface configuration includes a **minimum-links** setting that allows you to set a minimum number of physical child links in a redundant Ethernet interface LAG that must be working on the primary node for the interface to be up. The default **minimum-links** value is 1. When the number of physical links on the primary node in a redundant Ethernet interface falls below the **minimum-links** value, the interface might be down even if some links are still working. For more information, see *Example: Configuring Chassis Cluster Minimum Links*.

Sub-LAGs

LACP maintains a point-to-point LAG. Any port connected to the third point is denied. However, a redundant Ethernet interface does connect to two different systems or two remote aggregated Ethernet interfaces by design.

To support LACP on redundant Ethernet interface active and standby links, a redundant Ethernet interface is created automatically to consist of two distinct sub-LAGs, where all active links form an active sub-LAG and all standby links form a standby sub-LAG.

In this model, LACP selection logic is applied and limited to one sub-LAG at a time. In this way, two redundant Ethernet interface sub-LAGs are maintained simultaneously while all the LACP advantages are preserved for each sub-LAG.

It is necessary for the switches used to connect the nodes in the cluster to have a LAG link configured and 802.3ad enabled for each LAG on both nodes so that the aggregate links are recognized as such and correctly pass traffic.

NOTE: **The redundant Ethernet interface LAG child links from each node in the chassis cluster must be connected to a different LAG at the peer devices. If a single peer switch is used to terminate the redundant Ethernet interface LAG, two separate LAGs must be used in the switch.**

Supporting Hitless Failover

With LACP, the redundant Ethernet interface supports hitless failover between the active and standby links in normal operation. The term *hitless* means that the redundant Ethernet interface state remains up during a failover.

The lacpd process manages both the active and standby links of the redundant Ethernet interfaces. A redundant Ethernet interface state remains up when the number of active up links is equal to or more than the number of minimum links configured. Therefore, to support hitless failover, the LACP state on the redundant Ethernet interface standby links must be collected and distributed before failover occurs.

Managing Link Aggregation Control PDUs

The protocol data units (PDUs) contain information about the state of the link. By default, aggregated and redundant Ethernet links do not exchange link aggregation control PDUs.

You can configure PDUs exchange in the following ways:

- Configure Ethernet links to actively transmit link aggregation control PDUs
- Configure Ethernet links to passively transmit PDUs, sending out link aggregation control PDUs only when they are received from the remote end of the same link

The local end of a child link is known as the actor and the remote end of the link is known as the partner. That is, the actor sends link aggregation control PDUs to its protocol partner that convey what the actor knows about its own state and that of the partner's state.

You configure the interval at which the interfaces on the remote side of the link transmit link aggregation control PDUs by configuring the **periodic** statement on the interfaces on the local side. It is the configuration on the local side that specifies the behavior of the remote side. That is, the remote side transmits link aggregation control PDUs at the specified interval. The interval can be **fast** (every second) or **slow** (every 30 seconds).

For more information, see "Example: Configuring LACP on Chassis Clusters" on page 300.

By default, the actor and partner transmit link aggregation control PDUs every second. 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.

Example: Configuring LACP on Chassis Clusters

This example shows how to configure LACP on chassis clusters.

Requirements

Before you begin:

Complete the tasks such as enabling the chassis cluster, configuring interfaces and redundancy groups. See *SRX Series Chassis Cluster Configuration Overview* and *Example: Configuring Chassis Cluster Redundant Ethernet Interfaces* for more details.

Overview

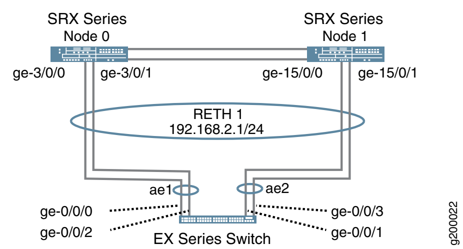
You can combine multiple physical Ethernet ports to form a logical point-to-point link, known as a link aggregation group (LAG) or bundle. You configure LACP on a redundant Ethernet interface of SRX series device in chassis cluster.

In this example, you set the LACP mode for the reth1 interface to active and set the link aggregation control PDU transmit interval to slow, which is every 30 seconds.

When you enable LACP, 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.

Figure 19 on page 301 shows the topology used in this example.

Figure 19: Topology for LAGs Connecting SRX Series Devices in Chassis Cluster to an EX Series Switch



In the Figure 19 on page 301, the ge-3/0/0 interface on SRX Series device is connected to ge-0/0/0 interface on EX Series switch and the ge-15/0/0 interface is connected to ge-0/0/1 on EX Series switch. For more information on EX Series switch configuration, see Configuring Aggregated Ethernet LACP (CLI Procedure).

Configuration

Step-by-Step Procedure

The following example requires you to navigate various levels in the configuration hierarchy. For instructions on how to do that, see the *CLI User Guide*.

To configure LACP on chassis clusters:

1. Bind redundant child physical interfaces to reth1.

```
[edit interfaces]
user@host# set interfaces ge-3/0/0 gigether-options redundant-parent reth1
user@host# set interfaces ge-3/0/1 gigether-options redundant-parent reth1
user@host# set interfaces ge-15/0/0 gigether-options redundant-parent reth1
user@host# set interfaces ge-15/0/1 gigether-options redundant-parent reth1
```

2. Add reth1 to redundancy group 1.

```
[edit interfaces]
user@host# set interfaces reth1 redundant-ether-options redundancy-group 1
```

3. Set the LACP on reth1.

```
[edit interfaces]
user@host# set interfaces reth1 redundant-ether-options lacp active
user@host# set interfaces reth1 redundant-ether-options lacp periodic slow
```

4. Assign an IP address to reth1.

```
[edit interfaces]
user@host# set interfaces reth1 unit 0 family inet address 192.168.2.1/24
```

5. If you are done configuring the device, commit the configuration.

```
[edit interfaces]
user@host# commit
```

Verification

Verifying LACP on Redundant Ethernet Interfaces

Purpose Display LACP status information for redundant Ethernet interfaces.

Action From operational mode, enter the **show lacp interfaces reth1** command.

```
user@host> show lacp interfaces reth1
Aggregated interface: reth1
    LACP state:       Role   Exp   Def  Dist  Col  Syn  Aggr  Timeout  Activity
      ge-15/0/0      Actor    No    No   Yes  Yes  Yes   Yes     Fast    Active
      ge-15/0/0    Partner    No    No   Yes  Yes  Yes   Yes     Fast    Active
      ge-15/0/1      Actor    No    No   Yes  Yes  Yes   Yes     Fast    Active
      ge-15/0/1    Partner    No    No   Yes  Yes  Yes   Yes     Fast    Active
      ge-3/0/0       Actor    No    No   Yes  Yes  Yes   Yes     Fast    Active
      ge-3/0/0     Partner    No    No   Yes  Yes  Yes   Yes     Fast    Active
      ge-3/0/1       Actor    No    No   Yes  Yes  Yes   Yes     Fast    Active
      ge-3/0/1     Partner    No    No   Yes  Yes  Yes   Yes     Fast    Active
     LACP protocol:       Receive State  Transmit State          Mux State
      ge-15/0/0                Current   Fast periodic Collecting distributing
      ge-15/0/1                Current   Fast periodic Collecting distributing
      ge-3/0/0                 Current   Fast periodic Collecting distributing
      ge-3/0/1                 Current   Fast periodic Collecting distributing
      {primary:node1}
```

The output shows redundant Ethernet interface information, such as the following:

- The LACP state—Indicates whether the link in the bundle is an actor (local or near-end of the link) or a partner (remote or far-end of the link).
- The LACP mode—Indicates whether both ends of the aggregated Ethernet interface are enabled (active or passive)—at least one end of the bundle must be active.
- The periodic link aggregation control PDU transmit rate.
- The LACP protocol state—Indicates the link is up if it is collecting and distributing packets.

Verifying LACP on Redundant Ethernet Interfaces

Purpose Display LACP status information for redundant Ethernet interfaces.

Action From operational mode, enter the **show lacp interfaces reth0** command.

```
user@host> show lacp interfaces reth0
Aggregated interface: reth0
    LACP state:       Role   Exp   Def  Dist  Col  Syn  Aggr  Timeout  Activity
      ge-11/0/0      Actor    No    No   Yes  Yes  Yes   Yes     Fast    Active
      ge-11/0/0    Partner    No    No   Yes  Yes  Yes   Yes     Fast    Active
      ge-11/0/1      Actor    No    No   Yes  Yes  Yes   Yes     Fast    Active
      ge-11/0/1    Partner    No    No   Yes  Yes  Yes   Yes     Fast    Active
      ge-11/0/2      Actor    No    No   Yes  Yes  Yes   Yes     Fast    Active
      ge-11/0/2    Partner    No    No   Yes  Yes  Yes   Yes     Fast    Active
      ge-11/0/3      Actor    No    No   Yes  Yes  Yes   Yes     Fast    Active
      ge-11/0/3    Partner    No    No   Yes  Yes  Yes   Yes     Fast    Active
      ge-3/0/0       Actor    No    No   Yes  Yes  Yes   Yes     Fast    Active
      ge-3/0/0     Partner    No    No   Yes  Yes  Yes   Yes     Fast    Active
      ge-3/0/1       Actor    No    No   Yes  Yes  Yes   Yes     Fast    Active
      ge-3/0/1     Partner    No    No   Yes  Yes  Yes   Yes     Fast    Active
      ge-3/0/2       Actor    No    No   Yes  Yes  Yes   Yes     Fast    Active
      ge-3/0/2     Partner    No    No   Yes  Yes  Yes   Yes     Fast    Active
      ge-3/0/3       Actor    No    No   Yes  Yes  Yes   Yes     Fast    Active
      ge-3/0/3     Partner    No    No   Yes  Yes  Yes   Yes     Fast    Active
    LACP protocol:        Receive State  Transmit State          Mux State
      ge-11/0/0                 Current   Fast periodic Collecting distributing
      ge-11/0/1                 Current   Fast periodic Collecting distributing
      ge-11/0/2                 Current   Fast periodic Collecting distributing
      ge-11/0/3                 Current   Fast periodic Collecting distributing
      ge-3/0/0                  Current   Fast periodic Collecting distributing
      ge-3/0/1                  Current   Fast periodic Collecting distributing
      ge-3/0/2                  Current   Fast periodic Collecting distributing
      ge-3/0/3                  Current   Fast periodic Collecting distributing
{primary:node1}
```

The output shows redundant Ethernet interface information, such as the following:

- The LACP state—Indicates whether the link in the bundle is an actor (local or near-end of the link) or a partner (remote or far-end of the link).
- The LACP mode—Indicates whether both ends of the aggregated Ethernet interface are enabled (active or passive)—at least one end of the bundle must be active.

- The periodic link aggregation control PDU transmit rate.
- The LACP protocol state—Indicates the link is up if it is collecting and distributing packets.

Related Documentation

- Example: Configuring LACP on Chassis Clusters on page 300
- Verifying LACP on Standalone Devices on page 296

LAG and LACP Support on SRX5000 Line Devices with I/O Cards (IOCs)

LAG and LACP Support on the SRX5000 Module Port Concentrator

The SRX5000 Module Port Concentrator (SRX5K-MPC) on SRX5400, SRX5600, and SRX5800 devices supports link aggregation groups (LAGs) and Link Aggregation Control Protocol (LACP).

Support for LAGs based on IEEE 802.3ad makes it possible to aggregate physical interface links on your device. LAGs provide increased interface bandwidth and link availability by linking physical ports and load-balancing traffic crossing the combined interface.

LACP provides a standardized means for exchanging information between partner (remote or far-end of the link) systems on a link. This exchange allows their link aggregation control instances to reach agreement on the identity of the LAG to which the link belongs, and then to move the link to that LAG. This exchange also enables the transmission and reception processes for the link to function in an orderly manner.

The following LAG and LACP features are supported on the SRX5K-MPC:

- Bandwidth aggregation—Increases bandwidth, provides graceful degradation as failure occurs, and increases availability.
- Link redundancy and load balancing (within chassis cluster)—Provides network redundancy by load-balancing traffic across all available links. If one of the links should fail, the system automatically load-balances traffic across all remaining links.
- Dynamic link management—Enables automatic addition and deletion of individual links to the aggregate bundle without user intervention.

LACP supports the following features:

- LACP bundles several physical interfaces to form one logical interface by exchanging LACP packets between the local interface and the remote interface. LACP monitors the link for changes in interface state by exchanging a periodic LACP heartbeat between two sides. Any changes in interface state are reflected in the LACP packet.
- Normally after an LACP is configured and committed, two sides start to exchange interface and port information. Once they identify each other and match the LACP state machine criteria, the LACP is declared as up. You can deactivate or delete the LACP configuration.

- By default, the LACP packets are exchanged in every second. You can configure the LACP interval as fast (every second) or slow (every 30 seconds) to ensure the health of the interfaces.
- LACP supports distributed and centralized modes. Chassis cluster setup is recommended to operate with LACP distributed mode, which handles chassis cluster failover better. The centralized mode might experience traffic loss during failover.

SRX5K-MPCs on SRX5000 line devices provide active and standby support with redundant Ethernet interface LAGs in chassis cluster deployments.

LAG and LACP Support on the SRX5000 Line IOCs in Express Path Mode

Starting in Junos OS Release 15.1X49-D40, the IOC2 and IOC3 cards on SRX5400, SRX5600, and SRX5800 devices support link aggregation groups (LAGs) and Link Aggregation Control Protocol (LACP) in Express Path mode.

You can use the links in a LAG as ingress or egress interfaces in Express Path mode. The LAG links can include links from cards such as IOC2 or IOC3. For a LAG link to qualify for Express Path, all its member links should be connected to Express Path-enabled network processors. If Express Path is disabled on any of the member links in a LAG, a regular session (non-Express Path session) is created.

NOTE:

- Cross-IOC LAG interfaces do not support Layer 2 transparent mode.
- Mixed interface speeds are not supported on the same aggregated bundle.
- A redundant Ethernet interface or aggregated Ethernet interface must contain child interfaces from the same IOC type. For example, if one child link is from 10-Gigabit Ethernet on IOC2, the second child link should also be from IOC2. Similarly, both child interfaces can be from IOC3. Configuring child interfaces by mixing links from both IOC2 and IOC3 is not supported.

Release History Table

Release	Description
15.1X49-D40	Starting in Junos OS Release 15.1X49-D40, the IOC2 and IOC3 cards on SRX5400, SRX5600, and SRX5800 devices support link aggregation groups (LAGs) and Link Aggregation Control Protocol (LACP) in Express Path mode.

Related Documentation

- Aggregated Ethernet Interfaces Configuration Overview on page 278
- Example: Configuring Link Aggregation Control Protocol (CLI Procedure) on page 292
- Example: Configuring LACP on Chassis Clusters on page 300

Example: Configuring LAG Interface on an SRX5000 Line Device with IOC2 or IOC3

Starting in Junos OS Release 15.15X49-D40, IEEE 802.3ad link aggregation enables you to group Ethernet interfaces to form a single, aggregated Ethernet interface. This single, aggregated Ethernet interface is also known as a LAG or bundle. The LACP provides additional functionality for LAGs.

This example shows how to configure LAG on an SRX Series device using the links from either IOC2 or IOC3 in Express Path mode.

Requirements

This example uses the following software and hardware components:

- Junos OS Release 15.1X49-D40 or later for SRX Series devices.
- SRX5800 with IOC2 or IOC3 with Express Path enabled on IOC2 and IOC3. For details, see *Example: Configuring SRX5K-MPC3-100G10G (IOC3) and SRX5K-MPC3-40G10G (IOC3) on an SRX5000 Line Device to Support Express Path*.

Overview

In this example, you create a logical aggregated Ethernet interface and define the parameters associated with the logical aggregated Ethernet interface, such as a logical unit, interface properties, and LACP. Next, define the member links to be contained within the aggregated Ethernet interface—for example, four 10-Gigabit Ethernet interfaces. Finally, configure an LACP for link detection.

The following member links are used in this example:

- xe-0/0/8
- xe-0/0/9
- xe-1/0/8
- xe-1/0/9
- xe-3/1/4
- xe-3/1/5
- xe-5/1/4
- xe-5/1/5

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, delete, and then copy and paste the commands into the CLI at the **[edit]** hierarchy level, and then enter **commit** from configuration mode.

```
set chassis aggregated-devices ethernet device-count 5
set interfaces xe-0/0/8 gigether-options 802.3ad ae1
set interfaces xe-0/0/9 gigether-options 802.3ad ae0
set interfaces xe-1/0/8 gigether-options 802.3ad ae1
set interfaces xe-1/0/9 gigether-options 802.3ad ae0
set interfaces xe-3/1/4 gigether-options 802.3ad ae1
set interfaces xe-3/1/5 gigether-options 802.3ad ae0
set interfaces xe-5/1/4 gigether-options 802.3ad ae1
set interfaces xe-5/1/5 gigether-options 802.3ad ae0
set interfaces ae0 unit 0 family inet address 17.0.0.1/24
set interfaces ae1 unit 0 family inet address 16.0.0.1/24
set interfaces ae0 aggregated-ether-options lacp active
set interfaces ae1 aggregated-ether-options lacp active
```

Step-by-Step Procedure

The following example requires you to navigate various levels in the configuration hierarchy. For instructions on how to do that, see the Junos OS CLI User Guide.

To configure LAG Interfaces:

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

```
[edit chassis]
user@host# set aggregated-devices ethernet device-count 5
```

2. Specify the members to be included within the aggregated Ethernet bundle.

```
[edit interfaces]
user@host# set xe-0/0/8 gigether-options 802.3ad ae1
user@host# set xe-0/0/9 gigether-options 802.3ad ae0
user@host# set xe-1/0/8 gigether-options 802.3ad ae1
user@host# set xe-1/0/9 gigether-options 802.3ad ae0
user@host# set xe-3/1/4 gigether-options 802.3ad ae1
user@host# set xe-3/1/5 gigether-options 802.3ad ae0
user@host# set xe-5/1/4 gigether-options 802.3ad ae1
user@host# set xe-5/1/5 gigether-options 802.3ad ae0
```

3. Assign an IP address to ae0 and ae1.

```
[edit interfaces]
user@host# set ae0 unit 0 family inet address 17.0.0.1/24
user@host# set ae1 unit 0 family inet address 16.0.0.1/24
```


4. Set the LACP on reth0.

```
[edit interfaces]
user@host# set ae0 aggregated-ether-options lacp active
user@host# set ae1 aggregated-ether-options lacp active
```

Results From configuration mode, confirm your configuration by entering the **show interfaces** command. If the output does not display the intended configuration, repeat the configuration instructions in this example to correct it.

```
[edit]
user@host# show interfaces
xe-0/0/8 {
  gigether-options {
    802.3ad ae1;
  }
}
xe-0/0/9 {
  gigether-options {
    802.3ad ae0;
  }
}
xe-1/0/8 {
  gigether-options {
    802.3ad ae1;
  }
}
xe-1/0/9 {
  gigether-options {
    802.3ad ae0;
  }
}
xe-3/1/4 {
  gigether-options {
    802.3ad ae1;
  }
}
xe-3/1/5 {
  gigether-options {
    802.3ad ae0;
  }
}
ae0 {
  aggregated-ether-options {
    lacp {
      active;
    }
  }
  unit 0 {
    family inet {
      address 17.0.0.1/24;
    }
```



```
    }
  }
  ae1 {
    aggregated-ether-options {
      lacp {
        active;
      }
    }
    unit 0 {
      family inet {
        address 16.0.0.1/24;
      }
    }
  }
```

```
[edit]
user@host# show chassis
aggregated-devices {
  ethernet {
    device-count 5;
  }
}
```

If you are done configuring the device, enter **commit** from configuration mode.

Verification

Verifying LACP on Redundant Ethernet Interfaces

Purpose Display LACP status information for redundant Ethernet interfaces.

Action From operational mode, enter the **show lacp interfaces** command to check that LACP has been enabled as active on one end.

user@host> **show lacp interfaces**

```
Aggregated interface: ae0
    LACP state:       Role   Exp   Def  Dist  Col  Syn  Aggr  Timeout  Activity
      xe-0/0/9       Actor    No    No   Yes  Yes  Yes   Yes     Fast    Active
      xe-0/0/9     Partner    No    No   Yes  Yes  Yes   Yes     Fast    Active
      xe-1/0/9       Actor    No    No   Yes  Yes  Yes   Yes     Fast    Active
      xe-1/0/9     Partner    No    No   Yes  Yes  Yes   Yes     Fast    Active
      xe-3/1/5       Actor    No    No   Yes  Yes  Yes   Yes     Fast    Active
      xe-3/1/5     Partner    No    No   Yes  Yes  Yes   Yes     Fast    Active
      xe-5/1/5       Actor    No    No   Yes  Yes  Yes   Yes     Fast    Active
      xe-5/1/5     Partner    No    No   Yes  Yes  Yes   Yes     Fast    Active
    LACP protocol:        Receive State  Transmit State          Mux State
      xe-0/0/9                  Current   Fast periodic Collecting distributing
      xe-1/0/9                  Current   Fast periodic Collecting distributing
      xe-3/1/5                  Current   Fast periodic Collecting distributing
      xe-5/1/5                  Current   Fast periodic Collecting distributing

Aggregated interface: ae1
    LACP state:       Role   Exp   Def  Dist  Col  Syn  Aggr  Timeout  Activity
```

```
   xe-0/0/8       Actor    No    No    Yes  Yes  Yes   Yes     Fast    Active
   xe-0/0/8     Partner    No    No    Yes  Yes  Yes   Yes     Fast    Active
   xe-1/0/8       Actor    No    No    Yes  Yes  Yes   Yes     Fast    Active
   xe-1/0/8     Partner    No    No    Yes  Yes  Yes   Yes     Fast    Active
   xe-3/1/4       Actor    No    No    Yes  Yes  Yes   Yes     Fast    Active
   xe-3/1/4     Partner    No    No    Yes  Yes  Yes   Yes     Fast    Active
   xe-5/1/4       Actor    No    No    Yes  Yes  Yes   Yes     Fast    Active
   xe-5/1/4     Partner    No    No    Yes  Yes  Yes   Yes     Fast    Active
  LACP protocol:       Receive State  Transmit State         Mux State
   xe-0/0/8                  Current   Fast periodic Collecting distributing
   xe-1/0/8                  Current   Fast periodic Collecting distributing
   xe-3/1/4                  Current   Fast periodic Collecting distributing
   xe-5/1/4                  Current   Fast periodic Collecting distributing
```

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

Release History Table

Release	Description
15.1X49-D40	Starting in Junos OS Release 15.15X49-D40, IEEE 802.3ad link aggregation enables you to group Ethernet interfaces to form a single, aggregated Ethernet interface.

Related Documentation

- Understanding LACP on Chassis Clusters on page 298
- Verifying LACP on Redundant Ethernet Interfaces on page 303

Example: Configuring Aggregated Ethernet Device with LAG and LACP on a Security Device (CLI Procedure)

Requirements

No special configuration beyond device initialization is required before configuring this feature.

Overview

This example shows the configuration of aggregated Ethernet (ae) devices with LAG and LACP.

Configuration

Step-by-Step Procedure

To configure LAG:

1. Configure the number of aggregated Ethernet interfaces with LAG interface that you need to create. Set the device-count option to 5.

   ```
   [edit]
   user@host# set chassis aggregated-devices ethernet device-count 5
   ```

2. Add a port to the aggregated Ethernet interface with LAG.

   ```
   [edit]
   user@host# set interfaces ge-2/0/1 ether-options 802.3ad ae0
   user@host# set interfaces ge-2/0/2 ether-options 802.3ad ae0
   ```

3. Configure LACP for the aggregated Ethernet interface with LAG.

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

4. Configure family Ethernet switching for the aggregated Ethernet interface with LAG.

   ```
   [edit]
   user@host# set interfaces ae0 unit 0 family ethernet-switching
   ```

5. Configure the VLAN vlan20 with VLAN ID 20.

   ```
   [edit]
   user@host# set vlans vlan20 vlan-id 20
   ```

6. Add the aggregated Ethernet interface to the VLAN.

   ```
   [edit]
   user@host# set vlans vlan20 interface ae0
   ```

7. Check the configuration by entering the **show vlans** and **show interfaces** commands

   ```
   user@host# show vlans
   vlan20 {
       vlan-id 20;
       interface {
           ae0.0;
       }
   }
   ```

```
user@host# show interfaces
ge-2/0/1 {
    ether-options {
        802.3ad ae0;
    }
}
ge-2/0/2 {
    ether-options {
        802.3ad ae0;
    }
}
ae0 {
    aggregated-ether-options {
        lacp {
            active;
        }
    }
    unit 0 {
        family ethernet-switching;
    }
}
```

8. If you are done configuring the device, commit the configuration.

```
[edit]
user@host# commit
```

NOTE: Likewise, you can configure other devices with LAG and LACP.

Verification

Verifying Aggregated Ethernet Interface with LAG and LACP

Purpose Verify that you can configure aggregated Ethernet interfaces with LAG and LACP.

Action From configuration mode, enter the **show lacp interfaces** to view the LACP interfaces.

```
user@host# run show lacp interfaces
Aggregated interface: ae0
    LACP state:       Role   Exp   Def  Dist  Col  Syn  Aggr  Timeout  Activity
      ge-2/0/1      Actor    No    No   Yes  Yes  Yes   Yes     Fast    Active
      ge-2/0/1    Partner    No    No   Yes  Yes  Yes   Yes     Fast    Active
      ge-2/0/2      Actor    No    No   Yes  Yes  Yes   Yes     Fast    Active
      ge-2/0/2    Partner    No    No   Yes  Yes  Yes   Yes     Fast    Active
    LACP protocol:        Receive State  Transmit State          Mux State
      ge-2/0/1                Current   Fast periodic Collecting distributing
      ge-2/0/2                Current   Fast periodic Collecting distributing
```


From configuration mode, enter the **show vlans** command to view the VLAN interfaces.

```
user@host# run show vlans
Name           Tag     Interfaces
default         1      None
vlan20          20     ae0.0
```

From configuration mode, enter the **show interfaces (interface name)** command to view the status of the ge-2/0/1 and ge-2/0/2 interfaces.

```
user@host# run show interfaces ge-2/0/1 terse
Interface               Admin Link Proto    Local                 Remote
ge-2/0/1                up    up
ge-2/0/1.0              up    up   aenet    --> ae0.0
```

```
user@host# run show interfaces ge-2/0/2 terse
Interface               Admin Link Proto    Local                 Remote
ge-2/0/2                up    up
ge-2/0/2.0              up    up   aenet    --> ae0.0
```

Meaning The output shows the aggregated Ethernet Interface with LAG and LACP is configured.

Related Documentation

- Understanding Aggregated Ethernet Interfaces on page 275
- Understanding LACP on Standalone Devices on page 291
- Example: Configuring Link Aggregation Control Protocol (CLI Procedure) on page 292

CHAPTER 16

Configuring Gigabit Ethernet Physical Interface Modules

Understanding the 1-Port Gigabit Ethernet SFP Mini-PIM

Small form-factor pluggables (SFPs) are hot-pluggable modular interface transceivers for Gigabit and Fast Ethernet connections. Gigabit Ethernet SFP Mini-PIMs can be used in copper and optical environments to provide maximum flexibility when upgrading from an existing infrastructure to Metro Ethernet.

The 1-Port Gigabit Ethernet SFP Mini-PIM interfaces a single Gigabit Ethernet device or a network. It supports a variety of transceivers with data speeds of 10-Mbps/100-Mbps/1-Gbps with extended LAN or WAN connectivity.

Transceivers are hot-swappable.

This topic includes the following sections:

Supported Features

The following features are supported on the 1-Port Gigabit Ethernet SFP Mini-PIM:

- 10-Mbps/100-Mbps/1-Gbps link speed
- Half-duplex/full-duplex support

- Autonegotiation
- Encapsulations
- Maximum transmission unit (MTU) size of 1514 bytes (default) and 9010 bytes (jumbo frames)
- Loopback
- Transceivers are hot-swappable

Interface Names and Settings

The following format is used to represent the 1-Port Gigabit Ethernet SFP Mini-PIM interface names:

type-fpc/pic/port

Where:

- type—Media type (ge)
- fpc—Number of the Flexible PIC Concentrator (FPC) card on which the physical interface is located
- pic—Number of the PIC on which the physical interface is located (0)
- port—Specific port on a PIC (0)

Examples: **ge-1/0/0** and **ge-2/0/0**

By default, the interfaces on the ports on the uplink module installed on the device are enabled. You can also specify the MTU size for the Gigabit Ethernet interface. Junos OS supports values from 256 through 9010. The default MTU size for Gigabit Ethernet interfaces is 1514.

Available Link Speeds and Modes

The 1-Port Gigabit Ethernet SFP Mini-PIM supports the following link speeds:

- **10m**—Sets the link speed to 10 Mbps.
- **100m**—Sets the link speed to 100 Mbps.
- **1g**—Sets the link speed to 1 Gbps.

The 1-Port Gigabit Ethernet SFP Mini-PIM supports the following link modes:

- **Full-duplex**—Allows bidirectional communication at a given point in time.
- **Half-duplex**—Allows single directional communication at a given point in time.

Link Settings

The 1-Port Gigabit Ethernet SFP Mini-PIM includes the following link settings:

- **auto-negotiation**—Enables autonegotiation of link mode and speed.

> NOTE: By default, autonegotiation is enabled. To disable autonegotiation, use **set gigether-options no-autonegotiation**
>
> We recommend enabling autonegotiation.

- **loopback**—Enables loopback.
- **no-auto-negotiation**—Disables autonegotiation of link mode and speed.
- **no-loopback**—Disables loopback.

By default a link speed of 1 Gbps in full-duplex mode is supported.

> NOTE: On SRX340 High Memory devices, traffic might stop between the SRX340 device and the Cisco switch due to link mode mismatch. We recommend setting the same value to the autonegotiation parameters on both ends.

> NOTE: On SRX300 devices, the link goes down when you upgrade FPGA on 1-Port Gigabit Ethernet SFP mini-PIM. As a workaround, run the **restart fpc** command and restart the FPC.

Related Documentation

- Understanding Ethernet Interfaces on page 255
- Example: Configuring the 1-Port Gigabit Ethernet SFP Mini-PIM Interface on page 317

Example: Configuring the 1-Port Gigabit Ethernet SFP Mini-PIM Interface

This example shows how to perform basic configuration for the 1-Port Gigabit Ethernet SFP Mini-PIM.

Requirements

Before you begin:

- Establish basic connectivity. See the *Getting Started Guide* for your device.
- Configure network interfaces as necessary. See “Example: Creating an Ethernet Interface” on page 261.

Overview

In this example, you configure the ge-2/0/0 interface, set the operating speed to 100 Mbps, and define a logical interface that you can connect to the 1-Port Gigabit Ethernet SFP Mini-PIM. You also set the MTU value to 9010 and set the link option to no-loopback.

Configuration

CLI Quick Configuration

To quickly configure this example, copy the following command, paste it into a text file, remove any line breaks, change any details necessary to match your network configuration, copy and paste the command into the CLI at the **[edit]** hierarchy level, and then enter **commit** from configuration mode.

```
set interfaces ge-2/0/0 link-mode full-duplex speed 100m
set interface ge-2/0/0 gigether-options no-loopback
```

Configuring Physical Properties

GUI Step-by-Step Procedure

To quickly configure the physical properties of a 1-Port Gigabit Ethernet SFP Mini-PIM using J-Web, use the following steps:

1. Select **Configure > Interfaces**.
2. Under Interface, select **ge-2/0/0** and then click **Edit**. A pop-up window appears.
3. In the Description box, type the description for the SFP Mini-PIM.
4. In the MTU box, type **9010**.
5. From the Speed list, select **100Mbps**.
6. From the Link-mode list, select **Full-duplex**.
7. Select the Enable Auto-negotiation checkbox.
8. Select the Enable Per Unit Scheduler checkbox.
9. Click **OK**

Disabling the Interface

GUI Step-by-Step Procedure

To disable the 1-Port Gigabit Ethernet SFP Mini-PIM using J-Web, use the following steps:

1. Select **Configure > Interfaces** .
2. Under Interface, select **ge-2/0/0** and then click **Disable**.

Configuring Logical Properties

GUI Step-by-Step Procedure

To quickly configure the logical properties of a 1-Port Gigabit Ethernet SFP Mini-PIM using J-Web, use the following steps:

1. Select **Configure > Interfaces**.
2. Under Interface, select **ge-2/0/0.0,** and then click **Add Logical Interface**. A pop-up window appears.
3. In the Unit box, type **0**.
4. In the Description box, type a description for the SFP Mini-PIM.
5. From the Zone list, select **untrust**.
6. To edit the family protocol type to the Mini-PIM interfaces, select the IPv4 tab, and then select **Enable address configuration**.
7. Click **Add,** and then type IPv4 address.
8. Click **OK**.

Editing Logical Properties

Step-by-Step Procedure

To quickly configure the physical properties of a 1-Port Gigabit Ethernet SFP Mini-PIM using J-Web:

1. Under Interface, select the logical interface added to the 1-Port Gigabit Ethernet SFP Mini-PIM and then click **Edit**. A pop-up window appears.
2. Under Interface, select **ge-2/0/0.0,** and then click **Edit Logical Interface**. A pop-up window appears.
3. From the Zone list, select **trust**.

4. To enable DHCP client on the interface, select the IPv4 tab and then select **Enable DHCP**.

5. Click **OK**.

NOTE: You cannot add or edit Description and Unit for a logical interface.

Deleting the Logical Interface

GUI Step-by-Step Procedure

To delete the logical interface of 1–Port Gigabit Ethernet SFP Mini-PIM using J-Web,

1. Select **Configure > Interfaces**.

2. Under Interface, select **ge-2/0/0.0,** and then click **Delete**.

Configuring a 1-Port Gigabit Ethernet SFP Mini-PIM

Step-by-Step Procedure

The following example requires you to navigate various levels in the configuration hierarchy. For instructions on how to do that, see *Using the CLI Editor in Configuration Mode* in the *CLI User Guide*.

To configure a 1-Port Gigabit Ethernet SFP Mini-PIM:

1. Configure the interface.

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

2. Set the operating link-mode full-duplex speed of 100 Mbps for the SFP Mini-PIM.

```
[edit interfaces ge-2/0/0]
user@host# set link-mode full-duplex speed 100m
```

3. Assign the MTU value.

```
[edit interfaces ge-2/0/0]
user@host# set mtu 9010
```

4. Add the logical interface.

```
[edit interfaces ge-2/0/0]
user@host# set unit 0 family inet address 14.1.1.1/24
```

5. Set the link options.

```
[edit interfaces ge-2/0/0]
user@host# set gigether-options no-loopback
```

Results From configuration mode, confirm your configuration by entering the **show interfaces ge-2/0/0** command. If the output does not display the intended configuration, repeat the configuration instructions in this example to correct it.

```
[edit]
  user@host# show interfaces ge-2/0/0
  mtu 9010;
  speed 100m;
  gigether-options {
  no-loopback;
}
unit 0 {
  family inet {
  14.1.1.1/24
  }
}
```

If you are done configuring the device, enter **commit** from configuration mode.

Verification

Confirm that the configuration is working properly.

- Verifying That the Correct Hardware Is Installed on page 321
- Verifying the FPC Status on page 322
- Verifying the Interface Settings on page 323

Verifying That the Correct Hardware Is Installed

Purpose Verify that the 1-Port Gigabit Ethernet SFP Mini-PIM is installed on the device.

Action From operational mode, enter the **show chassis hardware** command.

```
user@host> show chassis hardware detail
Hardware inventory:
Item             Version  Part number  Serial number     Description
Chassis                                AG0309AA0004      SRX240b
Routing Engine   REV 16   750-021792   VL3180            RE-SRX240B
  da0      999 MB  ST72682                               Nand Flash
  usb0 (addr 1)  DWC OTG root hub 0    vendor 0x0000     uhub0
  usb0 (addr 2)  product 0x005a 90  vendor 0x0409     uhub1
  usb0 (addr 3)  ST72682  High Speed Mode 64218 STMicroelectronics umass0
FPC 0                                                    FPC
  PIC 0                                                  16x GE Base PIC
FPC 1                     750-023367   112009000278      FPC
```

```
  PIC 0                                                   1x T1E1 mPIM
FPC 2            REV 00    750-03273    AABC5081         FPC
  PIC 0                                                  1x GE High-Perf SFP mPIM

    Xcvr 0       REV 02    740-011612    9101465          SFP-T
FPC 4                      750-029145    122009000061     FPC
PIC 0                                                    1x GE SFP mPIM
    Xcvr 0       REV 01    740-011782    PBL0C3T          SFP-SX
Power Supply 0
```

Verify that the output contains the following values:

- **FPC 2, PIC 0** —1x GE High-Perf SFP mPIM
- **FPC 4, PIC 0** —1x GE SFP mPIM

NOTE: In the example shown above, the output for 1-Port SFP Mini-Physical Interface Module is displayed as 1X GE SFP mPIM and the output for 1-Port Gigabit Ethernet SFP Mini-Physical Interface Module is displayed as 1X GE High-Perf SFP mPIM.

NOTE: The 1-Port GE SFP Mini-PIM is installed in the second slot of the device chassis; therefore the output displayed is 1x GE High-Perf SFP mPIM and the Flexible PIC Concentrator (FPC) used here is fpc 2.

The 1-Port SFP Mini-PIM is installed in the fourth slot of the device chassis; therefore the output displayed is 1x GE SFP mPIM and Flexible PIC Concentrator (FPC) used here is fpc 4.

Verifying the FPC Status

Purpose Verify the FPC status.

Action From operational mode, enter the **show chassis fpc** command.

```
show@host> show chassis fpc
                      Temp  CPU Utilization (%)   Memory    Utilization (%)
Slot State            (C)  Total  Interrupt     DRAM (MB) Heap     Buffer
  0  Online          -------------------- CPU less FPC --------------------
  1  Online          -------------------- CPU less FPC --------------------
  2  Online          -------------------- CPU less FPC --------------------
  3  Empty
  4  Online          -------------------- CPU less FPC --------------------
```


The output should show the FPC status as online.

The 1-Port SFP Mini-PIM is installed in the fourth slot of the device chassis; the output shows the FPC status for slot 4 as online.

The 1-Port Gigabit Ethernet SFP Mini-PIM is installed in the second slot of the device chassis; the output shows the FPC status for slot 2 as online.

Verifying the Interface Settings

Purpose Verify that the interface is configured as expected.

Action From operational mode, enter the **show interface ge-2/0/0** command.

```
user@host# run show interfaces ge-2/0/0
Physical interface: ge-2/0/0, Enabled, Physical link is Up
  Interface index: 156, SNMP ifIndex: 552
  Link-level type: Ethernet, MTU: 9010, Link-mode: Full-duplex, Speed: 100mbps,
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
  Current address: 00:22:83:99:ac:f2, Hardware address: 00:22:83:99:ac:f2
  Last flapped   : 2010-08-17 12:20:33 UTC (00:00:20 ago)
  Input rate     : 0 bps (0 pps)
  Output rate    : 0 bps (0 pps)
  Active alarms  : None
  Active defects : None

  Logical interface ge-2/0/0.0 (Index 88) (SNMP ifIndex 557)
    Flags: SNMP-Traps Encapsulation: ENET2
    Input packets : 108
    Output packets: 1
    Security: Zone: Null
    Protocol inet, MTU: 8996
      Flags: Sendbcast-pkt-to-re
      Addresses, Flags: Is-Preferred Is-Primary
        Destination: 14.1.1/24, Local: 14.1.1.1, Broadcast: 14.1.1.255
```

Verify the following information in the command output:

- Physical interface—ge-2/0/0, Enabled, Physical link is Up
- MTU—9010; Link-mode—Full-duplex
- Speed—100 Mbps
- Loopback—Disabled

Related Documentation

- Understanding Ethernet Interfaces on page 255
- Understanding the 1-Port Gigabit Ethernet SFP Mini-PIM on page 315

Understanding the 2-Port 10-Gigabit Ethernet XPIM

The 10-Gigabit Ethernet (also known as 10GBASE-T or IEEE 802.3an) is a telecommunication technology that offers data speeds up to 10 billion bits per second over unshielded or shielded twisted pair cables.

The 2-Port 10-Gigabit Ethernet Physical Interface Module (XPIM) is a 2 x 10GBASE-T / SFP+ XPIM line card. (SFP+ is a fiber optic transceiver module designed for 10-Gigabit Ethernet and 8.5 Gbps-fiber channel systems.) The 2-Port 10-Gigabit Ethernet XPIM provides a front-end interface connection that includes the following ports:

- 2 X copper ports. The copper ports support 10GBASE-T running with CAT6A or CAT7 Ethernet cable for up to 100 meters.
- 2 X fiber (SFP+) ports. The fiber ports support SFP+ multiple 10G modules.

The 2-Port 10-Gigabit Ethernet XPIM provides interconnects for LANs, WANs, and metropolitan area networks (MANs). The XPIM provides multiple service levels (1-Gigabit Ethernet to 10-Gigabit Ethernet in increments) and a single connection option for a wide range of customer needs and applications.

NOTE: **By default, the 2-Port 10-Gigabit Ethernet XPIM ports comes up in fiber mode, while autonegotiation is not supported.**

This topic includes the following sections:

Supported Features

The following features are supported on the 2-Port 10-Gigabit Ethernet XPIM:

- Multiple SFP+ 10G modules and the following SFP modules:
  - SFPP-10GE-SR
  - SFPP-10GE-LR
  - SFPP-10GE-ER
  - SFPP-10GE-LRM

- Copper TWIN-AX 1M and Copper TWIN-AX 3M
- Online Insertion and Removal (OIR) functionality
- Link speeds of up to 10-Gbps
- Full-duplex and half-duplex modes
- Flow control
- Autonegotiation and autosensing
- Quality of service (QoS)

Interface Names and Settings

The following format is used to represent the 2-Port 10-Gigabit Ethernet XPIM interface names:

type-fpc/pic/port

Where:

- type — Media type (xe)
- fpc — Number of the Flexible PIC Concentrator (FPC) card on which the physical interface is located
- pic — Number of the PIC on which the physical interface is located (0)
- port — Specific port on a PIC (0 or 1)

By default, the interfaces (for example, **xe-6/0/0** or **xe-2/0/0**) on the ports on the uplink module installed on the device are enabled. You can also specify the maximum transmission unit (MTU) size for the Gigabit Ethernet interface. Junos OS supports values from 256 through 9192. The default MTU for Gigabit Ethernet interfaces is 1514.

Copper and Fiber Operating Modes

On the 2-Port 10-Gigabit Ethernet XPIM, one copper port and one fiber port is grouped together as port 0, and another copper port and fiber port are grouped as port 1. Only two ports can be active at the same time (one port from port 0 and another port from port 1).

The 2-Port 10-Gigabit Ethernet XPIM can be configured to operate in two copper mode, two fiber mode, or mixed mode (one copper and one fiber). In mixed mode, the two ports should be from different port groups (one port from port 1 and the other from port 2).

Link Speeds

The 2-Port 10-Gigabit Ethernet XPIM ports support the following link speeds for copper and fiber:

- Copper—10/100/1000 Mbps or 10Gbps (full duplex). Half-duplex is only for 10/100 Mbps.
- Fiber—1000 Mbps or 10 Gbps (full duplex). Half-duplex mode is not supported.

To set the link speeds, use the following options:

- **10m**—Sets the link speed to 10 Mbps.
- **10g**—Sets the link speed to 10 Gbps.
- **100m**—Sets the link speed to 100 Mbps.
- **1g**—Sets the link speed to 1 Gbps.

Link Settings

The 2-Port 10-Gigabit Ethernet XPIM includes the following link settings:

- **802.3ad**—Specifies an aggregated Ethernet bundle.
- **auto-negotiation**—Enables autonegotiation of flow control, link mode, and speed.
- **loopback**—Enables loopback.
- **no-auto-negotiation**—Disables autonegotiation of flow control, link mode, and speed.
- **no-loopback**—Disables loopback.

By default, flow control is enabled on all ports, a link speed of 10 Gbps in full duplex is supported, autonegotiation is disabled on the fiber ports, and autonegotiation is enabled on copper ports.

NOTE: Autonegotiation is not supported when the 2-Port 10-Gigabit Ethernet XPIM is operating in fiber mode at a link speed of 10 Gbps.

Related Documentation

- Understanding Ethernet Interfaces on page 255
- Example: Configuring the 2-Port 10-Gigabit Ethernet XPIM Interface on page 326

Example: Configuring the 2-Port 10-Gigabit Ethernet XPIM Interface

This example shows how to perform basic configuration for the 1-Port Gigabit Ethernet SFP Mini-PIM.

- Requirements on page 326
- Overview on page 327
- Configuration on page 327
- Verification on page 329

Requirements

Before you begin:

- Establish basic connectivity. See the *Getting Started Guide* for your device.

- Configure network interfaces as necessary. See “Example: Creating an Ethernet Interface” on page 261.

Overview

In this example, you configure the xe-6/0/0 interface, set the operating mode to copper mode, set the operating speed to 10 Gbps, and define a logical interface that you can connect to the 2-Port 10-Gigabit Ethernet XPIM. Additionally, you set the MTU value to 1514, set the link option to no loopback, and enable the interface.

Configuration

CLI Quick Configuration

To quickly configure this example, copy the following command, paste it into a text file, remove any line breaks, change any details necessary to match your network configuration, copy and paste the command into the CLI at the **[edit]** hierarchy level, and then enter **commit** from configuration mode.

```
set interfaces xe-6/0/0 media-type copper speed 10g unit 0 family inet mtu 1514
set interface xe-6/0/0 gigether-options no-loopback
```

Step-by-Step Procedure

The following example requires you to navigate various levels in the configuration hierarchy. For instructions on how to do that, see *Using the CLI Editor in Configuration Mode* in the *CLI User Guide*.

To configure a 2-Port 10-Gigabit Ethernet XPIM:

1. Configure the interface.

```
[edit]
user@host# edit interfaces xe-6/0/0
```

2. Configure the operating mode.

```
[edit interfaces xe-6/0/0]
user@host# set media-type copper
```

3. Set the operating speed for the XPIM.

```
[edit interfaces xe-6/0/0]
user@host# set speed 10g
```

4. Add the logical interface.

```
[edit interfaces xe-6/0/0]
user@host# set unit 0 family inet
```

5. Assign the physical interface MTU value.


```
[edit interfaces xe-6/0/0]
user@host# set interface xe-6/0/0 mtu 1514
```

6. Assign the logical interface MTU value.

```
[edit interfaces xe-6/0/0]
user@host# set unit 0 family inet mtu 1500
```

7. Set the link options.

```
[edit interfaces xe-6/0/0]
user@host# set gigether-options no-loopback
```

8. Disable the interface.

```
[edit interfaces xe-6/0/0]
user@host# set disable
```

9. Enable the interface.

```
[edit interfaces xe-6/0/0]
user@host# delete disable
```

Results From configuration mode, confirm your configuration by entering the **show interfaces xe-6/0/0** command. If the output does not display the intended configuration, repeat the configuration instructions in this example to correct it.

```
[edit]
   user@host# show interfaces xe-6/0/0
   speed 10g;
   media-type copper;
   gigether-options {
   no-loopback;
}
unit 0 {
   family inet {
   mtu 1514;
   }
}
```

If you are done configuring the device, enter **commit** from configuration mode.

Verification

Confirm that the configuration is working properly.

Verifying That the Correct Hardware Is Installed

Purpose Verify that the 2-Port 10-Gigabit Ethernet XPIM is installed on the device.

Action From operational mode, enter the **show chassis hardware** command.

```
Hardware inventory:
Item      Version   Part number  Serial number   Description
Chassis             AJ0309AC0047   SRX650
Midplane    REV 04   710-023875   TV3993
System IO    REV 04   710-023209   TV4035     SRXSME System IO
Routing Engine  REV 01   710-023224   DT5109     RE-SRXSME-SRE6
FPC 0                    FPC
PIC 0                    4x GE Base PIC
FPC 2                    FPC
PIC 0                    2x 10G gPIM
FPC 6                    FPC
PIC 0                    2x 10G gPIM
Power Supply 0  REV 01   740-024283   TA00049WSSSS   PS 645W AC
```

Verify that the output contains the following values:

- **FPC 2 , PIC 0**—2x 10G gPIM
- **FPC 6, PIC 0**—2x 10G gPIM

Verifying the FPC Status

Purpose Verify the FPC status.

Action From operational mode, enter the **show chassis fpc** command.

```
   Temp   CPU Utilization  (%)  Memory   Utilization (%)
Slot State   (C)   Total Interrupt    DRAM (MB)  Heap Buffer
0 Online   -------------------- CPU less FPC --------------------
1 Empty
2 Online   -------------------- CPU less FPC --------------------
3 Empty
4 Empty
5 Empty
6 Online   -------------------- CPU less FPC --------------------
7 Empty
8 Empty
```

The output should display FPC status as online.

Verifying the Interface Settings

Purpose Verify that the interface is configured as expected.

Action From operational mode, enter the **show interface xe-6/0/0** command.

```
Physical interface: xe-6/0/0, Enabled, Physical link is Up
 Interface index: 144, SNMP ifIndex: 501
 Link-level type: Ethernet, MTU: 1514, Link-mode: Full-duplex, Speed: 10Gbps,
 BPDU Error: None, MAC-REWRITE Error: None, Loopback: Disabled,
 Source filtering: Disabled, Flow control: Enabled
 Device flags : Present Running
 6 Copyright © 2010, Juniper Networks, Inc.
 Interface flags: SNMP-Traps Internal: 0x0
 Link flags : None
 CoS queues : 8 supported, 8 maximum usable queues
 Current address: 00:1f:12:e0:80:a8, Hardware address: 00:1f:12:e0:80:a8
 Last flapped : 1970-01-01 00:34:22 PST (07:26:29 ago)
 Input rate : 0 bps (0 pps)
 Output rate : 0 bps (0 pps)
 Active alarms : None
 Active defects : None

Logical interface xe-6/0/0.0 (Index 72) (SNMP ifIndex 503)
 Flags: SNMP-Traps Encapsulation: ENET2
 Input packets : 25
 Output packets: 25
 Security: Zone: HOST
 Allowed host-inbound traffic : any-service bfd bgp dvmrp igmp ldp msdp nhrp
 ospf pgm pim rip router-discovery rsvp sap vrrp
 Protocol inet, MTU: 1500
 Flags: Sendbcast-pkt-to-re
 Addresses, Flags: Is-Preferred Is-Primary
 Destination: 10.10.10/24, Local: 10.10.10.10, Broadcast: 10.10.10.255
```

Verify the following information in the command output:

- Physical interface—xe-6/0/0, Enabled, Physical link is Up
- MTU—1514
- Link mode—Full duplex
- Speed—10 Gbps
- Loopback—Disabled
- Flow control—Enabled

Related Documentation

- Understanding the 2-Port 10-Gigabit Ethernet XPIM on page 324

- Understanding Ethernet Interfaces on page 255

Understanding the 8-Port Gigabit Ethernet SFP XPIM

A Gigabit Ethernet Physical Interface Module (XPIM) is a network interface card (NIC) that installs in the front slots of the SRX550 Services Gateway to provide physical connections to a LAN or a WAN.

NOTE: **Starting in Junos OS Release 15.1X49-D10, the 8-Port Gigabit Ethernet SFP XPIM is not supported on legacy SRX Series systems. In Junos OS Release 15.1X49-D30, support for the 8-Port Gigabit Ethernet SFP XPIM is restored for SRX550 Service Gateway systems.**

Small form-factor pluggables (SFPs) are hot-pluggable modular interface transceivers for gigabit and Fast Ethernet connections. The 8-port SFP Gigabit Ethernet interface enables customers to connect to Ethernet WAN services as well as to local servers at gigabit speed.

Supported Features

The following features are supported on the 8-Port Gigabit Ethernet SFP XPIM:

- Operates on both a slot with a maximum bandwidth of 8 gigabits and a slot with a maximum bandwidth of 1 gigabit
- Operates in tri-rate (10/100/1000 Mbps) mode with copper SFPs
- Routing and switched mode operation
- Layer 2 protocols
  - Link Aggregation Control Protocol (LACP)
  - Link Layer Discovery Protocol (LLDP)
  - GARP VLAN Registration Protocol (GVRP)
  - Internet Group Management Protocol (IGMP) snooping (v1 and v2)
  - Spanning Tree Protocol (STP), Real-Time Streaming Protocol (RTSP), and Multiple Spanning Tree Protocol (MSTP)
  - 802.1x
- Encapsulation (supported at the Physical Layer)
  - ethernet-bridge
  - ethernet-ccc
  - ethernet-tcc
  - ethernet-vpls
  - extended-vlan-ccc

  - extended-vlan-tcc
  - flexible-ethernet-services
  - vlan-ccc
- Q in Q VLAN tagging
- Integrated routing and bridging (IRB)
- Jumbo frames (9192 byte size)
- Chassis cluster switching
- Chassis cluster fabric link using GE ports

NOTE:

The following Layer 2 switching features are not supported when the 8-Port Gigabit Ethernet SFP XPIM is plugged in slots with speeds of less than 1 gigabit:

- **Q in Q VLAN tagging**
- **Link aggregation using ports across multiple XPIMs**

Interface Names and Settings

The following format is used to represent the 8-Port SFP XPIM:

type-fpc/pic/port

Where:

- type—Media type (ge)
- fpc—Number of the Flexible PIC Concentrator (FPC) card where the physical interface resides
- pic—Number of the PIC where the physical interface resides (0)
- port—Specific port on a PIC (0)

Examples: **ge-1/0/0** and **ge-2/0/0**

By default, the interfaces on the ports on the uplink module installed on the device are enabled. You can also specify the maximum transmission unit (MTU) size for the XPIM. Junos OS supports values from 256 through 9192. The default MTU size for the 8-Port Gigabit Ethernet SFP XPIM is 1514.

Release History Table

Release	Description
15.1X49-D10	Starting in Junos OS Release 15.1X49-D10, the 8-Port Gigabit Ethernet SFP XPIM is not supported on legacy SRX Series systems.

Related Documentation

- Example: Configuring 8-Port Gigabit Ethernet SFP XPIMs on page 333

Example: Configuring 8-Port Gigabit Ethernet SFP XPIMs

This example shows how to perform a basic back-to-back device configuration with 8-port Gigabit Ethernet small form-factor pluggable (SFP) XPIMs. It describes a common scenario in which SFP XPIMs are deployed.

NOTE: Starting in Junos OS Release 15.1X49-D10, the 8-Port Gigabit Ethernet SFP XPIM is not supported on legacy SRX Series systems. In Junos OS Release 15.1X49-D30, support for the 8-Port Gigabit Ethernet SFP XPIM is restored for SRX550 Service Gateway systems.

Requirements

This example uses the following hardware and software components:

- Junos OS Release 12.1X44-D10 or later for SRX Series Services Gateways.
- Two SRX650 devices connected back-to-back.
- Two 8-port Gigabit Ethernet SFP XPIMs.
- Eight pairs of SFP transceivers as mentioned in *8-Port Gigabit Ethernet SFP XPIM Supported Modules* and eight cables to connect them.

Before you begin:

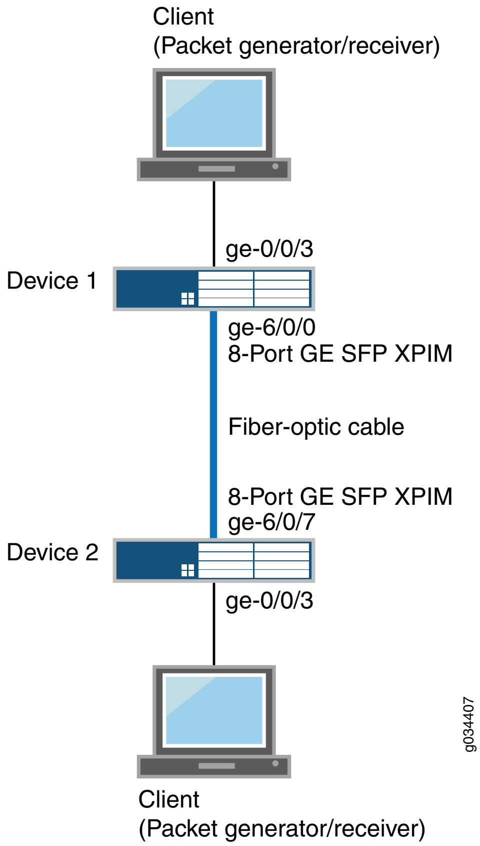
- Establish basic connectivity. See the Getting Started Guide for your device.
- Configure network interfaces as necessary. See “Example: Creating an Ethernet Interface” on page 261.

Overview and Topology

In this example, you configure two SRX650 devices. On each device you configure eight interfaces (ge-6/0/0 through ge-6/0/7), set the maximum transmission unit (MTU) value to 9192, and define a logical interface that you can connect to the 8-port SFP XPIM.

Figure 20 on page 334 shows the topology used in this example.

Figure 20: Basic Back-to-Back Device Configuration



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.

Device 1

```
set interfaces ge-6/0/0 mtu 9192
set interfaces ge-6/0/0 unit 0 family inet address 10.1.1.1/24
set interfaces ge-6/0/1 mtu 9192
set interfaces ge-6/0/1 unit 0 family inet address 11.1.1.1/24
set interfaces ge-6/0/2 mtu 9192
set interfaces ge-6/0/2 unit 0 family inet address 12.1.1.1/24
set interfaces ge-6/0/3 mtu 9192
set interfaces ge-6/0/3 unit 0 family inet address 13.1.1.1/24
set interfaces ge-6/0/4 mtu 9192
set interfaces ge-6/0/4 unit 0 family inet address 14.1.1.1/24
set interfaces ge-6/0/5 mtu 9192
set interfaces ge-6/0/5 unit 0 family inet address 15.1.1.1/24
set interfaces ge-6/0/6 mtu 9192
set interfaces ge-6/0/6 unit 0 family inet address 16.1.1.1/24
```

```
set interfaces ge-6/0/7 mtu 9192
set interfaces ge-6/0/7 unit 0 family inet address 17.1.1.1/24
```

Device 2

```
set interfaces ge-6/0/0 mtu 9192
set interfaces ge-6/0/0 unit 0 family inet address 10.1.1.2/24
set interfaces ge-6/0/1 mtu 9192
set interfaces ge-6/0/1 unit 0 family inet address 11.1.1.2/24
set interfaces ge-6/0/2 mtu 9192
set interfaces ge-6/0/2 unit 0 family inet address 12.1.1.2/24
set interfaces ge-6/0/3 mtu 9192
set interfaces ge-6/0/3 unit 0 family inet address 13.1.1.2/24
set interfaces ge-6/0/4 mtu 9192
set interfaces ge-6/0/4 unit 0 family inet address 14.1.1.2/24
set interfaces ge-6/0/5 mtu 9192
set interfaces ge-6/0/5 unit 0 family inet address 15.1.1.2/24
set interfaces ge-6/0/6 mtu 9192
set interfaces ge-6/0/6 unit 0 family inet address 16.1.1.2/24
set interfaces ge-6/0/7 mtu 9192
set interfaces ge-6/0/7 unit 0 family inet address 17.1.1.2/24
```

Step-by-Step Procedure

The following example requires you to navigate various levels in the configuration hierarchy. For instructions on how to do that, see *Using the CLI Editor in Configuration Mode*.

To configure the interfaces on Device 1:

1. Configure the interface.

```
[edit]
user@host# set interfaces ge-6/0/0
```

2. Assign the maximum transmission unit value for the interface.

```
[edit interfaces ge-6/0/0]
user@host# set mtu 9192
```

3. Add the logical interface.

```
[edit interfaces ge-6/0/0]
user@host# set unit 0 family inet address 10.1.1.1/24
```

NOTE: Repeat these steps for the remaining seven ports on Device 1.

Step-by-Step Procedure

To configure the interfaces on Device 2:

1. Configure the interface.

```
[edit]
user@host# edit interfaces ge-6/0/0
```

2. Assign the maximum transmission unit value for the interface.

```
[edit interfaces ge-6/0/0]
user@host# set mtu 9192
```

3. Add the logical interface.

```
[edit interfaces ge-6/0/0]
user@host# set unit 0 family inet address 10.1.1.2/24
```

NOTE: Repeat these steps for the remaining seven ports on Device 2.

Results

From configuration mode, confirm your configuration by entering the **show interfaces** command. If the output does not display the intended configuration, repeat the configuration instructions in this example to correct it.

Device 1

```
[edit]
user@host# show interfaces
ge-6/0/0 {
  mtu 9192;
  unit 0 {
    family inet {
      address 10.1.1.1/24;
    }
  }
}
ge-6/0/1 {
  mtu 9192;
  unit 0 {
    family inet {
      address 11.1.1.1/24;
    }
  }
}
ge-6/0/2 {
  mtu 9192;
  unit 0 {
    family inet {
      address 12.1.1.1/24;
    }
```

```
    }
}
ge-6/0/3 {
    mtu 9192;
    unit 0 {
        family inet {
            address 13.1.1.1/24;
        }
    }
}
ge-6/0/4 {
    mtu 9192;
    unit 0 {
        family inet {
            address 14.1.1.1/24;
        }
    }
}
ge-6/0/5 {
    mtu 9192;
    unit 0 {
        family inet {
            address 15.1.1.1/24;
        }
    }
}
ge-6/0/6 {
    mtu 9192;
    unit 0 {
        family inet {
            address 16.1.1.1/24;
        }
    }
}
ge-6/0/7 {
    mtu 9192;
    unit 0 {
        family inet {
            address 17.1.1.1/24;
        }
    }
}
```

Device 2

```
[edit]
user@host# show interfaces
ge-6/0/0 {
    mtu 9192;
    unit 0 {
        family inet {
            address 10.1.1.2/24;
        }
    }
}
```



```
ge-6/0/1 {
  mtu 9192;
  unit 0 {
    family inet {
      address 11.1.1.2/24;
    }
  }
}
ge-6/0/2 {
  mtu 9192;
  unit 0 {
    family inet {
      address 12.1.1.2/24;
    }
  }
}
ge-6/0/3 {
  mtu 9192;
  unit 0 {
    family inet {
      address 13.1.1.2/24;
    }
  }
}
ge-6/0/4 {
  mtu 9192;
  unit 0 {
    family inet {
      address 14.1.1.2/24;
    }
  }
}
ge-6/0/5 {
  mtu 9192;
  unit 0 {
    family inet {
      address 15.1.1.2/24;
    }
  }
}
ge-6/0/6 {
  mtu 9192;
  unit 0 {
    family inet {
      address 16.1.1.2/24;
    }
  }
}
ge-6/0/7 {
  mtu 9192;
  unit 0 {
    family inet {
      address 17.1.1.2/24;
    }
  }
```

```
}
```

If you are done configuring the device, enter **commit** from configuration mode.

Verification

Confirm that the configuration is working properly.

Verifying the Hardware was Properly Installed

Purpose Verify that the 8-Port Gigabit Ethernet SFP XPIM is installed on the device.

Action From operational mode, enter the **show chassis hardware** command.

```
user@host> show chassis hardware detail
Hardware inventory:
Item             Version  Part number  Serial number     Description
Chassis                                AJ3009AA0001      SRX650
Midplane         REV 08   710-023875   AAAK0059
System IO        REV 08   710-023209   AAAJ9290          SRXSME System IO
Routing Engine   REV 13   750-023223   AAAJ1987          RE-SRXSME-SRE6
  ad0     2000 MB  CF 2GB              2009A     0000194075 Compact Flash
  usb0 (addr 1)  DWC OTG root hub 0    vendor 0x0000     uhub0
  usb0 (addr 2)  product 0x005a 90     vendor 0x0409     uhub1
FPC 0                                                    FPC
  PIC 0                                                  4x GE Base PIC
FPC 1            REV 03   750-038290   AADL2016          FPC
FPC 5                                                    FPC
  PIC 0                                                  8x GE SFP gPIM
FPC 6            REV 03   750-037551   AAEC8065          FPC
  PIC 0                                                  8x GE SFP gPIM
    Xcvr 0       REV 01   740-013111   8043353           SFP-T
    Xcvr 1                NON-JNPR     PC602QW           SFP-SX
    Xcvr 2       k        NON-JNPR     BDS3I             SFP-1000BASE-BX10-D
    Xcvr 3       REV 01   740-011612   9XT702501080      SFP-LH
    Xcvr 4       REV 01   740-011612   9XT702501079      SFP-LH
    Xcvr 5                NON-JNPR     PCH2GTJ           SFP-SX
    Xcvr 6                NON-JNPR     PC604DL           SFP-SX
    Xcvr 7       REV 01   740-011620   5349504           SFP-FX
FPC 8            REV 00   750-038290                     FPC
Power Supply 0
```

Meaning The output displays the hardware details of the device and a list of all interfaces configured.

Verify that the output contains the following values:

- **FPC 5, PIC 0** —8x SFP gPIM
- **FPC 6, PIC 0** —8x SFP gPIM

NOTE: In the example, the output for 8-Port SFP Gigabit Ethernet XPIM is displayed as 8x GE SFP gPIM.

Verifying the FPC Status

Purpose Verify that the status of the Flexible PIC Concentrator is online.

Action From operational mode, enter the **show chassis fpc pic-status** command.

```
user@host>  show chassis fpc pic-status
Slot 0   Online       FPC
  PIC 0  Online       4x GE Base PIC
Slot 1   Present      FPC
Slot 5   Online       FPC
  PIC 0  Online       8x GE SFP gPIM
Slot 6   Online       FPC
  PIC 0  Online       8x GE SFP gPIM
Slot 8   Present      FPC
```

Meaning The output shows the FPC status for slot 5 and slot 6 as online. The 8-Port Gigabit Ethernet SFP XPIM is installed in slot 5 and slot 6 of the device.

Verifying Interface Link Status on Device 1

Purpose Verify that the interface link status is up.

Action From operational mode, enter the **show interface terse ge-6/0/*** command.

```
user@host> show interface terse ge-6/0/*
```

Output for Device 1

```
Interface               Admin Link Proto    Local                 Remote
ge-6/0/0                up    up
ge-6/0/0.0              up    up   inet     10.1.1.1/24
```



```
ge-6/0/1                up    up
ge-6/0/1.0              up    up   inet     11.1.1.1/24
ge-6/0/2                up    up
ge-6/0/2.0              up    up   inet     12.1.1.1/24
ge-6/0/3                up    up
ge-6/0/3.0              up    up   inet     13.1.1.1/24
ge-6/0/4                up    up
ge-6/0/4.0              up    up   inet     14.1.1.1/24
ge-6/0/5                up    up
ge-6/0/5.0              up    up   inet     15.1.1.1/24
ge-6/0/6                up    up
ge-6/0/6.0              up    up   inet     16.1.1.1/24
ge-6/0/7                up    up
ge-6/0/7.0              up    up   inet     17.1.1.1/24
```

Meaning The output displays a list of all interfaces configured.

If the link displays **up** for all interfaces, the configuration is working properly. This verifies that the XPIM is up and end-to-end ping is working.

Verifying the Interface Settings on Device 1

Purpose Verify that the interfaces are configured as expected.

Action From operational mode, enter the **show interface ge-6/0/0 extensive | no-more** command.

```
user@host>show interface ge-6/0/0 extensive | no-more
```

Output for Device 1

```
Physical interface: ge-6/0/0, Enabled, Physical link is Up
  Interface index: 152, SNMP ifIndex: 544, Generation: 155
  Link-level type: Ethernet, MTU: 9192, 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
  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: 00:26:88:04:0a:a8, Hardware address: 00:26:88:04:0a:a8
  Last flapped   : 2012-07-05 21:58:46 PDT (00:13:29 ago)
  Statistics last cleared: Never
  Traffic statistics:
   Input  bytes  :                  228                    0 bps
   Output bytes  :                  540                    0 bps
   Input  packets:                    3                    0 pps
   Output packets:                    6                    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
Egress queues: 8 supported, 4 in use
Queue counters:       Queued packets  Transmitted packets      Dropped packets

  0 best-effort                    3                    3                    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
MAC statistics:                      Receive         Transmit
  Total octets                           268              268
  Total packets                            3                3
  Unicast packets                          3                2
  Broadcast packets                        0                1
  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: 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: 6
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-6/0/0.0 (Index 81) (SNMP ifIndex 509) (Generation 146)
    Flags: 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
    Security: Zone: HOST
    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 :        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: 9178, Generation: 162, Route table: 0
      Flags: Sendbcast-pkt-to-re
      Addresses, Flags: Is-Preferred Is-Primary
        Destination: 10.1.1/24, Local: 10.1.1.1, Broadcast: 10.1.1.255,
        Generation: 176
```

Meaning The output displays a list of all interface verification parameters.

Verify the following information in the command output:

- Physical Interface—ge-6/0/0, enabled, physical link is **Up**
- MTU—9192
- Speed—1000 Mbps

If the verification parameters are as expected, the configuration is working properly.

Verifying Interface Link Status on Device 2

Purpose Verify that the interface link status is up.

Action From operational mode, enter the **show interface terse ge-6/0/*** command.

```
user@host> show interface terse ge-6/0/*
```

Output for Device 2

```
Interface               Admin Link Proto    Local                 Remote
ge-6/0/0                up    up
ge-6/0/0.0              up    up   inet     10.1.1.2/24
ge-6/0/1                up    up
ge-6/0/1.0              up    up   inet     11.1.1.2/24
ge-6/0/2                up    up
ge-6/0/2.0              up    up   inet     12.1.1.2/24
ge-6/0/3                up    up
ge-6/0/3.0              up    up   inet     13.1.1.2/24
ge-6/0/4                up    up
ge-6/0/4.0              up    up   inet     14.1.1.2/24
ge-6/0/5                up    up
ge-6/0/5.0              up    up   inet     15.1.1.2/24
ge-6/0/6                up    up
ge-6/0/6.0              up    up   inet     16.1.1.2/24
ge-6/0/7                up    up
ge-6/0/7.0              up    up   inet     17.1.1.2/24
```

Meaning The output displays a list of all interfaces configured.

If the link displays **up** for all interfaces, the configuration is working properly. This verifies that the XPIM is up and end-to-end ping is working.

Verifying the Interface Settings on Device 2

Purpose Verify that the interfaces are configured as expected.

Action From operational mode, enter the **show interface ge-6/0/0 extensive | no-more** command.

```
user@host>show interface ge-6/0/0 extensive | no-more
```

Output for Device 2

```
Physical interface: ge-6/0/0, Enabled, Physical link is Up
  Interface index: 144, SNMP ifIndex: 520, Generation: 147
  Link-level type: Ethernet, MTU: 9192, 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
  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: 00:24:dc:17:2f:a8, Hardware address: 00:24:dc:17:2f:a8
  Last flapped   : 2012-07-05 21:59:42 PDT (00:15:32 ago)
  Statistics last cleared: Never
  Traffic statistics:
   Input  bytes  :                  228                    0 bps
   Output bytes  :                  294                    0 bps
   Input  packets:                    3                    0 pps
   Output packets:                    5                    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: 13, 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                    3                    3                    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
  MAC statistics:                      Receive         Transmit
    Total octets                           268              268
    Total packets                            3                3
    Unicast packets                          2                3
    Broadcast packets                        1                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: 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: 6
  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-6/0/0.0 (Index 73) (SNMP ifIndex 509) (Generation 146)
    Flags: 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
    Security: Zone: HOST
    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 :        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: 9178, Generation: 162, Route table: 0
      Flags: Sendbcast-pkt-to-re
      Addresses, Flags: Is-Preferred Is-Primary
        Destination: 10.1.1/24, Local: 10.1.1.2, Broadcast: 10.1.1.255,
        Generation: 176
```

Meaning The output displays a list of all interface verification parameters.

Verify the following information in the command output:

- Physical Interface—ge-6/0/0, enabled, physical link is **Up**
- MTU—9192
- Speed—1000 Mbps

If the verification parameters are as expected, the configuration is working properly.

Release History Table

Release	Description
15.1X49-D10	Starting in Junos OS Release 15.1X49-D10, the 8-Port Gigabit Ethernet SFP XPIM is not supported on legacy SRX Series systems.

Related Documentation

- Understanding the 8-Port Gigabit Ethernet SFP XPIM on page 331

CHAPTER 17

Configuring Port Mirroring

Understanding Port Mirroring on SRX Devices

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

Port mirroring is used to send a copy of all the packets or only the sampled packets seen on a port to a network monitoring connection. You can mirror the packets either on the incoming port (ingress port mirroring) or the outgoing port (egress port mirroring).

NOTE: Port mirroring is supported only on the SRX devices with the following I/O cards:

- SRX1K-SYSIO-GE
- SRX1K-SYSIO-XGE
- SRX3K-SFB-12GE
- SRX3K-2XGE-XFP
- SRX5K-FPC-IOC Flex I/O

On SRX devices, all packets passing through the **mirrored** port are copied and sent to the specified **mirror-to** port. These ports must be on the same Broadcom chipset in the I/O cards.

NOTE: On SRX devices, port mirroring works on physical interfaces only.

Related Documentation

- Configuring Port Mirroring on SRX Devices on page 271

Configuring Port Mirroring on SRX Devices

To configure port mirroring on an SRX device, you must first configure the **forwarding-options** and **interfaces** at the **[edit]** hierarchy level.

You must configure the **forwarding-options** statement to define an instance of the **mirror-to** port for port mirroring and also configure the interface to be mirrored.

NOTE: The mirrored port and the mirror-to port must be under the same Broadcom chipset in a I/O card.

To configure port mirroring:

1. Specify the **rate** and **run-length** at the **[edit forwarding-options port-mirroring input]** hierarchy level:

   NOTE:
   - **rate**: Ratio of packets to be sampled (1 out of *N*) (1 through 65535)
   - **run-length**: Number of samples after initial trigger (0 through 20)

   ```
   [edit]
     forwarding-options
       port-mirroring {
           input {
             rate number;
             run-length number;
           }
         }
   ```

2. To send the copies of the packet to the **mirror-to** port, include the **interface** ***intf-name*** statement at the **[edit forwarding-options port-mirroring family any output]** hierarchy level.

   ```
   output {
     interface intf-name;
   }
   ```

   NOTE: Port mirroring on SRX devices uses **family any** to transfer the **mirror-to** port information to the Packet Forwarding Engine (PFE). The mirroring engine copies all the packets from **mirrored** port to the **mirror-to** port.

NOTE: You can configure an **instance** clause to specify multiple **mirror-to** ports.

To mirror an interface, include the **port-mirror-instance** statement at the **[edit interface mirrored-intf-name]** hierarchy level.

The mirrored interface is configured with an instance name, defined in the **forwarding-options**. The **mirrored** port and the **mirror-to** port are linked through that instance.

```
instance {
   inst-name {
      input {
         rate number;
         run-length number;
      }
      family any {
         output {
            interface intf-name;
         }
      }
   }
}
interfaces
      mirrored-intf-name {
         port-mirror-instance instance-name;
      }
```

NOTE: Port mirroring on SRX devices does not differentiate the traffic direction, but mirrors the ingress and egress samples together.

A sample configuration for port mirroring is shown below:

```
mirror port ge-1/0/2 to port ge-1/0/9.0
forwarding-options
   port-mirroring {
      input {
         rate 1;
         run-length 10;
      }
      family any {
         output {
            interface ge-1/0/9.0;
         }
      }
      instance {
         inst1 {
            input {
               rate 1;
```



```
                run-length 10;
            }
            family any {
                output {
                    interface ge-1/0/9.0;
                }
            }
        }
    }
interfaces {
    ge-1/0/2 {
        port-mirror-instance inst1;
    }
}
```

Related Documentation

Understanding Port Mirroring on SRX Devices on page 260

CHAPTER 18

Configuring Ethernet OAM Link Fault Management

Understanding Ethernet OAM Link Fault Management for SRX Series Services Gateways

Starting in Junos OS Release 15.1X49-D70, Ethernet OAM link fault management for SRX Series services gateways is supported on SRX300, SRX320, SRX340, SRX345, SRX550M, and SRX1500 devices.

The Ethernet interfaces on SRX Series devices support the IEEE 802.3ah standard for Operation, Administration, and Maintenance (OAM). 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 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.

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. 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 device 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 convey Link Fault (a loss of signal), Dying Gasp (an unrecoverable condition such as a power failure), and Critical Event (an unspecified vendor-specific critical event). You can specify the periodic OAM PDU sending interval for fault detection. SRX Series devices use 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—Remote loopback mode ensures link quality between the device 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 data terminal equipment (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.

Table 33 on page 354 lists the interfaces modes supported.

Table 33: Supported Interface Modes

Interfaces	Mode
Physical interface (fe/ge)	Family • ccc • ethernet-switching • inet6 • inet • iso • mpls • tcc
	IFD encapsulations • ethernet-ccc • extended-vlan-ccc (IFD vlan-tagging mode) • ethernet-tcc • extended-vlan-tcc

Table 33: Supported Interface Modes (continued)

Interfaces	Mode
Aggregated Ethernet interface (Static or LACP lag)	Family • ethernet-switching • inet • mpls • iso • inet6
	IFD encapsulations • ethernet-ccc • extended-vlan-ccc (IFD vlan-tagging mode) • vlan-ccc

Related Documentation

- Example: Configuring Ethernet OAM Link Fault Management on a Security Device on page 355

Example: Configuring Ethernet OAM Link Fault Management on a Security Device

Starting in Junos OS Release 15.1X49-D70, configuring Ethernet OAM link fault management is supported on SRX300, SRX320, SRX340, SRX345, SRX550M, and SRX1500 devices.

The Ethernet interfaces on the SRX Series devices support the IEEE 802.3ah standard for Operation, Administration, and Maintenance (OAM). 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 or Fast Ethernet interface:

Requirements

This example uses the following hardware and software components:

- Junos OS Release 12.1 R2 or later for SRX Series Services Gateways
- Any two models of SRX Series devices connected directly

Before you begin:

- Establish basic connectivity. See the Getting Started Guide for your device.

- Configure network interfaces as necessary. See “Example: Creating an Ethernet Interface” on page 261.
- Ensure that you configure the interfaces as per the interface modules listed in “Understanding Ethernet OAM Link Fault Management for SRX Series Services Gateways” on page 353

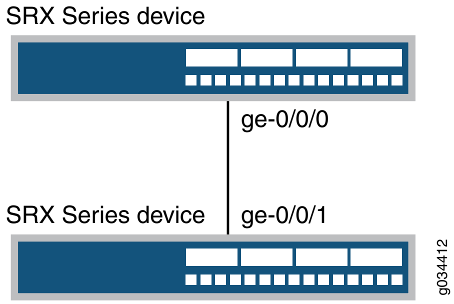
Overview

The Ethernet interfaces on the SRX Series devices support the IEEE 802.3ah standard for Operation, Administration, and Maintenance (OAM). 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 SRX Series devices connected directly. Before you begin configuring Ethernet OAM LFM on these two devices, connect the two devices directly through supported interfaces. See “Understanding Ethernet OAM Link Fault Management for SRX Series Services Gateways” on page 353.

Figure 21 on page 356 shows the topology used in this example.

Figure 21: Ethernet LFM with SRX Series Devices



NOTE: For more information about configuring Ethernet OAM Link Fault Management, see Junos® OS Ethernet Interfaces.

Configuration

To configure Ethernet OAM LFM, perform these tasks:

- Configuring Ethernet OAM Link Fault Management on Device 1 on page 356
- Configuring Ethernet OAM Link Fault Management on Device 2 on page 358

Configuring Ethernet OAM Link Fault Management on Device 1

CLI Quick Configuration

To quickly configure this example, copy the following command, paste it into a text file, remove any line breaks, change any details necessary to match your network configuration, copy and paste the command into the CLI at the **[edit]** hierarchy level, and then enter **commit** from configuration mode.


```
set protocols oam ethernet link-fault-management interface ge-0/0/0
set protocols oam ethernet link-fault-management interface ge-0/0/0 pdu-interval 800
set protocols oam ethernet link-fault-management interface ge-0/0/0 link-discovery
  active
```

Step-by-Step Procedure

The following example requires you to navigate various levels in the configuration hierarchy. For instructions on how to do that, see *Using the CLI Editor in Configuration Mode* in the Junos OS CLI User Guide.

To configure Ethernet OAM LFM on device 1:

1. Enable IEEE 802.3ah OAM support.

   ```
   [edit protocols oam ethernet link-fault-management]
   user@device1# set interface ge-0/0/0
   ```

2. Set the periodic OAM PDU-sending interval (in milliseconds) for fault detection.

   ```
   [edit protocols oam ethernet link-fault-management]
   user@device1# set interface pdu-interval 800
   ```

3. Specify that the interface initiates the discovery process.

   ```
   [edit protocols oam ethernet link-fault-management]
   user@device1# set interface ge-0/0/0 link-discovery active
   ```

Results

From configuration mode, confirm your configuration by entering the **show protocols** command. If the output does not display the intended configuration, repeat the configuration instructions in this example to correct it.

```
[edit]
user@device1# show protocols
protocols {
  oam {
    ethernet {
      link-fault-management {
        interface ge-0/0/0 {
          pdu-interval 800;
          link-discovery active;
        }
      }
    }
  }
}
```

Configuring Ethernet OAM Link Fault Management on Device 2

CLI Quick Configuration

To quickly configure this example, copy the following command, paste it into a text file, remove any line breaks, change any details necessary to match your network configuration, copy and paste the command into the CLI at the **[edit]** hierarchy level, and then enter **commit** from configuration mode.

```
set protocols oam ethernet link-fault-management interface ge-0/0/1
set protocols oam ethernet link-fault-management interface ge-0/0/1 pdu-interval 800
set protocols oam ethernet link-fault-management interface ge-0/0/1 negotiation-options
  allow-remote-loopback
```

Step-by-Step Procedure

To configure Ethernet OAM LFM on device 2:

1. Enable OAM on the peer interface.

   ```
   [edit protocols oam ethernet link-fault-management]
   user@device2# set interface ge-0/0/1
   ```

2. Set the periodic OAM PDU-sending interval (in milliseconds) for fault detection.

   ```
   [edit protocols oam ethernet link-fault-management]
   user@device2# set interface ge-0/0/1 pdu-interval 800
   ```

3. Enable remote loopback support for the local interface.

   ```
   [edit protocols oam ethernet link-fault-management]
   user@device2# set interface ge-0/0/1 negotiation-options allow-remote-loopback
   ```

Results

From configuration mode, confirm your configuration by entering the **show protocols** command. If the output does not display the intended configuration, repeat the configuration instructions in this example to correct it.

```
[edit]
user@device2# show protocols
protocols {
  oam {
    ethernet {
      link-fault-management {
        interface ge-0/0/1 {
          negotiation-options {
            allow-remote-loopback;
          }
        }
      }
    }
  }
```



```
}
```

Verification

Verify the OAM LFM Configuration

Purpose Verify that OAM LFM is configured properly.

Action From operational mode, enter the **show oam ethernet link-fault-management** command.

```
user@device1> show oam ethernet link-fault-management
```

```
Interface: ge-0/0/0.0
Status: Running, Discovery state: Send Any
Peer address: 2001:bd8:00:31
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 The output displays the MAC address and the discovery state is **Send Any** if OAM LFM has been configured properly.

Related Documentation

- Understanding Ethernet OAM Link Fault Management for SRX Series Services Gateways on page 353

Example: Configuring Remote Loopback Mode on VDSL Interfaces on a Security Device

Starting in Junos OS Release 15.1X49-D110, configuring remote loopback mode in Ethernet OAM link fault management (LFM) on a VDSL interface is supported on SRX320, SRX340, SRX345, and SRX550M devices.

This example describes the following configuration scenarios:

Starting in Junos OS Release 12.3X48-D65, configuring remote loopback mode in Ethernet OAM link fault management (LFM) on a VDSL interface is supported on SRX210, SRX220, SRX240, and SRX550 devices.

This example describes the following configuration scenarios:

- Scenario 1: Configuring remote loopback mode on a VDSL interface.

- Scenario 2: Configuring remote loopback mode on a VDSL interface acting as a PPPOE's underlying interface.

Requirements

This example uses the following hardware and software components:

- Junos OS Release 15.1X49-D110 or later for SRX Series Services Gateways
- An SRX 210/220/240/320/340/345/550/550M device connected with a DSLAM

Before you begin:

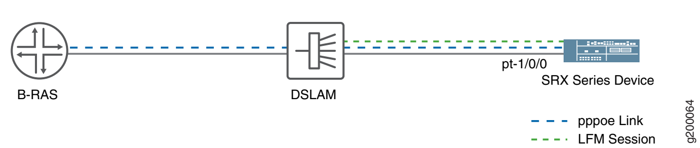
- Establish basic connectivity. See the Getting Started Guide for your device.
- Configure network interfaces as necessary. See "Example: Configuring VDSL2 Interfaces (Basic)" on page 216.
- Ensure that you configure the interfaces as per the interface modules listed in "Understanding Ethernet OAM Link Fault Management for SRX Series Services Gateways" on page 353
- Ensure that you configure PPPOE as per the instructions listed in "Example: Configuring PPPoE Interfaces" on page 433

Overview

This example uses an SRX Series device connected to a DSLAM. Before you begin configuring Ethernet OAM LFM on these two devices, connect the two devices directly through supported interfaces. See "Understanding Ethernet OAM Link Fault Management for SRX Series Services Gateways" on page 353.

Figure 21 on page 356 shows the topology used in this example.

Figure 22: Ethernet LFM with SRX Series Devices



NOTE: For more information about configuring Ethernet OAM Link Fault Management, see Junos® OS Ethernet Interfaces.

Configuration for Scenario 1

To configure remote loopback mode on a VDSL interface, perform these tasks:

- Configuring Remote Loopback Mode on a VDSL interface of an SRX Series Device on page 361

Configuring Remote Loopback Mode on a VDSL interface of an SRX Series Device

CLI Quick Configuration

To quickly configure this example, copy the following command, paste it into a text file, remove any line breaks, change any details necessary to match your network configuration, copy and paste the command into the CLI at the **[edit]** hierarchy level, and then enter **commit** from configuration mode.

```
set protocols oam ethernet link-fault-management interface pt-1/0/0
set protocols oam ethernet link-fault-management interface pt-1/0/0 negotiation-options
  allow-remote-loopback
```

Step-by-Step Procedure

To configure remote loopback mode on a VDSL interface of an SRX Series device:

1. Enable OAM on a VDSL interface.

   ```
   [edit protocols oam ethernet link-fault-management]
   user@device2# set interface pt-1/0/0
   ```

2. Enable remote loopback support for the interface.

   ```
   [edit protocols oam ethernet link-fault-management]
   user@device2# set interface pt-1/0/0 negotiation-options allow-remote-loopback
   ```

Results

From configuration mode, confirm your configuration by entering the **show protocols** command. If the output does not display the intended configuration, repeat the configuration instructions in this example to correct it.

```
[edit]
user@device2# show protocols
protocols {
  oam {
    ethernet {
      link-fault-management {
        interface pt-1/0/0 {
          negotiation-options {
            allow-remote-loopback;
          }
        }
      }
    }
  }
```

```
}
```

Configuration for Scenario 2

To configure remote loopback mode on a PPPOE's underlying interface, perform these tasks:

- Configuring Remote Loopback Mode on a PPPOE's underlying interface on page 362

Configuring Remote Loopback Mode on a PPPOE's underlying interface

CLI Quick Configuration

To quickly configure this example, copy the following command, paste it into a text file, remove any line breaks, change any details necessary to match your network configuration, copy and paste the command into the CLI at the **[edit]** hierarchy level, and then enter **commit** from configuration mode.

```
set interfaces pp0 unit 0 pppoe-options underlying-interface pt-1/0/0
set protocols oam ethernet link-fault-management interface pt-1/0/0 link-discovery
  active
set protocols oam ethernet link-fault-management interface pt-1/0/0 negotiation-options
  allow-remote-loopback
```

Step-by-Step Procedure

To configure remote loopback mode on a PPPOE's underlying interface:

1. Create the PPPoE interface pp0 and specify the logical PT interface pt-1/0/0 as the underlying interface.

   ```
   [edit protocols oam ethernet link-fault-management]
   user@device2# set interfaces pp0 unit 0 pppoe-options underlying-interface
     pt-1/0/0
   ```

2. Specify that the interface initiates the discovery process.

   ```
   user@device2# set protocols oam ethernet link-fault-management interface
     pt-1/0/0 link-discovery active
   ```

3. Enable remote loopback mode.

   ```
   user@device2# set protocols oam ethernet link-fault-management interface
     pt-1/0/0 negotiation-options allow-remote-loopback
   ```

Results

From configuration mode, confirm your configuration by entering the **show protocols** command. If the output does not display the intended configuration, repeat the configuration instructions in this example to correct it.

```
[edit]
user@device2# show protocols
```



```
protocols {
    oam {
        ethernet {
            link-fault-management {
                interface pt-1/0/0 {
                    link-discovery active;
                    negotiation-options {
                        allow-remote-loopback;
                    }
                }
            }
        }
    }
}
```

Verification

Verify the OAM LFM Configuration

Purpose Verify that OAM LFM is configured properly.

Action From operational mode, enter the **show oam ethernet link-fault-management** command.

```
user@device1> show oam ethernet link-fault-management
```

```
Interface: pt-1/0/0.0
Status: Running, Discovery state: Send Any
Transmit interval: 300ms, PDU threshold: 3 frames, Hold time: 900ms
Peer address: 2001:db8:e5:b9:c8:ed
Flags:Remote-Stable Remote-State-Valid Local-Stable 0x50
Loopback tracking: Disabled, Loop status: Unknown
Remote entity information:
Remote MUX action: forwarding, Remote parser action: forwarding
Discovery mode: active, Unidirectional mode: unsupported
Remote loopback mode: unsupported, Link events: supported
Variable requests: unsupported
```

Meaning The output displays the MAC address and the discovery state is **Send Any** if OAM LFM has been configured properly.

Related Documentation

- Understanding Ethernet OAM Link Fault Management for SRX Series Services Gateways on page 353

CHAPTER 19

Configuring Ethernet OAM Connectivity Fault Management

Understanding Ethernet OAM Connectivity Fault Management

Ethernet interfaces on SRX Series devices support the IEEE 802.1ag standard for Operation, Administration, and Management (OAM). The 802.1ag is an IEEE standard for connectivity fault management (CFM). The IEEE 802.1ag provides a specification for Ethernet CFM. The Ethernet network can consist of one or more service instances. A service instance could be a VLAN or a concatenation of VLANs. The goal of CFM is to provide a mechanism to monitor, locate, and isolate faulty links.

NOTE: **Support for the IEEE 802.1ag standard for OAM on SRX Series devices depends on the Junos OS release running on the device.**

Starting in Junos OS Release 15.1X49-D80, Ethernet OAM CFM is supported on SRX1500 devices.

Starting in Junos OS Release 15.1X49-D75, Ethernet OAM CFM is supported on SRX300, SRX320, SRX340, SRX345, and SRX550M devices.

Ethernet OAM CFM is not supported from Junos OS Release 15.1X49-D40 to Junos OS Release 15.1X49-D70.

CFM support includes the following features:

- Fault monitoring using the Continuity Check Protocol. This is a neighbor discovery and health check protocol that discovers and maintains adjacencies at the VLAN or link level.
- Path discovery and fault verification using the Link Trace protocol. This feature is not supported in Junos OS Release 12.3X48-D65.
- Fault isolation using the Loopback protocol.

  The Loopback protocol is used to check access to maintenance association end points (MEPs) under the same maintenance association (MA). The Loopback messages are triggered by an administrator using the **ping ethernet** command.

NOTE: Virtual private LAN service (VPLS) is not supported on SRX100, SRX110, SRX210, SRX220, SRX240, SRX300, SRX320, SRX340, SRX345, SRX550M, SRX1400, and SRX1500 devices.

CFM partitions the service network into various administrative domains. For example, operators, providers, and customers might be part of different administrative domains. Each administrative domain is mapped into one maintenance domain providing enough information to perform its own management, thus avoiding security breaches and making end-to-end monitoring possible.

In a CFM maintenance domain, each service instance is called a maintenance association. A maintenance association can be thought of as a full mesh of maintenance association end points (MEPs) having similar characteristics. MEPs are active CFM entities generating and responding to CFM protocol messages. There is also a maintenance association intermediate point (MIP), which is a CFM entity similar to the MEP, but more passive (MIPs only respond to CFM messages).

Each maintenance domain is associated with a maintenance domain level from 0 through 7. Level allocation is based on the network hierarchy, where outer domains are assigned a higher level than the inner domains. You configure customer end points to have the highest maintenance domain level. The maintenance domain level is a mandatory parameter that indicates the nesting relationships between various maintenance domains. The level is embedded in each CFM frame. CFM messages within a given level are processed by MEPs at that same level.

To enable CFM on an Ethernet interface, you must configure maintenance domains, maintenance associations, and MEPs.

The limitations for CFM are as follows:

- You cannot configure MEP and MIP on the same VLAN.
- CFM and link fault management (LFM) can be configured on the same interface.
- You cannot configure CFM with Generic VLAN Registration Protocol (GVRP).

- CFM is not supported on VoIP VLAN ports.
- On SRX240, and SRX550M devices, the default Loopback message (LBM) packet size is 113 bytes.

Benefits of Ethernet CFM

Ethernet CFM provides the following benefits:

- End-to-end service-level OAM technology
- Reduced operating expense for service provider Ethernet networks
- Competitive advantage for service providers

CFM over VDSL and PPPoE interfaces for SRX210, SRX220, SRX240, SRX320, SRX340, SRX345, SRX550, and SRX550M Devices

Starting in Junos OS Release 12.3X48-D65, on SRX210, SRX220, SRX240, and SRX550 devices, Operation, Administration, and Maintenance (OAM) connectivity fault management (CFM) is supported on very-high-bit-rate digital subscriber line (VDSL) and Point-to-Point Protocol over Ethernet (PPPoE) interfaces in addition to Ethernet interfaces.

CFM over VDSL should be configured on the pt interface. To support CFM over PPPoE, you need to configure maintenance domain and maintenance association end point (MEP). The CFM over VDSL interface supports down direction MEP, continuity check, and loopback protocols.

The following are the limitations when configuring Ethernet CFM over VDSL or Layer 3 interface:

- CFM action profiles are not supported on the Point-to-Point Protocol over Ethernet (PPPoE) logical interface on SRX210, SRX220, SRX240, SRX550, and SRX650 devices.
- Synthetic loss measurement on demand is supported only on SRX320, SRX340, SRX345, and SRX550M devices. Proactive synthetic loss measurement is not supported.
- When CFM over PPPoE is implemented, CFM must be applied on the PPPoE logical interface and not on the underlying interface.
- CFM over VDSL can be implemented as a MEP but not as a MIP.
- CFM higher-level pass-through over a VDSL or Gigabit Ethernet interface in Layer 3 interface mode is not supported.
- For a VLAN-tagged VDSL interface, CFM must always be applied on the respective logical interface and not over the physical interface.
- When CFM is enabled on VDSL, CFM packets are dropped randomly, causing CFM sessions to flap based on the timer when transit traffic exceeds the line rate. Flapping occurs because the VDSL Mini-Physical Interface Module (Mini-PIM) cannot differentiate and prioritize CFM packets.

Related Documentation

- Example: Configuring Ethernet OAM Connectivity Fault Management on a Security Device on page 375

Configuring the Continuity Check Protocol on a Security Device

The Continuity Check Protocol is used for fault detection by a maintenance association end point (MEP) within a maintenance association. The MEP periodically sends continuity check multicast messages. The receiving MEPs use the continuity check messages (CCMs) to build a MEP database of all MEPs in the maintenance association.

Starting in Junos OS Release 12.3X48-D65, on SRX210, SRX220, SRX240, and SRX550 devices, the continuity check protocol for Ethernet Operation, Administration, and Management (OAM) connectivity fault management is supported over VDSL and PPPoE interfaces in addition to Ethernet interfaces.

Starting in Junos OS Release 15.1X49-D80, the continuity check protocol for Ethernet OAM CFM is supported on SRX1500 devices.

Starting in Junos OS Release 15.1X49-D75, the continuity check protocol for Ethernet OAM CFMis supported on SRX300, SRX320, SRX340, SRX345, and SRX550M devices.

The continuity check protocol for Ethernet OAM CFM is not supported from Junos OS Release 15.1X49-D40 to Junos OS Release 15.1X49-D70.

To configure the Continuity Check Protocol:

1. Enable the Continuity Check Protocol.

   ```
   [edit protocols oam ethernet connectivity-fault-management maintenance-domain
     domain-name maintenance-association ma-name]
   user@host# set continuity-check
   ```

2. Specify the continuity check hold interval. The hold interval is the number of minutes to wait before flushing the MEP database if no updates occur. The default value is 10 minutes (not supported in Junos OS Release 12.3X48-D60).

   ```
   [edit protocols oam ethernet connectivity-fault-management maintenance-domain
     domain-name maintenance-association ma-name continuity-check]
   user@host# set hold-interval number
   ```

3. Specify the CCM interval. The interval is the time between the transmission of CCMs. You can specify 10 minutes (10m), 1 minute (1m), 10 seconds (10s), 1 second (1s), or 100 milliseconds (100ms).

   ```
   [edit protocols oam ethernet connectivity-fault-management maintenance-domain
     domain-name maintenance-association ma-name continuity-check]
   user@host# set interval number
   ```


4. Specify the number of CCMs (that is, protocol data units) that can be lost before the MEP is marked as down. The default number of protocol data units (PDUs) is 3.

```
[edit protocols oam ethernet connectivity-fault-management maintenance-domain
   domain-name maintenance-association ma-name continuity-check]
user@host# set loss-threshold number
```

NOTE: If the CCM interval is 100 milliseconds, only four MEPs are supported on a device.

Related Documentation

- Understanding Ethernet OAM Connectivity Fault Management on page 365
- Creating a Maintenance Domain on a Security Device on page 370
- Creating a Maintenance Association on a Security Device on page 372
- Configuring a Maintenance Domain MIP Half Function on a Security Device on page 371
- Configuring the Link Trace Protocol on a Security Device on page 369

Configuring the Link Trace Protocol on a Security Device

Starting in Junos OS Release 15.1X49-D80, configuring the Link Trace protocol for Ethernet OAM connectivity fault management is supported on SRX1500 devices.

Starting in Junos OS Release 15.1X49-D75, configuring the Link Trace protocol for Ethernet OAM connectivity fault management is supported on SRX300, SRX320, SRX340, SRX345, and SRX550M devices.

Configuring the Link Trace protocol for Ethernet OAM connectivity fault management is not supported from Junos OS Release 15.1X49-D40 to Junos OS Release 15.1X49-D70.

The Link Trace protocol is used for path discovery between a pair of maintenance points. Link Trace Messages (LTMs) are triggered by an administrator using the **traceroute ethernet** command to verify the path between a pair of MEPs under the same maintenance association. LTMs can also be used to verify the path between a MEP and a MIP under the same maintenance domain.

To configure the Link Trace protocol:

1. Configure the Link Trace path age timer. If no response to a Link Trace request is received, the request and response entries are deleted after the age timer expires.

```
[edit protocols oam ethernet connectivity-fault-management]
user@host# set linktrace age time
```

2. Configure the number of Link Trace Reply (LTR) entries to be stored per Link Trace request.


```
[edit protocols oam ethernet connectivity-fault-management]
user@host# set linktrace path-database-size path-database-size
```

Related Documentation

- Understanding Ethernet OAM Connectivity Fault Management on page 365
- Creating a Maintenance Domain on a Security Device on page 370
- Creating a Maintenance Association on a Security Device on page 372
- Configuring a Maintenance Domain MIP Half Function on a Security Device on page 371
- Configuring the Continuity Check Protocol on a Security Device on page 368

Creating a Maintenance Domain on a Security Device

A maintenance domain consists of network entities such as operators, providers, and customers. A maintenance domain is a management space for managing and administering a network. A domain is owned and operated by a single entity and defined by the set of ports internal to it and at its boundary. Each maintenance domain is associated with a maintenance domain level from 0 through 7. Level allocation is based on the network hierarchy, where outer domains are assigned a higher level than the inner domains. You configure customer end points to have the highest maintenance domain level. The maintenance domain level is a mandatory parameter that indicates the nesting relationships between various maintenance domains.

To enable connectivity fault management (CFM) on an Ethernet interface, maintenance domains, maintenance associations, and maintenance association end points (MEPs) must be created and configured.

Starting in Junos OS Release 12.3X48-D65, on SRX210, SRX220, SRX240, and SRX550 devices, creating a maintenance domain for Ethernet OAM CFM is supported over VDSL and PPPoE interfaces in addition to Ethernet interfaces.

Starting in Junos OS Release 15.1X49-D80, creating a maintenance domain for Ethernet OAM CFM is supported on SRX1500 devices.

Starting in Junos OS Release 15.1X49-D75, creating a maintenance domain for Ethernet OAM CFM is supported on SRX300, SRX320, SRX340, SRX345, and SRX550M devices.

Creating a maintenance domain for Ethernet OAM CFM is not supported from Junos OS Release 15.1X49-D40 to Junos OS Release 15.1X49-D70.

To create a maintenance domain:

1. Specify a name for the maintenance domain.

   ```
   [edit protocols oam ethernet connectivity-fault-management]
   user@host# set maintenance-domain domain-name
   ```

2. Specify a format for the maintenance domain name. If you do not specify a format, no name is configured.

- A plain ASCII character string
- A Domain Name System (DNS) format
- A media access control (MAC) address plus a two-octet identifier in the range 0 through 65,535
- None

```
[edit protocols oam ethernet connectivity-fault-management maintenance-domain
  domain-name]
user@host# set name-format format
```

For example, to specify the name format as a MAC address plus a two-octet identifier:

[edit protocols oam ethernet connectivity-fault-management maintenance-domain *domain-name*]

user@host# set name-format *mac+2oct*

3. Configure the maintenance domain level, which is used to indicate the nesting relationship between this domain and other domains. Use a value from 0 through 7.

   [edit protocols oam ethernet connectivity-fault-management maintenance-domain *domain-name*]

   user@host# set level *level-number*

Related Documentation

- Understanding Ethernet OAM Connectivity Fault Management on page 365
- Configuring the Continuity Check Protocol on a Security Device on page 368
- Configuring a Maintenance Domain MIP Half Function on a Security Device on page 371
- Creating a Maintenance Association on a Security Device on page 372
- Configuring a Maintenance Association End Point on a Security Device on page 373
- Configuring the Link Trace Protocol on a Security Device on page 369

Configuring a Maintenance Domain MIP Half Function on a Security Device

Starting in Junos OS Release 15.1X49-D80, configuring a maintenance domain MIP half function for Ethernet OAM connectivity fault management is supported on SRX1500 devices.

Starting in Junos OS Release 15.1X49-D75, configuring a maintenance domain MIP half function for Ethernet OAM connectivity fault management is supported on SRX300, SRX320, SRX340, SRX345, and SRX550M devices.

Configuring a maintenance domain MIP half function for Ethernet OAM connectivity fault management is not supported from Junos OS Release 15.1X49-D40 to Junos OS Release 15.1X49-D70.

MIP half function (MHF) divides the maintenance association intermediate point (MIP) functionality into two unidirectional segments, improves visibility with minimal configuration, and improves network coverage by increasing the number of points that can be monitored. MHF extends monitoring capability by responding to loopback and Link Trace messages to help isolate faults. Whenever a MIP is configured, the MIP half function value for all maintenance domains and maintenance associations must be the same.

To configure the MIP half function:

```
[edit protocols oam ethernet connectivity-fault-management maintenance-domain
  domain-name]
user@host# set mip-half-function default
```

NOTE:

- If SRX340, or SRX345 devices are configured as MIPs, ensure that a static MAC is configured in the Ethernet switching table with the next-hop interface to the MEP MAC.
- You cannot configure MIP in a nondefault domain.
- In Q-in-Q mode, double tag packets are not retained by MIP.
- A maximum of 116 MIPs can be configured on a device.

Related Documentation

- Understanding Ethernet OAM Connectivity Fault Management on page 365
- Creating a Maintenance Domain on a Security Device on page 370
- Creating a Maintenance Association on a Security Device on page 372
- Configuring the Continuity Check Protocol on a Security Device on page 368
- Configuring a Maintenance Association End Point on a Security Device on page 373
- Configuring the Link Trace Protocol on a Security Device on page 369

Creating a Maintenance Association on a Security Device

In a connectivity fault management (CFM) maintenance domain, each service instance is called a maintenance association. A maintenance association can be thought of as a full mesh of maintenance association end points (MEPs) having similar characteristics.

Starting in Junos OS Release 12.3X48-D65, on SRX210, SRX220, SRX240, and SRX550 devices, creating a maintenance association for Ethernet OAM connectivity fault management is supported over VDSL and PPPoE interfaces in addition to Ethernet interfaces.

Starting in Junos OS Release 15.1X49-D80, creating a maintenance association for Ethernet OAM CFM is supported on SRX1500 devices.

Starting in Junos OS Release 15.1X49-D75, creating a maintenance association for Ethernet OAM CFM is supported on SRX300, SRX320, SRX340, SRX345, and SRX550M devices.

Creating a maintenance association for Ethernet OAM CFM is not supported from Junos OS Release 15.1X49-D40 to Junos OS Release 15.1X49-D70.

To create a maintenance association:

```
[edit protocols oam ethernet connectivity-fault-management maintenance-domain
  domain-name]
user@host# set maintenance-association ma-name
```

NOTE: On SRX210, SRX220, SRX240, SRX300, SRX320, SRX340, SRX345, SRX550, SRX550M, and SRX650 devices, a maximum of seven maintenance associations are supported.

Related Documentation

- Understanding Ethernet OAM Connectivity Fault Management on page 365
- Creating a Maintenance Domain on a Security Device on page 370
- Configuring a Maintenance Domain MIP Half Function on a Security Device on page 371
- Configuring the Continuity Check Protocol on a Security Device on page 368
- Configuring a Maintenance Association End Point on a Security Device on page 373
- Configuring the Link Trace Protocol on a Security Device on page 369

Configuring a Maintenance Association End Point on a Security Device

Starting in Junos OS Release 12.3X48-D65, on SRX210, SRX220, SRX240, and SRX550 devices, configuring a maintenance association end point for Ethernet OAM CFM is supported over VDSL and PPPoE interfaces in addition to Ethernet interfaces.

Starting in Junos OS Release 15.1X49-D80, configuring a maintenance association end point for Ethernet OAM CFM is supported on SRX1500 devices.

Starting in Junos OS Release 15.1X49-D75, configuring a maintenance association end point for Ethernet OAM CFM is supported on SRX300, SRX320, SRX340, SRX345, and SRX550M devices.

Configuring a maintenance association end point for Ethernet OAM CFM is not supported from Junos OS Release 15.1X49-D40 to Junos OS Release 15.1X49-D70.

To configure a MEP:

1. Specify an ID for the MEP. The value can be from 1 through 8191.

```
[edit protocols oam ethernet connectivity-fault-management maintenance-domain
  domain-name maintenance-association ma-name]
user@host# set mep mep-id
```

2. Enable MEP automatic discovery if you want to have the MEP accept continuity check messages (CCMs) from all remote MEPs of the same maintenance association.

   [edit protocols oam ethernet connectivity-fault-management maintenance-domain *domain-name* maintenance-association *ma-name* mep *mep-id*]
   user@host# set auto-discovery

3. Specify that CFM CCM packets be transmitted only in one direction for the MEP. That is, set the direction as down so that CCMs are transmitted only out of (not into) the interface configured on this MEP.

   [edit protocols oam ethernet connectivity-fault-management maintenance-domain *domain-name* maintenance-association *ma-name* mep *mep-id*]
   user@host# set direction down

4. Specify the logical interface to which the MEP is attached. It can be either an access interface or a trunk interface. If you specify a trunk interface, the VLAN associated with that interface must have a VLAN ID.

   [edit protocols oam ethernet connectivity-fault-management maintenance-domain *domain-name* maintenance-association *ma-name* mep *mep-id*]
   user@host# set interface *interface-name*

5. Configure a remote MEP from which CCMs are expected. If automatic discovery is not enabled, the remote MEP must be configured under the **mep** statement; otherwise, the CCMs from the remote MEP will be treated as errors.

   [edit protocols oam ethernet connectivity-fault-management maintenance-domain domain-name maintenance-association ma-name mep mep-id]
   user@host# set remote-mep mep-id

NOTE: You cannot configure MEPs at different levels for the same VLANs.

Related Documentation

- Understanding Ethernet OAM Connectivity Fault Management on page 365
- Creating a Maintenance Domain on a Security Device on page 370
- Configuring a Maintenance Domain MIP Half Function on a Security Device on page 371
- Creating a Maintenance Association on a Security Device on page 372
- Configuring the Continuity Check Protocol on a Security Device on page 368
- Configuring the Link Trace Protocol on a Security Device on page 369

Example: Configuring Ethernet OAM Connectivity Fault Management on a Security Device

Starting in Junos OS Release 15.1X49-D80, Ethernet OAM connectivity fault management is supported on SRX1500 devices.

Starting in Junos OS Release 15.1X49-D75, Ethernet OAM connectivity fault management is supported on SRX300, SRX320, SRX340, SRX345, and SRX550M devices.

Ethernet OAM connectivity fault management is not supported from Junos OS Release 15.1X49-D40 to Junos OS Release 15.1X49-D70.

Connectivity Fault Management (CFM) provides a mechanism to monitor, locate, and isolate faulty links.

This example describes how to enable and configure an end-to-end OAM CFM session on an Ethernet interface.

Requirements

This example uses the following hardware and software components:

- Three SRX Series devices connected by a point-to-point Ethernet link.
- Junos OS Release 12.1X44-D10 or later for SRX Series devices.

Overview

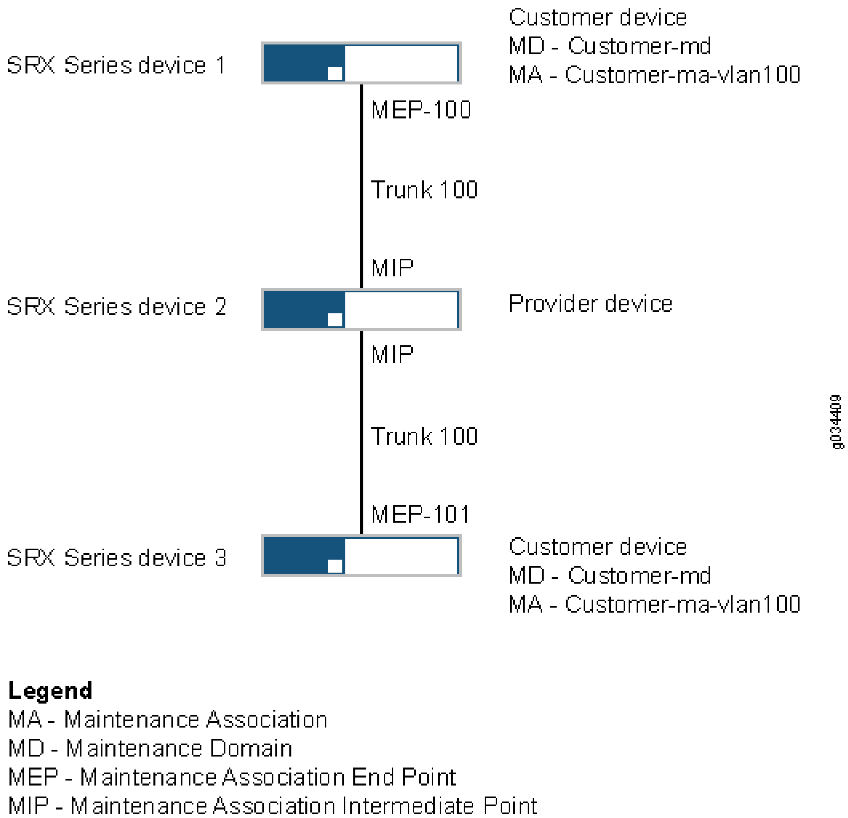
Ethernet interfaces on SRX Series devices support the IEEE 802.1ag standard for Operation, Administration, and Management (OAM). The IEEE 802.1ag specification provides a specification for Ethernet connectivity fault management (CFM). CFM can be used to detect faults in the network path between the customer premises devices. It also helps in detecting the device or node in the provider network, where the failure occurred.

This example describes how to configure an end to end CFM session. In this example, three devices are connected by a point-to-point Ethernet link. The link between these devices is monitored using CFM. To check connectivity or fault through the provider network, maintenance intermediate point (MIP) is configured.

Topology

Figure 23 on page 376 shows three SRX Series devices connected by a point-to-point Ethernet link.

Figure 23: Ethernet CFM with SRX Series Devices



Configuring Ethernet OAM Connectivity Fault Management

- Configuring Ethernet OAM Connectivity Fault Management on Device 1 on page 376
- Configuring Ethernet OAM CFM with MIP Half Function on Device 2 on page 378
- Configuring Ethernet OAM Connectivity Fault Management on Device 3 on page 380

Configuring Ethernet OAM Connectivity Fault Management on Device 1

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, copy and paste the commands into the CLI at the **[edit]** hierarchy level, and then enter **commit** from configuration mode.

```
set interfaces ge-0/0/4 unit 0 family ethernet-switching interface-mode trunk
set interfaces ge-0/0/4 unit 0 family ethernet-switching vlan members v100
set vlans v100 vlan-id 100
set protocols oam ethernet connectivity-fault-management maintenance-domain
  Customer-md level 5
set protocols oam ethernet connectivity-fault-management maintenance-domain
  Customer-md maintenance-association Customer-ma mep 100 interface ge-0/0/4.0
```

```
set protocols oam ethernet connectivity-fault-management maintenance-domain
  Customer-md maintenance-association Customer-ma mep 100 interface vlan 100
set protocols oam ethernet connectivity-fault-management maintenance-domain
  Customer-md maintenance-association Customer-ma mep 100 auto-discovery
set protocols oam ethernet connectivity-fault-management maintenance-domain
  Customer-md maintenance-association Customer-ma continuity-check interval 10s
set protocols oam ethernet connectivity-fault-management maintenance-domain
  Customer-md maintenance-association Customer-ma continuity-check hold-interval
  20
```

Step-by-Step Procedure

The following example requires you to navigate various levels in the configuration hierarchy. For instructions on how to do that, see *Using the CLI Editor in Configuration Mode* in the *CLI User Guide*.

To enable and configure OAM CFM on device 1:

1. Define a VLAN and enable the interface for family Ethernet switching with interface mode trunk or access.

```
[edit]
user@host# set interfaces ge-0/0/4 unit 0 family ethernet-switching interface-mode
  trunk
user@host# set interfaces ge-0/0/4 unit 0 family ethernet-switching vlan members
  v100
user@host# set vlans v100 vlan-id 100
```

2. Specify the maintenance domain name and the maintenance domain level.

```
[edit protocols oam ethernet connectivity-fault-management ]
user@host# set maintenance-domain Customer-md level 5
```

3. Create a maintenance association and configure MEP.

```
[edit protocols oam ethernet connectivity-fault-management maintenance-domain
  Customer-md]
user@host# set maintenance-association Customer-ma mep 100 interface
  ge-0/0/4.0
user@host# set maintenance-association Customer-ma mep 100 interface vlan
  100
```

4. Enable MEP automatic discovery.

```
[edit protocols oam ethernet connectivity-fault-management maintenance-domain
  Customer-md maintenance-association Customer-ma]
user@host# set mep 100 auto-discovery
```

5. Enable the Continuity Check Protocol and specify the continuity check interval and hold interval.

```
[edit protocols oam ethernet connectivity-fault-management maintenance-domain
  Customer-md maintenance-association Customer-ma]
user@host# set continuity-check interval 10s
user@host# set continuity-check hold-interval 20
```

Results From configuration mode, confirm your configuration by entering the **show protocols** command. If the output does not display the intended configuration, repeat the configuration instructions in this example to correct it.

For brevity, this **show protocols** command output includes only the configuration that is relevant to this example. Any other configuration on the system has been replaced with ellipses (...).

```
[edit]
user@host# show protocols
```

```
oam {
  ethernet {
    connectivity-fault-management {
      maintenance-domain Customer-md {
        level 5;
        maintenance-association Customer-ma {
          continuity-check {
            interval 10s;
            hold-interval 20;
          }
          mep 100 {
            interface ge-0/0/4.0 vlan 100;
            auto-discovery;
          }
        }
      }
    }
  }
}
```

If you are done configuring the device, enter **commit** from configuration mode.

Configuring Ethernet OAM CFM with MIP Half Function on Device 2

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, copy and paste the commands into the CLI at the **[edit]** hierarchy level, and then enter **commit** from configuration mode.

```
set interfaces ge-0/0/1 unit 0 family ethernet-switching interface-mode trunk
set interfaces ge-0/0/1 unit 0 family ethernet-switching vlan members v100
set interfaces ge-0/0/4 unit 0 family ethernet-switching interface-mode trunk
set interfaces ge-0/0/4 unit 0 family ethernet-switching vlan members v100
```



```
set vlans v100 vlan-id 100
set protocols oam ethernet connectivity-fault-management maintenance-domain
   default-5 v100
set protocols oam ethernet connectivity-fault-management maintenance-domain
   default-5 mip-half-function default
```

Step-by-Step Procedure

The following example requires you to navigate various levels in the configuration hierarchy. For instructions on how to do that, see *Using the CLI Editor in Configuration Mode* in the *CLI User Guide*.

To configure MIP half function:

1. Define a VLAN and enable the interface for family Ethernet switching with interface mode trunk or access.

   ```
   [edit]
   user@host# set interfaces ge-0/0/1 unit 0 family ethernet-switching interface-mode
      trunk
   user@host# set interfaces ge-0/0/1 unit 0 family ethernet-switching vlan members
      v100
   user@host# set interfaces ge-0/0/4 unit 0 family ethernet-switching interface-mode
      trunk
   user@host# set interfaces ge-0/0/4 unit 0 family ethernet-switching vlan members
      v100
   user@host# set vlans v100 vlan-id 100
   ```

2. Create a maintenance domain and configure VLAN.

   ```
   [edit protocols oam ethernet connectivity-fault-management]
   user@host# set maintenance-domain default-5 v100
   ```

3. Create a MIP half function.

   ```
   [edit protocols oam ethernet connectivity-fault-management ]
   user@host# set maintenance-domain default-5 mip-half-function default
   ```

   NOTE: If you want to configure traceoptions, run the following commands:

   ```
   set protocols oam ethernet connectivity-fault-management traceoptions
      file CFM_trace
   set protocols oam ethernet connectivity-fault-management traceoptions
      flag all
   ```


Results From configuration mode, confirm your configuration by entering the **show protocols** command. If the output does not display the intended configuration, repeat the configuration instructions in this example to correct it.

For brevity, this **show** command output includes only the configuration that is relevant to this example. Any other configuration on the system has been replaced with ellipses (...).

```
[edit]
user@host# show protocols
  oam {
    ethernet {
      connectivity-fault-management {
        traceoptions {
          file CFM_trace;
          flag all;
        }
        maintenance-domain default-5 {
          v100;
          mip-half-function default;
        }
      }
    }
  }
```

If you are done configuring the device, enter **commit** from configuration mode.

Configuring Ethernet OAM Connectivity Fault Management on Device 3

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, copy and paste the commands into the CLI at the **[edit]** hierarchy level, and then enter **commit** from configuration mode.

```
set interfaces ge-0/0/1 unit 0 family ethernet-switching interface-mode trunk
set interfaces ge-0/0/1 unit 0 family ethernet-switching vlan members v100
set vlans v100 vlan-id 100
set protocols oam ethernet connectivity-fault-management maintenance-domain
  Customer-md level 5
set protocols oam ethernet connectivity-fault-management maintenance-domain
  Customer-md maintenance-association Customer-ma mep 101 interface ge-0/0/1.0
set protocols oam ethernet connectivity-fault-management maintenance-domain
  Customer-md maintenance-association Customer-ma mep 101 interface vlan 100
set protocols oam ethernet connectivity-fault-management maintenance-domain
  Customer-md maintenance-association Customer-ma mep 101 auto-discovery
set protocols oam ethernet connectivity-fault-management maintenance-domain
  Customer-md maintenance-association Customer-ma continuity-check hold-interval
  20
set protocols oam ethernet connectivity-fault-management maintenance-domain
  Customer-md maintenance-association Customer-ma continuity-check interval 10s
```


Step-by-Step Procedure

The following example requires you to navigate various levels in the configuration hierarchy. For instructions on how to do that, see *Using the CLI Editor in Configuration Mode* in the *CLI User Guide*.

To enable and configure OAM CFM on Device 3:

1. Define a VLAN and enable the interface for family Ethernet switching with interface mode trunk or access.

```
[edit]
user@host# set interfaces ge-0/0/1 unit 0 family ethernet-switching interface-mode
   trunk
user@host# set interfaces ge-0/0/1 unit 0 family ethernet-switching vlan members
   v100
user@host# set vlans v100 vlan-id 100
```

2. Specify the maintenance domain name and the maintenance domain level.

```
[edit protocols oam ethernet connectivity-fault-management ]
user@host# set maintenance-domain Customer-md level 5
```

3. Create a maintenance association and configure MEP.

```
[edit protocols oam ethernet connectivity-fault-management maintenance-domain
   Customer-md]
user@host# set maintenance-association Customer-ma mep 101 interface
   ge-0/0/1.0
user@host# set maintenance-association Customer-ma mep 101 interface vlan 100
```

4. Enable MEP automatic discovery.

```
[edit protocols oam ethernet connectivity-fault-management maintenance-domain
   Customer-md]
user@host# set maintenance-association Customer-ma mep 101 auto-discovery
```

5. Enable the Continuity Check Protocol and specify the continuity check interval and hold interval.

```
[edit protocols oam ethernet connectivity-fault-management maintenance-domain
   Customer-md maintenance-association Customer-ma]
user@host# set continuity-check interval 10s
user@host# set continuity-check hold-interval 20
```

Results

From configuration mode, confirm your configuration by entering the **show protocols** command. If the output does not display the intended configuration, repeat the configuration instructions in this example to correct it.

For brevity, this **show** command output includes only the configuration that is relevant to this example. Any other configuration on the system has been replaced with ellipses (...).

```
[edit]
user@host# show protocols
  oam {
    ethernet {
      connectivity-fault-management {
        maintenance-domain Customer-md {
          level 5;
          maintenance-association Customer-ma {
            continuity-check {
              interval 10s;
              hold-interval 20;
            }
            mep 101 {
              interface ge-0/0/1.0 vlan 100;
              auto-discovery;
            }
          }
        }
      }
    }
  }
```

If you are done configuring the device, enter **commit** from configuration mode.

Verification

Confirm that the configuration is working properly.

Verifying the OAM CFM Configuration on Device 1

Purpose Verify that OAM CFM has been configured properly.

Action From operational mode, enter the following commands:

- **show oam ethernet connectivity-fault-management adjacencies** to display connectivity-fault-management adjacencies.

- **show oam ethernet connectivity-fault-management interfaces** to display the Ethernet OAM information for the specified interface.

These commands produce the following sample output:

`user@host#` **show oam ethernet connectivity-fault-management adjacencies**

```
Mep-id   Interface         State              Timer to Expire
          101     ge-0/0/4.0         ok                29
```

`user@host#` **show oam ethernet connectivity-fault-management interfaces**

```
Interface         Link      Status       Level  MEP        Neighbours
                                                     Identifier
       ge-0/0/4.0          Up        Active       5      100         1
```

`user@host#` **show oam ethernet connectivity-fault-management interfaces detail**

```
Interface name: ge-0/0/4.0, vlan 100, Interface status: Active, Link status: Up
  Maintenance domain name: Customer-md, Format: string, Level: 5
    Maintenance association name: Customer-ma, Format: string
    Continuity-check status: enabled, Interval: 10s
    MEP identifier: 100, Direction: down, MAC address: 2c:6b:f5:62:29:84
    MEP status: running
    Defects:
      Remote MEP not receiving CCM                  : no
      Erroneous CCM received                        : no
      Cross-connect CCM received                    : no
      RDI sent by some MEP                          : no
    Statistics:
      CCMs sent                                     : 7
      CCMs received out of sequence                 : 0
      LBMs sent                                     : 0
      Valid in-order LBRs received                  : 0
      Valid out-of-order LBRs received              : 0
      LBRs received with corrupted data             : 0
      LBRs sent                                     : 0
      LTMs sent                                     : 0
      LTMs received                                 : 0
      LTRs sent                                     : 0
      LTRs received                                 : 0
      Sequence number of next LTM request           : 0
      1DMs sent                                     : 0
      Valid 1DMs received                           : 0
      Invalid 1DMs received                         : 0
      DMMs sent                                     : 0
      DMRs sent                                     : 0
      Valid DMRs received                           : 0
      Invalid DMRs received                         : 0
    Remote MEP count: 1
      Identifier    MAC address        State    Interface
        101     80:71:1f:ad:53:81       ok    ge-0/0/4.0
```

Meaning

- If the **show oam ethernet connectivity-fault-management interfaces detail** command output displays continuity-check status as **enabled** and displays details of the remote MEP, it means that connectivity fault management (CFM) was configured properly.

- If the **show oam ethernet connectivity-fault-management adjacencies** command output displays the state as **ok**, it indicates that the Continuity Check Protocol is up.

Verifying the OAM CFM Configuration with MIP Half Function on Device 2

Purpose Verify that OAM CFM has been configured properly.

Action From operational mode, run the **show oam ethernet connectivity-fault-management mip** command.

`user@host#` **show oam ethernet connectivity-fault-management mip vlan 100**

```
default maintenance-domain mhf    : default

  Interface       Level
  ge-0/0/1.0          5
  ge-0/0/4.0          5
```

Meaning The **show oam ethernet connectivity-fault-management mip** command output displays the MIP information.

Verifying the OAM CFM Configuration on Device 3

Purpose Verify that OAM CFM has been configured properly.

Action From operational mode, enter the following commands:

- **show oam ethernet connectivity-fault-management adjacencies** to display connectivity-fault-management adjacencies.
- **show oam ethernet connectivity-fault-management interfaces** to display the Ethernet OAM information for the specified interface.

`user@host#` **show oam ethernet connectivity-fault-management adjacencies**

```
Mep-id      Interface          State       Timer to Expire
          100       ge-0/0/1.0         ok             27
```

`user@host#` **show oam ethernet connectivity-fault-management interfaces detail**

```
Interface name: ge-0/0/1.0, vlan 100, Interface status: Active, Link status: Up
  Maintenance domain name: Customer-md, Format: string, Level: 5
    Maintenance association name: Customer-ma, Format: string
    Continuity-check status: enabled, Interval: 10s
    MEP identifier: 101, Direction: down, MAC address: 80:71:1f:ad:53:81
    MEP status: running
    Defects:
      Remote MEP not receiving CCM                  : no
      Erroneous CCM received                        : no
      Cross-connect CCM received                    : no
```

```
    RDI sent by some MEP                             : no
  Statistics:
    CCMs sent                                        : 77
    CCMs received out of sequence                    : 0
    LBMs sent                                        : 0
    Valid in-order LBRs received                     : 0
    Valid out-of-order LBRs received                 : 0
    LBRs received with corrupted data                : 0
    LBRs sent                                        : 0
    LTMs sent                                        : 0
    LTMs received                                    : 0
    LTRs sent                                        : 0
    LTRs received                                    : 0
    Sequence number of next LTM request              : 0
    1DMs sent                                        : 0
    Valid 1DMs received                              : 0
    Invalid 1DMs received                            : 0
    DMMs sent                                        : 0
    DMRs sent                                        : 0
    Valid DMRs received                              : 0
    Invalid DMRs received                            : 0
  Remote MEP count: 1
    Identifier    MAC address        State    Interface
      100     2c:6b:f5:62:29:84       ok    ge-0/0/1.0
```

Meaning

- If the **show oam ethernet connectivity-fault-management interfaces detail** command output displays continuity-check status as **enabled** and displays details of the remote MEP, it means that connectivity fault management (CFM) was configured properly.
- If the **show oam ethernet connectivity-fault-management adjacencies** command output displays the state as **ok**, it indicates that the Continuity Check Protocol is up.

Verifying the Path Using the Link Trace Protocol

Purpose Verify the path between maintenance endpoints.

Action From operational mode, enter the **traceroute ethernet** command.

`user@host#` **traceroute ethernet maintenance-domain Customer-md maintenance-association Customer-ma mep 101**

```
Linktrace to 80:71:1f:ad:53:81, Interface : ge-0/0/4.0
      Maintenance Domain: Customer-md, Level: 5
      Maintenance Association: Customer-ma, Local Mep: 100
      Transaction Identifier: 3
    Hop   TTL    Source MAC address        Next-hop MAC address
    .
    1     63     80:71:1f:ad:50:01         80:71:1f:ad:50:01
    2     62     80:71:1f:ad:53:81         00:00:00:00:00:00
```

Verifying MEP Continuity Using Ping

Purpose Verify access to MEPs under the same maintenance association.

Action From operational mode, enter the **ping ethernet** command.

`user@host#` **ping ethernet maintenance-domain Customer-md maintenance-association Customer-ma mep 101**

```
PING to 80:71:1f:ad:53:81, Interface ge-0/0/4.0
60 bytes from 80:71:1f:ad:53:81: lbm_seq=0
60 bytes from 80:71:1f:ad:53:81: lbm_seq=1
60 bytes from 80:71:1f:ad:53:81: lbm_seq=2
60 bytes from 80:71:1f:ad:53:81: lbm_seq=3
--- ping statistics ---
4 packets transmitted, 4 packets received, 0% packet loss
```

Related Documentation

- Understanding Ethernet OAM Connectivity Fault Management on page 365

CHAPTER 20

Configuring Power over Ethernet

Understanding Power over Ethernet

Power over Ethernet (PoE) is the implementation of the IEEE 802.3 AF and IEEE 802.3 AT standards that allow both data and electrical power to pass over a copper Ethernet LAN cable.

The SRX Series devices support PoE on Ethernet ports. PoE ports transfer electrical power and data to remote devices over standard twisted-pair cable in an Ethernet network. PoE ports allow you to plug in devices that require both network connectivity and electrical power, such as VoIP and IP phones and wireless LAN access points.

You can configure the SRX Series device to act as power sourcing equipment (PSE), supplying power to powered devices that are connected on designated ports.

This topic contains the following sections:

SRX Series Services Gateway PoE Specifications

Table 34 on page 388 lists the PoE specifications for the SRX210, SRX240, SRX320, SRX340, and SRX650 devices. (Platform support depends on the Junos OS release in your installation.)

Table 34: PoE Specifications for the SRX210, SRX240, SRX320, SRX340, and SRX650 Devices

Specifications	For SRX210 Device	For SRX240 Device	For SRX320 Device	For SRX340 Device	For SRX650 Device
Supported standards	• IEEE 802.3 AF • Legacy (pre-standards)	• IEEE 802.3 AF • IEEE 802.3 AT (PoE+) • Legacy (pre-standards)	• IEEE 802.3 AF • Legacy (pre-standards)	• IEEE 802.3 AF • IEEE 802.3 AT (PoE+) • Legacy (pre-standards)	• IEEE 802.3 AF • IEEE 802.3 AT (PoE+) • Legacy (pre-standards)

Supported ports	Supported on two Gigabit Ethernet ports and two Fast Ethernet ports (**ge-0/0/0**, **ge-0/0/1**, **fe-0/0/2**, and **fe-0/0/3**).	Supported on all 16 Gigabit Ethernet ports (**ge-0/0/0** to **ge-0/0/15**).	Supported on two Gigabit Ethernet ports and two Fast Ethernet ports (**ge-0/0/0** to **ge-0/0/5**).	Supported on all 16 Gigabit Ethernet ports (**ge-0/0/0** to **ge-0/0/15**).	Supported on the following ports:
					• Slot 2 or 6 on 16 Gigabit Ethernet ports
					  ◦ **ge-2/0/0 to ge-2/0/15**
					  ◦ **ge-6/0/0 to ge-6/0/15**
					• Slot 2 or 6 on 24 Gigabit Ethernet ports
					  ◦ **ge-2/0/0 to ge-2/0/23**
					  ◦ **ge-6/0/0 to ge-6/0/23**

Total PoE power sourcing capacity	50 W	150 W	50 W	150 W	The 645 watts AC and 645 watts DC power supplies support the following capacities: • 250 watts on a single power supply, or with redundancy using the two-power-supply option. • 500 watts with the two-power-supply option operating as nonredundant.
Default per port power limit	15.4 W	15.4 W	15.4 W	15.4 W	15.4 W
Maximum per port power limit	30 W	30 W	30 W	30 W	30 W

Table 34: PoE Specifications for the SRX210, SRX240, SRX320, SRX340, and SRX650 Devices (continued)

Specifications	For SRX210 Device	For SRX240 Device	For SRX320 Device	For SRX340 Device	For SRX650 Device
Power management modes	• Static: Power allocated for each interface can be configured. • Class: Power allocated for interfaces is based on the class of powered device connected.	• Static: Power allocated for each interface can be configured. • Class: Power allocated for interfaces is based on the class of powered device connected.	• Static: Power allocated for each interface can be configured. • Class: Power allocated for interfaces is based on the class of powered device connected.	• Static: Power allocated for each interface can be configured. • Class: Power allocated for interfaces is based on the class of powered device connected.	• Static: Power allocated for each interface can be configured. • Class: Power allocated for interfaces is based on the class of powered device connected.

PoE Classes and Power Ratings

A powered device is classified based on the maximum power that it draws across all input voltages and operational modes. When class-based power management mode is configured on the SRX Series devices, power is allocated taking into account the maximum power ratings defined for the different classes of devices.

Table 35 on page 389 lists the classes and their power ratings as specified by the IEEE standards.

Table 35: SRX Series Devices PoE Specifications

Class	Usage	Minimum Power Levels Output from PoE Port
0	Default	15.4 W
1	Optional	4.0 W
2	Optional	7.0 W
3	Optional	15.4 W
4	Reserved	Class 4 power devices are eligible to receive power up to 30 W according to IEEE standards.

PoE Options

When configuring PoE, you must enable the PoE interface in order for the port to provide power to a connected, powered device. In addition, you can configure the following PoE features:

- Port priority—Sets port priority. When it is not possible to maintain power to all connected ports, lower priority ports are powered off before higher priority ports. When a new device is connected on a higher-priority port, a lower priority port will be powered off automatically if available power is insufficient to power on the higher priority port. (For the ports with the same priority configuration, ports on the left are given higher priority than the ports on the right.)
- Maximum available wattage power available to a port—Sets the maximum amount of power that can be supplied to the port. The default wattage per port is 15.4 watts.
- PoE power consumption logging—Allows logging of per-port PoE power consumption. The telemetries section must be explicitly specified to enable logging. If left unspecified, telemetries is disabled by default. The default telemetry duration is 1 hour. The default telemetry interval is 5 minutes.
- PoE power management mode—Has two modes:
  - Class—When a powered device is connected to a PoE port, the power allocated to it is equal to the maximum power for the class as defined by the IEEE standards.
  - Static—When a powered device is connected to a PoE port, the power allocated to it is equal to the maximum power configured for the port.
- Reserve power—Reserves the specified amount of power for the gateway in case of a spike in PoE consumption. The default is 0.

Related Documentation

- Understanding Ethernet Interfaces on page 255
- Example: Configuring PoE on All Interfaces on page 390
- Example: Configuring PoE on an Individual Interface on page 393
- Example: Disabling a PoE Interface on page 396

Example: Configuring PoE on All Interfaces

This example shows how to configure PoE on all interfaces.

Requirements

Before you begin, configure Ethernet interfaces. See "Example: Creating an Ethernet Interface" on page 261.

Overview

This example shows how to configure PoE on all interfaces on a device. In this example, you set the power port priority to low and the maximum power available to a port to 15.4 watts. Then you enable the PoE power consumption logging with the default telemetries settings, and you set the PoE management mode to static. Finally, you set the reserved power consumption to 15 watts in case of a spike in PoE consumption.

Configuration

CLI Quick Configuration

To quickly configure this example, copy the following command, paste it into a text file, remove any line breaks, change any details necessary to match your network configuration, copy and paste the command into the CLI at the **[edit]** hierarchy level, and then enter **commit** from configuration mode.

```
set poe interface all priority low maximum-power 15.4 telemetries
set poe management static guard-band 15
```

Step-by-Step Procedure

The following example requires you to navigate various levels in the configuration hierarchy. For instructions on how to do that, see the Junos OS CLI User Guide.

To configure PoE on all interfaces:

1. Enable PoE.

   ```
   [edit]
   user@host# edit poe interface all
   ```

2. Set the power port priority.

   ```
   [edit poe interface all]
   user@host# set priority low
   ```

3. Set the maximum PoE wattage available for a port.

   ```
   [edit poe interface all]
   user@host# set maximum-power 15.4
   ```

4. Enable logging of PoE power consumption.

   ```
   [edit poe interface all]
   user@host# set telemetries
   ```


5. Set the PoE management mode.

```
[edit]
user@host# set poe management static
```

6. Reserve power wattage in case of a spike in PoE consumption.

```
[edit]
user@host# set poe guard-band 15
```

Results From configuration mode, confirm your configuration by entering the **show poe interface all** command. If the output does not display the intended configuration, repeat the configuration instructions in this example to correct it.

```
[edit]
   user@host# show poe interface all
   priority low;
   maximum-power 15.4;
telemetries;
```

If you are done configuring the device, enter **commit** from configuration mode.

Verification

Confirm that the configuration is working properly.

Verifying the Status of PoE Interfaces

Purpose Verify that the PoE interfaces on the device are enabled and set to the desired priority settings. (The device used here is the SRX340 Services Gateway.)

Action From operational mode, enter the **show poe interface all** command.

```
user@host> show poe interface all
```

```
Interface Admin status Oper status Max power Priority Power consumption Class
 ge-0/0/0 Enabled      Searching   15.4W     Low      0.0W                0
 ge-0/0/1 Enabled      Powered-up  15.4W     High     6.6W                0
 ge-0/0/2 Disabled     Disabled    15.4W     Low      0.0W                0
 ge-0/0/3 Disabled     Disabled    15.4W     Low      0.0W                0
```

The **show poe interface all** command lists PoE interfaces configured on the SRX 240 device, including information on status, priority, power consumption, and class. This output shows that the device has four PoE interfaces of which two are enabled with default values. One port has a device connected that is drawing power within expected limits.

Related Documentation

- Understanding Power over Ethernet on page 387
- Example: Configuring PoE on an Individual Interface on page 393
- Example: Disabling a PoE Interface on page 396

Example: Configuring PoE on an Individual Interface

This example shows how to configure PoE on an individual interface.

Requirements

Before you begin:

- Configure Ethernet interfaces. See "Example: Creating an Ethernet Interface" on page 261.
- Configure PoE on all interfaces. See "Example: Configuring PoE on All Interfaces" on page 390.

Overview

This example shows how to configure PoE on the ge-0/0/0 interface. In this example, you set the power port priority to high and the maximum power available to a port to 15.4 watts. Then you enable the PoE power consumption logging with the default telemetries settings, and you set the PoE management mode to static. Finally, you set the reserved power to 15 watts in case of a spike in PoE consumption.

Configuration

CLI Quick Configuration

To quickly configure this example, copy the following command, paste it into a text file, remove any line breaks, change any details necessary to match your network configuration, copy and paste the command into the CLI at the **[edit]** hierarchy level, and then enter **commit** from configuration mode.

```
set poe interface ge-0/0/0 priority high maximum-power 15.4 telemetries
set poe management static guard-band 15
```

Step-by-Step Procedure

The following example requires you to navigate various levels in the configuration hierarchy. For instructions on how to do that, see the Junos OS CLI User Guide.

To configure PoE:

1. Enable PoE.

```
[edit]
```

```
user@host# edit poe interface ge-0/0/0
```

2. Set the power port priority.

```
[edit poe interface ge-0/0/0]
user@host# set priority high
```

3. Set the maximum PoE wattage available for a port.

```
[edit poe interface ge-0/0/0]
user@host# set maximum power 15.4
```

4. Enable logging of PoE power consumption.

```
[edit poe interface ge-0/0/0]
user@host# set telemetries
```

5. Set the PoE management mode.

```
[edit]
user@host# set poe management static
```

6. Reserve power wattage in case of a spike in PoE consumption.

```
[edit]
user@host# set poe guard-band 15
```

Results From configuration mode, confirm your configuration by entering the **show poe interface ge-0/0/0** command. If the output does not display the intended configuration, repeat the configuration instructions in this example to correct it.

```
[edit]
  user@host# show poe interface ge-0/0/0
  priority high;
  maximum-power 15.4;
telemetries;
```

If you are done configuring the device, enter **commit** from configuration mode.

Verification

Confirm that the configuration is working properly.

- Verifying the Status of PoE Interfaces on page 395
- Verifying the Telemetry Data (History) for the Specified Interface on page 395
- Verifying PoE Global Parameters on page 396

Verifying the Status of PoE Interfaces

Purpose Verify that the PoE interfaces on the device are enabled and set to the desired priority settings. (The device used in this example is the SRX240 or SRX340 Services Gateway, depending on the Junos OS release in the installation.)

Action From operational mode, enter the **show poe interface ge-0/0/1** command.

user@host> **show poe interface ge-0/0/1**

```
PoE interface status:
PoE interface                 : ge-0/0/1
Administrative status         : Enabled
Operational status            : Powered-up
Power limit on the interface : 15.4 W
Priority                      : High
Power consumed                : 6.6 W
Class of power device         : 0
```

The **show poe interface ge-0/0/1** command lists PoE interfaces configured on the SRX340 device, with their status, priority, power consumption, and class.

Verifying the Telemetry Data (History) for the Specified Interface

Purpose Verify the PoE interface's power consumption over a specified period.

Action From operational mode, enter the **show poe telemetries interface** command.

For all records:

user@host> **show poe telemetries interface ge-0/0/1 all**

```
Sl No Timestamp Power Voltage
1 Fri Jan 04 11:41:15 2009 5.1 W 47.3 V
2 Fri Jan 04 11:40:15 2009 5.1 W 47.3 V
3 Fri Jan 04 11:39:15 2009 5.1 W 47.3 V
4 Fri Jan 04 11:38:15 2009 0.0 W 0.0 V
5 Fri Jan 04 11:37:15 2009 0.0 W 0.0 V
6 Fri Jan 04 11:36:15 2009 6.6 W 47.2 V
7 Fri Jan 04 11:35:15 2009 6.6 W 47.2 V
```


For a specific number of records:

user@host> **show poe telemetries interface ge-0/0/15**

```
Sl No Timestamp Power Voltage
1 Fri Jan 04 11:31:15 2009 6.6 W 47.2 V
2 Fri Jan 04 11:30:15 2009 6.6 W 47.2 V
3 Fri Jan 04 11:29:15 2009 6.6 W 47.2 V
4 Fri Jan 04 11:28:15 2009 6.6 W 47.2 V
5 Fri Jan 04 11:27:15 2009 6.6 W 47.2 V
```

The telemetry status displays the power consumption history for the specified interface, provided telemetry has been configured for that interface.

Verifying PoE Global Parameters

Purpose Verify global parameters such as guard band, power limit, and power consumption.

Action From operational mode, enter the **show poe controller** command.

user@host> **show poe controller**

```
Controller  Maximum   Power          Guard band  Management
index       power     consumption
   0        150.0 W    0.0 W         0 W         Static
```

The **show poe controller** command lists the global parameters configured on the SRX Series device such as controller index, maximum power, power consumption, guard band, and management mode along with their status.

Related Documentation

- Understanding Power over Ethernet on page 387
- Example: Configuring PoE on All Interfaces on page 390
- Example: Disabling a PoE Interface on page 396

Example: Disabling a PoE Interface

This example shows how to disable PoE on all interfaces or on a specific interface.

Requirements

Before you begin:

- Configure PoE on all interfaces. See “Example: Configuring PoE on All Interfaces” on page 390.
- Configure PoE on an individual interface. See “Example: Configuring PoE on an Individual Interface” on page 393.

Overview

In this example, you disable PoE on all interfaces and on a specific interface, which in this case is ge-0/0/0.

Configuration

Step-by-Step Procedure

To disable PoE on interfaces:

1. Disable PoE on all interfaces.

```
[edit]
user@host# set poe interface all disable
```

2. Disable PoE on a specific interface.

```
[edit]
user@host# set poe interface ge-0/0/0 disable
```

3. If you are done configuring the device, commit the configuration.

```
[edit]
user@host# commit
```

Verification

To verify the configuration is working properly, enter the **show poe interface** command.

Related Documentation

- Understanding Power over Ethernet on page 387

PART 5

Configuring Interface Encapsulation

CHAPTER 21

Interface Encapsulation Overview

Understanding Physical Encapsulation on an Interface

Encapsulation is the process by which a lower level protocol accepts a message from a higher level protocol and places it in the data portion of the lower level frame. As a result, datagrams transmitted through a physical network have a sequence of headers: the first header for the physical network (or Data Link Layer) protocol, the second header for the Network Layer protocol (IP, for example), the third header for the Transport Layer protocol, and so on.

The following encapsulation protocols are supported on physical interfaces:

- Frame Relay Encapsulation. See "Understanding Frame Relay Encapsulation on an Interface" on page 402.
- Point-to-Point Protocol. See "Understanding Point-to-Point Protocol" on page 404.
- Point-to-Point Protocol over Ethernet. See "Understanding Point-to-Point Protocol over Ethernet" on page 429.
- High-Level Data Link Control. See "Understanding High-Level Data Link Control" on page 406.

Related Documentation

- Understanding Interfaces on page 3
- Understanding Frame Relay Encapsulation on an Interface on page 402

Understanding Frame Relay Encapsulation on an Interface

The Frame Relay packet-switching protocol operates at the Physical Layer and Data Link Layer in a network to optimize packet transmissions by creating virtual circuits between hosts. Figure 24 on page 402 shows a typical Frame Relay network.

Figure 24: Frame Relay Network

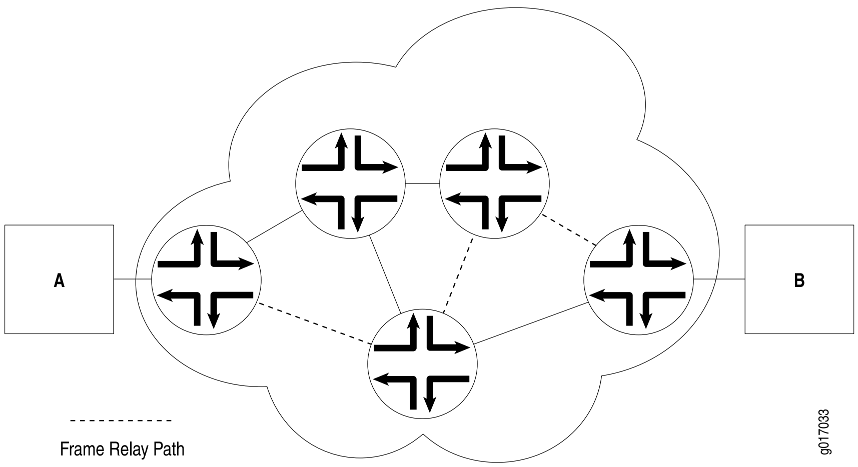


Figure 24 on page 402 shows multiple paths from Host A to Host B. In a typical routed network, traffic is sent from device to device with each device making routing decisions based on its own routing table. In a packet-switched network, the paths are predefined. Devices switch a packet through the network according to predetermined next-hops established when the virtual circuit is set up.

This topic contains the following sections:

Virtual Circuits

A virtual circuit is a bidirectional path between two hosts in a network. Frame Relay virtual circuits are logical connections between two hosts that are established either by a call setup mechanism or by an explicit configuration.

A virtual circuit created through a call setup mechanism is known as a switched virtual circuit (SVC). A virtual circuit created through an explicit configuration is called a permanent virtual circuit (PVC).

Switched and Permanent Virtual Circuits

Before data can be transmitted across an SVC, a signaling protocol like ISDN must set up a call by the exchange of setup messages across the network. When a connection is established, data is transmitted across the SVC. After data transmission, the circuit is torn down and the connection is lost. For additional traffic to pass between the same two hosts, a subsequent SVC must be established, maintained, and terminated.

Because PVCs are explicitly configured, they do not require the setup and teardown of SVCs. Data can be switched across the PVC whenever a host is ready to transmit. SVCs are useful in networks where data transmission is sporadic and a permanent circuit is not needed.

Data-Link Connection Identifiers

An established virtual circuit is identified by a data-link connection identifier (DLCI). The DLCI is a value from 16 through 1022. (Values 1 through 15 are reserved.) The DLCI uniquely identifies a virtual circuit locally so that devices can switch packets to the appropriate next-hop address in the circuit. Multiple paths that pass through the same transit devices have different DLCIs and associated next-hop addresses.

Congestion Control and Discard Eligibility

Frame Relay uses the following types of congestion notification to control traffic within a Frame Relay network. Both are controlled by a single bit in the Frame Relay header.

- Forward explicit congestion notification (FECN)
- Backward explicit congestion notification (BECN)

Traffic congestion is typically defined in the buffer queues on a device. When the queues reach a predefined level of saturation, traffic is determined to be congested. When traffic congestion occurs in a virtual circuit, the device experiencing congestion sets the congestion bits in the Frame Relay header to 1. As a result, transmitted traffic has the FECN bit set to 1, and return traffic on the same virtual circuit has the BECN bit set to 1.

When the FECN and BECN bits are set to 1, they provide a congestion notification to the source and destination devices. The devices can respond in either of two ways: to control traffic on the circuit by sending it through other routes, or to reduce the load on the circuit by discarding packets.

If devices discard packets as a means of congestion (flow) control, Frame Relay uses the discard eligibility (DE) bit to give preference to some packets in discard decisions. A DE value of 1 indicates that the frame is of lower importance than other frames and more likely to be dropped during congestion. Critical data (such as signaling protocol messages) without the DE bit set is less likely to be dropped.

Related Documentation

- Understanding Physical Encapsulation on an Interface on page 401

Understanding Point-to-Point Protocol

The Point-to-Point Protocol (PPP) is an encapsulation protocol for transporting IP traffic across point-to-point links. PPP is made up of three primary components:

- Link Control Protocol (LCP)—Establishes working connections between two points.
- Authentication protocol—Enables secure connections between two points.
- Network control protocol (NCP)—Initializes the PPP protocol stack to handle multiple Network Layer protocols, such as IPv4, IPv6, and Connectionless Network Protocol (CLNP).

This topic contains the following sections:

Link Control Protocol

LCP is responsible for establishing, maintaining, and tearing down a connection between two endpoints. LCP also tests the link and determines whether it is active. LCP establishes a point-to-point connection as follows:

1. LCP must first detect a clocking signal on each endpoint. However, because the clocking signal can be generated by a network clock and shared with devices on the network, the presence of a clocking signal is only a preliminary indication that the link might be functioning.

2. When a clocking signal is detected, a PPP host begins transmitting PPP Configure-Request packets.

3. If the remote endpoint on the point-to-point link receives the Configure-Request packet, it transmits a Configure-Acknowledgement packet to the source of the request.

4. After receiving the acknowledgement, the initiating endpoint identifies the link as established. At the same time, the remote endpoint sends its own request packets and processes the acknowledgement packets. In a functioning network, both endpoints treat the connection as established.

During connection establishment, LCP also negotiates connection parameters such as FCS and HDLC framing. By default, PPP uses a 16-bit FCS, but you can configure PPP to use either a 32-bit FCS or a 0-bit FCS (no FCS). Alternatively, you can enable HDLC encapsulation across the PPP connection.

After a connection is established, PPP hosts generate Echo-Request and Echo-Response packets to maintain a PPP link.

PPP Authentication

PPP's authentication layer uses a protocol to help ensure that the endpoint of a PPP link is a valid device. Authentication protocols include the Password Authentication Protocol (PAP), the Extensible Authentication Protocol (EAP), and the Challenge Handshake Authentication Protocol (CHAP). CHAP is the most commonly used.

NOTE: Support for user id and the password to comply with full ASCII character set is supported through RFC 2486.

The user can enable or disable the RFC 2486 support under the PPP options. The RFC 2486 is disabled by default, and enable the support globally use the command **set access ppp-options compliance rfc 2486**".

CHAP ensures secure connections across PPP links. After a PPP link is established by LCP, the PPP hosts at either end of the link initiate a three-way CHAP handshake. Two separate CHAP handshakes are required before both sides identify the PPP link as established.

CHAP configuration requires each endpoint on a PPP link to use a shared secret (password) to authenticate challenges. The shared secret is never transmitted over the wire. Instead, the hosts on the PPP connection exchange information that enables both to determine that they share the same secret. Challenges consist of a hash function calculated from the secret, a numeric identifier, and a randomly chosen challenge value that changes with each challenge. If the response value matches the challenge value, authentication is successful. Because the secret is never transmitted and is required to calculate the challenge response, CHAP is considered very secure.

PAP authentication protocol uses a simple two-way handshake to establish identity. PAP is used after the link establishment phase (LCP up), during the authentication phase. Junos OS can support PAP in one direction (egress or ingress), and CHAP in the other.

Network Control Protocols

After authentication is completed, the PPP connection is fully established. At this point, any higher level protocols (for example, IP protocols) can initialize and perform their own negotiations and authentication.

PPP NCPs include support for the following protocols. IPCP and IPv6CP are the most widely used on SRX Series devices.

- IPCP—IP Control Protocol
- IPv6CP—IPv6 Control Protocol
- OSINLCP—OSI Network Layer Control Protocol (includes IS-IS, ES-IS, CLNP, and IDRP)

Magic Numbers

Hosts running PPP can create “magic” numbers for diagnosing the health of a connection. A PPP host generates a random 32-bit number and sends it to the remote endpoint during LCP negotiation and echo exchanges.

In a typical network, each host's magic number is different. A magic number mismatch in an LCP message informs a host that the connection is not in loopback mode and traffic is being exchanged bidirectionally. If the magic number in the LCP message is the same as the configured magic number, the host determines that the connection is in loopback mode, with traffic looped back to the transmitting host.

Looping traffic back to the originating host is a valuable way to diagnose network health between the host and the loopback location. To enable loopback testing, telecommunications equipment typically supports channel service unit/data service unit (CSU/DSU) devices.

CSU/DSU Devices

A channel service unit (CSU) connects a terminal to a digital line. A data service unit (DSU) performs protective and diagnostic functions for a telecommunications line. Typically, the two devices are packaged as a single unit. A CSU/DSU device is required for both ends of a T1 or T3 connection, and the units at both ends must be set to the same communications standard.

A CSU/DSU device enables frames sent along a link to be looped back to the originating host. Receipt of the transmitted frames indicates that the link is functioning correctly up to the point of loopback. By configuring CSU/DSU devices to loop back at different points in a connection, network operators can diagnose and troubleshoot individual segments in a circuit.

Related Documentation

- Understanding Physical Encapsulation on an Interface on page 401

Understanding High-Level Data Link Control

High-Level Data Link Control (HDLC) is a bit-oriented, switched and nonswitched link-layer protocol. HDLC is widely used because it supports half-duplex and full-duplex connections, point-to-point and point-to-multipoint networks, and switched and nonswitched channels.

This topic contains the following sections:

- HDLC Stations on page 406
- HDLC Operational Modes on page 407

HDLC Stations

Nodes within a network running HDLC are called stations. HDLC supports three types of stations for data link control:

- Primary stations—Responsible for controlling the secondary and combined other stations on the link. Depending on the HDLC mode, the primary station is responsible for issuing acknowledgement packets to allow data transmission from secondary stations.
- Secondary stations—Controlled by the primary station. Under normal circumstances, secondary stations cannot control data transmission across the link with the primary station, are active only when requested by the primary station, and can respond to the primary station only (not to other secondary stations). All secondary station frames are response frames.
- Combined stations—A combination of primary and secondary stations. On an HDLC link, all combined stations can send and receive commands and responses without any permission from any other stations on the link and cannot be controlled by any other station.

HDLC Operational Modes

HDLC runs in three separate modes:

- Normal Response Mode (NRM)—The primary station on the HDLC link initiates all information transfers with secondary stations. A secondary station on the link can transmit a response of one or more information frames only when it receives explicit permission from the primary station. When the last frame is transmitted, the secondary station must wait for explicit permission before it can transmit more frames.

  NRM is used most widely for point-to-multipoint links, in which a single primary station controls many secondary stations.
- Asynchronous Response Mode (ARM)—The secondary station can transmit either data or control traffic at any time, without explicit permission from the primary station. The primary station is responsible for error recovery and link setup, but the secondary station can transmit information at any time.

  ARM is used most commonly with point-to-point links, because it reduces the overhead on the link by eliminating the need for control packets.
- Asynchronous Balance Mode (ABM)—All stations are combined stations. Because no other station can control a combined station, all stations can transmit information without explicit permission from any other station. ABM is not a widely used HDLC mode.

Related Documentation

- Understanding Physical Encapsulation on an Interface on page 401

Understanding GRE Keepalive Time

Generic routing encapsulation (GRE) tunnel interfaces do not have a built-in mechanism for detecting when a tunnel is down. You can enable keepalive messages to serve as the detection mechanism.

Keepalive times are only configurable for the ATM-over-ADSL interface, which is no longer supported on SRX300, SRX320, SRX340, SRX345, and SRX550HM starting in Junos OS Release 15.1X49-D10. Keepalive times are enabled by default for other interfaces.

Keepalives can be configured on the physical or on the logical interface. If configured on the physical interface, keepalives are sent on all logical interfaces that are part of the physical interface. If configured on a individual logical interface, keepalives are only sent to that logical interface. In addition to configuring a keepalive, you must configure the hold time.

You can configure the keepalives on a generic routing encapsulation (GRE) tunnel interface by including both the **keepalive-time** statement and the **hold-time** statement at the **[edit protocols oam gre-tunnel interface *interface-name*]** hierarchy level.

NOTE: For proper operation of keepalives on a GRE interface, you must also include the family inet statement at the [edit interfaces *interface-name* unit *unit*] hierarchy level. If you do not include this statement, the interface is marked as down.

Related Documentation

- *Configuring GRE Keepalive Time*
- *keepalive-time*
- *hold-time*

Configuring GRE Keepalive Time

Keepalive times are only configurable for the ATM-over-ADSL interface, which is no longer supported on SRX300, SRX320, SRX340, SRX345, and SRX550HM starting in Junos OS Release 15.1X49-D10.

Configuring Keepalive Time and Hold time for a GRE Tunnel Interface

You can configure the keepalives on a generic routing encapsulation (GRE) tunnel interface by including both the **keepalive-time** statement and the **hold-time** statement at the **[edit protocols oam gre-tunnel interface *interface-name*]** hierarchy level.

NOTE: For proper operation of keepalives on a GRE interface, you must also include the family inet statement at the [edit interfaces *interface-name* unit *unit*] hierarchy level. If you do not include this statement, the interface is marked as down.

To configure a GRE tunnel interface:

1. Configure the GRE tunnel interface at **[edit interfaces *interface-name* unit *unit-number*]** hierarchy level, where the interface name is gr-x/y/z, and the family is set as **inet**.

   ```
   user@host# set interfaces interface-name unit unit-number family family-name
   ```

2. Configure the rest of the GRE tunnel interface options based on requirement.

To configure keepalive time for a GRE tunnel interface:

1. Configure the Operation, Administration, and Maintenance (OAM) protocol at the **[edit protocols]** hierarchy level for the GRE tunnel interface.

   ```
   [edit]
   user@host# edit protocols oam
   ```

2. Configure the GRE tunnel interface option for OAM protocol.

   ```
   [edit protocols oam]
   user@host# edit gre-tunnel interface interface-name
   ```

3. Configure the keepalive time from 1 through 50 seconds for the GRE tunnel interface.

   ```
   [edit protocols oam gre-tunnel interface interface-name]
   user@host# set keepalive-time seconds
   ```

4. Configure the hold time from 5 through 250 seconds. Note that the hold time must be at least twice the keepalive time.

   ```
   [edit protocols oam gre-tunnel interface interface-name]
   user@host# set hold-time seconds
   ```

Display GRE Keepalive Time Configuration

Purpose Display the configured keepalive time value as 10 and hold time value as 30 on a GRE tunnel interface (for example, gr-1/1/10.1):

Action To display the configured values on the GRE tunnel interface, run the **show oam gre-tunnel** command at the **[edit protocols]** hierarchy level:

```
[edit protocols]
user@host# show oam gre-tunnel
  interface gr-1/1/10.1 {
    keepalive-time 10;
    hold-time 30;
  }
```

Display Keepalive Time Information on a GRE Tunnel Interface

Purpose Display the current status information of a GRE tunnel interface when keepalive time and hold time parameters are configured on it and when the hold time expires.

Action To verify the current status information on a GRE tunnel interface (for example, gr-3/3/0.3), run the **show interfaces gr-3/3/0.3 terse** and **show interfaces gr-3/3/0.3 extensive** operational commands.

show interfaces gr-3/3/0.3 terse

user@host> **show interfaces gr-3/3/0.3 terse**

```
                                      Interface               Admin Link Proto
Local                 Remote
                                      gr-3/3/0.3              up    up   inet
200.1.3.1/24
                                      mpls
```

show interfaces gr-3/3/0.3 extensive

user@host> **show interfaces gr-3/3/0.3 extensive**

```
Logical interface gr-3/3/0.3 (Index 73) (SNMP ifIndex 594) (Generation 900)
                                            Flags: Point-To-Point SNMP-Traps
0x4000 IP-Header 10.1.19.11:10.1.19.12:47:df:64:0000000000000000 Encapsulation:
GRE-NULL
                                            Gre keepalives configured: On, Gre
keepalives adjacency state: down

^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^
```



```
                        Traffic statistics:
      Input  bytes  :           15629992
      Output bytes  :           15912273
      Input  packets:             243813
      Output packets:             179476
      Local statistics:
      Input  bytes  :           15322586
      Output bytes  :           15621359
      Input  packets:             238890
      Output packets:             174767
      Transit statistics:
      Input  bytes  :             307406                    0
bps
      Output bytes  :             290914                    0
bps
      Input  packets:               4923                    0
pps
      Output packets:               4709                    0
pps
      Protocol inet, MTU: 1476, Generation: 1564, Route table: 0

      Flags: Sendbcast-pkt-to-re
      Addresses, Flags: Dest-route-down Is-Preferred Is-Primary
        ^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^
        Destination: 200.1.3/24, Local: 200.1.3.1, Broadcast:
200.1.3.255, Generation: 1366
        Protocol mpls, MTU: 1464, Maximum labels: 3, Generation:
 1565, Route table: 0
```

NOTE:
When the hold time expires:

- The GRE tunnel will stay up even though the interface cannot send or receive traffic.
- The Link status will be **Up** and the **Gre keepalives adjacency state** will be **Down**.

Meaning The current status information of a GRE tunnel interface with keepalive time and hold time parameters is displayed as expected when the hold time expires.

Related Documentation

- Understanding GRE Keepalive Time on page 13

Example: GRE Configuration

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 encapsulates a payload as a GRE packet. This GRE packet is encapsulated in an outer protocol (delivery protocol). GRE tunnel endpoints forward payloads into GRE tunnels for routing packets to the destination. After reaching the end point, GRE encapsulation is removed and the payload is transmitted to its final destination. The primary use of GRE is to carry non-IP packets through an IP network; however, GRE is also used to carry IP packets through an IP cloud.

Requirements

- Configure a GRE (gr-) interface. The gr- interface contains a local address and destination address. It comes up as soon as it is configured. You can even configure an IP address on the gr- interface.
- Configure a route to reach the destination subnet (end-to-end connectivity). You can configure either a static route through the gr- interface or use an interior gateway protocol (IGP) such as OSPF.

Overview

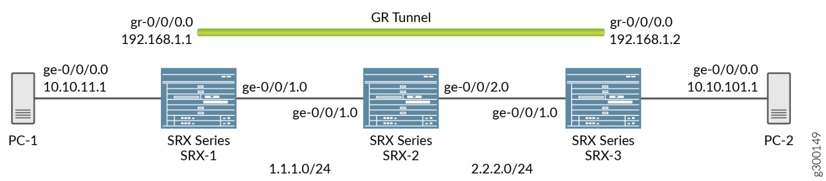
GRE tunnels are designed to be completely stateless, which means that each tunnel endpoint does not keep any information about the state or availability of the remote tunnel endpoint. Normally, a GRE tunnel interface comes up as soon as it is configured, and it stays up as long as there is a valid tunnel source address or interface that is up.

Configuration

By default, the local subnet interface is ge-0/0/0 with IPv4 address as 10.10.11.1/24. The destination subnet is 10.10.10.0/24 with the tunnel endpoint IPv4 interface as 10.10.10.1/24.

Figure 25 on page 413 shows the default configuration between the tunnel interfaces on SRX series devices.

Figure 25: GRE Configuration



Configuring a Route to Reach the Destination Subset

Step-by-Step Procedure

You can either configure a static route through the gr- interface or by using IGP.

1. Configure the gr- tunnel endpoints and specify the source address, destination address, and family as inet for the tunnel endpoints.

```
[edit interfaces]
user@host# set interfaces gr-0/0/0  unit 0 tunnel source 1.1.1.1 destination 2.2.2.1
```

2. Similarly, configure the ge-0/0/0 interface for the destination subnet interface with the tunnel endpoint address.

```
[edit interfaces]
user@host# set interfaces ge-0/0/0 unit 0 family inet address 1.1.1.1/24
```

3. The configured interfaces are bound to a security zone at the **[edit security]** hierarchy level. Use the **show zones** command to view the zones, where the configured tunnel interfaces, lo0- and st0-, are displayed. Configure the zones as follows:

```
[edit security zones security-zones trust]]
user@host# set host-inbound-traffic system-services all
user@host# set host-inbound-traffic protocols all
user@host# set interfaces gr-0/0/0.0
user@host# set zones zone names protocols all interfaces gr-0/0/0
```

```
[edit security zones security-zones untrust]]
user@host# set host-inbound-traffic system-services all
user@host# set host-inbound-traffic protocols all
user@host# set interfaces gr-0/0/0.0.1
user@host# set interfaces lo0.0
user@host# set interfaces st0.0
```


4. View the configured interfaces at the **[edit interfaces]** hierarchy level using the **show** command.

   ```
   [edit interfaces]
   user@host# set routing options static route 10.10.10.0/24 next hop gr-0/0/0.0
   ```

5. In case you do not want to define a static route, OSPF can be configured between gr-0/0/0 interfaces on both the sides and internal subnet as passive neighbor, to receive all the internal routes. Configure OSPF at the **[edit protocols]** hierarchy level and view it using the **show** command.

   ```
   [edit protocols]
   user@host# show ospf
   ```

   show ospf

   ```
   ospf {
       area 0.0.0.0 {
           interface gr-0/0/0.0;
           interface ge-0/0/0.0 {
               passive;
           }
       }
   }
   ```

Results In configuration mode, confirm your configuration on the devices by entering the **show** command. If the output does not display the intended configuration, repeat the configuration instructions in this example to correct it.

GRE configuration using the static route:

```
[edit interfaces]
root@SRX-1# show
ge-0/0/0 {
    unit 0 {
        family inet {
            address 10.10.11.1/24;
        }
    }
}

gr-0/0/0 {
    unit 0 {
        tunnel {
            source 1.1.1.1;
            destination 2.2.2.1;
        }
        family inet {
            address 192.168.1.1/24;
        }
    }
}

ge-0/0/1 {
```



```
    unit 0 {
        family inet {
            address 1.1.1.1/24;
        }
    }
}

[edit security]
root@SRX-1# show
zones {
    security-zone trust {
        host-inbound-traffic {
            system-services {
                all;
            }
            protocols {
                all;
            }
        }
        interfaces {
            gr-0/0/0.0;
        }
    }
}

root@SRX-1# show routing-options
static {
    route 10.10.10.0/24 next-hop gr-0/0/0.0;
}
```

GRE configuration using OSPF configured between interfaces gr-0/0/0 on both sides and internal subnet as passive neighbor:

```
[edit protocols]
root@SRX-1# show
ospf {
    area 0.0.0.0 {
        interface gr-0/0/0.0;
        interface ge-0/0/0.0 {
            passive;
        }
    }
}
```

Verification

To verify that the configuration of GRE on the SRX Series device is successful, perform the following tasks:

- Verification of the GRE Interfaces on page 416
- Verification of the Route on page 416
- Verification of Tunnel Destinations on page 416
- Verification of the Destination Address Through a GRE Tunnel on page 417

Verification of the GRE Interfaces

Purpose Verify that the GRE interfaces are up.

Action Run the **show interfaces** command at the **[edit interfaces]** hierarchy level:

```
show interfaces gr-0/0/0 terse
```

```
[edit interfaces]
Interface Admin Link Proto Local Remote
gr-0/0/0   up up
gr-0/0/0.0 up up inet 192.168.1.1/24
```

Verification of the Route

Purpose Verify that the route for the destination network is reachable through the GRE tunnel interface.

Action Run the **show route route-name** command at the **[edit interfaces]** hierarchy level:

```
[edit interfaces]
user@router# run show route 2.2.2.0/24

inet.0: 11 destinations, 11 routes (11 active, 0 holddown, 0 hidden)
+ = Active Route, - = Last Active, * = Both

2.2.2.0/24 *[Static/5] 00:22:32
> via gr-0/0/0.0
```

Verification of Tunnel Destinations

Purpose Verify that the tunnel destinations are in the local routing table on a GRE tunnel interface.

Action Run the **show route** *route-name* command at the **[edit interfaces]** hierarchy level:

```
[edit interfaces]
user@router# run show route 10.1.1.2

inet.0: 11 destinations, 11 routes (11 active, 0 holddown, 0 hidden)
+ = Active Route, - = Last Active, * = Both

10.1.1.0/30 *[Direct/0] 01:04:33
> via fe-0/0/0.0
```

Verification of the Destination Address Through a GRE Tunnel

Purpose Ping a destination address through the GRE tunnel.

Action Run the **show interfaces gr-0/0/0 extensive** operational command. Also verify that the packets are leaving through the gr- interface.

`user@host>` **show interfaces gr-0/0/0 extensive**

```
Physical interface: gr-0/0/0, Enabled, Physical link is Up
Interface index: 134, SNMP ifIndex: 40, Generation: 17
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: 2005-08-05 21:39:41 UTC (00:00:47 ago)
Traffic statistics:
Input bytes : 8400 0 bps
Output bytes : 8400 0 bps
Input packets: 100 0 pps
Output packets: 100 0 pps

Logical interface gr-0/0/0.0 (Index 72) (SNMP ifIndex 28) (Generation 17)
Flags: Point-To-Point SNMP-Traps 16384
IP-Header 10.1.1.2:10.1.1.1:47:df:64:0000000000000000
Encapsulation: GRE-NULL
Traffic statistics:
Input bytes : 8400
Output bytes : 8400
Input packets: 100
Output packets: 100
Local statistics:
Input bytes : 0
Output bytes : 0
Input packets: 0
Output packets: 0
Transit statistics:
Input bytes : 8400 0 bps
Output bytes : 8400 0 bps
Input packets: 100 0 pps
Output packets: 100 0 pps
Protocol inet, MTU: 1476, Generation: 25, Route table: 0
Flags: None
Addresses, Flags: Is-Primary
Destination: Unspecified, Local: 100.1.1.1, Broadcast: Unspecified,
Generation: 30
```

Related Documentation

- *Generic Routing Encapsulation (GRE)*
- *Understanding Generic Routing Encapsulation*
- *Verifying That Generic Routing Encapsulation Tunneling Is Working Correctly*

Example: Configuring a GRE Tunnel When the Tunnel Destination Is in a Routing Instance

Overview

You can configure a GRE tunnel when the tunnel destination is in a default routing instance or non-default routing instance. Configuration of a GRE tunnel requires defining the tunnel source and the tunnel destination addresses. If the tunnel destination is in a routing instance, and there is more than one routing instance present, you need to specify the correct routing instance and also the routing table to be used to reach the configured tunnel destination address.

NOTE: **The tunnel destination address is by default considered to be reachable using the default routing table "inet.0".**

Configuration

In this example, you can configure a GRE tunnel between the gr- interfaces on SRX Series devices with two instances. The instances are when the tunnel destination is in a default routing instance and when the tunnel destination is in a non-default routing instance.

- Configuring a GRE Tunnel When the Tunnel Destination Is in a Default Routing Instance on page 419
- Configuring a GRE Tunnel When the Tunnel Destination Is in a Non-default Routing Instance on page 420
- Results on page 421

Configuring a GRE Tunnel When the Tunnel Destination Is in a Default Routing Instance

This example uses the default routing instance to reach the tunnel destination. Because of this, the routing table inet.0 is used by default.

Step-by-Step Procedure

1. Specify the source and destination address of the tunnel.

```
[edit interfaces]
user@host# set interfaces gr-0/0/0  unit 0 tunnel source 172.16.0.1 destination
   10.10.1.2 family inet 192.168.100.1/30;
```

2. Configure the ge- interface and lo0 interface with the family set as inet.

```
[edit interfaces]
user@host# set interfaces ge-0/0/0 unit 0 family inet address 172.30.73.56/24
user@host# set interfaces lo0 unit 0 family inet address 172.16.0.1/32
```

3. Configure the GRE tunnel interface for routing options as mentioned in the “Example: GRE Configuration” on page 412 topic.

Configuring a GRE Tunnel When the Tunnel Destination Is in a Non-default Routing Instance

For a non-default routing instance, ensure that you have already configured the gr-0/0/0 interface.

Step-by-Step Procedure

1. Configure the GRE tunnel with the gr-0/00 interface and family set as inet.

```
[edit interfaces]
user@host# set interfaces gr-0/00 unit 0 family inet address
```

2. Specify the source and destination address of the tunnel.

```
[edit interfaces]
user@host# set interfaces gr-0/0/0  unit 0 tunnel source 172.16.0.1 tunnel destination
  10.10.1.2 family inet 192.168.100.1/30;
```

3. Configure the ge- interface and lo0 interface with the family set as inet.

```
[edit interfaces]
user@host# set interfaces ge-0/0/0 unit 0 family inet address 172.30.73.56/24
user@host# set interfaces lo0 unit 0 family inet address 172.16.0.1/32
```

4. Configure the remaining GRE tunnel interfaces .

```
[edit interfaces]
user@host# set routing-options static route 10.10.1.2/32 next-hop 172.30.73.57
```

5. Configure the routing instances used for the tunnel interface.

```
[edit interfaces]
user@host# set routing-options static route 10.10.1.2/32 next-tabletest.inet.0
```

NOTE: When the SRX Series device is in packet mode, you do not need to configure a static route to make the tunnel destination reachable from inet.0. However, you still need to specify the correct routing instance under the gr-0/0/0 interface.

Results

In configuration mode, confirm your configuration on the devices by entering the **show** command. If the output does not display the intended configuration, repeat the configuration instructions in this example to correct it.

When the tunnel destination is in a default routing instance:

```
interfaces {
    gr-0/0/0 {
        unit 0 {
            tunnel {
                source 172.16.0.1;
                destination 10.10.1.2;
            }
            family inet {
                address 192.168.100.1/30;
            }
        }
    }
    ge-0/0/0 {
        unit 0 {
            family inet {
                address 172.30.73.56/24;
            }
        }
    }
    lo0 {
        unit 0 {
            family inet {
                address 172.16.0.1/32;
            }
        }
    }
    ...
}
routing-options {
    static {
        route 10.10.1.2/32 next-hop 172.30.73.57;                   # Tunnel
destination is reachable from default routing-instance
        ...
    }
}
routing-instances {
    test {
        instance-type virtual-router;
        interface gr-0/0/0.0;
        routing-options {
            ...
        }
    }
}
```

When the tunnel destination is in a non-default routing instance:

```
interfaces {
    gr-0/0/0 {
        unit 0 {
            tunnel {
                source 172.16.0.1;
                destination 10.10.1.2;
                routing-instance {
                    destination test;                               #
Routing-instance to reach tunnel destination
                }
            }
            family inet {
                address 192.168.100.1/30;
            }
        }
    }
    ge-0/0/0 {
        unit 0 {
            family inet {
                address 172.30.73.56/24;
            }
        }
    }
    lo0 {
        unit 0 {
            family inet {
                address 172.16.0.1/32;
            }
        }
    }
    ...
}

routing-options {
         static {
         route 10.10.1.2/32 next-table test.inet.0;                 # Tunnel
destination is reachable via test.inet.0
     ...
     }
}

routing-instances {
     test {
         instance-type virtual-router;
         interface ge-0/0/0;
         routing-options {
             static {
                 route 10.10.1.2/32 next-hop 172.30.73.57;          # Tunnel
destination is reachable from non-default routing-instance
                 ...
             }
         }
     }
}
```


Verification

Verification of Static Route Use

Purpose Verify that the static route is used.

Action Run the **show route forwarding table** command.

user@host> **show route forwarding-table table ABC**

```
Routing table: ABC.inet
Internet:
Enabled protocols: Bridging,
Destination        Type RtRef Next hop           Type Index    NhRef Netif
default            perm     0                    rjct      541     1
0.0.0.0/32         perm     0                    dscd      539     1
10.11.12.0/24      intf     0                    rslv      617     1 ge-0/0/0.0
10.11.12.0/32      dest     0 10.11.12.0         recv      615     1 ge-0/0/0.0
10.11.12.13/32     intf     0 10.11.12.13        locl      616     2
10.11.12.13/32     dest     0 10.11.12.13        locl      616     2
10.11.12.13.10.11.12.14.4/72
                   dest     0                    locl      594     1
10.11.12.13.10.11.12.14.47/72
                   dest     0                    locl      589     1
10.11.12.14/32     dest     1 56:68:ad:d8:47:a3  ucst      618     2 ge-0/0/0.0
10.11.12.255/32    dest     0 10.11.12.255       bcst      614     1 ge-0/0/0.0
224.0.0.0/4        perm     0                    mdsc      540     1
224.0.0.1/32       perm     0 224.0.0.1          mcst      543     1
255.255.255.255/32 perm     0                    bcst      544     1

Routing table: ABC.iso
ISO:
Enabled protocols: Bridging,
Destination        Type RtRef Next hop           Type Index    NhRef Netif
default            perm     0                    rjct      554     1

Routing table: ABC.inet6
Internet6:
Enabled protocols: Bridging,
Destination        Type RtRef Next hop           Type Index    NhRef Netif
default            perm     0                    rjct      569     1
::/128             perm     0                    dscd      567     2
::1/128            perm     0                    locl      570     1
fe80::/10          perm     0                    dscd      567     2
ff00::/8           perm     0                    mdsc      568     1
ff02::1/128        perm     0 ff02::1            mcst      571     2
ff02::2/128        user     0 ff02::2            mcst      571     2
```

Related Documentation

- *Generic Routing Encapsulation (GRE)*
- *Understanding Generic Routing Encapsulation*
- *Verifying That Generic Routing Encapsulation Tunneling Is Working Correctly*

Example: Configuring GRE over IPsec Tunnels

Overview

GRE tunnels offer minimal security, whereas an IPsec tunnel offers enhanced security in terms of confidentiality, data authentication, and integrity assurance. Also, IPsec cannot directly support multicast packets. However, if an encapsulated GRE tunnel is used first, an IPsec tunnel can then be used to provide security to the multicast packet. In a GRE over IPsec tunnel, all of the routing traffic (IP and non-IP) can be routed through. When the original packet (IP/non-IP) is GRE encapsulated, it has an IP header as defined by the GRE tunnel, normally the tunnel interface IP addresses. The IPs ec protocol can understand the IP packet; so it encapsulates the GRE packet to make it GRE over IPsec.

The basic steps involved in configuring GRE over IPsec are as follows:

- Configure the route-based IPsec tunnel.
- Configure the GRE tunnel.
- Configure a static route with the destination as the remote subnet through the gr- interface.
- Configure the static route for the GRE endpoint with the st0 interface as next hop.

Configuration

In this example, the default configuration has the local subnet interface as ge-0/0/0 with the IPv4 address as 10.10.11.1/24. The destination subnet is 10.10.10.0/24 with the tunnel endpoint IPv4 interface as 10.10.10.1/24. The gr- interface tunnel endpoints are loopback addresses on both the sides, with the local loopback IPv4 address as 172.20.1.1 and the remote loopback IPv4 address as 172.20.1.2. The gr-, st0.0 and lo0 interfaces are bound to a security zone and policies are created accordingly.

- Configuring a GRE interface over an IPsec tunnel on page 424
- Results on page 425

Configuring a GRE interface over an IPsec tunnel

Step-by-Step Procedure

1. Configure the GRE at the **[set interfaces *interface-name* unit *unit-number*]** hierarchy level, where the interface name is ge-0/0/0, and the family is set as inet.

   ```
   [edit interfaces]
   user@host# set interfaces ge-0/0/0 unit 0 family inet address 10.10.11.1/24
   ```

2. Configure the gr- tunnel endpoints and specify the source address, destination address, and family as inet for the tunnel endpoints.

   ```
   [edit interfaces]
   user@host# set interfaces gr-0/0/0  unit 0 tunnel source 172.20.1.1 destination
     172.20.1.2 family inet 192.168.1.1/24
   ```


3. Similarly configure the lo0- and st0.0 interface with the family set as inet.

   [edit interfaces]
   user@host# **set interfaces *lo-0/0/0* unit *0* family *inet* address *172.20.1.1/32***

   [edit interfaces]
   user@host# **set interfaces *st-0/0/0.0* unit *0* family *inet***

4. Confifure the GRE interfaces with security zones. Use the **show zones** command to view the zones, where the configured tunnel interfaces, lo0- and st0- are displayed.

   [edit security zones security-zones trust]]
   user@host# **set host-inbound-traffic system-services all**
   user@host# **set host-inbound-traffic protocols all**
   user@host# **set interfaces *gr-0/0/0.0***
   user@host# **set zones *zone names* protocols all interfaces *gr-0/0/0***

   [edit security zones security-zones untrust]]
   user@host# **set host-inbound-traffic system-services all**
   user@host# **set host-inbound-traffic protocols all**
   user@host# **set interfaces *gr-0/0/0.0.1***
   user@host# **set interfaces *lo0.0***
   user@host# **set interfaces *st0.0***

Results

In configuration mode, confirm your interface configuration by entering the **show** command. The configured interfaces are bound to a security zone at the **[edit security]** hierarchy level. Use the **show zones** command to view the zones, where the configured interfaces (gr-, st0.0, and lo0) are displayed. If the output does not display the intended configuration, repeat the configuration instructions in this example to correct it.

Parameters for configuring the GRE interfaces:

`user@host>` **show interfaces**

```
ge-0/0/0 {
    unit 0 {
        family inet {
            address 10.10.11.1/24;
        }
    }
}

gr-0/0/0 {
    unit 0 {
        tunnel {
            source 172.20.1.1;
            destination 172.20.1.2;
        }
        family inet {
            address 192.168.1.1/24;
```

```
        }
    }
}

lo0 {
    unit 0 {
        family inet {
            address 172.20.1.1/32;
        }
    }
}

st0 {
    unit 0 {
        family inet;
    }
}

[edit]
root@Juniper# show
routing-options {
    static {
        route 10.10.10.0/24 next-hop gr-0/0/0.0;
        route 172.20.1.2/32 next-hop st0.0;
    }
}
```

Parameters for configuring the GRE interfaces with security zones:

```
[edit security]
root@Juniper# show
zones {
    security-zone trust {
        host-inbound-traffic {
            system-services {
                all;
            }
            protocols {
                all;
            }
        }
        interfaces {
            gr-0/0/0.0;
            lo0.0;
            st0.0;
        }
    }
}
```

Verification

Verification of the IPsec Tunnel

Purpose Verify that the IPsec tunnel is up.

Action Run the commands **show security ike security-associations** and **show security ipsec security-associations** commands.

Related Documentation

- *Generic Routing Encapsulation (GRE)*
- *Understanding Generic Routing Encapsulation*
- *Verifying That Generic Routing Encapsulation Tunneling Is Working Correctly*

CHAPTER 22

Configuring Point-to-Point Protocol over Ethernet

Understanding Point-to-Point Protocol over Ethernet

Point-to-Point Protocol over Ethernet (PPPoE) combines PPP, which typically runs over broadband connections, with the Ethernet link-layer protocol that allows users to connect to a network of hosts over a bridge or access concentrator. PPPoE enables service providers to maintain access control through PPP connections and also manage multiple hosts at a remote site.

PPPoE connects multiple hosts on an Ethernet LAN to a remote site through a single customer premises equipment (CPE) device—a Juniper Networks device. Hosts share a common digital subscriber line (DSL), a cable modem, or a wireless connection to the Internet.

To use PPPoE, you must initiate a PPPoE session, encapsulate Point-to-Point Protocol (PPP) packets over Ethernet, and configure the device as a PPPoE client. To provide a PPPoE connection, each PPP session must learn the Ethernet address of the remote peer and establish a unique session identifier during the PPPoE discovery and session stages.

NOTE: **Juniper Networks devices with asymmetric digital subscriber line (ADSL) or symmetric high-speed DSL (SHDSL) interfaces can use PPPoE over Asynchronous Transfer Mode (ATM) to connect through DSL lines only, not for direct ATM connections.**

PPPoE has two stages, the discovery stage and the PPPoE session stage. In the discovery stage, the client discovers the access concentrator by identifying the Ethernet media access control (MAC) address of the access concentrator and establishing a PPPoE session ID. In the session stage, the client and the access concentrator build a point-to-point connection over Ethernet, based on the information collected in the discovery stage.

This topic contains the following sections:

- PPPoE Discovery Stage on page 430
- PPPoE Session Stage on page 431

PPPoE Discovery Stage

To initiate a PPPoE session, a host must first identify the Ethernet MAC address of the remote peer and establish a unique PPPoE session ID for the session. Learning the remote Ethernet MAC address is called PPPoE discovery.

During the PPPoE discovery process, the host does not discover a remote endpoint on the Ethernet network. Instead, the host discovers the access concentrator through which all PPPoE sessions are established. Discovery is a client/server relationship, with the host (a device running Junos OS) acting as the client and the access concentrator acting as the server. Because the network might have more than one access concentrator, the discovery stage allows the client to communicate with all of them and select one.

NOTE: **A device cannot receive PPPoE packets from two different access concentrators on the same physical interface.**

The PPPoE discovery stage consists of the following steps:

1. PPPoE Active Discovery Initiation (PADI)—The client initiates a session by broadcasting a PADI packet to the LAN to request a service.
2. PPPoE Active Discovery Offer (PADO)—Any access concentrator that can provide the service requested by the client in the PADI packet replies with a PADO packet that contains its own name, the unicast address of the client, and the service requested.

An access concentrator can also use the PADO packet to offer other services to the client.

3. PPPoE Active Discovery Request (PADR)—From the PADOs it receives, the client selects one access concentrator based on its name or the services offered and sends it a PADR packet to indicate the service or services needed.
4. PPPoE Active Discovery Session-Confirmation (PADS)—When the selected access concentrator receives the PADR packet, it accepts or rejects the PPPoE session:
   - To accept the session, the access concentrator sends the client a PADS packet with a unique session ID for a PPPoE session and a service name that identifies the service under which it accepts the session.
   - To reject the session, the access concentrator sends the client a PADS packet with a service name error and resets the session ID to zero.

PPPoE Session Stage

The PPPoE session stage starts after the PPPoE discovery stage is over. The access concentrator can start the PPPoE session after it sends a PADS packet to the client, or the client can start the PPPoE session after it receives a PADS packet from the access concentrator. A device supports multiple PPPoE sessions on each interface, but no more than 256 PPPoE sessions per device.

Each PPPoE session is uniquely identified by the Ethernet address of the peer and the session ID. After the PPPoE session is established, data is sent as in any other PPP encapsulation. The PPPoE information is encapsulated within an Ethernet frame and is sent to a unicast address. Magic numbers, echo requests, and all other PPP traffic behave exactly as in normal PPP sessions. In this stage, both the client and the server must allocate resources for the PPPoE logical interface.

After a session is established, the client or the access concentrator can send a PPPoE Active Discovery Termination (PADT) packet anytime to terminate the session. The PADT packet contains the destination address of the peer and the session ID of the session to be terminated. After this packet is sent, the session is closed to PPPoE traffic.

NOTE: **If PPPoE session is already up and the user restarts the PPPoE daemon, a new PPPoE daemon with a new PID starts while the existing session is not terminated.**

If PPPoE session is already down and user restarts the PPPoE daemon, the PPPoE discovery establishes a new session.

The PPPoE session is not terminated for the following configuration changes:

- Changing idle time out value
- Changing auto rec timer value
- Deleting idle time out

- Deleting auto rec timer
- Add new auto rec time
- Add new idle time out
- Change negotiate address to static address
- Change static ip address to a new static ip address
- Changing default chap secrete

The PPPoE session is terminated for the following configuration changes:

- Add ac name
- Delete chap ppp options
- Add new chap ppp options
- Configure uifd mac

NOTE: When the MTU for an underlying physical interface is changed, it brings down the PPPoE session. The PPPoE MTU can be greater than 1492 if the Ethernet or WAN connection supports RFC 4638 (Mini Jumbo Frames).

Related Documentation

- Understanding Physical Encapsulation on an Interface on page 401
- Understanding PPPoE Interfaces on page 432
- Understanding PPPoE Ethernet Interfaces on page 440
- Understanding PPPoE ATM-over-ADSL and ATM-over-SHDSL Interfaces on page 441
- Understanding CHAP Authentication on a PPPoE Interface on page 447
- Understanding the PPPoE-Based Radio-to-Router Protocol on page 456

Understanding PPPoE Interfaces

The device's Point-to-Point Protocol over Ethernet (PPPoE) interface to the access concentrator can be a Fast Ethernet interface, a Gigabit Ethernet interface, a redundant Ethernet interface, an ATM-over-ADSL interface, or an ATM-over-SHDSL interface. The PPPoE configuration is the same for all interfaces. The only difference is the encapsulation for the underlying interface to the access concentrator:

- If the interface is Ethernet, use a PPPoE encapsulation.
- If the interface is ATM-over-ADSL or ATM-over-SHDSL, use a PPPoE over ATM encapsulation.

To configure a PPPoE interface, you create an interface with a logical interface unit 0, then specify a logical Ethernet or ATM interface as the underlying interface for the PPPoE session. You then specify other PPPoE options, including the access concentrator and PPPoE session parameters.

NOTE: PPPoE over redundant Ethernet (reth) interface is supported on SRX100, SRX210, SRX220, SRX240, SRX300, SRX320, SRX340 and SRX650 devices. (Platform support depends on the Junos OS release in your installation.) This feature allows an existing PPPoE session to continue without starting a new PPP0E session in the event of a failover.

Related Documentation

- Understanding Point-to-Point Protocol on page 404
- Example: Configuring PPPoE Interfaces on page 433

Example: Configuring PPPoE Interfaces

This example shows how to configure a PPPoE interface.

Requirements

Before you begin, configure an Ethernet interface. See “Example: Creating an Ethernet Interface” on page 261.

Overview

In this example, you create the PPPoE interface pp0.0 and specify the logical Ethernet interface ge-0/0/1.0 as the underlying interface. You also set the access concentrator, set the PPPoE session parameters, and set the MTU of the IPv4 family to **1492**.

Configuration

CLI Quick Configuration

To quickly configure this example, copy the following command, paste it into a text file, remove any line breaks, change any details necessary to match your network configuration, copy and paste the command into the CLI at the **[edit]** hierarchy level, and then enter **commit** from configuration mode.

```
set interfaces pp0 unit 0 pppoe-options underlying-interface ge-0/0/1.0
  access-concentrator ispl.com auto-reconnect 100 idle-timeout 100 client service-name
  video@ispl.com
set interfaces pp0 unit 0 family inet mtu 1492 negotiate-address
```

Step-by-Step Procedure

The following example requires you to navigate various levels in the configuration hierarchy. For instructions on how to do that, see *Using the CLI Editor in Configuration Mode*.

To configure a PPPoE interface:

1. Create a PPPoE interface.

```
[edit]
user@host# edit interfaces pp0 unit 0
```

2. Configure PPPoE options.

```
[edit interfaces pp0 unit 0]
user@host# set pppoe-options underlying-interface ge-0/0/1.0 access-concentrator
   ispl.com auto-reconnect 100 idle-timeout 100 client service-name video@ispl.com
```

3. Configure the MTU.

```
[edit interfaces pp0 unit 0]
user@host# set family inet mtu 1492
```

NOTE: If you want to configure **mtu** to a value above 1492 octets, then use **ppp-max-payload** option. Refer *pppoe-options* for more details.

4. Configure the PPPoE interface address.

```
[edit interfaces pp0 unit 0]
user@host# set family inet negotiate-address
```

Results

From configuration mode, confirm your configuration by entering the **show interfaces pp0** command. If the output does not display the intended configuration, repeat the configuration instructions in this example to correct it.

```
[edit]
  user@host# show interfaces pp0
unit 0 {
  pppoe-options {
    underlying-interface ge-0/0/1.0;
    idle-timeout 100;
    access-concentrator ispl.com;
    service-name "vide0@ispl.com";
    auto-reconnect 100;
    client;
  }
  family inet {
```

```
        mtu 1492;
        negotiate-address;
      }
    }
```

If you are done configuring the device, enter **commit** from configuration mode.

Verification

Confirm that the configuration is working properly.

Verifying PPPoE Interfaces

Purpose Verify that the PPPoE device interfaces are configured properly.

Action From operational mode, enter the **show interfaces pp0** command.

user@host> **show interfaces pp0**

```
Physical interface: pp0, Enabled, Physical link is Up
  Interface index: 67, SNMP ifIndex: 317
  Type: PPPoE, Link-level type: PPPoE, MTU: 9192
  Device flags   : Present Running
  Interface flags: Point-To-Point SNMP-Traps
  Link type      : Full-Duplex
  Link flags     : None
  Last flapped   : Never
  Input rate     : 0 bps (0 pps)
  Output rate    : 0 bps (0 pps)

  Logical interface pp0.0 (Index 1) (SNMP ifIndex 330)
    Flags: Point-To-Point SNMP-Traps 16384 Encapsulation: PPPoE
    PPPoE:
      State: SessionUp, Session ID: 3304,
      Session AC name: isp1.com, AC MAC address: 00:90:1a:40:f6:4c,
      Service name: video@isp1.com, Configured AC name: isp1.com,
      Auto-reconnect timeout: 60 seconds
      Underlying interface: ge-5/0/0.0 (Index 71)
  Input packets : 23
  Output packets: 22
  Keepalive settings: Interval 10 seconds, Up-count 1, Down-count 3
  Keepalive: Input: 16 (00:00:26 ago), Output: 0 (never)
  LCP state: Opened
  NCP state: inet: Opened, inet6: Not-configured, iso: Not-configured, mpls:
  Not-configured
  CHAP state: Success
    Protocol inet, MTU: 1492
      Flags: Negotiate-Address
      Addresses, Flags: Kernel Is-Preferred Is-Primary
        Destination: 211.211.211.2, Local: 211.211.211.1
```

The output shows information about the physical and the logical interfaces. Verify the following information:

- The physical interface is enabled and the link is up.
- The PPPoE session is running on the correct logical interface.
- For state, the state is active (up).
- For underlying interface, the physical interface on which the PPPoE session is running is correct:
  - For an Ethernet connection, the underlying interface is Fast Ethernet or Gigabit Ethernet—for example, ge-5/0/0.0.
  - For an ATM-over-ADSL or ATM-over-SHDSL connection, the underlying interface is ATM—for example, at-2/0/0.0.

Verifying PPPoE Sessions

Purpose Verify that a PPPoE session is running properly on the logical interface.

Action From operational mode, enter the **show pppoe interfaces** command.

user@host> **show pppoe interfaces**

```
pp0.0 Index 67
  State: Session up, Session ID: 31,
  Service name: video@isp1.com, Configured AC name: isp1.com,
  Session AC name: belur, AC MAC address: 00:90:1a:40:f6:4e,
  Auto-reconnect timeout: 1 seconds,
  Underlying interface: ge-0/0/1.0 Index 69
```

The output shows information about the PPPoE sessions. Verify the following information:

- The PPPoE session is running on the correct logical interface.
- For state, the session is active (up).
- For underlying interface, the physical interface on which the PPPoE session is running is correct:
  - For an Ethernet connection, the underlying interface is Fast Ethernet or Gigabit Ethernet—for example, ge-0/0/1.0.
  - For an ATM-over-ADSL or ATM-over-SHDSL connection, the underlying interface is ATM—for example, at-2/0/0.0.

NOTE: To clear a PPPoE session on the pp0.0 interface, use the **clear pppoe sessions pp0.0** command. To clear all sessions on the interface, use the **clear pppoe sessions** command.

Verifying the PPPoE Version

Purpose Verify the version information of the PPPoE protocol configured on the device interfaces.

Action From operational mode, enter the **show pppoe version** command.

user@host> **show pppoe version**

```
Point-to-Point Protocol Over Ethernet, version 1. rfc2516
   PPPoE protocol               = Enabled
   Maximum Sessions             = 256
   PADI resend timeout          = 2 seconds
   PADR resend timeout          = 16 seconds
   Max resend timeout           = 64 seconds
   Max Configured AC timeout    = 4 seconds
```

The output shows PPPoE protocol information. Verify the following information:

- The correct version of the PPPoE protocol is configured on the interface.
- For PPPoE protocol, the PPPoE protocol is enabled.

Verifying PPPoE Statistics

Purpose Verify the statistics information about PPPoE interfaces.

Action From operational mode, enter the **show pppoe statistics** command.

user@host> **show pppoe statistics**

```
Active PPPoE sessions: 4
  PacketType                       Sent         Received
    PADI                            502                0
    PADO                              0              219
    PADR                            219                0
    PADS                              0              219
    PADT                              0              161
    Service name error                0                0
    AC system error                   0               13
    Generic error                     0                0
    Malformed packets                 0               41
    Unknown packets                   0                0
  Timeout
    PADI                             42
    PADO                              0
    PADR                              0
```

The output shows information about active sessions on PPPoE interfaces. Verify the following information:

- Total number of active PPPoE sessions running on the interfac
- For packet type, the number of packets of each type sent and received during the PPPoE session

Disabling the End-of-List Tag

During the PPPoE discovery stage, any access concentrator that can provide the service requested by the client in the PADI packet replies with a PADO packet that contains its own name, the unicast address of the client, and the service requested. An access concentrator can also use the PADO packet to offer other services to the client. When a client receives a PADO packet, and if it encounters the **End-of-List** tag in the PADO packet, tags after the **End-of-List** tag are ignored and the complete information is not processed correctly. As a result, the PPPoE connection is not established correctly.

Starting in Junos OS Release 12.3X48-D10 you can avoid some PPPoE connection errors by configuring the **ignore-eol-tag** option to disable the **End-of-List** tag in the PADO packet.

Step-by-Step Procedure

The following example requires you to navigate various levels in the configuration hierarchy. For instructions on how to do that, see *Using the CLI Editor in Configuration Mode*.

To disable the **End-of-List** tag:

1. Create a PPPoE interface.

```
[edit]
user@host# set interfaces pp0 unit 0
```

2. Configure PPPoE options.

```
[edit interfaces pp0 unit 0]
user@host# set pppoe-options ignore-eol-tag
```

Results

From configuration mode, confirm your configuration by entering the **show interfaces pp0** command. If the output does not display the intended configuration, repeat the configuration instructions in this example to correct it.

```
[edit]
user@host# show interfaces pp0
unit 0 {
pppoe-options {
   ignore-eol-tag;
}
```

If you are done configuring the device, enter **commit** from configuration mode.

Verifying That the End-of-List Tag Is Disabled

Purpose

Verify the status of the **End-of-List** tag in the PPPoE configuration.

Action From operational mode, enter the **show interfaces pp0.0** command.

`user@host>` **show pppoe interfaces pp0.0**

```
Logical interface pp0.0 (Index 78) (SNMP ifIndex 541)
    Flags: Point-To-Point SNMP-Traps 0x0 Encapsulation: PPPoE
    PPPoE:
      State: SessionUp, Session ID: 3,
      Session AC name: cell, Remote MAC address: 00:26:88:f7:77:83,
      Configured AC name: None, Service name: None,
      Auto-reconnect timeout: Never, Idle timeout: Never,
      Underlying interface: ge-0/0/3.0 (Index 77)
     Ignore End-Of-List tag: Enable
```

`user@host>` **show pppoe interfaces pp0.0 extensive**

```
pp0.0 Index 74
  State: Session up, Session ID: 1,
  Service name: None,
  Session AC name: cell, Configured AC name: None,
  Remote MAC address: 00:26:88:f7:77:83,
  Session uptime: 00:02:03 ago,
  Auto-reconnect timeout: 10 seconds, Idle timeout: Never,
  Underlying interface: ge-0/0/3.0 Index 73
  Ignore End-of-List tag: Enable
  PacketType                       Sent         Received
    PADI                             23                0
    PADO                              0                5
    PADR                             11                0
    PADS                              0                2
    PADT                              2                0
    Service name error                0                0
    AC system error                   0                0
    Generic error                     0                0
    Malformed packets                 0                0
    Unknown packets                   0                0
  Timeout
    PADI                              3
    PADO                              0
    PADR                              3
  Receive Error Counters
    PADI                              0
    PADO                              0
    PADR                              0
    PADS                              0
```

The output shows information about active sessions on PPPoE interfaces. Verify that the **Ignore End-of-List tag: Enable** option is set.

Release History Table

Release	Description
12.3X48-D10	Starting in Junos OS Release 12.3X48-D10 you can avoid some PPPoE connection errors by configuring the **ignore-eol-tag** option to disable the **End-of-List** tag in the PADO packet.

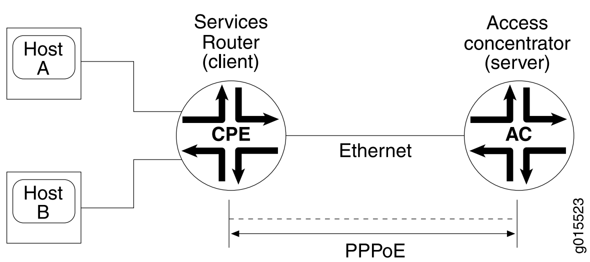
Related Documentation

- Understanding PPPoE Interfaces on page 432

Understanding PPPoE Ethernet Interfaces

During a Point-to-Point Protocol over Ethernet (PPPoE) session, the device encapsulates each PPP frame in an Ethernet frame and transports the frames over an Ethernet loop. Figure 26 on page 440 shows a typical PPPoE session between a device and an access concentrator on the Ethernet loop.

Figure 26: PPPoE Session on the Ethernet Loop



To configure PPPoE on an Ethernet interface, you configure encapsulation on the logical interface.

Related Documentation

- Understanding Point-to-Point Protocol over Ethernet on page 429
- Example: Configuring PPPoE Encapsulation on an Ethernet Interface on page 440

Example: Configuring PPPoE Encapsulation on an Ethernet Interface

This example shows how to configure PPPoE encapsulation on an Ethernet interface.

Requirements

Before you begin:

- Configure an Ethernet interface. See “Example: Creating an Ethernet Interface” on page 261.
- Configure a PPPoE encapsulation interface. See “Example: Configuring PPPoE Interfaces” on page 433.

Overview

In this example, you configure PPPoE encapsulation on the ge-0/0/1 interface.

Configuration

Step-by-Step Procedure

To configure PPPoE encapsulation:

1. Enable PPPoE encapsulation on the interface.

```
[edit]
user@host# set interfaces ge-0/0/1 unit 0 encapsulation ppp-over-ether
```

2. Commit the configuration if you are done configuring the device.

```
[edit]
user@host# commit
```

Verification

To verify the configuration is working properly, enter the **show interfaces ge-0/0/1** command.

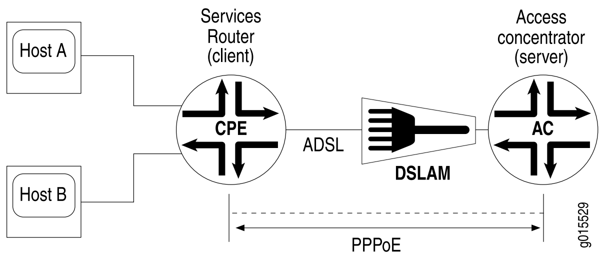
Related Documentation

- Understanding PPPoE Ethernet Interfaces on page 440

Understanding PPPoE ATM-over-ADSL and ATM-over-SHDSL Interfaces

When an ATM network is configured with a point-to-point connection, Point-to-Point Protocol over Ethernet (PPPoE) can use ATM Adaptation Layer 5 (AAL5) for framing PPPoE-encapsulated packets. The AAL5 protocol provides a virtual connection between the client and the server within the same network. The device encapsulates each PPPoE frame in an ATM frame and transports each frame over an asymmetric digital subscriber line (ADSL) or symmetric high-speed DSL (SHDSL) loop and a digital subscriber line access multiplexer (DSLAM). For example, Figure 27 on page 442 shows a typical PPPoE over ATM session between a device and an access concentrator on an ADSL loop.

Figure 27: PPPoE Session on an ADSL Loop



For PPPoE on an ATM-over-ADSL or ATM-over-SHDSL interface, you must configure encapsulation on both the physical and logical interfaces. To configure encapsulation on an ATM-over-ADSL or ATM-over-SHDSL physical interface, use Ethernet over ATM encapsulation. To configure encapsulation on an ATM-over-ADSL or ATM-over-SHDSL logical interface, use PPPoE over AAL5 logical link control (LLC) encapsulation. LLC encapsulation allows a single ATM virtual connection to transport multiple protocols.

Related Documentation

- Understanding Point-to-Point Protocol over Ethernet on page 429
- Example: Configuring PPPoE Encapsulation on an ATM-over-ADSL Interface on page 442

Example: Configuring PPPoE Encapsulation on an ATM-over-ADSL Interface

This example shows how to configure a physical interface for Ethernet over ATM encapsulation and how to create a logical interface for PPPoE over LLC encapsulation.

- Requirements on page 442
- Overview on page 442
- Configuration on page 443
- Verification on page 444

Requirements

Before you begin:

- Configure network interfaces. See “Example: Creating an Ethernet Interface” on page 261.
- Configure PPPoE interfaces. See “Example: Configuring PPPoE Interfaces” on page 433.
- Configure PPPoE encapsulation on an Ethernet interface. See “Example: Configuring PPPoE Encapsulation on an Ethernet Interface” on page 440.

Overview

In this example, you configure the physical interface at-2/0/0 for Ethernet over ATM encapsulation. As part of the configuration, you set the virtual path identifier (VPI) on an ATM-over-ADSL physical interface to 0, you set the ADSL operating mode to auto, and you set the encapsulation type to ATM-over-ADSL. Then you create a logical interface for PPPoE over LLC encapsulation.

Configuration

CLI Quick Configuration

To quickly configure this example, copy the following command, paste it into a text file, remove any line breaks, change any details necessary to match your network configuration, copy and paste the command into the CLI at the **[edit]** hierarchy level, and then enter **commit** from configuration mode.

```
set interfaces at-2/0/0 atm-options vpi 0
set interfaces at-2/0/0 dsl-options operating-mode auto
set interfaces at-2/0/0 encapsulation ethernet-over-atm
set interfaces at-2/0/0 unit 0 encapsulation ppp-over-ether-over-atm-llc vci 0.120
```

Step-by-Step Procedure

The following example requires you to navigate various levels in the configuration hierarchy. For instructions on how to do that, see *Using the CLI Editor in Configuration Mode*.

To configure PPPoE encapsulation on an ATM-over-ADSL interface:

1. Configure the physical interface.

   ```
   [edit]
   user@host# edit interfaces at-2/0/0
   ```

2. Set the VPI on the interface.

   ```
   [edit interfaces at-2/0/0]
   user@host# set atm-options vpi 0
   ```

3. Configure the ADSL operating mode.

   ```
   [edit interfaces at-2/0/0]
   user@host# set dsl-options operating-mode auto
   ```

4. Configure PPPoE encapsulation.

   ```
   [edit interfaces at-2/0/0]
   user@host# set encapsulation ethernet-over-atm
   ```

5. Create a logical interface and configure LLC encapsulation.

   ```
   [edit interfaces at-2/0/0]
   user@host# set unit 0 encapsulation ppp-over-ether-over-atm-llc vci 0.120
   ```

Results From configuration mode, confirm your configuration by entering the **show interfaces at-2/0/0** command. If the output does not display the intended configuration, repeat the configuration instructions in this example to correct it.

```
[edit]
user@host# show interfaces at-2/0/0 {
  encapsulation ethernet-over-atm;
    atm-options {
    vpi 0;
  }
  dsl-options {
    operating-mode auto;
  }
  unit 0 {
    encapsulation ppp-over-ether-over-atm-llc;
    vci 0.120;
    }
  }
```

If you are done configuring the device, enter **commit** from configuration mode.

Verification

Confirm that the configuration is working properly.

- Verifying a PPPoE Configuration for an ATM-over-ADSL or ATM-over-SHDSL Interface on page 444

Verifying a PPPoE Configuration for an ATM-over-ADSL or ATM-over-SHDSL Interface

Purpose Verify the PPPoE configuration for an ATM-over-ADSL or ATM-over-SHDSL interface.

Action From operational mode, enter the **show interfaces** command.

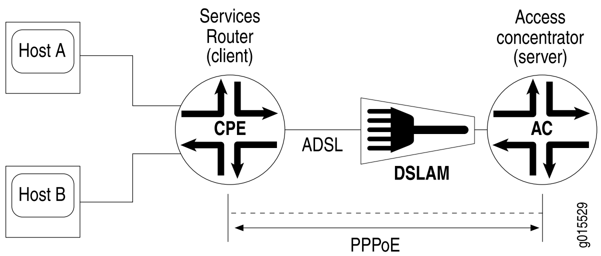
Related Documentation

- Understanding PPPoE ATM-over-ADSL and ATM-over-SHDSL Interfaces on page 441

Understanding PPPoE ATM-over-ADSL and ATM-over-SHDSL Interfaces

When an ATM network is configured with a point-to-point connection, Point-to-Point Protocol over Ethernet (PPPoE) can use ATM Adaptation Layer 5 (AAL5) for framing PPPoE-encapsulated packets. The AAL5 protocol provides a virtual connection between the client and the server within the same network. The device encapsulates each PPPoE frame in an ATM frame and transports each frame over an asymmetric digital subscriber line (ADSL) or symmetric high-speed DSL (SHDSL) loop and a digital subscriber line access multiplexer (DSLAM). For example, Figure 27 on page 442 shows a typical PPPoE over ATM session between a device and an access concentrator on an ADSL loop.

Figure 28: PPPoE Session on an ADSL Loop



For PPPoE on an ATM-over-ADSL or ATM-over-SHDSL interface, you must configure encapsulation on both the physical and logical interfaces. To configure encapsulation on an ATM-over-ADSL or ATM-over-SHDSL physical interface, use Ethernet over ATM encapsulation. To configure encapsulation on an ATM-over-ADSL or ATM-over-SHDSL logical interface, use PPPoE over AAL5 logical link control (LLC) encapsulation. LLC encapsulation allows a single ATM virtual connection to transport multiple protocols.

Related Documentation

- Understanding Point-to-Point Protocol over Ethernet on page 429
- Example: Configuring PPPoE Encapsulation on an ATM-over-ADSL Interface on page 442

Example: Configuring PPPoE Encapsulation on an ATM-over-ADSL Interface

This example shows how to configure a physical interface for Ethernet over ATM encapsulation and how to create a logical interface for PPPoE over LLC encapsulation.

Requirements

Before you begin:

- Configure network interfaces. See “Example: Creating an Ethernet Interface” on page 261.
- Configure PPPoE interfaces. See “Example: Configuring PPPoE Interfaces” on page 433.
- Configure PPPoE encapsulation on an Ethernet interface. See “Example: Configuring PPPoE Encapsulation on an Ethernet Interface” on page 440.

Overview

In this example, you configure the physical interface at-2/0/0 for Ethernet over ATM encapsulation. As part of the configuration, you set the virtual path identifier (VPI) on an ATM-over-ADSL physical interface to 0, you set the ADSL operating mode to auto, and you set the encapsulation type to ATM-over-ADSL. Then you create a logical interface for PPPoE over LLC encapsulation.

Configuration

CLI Quick Configuration

To quickly configure this example, copy the following command, paste it into a text file, remove any line breaks, change any details necessary to match your network configuration, copy and paste the command into the CLI at the **[edit]** hierarchy level, and then enter **commit** from configuration mode.

```
set interfaces at-2/0/0 atm-options vpi 0
set interfaces at-2/0/0 dsl-options operating-mode auto
set interfaces at-2/0/0 encapsulation ethernet-over-atm
set interfaces at-2/0/0 unit 0 encapsulation ppp-over-ether-over-atm-llc vci 0.120
```

Step-by-Step Procedure

The following example requires you to navigate various levels in the configuration hierarchy. For instructions on how to do that, see *Using the CLI Editor in Configuration Mode*.

To configure PPPoE encapsulation on an ATM-over-ADSL interface:

1. Configure the physical interface.

```
[edit]
user@host# edit interfaces at-2/0/0
```

2. Set the VPI on the interface.

```
[edit interfaces at-2/0/0]
user@host# set atm-options vpi 0
```

3. Configure the ADSL operating mode.

```
[edit interfaces at-2/0/0]
user@host# set dsl-options operating-mode auto
```

4. Configure PPPoE encapsulation.

```
[edit interfaces at-2/0/0]
user@host# set encapsulation ethernet-over-atm
```

5. Create a logical interface and configure LLC encapsulation.

```
[edit interfaces at-2/0/0]
user@host# set unit 0 encapsulation ppp-over-ether-over-atm-llc vci 0.120
```

Results From configuration mode, confirm your configuration by entering the **show interfaces at-2/0/0** command. If the output does not display the intended configuration, repeat the configuration instructions in this example to correct it.

```
[edit]
user@host# show interfaces at-2/0/0 {
  encapsulation ethernet-over-atm;
    atm-options {
    vpi 0;
  }
  dsl-options {
    operating-mode auto;
  }
  unit 0 {
    encapsulation ppp-over-ether-over-atm-llc;
    vci 0.120;
    }
  }
```

If you are done configuring the device, enter **commit** from configuration mode.

Verification

Confirm that the configuration is working properly.

- Verifying a PPPoE Configuration for an ATM-over-ADSL or ATM-over-SHDSL Interface on page 447

Verifying a PPPoE Configuration for an ATM-over-ADSL or ATM-over-SHDSL Interface

Purpose Verify the PPPoE configuration for an ATM-over-ADSL or ATM-over-SHDSL interface.

Action From operational mode, enter the **show interfaces** command.

Related Documentation

- Understanding PPPoE ATM-over-ADSL and ATM-over-SHDSL Interfaces on page 441

Understanding CHAP Authentication on a PPPoE Interface

For interfaces with Point-to-Point Protocol over Ethernet (PPPoE) encapsulation, you can configure interfaces to support the PPP Challenge Handshake Authentication Protocol (CHAP). When you enable CHAP on an interface, the interface can authenticate its peer and be authenticated by its peer.

If you set the **passive** option to handle incoming CHAP packets only, the interface does not challenge its peer. However, if the interface is challenged, it responds to the challenge. If you do not set the **passive** option, the interface always challenges its peer.

You can configure Remote Authentication Dial-In User Service (RADIUS) authentication of PPP sessions using CHAP. CHAP enables you to send RADIUS messages through a routing instance to customer RADIUS servers in a private network.

Related Documentation

- Understanding Point-to-Point Protocol over Ethernet on page 429
- Example: Configuring CHAP Authentication on a PPPoE Interface on page 448

Example: Configuring CHAP Authentication on a PPPoE Interface

This example shows how to configure CHAP authentication on a PPPoE interface.

Requirements

Before you begin:

- Configure an Ethernet interface. See "Example: Creating an Ethernet Interface" on page 261.
- Configure a PPPoE interface. See "Example: Configuring PPPoE Interfaces" on page 433.
- Configure PPPoE encapsulation on an ATM-over-ADSL interface. See "Example: Configuring PPPoE Encapsulation on an ATM-over-ADSL Interface" on page 442.

Overview

In this example, you configure a CHAP access profile, and then apply it to the PPPoE interface pp0. You also configure the hostname to be used in CHAP challenge and response packets, and set the passive option for handling incoming CHAP packets.

Configuration

CLI Quick Configuration

To quickly configure this example, copy the following command, paste it into a text file, remove any line breaks, change any details necessary to match your network configuration, copy and paste the command into the CLI at the **[edit]** hierarchy level, and then enter **commit** from configuration mode.

```
set access profile A-ppp-client client client1 chap-secret my-secret
set interfaces pp0 unit 0 ppp-options chap access-profile A-ppp-client local-name
  A-ge-0/0/1.0 passive
```


Step-by-Step Procedure

The following example requires you to navigate various levels in the configuration hierarchy. For instructions on how to do that, see *Using the CLI Editor in Configuration Mode*.

To configure CHAP on a PPPoE interface:

1. Configure a CHAP access profile.

   ```
   [edit]
   user@host# set access profile A-ppp-client client client1 chap-secret my-secret
   ```

2. Enable CHAP options on the interface.

   ```
   [edit]
   user@host# edit interfaces pp0 unit 0 ppp-options chap
   ```

3. Configure the CHAP access profile on the interface.

   ```
   [edit interfaces pp0 unit 0 ppp-options chap]
   user@host# set access-profile A-ppp-client
   ```

4. Configure a hostname for the CHAP challenge and response packets.

   ```
   [edit interfaces pp0 unit 0 ppp-options chap]
   user@host# set local-name A-ge-0/0/1.0
   ```

5. Set the passive option to handle incoming CHAP packets only.

   ```
   [edit interfaces pp0 unit 0 ppp-options chap]
   user@host# set passive
   ```

Results

From configuration mode, confirm your configuration by entering the **show interfaces** command. If the output does not display the intended configuration, repeat the configuration instructions in this example to correct it.

```
[edit]
  user@host# show interfaces
  pp0 {
  unit 0 {
  ppp-options {
  chap {
  access-profile A-ppp-client;
  local-name A-ge-0/0/1.0;
  passive;
  }
  }
  }
}
```


If you are done configuring the device, enter **commit** from configuration mode.

Verification

Confirm that the configuration is working properly.

Verifying CHAP Authentication

Purpose Verify that CHAP is enabled on the interface.

Action From operational mode, enter the **show interfaces** command.

Related Documentation

- Understanding CHAP Authentication on a PPPoE Interface on page 447

Verifying Credit-Flow Control

Purpose Display PPPoE credit-flow control information about credits on each side of the PPPoE session when credit processing is enabled on the interface.

Action

```
user@host> show pppoe interface detail
```

```
pp0.51 Index 73
  State: Session up, Session ID: 3,
  Service name: None,
  Configured AC name: None, Session AC name: None,
  Remote MAC address: 00:22:83:84:2e:81,
  Session uptime: 00:05:48 ago,
  Auto-reconnect timeout: Never, Idle timeout: Never,
  Underlying interface: ge-0/0/4.1 Index 72
  PADG Credits: Local: 12345, Remote: 6789, Scale factor: 128 bytes
  PADQ Current bandwidth: 750 Kbps, Maximum 1000 Kbps
    Quality: 85, Resources 65, Latency 100 msec.
  Dynamic bandwidth: 3 Kbps
```

```
pp0.1000 Index 71
  State: Down, Session ID: 1,
  Service name: None,
  Configured AC name: None, Session AC name: None,
  Remote MAC address: 00:00:00:00:00:00,
  Auto-reconnect timeout: Never, Idle timeout: Never,
  Underlying interface: ge-0/0/1.0 Index 70
  PADG Credits: enabled
  Dynamic bandwidth: enabled
```

Related Documentation

- Understanding CHAP Authentication on a PPPoE Interface on page 447
- Verifying Credit-Flow Control on page 450

Verifying PPPoE Interfaces

Purpose Display PPPoE interfaces information.

Action

- To display PPPoE interface information:

  user@host> **show pppoe interfaces pp0.51 detail**

```
pp0.51 Index 75
  State: Session up, Session ID: 1,
  Service name: None,
  Configured AC name: None, Session AC name: None,
  Remote MAC address: 00:11:22:33:44:55,
  Session uptime: 00:04:18 ago,
  Auto-reconnect timeout: Never, Idle timeout: Never,
  Underlying interface: ge-0/0/1.0 Index 70
  PADQ Current bandwidth: 750 Kbps, Maximum 1000 Kbps
    Quality: 85, Resources 65, Latency 100 msec.
  Dynamic bandwidth: 3 Kbps
```

- To display PPPoE terse interface information:

  user@host> **show pppoe interfaces terse pp0.51**

```
Interface     Admin Link Proto    Local         Remote
    pp0.51       up   up    inet   5.1.1.1     --> 5.1.1.2
          inet6     fe80::21f:12ff:fed2:2918/64
                                feee::5:1:1:1/126
```

Related Documentation

- Understanding PPPoE Interfaces on page 432
- Example: Configuring PPPoE Interfaces on page 433

Verifying R2CP Interfaces

Purpose Display R2CP interfaces information.

Action

- To display R2CP interface information:

  root@host> **show r2cp interfaces**

```
Interface: ge-0/0/3.51
  Nodes: 0
```

- To display R2CP information:

```
root@host> show r2cp radio extensive
```

```
  Node Packet Type          Sent        Received          Errors
  MIM                          -               1               0
  ROM                          1               -               -
  Heartbeats                   0               0               0
  Node Term                    0               0               0
  Node Term Ack                0               0               -

  Heartbeat Timeouts              0
  Node Term Timeouts              0


  Session Packet Type       Sent        Received          Errors
  Init                         -               1               0
  Init ACK                     1               -               -
  Update                       -               0               0
  Terminate                    0               0               0
  Terminate ACK                0               0               0

  Terminate Timeouts              0
```

- To display R2CP session information:

```
root@host> show r2cp sessions extensive
```

```
Session: 1
  Destination MAC address 01:02:03:04:05:06
   Status: Established VLANs 201
   Virtual channel:  2
   Session Update:  last received: 3.268 seconds
     Current bandwidth: 22000 Kbps, Maximum 22000 Kbps
     Quality: 100, Resources 100, Latency 100 msec.
   Effective bandwidth: 952 Kbps, last change: 51.484 seconds
     Updates below threshold: 1


    Session Packet Type       Sent        Received          Errors
    Init                         -               1               0
    Init ACK                     1               -               -
    Update                       -               0               0
    Terminate                    0               0               0
    Terminate ACK                0               0               0

    Terminate Timeouts              0
```

Related Documentation

- Understanding PPPoE Interfaces on page 432
- Example: Configuring PPPoE Interfaces on page 433

Displaying Statistics for PPPoE

Purpose Display PPPoE statistics.

Action

```
user@host> show interfaces pp0.51 statistics
```

```
Logical interface pp0.51 (Index 75) (SNMP ifIndex 137)
    Flags: Point-To-Point SNMP-Traps 0x0 Encapsulation: PPPoE
    PPPoE:
      State: SessionUp, Session ID: 1,
      Session AC name: None, Remote MAC address: 00:22:83:84:2f:03,
      Underlying interface: ge-0/0/4.1 (Index 74)
    Input packets : 20865
    Output packets: 284636
  Keepalive settings: Interval 10 seconds, Up-count 1, Down-count 3
  Keepalive: Input: 0 (never), Output: 943 (00:00:06 ago)
  LCP state: Opened
  NCP state: inet: Opened, inet6: Opened, iso: Not-configured, mpls:
  Not-configured
  CHAP state: Closed
  PAP state: Closed
    Security: Zone: Null
    Protocol inet, MTU: 1492
      Flags: None
      Addresses, Flags: Is-Preferred Is-Primary
        Destination: 5.1.1.2, Local: 5.1.1.1
    Protocol inet6, MTU: 1492
      Flags: None
      Addresses, Flags: Is-Preferred
        Destination: fe80::/64, Local: fe80::21f:12ff:fed2:2918
      Addresses, Flags: Is-Preferred Is-Primary
        Destination: feee::5:1:1:0/126, Local: feee::5:1:1:1
```

Related Documentation

- Understanding CHAP Authentication on a PPPoE Interface on page 447
- Verifying Credit-Flow Control on page 450

Setting Tracing Options for PPPoE

To trace the operations of the router's PPPoE process, include the traceoptions statement at the [edit protocols pppoe] hierarchy level:

```
[edit protocols pppoe]
traceoptions {
  file filename <files number> <match regular-expression> <size size> <world-readable |
    no-world-readable>;
  flag flag;
  level severity-level;
  no-remote-trace;
}
```


To specify more than one tracing operation, include multiple **flag** statements.

You can specify the following flags in the **traceoptions** statement:

- **all**—All areas of code
- **config**—Configuration code
- **events**—Event code
- **gres**—Gres code
- **init**—Initialization code
- **interface-db**—Interface database code
- **memory**—Memory management code
- **protocol**—PPPoE protocol processing code
- **rtsock**—Routing socket code
- **session-db**—Session management code
- **signal**—Signal handling code
- **state**—State handling code
- **timer**—Timer code
- **ui**—User interface code

Related Documentation

- Understanding PPPoE Interfaces on page 432
- Example: Configuring PPPoE Interfaces on page 433

CHAPTER 23

Configuring PPPoE-Based Radio-to-Router Protocol

PPPoE-Based Radio-to-Router Protocols Overview

Support for PPPoE-based radio-to-router protocols includes the following extensions to the PPPoE protocol:

- Messages that define how an external device provides the router with timely information about the quality of a link connection
- A flow control mechanism that indicates how much data the router can forward

The router uses the information provided in these PPPoE messages to dynamically adjust the interface speed. When OSPF is notified of this change, it adjusts the cost of the link and updates the routing tables accordingly.

The radio provides ground-to-ground or ground-to-air communications with like devices. When the radio picks up a signal from another device, it initiates a PPPoE session with a directly connected router. The PPPoE session encapsulates the packets that are relayed over a PPP link between the local and remote routers. The remote radio then forwards traffic over an independent PPPoE session between the remote radio and the router to which it is connected. The two routers exchange LCP and IPCP messages to configure the link and exchange OSPF messages to establish the network topology.

The router and radio are deployed in highly dynamic environments, such as moving vehicles. The quality of the radio link between the routers can vary significantly as a vehicle moves behind an obstruction. Each radio monitors the link every 50 milliseconds for changes in the link bandwidth, quality, and utilization. If any changes are detected, the radios announce the new set of metrics to the respective routers through a PPPoE Active Discovery Quality (PADQ) message, which is a nonstandard extension to the

PPPoE Discovery Protocol [RFC2516]. The router transforms these metrics into a bandwidth value for the PPP link and compares it to the value currently in use. When the router detects that the difference exceeds a user-specified threshold, it adjusts the speed of the PPP link. An event message notifies OSPF of the change, which then triggers OSPF to announce any resulting routing topology changes to its neighbors.

The PPPoE-based radio-to-router protocol notifies the router about neighbors joining or leaving the network and to create and maintain OSPF adjacencies over the dynamic links established between them. The costs assigned to these links are based on network conditions and flow control information sent by the radios. The calculations and requests to update interface speeds are performed by routines in a common library.

When PPPoE is used for applications, such as mobile radio, the radio links have variable bandwidth. So a mobile radio can function in a PPPoE environment, PPPoE messaging includes PADQ messages, which enable a link cost to be propagated to OSPF through the evaluation of various link quality metrics. The router uses information from these notifications along with user-configured parameters to calculate interface link costs that are used by the routing protocols.

A radio can send an optional PADQ at any time to query or report link quality metrics. When transmitting PPP streams over radio links, the quality of the link directly affects the throughput. The PADQ packet is used by the radio modem to report link metrics.

To support the credit-based flow control extensions described in RFC4938, PPPoE peers can also grant each other forwarding credits. The grantee can forward traffic to the peer only when it has a sufficient number of credits to do so. Credit-based forwarding allows both sides of the session to agree to use a non-default credit scaling factor during the PADR and PADS message exchange. Although this is used on both sides of the session, this feature provides the radio client with a flow control mechanism that throttles traffic by limiting the number of credits it grants to the router.

Related Documentation

- Understanding the PPPoE-Based Radio-to-Router Protocol on page 456

Understanding the PPPoE-Based Radio-to-Router Protocol

Point-to-Point Protocol over Ethernet (PPPoE)-based radio-to-router protocols include messages that define how an external system will provide the device with timely information about the quality of a link's connection. They also include a flow control mechanism to indicate how much data the device can forward. The device can then use the information provided in the PPPoE messages to dynamically adjust the interface speed of PPP links.

For example, a high-band networking waveform (HNW) radio provides ground-to-ground or ground-to-air communications with like devices. When the HNW picks up a signal from another device, it initiates a PPPoE session with a directly connected device (router). The PPPoE session encapsulates the packets that are relayed over a PPP link between the local and remote devices. The remote radio then forwards traffic to a remote device using an independent PPPoE session. The two devices exchange Link Control Protocol

(LCP) and Internet Protocol Control Protocol (IPCP) messages to configure the link and exchange OSPF messages to establish the network topology.

Each HNW radio monitors the link every 50 milliseconds for changes in the link bandwidth, quality, and utilization. If any changes are detected, the radios announce the new set of metrics to the respective devices through a PPPoE Active Discovery Quality (PADQ) message, which is a nonstandard extension to the PPPoE Discovery Protocol (RFC 2516). The device transforms these metrics into a bandwidth value for the PPP link and compares it to the value currently in use. When the device detects that the difference exceeds a user-specified threshold, it adjusts the speed of the PPP link. OSPF is notified of the change and announces any resulting routing topology changes to its neighbors.

The CLI statement, **radio-router**, indicates that metrics announcements received on the interface will be processed by the device. When a PPPoE logical interface refers to this as an underlying interface, the device then processes incoming PADQ messages and uses information from the host's messages to control the flow of traffic and manage the speed of the link, resulting in a corresponding adjustment of the OSPF cost. If this option is not specified, then PADQ messages received over the underlying interface are ignored.

The following options are available within the **radio-router** configuration statement:

- **bandwidth**, **resource**, **latency**, and **quality** —These statements provide control over the weights used when transforming PADQ link metrics into an interface speed for the virtual link:
  - **bandwidth**—Weight of current (vs. maximum) data rate
  - **resource**—Resource weight
  - **latency**—Latency weight
  - **quality**—Relative link quality weight

  All four weights accept values from 0 through 100. The default value for all four weights is 100.
- **credit**—This statement supports the credit-based flow control extensions described in RFC 4938, The statement enables PPPoE peers to grant each other forwarding credits. The grantee is then allowed to forward traffic to the peer only when it has a sufficient number of credits to do so. The subsequent credit interval statement controls how frequently the device generates credit announcement messages. The **interval** sub-statement, which controls the grant rate interval, accepts values from 1 through 60 seconds.
- **threshold**—This statement specifies how much of a difference is required between the calculated and the current interface speeds. The **threshold** value, expressed as a percentage, defaults to 10.

The following hierarchy provides another view of the **radio-router** configuration statements.

```
interfaces{
  interface-name {
    radio-router {
```

```
        bandwidth;
        credit {
          interval;
        }
        latency;
        quality;
        resource;
        threshold;
      }
    }
  }
```

Related Documentation

- Understanding Point-to-Point Protocol over Ethernet on page 429
- Example: Configuring the PPPoE-Based Radio-to-Router Protocol on page 458

Configuring PPPoE-Based Radio-to-Router Protocols

To configure the PPPoE-based radio-to-router protocol:

1. Configure PPPoE encapsulation for an Ethernet interface.
2. Configure radio-router on the logical Ethernet interface.
3. Specify the logical Ethernet interface as the underlying interface for the PPPoE session.
4. Configure the operational mode as server.
5. (Optional) Identify the access concentrator by a unique name.
6. Specify how many seconds to wait before attempting to reconnect.
7. Provide a name for the type of service provided by the access concentrator.
8. Configure the maximum transmission unit (MTU) of the interface.
9. Configure the MTU size for the protocol family.
10. Disable the sending of keepalive messages on the logical interface.

Related Documentation

- Understanding the PPPoE-Based Radio-to-Router Protocol on page 456
- Example: Configuring the PPPoE-Based Radio-to-Router Protocol on page 458

Example: Configuring the PPPoE-Based Radio-to-Router Protocol

This example shows how to configure the PPPoE-based radio-to-router protocol.

Requirements

Before you begin:

1. Configure network interfaces. See "Example: Creating an Ethernet Interface" on page 261.
2. Configure PPPoE interfaces. See "Example: Configuring PPPoE Interfaces" on page 433.
3. Configure PPPoE encapsulation on an Ethernet interface. See "Example: Configuring PPPoE Encapsulation on an Ethernet Interface" on page 440.
4. Configure PPPoE encapsulation on an ATM-over-ADSL interface. See "Example: Configuring PPPoE Encapsulation on an ATM-over-ADSL Interface" on page 442.
5. Configure CHAP authentication on a PPPoE interface. See "Example: Configuring CHAP Authentication on a PPPoE Interface" on page 448.

Overview

In this example, you configure the ge-3/0/3 interface and set the bandwidth, resource, latency, and quality to **100**. You also set the threshold value to **10**, and then configure options on the logical interface.

Configuration

CLI Quick Configuration

To quickly configure this example, copy the following command, paste it into a text file, remove any line breaks, change any details necessary to match your network configuration, copy and paste the command into the CLI at the **[edit]** hierarchy level, and then enter **commit** from configuration mode.

```
[edit]
set interfaces ge-3/0/3 unit 1 radio-router bandwidth 100 resource 100 latency 100 quality
  100 threshold 10
set interfaces pp0 unit 1 pppoe-options underlying-interface ge-3/0/3 server
set interfaces pp0 unit 1 family inet unnumbered-address lo0.0 destination 192.168.1.2
set interfaces pp0 unit 1 family inet6 address lo0.0 destination fec0:1:1:1::2
```

Step-by-Step Procedure

The following example requires you to navigate various levels in the configuration hierarchy. For instructions on how to do that, see the Junos OS CLI User Guide.

To configure the PPPoE-based radio-to-router protocol:

1. Enable the PPPoE-based radio-to-router protocol.

```
[edit]
user@host# edit interfaces ge-3/0/3 unit 1 radio-router
```

2. Set the interface speed for the virtual link.

```
[edit interfaces ge-3/0/3 unit 1 radio-router]
```



```
user@host# set bandwidth 100 resource 100 latency 100 quality 100
```

3. Set the calculated and current interface speeds, as a percentage.

```
[edit interfaces ge-3/0/3 unit 1 radio-router]
user@host# set threshold 10
```

4. Configure options on the logical interface.

```
[edit interfaces pp0 unit 1]
user@host# set pppoe-options underlying-interface ge-3/0/3
user@host# set pppoe-options server
user@host# set family inet unnumbered-address lo0.0 destination 192.168.1.2
user@host# set family inet6 address lo0.0 destination fec0:1:1:1::2
```

Results From configuration mode, confirm your configuration by entering the **show interfaces** command. If the output does not display the intended configuration, repeat the configuration instructions in this example to correct it.

For brevity, this **show interfaces** command output includes only the configuration that is relevant to this example. Any other configuration on the system has been replaced with ellipses (...).

```
[edit]
  user@host# show interfaces ge-3/0/3 {
  unit 1
  radio-router {
  bandwidth 100;
  resource 100;
  latency 100;
  quality 100;
  threshold 10;
  }
  }
}
  ...
  pp0 {
    unit 1 {
    pppoe-options {
    underlying-interface ge-3/0/3;
    server;
  }
  family inet {
    unnumbered-address lo0.0 destination 192.168.1.2;
    }
    family inet6;
    }
  }
```

If you are done configuring the device, enter **commit** from configuration mode.

Verification

Confirm that the configuration is working properly.

Verifying the PPPoE-based Radio-to-Router Protocol

Purpose Verify the PPPoE-Based radio-to-router protocol.

Action From operational mode, enter the **show interfaces** command.

Related Documentation

- Understanding the PPPoE-Based Radio-to-Router Protocol on page 456

Credit Flow Control for PPPoE

To support the credit-based flow control extensions described in RFC4938, PPPoE peers can grant each other forwarding credits. The grantee is allowed to forward traffic to the peer only when it has a sufficient number of credits to do so. When credit-based forwarding is used on both sides of the session, the radio client can throttle traffic by limiting the number of credits it grants to the router.

The **interfaces** statement includes the **radio-router** attribute, which contains the parameters used for rate-based scheduling and OSPF link cost calculations. It also includes the **credit** attribute to indicate that credit-based packet scheduling is supported on the PPPoE interfaces that reference this underlying interface. Interfaces that set the **encapsulation** attribute support the PPPoE Active Discovery Grant (PADG) and PPPoE Active Discovery Credit (PADC) messages in the same way that the **radio-router** attribute provides active support for the PPPoE Active Discovery Quality (PADQ) message.

The **credit interval** parameter controls how frequently the router generates credit announcement messages. For PPPoE this corresponds to the interval between PADG credit announcements for each session.

Related Documentation

- PPPoE-Based Radio-to-Router Protocols Overview on page 455
- Understanding the PPPoE-Based Radio-to-Router Protocol on page 456
- Configuring PPPoE-Based Radio-to-Router Protocols on page 458

PPPoE Credit-Based Flow Control Configuration

This example shows a PPPoE credit-based flow control configuration.

```
[edit interfaces ge-0/0/1]
unit 0 {
  encapsulation ppp-over-ether;
  radio-router {
    credit {
```

```
            interval 10;
        }
        bandwidth 80;
        threshold 5;
    }
}
```

Related Documentation

- Understanding the PPPoE-Based Radio-to-Router Protocol on page 456
- Configuring PPPoE-Based Radio-to-Router Protocols on page 458

CHAPTER 24

Configuring R2CP Radio-to-Router Protocol

R2CP Radio-to-Router Protocol Overview

The Network Centric Waveform (NCW) radio-specific radio-to-router control protocol (R2CP) is similar to the PPPoE radio-to-router protocol. Both of these protocols exchange dynamic metric changes in the network that the routers use to update the OSPF topologies.

In radio-router topologies, the router connects to the radio over a Gigabit Ethernet link and the radio transmits packets over the radio frequency (RF) link. The radio periodically sends metrics to the router, which uses RF link characteristics and other data to inform the router on the shaping and OSPF link capacity. The router uses this information to shape the data traffic and provide the OSPF link cost for its SPF calculations. The radio functions like a Layer 2 switch and can only identify remote radio-router pairs using the Layer 2 MAC addresses. With R2CP the router receives metrics for each neighboring router, identified by the MAC address of the remote router. The R2CP daemon translates the MAC addresses to link the local IPv6 address and sends the metrics for each neighbor to OSPF. Processing these metrics is similar to the handling of PPPoE PADQ metrics. Unlike PPPoE, which is a point-to-point link, these R2CP neighbors are treated as nodes in a broadcast LAN.

You must configure each neighbor node with a per unit scheduler for CoS. The scheduler context defines the attributes of Junos class-of-service. To define CoS for each radio, you can configure virtual channels to limit traffic. You need to configure virtual channels for as many remote radio-router pairs as there are in the network. You configure virtual channels on a logical interface. Each virtual channel can be configured to have a set of eight queues with a scheduler and an optional shaper. When the radio initiates the session with a peer radio-router pair, a new session is created with the remote MAC address of the router and the VLAN over which the traffic flows. Junos OS chooses from the list of free virtual channels and assigns the remote MAC and the eight CoS queues and the scheduler to this remote MAC address. All traffic destined to this remote MAC address is subjected to the CoS that is defined in the virtual channel.

A virtual channel group is a collection of virtual channels. Each radio can have only one virtual channel group assigned uniquely. If you have more than one radio connected to the router, you must have one virtual channel group for each local radio-to-router pair. Although a virtual channel group is assigned to a logical interface, a virtual channel is not the same as a logical interface. The only features supported on a virtual channel are queuing, packet scheduling, and accounting. Rewrite rules and routing protocols apply to the entire logical interface.

All nodes in the R2CP network are in a broadcast LAN. The point-to-multipoint over LAN protocol supports advertising different bandwidth information for neighbors on a broadcast link. The network link is a point-to-multipoint link in the OSPFv3 link state database, which uses existing OSPF neighbor discovery to provide automatic discovery without configuration. It enables each node to advertise a different metric to every other node in the network to accurately represent the cost of communication. The **p2mp-over-lan** interface type under the OSPFv3 interface configuration enables you to configure the interface. OSPFv3 then uses LAN procedures for neighbor discovery and flooding, but represents the interface as point-to-multipoint in the link state database.

The interface type and router LSA are available under the following hierarchies:

[protocols ospf3 area *area-id* interface *interface-name*]

[routing-instances *routing-instances-name* protocols ospf3 area *area-id* interface *interface-name*]

For example:

```
protocols {
  ospf3 {
    area 0.0.0.0 {
      interface ge-0/0/2.0 {
        interface-type p2mp-over-lan;
      }
    }
  }
}
```

Related Documentation

- Configuring the R2CP Radio-to-Router Protocol on page 464

Configuring the R2CP Radio-to-Router Protocol

To configure the R2CP protocol:

1. Configure the interfaces.

   The following example creates four logical interfaces on ge-0/0/2, using unit 52 for R2CP control messages and units 101-193 for data traffic. The **per-unit-scheduler** statement is required for R2CP.

   ```
   interfaces {
   ```

```
    ge-0/0/2 {
      per-unit-scheduler;
      vlan-tagging;
      unit 52 {
        vlan-id 52;
        family inet {
          address 52.1.1.1/24;
        }
      }
      unit 101 {
        vlan-id 101;
        family inet {
          address 101.1.1.1/24;
        }
      }
      unit 102 {
        vlan-id 102;
        family inet {
          address 102.1.1.1/24;
        }
      }
      unit 103 {
        vlan-id 103;
        family inet {
          address 103.1.1.1/24;
        }
      }
    }
  }
```

2. Configure the R2CP protocol.

   The following example configures g2-0/0/2.52 as the interface for R2CP control messages, vg1 as the virtual-channel group, and ge-0/0/2.101-103 as data interfaces using the radio-interface statement.

```
protocols {
  r2cp {
    radio myRadio {
      interface ge-0/0/2.52;
      virtual-channel-group vg1;
      radio-interface ge-0/0/2.101;
      radio-interface ge-0/0/2.102;
      radio-interface ge-0/0/2.103;
    }
  }
}
```

3. Configure class of service.

   The following example defines virtual-channels, their initial shaping-rates, and the virtual-channel-group to which they belong. It also makes the association between radio-interface interfaces and virtual-channel-group. In the class of service configuration, the **vc-shared-scheduler** configuration statement is required for each interface configured as a radio interface in the R2CP protocol configuration.

```
class-of-service {
  virtual-channels {
    vc1;
    vc2;
    vc3;
    vc4;
  }
  virtual-channel-groups {
    vg1 {
      vc1 {
        scheduler-map sm;
        shaping-rate 15m;
        default;
      }
      vc2 {
        scheduler-map sm;
        shaping-rate 20m;
      }
      vc3 {
        scheduler-map sm;
        shaping-rate 20m;
      }
      vc4 {
        scheduler-map sm;
        shaping-rate 20m;
      }
    }
  }
  forwarding-classes {
    queue 0 DATA-queue;
  }
  interfaces {
    ge-0/0/2 {
      unit 101 {
        virtual-channel-group vg1;
        vc-shared-scheduler;
      }
      unit 102 {
        virtual-channel-group vg1;
        vc-shared-scheduler;
      }
      unit 103 {
        virtual-channel-group vg1;
        vc-shared-scheduler;
      }
    }
  }
  scheduler-maps {
    sm {
      forwarding-class DATA-queue scheduler sm-scheduler;
    }
  }
  schedulers {
    sm-scheduler {
      transmit-rate percent 20;
```



```
            buffer-size percent 20;
            priority low;
        }
    }
}
```

Related Documentation

- R2CP Radio-to-Router Protocol Overview on page 463

PART 6

Configuring Link Services and Special Interfaces

CHAPTER 25

Configuring Link Services Interfaces

Link Services Interfaces Overview

Link services include the multilink services Multilink Point-to-Point Protocol (MLPPP), Multilink Frame Relay (MLFR), and Compressed Real-Time Transport Protocol (CRTP). Juniper Networks devices support link services on the **lsq-0/0/0** link services queuing interface.

You configure the link services queuing interface (**lsq-0/0/0**) on a Juniper Networks device to support multilink services and CRTP.

The link services queuing interface on SRX Series devices consists of services provided by the following interfaces on the Juniper Networks M Series and T Series routing platforms: multilink services interface (**ml-*fpc/pic/port***), link services interface (**ls-*fpc/pic/port***), and link services intelligent queuing interface (**lsq-*fpc/pic/port***). Although the multilink services, link services, and link services intelligent queuing (IQ) interfaces on M Series and T Series routing platforms are installed on Physical Interface Cards (PICs), the link services queuing interface on SRX Series devices is an internal interface only and is not associated with a physical medium or Physical Interface Module (PIM).

NOTE: (**ls-*fpc/pic/port***) is not supported on SRX Series devices.

This section contains the following topics.

- Configuring Fragmentation by Forwarding Class on page 475
- Configuring Link-Layer Overhead on page 477

Services Available on a Link Services Interface

The link services interface is a logical interface available by default. Table 36 on page 472 summarizes the services available on the interface.

Table 36: Services Available on a Link Services Interface

Services	Purpose	More Information
Multilink bundles by means of MLPPP and MLFR encapsulation	Aggregates multiple constituent links into one larger logical bundle to provide additional bandwidth, load balancing, and redundancy. NOTE: Dynamic call admission control (DCAC) configurations are not supported on Link Services Interfaces.	• Example: Configuring an MLPPP Bundle on page 512 • Example: Configuring Multilink Frame Relay FRF.15 on page 517 • Example: Configuring Multilink Frame Relay FRF.16 on page 521
Link fragmentation and interleaving (LFI)	Reduces delay and jitter on links by breaking up large data packets and interleaving delay-sensitive voice packets with the resulting smaller packets.	"Understanding Link Fragmentation and Interleaving Configuration" on page 495
Compressed Real-Time Transport Protocol (CRTP)	Reduces the overhead caused by Real-Time Transport Protocol (RTP) on voice and video packets.	"Compressed Real-Time Transport Protocol Overview" on page 475
Class-of-service (CoS) classifiers, forwarding classes, schedulers and scheduler maps, and shaping rates	Provides a higher priority to delay-sensitive packets—by configuring CoS, such as the following: • Classifiers—To classify different types of traffic, such as voice, data, and network control packets. • Forwarding classes—To direct different types of traffic to different output queues. • Fragmentation map—To define mapping between forwarding class and multilink class, and forwarding class and fragment threshold. In forwarding class and multilink class mapping, drop timeout can be configured. • Schedulers and scheduler maps—To define properties for the output queues such as delay-buffer, transmission rate, and transmission priority. • Shaping rate—To define certain bandwidth usage by an interface.	• Example: Configuring Interface Shaping Rates on page 509 • Configuring Fragmentation by Forwarding Class on page 475

Link Services Exceptions

The link and multilink services implementation on SRX Series devices is similar to the implementation on the M Series and T Series routing platforms, with the following exceptions:

- Support for link and multilink services are on the **lsq-0/0/0** interface instead of the **ml-*fpc/pic/port***, **lsq-*fpc/pic/port***, and **ls-*fpc/pic/port*** interfaces.
- When LFI is enabled, fragmented packets are queued in a round-robin fashion on the constituent links to enable per-packet and per-fragment load balancing. See "Queuing with LFI" on page 474.
- Support for per-unit scheduling is on all types of constituent links (on all types of interfaces).
- Support for Compressed Real-Time Transport Protocol (CRTP) is for both MLPPP and PPP.

Configuring Multiclass MLPPP

For **lsq-0/0/0** on Juniper Networks device, with MLPPP encapsulation, you can configure multiclass MLPPP. If you do not configure multiclass MLPPP, fragments from different classes cannot be interleaved. All fragments for a single packet must be sent before the fragments from another packet are sent. Non-fragmented packets can be interleaved between fragments of another packet to reduce latency seen by non-fragmented packets. In effect, latency-sensitive traffic is encapsulated as regular PPP traffic, and bulk traffic is encapsulated as multilink traffic. This model works as long as there is a single class of latency-sensitive traffic, and there is no high-priority traffic that takes precedence over latency-sensitive traffic. This approach to LFI, used on the Link Services PIC, supports only two levels of traffic priority, which is not sufficient to carry the four-to-eight forwarding classes that are supported by M series and T series routing platforms.

Multiclass MLPPP makes it possible to have multiple classes of latency-sensitive traffic that are carried over a single multilink bundle with bulk traffic. In effect, multiclass MLPPP allows different classes of traffic to have different latency guarantees. With multiclass MLPPP, you can map each forwarding class into a separate multilink class, thus preserving priority and latency guarantees.

NOTE: Configuring both LFI and multiclass MLPPP on the same bundle is not necessary, nor is it supported, because multiclass MLPPP represents a superset of functionality. When you configure multiclass MLPPP, LFI is automatically enabled.

The Junos OS PPP implementation does not support the negotiation of address field compression and protocol field compression PPP NCP options, which means that the software always sends a full 4-byte PPP header.

The Junos OS implementation of multiclass MLPPP does not support compression of common header bytes.

Multiclass MLPPP greatly simplifies packet ordering issues that occur when multiple links are used. Without multiclass MLPPP, all voice traffic belonging to a single flow is hashed to a single link to avoid packet ordering issues. With multiclass MLPPP, you can assign voice traffic to a high-priority class, and you can use multiple links.

To configure multiclass MLPPP on a link services IQ interface, you must specify how many multilink classes should be negotiated when a link joins the bundle, and you must specify the mapping of a forwarding class into an multiclass MLPPP class.

To specify how many multilink classes should be negotiated when a link joins the bundle, include the **multilink-max-classes** statement:

```
multilink-max-classes number;
```

You can include this statement at the following hierarchy levels:

- **[edit interfaces *interface-name* unit *logical-unit-number*]**
- **[edit logical-routers *logical-router-name* interfaces *interface-name* unit *logical-unit-number*]**

The number of multilink classes can be 1 through 8. The number of multilink classes for each forwarding class must not exceed the number of multilink classes to be negotiated.

To specify the mapping of a forwarding class into a multiclass MLPPP class, include the **multilink-class** statement at the **[edit class-of-service fragmentation-maps forwarding-class *class-name*]** hierarchy level:

```
edit class-of-service fragmentation-maps forwarding-class class-namemultilink-class
  number
```

The multilink class index number can be 0 through 7. The **multilink-class** statement and the **no-fragmentation** statement are mutually exclusive.

To view the number of multilink classes negotiated, issue the **show interfaces lsq-0/0/0.*logical-unit-number* detail** command.

Queuing with LFI

LFI or non-LFI packets are placed into queues on constituent links based on the queues in which they arrive. No changes in the queue number occur while the fragmented, non-fragmented, or LFI packets are being queued.

For example, assume that Queue Q0 is configured with fragmentation threshold 128, Q1 is configured with no fragmentation, and Q2 is configured with fragmentation threshold 512. Q0 is receiving stream of traffic with packet size 512. Q1 is receiving voice traffic of 64 bytes, and Q2 is receiving stream of traffic with 128-byte packets. Next the stream on Q0 gets fragmented and queued up into Q0 of a constituent link. Also, all packets on Q2 are queued up on Q0 on constituent link. The stream on Q1 is considered to be LFI because no fragmentation is configured. All the packets from Q0 and Q2 are queued up on Q0 of constituent link. All the packets from Q1 are queued up on Q2 of constituent link.

Using **lsq-0/0/0**, CRTP can be applied on LFI and non-LFI packets. There will be no changes in their queue numbers because of CRTP.

Queuing on Q2s of Constituent Links

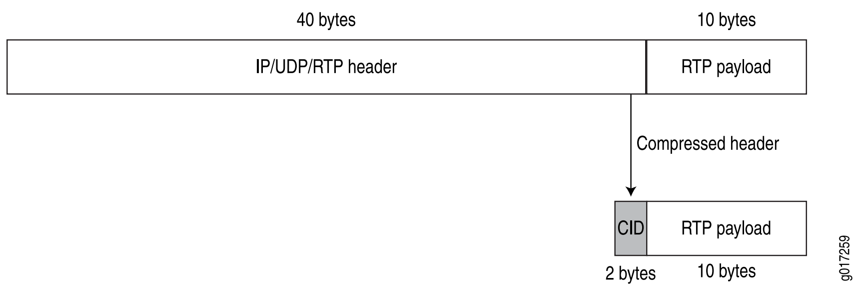
When using class of service on a multilink bundle, all Q2 traffic from the multilink bundle is queued to Q2 of constituent links based on a hash computed from the source address, destination address, and the IP protocol of the packet. If the IP payload is TCP or UDP traffic, the hash also includes the source port and destination port. As a result of this hash algorithm, all traffic belonging to one traffic flow is queued to Q2 of one constituent link. This method of traffic delivery to the constituent link is applied at all times, including when the bundle has not been set up with LFI.

Compressed Real-Time Transport Protocol Overview

Real-Time Transport Protocol (RTP) can help achieve interoperability among different implementations of network audio and video applications. However, in some cases, the header, which includes the IP, UDP, and RTP headers, can be too large (around 40 bytes) on networks using low-speed lines such as dial-up modems. Compressed Real-Time Transport Protocol (CRTP) can be configured to reduce network overhead on low-speed links. CRTP replaces the IP, UDP, and RTP headers with a 2-byte context ID (CID), reducing the header overhead considerably.

Figure 29 on page 475 shows how CRTP compresses the RTP header in a voice packet by reducing a 40-byte header to a 2-byte header.

Figure 29: CRTP



You can configure CRTP with MLPPP or PPP logical interface encapsulation on link services interfaces. See “Example: Configuring an MLPPP Bundle” on page 512.

Real-time and non-real-time data frames are carried together on lower-speed links without causing excessive delays to the real-time traffic. See “Understanding Link Fragmentation and Interleaving Configuration” on page 495.

Configuring Fragmentation by Forwarding Class

For **lsq-0/0/0**, you can specify fragmentation properties for specific forwarding classes. Traffic on each forwarding class can be either multilink encapsulated (fragmented and sequenced) or non-encapsulated (hashed with no fragmentation). By default, traffic in all forwarding classes is multilink encapsulated.

When you do not configure fragmentation properties for the queues on MLPPP interfaces, the fragmentation threshold you set at the **[edit interfaces *interface-name* unit *logical-unit-number* fragment-threshold]** hierarchy level is the fragmentation threshold for all forwarding classes within the MLPPP interface. For MLFR FRF.16 interfaces, the fragmentation threshold you set at the **[edit interfaces *interface-name* mlfr-uni-nni-bundle-options fragment-threshold]** hierarchy level is the fragmentation threshold for all forwarding classes within the MLFR FRF.16 interface.

If you do not set a maximum fragment size anywhere in the configuration, packets are still fragmented if they exceed the smallest maximum transmission unit (MTU) or maximum received reconstructed unit (MRRU) of all the links in the bundle. A non-encapsulated flow uses only one link. If the flow exceeds a single link, then the forwarding class must be multilink encapsulated, unless the packet size exceeds the MTU/MRRU.

Even if you do not set a maximum fragment size anywhere in the configuration, you can configure the MRRU by including the mrru statement at the **[edit interfaces *lsq-0/0/0* unit *logical-unit-number*]** or **[edit interfaces *interface-name* mlfr-uni-nni-bundle-options]** hierarchy level. The MRRU is similar to the MTU, but is specific to link services interfaces. By default the MRRU size is 1504 bytes, and you can configure it to be from 1500 through 4500 bytes.

To configure fragmentation properties on a queue, include the fragmentation-maps statement at the **[edit class-of-service]** hierarchy level:

```
[edit class-of-service]
```

```
fragmentation-maps {
  map-name {
    forwarding-class class-name {
      fragment-threshold bytes;
      multilink-class number;
      no-fragmentation;
    }
  }
}
```

To set a per-forwarding class fragmentation threshold, include the **fragment-threshold** statement in the fragmentation map. This statement sets the maximum size of each multilink fragment.

To set traffic on a queue to be non-encapsulated rather than multilink encapsulated, include the **no-fragmentation** statement in the fragmentation map. This statement specifies that an extra fragmentation header is not prepended to the packets received on this queue and that static link load balancing is used to ensure in-order packet delivery.

For a given forwarding class, you can include either the **fragment-threshold** or **no-fragmentation** statement; they are mutually exclusive.

You use the **multilink-class** statement to map a forwarding class into a multiclass MLPPP. For a given forwarding class, you can include either the **multilink-class** or **no-fragmentation** statement; they are mutually exclusive.

To associate a fragmentation map with a multilink PPP interface or MLFR FRF.16 DLCI, include the **fragmentation-map** statement at the **[edit class-of-service interfaces *interface-name* unit logical-unit-number]** hierarchy level:


```
[edit class-of-service interfaces]
```

```
lsq-0/0/0 {
  unit logical-unit-number { # Multilink PPP
  fragmentation-map map-name;
  }
}
```

```
lsq-0/0/0:channel { # MLFR FRF.16
  unit logical-unit-number
  fragmentation-map map-name;
  }
}
```

Configuring Link-Layer Overhead

Link-layer overhead can cause packet drops on constituent links because of bit stuffing on serial links. Bit stuffing is used to prevent data from being interpreted as control information.

By default, 4 percent of the total bundle bandwidth is set aside for link-layer overhead. In most network environments, the average link-layer overhead is 1.6 percent. Therefore, we recommend 4 percent as a safeguard.

For **lsq-0/0/0** on Juniper Networks device, you can configure the percentage of bundle bandwidth to be set aside for link-layer overhead. To do this, include the link-layer-overhead statement:

```
link-layer-overhead percent;
```

You can include this statement at the following hierarchy levels:

- **[edit interfaces *interface-name* mlfr-uni-nni-bundle-options]**
- **[edit interfaces *interface-name* unit *logical-unit-number*]**
- **[edit logical-routers *logical-router-name* interfaces *interface-name* unit *logical-unit-number*]**

You can configure the value to be from 0 percent through 50 percent.

Related Documentation

- Link Services Configuration Overview on page 477
- Understanding the Internal Interface LSQ-0/0/0 Configuration on page 531
- Verifying the Link Services Interface on page 478

Link Services Configuration Overview

Before you begin:

- Install device hardware.

- Establish basic connectivity. See the Getting Started Guide for your device.
- Have a basic understanding of physical and logical interfaces and Juniper Networks interface conventions. See "Understanding Interfaces" on page 3

Plan how you are going to use the link services interface on your network. See "Link Services Interfaces Overview" on page 471.

To configure link services on an interface, perform the following tasks:

1. Configure link fragmentation and interleaving (LFI). See "Example: Configuring Link Fragmentation and Interleaving" on page 496.
2. Configure classifiers and forwarding classes. See "Example: Defining Classifiers and Forwarding Classes" on page 500.
3. Configure scheduler maps. See "Understanding How to Define and Apply Scheduler Maps" on page 503.
4. Configure interface shaping rates. See "Example: Configuring Interface Shaping Rates" on page 509
5. Configure an MLPPP bundle. See "Example: Configuring an MLPPP Bundle" on page 512.
6. To configure MLFR, see "Example: Configuring Multilink Frame Relay FRF.15" on page 517 or "Example: Configuring Multilink Frame Relay FRF.16" on page 521
7. To configure CRTP, see "Example: Configuring the Compressed Real-Time Transport Protocol" on page 527

Related Documentation

- Link Services Interfaces Overview on page 471
- Understanding Multilink Frame Relay FRF.15 on page 517
- Understanding Multilink Frame Relay FRF.16 on page 521
- Understanding Compressed Real-Time Transport Protocol on page 527
- Understanding the Internal Interface LSQ-0/0/0 Configuration on page 531
- Verifying the Link Services Interface on page 478

Verifying the Link Services Interface

Confirm that the configuration is working properly.

- Verifying Link Services Interface Statistics on page 479
- Verifying Link Services CoS Configuration on page 481

Verifying Link Services Interface Statistics

Purpose Verify the link services interface statistics.

Action The sample output provided in this section is based on the configurations provided in "Example: Configuring an MLPPP Bundle" on page 512. To verify that the constituent links are added to the bundle correctly and the packets are fragmented and transmitted correctly, take the following actions:

1. On device R0 and device R1, the two devices used in this example, configure MLPPP and LFI as described in "Example: Configuring an MLPPP Bundle" on page 512.
2. From the CLI, enter the **ping** command to verify that a connection is established between R0 and R1.
3. Transmit 10 data packets, 200 bytes each, from R0 to R1.
4. On R0, from the CLI, enter the **show interfaces *interface-name* statistics** command.

user@R0> **show interfaces lsq-0/0/0 statistics detail**

```
Physical interface: lsq-0/0/0, Enabled, Physical link is Up
  Interface index: 134, SNMP ifIndex: 29, Generation: 135
  Link-level type: LinkService, MTU: 1504
  Device flags   : Present Running
  Interface flags: Point-To-Point SNMP-Traps
  Last flapped   : 2006-06-23 11:36:23 PDT (03:38:43 ago)
  Statistics last cleared: 2006-06-23 15:13:12 PDT (00:01:54 ago)
  Traffic statistics:
   Input  bytes  :                    0                    0 bps
   Output bytes  :                 1820                    0 bps
   Input  packets:                    0                    0 pps
   Output packets:                   10                    0 pps
  ...
  Egress queues: 8 supported, 8 in use
  Queue counters:       Queued packets  Transmitted packets      Dropped packets

    0 DATA                          10                   10                    0

    1 expedited-fo                   0                    0                    0

    2 VOICE                          0                    0                    0

    3 NC                             0                    0                    0


  Logical interface lsq-0/0/0.0 (Index 67) (SNMP ifIndex 41) (Generation 133)
    Flags: Point-To-Point SNMP-Traps 0x4000 Encapsulation: Multilink-PPP
    Bandwidth: 16mbps
    Bundle options:
      ...
      Drop timer period              0
      Sequence number format         long (24 bits)
```



```
      Fragmentation threshold        128
      Links needed to sustain bundle  1
      Interleave fragments           Enabled
    Bundle errors:
      Packet drops                   0 (0 bytes)
      Fragment drops                 0 (0 bytes)
     ...
    Statistics        Frames        fps         Bytes          bps
    Bundle:
      Fragments:
        Input :            0          0             0            0
        Output:           20          0          1920            0
      Packets:
        Input :            0          0             0            0
        Output:           10          0          1820            0
    Link:
      se-1/0/0.0
        Input :            0          0             0            0
        Output:           10          0          1320            0
      se-1/0/1.0
        Input :            0          0             0            0
        Output:           10          0           600            0
  ...
      Destination: 10.0.0.9/24, Local: 10.0.0.10, Broadcast: Unspecified,
Generation:144
```

This output shows a summary of interface information. Verify the following information:

- **Physical interface**—The physical interface is **Enabled**. If the interface is shown as **Disabled**, do either of the following:
  - In the CLI configuration editor, delete the **disable** statement at the **[edit interfaces *interface-name*]** level of the configuration hierarchy.
  - In the J-Web configuration editor, clear the **Disable** check box on the **Interfaces>*interface-name*** page.
- **Physical link**—The physical link is **Up**. A link state of **Down** indicates a problem with the interface module, interface port, or physical connection (link-layer errors).
- **Last flapped**—The **Last Flapped** time is an expected value. The **Last Flapped** time indicates the last time the physical interface became unavailable and then available again. Unexpected flapping indicates likely link-layer errors.
- **Traffic statistics**—Number and rate of bytes and packets received and transmitted on the interface. Verify that the number of inbound and outbound bytes and packets match the expected throughput for the physical interface. To clear the statistics and see only new changes, use the **clear interfaces statistics *interface-name*** command.
- **Queue counters**—Name and number of queues are as configured. This sample output shows that 10 data packets were transmitted and no packets were dropped.
- **Logical interface**—Name of the multilink bundle you configured—**lsq-0/0/0.0**.
- **Bundle options**—Fragmentation threshold is correctly configured, and fragment interleaving is enabled.

- **Bundle errors**—Any packets and fragments dropped by the bundle.
- **Statistics**—The fragments and packets are received and transmitted correctly by the device. All references to traffic direction (input or output) are defined with respect to the device. Input fragments received by the device are assembled into input packets. Output packets are segmented into output fragments for transmission out of the device.

  In this example, 10 data packets of 200 bytes were transmitted. Because the fragmentation threshold is set to 128 bytes, all data packets were fragmented into two fragments. The sample output shows that 10 packets and 20 fragments were transmitted correctly.
- **Link**—The constituent links are added to this bundle and are receiving and transmitting fragments and packets correctly. The combined number of fragments transmitted on the constituent links must be equal to the number of fragments transmitted from the bundle. This sample output shows that the bundle transmitted 20 fragments and the two constituent links **se-1/0/0.0** and **se-1/0/1.0.0** correctly transmitted **10+10=20** fragments.
- **Destination** and **Local**—IP address of the remote side of the multilink bundle and the local side of the multilink bundle. This sample output shows that the destination address is the address on R1 and the local address is the address on R0.

See Also

- Link Services Interfaces Overview on page 471

Verifying Link Services CoS Configuration

Purpose Verify CoS configurations on the link services interface.

Action From the CLI, enter the following commands:

- **show class-of-service interface** ***interface-name***
- **show class-of-service classifier name** ***classifier-name***
- **show class-of-service scheduler-map** ***scheduler-map-name***

The sample output provided in this section is based on the configurations provided in“Example: Configuring an MLPPP Bundle” on page 512.

`user@R0>` **show class-of-service interface lsq-0/0/0**

```
Physical interface: lsq-0/0/0, Index: 136
Queues supported: 8, Queues in use: 4
  Scheduler map: [default], Index: 2
  Input scheduler map: [default], Index: 3
  Chassis scheduler map: [default-chassis], Index: 4
 Logical interface: lsq-0/0/0.0, Index: 69
    Object              Name                     Type              Index
    Scheduler-map       s_map                    Output            16206
    Classifier         ipprec-compatibility     ip                   12
```

user@R0> **show class-of-service interface ge-0/0/1**

```
Physical interface: ge-0/0/1, Index: 140
          Queues supported: 8, Queues in use: 4
          Scheduler map: [default], Index: 2
          Input scheduler map: [default], Index: 3

         Logical interface: ge-0/0/1.0, Index: 68
         Object              Name                   Type         Index
         Classifier         classfy_input            ip           4330
```

user@R0> **show class-of-service classifier name classify_input**

```
Classifier: classfy_input, Code point type: inet-precedence, Index: 4330

  Code point       Forwarding class            Loss priority
    000                  DATA                         low
    010                  VOICE                        low
```

user@R0> **show class-of-service scheduler-map s_map**

```
Scheduler map: s_map, Index: 16206

  Scheduler: DATA, Forwarding class: DATA, Index: 3810
  Transmit rate: 49 percent, Rate Limit: none, Buffer size: 49 percent,
Priority:low
    Drop profiles:
      Loss priority       Protocol         Index         Name
      Low                   any              1        [default-drop-profile]

      Medium low            any              1        [default-drop-profile]

      Medium high           any              1        [default-drop-profile]

      High                  any              1        [default-drop-profile]


  Scheduler: VOICE, Forwarding class: VOICE, Index: 43363
  Transmit rate: 50 percent, Rate Limit: none, Buffer size: 5 percent,
Priority:high
    Drop profiles:
      Loss priority       Protocol          Index        Name
      Low                   any               1        [default-drop-profile]

      Medium low            any               1        [default-drop-profile]

      Medium high           any               1        [default-drop-profile]

      High                  any               1        [default-drop-profile]


  Scheduler: NC, Forwarding class: NC, Index: 2435
  Transmit rate: 1 percent, Rate Limit: none, Buffer size: 1 percent, Priority:high

    Drop profiles:
      Loss priority       Protocol         Index      Name
      Low                   any              1      [default-drop-profile]

      Medium low            any              1      [default-drop-profile]
```



```
Medium high              any          1       [default-drop-profile]
High                     any          1       [default-drop-profile]
```

These output examples show a summary of configured CoS components. Verify the following information:

- **Logical Interface**—Name of the multilink bundle and the CoS components applied to the bundle. The sample output shows that the multilink bundle is **lsq-0/0/0.0**, and the CoS scheduler-map **s_map** is applied to it.
- **Classifier**—Code points, forwarding classes, and loss priorities assigned to the classifier. The sample output shows that a default classifier, **ipprec-compatibility**, was applied to the **lsq-0/0/0** interface and the classifier **classify_input** was applied to the **ge-0/0/1** interface.
- **Scheduler**—Transmit rate, buffer size, priority, and loss priority assigned to each scheduler. The sample output displays the data, voice, and network control schedulers with all the configured values.

See Also

- Troubleshooting the Link Services Interface on page 483
- Link Services Interfaces Overview on page 471

Troubleshooting the Link Services Interface

To solve configuration problems on a link services interface:

- Determine Which CoS Components Are Applied to the Constituent Links on page 483
- Determine What Causes Jitter and Latency on the Multilink Bundle on page 485
- Determine If LFI and Load Balancing Are Working Correctly on page 485
- Determine Why Packets Are Dropped on a PVC Between a Juniper Networks Device and a Third-Party Device on page 492

Determine Which CoS Components Are Applied to the Constituent Links

Problem

Description: You are configuring a multilink bundle, but you also have traffic without MLPPP encapsulation passing through constituent links of the multilink bundle. Do you apply all CoS components to the constituent links, or is applying them to the multilink bundle enough?

Solution

You can apply a scheduler map to the multilink bundle and its constituent links. Although you can apply several CoS components with the scheduler map, configure only the ones that are required. We recommend that you keep the configuration on the constituent links simple to avoid unnecessary delay in transmission.

Table 37 on page 484 shows the CoS components to be applied on a multilink bundle and its constituent links.

Table 37: CoS Components Applied on Multilink Bundles and Constituent Links

Cos Component	Multilink Bundle	Constituent Links	Explanation
Classifier	Yes	No	CoS classification takes place on the incoming side of the interface, not on the transmitting side, so no classifiers are needed on constituent links.
Forwarding class	Yes	No	Forwarding class is associated with a queue, and the queue is applied to the interface by a scheduler map. The queue assignment is predetermined on the constituent links. All packets from Q2 of the multilink bundle are assigned to Q2 of the constituent link, and packets from all the other queues are queued to Q0 of the constituent link.
Scheduler map	Yes	Yes	Apply scheduler maps on the multilink bundle and the constituent link as follows: • Transmit rate—Make sure that the relative order of the transmit rate configured on Q0 and Q2 is the same on the constituent links as on the multilink bundle. • Scheduler priority—Make sure that the relative order of the scheduler priority configured on Q0 and Q2 is the same on the constituent links as on the multilink bundle. • Buffer size—Because all non-LFI packets from the multilink bundle transit on Q0 of the constituent links, make sure that the buffer size on Q0 of the constituent links is large enough. • RED drop profile—Configure a RED drop profile on the multilink bundle only. Configuring the RED drop profile on the constituent links applies a back pressure mechanism that changes the buffer size and introduces variation. Because this behavior might cause fragment drops on the constituent links, make sure to leave the RED drop profile at the default settings on the constituent links.
Shaping rate for a per-unit scheduler or an interface-level scheduler	No	Yes	Because per-unit scheduling is applied only at the end point, apply this shaping rate to the constituent links only. Any configuration applied earlier is overwritten by the constituent link configuration.
Transmit-rate exact or queue-level shaping	Yes	No	The interface-level shaping applied on the constituent links overrides any shaping on the queue. Thus apply transmit-rate exact shaping on the multilink bundle only.
Rewrite rules	Yes	No	Rewrite bits are copied from the packet into the fragments automatically during fragmentation. Thus what you configure on the multilink bundle is carried on the fragments to the constituent links.

Table 37: CoS Components Applied on Multilink Bundles and Constituent Links (continued)

Cos Component	Multilink Bundle	Constituent Links	Explanation
Virtual channel group	Yes	No	Virtual channel groups are identified through firewall filter rules that are applied on packets only before the multilink bundle. Thus you do not need to apply the virtual channel group configuration to the constituent links.

See Also

- Link Services Interfaces Overview on page 471
- Troubleshooting the Link Services Interface on page 483
- See the *Junos OS Class of Service Configuration Guide for Security Devices*

Determine What Causes Jitter and Latency on the Multilink Bundle

Problem **Description:** To test jitter and latency, you send three streams of IP packets. All packets have the same IP precedence settings. After configuring LFI and CRTP, the latency increased even over a noncongested link. How can you reduce jitter and latency?

Solution To reduce jitter and latency, do the following:

1. Make sure that you have configured a shaping rate on each constituent link.
2. Make sure that you have not configured a shaping rate on the link services interface.
3. Make sure that the configured shaping rate value is equal to the physical interface bandwidth.
4. If shaping rates are configured correctly, and jitter still persists, contact the Juniper Networks Technical Assistance Center (JTAC).

See Also

- *RPM Overview*

Determine If LFI and Load Balancing Are Working Correctly

Problem **Description:** In this case, you have a single network that supports multiple services. The network transmits data and delay-sensitive voice traffic. After configuring MLPPP and LFI, make sure that voice packets are transmitted across the network with very little delay and jitter. How can you find out if voice packets are being treated as LFI packets and load balancing is performed correctly?

Solution When LFI is enabled, data (non-LFI) packets are encapsulated with an MLPPP header and fragmented to packets of a specified size. The delay-sensitive, voice (LFI) packets are PPP-encapsulated and interleaved between data packet fragments. Queuing and load balancing are performed differently for LFI and non-LFI packets.

To verify that LFI is performed correctly, determine that packets are fragmented and encapsulated as configured. After you know whether a packet is treated as an LFI packet or a non-LFI packet, you can confirm whether the load balancing is performed correctly.

Solution Scenario—Suppose two Juniper Networks devices, R0 and R1, are connected by a multilink bundle **lsq-0/0/0.0** that aggregates two serial links, **se-1/0/0** and **se-1/0/1**. On R0 and R1, MLPPP and LFI are enabled on the link services interface and the fragmentation threshold is set to 128 bytes.

In this example, we used a packet generator to generate voice and data streams. You can use the packet capture feature to capture and analyze the packets on the incoming interface.

The following two data streams were sent on the multilink bundle:

- 100 data packets of 200 bytes (larger than the fragmentation threshold)
- 500 data packets of 60 bytes (smaller than the fragmentation threshold)

The following two voice streams were sent on the multilink bundle:

- 100 voice packets of 200 bytes from source port 100
- 300 voice packets of 200 bytes from source port 200

To confirm that LFI and load balancing are performed correctly:

NOTE: **Only the significant portions of command output are displayed and described in this example.**

1. Verify packet fragmentation. From operational mode, enter the **show interfaces lsq-0/0/0** command to check that large packets are fragmented correctly.

   `user@R0#>` **show interfaces lsq-0/0/0**

```
Physical interface: lsq-0/0/0, Enabled, Physical link is Up
  Interface index: 136, SNMP ifIndex: 29
  Link-level type: LinkService, MTU: 1504
  Device flags   : Present Running
  Interface flags: Point-To-Point SNMP-Traps
  Last flapped   : 2006-08-01 10:45:13 PDT (2w0d 06:06 ago)
  Input rate     : 0 bps (0 pps)
  Output rate    : 0 bps (0 pps)

  Logical interface lsq-0/0/0.0 (Index 69) (SNMP ifIndex 42)
    Flags: Point-To-Point SNMP-Traps 0x4000 Encapsulation: Multilink-PPP
    Bandwidth: 16mbps
    Statistics         Frames      fps       Bytes        bps
    Bundle:
      Fragments:
        Input :             0        0           0          0
        Output:          1100        0      118800          0
      Packets:
        Input :             0        0           0          0
        Output:          1000        0      112000          0
   ...
    Protocol inet, MTU: 1500
      Flags: None
      Addresses, Flags: Is-Preferred Is-Primary
        Destination: 9.9.9/24, Local: 9.9.9.10
```

   Meaning—The output shows a summary of packets transiting the device on the multilink bundle. Verify the following information on the multilink bundle:

   - The total number of transiting packets = 1000
   - The total number of transiting fragments=1100
   - The number of data packets that were fragmented =100

   The total number of packets sent (600 + 400) on the multilink bundle match the number of transiting packets (1000), indicating that no packets were dropped.

   The number of transiting fragments exceeds the number of transiting packets by 100, indicating that 100 large data packets were correctly fragmented.

   Corrective Action—If the packets are not fragmented correctly, check your fragmentation threshold configuration. Packets smaller than the specified fragmentation threshold are not fragmented.

2. Verify packet encapsulation. To find out whether a packet is treated as an LFI or non-LFI packet, determine its encapsulation type. LFI packets are PPP encapsulated, and non-LFI packets are encapsulated with both PPP and MLPPP. PPP and MLPPP encapsulations have different overheads resulting in different-sized packets. You can compare packet sizes to determine the encapsulation type.

   A small unfragmented data packet contains a PPP header and a single MLPPP header. In a large fragmented data packet, the first fragment contains a PPP header and an MLPPP header, but the consecutive fragments contain only an MLPPP header.

   PPP and MLPPP encapsulations add the following number of bytes to a packet:

   - PPP encapsulation adds 7 bytes:

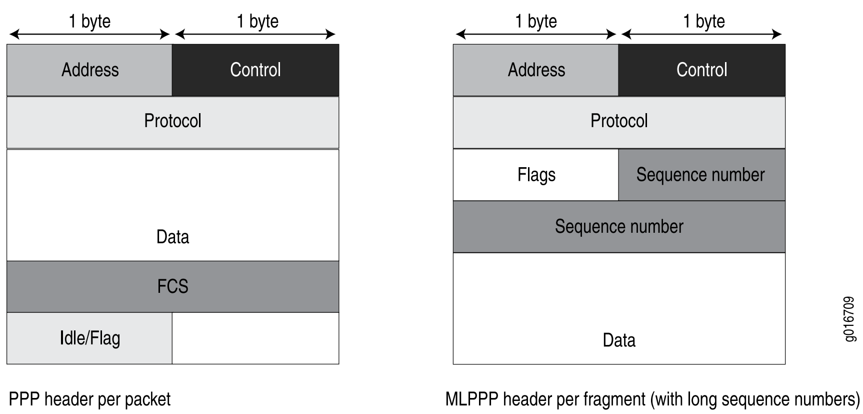
     4 bytes of header+2 bytes of frame check sequence (FCS)+1 byte that is idle or contains a flag

   - MLPPP encapsulation adds between 6 and 8 bytes:

     4 bytes of PPP header+2 to 4 bytes of multilink header

   Figure 30 on page 488 shows the overhead added to PPP and MLPPP headers.

Figure 30: PPP and MLPPP Headers



For CRTP packets, the encapsulation overhead and packet size are even smaller than for an LFI packet. For more information, see Example: Configuring the Compressed Real-Time Transport Protocol.

Table 38 on page 488 shows the encapsulation overhead for a data packet and a voice packet of 70 bytes each. After encapsulation, the size of the data packet is larger than the size of the voice packet.

Table 38: PPP and MLPPP Encapsulation Overhead

Packet Type	Encapsulation	Initial Packet Size	Encapsulation Overhead	Packet Size after Encapsulation
Voice packet (LFI)	PPP	70 bytes	4 + 2 + 1 = 7 bytes	77 bytes
Data fragment (non-LFI) with short sequence	MLPPP	70 bytes	4 + 2 + 1 + 4 + 2 = 13 bytes	83 bytes

Table 38: PPP and MLPPP Encapsulation Overhead (continued)

Packet Type	Encapsulation	Initial Packet Size	Encapsulation Overhead	Packet Size after Encapsulation
Data fragment (non-LFI) with long sequence	MLPPP	70 bytes	4 + 2 + 1 + 4 + 4 = 15 bytes	85 bytes

From operational mode, enter the **show interfaces queue** command to display the size of transmitted packet on each queue. Divide the number of bytes transmitted by the number of packets to obtain the size of the packets and determine the encapsulation type.

3. Verify load balancing. From operational mode, enter the **show interfaces queue** command on the multilink bundle and its constituent links to confirm whether load balancing is performed accordingly on the packets.

user@R0> **show interfaces queue lsq-0/0/0**

```
Physical interface: lsq-0/0/0, Enabled, Physical link is Up
  Interface index: 136, SNMP ifIndex: 29
Forwarding classes: 8 supported, 8 in use
Egress queues: 8 supported, 8 in use
Queue: 0, Forwarding classes: DATA
  Queued:
    Packets              :             600                  0 pps
    Bytes                :           44800                  0 bps
  Transmitted:
    Packets              :             600                  0 pps
    Bytes                :           44800                  0 bps
    Tail-dropped packets :               0                  0 pps
    RED-dropped packets  :               0                  0 pps
    …
Queue: 1, Forwarding classes: expedited-forwarding
  Queued:
    Packets              :               0                  0 pps
    Bytes                :               0                  0 bps
  …
Queue: 2, Forwarding classes: VOICE
  Queued:
    Packets              :             400                  0 pps
    Bytes                :           61344                  0 bps
  Transmitted:
    Packets              :             400                  0 pps
    Bytes                :           61344                  0 bps
    …
Queue: 3, Forwarding classes: NC
  Queued:
    Packets              :               0                  0 pps
    Bytes                :               0                  0 bps
 …
```

user@R0> **show interfaces queue se-1/0/0**

```
Physical interface: se-1/0/0, Enabled, Physical link is Up
  Interface index: 141, SNMP ifIndex: 35
```

```
Forwarding classes: 8 supported, 8 in use
Egress queues: 8 supported, 8 in use
Queue: 0, Forwarding classes: DATA
  Queued:
    Packets              :                 350                 0 pps
    Bytes                :               24350                 0 bps
  Transmitted:
    Packets              :                 350                 0 pps
    Bytes                :               24350                 0 bps
   ...
Queue: 1, Forwarding classes: expedited-forwarding
  Queued:
    Packets              :                   0                 0 pps
    Bytes                :                   0                 0 bps
  …
Queue: 2, Forwarding classes: VOICE
  Queued:
    Packets              :                 100                 0 pps
    Bytes                :               15272                 0 bps
  Transmitted:
    Packets              :                 100                 0 pps
    Bytes                :               15272                 0 bps
    …
Queue: 3, Forwarding classes: NC
  Queued:
    Packets              :                  19                 0 pps
    Bytes                :                 247                 0 bps
  Transmitted:
    Packets              :                  19                 0 pps
    Bytes                :                 247                 0 bps
    …
```

user@R0> **show interfaces queue se-1/0/1**

```
Physical interface: se-1/0/1, Enabled, Physical link is Up
  Interface index: 142, SNMP ifIndex: 38
Forwarding classes: 8 supported, 8 in use
Egress queues: 8 supported, 8 in use
Queue: 0, Forwarding classes: DATA
  Queued:
    Packets              :                 350                 0 pps
    Bytes                :               24350                 0 bps
  Transmitted:
    Packets              :                 350                 0 pps
    Bytes                :               24350                 0 bps
    …
Queue: 1, Forwarding classes: expedited-forwarding
  Queued:
    Packets              :                   0                 0 pps
    Bytes                :                   0                 0 bps
  …
Queue: 2, Forwarding classes: VOICE
  Queued:
    Packets              :                 300                 0 pps
    Bytes                :               45672                 0 bps
  Transmitted:
    Packets              :                 300                 0 pps
    Bytes                :               45672                 0 bps
    …
Queue: 3, Forwarding classes: NC
```



```
Queued:
  Packets              :              18               0 pps
  Bytes                :             234               0 bps
Transmitted:
  Packets              :              18               0 pps
  Bytes                :             234               0 bps
```

Meaning—The output from these commands shows the packets transmitted and queued on each queue of the link services interface and its constituent links. Table 39 on page 491 shows a summary of these values. (Because the number of transmitted packets equaled the number of queued packets on all the links, this table shows only the queued packets.)

Table 39: Number of Packets Transmitted on a Queue

Packets Queued	Bundle lsq-0/0/0.0	Constituent Link se-1/0/0	Constituent Link se-1/0/1	Explanation
Packets on Q0	600	350	350	The total number of packets transiting the constituent links (350+350 = 700) exceeded the number of packets queued (600) on the multilink bundle.
Packets on Q2	400	100	300	The total number of packets transiting the constituent links equaled the number of packets on the bundle.
Packets on Q3	0	19	18	The packets transiting Q3 of the constituent links are for keepalive messages exchanged between constituent links. Thus no packets were counted on Q3 of the bundle.

On the multilink bundle, verify the following:

- The number of packets queued matches the number transmitted. If the numbers match, no packets were dropped. If more packets were queued than were transmitted, packets were dropped because the buffer was too small. The buffer size on the constituent links controls congestion at the output stage. To correct this problem, increase the buffer size on the constituent links.
- The number of packets transiting Q0 (600) matches the number of large and small data packets received (100+500) on the multilink bundle. If the numbers match, all data packets correctly transited Q0.
- The number of packets transiting Q2 on the multilink bundle (400) matches the number of voice packets received on the multilink bundle. If the numbers match, all voice LFI packets correctly transited Q2.

On the constituent links, verify the following:

- The total number of packets transiting Q0 (350+350) matches the number of data packets and data fragments (500+200). If the numbers match, all the data packets after fragmentation correctly transited Q0 of the constituent links.

Packets transited both constituent links, indicating that load balancing was correctly performed on non-LFI packets.

- The total number of packets transiting Q2 (300+100) on constituent links matches the number of voice packets received (400) on the multilink bundle. If the numbers match, all voice LFI packets correctly transited Q2.

  LFI packets from source port **100** transited **se-1/0/0**, and LFI packets from source port **200** transited **se-1/0/1**. Thus all LFI (Q2) packets were hashed based on the source port and correctly transited both constituent links.

Corrective Action—If the packets transited only one link, take the following steps to resolve the problem:

a. Determine whether the physical link is **up** (operational) or **down** (unavailable). An unavailable link indicates a problem with the PIM, interface port, or physical connection (link-layer errors). If the link is operational, move to the next step.

b. Verify that the classifiers are correctly defined for non-LFI packets. Make sure that non-LFI packets are not configured to be queued to Q2. All packets queued to Q2 are treated as LFI packets.

c. Verify that at least one of the following values is different in the LFI packets: source address, destination address, IP protocol, source port, or destination port. If the same values are configured for all LFI packets, the packets are all hashed to the same flow and transit the same link.

4. Use the results to verify load balancing.

See Also

- Link Services Interfaces Overview on page 471
- Troubleshooting the Link Services Interface on page 483

Determine Why Packets Are Dropped on a PVC Between a Juniper Networks Device and a Third-Party Device

Problem

Description: You are configuring a permanent virtual circuit (PVC) between T1, E1, T3, or E3 interfaces on a Juniper Networks device and a third-party device, and packets are being dropped and ping fails.

Solution

If the third-party device does not have the same FRF.12 support as the Juniper Networks device or supports FRF.12 in a different way, the Juniper Networks device interface on the PVC might discard a fragmented packet containing FRF.12 headers and count it as a "Policed Discard."

As a workaround, configure multilink bundles on both peers, and configure fragmentation thresholds on the multilink bundles.

See Also

- Link Services Interfaces Overview on page 471
- Troubleshooting the Link Services Interface on page 483

CHAPTER 26

Configuring Link Fragmentation and Interleaving

Understanding Link Fragmentation and Interleaving Configuration

As it does on any other interface, priority scheduling on a multilink bundle determines the order in which an output interface transmits traffic from an output queue. The queues are serviced in a weighted round-robin fashion. But when a queue containing large packets starts using the multilink bundle, small and delay-sensitive packets must wait their turn for transmission. Because of this delay, some slow links, such as T1 and E1, can become useless for delay-sensitive traffic.

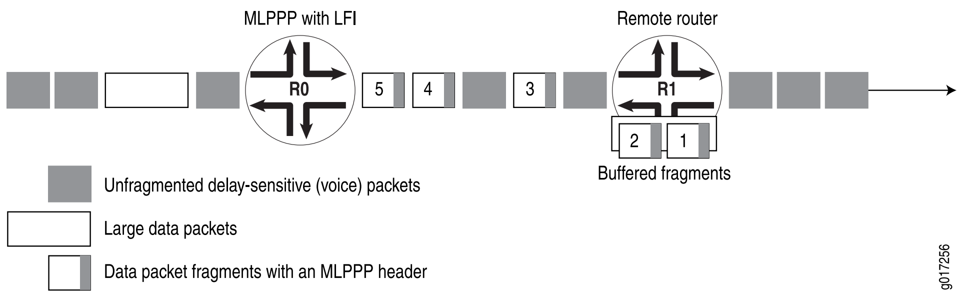
Link fragmentation and interleaving (LFI) solves this problem. It reduces delay and jitter on links by fragmenting large packets and interleaving delay-sensitive packets with the resulting smaller packets for simultaneous transmission across multiple links of a multilink bundle.

Figure 31 on page 496 illustrates how LFI works. In this figure, device R0 and device R1 have LFI enabled. When device R0 receives large and small packets, such as data and voice packets, it divides them into two categories. All voice packets and any other packets configured to be treated as voice packets are categorized as LFI packets and transmitted without fragmentation or an MLPPP header. If CRTP is configured on the bundle, LFI packets are transmitted through CRTP processing. The remaining non-LFI (data) packets can be fragmented or unfragmented based on the configured fragmentation threshold. The packets larger than the fragmentation threshold are fragmented. An MLPPP header (containing a multilink sequence number) is added to all non-LFI packets, fragmented and unfragmented.

The fragmentation is performed according to the fragmentation threshold that you configure. For example, if you configure a fragmentation threshold of 128 bytes, all packets larger than 128 bytes are fragmented. When device R1 receives the packets, it sends the unfragmented voice packets immediately but buffers the packet fragments until it receives the last fragment for a packet. In this example, when device R1 receives fragment 5, it reassembles the fragments and transmits the whole packet.

The unfragmented data packets are treated as a single fragment. Thus device R1 does not buffer the unfragmented data packets and transmits them as it receives them.

Figure 31: LFI on a Services Router



To configure LFI, you define the MLPPP encapsulation type and enable fragmentation and interleaving of packets by specifying the fragmentation threshold and fragmentation maps, with a no-fragmentation knob mapped to the forwarding class of choice.

Related Documentation

- Link Services Interfaces Overview on page 471
- Example: Configuring Link Fragmentation and Interleaving on page 496

Example: Configuring Link Fragmentation and Interleaving

This example shows how to configure LFI.

- Requirements on page 496
- Overview on page 496
- Configuration on page 497
- Verification on page 497

Requirements

Before you begin, you should have two Juniper Networks devices configured with at least two serial interfaces that communicate over serial links. This example shows two devices.

Overview

In this example, you create an interface called lsq-0/0/0. You specify the encapsulation type as multilink-ppp and set the fragmentation threshold value to 128. Set a fragmentation threshold of 128 bytes on the MLPPP bundle so that it applies to all traffic on both constituent links, enabling that any packet larger than 128 bytes transmitted on these links is fragmented. Any nonzero value must be a multiple of 64 bytes. The value can be between 128 and 16320. The default value is 0 bytes.

Configuration

Step-by-Step Procedure

The following example requires you to navigate various levels in the configuration hierarchy. For instructions on how to do that, see *Using the CLI Editor in Configuration Mode*.

To configure LFI:

1. Create an interface.

```
[edit]
user@host# edit interfaces lsq-0/0/0
```

2. Specify the encapsulation type and fragmentation threshold value.

```
[edit interfaces lsq-0/0/0]
user@host# set unit 0 encapsulation multilink-ppp fragment-threshold 128
```

3. If you are done configuring the device, commit the configuration.

```
[edit]
user@host# commit
```

Verification

Verifying Link Fragmentation and Interleaving Configuration

Purpose

Verify the LFI configuration.

Action

From operational mode, enter the **show interfaces lsq-0/0/0** command.

Related Documentation

- Understanding Link Fragmentation and Interleaving Configuration on page 495
- Troubleshooting the Link Services Interface on page 483
- Verifying the Link Services Interface on page 478

CHAPTER 27

Configuring Class-of-Service on Link Services Interfaces

Understanding How to Define Classifiers and Forwarding Classes

By defining classifiers you associate incoming packets with a forwarding class and loss priority. Based on the associated forwarding class, you assign packets to output queues. To configure classifiers, you specify the bit pattern for the different types of traffic. The classifier takes this bit pattern and attempts to match it to the type of packet arriving on the interface. If the information in the packet's header matches the specified pattern, the packet is sent to the appropriate queue, defined by the forwarding class associated with the classifier.

On a Juniper Networks device, when LFI is enabled, all forwarding traffic assigned to queue 2 or member link is treated as LFI (voice) traffic. You do not need to assign network control traffic to a queue explicitly, because it is assigned to queue 3 by default.

NOTE:
On member links:

- DATA is assigned to queue 0.
- VOICE is assigned to queue 2.
- NC (network control) is assigned to queue 3. By default NC is assigned to queue 3.

Related Documentation

- Link Services Interfaces Overview on page 471
- Example: Defining Classifiers and Forwarding Classes on page 500

Example: Defining Classifiers and Forwarding Classes

This example shows how to define classifiers for different types of traffic, such as voice, data, and network control packets, and to direct the traffic to different output queues to manage your throughput.

Requirements

Before you begin:

- Configure two Juniper Networks devices with at least two serial interfaces that communicate over serial links.
- Configure CoS components. See *Junos OS Class of Service Configuration Guide for Security Devices*.

Overview

In this example, you configure class of service and set the default IP precedence classifier to classify_input, which is assigned to all incoming traffic. You then set the precedence bit value in the type of service field to 000 for all incoming data traffic and 010 for all incoming voice traffic. You set all outgoing data traffic to queue 0 and all voice traffic to queue 2, and fragmentation-map maps queue 2 to no fragmentation.

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 class-of-service classifiers inet-precedence classify_input forwarding-class DATA
  loss-priority low code-points 000
set class-of-service classifiers inet-precedence classify_input forwarding-class VOICE
  loss-priority low code-points 010
set class-of-service forwarding-classes queue 0 DATA
set class-of-service forwarding-classes queue 2 VOICE
set class-of-service forwarding-classes queue 3 NC
set class-of-service interfaces ge-0/0/1 unit 0 classifiers inet-precedence classify_input
set class-of-service fragmentation-maps FM forwarding-class VOICE no-fragmentation
set class-of-service interfaces lsq-0/0/0 unit 0 fragmentation-map FM
```


Step-by-Step Procedure

The following example requires you to navigate various levels in the configuration hierarchy. For instructions on how to do that, see *Using the CLI Editor in Configuration Mode* in the *CLI User Guide*.

To define classifiers and forwarding classes:

1. Configure class of service.

```
[edit]
user@host# edit class-of-service
```

2. Configure the behavior aggregate classifier for classifying packets.

```
[edit class-of-service]
user@host# edit classifiers inet-precedence classify_input
```

3. Assign packets with IP precedence to the data forwarding class and specify a loss priority.

```
[edit class-of-service classifiers inet-precedence classify_input]
user@host# set forwarding-class DATA loss-priority low code-points 000
```

4. Assign packets with IP precedence to the voice forwarding class and specify a loss priority.

```
[edit class-of-service classifiers inet-precedence classify_input]
user@host# set forwarding-class VOICE loss-priority low code-points 010
```

5. Specify the forwarding class one-to-one with the output queues.

```
[edit class-of-service]
user@host# edit forwarding-classes
user@host# set queue 0 DATA
user@host# set queue 2 VOICE
user@host# set queue 3 NC
```

6. Create an interface and apply the behavior aggregate classifier.

```
[edit class-of-service]
user@host# edit interfaces ge-0/0/1
user@host# set unit 0 classifiers inet-precedence classify_input
```

7. Configure fragmentation map.

```
[edit]
user@host# edit class-of-service
user@host# set fragmentation-maps FM forwarding-class VOICE no-fragmentation
```

8. Attach fragmentation map to the interface.

```
[edit class-of-service]
user@host# set interfaces lsq-0/0/0 unit 0 fragmentation-map FM
```

Results From configuration mode, confirm your configuration by entering the **show class-of-service** command. If the output does not display the intended configuration, repeat the configuration instructions in this example to correct it.

```
[edit]
  user@host# show class-of-service
classifiers {
    inet-precedence classify_input {
      forwarding-class DATA {
    loss-priority low code-points 000;
    }
      forwarding-class VOICE {
    loss-priority low code-points 010;
    }
      }
    }
    forwarding-classes {
      queue 0 DATA;
      queue 2 VOICE;
      queue 3 NC;
      }
      interfaces {
        lsq-0/0/0 {
        unit 0 {
        fragmentation-map FM;
          }
          }
          ge-0/0/1 {
            unit 0 {
            classifiers {
          inet-precedence classify_input;
          }
        }
      }
      }
      fragmentation-maps {
        FM {
        forwarding-class {
        VOICE {
          no-fragmentation;
        }
      }
    }
  }
```

If you are done configuring the device, enter **commit** from configuration mode.

Verification

To confirm that the configuration is working properly, perform this task:

- Verifying Classifiers and Forwarding Classes on page 503

Verifying Classifiers and Forwarding Classes

Purpose Verify the classifiers and the forwarding classes.

Action From operational mode, enter the **show class-of-service** command.

Related Documentation

- *Junos OS Feature Support Reference for SRX Series and J Series Devices*
- Understanding How to Define Classifiers and Forwarding Classes on page 499
- Link Services Interfaces Overview on page 471
- Troubleshooting the Link Services Interface on page 483
- Verifying the Link Services Interface on page 478

Understanding How to Define and Apply Scheduler Maps

Juniper Networks devices support per-unit scheduling **set class-of-service schedulers S0 priority low**, which allows you to configure scheduler maps on each MLPPP or MLFR multilink bundle. You can also configure scheduler maps on constituent links, but you must maintain the same relative priority on the constituent links and on the multilink bundle.

If you configure CoS components with LFI on a Juniper Networks device, we recommend that you follow certain recommendations for shaping rate, scheduling priority, and buffer size.

When you configure LFI, we recommend that you configure the shaping rate on each constituent link of the multilink bundle. Shaping rate configuration on the constituent links is required to limit the jitter on the LFI queue. If you anticipate no delay-sensitive or jitter-sensitive traffic on the LFI queue, or if there is no LFI traffic at all, shaping rate configuration is optional.

Table 40 on page 504 shows an example of correct and incorrect relative priorities on a multilink bundle and its constituent link. In this example, you have assigned a high priority to LFI packets and a low priority to data packets on the multilink bundle. To maintain the relative priority on the constituent links, you can assign a high priority to the LFI packets and a medium-high priority to the data packets, but you cannot assign a medium-high priority to LFI packets and a high priority to data packets.

Table 40: Relative Priorities on Multilink Bundles and Constituent Links

Multilink Bundle	Correct Constituent Link Priorities	Incorrect Constituent Link Priorities
LFI packets—High priority	LFI packets—High priority	LFI packet—Medium-high priority
Data packets—Low priority	Data packets—Medium-high priority	Data packets—High priority

By defining schedulers you configure the properties of output queues that determine the transmission service level for each queue. These properties include the amount of interface bandwidth assigned to the queue, the size of the memory buffer allocated for storing packets, and the priority of the queue. After defining schedulers you associate them with forwarding classes by means of scheduler maps. You then associate each scheduler map with an interface, thereby configuring the hardware queues and packet schedulers that operate according to this mapping.

NOTE: When data and LFI streams are present, the following scheduler map configuration is recommended for constituent links. This gives less latency for LFI traffic and avoids out-of-order transmission of data traffic.

Configure the following schedulers:

- **set class-of-service schedulers S0 buffer-size temporal 20k**
- **set class-of-service schedulers S0 priority low**
- **set class-of-service schedulers S2 priority high**
- **set class-of-service schedulers S3 priority high**

Configure the following scheduler map:

- **set class-of-service scheduler-maps lsqlink_map forwarding-class best-effort scheduler S0**
- **set class-of-service scheduler-maps lsqlink_map forwarding-class assured-forwarding scheduler S2**
- **set class-of-service scheduler-maps lsqlink_map forwarding-class network-control scheduler S3**

Attach scheduler map to all member links:

- **set class-of-service interfaces t1-2/0/0 unit 0 scheduler-map lsqlink_map**

NOTE: Even after this configuration, if out-of-range sequence number drops are observed on the reassembly side, increase the drop-timeout of the bundle to 200 ms.

Related Documentation

- Link Services Interfaces Overview on page 471
- Example: Configuring Scheduler Maps on page 505
- Example: Configuring an MLPPP Bundle on page 512
- Understanding Interface Shaping Rates on page 508

Example: Configuring Scheduler Maps

This example shows how to configure scheduler maps to determine the transmission service level for each output queue.

Requirements

Before you begin, you should have two Juniper Networks devices configured with at least two serial interfaces that communicate over serial links.

Overview

In this example, you create interfaces called lsq-0/0/0, se-1/0/0, and se-1/0/1. You enable per-unit scheduling to allow the configuration of scheduler maps on the bundle. You configure a scheduler map as s_map on lsq-0/0/0. You then apply the scheduler map to the constituent links, se-1/0/0 and se-1/0/1, of the multilink bundle. You associate the scheduler with each of the forwarding classes, DATA, VOICE and NC. You define the properties of output queues for the DATA scheduler by setting the transmit rate and the buffer size to 49 percent. You specify the properties of output queues for the VOICE scheduler by setting the transmit rate to 50 percent, the buffer size to 5 percent, and the priority to high. Finally, you define the properties of output queues for the NC scheduler by setting the transmit rate and the buffer size to 1 percent and the priority to high.

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 interfaces lsq-0/0/0 per-unit-scheduler
set interfaces se-1/0/0 per-unit-scheduler
set interfaces se-1/0/1 per-unit-scheduler
set class-of-service interfaces lsq-0/0/0 unit 0 scheduler-map s_map
set class-of-service interfaces se-1/0/0 unit 0 scheduler-map s_map
set class-of-service interfaces se-1/0/1 unit 0 scheduler-map s_map
set class-of-service scheduler-maps s_map forwarding-class DATA scheduler DATA
set class-of-service scheduler-maps s_map forwarding-class VOICE scheduler VOICE
```

```
set class-of-service scheduler-maps s_map forwarding-class NC scheduler NC
set class-of-service schedulers DATA transmit-rate percent 49
set class-of-service schedulers DATA buffer-size percent 49
set class-of-service schedulers VOICE transmit-rate percent 50
set class-of-service schedulers VOICE buffer-size percent 5
set class-of-service schedulers VOICE priority high
set class-of-service schedulers NC transmit-rate percent 1
set class-of-service schedulers NC buffer-size percent 1
set class-of-service schedulers NC priority high
```

Step-by-Step Procedure

The following example requires you to navigate various levels in the configuration hierarchy. For instructions on how to do that, see *Using the CLI Editor in Configuration Mode* in the *CLI User Guide*.

To configure scheduler maps:

1. Create interfaces and enable per-unit scheduling.

```
[edit interfaces]
user@host# set lsq-0/0/0 per-unit-scheduler
user@host# set se-1/0/0 per-unit-scheduler
user@host# set se-1/0/1 per-unit-scheduler
```

2. Define a scheduler map and apply it to the constituent links in the multilink bundle.

```
[edit class-of-service interfaces]
user@host# set lsq-0/0/0 unit 0 scheduler-map s_map
user@host# set se-1/0/0 unit 0 scheduler-map s_map
user@host# set se-1/0/1 unit 0 scheduler-map s_map
```

3. Associate a scheduler with each forwarding class.

```
[edit class-of-service scheduler-maps]
user@host# set s_map forwarding-class DATA scheduler DATA
user@host# set s_map forwarding-class VOICE scheduler VOICE
user@host# set s_map forwarding-class NC scheduler NC
```

4. Define the properties of output queues for the DATA scheduler.

```
[edit class-of-service schedulers]
user@host# set DATA transmit-rate percent 49
user@host# set DATA buffer-size percent 49
```

5. Define the properties of output queues for the VOICE scheduler.

```
[edit class-of-service schedulers]
user@host# set VOICE transmit-rate percent 50
user@host# set VOICE buffer-size percent 5
user@host# set VOICE priority high
```


6. Define the properties of output queues for the NC scheduler.

```
[edit class-of-service schedulers]
user@host# set NC transmit-rate percent 1
user@host# set NC buffer-size percent 1
user@host# set NC priority high
```

Results From configuration mode, confirm your configuration by entering the **show class-of-service** command. If the output does not display the intended configuration, repeat the configuration instructions in this example to correct it.

```
[edit]
  user@host# show class-of-service
  interfaces {
  lsq-0/0/0 {
  unit 0 {
    scheduler-map s_map;
  }
  }
  se-1/0/0 {
    unit 0 {
    scheduler-map s_map;
  }
  }
  se-1/0/1 {
    unit 0 {
    scheduler-map s_map;
    }
  }
  }
    scheduler-maps {
  s_map {
  forwarding-class DATA scheduler DATA;
    forwarding-class VOICE scheduler VOICE;
    forwarding-class NC scheduler NC;
  }
}
  schedulers {
    DATA {
    transmit-rate percent 49;
    buffer-size percent 49;
    }
    VOICE {
      transmit-rate percent 50;
      buffer-size percent 5;
      priority high;
      }
      NC {
        transmit-rate percent 1;
        buffer-size percent 1;
      priority high;
    }
```

```
}
```

If you are done configuring the device, enter **commit** from configuration mode.

Verification

To confirm that the configuration is working properly, perform this task:

- Verifying the Configuration of scheduler maps. on page 508

Verifying the Configuration of scheduler maps.

Purpose Verify the configuration of scheduler maps.

Action From operational mode, enter the **show class-of-services lsq-0/0/0 scheduler-map s_map**, **show class-of-services se-1/0/0 scheduler-map s_map**, and **show class-of-services se-1/0/1 scheduler-map s_map** commands.

Related Documentation

- *Junos OS Feature Support Reference for SRX Series and J Series Devices*
- Understanding How to Define and Apply Scheduler Maps on page 503
- Troubleshooting the Link Services Interface on page 483
- Verifying the Link Services Interface on page 478

Understanding Interface Shaping Rates

When you configure LFI, we recommend that you configure the shaping rate on each constituent link of the multilink bundle. Shaping rate configuration on the constituent links is required to limit the jitter on the LFI queue. If you anticipate no delay-sensitive or jitter-sensitive traffic on the LFI queue, or if there is no LFI traffic at all, shaping rate configuration is optional.

The shaping rate specifies the amount of bandwidth to be allocated for the multilink bundle. You must configure the shaping rate to be equal to the combined physical interface bandwidth for the constituent links. The combined bandwidth capacity of the two constituent links is 2 Mbps. Hence, configure a shaping rate of 2 Mbps on each constituent link.

Related Documentation

- Link Services Interfaces Overview on page 471
- Example: Configuring Interface Shaping Rates on page 509
- Understanding How to Define and Apply Scheduler Maps on page 503

Example: Configuring Interface Shaping Rates

This example shows how to configure interface shaping rates to control the maximum rate of traffic transmitted on an interface.

Requirements

Before you begin:

- Configure two Juniper Networks devices configured with at least two serial interfaces that communicate over serial links. For more information about serial interfaces. See "Serial Interfaces Overview" on page 615.
- To apply shaping rates to interfaces, you have to first enable per-unit scheduling. For more information on per-unit scheduling. See "Example: Configuring Scheduler Maps" on page 505.

Overview

In this example, you set the shaping rate to 2000000 for the constituent links of the multilink bundle, se-1/0/0 and se-1/0/1.

Configuration

Step-by-Step Procedure

To configure the interface shaping rates:

1. Configure class of service.

```
[edit]
user@host# edit class-of-service
```

2. Apply the shaping rates to the constituent links of the multilink bundle.

```
[edit class-of-service]
user@host# set interfaces se-1/0/0 unit 0 shaping-rate 2000000
user@host# set interfaces se-1/0/1 unit 0 shaping-rate 2000000
```

Verification

To verify the configuration is working properly, enter the **show class-of-service** command.

Related Documentation

- *Junos OS Feature Support Reference for SRX Series and J Series Devices*
- Link Services Interfaces Overview on page 471

CHAPTER 28

Achieving Greater Bandwidth, Load Balancing, and Redundancy with Multilink Bundles

Understanding MLPPP Bundles and Link Fragmentation and Interleaving (LFI) on Serial Links

Juniper Networks devices support MLPPP and MLFR multilink encapsulations. MLPPP multilink encapsulation enables you to bundle multiple PPP links into a single multilink bundle and MLFR multilink encapsulation enables you to bundle multiple Frame Relay data-link connection identifiers (DLCIs) into a single multilink bundle. Multilink bundles provide additional bandwidth, load balancing, and redundancy by aggregating low-speed links, such as T1, E1, and serial links.

NOTE: **Currently, Junos OS supports bundling of only one xDSL link under bundle interface.**

You configure multilink bundles as logical units or channels on the link services interface **lsq-0/0/0**:

- With MLPPP and MLFR FRF.15, multilink bundles are configured as logical units on **lsq-0/0/0**—for example, **lsq-0/0/0.0** and **lsq-0/0/0.1**.
- With MLFR FRF.16, multilink bundles are configured as channels on **lsq-0/0/0**—for example, **lsq-0/0/0:0** and **lsq-0/0/0:1**.

After creating multilink bundles, you add constituent links to the bundle. The constituent links are the low-speed physical links that are to be aggregated. You can create 64 multilink bundles, and on each multilink bundle you can add up to 8 constituent links. The following rules apply when you add constituent links to a multilink bundle:

- On each multilink bundle, add only interfaces of the same type. For example, you can add either T1 or E1, but not both.
- Only interfaces with a PPP encapsulation can be added to an MLPPP bundle, and only interfaces with a Frame Relay encapsulation can be added to an MLFR bundle.
- If an interface is a member of an existing bundle and you add it to a new bundle, the interface is automatically deleted from the existing bundle and added to the new bundle.

Configuring a multilink bundle on the two serial links increases the bandwidth by 70 percent from approximately 1 Mbps to 1.7 Mbps and prepends each packet with a multilink header as specified in the FRF.12 standard. To increase the bandwidth further, you can add up to eight serial links to the bundle. In addition to a higher bandwidth, configuring the multilink bundle provides load balancing and redundancy. If one of the serial links fails, traffic continues to be transmitted on the other links without any interruption. In contrast, independent links require routing policies for load balancing and redundancy. Independent links also require IP addresses for each link as opposed to one IP address for the bundle. In the routing table, the multilink bundle is represented as a single interface.

Related Documentation

- Link Services Interfaces Overview on page 471
- Example: Configuring an MLPPP Bundle on page 512
- Example: Configuring Multilink Frame Relay FRF.15 on page 517
- Example: Configuring Multilink Frame Relay FRF.16 on page 521

Example: Configuring an MLPPP Bundle

This example shows how to configure an MLPPP bundle to increase traffic bandwidth.

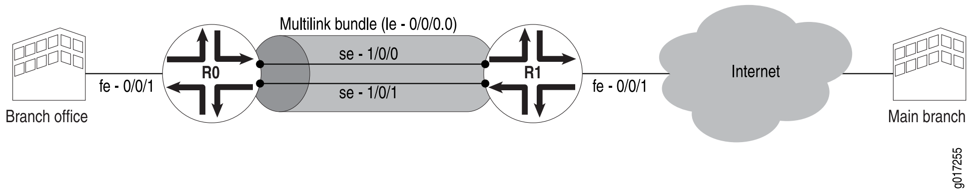
Requirements

Before you begin, you should have two Juniper Networks devices configured with at least two serial interfaces that communicate over serial links.

Overview

In this example, you create the MLPPP bundle lsq-0/0/0.0 at the logical unit level of the link services interface lsq-0/0/0 on Juniper Networks devices R0 and R1. You then add the two serial interfaces se-1/0/0 and se-1/0/1 as constituent links to the multilink bundle. In Figure 32 on page 513, your company's branch office is connected to its main branch using devices R0 and R1. You transmit data and voice traffic on two low-speed 1-Mbps serial links. To increase bandwidth, you configure MLPPP and join the two serial links se-1/0/0 and se-1/0/1 into the multilink bundle lsq-0/0/0.0. Then you configure LFI and CoS on R0 and R1 to enable them to transmit voice packets ahead of data packets.

Figure 32: Configuring MLPPP and LFI on Serial Links



Configuration

CLI Quick Configuration

To quickly configure this example, copy the following command, paste it into a text file, remove any line breaks, change any details necessary to match your network configuration, copy and paste the command into the CLI at the **[edit]** hierarchy level, and then enter **commit** from configuration mode.

```
For device R0
set interfaces lsq-0/0/0 unit 0 family inet address 10.0.0.10/24
set interfaces se-1/0/0 unit 0 family mlppp bundle lsq-0/0/0.0
set interfaces se-1/0/1 unit 0 family mlppp bundle lsq-0/0/0.0
set interfaces se-1/0/0 serial-options clocking-mode dce clock-rate 2.0mhz
set interfaces se-1/0/1 serial-options clocking-mode dce clock-rate 2.0mhz
```

```
For device R1
set interfaces lsq-0/0/0 unit 0 family inet address 10.0.0.9/24
set interfaces se-1/0/0 unit 0 family mlppp bundle lsq-0/0/0.0
set interfaces se-1/0/1 unit 0 family mlppp bundle lsq-0/0/0.0
```

Step-by-Step Procedure

The following example requires you to navigate various levels in the configuration hierarchy. For instructions on how to do that, see *Using the CLI Editor in Configuration Mode*.

To configure MLPPP bundle:

1. Create an interface on both devices.

```
[edit]
user@host# edit interfaces lsq-0/0/0 unit 0
```

2. Configure a family inet and define the IP address on device R0.

```
[edit interfaces lsq-0/0/0 unit 0]
user@host# set family inet address 10.0.0.10/24
```

3. Configure a family inet and define the IP address on device R1.

```
[edit interfaces lsq-0/0/0 unit 0]
```

```
user@host# set family inet address 10.0.0.9/24
```

4. Specify the names of the constituent links to be added to the multilink bundle on both devices.

```
[edit interfaces]
user@host# edit se-1/0/0 unit 0
user@host# set family mlppp bundle lsq-0/0/0.0
[edit interfaces]
user@host# edit se-1/0/1 unit 0
user@host# set family mlppp bundle lsq-0/0/0.0
```

5. Set the serial options to the same values for both interfaces on R0.

NOTE: R0 is set as a DCE device. The serial options are not set for interfaces on R1. You can set the serial options according to your network setup.

```
[edit interfaces]
user@host# set se-1/0/0 serial-options clocking-mode dce clock-rate 2.0mhz
user@host# set se-1/0/1 serial-options clocking-mode dce clock-rate 2.0mhz
```

Results From configuration mode, confirm your configuration by entering the **show interfaces lsq-0/0/0**, **show interfaces se-1/0/0**, and **show interfaces se-1/0/1** commands for R0 and R1. If the output does not display the intended configuration, repeat the configuration instructions in this example to correct it.

```
For device R0
[edit]
  user@host# show interfaces lsq-0/0/0
family inet {
  address 10.0.0.10/24;
    }
  }
[edit]
user@host# show interfaces se-1/0/0
  clocking-mode dce;
    clock-rate 2.0mhz;
    }
    unit 0 {
      family mlppp {
      bundle lsq-0/0/0.0;
    }
  }
[edit]
  user@host# show interfaces se-1/0/1
```



```
serial-options {
  clocking-mode dce;
    clock-rate 2.0mhz;
    }
    unit 0 {
      family mlppp {
      bundle lsq-0/0/0.0;
    }
  }
```

```
For device R1
[edit]
user@host# show interfaces lsq-0/0/0
  family inet {
    address 10.0.0.9/24;
    }
  }
[edit]
  user@host# show interfaces se-1/0/0
  unit 0 {
  family mlppp {
    bundle lsq-0/0/0.0;
  }
}
[edit]
  user@host# show interfaces se-1/0/1
  unit 0 {
  family mlppp {
    bundle lsq-0/0/0.0;
  }
}
```

If you are done configuring the device, enter **commit** from configuration mode.

Verification

Confirm that the configuration is working properly.

Verifying the MLPPP Bundle

Purpose Verify that the constituent links are added to the bundle correctly.

Action From operational mode, enter the **show interfaces lsq-0/0/0 statistics** command.

Related Documentation

- Understanding MLPPP Bundles and Link Fragmentation and Interleaving (LFI) on Serial Links on page 511
- Troubleshooting the Link Services Interface on page 483
- Verifying the Link Services Interface on page 478

CHAPTER 29

Configuring Multilink Frame Relay

Understanding Multilink Frame Relay FRF.15

The link services intelligent queuing interface **lsq-0/0/0** supports Multilink Frame Relay end-to-end (MLFR FRF.15).

With MLFR FRF.15, multilink bundles are configured as logical units on the link services intelligent queuing interface, such as **lsq-0/0/0.0**. MLFR FRF.15 bundles combine multiple permanent virtual circuits (PVCs) into one aggregated virtual circuit (AVC). This process provides fragmentation over multiple PVCs on one end and reassembly of the AVC on the other end. You can configure LFI and CoS with MLFR in the same way that you configure them with MLPPP.

Related Documentation

- Understanding MLPPP Bundles and Link Fragmentation and Interleaving (LFI) on Serial Links on page 511
- Example: Configuring an MLPPP Bundle on page 512
- Link Services Interfaces Overview on page 471
- Example: Configuring Multilink Frame Relay FRF.15 on page 517

Example: Configuring Multilink Frame Relay FRF.15

This example shows how to configure MLFR FRF.15 for additional bandwidth, load balancing, and redundancy by aggregating low-speed links such as T1, E1, and serial links.

Requirements

Before you begin, you should have two Juniper Networks devices configured with at least two serial interfaces that communicate over serial links.

Overview

In this example, you aggregate two T1 links to create the MLFR FRF.15 bundle on two Juniper Networks devices, R0 and R1, and set the interface to lsq-0/0/0. You configure a logical unit on the lsq-0/0/0 interface and set the family type to inet with address 10.0.0.4/24. Then you configure an IP address for the multilink bundle on the unit level of the interface.

You define the multilink bundle as an MLFR FRF.15 bundle by specifying the MLFR end-to-end encapsulation type. You specify the names of the constituent links to be added to the multilink bundle as t1-2/0/0 and t1-2/0/1 and set the encapsulation type to frame relay. You then define R0 as a DCE device and R1 as a DTE device. You set the DLCI value to 100 (range is 16 through 1022). Finally, you set the multilink bundle to lsq-0/0/0.0.

Configuration

CLI Quick Configuration

To quickly configure this example, copy the following command, paste it into a text file, remove any line breaks, change any details necessary to match your network configuration, copy and paste the command into the CLI at the **[edit]** hierarchy level, and then enter **commit** from configuration mode.

```
For device R0
set interfaces lsq-0/0/0 unit 0 family inet address 10.0.0.4/24
set interfaces lsq-0/0/0 unit 0 encapsulation multilink-frame-relay-end-to-end
set interfaces t1-2/0/0 encapsulation frame-relay
set interfaces t1-2/0/1 encapsulation frame-relay
set interfaces lsq-0/0/0 dce
set interfaces lsq-0/0/0 unit 0 dlci 100 family mlfr-end-to-end bundle lsq-0/0/0.0
```

```
For device R1
set interfaces lsq-0/0/0 unit 0 family inet address 10.0.0.5/24
set interfaces lsq-0/0/0 unit 0 encapsulation multilink-frame-relay-end-to-end
set interfaces t1-2/0/0 encapsulation frame-relay
set interfaces t1-2/0/1 encapsulation frame-relay
set interfaces lsq-0/0/0 unit 0 dlci 100 family mlfr-end-to-end bundle lsq-0/0/0.0
```

Step-by-Step Procedure

The following example requires you to navigate various levels in the configuration hierarchy. For instructions on how to do that, see *Using the CLI Editor in Configuration Mode*.

To configure the MLFR FRF.15 bundle:

1. Create an interface on both devices.

```
[edit]
user@host# edit interfaces lsq-0/0/0 unit 0
```

2. Set a logical unit on the interface and define the family type for devices R0 and R1.

```
[edit interfaces lsq-0/0/0 unit 0]
user@host# set family inet address 10.0.0.4/24
user@host# set family inet address 10.0.0.5/24
```

3. Define the multilink bundle as an MLFR FRF.15 bundle.

```
[edit interfaces lsq-0/0/0 unit 0]
user@host# set encapsulation multilink-frame-relay-end-to-end
```

4. Specify the names of the constituent links to be added to the multilink bundle.

```
[edit interfaces]
user@host# set t1-2/0/0 encapsulation frame-relay
user@host# set t1-2/0/1 encapsulation frame-relay
```

5. Define device R0 as a DCE device.

```
[edit interfaces]
user@host# edit lsq-0/0/0
user@host# set dce
```

6. Specify the DLCI as well as the multilink bundle to which the interface is to be added.

```
[edit interfaces lsq-0/0/0]
user@host# set unit 0 dlci 100 family mlfr-end-to-end bundle lsq-0/0/0.0
```

Results From configuration mode, confirm your configuration by entering the **show interfaces lsq-0/0/0**, **show interfaces t1-2/0/0**, and **show interfaces t1-2/0/1** commands for R0 and R1. If the output does not display the intended configuration, repeat the configuration instructions in this example to correct it.

```
For device R0
[edit]
  user@host# show interfaces lsq-0/0/0
  dce;
unit 0 {
  encapsulation multilink-frame-relay-end-to-end;
    dlci 100;
  family inet {
    address 10.0.0.4/24;
      }
```



```
      family mlfr-end-to-end {
      bundle lsq-0/0/0.0;
        }
      }
[edit]
  user@host#show interfaces t1-2/0/0
encapsulation frame-relay;
  [edit]
    user@host# show interfaces t1-2/0/1
  encapsulation frame-relay;
```

```
For device R1
[edit]
  user@host# show interfaces lsq-0/0/0
  unit 0 {
  encapsulation multilink-frame-relay-end-to-end;
    dlci 100;
    family inet {
  address 10.0.0.5/24;
  }
  family mlfr-end-to-end {
    bundle lsq-0/0/0.0;
  }
}
[edit]
  user@host# show interfaces t1-2/0/0
encapsulation frame-relay;
  [edit]
    user@host# show interfaces t1-2/0/1
  encapsulation frame-relay;
```

If you are done configuring the device, enter **commit** from configuration mode.

Verification

Confirm that the configuration is working properly.

Verifying the MLFR FRF.15 Configuration

Purpose Verify the MLFR FRF.15 configuration.

Action From operational mode, enter the **show interfaces** command.

Related Documentation

- Understanding Multilink Frame Relay FRF.15 on page 517
- Link Services Configuration Overview on page 477

Understanding Multilink Frame Relay FRF.16

The link services intelligent queuing interface **lsq-0/0/0** supports the Multilink Frame Relay (MLFR) user-to-network interface (UNI) and network-to-network interface (NNI) (MLFR FRF.16).

MLFR FRF.16 configures multilink bundles as channels on the link services intelligent queuing interface, such as **lsq-0/0/0:0**. A multilink bundle carries Frame Relay permanent virtual circuits (PVCs), identified by their data-link connection identifiers (DLCIs). Each DLCI is configured at the logical unit level of the link services intelligent queuing interface and is also referred as a logical interface. Packet fragmentation and reassembly occur on each virtual circuit. You can configure LFI and CoS with MLFR in the same way that you configure them with MLPPP.

Related Documentation

- Understanding MLPPP Bundles and Link Fragmentation and Interleaving (LFI) on Serial Links on page 511
- Example: Configuring an MLPPP Bundle on page 512
- Link Services Interfaces Overview on page 471
- Example: Configuring Multilink Frame Relay FRF.16 on page 521

Example: Configuring Multilink Frame Relay FRF.16

This example shows how to configure MLFR FRF.16 for additional bandwidth, load balancing, and redundancy.

- Requirements on page 521
- Overview on page 521
- Configuration on page 522
- Verification on page 525

Requirements

Before you begin, you should have two Juniper Networks devices configured with at least two serial interfaces that communicate over serial links.

Overview

In this example, you aggregate two T1 interfaces to create an MLFR FRF.16 bundle on two Juniper Networks devices, R0 and R1. You configure the chassis interface and specify the number of MLFR FRF.16 bundles to be created on the interface. You then specify the channel to be configured as a multilink bundle and create interface lsq-0/0/0:0. You set the multilink bundle as an MLFR FRF.16 bundle by specifying the MLFR UNI NNI encapsulation type.

Then you define R0 as a DCE device and R1 as a DTE device. You configure a logical unit on the multilink bundle lsq-0/0/0:0, and set the family type to inet. You then assign a DLCI of 400 and an IP address of 10.0.0.10/24 to the multilink bundle. You create the T1 interfaces, t1-2/0/0 and t1-2/0/1, that are to be added as constituent links to the multilink bundle and define the Frame Relay encapsulation type. Finally, you set the multilink bundle to lsq-0/0/0:0.

Configuration

CLI Quick Configuration

To quickly configure this example, copy the following command, paste it into a text file, remove any line breaks, change any details necessary to match your network configuration, copy and paste the command into the CLI at the **[edit]** hierarchy level, and then enter **commit** from configuration mode.

```
For device R0
set chassis fpc 0 pic 0 mlfr-uni-nni-bundles 1
set interfaces lsq-0/0/0:0 encapsulation multilink-frame-relay-uni-nni
set interfaces lsq-0/0/0:0 dce
set interfaces lsq-0/0/0 unit 0 dlci 400 family inet address 10.0.0.10/24
set interfaces t1-2/0/0 encapsulation multilink-frame-relay-uni-nni
set interfaces t1-2/0/1 encapsulation multilink-frame-relay-uni-nni
set interfaces t1-2/0/0 unit 0 family mlfr-uni-nni bundle lsq-0/0/0:0
set interfaces t1-2/0/1 unit 0 family mlfr-uni-nni bundle lsq-0/0/0:0
For device R1
set chassis fpc 0 pic 0 mlfr-uni-nni-bundles 1
set interfaces lsq-0/0/0:0 encapsulation multilink-frame-relay-uni-nni
set interfaces lsq-0/0/0 unit 0 dlci 400 family inet address 10.0.0.9/24
set interfaces t1-2/0/0 encapsulation multilink-frame-relay-uni-nni
set interfaces t1-2/0/1 encapsulation multilink-frame-relay-uni-nni
set interfaces t1-2/0/0 unit 0 family mlfr-uni-nni bundle lsq-0/0/0:0
set interfaces t1-2/0/1 unit 0 family mlfr-uni-nni bundle lsq-0/0/0:0
```

Step-by-Step Procedure

The following example requires you to navigate various levels in the configuration hierarchy. For instructions on how to do that, see *Using the CLI Editor in Configuration Mode*.

To configure an MLFR FRF.16 bundle:

1. Configure a chassis interface.

```
[edit]
user@host# edit chassis
```

2. Specify the number of MLFR bundles.

```
[edit chassis]
user@host# set fpc 0 pic 0 mlfr-uni-nni-bundles 1
```

3. Create an interface.

```
[edit]
user@host# edit interfaces lsq-0/0/0:0
```

4. Specify the MLFR encapsulation type.

```
[edit interfaces lsq-0/0/0:0]
user@host# set encapsulation multilink-frame-relay-uni-nni
```

5. Set device R0 as a DCE device.

```
[edit interfaces lsq-0/0/0:0]
user@host# set dce
```

6. Specify a logical unit on the multilink bundle and set the family type.

```
[edit interfaces lsq-0/0/0]
user@host# set unit 0 dlci 400 family inet address 10.0.0.10/24
```

7. Create the T1 interfaces and set the Frame Relay encapsulation.

```
[edit interfaces]
user@host# set t1-2/0/0 encapsulation multilink-frame-relay-uni-nni
user@host# set t1-2/0/1 encapsulation multilink-frame-relay-uni-nni
```

8. Specify the multilink bundle to which the interface is to be added as a constituent link on device R0.

```
[edit interfaces t1-2/0/0]
user@host# set unit 0 family mlfr-uni-nni bundle lsq-0/0/0:0
```

9. Specify the multilink bundle to which the interface is to be added as a constituent link on device R1.

```
[edit interfaces t1-2/0/1]
user@host# set unit 0 family mlfr-uni-nni bundle lsq-0/0/0:0
```

Results From configuration mode, confirm your configuration by entering the **show** commands for devices R0 and R1. If the output does not display the intended configuration, repeat the configuration instructions in this example to correct it.

For device R0

```
[edit chassis]
user@host#show
fpc 0 {
   pic 0 {
      mlfr-uni-nni-bundles 1;
   }
}
```

```
[edit interfaces lsq-0/0/0:0]
user@host#show
dce;
encapsulation multilink-frame-relay-uni-nni;
```

```
[edit interfaces lsq-0/0/0]
user@host#show
unit 0 {
   dlci 400;
   family inet {
      address 10.0.0.10/24;
   }
}
```

```
[edit interfaces t1-2/0/0]
user@host#show
encapsulation multilink-frame-relay-uni-nni;
unit 0 {
   family mlfr-uni-nni {
      bundle lsq-0/0/0:0;
   }
}
```

```
[edit interfaces t1-2/0/1]
user@host#show
encapsulation multilink-frame-relay-uni-nni;
unit 0 {
   family mlfr-uni-nni {
      bundle lsq-0/0/0:0;
   }
}
```

For device R1

```
[edit chassis]
user@host#show
fpc 0 {
   pic 0 {
      mlfr-uni-nni-bundles 1;
   }
}
```

```
[edit interfaces lsq-0/0/0:0]
user@host#show
encapsulation multilink-frame-relay-uni-nni;
```

```
[edit interfaces t1-2/0/0]
user@host#show
encapsulation multilink-frame-relay-uni-nni;
unit 0 {
   family mlfr-uni-nni {
      bundle lsq-0/0/0:0;
```

```
   }
}
```

```
[edit interfaces t1-2/0/1]
user@host#show
encapsulation multilink-frame-relay-uni-nni;
   unit 0 {
      family mlfr-uni-nni {
   bundle lsq-0/0/0:0;
}
```

If you are done configuring the device, enter **commit** from configuration mode.

Verification

Confirm that the configuration is working properly.

Verifying the MLFR FRF.16 Configuration

Purpose Verify the MLFR FRF.16 configuration.

Action From operational mode, enter the **show interfaces** command.

Related Documentation

- Link Services Interfaces Overview on page 471
- Understanding Multilink Frame Relay FRF.16 on page 521
- Link Services Configuration Overview on page 477

CHAPTER 30

Configuring Compressed Real-Time Transport Protocol

Understanding Compressed Real-Time Transport Protocol

Compressed Real-Time Transport Protocol (CRTP) is typically used for compressing voice and video packets. You can configure CRTP with LFI on a link services interface.

CRTP can be configured as a compression device on a T1 or E1 interface with PPP encapsulation, using the link services interface.

NOTE:

- F-max period—Maximum number of compressed packets allowed between transmission of full headers. It has a range from 1 to 65,535.
- Maximum and Minimum—UDP port values from 1 to 65,536 reserve these ports for RTP compression. CRTP is applied to network traffic on ports within this range. This feature is applicable only to voice services interfaces.

Related Documentation

- Link Services Interfaces Overview on page 471
- Example: Configuring the Compressed Real-Time Transport Protocol on page 527

Example: Configuring the Compressed Real-Time Transport Protocol

This example shows how to configure CRTP to improve packet transmission, especially for time-sensitive voice packets.

Requirements

Before you begin, you should have two Juniper Networks devices configured with at least two serial interfaces that communicate over serial links.

Overview

In this example, you create a T1 interface called t1-1/0/0 and set the type of encapsulation to PPP. You set the link services intelligent queuing interface to lsq-0/0/0.0. You then create an interface called lsq-0/0/0 and set the logical unit 0. Finally, you set the F-max period to 2500, the minimum UDP port value to 2000, and the maximum UDP port value to 64009.

Configuration

CLI Quick Configuration

To quickly configure this example, copy the following command, paste it into a text file, remove any line breaks, change any details necessary to match your network configuration, copy and paste the command into the CLI at the **[edit]** hierarchy level, and then enter **commit** from configuration mode.

```
set interfaces t1-1/0/0 encapsulation ppp
set interfaces t1-1/0/0 unit 0 compression-device lsq-0/0/0.0
set interfaces lsq-0/0/0 unit 0 compression rtp f-max-period 2500 port minimum 2000
  maximum 64009
```

Step-by-Step Procedure

The following example requires you to navigate various levels in the configuration hierarchy. For instructions on how to do that, see *Using the CLI Editor in Configuration Mode*.

To configure CRTP on a device:

1. Create the T1 interface.

   ```
   [edit]
   user@host# edit interfaces t1-1/0/0
   ```

2. Set the type of encapsulation.

   ```
   [edit interfaces t1-1/0/0]
   user@host# set encapsulation ppp
   ```

3. Add the link services intelligent queuing interface to the physical interface.

   ```
   [edit interfaces t1-1/0/0]
   user@host# edit unit 0
   user@host# set compression-device lsq-0/0/0.0
   ```

4. Create an interface and set the logical unit.

```
[edit interfaces]
user@host# edit lsq-0/0/0 unit 0
```

5. Configure the link services intelligent queuing interface.

```
[edit interfaces lsq-0/0/0 unit 0]
user@host# set compression rtp f-max-period 2500 port minimum 2000 maximum
  64009
```

Results From configuration mode, confirm your configuration by entering the **show interfaces** command. If the output does not display the intended configuration, repeat the configuration instructions in this example to correct it.

```
[edit]
  user@host# show interfaces
  lsq-0/0/0 {
  unit 0 {
    compression {
    rtp {
    f-max-period 2500;
      port minimum 2000 maximum 64009;
      }
    }
  }
}
  t1-1/0/0 {
    encapsulation ppp;
  unit 0 {
    compression-device lsq-0/0/0.0;
      }
    }
```

If you are done configuring the device, enter **commit** from configuration mode.

Verification

Confirm that the configuration is working properly.

Verifying the CRTP Configuration

Purpose Verify the CRTP configuration.

Action From operational mode, enter the **show interfaces** command.

Related Documentation

- Link Services Interfaces Overview on page 471
- Understanding Compressed Real-Time Transport Protocol on page 527

CHAPTER 31

Configuring Link Services Queuing Interface

Understanding the Internal Interface LSQ-0/0/0 Configuration

The link services interface is an internal interface only. It is not associated with a physical medium or PIM. Within an SRX Series device, packets are routed to this interface for link bundling or compression.

It may be required that you upgrade your configuration to use the internal interface lsq-0/0/0 as the link services queuing interface instead of ls-0/0/0, which has been deprecated. You can also roll back your modified configuration to use ls-0/0/0.

Related Documentation

- Link Services Interfaces Overview on page 471
- Example: Upgrading from ls-0/0/0 to lsq-0/0/0 for Multilink Services on page 531

Example: Upgrading from ls-0/0/0 to lsq-0/0/0 for Multilink Services

This example shows how to upgrade from ls-0/0/0 to lsq-0/0/0 (or to reverse the change) for multilink services.

Requirements

This procedure is only necessary if you are still using ls-0/0/0 instead of lsq-/0/0/0 or if you need to revert to the old interface.

Overview

In this example, you rename the link services internal interface from ls-0/0/0 to lsq-0/0/0 or vice versa. You rename all occurrences of ls-0/0/0 in the configuration to lsq-0/0/0 and configure the fragmentation map by adding no fragmentation. You specify no fragmentation after the name of queue 2, if queue 2 is configured, or after assured forwarding. You then attach the fragmentation map configured in the preceding step to lsq-0/0/0 and specify the unit number as 6 of the multilink bundle for which interleave fragments is configured.

Then you roll back the configuration from lsq-0/0/0 to ls-0/0/0. You rename all occurrences in the configuration from lsq-0/0/0 to ls-0/0/0. You delete the fragmentation map if it is configured under the [class-of-service] hierarchy and delete the fragmentation map if it is assigned to lsq-0/0/0. You can delete multilink-max-classes if it is configured for lsq-0/0/0 under the [interfaces] hierarchy. You then delete link-layer-overhead if it is configured for lsq-0/0/0 under the [interfaces] hierarchy.

If no fragmentation is configured on any forwarding class and the fragmentation map is assigned to lsq-0/0/0, then you configure interleave fragments for the ls-0/0/0 interface. Finally, you configure the classifier for LFI packets to refer to queue 2. (The ls-0/0/0 interface treats queue 2 as the LFI queue.)

Configuration

CLI Quick Configuration

To quickly upgrade from ls-0/0/0 to lsq-0/0/0 (or reverse the change), copy the following commands and paste them into the CLI:

```
For interfaces ls-0/0/0 to lsq-0/0/0
[edit]
rename interfaces ls-0/0/0 to lsq-0/0/0
set class-of-service fragmentation-maps map6 forwarding-class assured-forwarding
  no-fragmentation
set class-of-service interfaces lsq-0/0/0 unit 6 fragmentation-map map6
```

```
For interfaces lsq-0/0/0 to ls-0/0/0
[edit]
rename interfaces lsq-0/0/0 to ls-0/0/0
delete class-of-service fragmentation-maps map6
delete class-of-service interfaces lsq-0/0/0 unit 6 fragmentation-map map6
delete interfaces lsq-0/0/0 unit 6 link-layer-overhead
delete interfaces lsq-0/0/0:0 mlfr-uni-nni-bundle-options link-layer-overhead
set interfaces ls-0/0/0 unit 6 interleave-fragments
```

Step-by-Step Procedure

The following example requires you to navigate various levels in the configuration hierarchy. For instructions on how to do that, see *Using the CLI Editor in Configuration Mode*.

To upgrade from ls-0/0/0 to lsq-0/0/0 or to reverse that change:

1. Rename all the occurrences of ls-0/0/0 in the configuration.


```
[edit]
user@host# rename interfaces ls-0/0/0 to lsq-0/0/0
```

2. Configure the fragmentation map.

```
[edit class-of-service fragmentation-maps]
user@host# set map6 forwarding-class assured-forwarding no-fragmentation
```

3. Specify the unit number of the multilink bundle.

```
[edit class-of-service ]
user@host# set interfaces lsq-0/0/0 unit 6 fragmentation-map map6
```

4. Roll back the configuration for all occurrences in the configuration.

```
[edit]
user@host# rename interfaces lsq-0/0/0 to ls-0/0/0
```

5. Delete fragmentation map under class of service.

```
[edit]
user@host# delete class-of-service fragmentation-maps map6
```

6. Delete fragmentation map if it is assigned to the lsq-0/0/0 interface.

```
[edit class-of-service interfaces]
user@host# delete lsq-0/0/0 unit 6 fragmentation-map map6
```

7. Delete multilink max classes if it is configured for lsq-0/0/0.

NOTE: **Multilink-max-classes is not supported and is most likely not configured.**

8. Delete link-layer-overhead if it is configured for lsq-0/0/0.

```
[edit interfaces]
user@host# delete lsq-0/0/0 unit 6 link-layer-overhead
```

9. Delete link-layer-overhead if it is configured for lsq-0/0/0:0.

```
[edit interfaces]
user@host# delete lsq-0/0/0:0 mlfr-uni-nni-bundle-options link-layer-overhead
```

10. Configure interleave fragments for the ls-0/0/0 interface.

```
[edit interfaces]
user@host# set ls-0/0/0 unit 6 interleave-fragments
```

Results From configuration mode, confirm your configuration by entering the **show class-of-service** command. If the output does not display the intended configuration, repeat the configuration instructions in this example to correct it.

```
[edit]
  user@host# show class-of-service
  interfaces {
  lsq-0/0/0 {
    unit 6 {
    fragmentation-map map6;
    }
  }
  }
  fragmentation-maps {
    map6 {
    forwarding-class {
    assured-forwarding {
      no-fragmentation;
      }
    }
  }
}
```

If you are done configuring the device, enter **commit** from configuration mode.

Verification

Confirm that the configuration is working properly.

Verifying Link Services Internal Interface ls-0/0/0 to lsq-0/0/0

Purpose Verify the link services internal interface ls-0/0/0 changed to lsq-0/0/0.

Action From operational mode, enter the **show class-of-service** command.

Related Documentation

- Link Services Interfaces Overview on page 471
- Understanding the Internal Interface LSQ-0/0/0 Configuration on page 531

CHAPTER 32

Understanding Special Interfaces

Understanding Management Interfaces

Management interfaces are the primary interfaces for accessing the device remotely. Typically, a management interface is not connected to the in-band network, but is connected instead to the device's 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. SNMP can use the management interface to gather statistics from the device.

Management interfaces vary based on device type:

- The SRX5600 and SRX5800 devices include a 10/100-Mbps Ethernet port on the Routing Engine (RE). This port, which is labeled ETHERNET, is a dedicated out-of-band management interface for the device. Junos OS automatically creates the device's management interface **fxp0**. To use **fxp0** as a management port, you must configure its logical port **fxp0.0** with a valid IP address. While you can use **fxp0** to connect to a management network, you cannot place it into the management zone.

NOTE: On the SRX5600 and SRX5800 devices, you must first connect to the device through the serial console port before assigning a unique IP address to the management interface.

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.

In an SRX Series device, the **fxp0** management interface is a dedicated port located on the Routing Engine. In an SRX Series chassis cluster configuration, the control link interface must be port **0** on an SPC. For each node in the chassis cluster, you must configure the SPC that is used for the control link interface.

Related Documentation

- Understanding Interfaces on page 3
- Understanding the Discard Interface on page 536
- Understanding the Loopback Interface on page 536

Understanding the Discard Interface

The discard (**dsc**) interface is not a physical interface, but a virtual interface that discards packets. You can configure one discard interface. This interface allows you to identify the ingress (inbound) point of a denial-of-service (DoS) attack. When your network is under attack, the target host IP address is identified, and the local policy forwards attacking packets to the discard interface. Traffic routed out the discard interface is silently discarded.

Related Documentation

- Understanding Interfaces on page 3
- Understanding Management Interfaces on page 535
- Understanding the Loopback Interface on page 536

Understanding the Loopback Interface

The loopback address (**lo0**) has several uses, depending on the particular Junos feature being configured. It can perform the following functions:

- Device identification—The loopback interface is used to identify the device. While any interface address can be used to determine if the device is online, the loopback address is the preferred method. Whereas interfaces might be removed or addresses changed based on network topology changes, the loopback address never changes.

  When you ping an individual interface address, the results do not always indicate the health of the device. For example, a subnet mismatch in the configuration of two endpoints on a point-to-point link makes the link appear to be inoperable. Pinging the interface to determine whether the device is online provides a misleading result. An interface might be unavailable because of a problem unrelated to the device's configuration or operation.
- Routing information—The loopback address is used by protocols such as OSPF to determine protocol-specific properties for the device or network. Further, some commands such as **ping mpls** require a loopback address to function correctly.
- Packet filtering—Stateless firewall filters can be applied to the loopback address to filter packets originating from, or destined for, the Routing Engine.

The Internet Protocol (IP) specifies a loopback network with the (IPv4) address **127.0.0.0/8**. Most IP implementations support a loopback interface (**lo0**) to represent the loopback facility. Any traffic that a computer program sends on the loopback network is addressed to the same computer. The most commonly used IP address on the loopback network is **127.0.0.1** for IPv4 and **::1** for IPv6. The standard domain name for the address is **localhost**.

The device also includes an internal loopback address (**lo0.16384**). The internal loopback address is a particular instance of the loopback address with the logical unit number 16384. Junos OS creates the loopback interface for the internal routing instance. This interface prevents any filter on **lo0.0** from disrupting internal traffic.

Related Documentation

- Configuring a Loopback Interface on page 537
- Understanding Interfaces on page 3
- Understanding Management Interfaces on page 535
- Understanding the Discard Interface on page 536

Configuring a Loopback Interface

The loopback interface supports many different network and operational functions and is an *always-up* interface. This means that the loopback interface ensures that the device is reachable, even if some of the physical interfaces are down or removed, or an IP address has changed. In most cases, you always define a loopback interface.

Junos OS follows the IP convention of identifying the loopback interface as lo0.

Junos OS requires that the loopback interface always be configured with a /32 network mask because the Routing Engine is essentially a host.

If you are using routing instances, you can configure the loopback interface for the default routing instance or for a specific routing instance. The following procedure adds the loopback interface to the default routing instance.

Optionally, instead of configuring the loopback interface at the **[edit interfaces]** hierarchy level, you can use a configuration group, as shown in this procedure. This is a recommended best practice for configuring the loopback interface. This procedure uses a group called **global** as an example.

To configure a loopback interface:

1. Using the host IP address, assign it to the loopback interface.

   Each host in your network deployment should have a unique loopback interface address. The address used here is only an example.

   ```
   [edit groups global interfaces lo0 unit 0 family inet]
   user@host# set address 192.0.2.27/32
   ```

2. (Optional) Set the preferred IP address.

   You can configure as many addresses as you need on the lo0 interface, so it is good practice to designate one preferred IP address.

   ```
   [edit groups global interfaces lo0 unit 0 family inet]
   user@host# set address 192.0.2.48/32 preferred
   ```


3. (Optional) Configure additional addresses.

   Only unit 0 is permitted as the master loopback interface. If you want to add more IP addresses to unit 0, you configure them in the normal way under unit 0, without the **preferred** option.

   ```
   [edit groups global interfaces lo0 unit 0 family inet]
   user@host# set address 198.51.100.48/32
   user@host# set address 192.168.11.27
   ```

   NOTE: You do not have to include the /32 as long as the IPv4 address is a valid host address. (This usually means that the last octet cannot be zero.)

4. Configure the localhost address.

   On the lo0.0 interface, it is useful to have the IP address 127.0.0.1 configured, as certain processes such as NTP and MPLS ping use this default host address. The 127.0.0.1/32 address is a Martian IP address (an address invalid for routing), so it is never advertised by the Juniper Networks device.

   ```
   [edit groups global interfaces lo0 unit 0 family inet]
   user@host# set address 127.0.0.1/32
   ```

5. (Optional) Configure an ISO address.

   Depending on your network configuration, you might also need an ISO address for the IS-IS routing protocol.

   ```
   [edit groups global interfaces lo0 unit 0 family iso]
   user@host# address 49.0026.0000.0000.0110.00
   ```

6. If you used a configuration group, apply the configuration group, substituting **global** with the appropriate group name.

   ```
   [edit]
   user@host# set apply-groups global
   ```

7. Commit the configuration.

   ```
   user@host# commit
   ```

Related Documentation

- Understanding the Loopback Interface on page 536

PART 7

Configuring LTE Interfaces

CHAPTER 33

Configuring LTE Interfaces

LTE Mini-PIM Overview

The LTE Mini-Physical Interface Module (Mini-PIM) provides wireless WAN support on the SRX320, SRX340, SRX345, and SRX550M (High Memory) Services Gateways. The LTE Mini-PIM operates on both 3G and 4G networks. Table 41 on page 541 provides a summary of the different models of the Mini-PIM.

Table 41: LTE Mini-PIM Models

Model	Mode	Operating Region	Frequency Band
SRX-MP-LTE-AE	• LTE • HSPA+	• North America • European Union	For LTE: • Bands 1 through 5, 7, 8, 12, 13, 20, 25, 26, 29, 30, and 41 For 3G (HSPA+): • Bands 1 through 5, and 8
SRX-MP-LTE-AA	• LTE • HSPA+	• Asia • Australia	For LTE: • Bands 1,3, 5, 7, 8, 18, 19, 21, 28, 38, 39, 40, and 41 For 3G (HSPA+): • Bands 1, 5, 6, 8, 9, and 19

Supported Features

The LTE Mini-PIM supports the following features:

- Automatic switchover between service providers through dual SIMs—The Mini-PIM supports up to two Subscriber Identity Module (SIM) cards. Dual SIM cards allow connectivity to two different ISP networks and provide a failover mechanism when the current active network fails. Each SIM card is associated with a profile, which is used to connect to the network.
- Multiple service provider and access point name (APN) profiles—You can configure up to 16 profiles for each SIM, although only one profile can be active at a time. The LTE Mini-PIM supports two SIM cards and so you can configure a total of 32 profiles.
- LTE carrier aggregation—Carrier aggregation expands the LTE bandwidth by combining secondary bands, which results in increased capacity and network efficiency.
- SIM security functions—The Mini-PIM supports security functions such as SIM lock and unlock, and PIN change.
- Always-on, dial-on-demand, and backup modes—The Mini-PIM can be configured in three modes:
  - Always-on—The Mini-PIM connects to the 3G/4G network after booting. The connection is always maintained, as long as there are no network or connectivity problems.
  - Dial-on-demand—The Mini-PIM initiates a connection when it receives interesting traffic. You define interesting traffic using the dialer filter. To configure dial-on-demand using a dialer filter, you first configure the dialer filter and then apply the filter to the dialer interface.

    NOTE: **The dial-on-demand mode is supported only if the LTE mini-PIM is configured as a primary interface.**

  - Backup—The Mini-PIM connects to the 3G/4G network when the primary connection fails.
- Primary and backup interface—You can configure the LTE Mini-PIM either as a primary interface or as a backup interface.

  When configured as the primary interface, the LTE Mini-PIM supports both the Always-on and Dial-on-demand modes.

  When configured as the backup interface, the LTE Mini-PIM connects to the network only when the primary interface fails.
- Over-the-air upgrade for modem firmware—Over-the-air (OTA) firmware upgrade enables automatic and timely upgrade of modem firmware when new firmware versions are available. The OTA upgrade can be enabled or disabled on the LTE Mini-PIM.

NOTE: OTA upgrade is disabled by default.

Understanding the LTE Physical Interface

The physical interface for the 4G LTE Mini-PIM uses the name cl-*slot number*/0/0, where *slot number* identifies the slot on the services gateway in which you insert the Mini-PIM. For example, cl-1/0/0. The Mini-PIM can be inserted in any of the Mini-PIM slots on the SRX320, SRX340, SRX345, and SRX550M Services Gateways. You configure the following properties on the physical interface:

- A dialer pool to which the physical interface belongs and the priority of the interface in the pool.
- Profiles for the SIM cards.
- Radio access technology (automatic, 3G, LTE)

Understanding the LTE Logical Interface

The dialer interface, dl0, is a logical interface, which is used to trigger calls. When traffic is sent to the dl0 interface, it enables the physical interface in the dialer pool and places calls through the physical interface. The dialer interface can perform backup and dialer filter functions. You can configure the dialer interface to operate in any one of the following ways:

- Primary interface—The dialer interface connects to the network and is always on. For more information, see "Configuring the LTE Mini-PIM as the Primary Interface" on page 545.
- Backup interface for the primary WAN connection—The dialer interface is activated only when the primary connection fails. For more information, see "Configuring the LTE Mini-PIM as a Backup Interface" on page 547.
- Dial-on-demand—The dialer interface activates the connection to the wireless network only when it receives interesting traffic. For more information, see "Configuring the LTE Interface as a Dial-on-Demand Interface" on page 556.

The following rules apply when you configure dialer interfaces:

- You cannot configure the dialer interface as a constituent link in a multilink bundle.
- You cannot configure any dial-in options for the dialer interface.

You configure the following for a dialer interface:

- A dialer pool to which the physical interface belongs.
- Dial string (destination number to be dialed).

You can also specify optional operating parameters for the dialer interface:

- Activation delay—Number of seconds after the primary interface is down before the backup interface is activated. The default value is 0 seconds, and the maximum value is 60 seconds.
- Deactivation delay—Number of seconds after the primary interface is up before the backup interface is deactivated. The default value is 0 seconds, and the maximum value is 60 seconds.

Class of Service on the Dialer Interface

The dialer interface has limited bandwidth, which can lead to traffic congestion. Starting with Junos OS Release 15.1X49-D100, the dialer interface supports the configuration of 4G LTE dialer interface Class of Service (CoS) parameters on SRX320, SRX340, SRX345, and SRX550M devices. The dialer interface supports the following CoS parameters:

- Behavior aggregate and multifield classifiers
- Policers
- Shapers
- Schedulers
- Rewrite rules

NOTE: **The dialer interface (dl0) supports scheduling only at the physical interface queue level. As this interface does not support shaping at the logical interface level, per-unit scheduling is not supported on the dialer interface.**

See *Class of Service Feature Guide (Security Devices)* for information on configuring these parameters.

Related Documentation

- LTE Mini-PIM Configuration Overview on page 544

LTE Mini-PIM Configuration Overview

The configuration process for the LTE Mini-PIM includes the following tasks:

1. Install your SRX Series device and establish basic connectivity for your device. For more information, see the SRX Series Hardware Guide for your device.
2. Establish an account with a cellular network service provider. Contact your service provider for more information.
3. Gather the following information from the service provider:
   - Username and password
   - Access Point Name (APN)
   - Authentication (Challenge Handshake Authentication Protocol (CHAP) or Password Authentication Protocol (PAP))

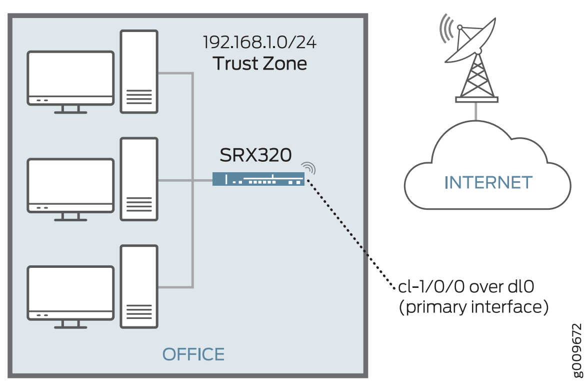
4. Install the LTE Mini-PIM.
5. Configure the LTE Mini-PIM. See:
   - Configuring the LTE Mini-PIM as the Primary Interface on page 545
   - Configuring the LTE Mini-PIM as a Backup Interface on page 547
   - Configuring the LTE Interface as a Dial-on-Demand Interface on page 556

Configuring the LTE Mini-PIM as the Primary Interface

Figure 33 on page 545 illustrates a scenario where the LTE Mini-PIM is installed on a SRX320 Services Gateway and functions as the primary interface. This procedure assumes that the LTE Mini-PIM is installed in slot 1 on the SRX320 Services Gateway.

NOTE: **The LTE Mini-PIM can be installed in any of the Mini-PIM slots on the SRX320, SRX340, SRX345, and SRX550M Services Gateways.**

Figure 33: LTE Mini-PIM Used as a Primary Interface



Before you begin the procedure, ensure that dl0.0 is not configured as a backup. If dl0.0 is configured as a backup option for any interface on the SRX Series device, then this configuration overrides the configuration outlined in this procedure, and the LTE Mini-PIM will function as a backup interface.

Use the **show interfaces | display set | match backup-option | match dl0.0** command to check whether any interface uses dl0.0 as a backup interface. If dl0.0 is configured as a backup interface, then delete the configuration by issuing the following command: **delete interfaces *interface-name* unit 0 backup-options interface dl0.0**

To configure the LTE Mini-PIM as a primary interface:

1. Configure the dialer interface:

   user@host# set interfaces dl0 unit 0 family inet negotiate-address
   user@host# set interfaces dl0 unit 0 family inet6 negotiate-address
   user@host# set interfaces dl0 unit 0 dialer-options pool *dialer-pool-number*
   user@host# set interfaces dl0 unit 0 dialer-options dial-string *dial-number*
   user@host# set interfaces dl0 unit 0 dialer-options always-on

2. Configure the dialer pool for the LTE Mini-PIM physical interface:

   user@host# set interfaces cl-1/0/0 dialer-options pool *number*

3. Configure the profile. The Subscriber Identity Module (SIM) uses a profile to establish a connection with the network. You can configure up to 16 profiles for each SIM card. The LTE Mini-PIM supports two SIM cards and so you can configure a total of 32 profiles, although only one profile can be active at a time.

   user@host# run request modem wireless create-profile profile-id *profile-id* cl-1/0/0 slot *sim-slot-number* access-point-name *apn-name* authentication-method *none*

   NOTE: sim-slot-number is the slot on the Mini-PIM in which the SIM card is inserted.

4. Verify that the profile is configured successfully:

   user@host# run show modem wireless profiles cl-1/0/0 slot 1

5. Activate the SIM card:

   user@host# set interfaces cl-1/0/0 act-sim *sim-slot-number*

6. Select the profile and configure the radio access type for the SIM card:

   user@host# set interfaces cl-1/0/0 cellular-options sim *sim-slot-number* select-profile profile-id *profile-id*
   user@host# set interfaces cl-1/0/0 cellular-options sim *sim-slot-number* radio-access automatic

   NOTE: If a SIM card is installed in the second slot, then select the profile and configure the radio access type for the secondary SIM card as well.

7. Verify the status of the wireless network and dialer interface:

   user@host# run show modem wireless network
   user@host# run show interfaces dl0.0

NOTE: If the LTE Mini-PIM gets an IP address with a mask of /32 from the service provider, the user has to configure the default gateway information using the **set interfaces** ***cl-interface*** **cellular-options sim** ***sim-slot*** **gateway** ***ip-address/mask*** command to make the Mini-PIM accept the assigned IP address.

Related Documentation

- Configuring the LTE Interface as a Dial-on-Demand Interface on page 556

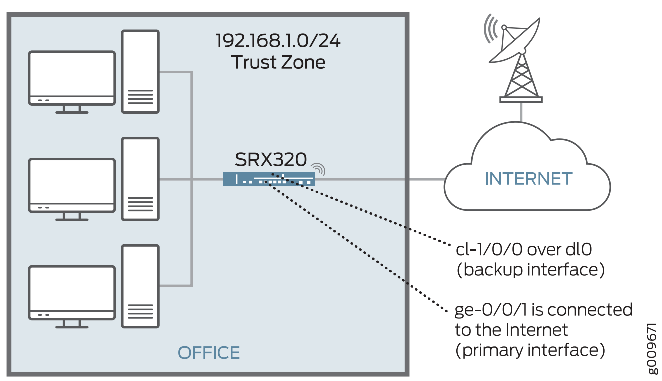
Configuring the LTE Mini-PIM as a Backup Interface

You can configure the LTE Mini-PIM as a backup interface. If the primary interface fails, the Mini-PIM connects to the network and remains online only until the primary interface becomes functional. The dialer interface is enabled only when the primary interface fails.

Figure 33 on page 545 illustrates a scenario where the LTE Mini-PIM is installed on a SRX320 Services Gateway and functions as a backup interface. The ge-0/0/1 port is connected to the Internet and functions as the primary interface.

NOTE: The LTE Mini-PIM can be installed in any of the Mini-PIM slots on the SRX320, SRX340, SRX345, and SRX550M Services Gateways. In this scenario, the Mini-PIM is installed on slot 1.

Figure 34: LTE Mini-PIM Used as a Backup Interface



To configure the LTE Mini-PIM as a backup interface:

1. Configure the dialer interface:

   user@host# set interfaces dl0 unit 0 family inet negotiate-address
   user@host# set interfaces dl0 unit 0 family inet6 negotiate-address
   user@host# set interfaces dl0 unit 0 dialer-options pool *dialer-pool-number*
   user@host# set interfaces dl0 unit 0 dialer-options dial-string *dial-number*

2. Configure the dialer pool for the LTE Mini-PIM physical interface:

   user@host# set interfaces *cl-1/0/0* dialer-options pool *dialer-pool-number*

3. Configure the profile. The Subscriber Identity Module (SIM) uses a profile to establish a connection with the network. You can configure up to 16 profiles for each SIM card. The LTE Mini-PIM supports two SIM cards and so you can configure a total of 32 profiles, although only one profile can be active at a time.

   user@host# run request modem wireless create-profile profile-id *profile-id cl-1/0/0* slot *sim-slot-number* access-point-name *l3vpn.corp* authentication-method none

   NOTE: **sim-slot-number** is the slot on the Mini-PIM in which the SIM card is inserted.

4. Verify that the profile is configured successfully:

   user@host# run show modem wireless profiles cl-1/0/0 slot 1

5. Activate the SIM card:

   user@host# set interfaces cl-1/0/0 act-sim *sim-slot-number*

6. Select the profile and configure the radio access type for the SIM card:

   user@host# set interfaces cl-1/0/0 cellular-options sim *sim-slot-number* select-profile profile-id *profile-id*
   user@host# set interfaces cl-1/0/0 cellular-options sim *sim-slot-number* radio-access automatic

   NOTE: If a SIM card is installed in the second slot, then select the profile and configure the radio access type for the secondary SIM card as well.

7. Configure the Ethernet interface as the primary interface, which connects to the wireless network. Configure the dl0 interface as the backup interface.

   user@host# set interfaces ge-0/0/1 unit 0 family inet address *192.168.2.1/24*
   user@host# set interfaces ge-0/0/1 unit 0 backup-options interface dl0.0

8. Verify the status of the wireless network and dialer interface:

```
user@host# run show modem wireless network
user@host# run show interfaces dl0.0
```

NOTE: The **activation-delay** and **deactivation-delay** command-line options can be used to avoid interface flaps by forcing a delay between the time the primary interface changes states, and the time the dialer interface is enabled or disabled. The activation delay controls the time between the primary interface going down and the activation of the dialer interface. Similarly, the deactivation delay controls the time between the recovery of the primary interface and the deactivation of the backup interface.

Related Documentation

- Configuring the LTE Mini-PIM as the Primary Interface on page 545
- Configuring the LTE Interface as a Dial-on-Demand Interface on page 556

Example: Configuring the LTE Mini-PIM as a Backup Interface

This example shows how to configure the LTE Mini-PIM as a backup interface. If the primary interface fails, the Mini-PIM connects to the network and remains online only until the primary interface becomes functional.The dialer interface is enabled only when the primary interface fails.

NOTE: The LTE Mini-PIM can be installed in any of the Mini-PIM slots on the SRX320, SRX340, SRX345, and SRX550M Services Gateways. In this scenario, the Mini-PIM is installed on slot 1.

Requirements

This example uses the following hardware and software components:

- Junos OS Release or later for SRX320

Overview

Configuration

CLI Quick Configuration

To quickly configure this example, copy the following command, paste it into a text file, remove any line breaks, change any details necessary to match your network configuration,

copy and paste the command into the CLI at the **[edit]** hierarchy level, and then enter commit from configuration mode.

```
set interfaces dl0 unit 0 family inet negotiate-address
set interfaces dl0 unit 0 family inet6 negotiate-address
set interfaces dl0 unit 0 dialer-options pool dialer-pool-number
set interfaces dl0 unit 0 dialer-options dial-string dial-number
set interfaces cl-1/0/0 dialer-options pool dialer-pool-number
run request modem wireless create-profile profile-id profile-id cl-1/0/0 slot
  sim-slot-number access-point-name l3vpn.corp authentication-method none
run show modem wireless profiles cl-1/0/0 slot 1
set interfaces cl-1/0/0 act-sim sim-slot-number
set interfaces cl-1/0/0 cellular-options sim sim-slot-number select-profile profile-id
  profile-id
set interfaces cl-1/0/0 cellular-options sim sim-slot-number radio-access automatic
set interfaces ge-0/0/1 unit 0 family inet address 192.168.2.1/24
set interfaces ge-0/0/1 unit 0 backup-options interface dl0.0
```

Configuring the LTE Mini-PIM as a Backup Interface

Step-by-Step Procedure

The following example requires you to navigate various levels in the configuration hierarchy. For instructions on how to do that, see *Using the CLI Editor in Configuration Mode* in the *CLI User Guide*.

To configure Mini-PIM as a backup interface:

1. Create the dialer interface:

```
[edit interfaces]
user@host# set interfaces dl0 unit 0 family inet negotiate-address
user@host# set interfaces dl0 unit 0 family inet6 negotiate-address
user@host# set interfaces dl0 unit 0 dialer-options pool dialer-pool-number
user@host# set interfaces dl0 unit 0 dialer-options dial-string dial-number
user@host#
```

2. Define the dialer pool for the LTE Mini-PIM physical interface:

```
user@host# set interfaces cl-1/0/0 dialer-options pool dialer-pool-number
```

3. Create and configure the profile. The Subscriber Identity Module (SIM) uses a profile to establish a connection with the network. You can configure up to 16 profiles for each SIM card. The LTE Mini-PIM supports two SIM cards and so you can configure a total of 32 profiles, although only one profile can be active at a time.

```
user@host# run request modem wireless create-profile profile-id profile-id cl-1/0/0
  slot sim-slot-number access-point-name l3vpn.corp authentication-method none
```

NOTE: **sim-slot-number** is the slot on the Mini-PIM in which the SIM card is inserted.

4. Activate the SIM card:

   user@host# **set interfaces cl-1/0/0 act-sim** ***sim-slot-number***

5. Select the profile and configure the radio access type for the SIM card:

   user@host# **set interfaces cl-1/0/0 cellular-options sim** ***sim-slot-number*** **select-profile profile-id** ***profile-id***
   user@host# **set interfaces cl-1/0/0 cellular-options sim** ***sim-slot-number*** **radio-access automatic**

   NOTE: If a SIM card is installed in the second slot, then select the profile and configure the radio access type for the secondary SIM card as well.

6. Specify Ethernet interface as the primary interface, which connects to the wireless network. Specify the dl0 interface as the backup interface.

   user@host# **set interfaces ge-0/0/1 unit 0 family inet address** ***192.168.2.1/24***
   user@host# **set interfaces ge-0/0/1 unit 0 backup-options interface dl0.0**

NOTE: The **activation-delay** and **deactivation-delay** command-line options can be used to avoid interface flaps by forcing a delay between the time the primary interface changes states, and the time the dialer interface is enabled or disabled. The activation delay controls the time between the primary interface going down and the activation of the dialer interface. Similarly, the deactivation delay controls the time between the recovery of the primary interface and the deactivation of the backup interface.

Results

From configuration mode, confirm your configuration by entering the **show interfaces dl0.0** command. If the output does not display the intended configuration, repeat the configuration instructions in this example to correct it.

```
user@host>
```

```
Logical interface dl0.0 (Index 353) (SNMP ifIndex 559)
    Flags: Up Point-To-Point SNMP-Traps 0x4004000 Encapsulation: ENET2
    Dialer:
    State: Active, Dial pool: pool1
    Primary interface: ge-1/0/1.0 (Index 350)
    Dial strings: 1234
    Subordinate interfaces: cl-1/1/0 (Index 161)
    Activation delay: 0, Deactivation delay: 0
    Initial route check delay: 120
    Redial delay: 120
```



```
    Callback wait period: 5
    Load threshold: 0, Load interval: 60
    Input packets : 7
    Output packets: 10
    Protocol inet, MTU: 1490
    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, Negotiate-Address
    Addresses, Flags: Is-Preferred Is-Primary
    Destination: 100.100.60.208/29, Local: 100.100.60.212, Broadcast:
100.100.60.215
    Protocol inet6, MTU: 1490
    Max nh cache: 75000, New hold nh limit: 75000, Curr nh cnt: 0, Curr new hold
 cnt: 0, NH drop cnt: 0
    Flags: Is-Primary, Negotiate-Address
    Addresses, Flags: Is-Preferred
    Destination: fe80::/64, Local: fe80::5a00:bb0f:fcaa:7d00
```

Verification

Verification of the configured profile

Purpose Verify that the profile is configured successfully.

Action From operational mode, run the **show modem wireless profiles cl-1/0/0 slot 1** command.

`user@host>` **show modem wireless profiles cl-1/0/0 slot 1**

```
Profile details
  Max profiles: 16
  Default profile Id: 1

Profile 1: ACTIVE
  Valid: TRUE
  Access point name (APN): airtelgprs.com
  Authentication: None
  IP Version: IPV4V6
Profile 2: Inactive
  Valid: TRUE
  Access point name (APN): airtelgprs.com
  Authentication: None
  IP Version: IPV4
Profile 3: Inactive
  Valid: TRUE
  Access point name (APN): airtelgprs.com
  Authentication: None
  IP Version: IPV4
Profile 4: Inactive
  Valid: TRUE
  Access point name (APN): airtelgprs.com
  Authentication: None
  IP Version: IPV4
Profile 5: Inactive
  Valid: TRUE
  Access point name (APN): airtelgprs.com
  Authentication: None
  IP Version: IPV4
Profile 6: Inactive
  Valid: TRUE
  Access point name (APN): airtelgprs.com
  Authentication: None
  IP Version: IPV4
Profile 7: Inactive
  Valid: TRUE
  Access point name (APN): airtelgprs.com
  Authentication: None
  IP Version: IPV4
Profile 8: Inactive
  Valid: TRUE
  Access point name (APN): airtelgprs.com
  Authentication: None
  IP Version: IPV4
Profile 9: Inactive
  Valid: TRUE
  Access point name (APN): airtelgprs.com
  Authentication: None
  IP Version: IPV4
Profile 10: Inactive
  Valid: TRUE
  Access point name (APN): airtelgprs.com
  Authentication: None
  IP Version: IPV4
Profile 11: Inactive
```

```
  Valid: TRUE
  Access point name (APN): airtelgprs.com
  Authentication: None
  IP Version: IPV4
Profile 12: Inactive
  Valid: TRUE
  Access point name (APN): airtelgprs.com
  Authentication: None
  IP Version: IPV4
Profile 13: Inactive
  Valid: TRUE
  Access point name (APN): airtelgprs.com
  Authentication: None
  IP Version: IPV4
Profile 14: Inactive
  Valid: TRUE
  Access point name (APN): airtelgprs.com
  Authentication: None
  IP Version: IPV4
Profile 15: Inactive
  Valid: TRUE
  Access point name (APN): airtelgprs.com
  Authentication: None
  IP Version: IPV4
Profile 16: Inactive
  Valid: TRUE
  Access point name (APN): airtelgprs.com
  Authentication: None
  IP Version: IPV4
```

Verification of status of the dialer interface

Purpose Verify that the dialer interface is configured successfully.

Action From operational mode, run the **show interfaces dl0.0** command.

user@host> **show interfaces dl0.0**

```
    Logical interface dl0.0 (Index 353) (SNMP ifIndex 559)
    Flags: Up Point-To-Point SNMP-Traps 0x4004000 Encapsulation: ENET2
    Dialer:
    State: Active, Dial pool: pool1
    Primary interface: ge-1/0/1.0 (Index 350)
    Dial strings: 1234
    Subordinate interfaces: cl-1/1/0 (Index 161)
    Activation delay: 0, Deactivation delay: 0
    Initial route check delay: 120
    Redial delay: 120
    Callback wait period: 5
    Load threshold: 0, Load interval: 60
    Input packets : 7
    Output packets: 10
    Protocol inet, MTU: 1490
    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, Negotiate-Address
    Addresses, Flags: Is-Preferred Is-Primary
    Destination: 100.100.60.208/29, Local: 100.100.60.212, Broadcast:
100.100.60.215
    Protocol inet6, MTU: 1490
    Max nh cache: 75000, New hold nh limit: 75000, Curr nh cnt: 0, Curr new hold
 cnt: 0, NH drop cnt: 0
    Flags: Is-Primary, Negotiate-Address
    Addresses, Flags: Is-Preferred
    Destination: fe80::/64, Local: fe80::5a00:bb0f:fcaa:7d00
```

Verification of status of the modem network and modem firmware

Purpose Verify that the wireless network is configured, check the firmware, and check if the sim is active.

Action From operational mode, enter the **show modem wireless network cl-1/0/0** command to verify the network status and **show modem wireless firmware cl-1/0/0** command to verify the firmware and sim status. Alternatively you can use the **show configuration** command to verify the complete status.

user@host> **show configuration**

```
set chassis jnu-management mode porter
set interfaces cl-1/0/0 cellular-options sim 1 radio-access automatic
set interfaces cl-1/0/0 dialer-options pool dialer-pool-number
set interfaces ge-1/0/1 disable
set interfaces ge-1/0/1 unit 0 family inet address 192.168.2.1/24
set interfaces ge-1/0/1 unit 0 backup-options interface dl0.0
set interfaces cl-1/1/0 act-sim 1
set interfaces cl-1/1/0 cellular-options sim 1 select-profile profile-id 1
set interfaces cl-1/1/0 dialer-options pool pool1
set interfaces dl0 unit 0 family inet negotiate-address
set interfaces dl0 unit 0 family inet6 negotiate-address
set interfaces dl0 unit 0 dialer-options pool pool1
set interfaces dl0 unit 0 dialer-options dial-string 1234
```

Related Documentation

- Configuring the LTE Mini-PIM as a Backup Interface on page 547

Configuring the LTE Interface as a Dial-on-Demand Interface

When the LTE interface is configured as a primary interface, it can function either in always-on mode or in dial-on-demand mode. In always-on mode, the interface remains connected to the network whereas In dial-on-demand mode, the connection is established only when needed.

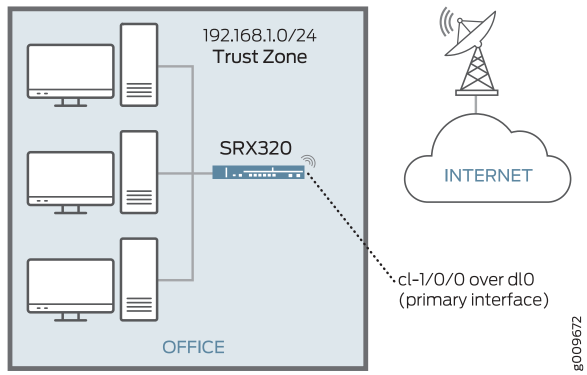
In dial-on-demand mode, the dialer interface is enabled only when network traffic configured as an “interesting traffic” arrives on the network. Interesting traffic triggers or activates the wireless WAN connection. You define an interesting packet by using the dialer filter. To configure dial-on-demand by using a dialer filter, you first configure the dialer filter and then apply the filter to the dialer interface. Once the traffic is sent over the network, an inactivity timer is triggered and the connection is closed after the timer expires.

NOTE: **The dial-on-demand mode is supported only if the LTE Mini-PIM is configured as a primary interface.**

Figure 33 on page 545 illustrates a scenario where the LTE Mini-PIM is installed on a SRX320 Services Gateway and functions as the primary interface. This procedure assumes that the LTE Mini-PIM is installed in slot 1 on the SRX320 Services Gateway.

NOTE: The LTE Mini-PIM can be installed in any of the Mini-PIM slots on the SRX320, SRX340, SRX345, and SRX550M Services Gateways.

Figure 35: LTE Mini-PIM Used as a Dial-on-Demand Interface



To configure the LTE Mini-PIM as a dial-on-demand interface:

1. Configure the dialer interface:

   user@host# set interfaces dl0 unit 0 family inet negotiate-address
   user@host# set interfaces dl0 unit 0 family inet6 negotiate-address
   user@host# set interfaces dl0 unit 0 family inet filter dialer *dialer-filter-name*
   user@host# set interfaces dl0 unit 0 dialer-options pool *dialer-pool-number*
   user@host# set interfaces dl0 unit 0 dialer-options dial-string *dial-number*

   NOTE: Optionally, you can configure the **idle-timeout** value, which determines the duration for which the connection will remain enabled in the absence of interesting traffic.

   user@host# set interfaces dl0 unit 0 dialer-options idle-timeout *idle-timeout-value*

2. Configure the dialer pool for the LTE Mini-PIM physical interface:

   user@host# set interfaces cl-1/0/0 dialer-options pool *number*

3. Create the dialer filter rule:

   user@host# set firewall family inet dialer-filter *dialer-filter-name* term *term1* from destination-address *ip-address* then note

4. Set the default route:

   set routing-options static route *ip-address* next-hop dl0.0

5. Configure the profile. The Subscriber Identity Module (SIM) uses a profile to establish a connection with the network. You can configure up to 16 profiles for each SIM card. The LTE Mini-PIM supports two SIM cards and so you can configure a total of 32 profiles, although only one profile can be active at a time.

   user@host# run request modem wireless create-profile profile-id *profile-id* cl-1/0/0 slot *sim-slot-number* access-point-name *apn-name* authentication-method *none*

   NOTE: ***sim-slot-number*** **is the slot on the Mini-PIM in which the SIM card is inserted.**

6. Verify that the profile is configured successfully:

   user@host# run show modem wireless profiles cl-1/0/0 slot 1

7. Activate the SIM card:

   user@host# set interfaces cl-1/0/0 act-sim *sim-slot-number*

8. Select the profile and configure the radio access type for the SIM card:

   user@host# set interfaces cl-1/0/0 cellular-options sim *sim-slot-number* select-profile profile-id *profile-id*
   user@host# set interfaces cl-1/0/0 cellular-options sim *sim-slot-number* radio-access automatic

   NOTE: **If a SIM card is installed in the second slot, then select the profile and configure the radio access type for the secondary SIM card as well.**

9. Verify the configuration by sending traffic to the destination address. The traffic is routed to the dl0 interface and if it matches the dialer filter rule, then the dl0 is triggered to dial.

10. Verify the status of the wireless network and dialer interface:

   user@host# run show modem wireless network
   user@host# run show interfaces dl0.0

Related Documentation

- Configuring the LTE Mini-PIM as the Primary Interface on page 545

PART 8

Configuring Modem Interfaces

CHAPTER 34

Configuring 3G Wireless Modems for WAN Connections

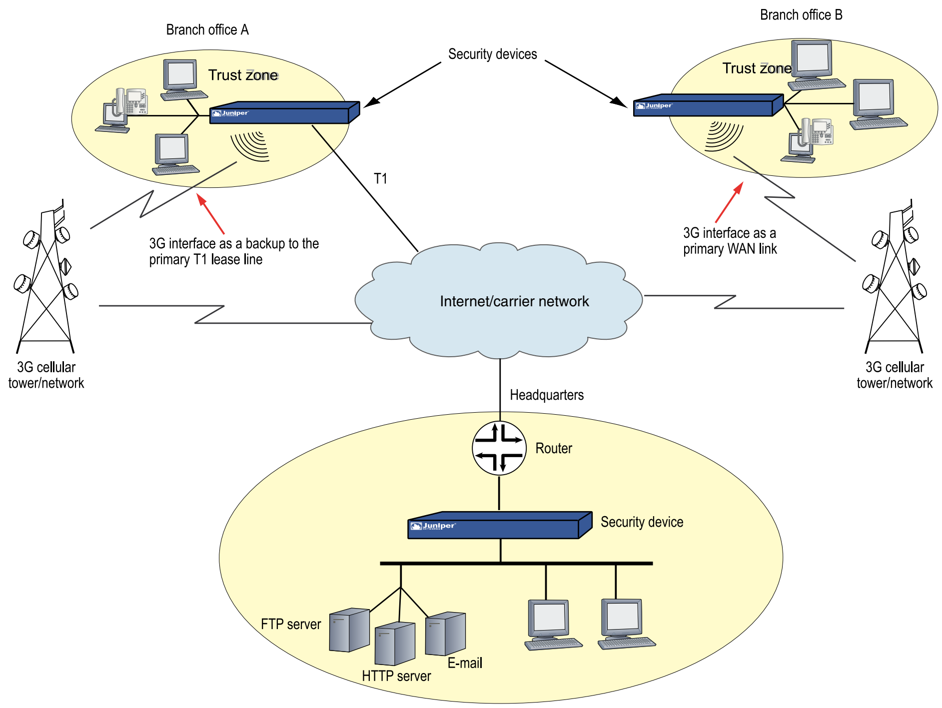
3G Wireless Modem Overview

3G refers to the third generation of mobile phone standards and technology based on the International Telecommunication Union (ITU) International Mobile Telecommunications-2000 (IMT-2000) global standard. 3G networks are wide area cellular telephone networks that have evolved to include high-data rate services of up to 3 Mbps. This increased bandwidth makes 3G networks a viable option as primary or backup wide area network (WAN) links for a branch office.

Juniper Networks security devices support 3G wireless interfaces (USB-based 3G modems). When used in a branch office, these devices can provide dial-out services to PC users and forward IP traffic through a service provider's cellular network.

Figure 36 on page 562 illustrates a basic setup for 3G wireless connectivity for two branch offices. Branch Office A has a T1 leased line as the primary wide area network (WAN) link and a 3G wireless modem connection as the failover link. Branch Office B uses the 3G wireless modem connection as the primary WAN link.

Figure 36: Wireless WAN Connections for Branch Offices



Related Documentation

- 3G Wireless Modem Configuration Overview on page 562

3G Wireless Modem Configuration Overview

Before you begin:

1. Install your SRX Series device and establish basic connectivity for your device. For more information, see the SRX Series Hardware Guide for your device.

2. Obtain a supported 3G wireless modem card for the device.

3. Establish an account with a cellular network service provider. Contact your service provider for more information.

4. With the services gateway powered off, insert the 3G wireless modem card into the ExpressCard slot (SRX320 devices) or 3G USB modems (SRX300 devices). Power on the device. The EXPCARD LED (for SRX320) and 3G LED (SRX320) on the front panel of the device indicates the status of the 3G wireless modem interface.

   WARNING: The device must be powered off before you insert the 3G wireless modem card in the ExpressCard slot (SRX320) or integrated 3G

USB modem (SRX320). Do not insert or remove the card when the device is powered on.

To configure and activate the 3G wireless modem card:

1. Configure a dialer interface. See “Example: Configuring the Dialer Interface” on page 566.
2. Configure the 3G wireless modem interface. See “Example: Configuring the 3G Wireless Modem Interface” on page 572.
3. Configure security zones and policies, as needed, to allow traffic through the WAN link. See *Example: Creating Security Zones*.

To use the 3G USB modems on the SRX210 device:

1. Upgrade the BIOS software packaged inside the Junos OS image. For detailed information about BIOS upgrade procedures, see the *Software Installation and Upgrade Guide*.

   NOTE: **You need the BIOS version of 2.1 or higher to use the 3G USB modems on the SRX210 device.**

2. Configure the WAN port using the CLI command **set chassis routing-engine usb-wwan port 1** to enable the USB port to use the U319 USB modem.
3. Plug the 3G USB modem in to the appropriate USB slot (USB port 1) on the device.

   NOTE: **You can use the USB modem with a standard USB extension cable of 1.8288 meters (6 ft) or longer.**

4. Reboot the device to start using the 3G USB modem.

Related Documentation

- 3G Wireless Modem Overview on page 561
- Understanding the GSM Profile on page 573
- Unlocking the GSM 3G Wireless Modem on page 583
- Understanding Account Activation for CDMA EV-DO Modem Cards on page 577

Understanding the Dialer Interface

The dialer interface, **dln**, is a logical interface for configuring properties for modem connections. You can configure multiple dialer interfaces on an SRX Series device. A dialer interface and a dialer pool (which includes the physical interface) are bound together in a dialer profile.

The dialer interface for 3G wireless modems is no longer supported on SRX300, SRX320, SRX340, SRX345, and SRX550HM devices.

This topic contains the following sections:

Dialer Interface Configuration Rules

The following rules apply when you configure dialer interfaces for 3G wireless modem connections:

- The dialer interface must be configured to use the default Point-to-Point Protocol (PPP) encapsulation. You cannot configure Cisco High-Level Data Link Control (HDLC) or Multilink PPP (MLPPP) encapsulation on dialer interfaces.
- You cannot configure the dialer interface as a constituent link in a multilink bundle.
- You cannot configure any dial-in options for the dialer interface.

You configure the following for a dialer interface:

- A dialer pool to which the physical interface belongs.
- Source IP address for the dialer interface.
- Dial string (optional) is the destination number to be dialed.
- Authentication, for GSM HSDPA 3G wireless modem cards.
- Watch list, if the dialer interface is a backup WAN link.

With GSM HSDPA 3G wireless modem cards, you might need to configure PAP or CHAP for authentication with the service provider network. The service provider must supply the username and password, which you configure in an access profile. You then specify the access profile in a dialer interface.

Next you set the dialer interface as a backup WAN link to a primary interface. Then you create a dialer watch to enable the device to monitor the route to a head office router and set a dialer pool. Finally, you create a dialer filter firewall rule for traffic from the branch office to the main office router and associate the dialer filter with a dialer interface.

Dialer Interface Authentication Support for GSM HSDPA 3G Wireless Modems

For GSM HSDPA 3G wireless modems, you configure a dialer interface to support authentication through Challenge Handshake Authentication Protocol (CHAP) or Password Authentication Protocol (PAP).

CHAP is a server-driven, three-step authentication method that depends on a shared secret password that resides on both the server and the client. When you enable CHAP on a dialer interface, the device can authenticate its peer and be authenticated by its peer.

PAP allows a simple method for a peer to establish its identity using a two-way handshake during initial link establishment. After the link is established, an identification and password pair is repeatedly sent by the peer to the authenticator until authentication is acknowledged or the connection is terminated.

Dialer Interface Functions

The dialer interface can perform backup, dialer filter, and dialer watch functions, but these operations are mutually exclusive. You can configure a single dialer interface to operate in only one of the following ways:

- As a backup interface for a single primary WAN connection. The dialer interfaces are activated only when the primary interface fails. The 3G wireless modem backup connectivity is supported on all interfaces except **lsq-0/0/0**.
- As a dialer filter. The Dialer filter enables the 3G wireless modem connection to be activated only when specific network traffic is sent on the backup WAN link. You configure a firewall rule with the dialer filter option, and then apply the dialer filter to the dialer interface.
- As a dialer watch interface. With dialer watch, the SRX Series device monitors the status of a specified route and if the route disappears, the dialer interface initiates the 3G wireless modem connection as a backup connection. To configure dialer watch, you first add the routes to be monitored to a watch list in a dialer interface; specify a dialer pool for this configuration. Then configure the 3G wireless modem interface to use the dialer pool.

Dialer Interface Operating Parameters

You can also specify optional operating parameters for the dialer interface:

- Activation delay—Number of seconds after the primary interface is down before the backup interface is activated. The default value is 0 seconds, and the maximum value is 60 seconds. Use this option only if dialer watch is configured.
- Deactivation delay—Number of seconds after the primary interface is up before the backup interface is deactivated. The default value is 0 seconds, and the maximum value is 60 seconds. Use this option only if dialer watch is configured.

- Idle timeout—Number of seconds the connection remains idle before disconnecting. The default value is 120 seconds, and the range is from 0 to 4,294,967,295 seconds.
- Initial route check—Number of seconds before the primary interface is checked to see if it is up. The default value is 120 seconds, and the range is from 1 to 300 seconds.

Related Documentation

- 3G Wireless Modem Overview on page 561
- 3G Wireless Modem Configuration Overview on page 562
- Example: Configuring the Dialer Interface on page 566

Example: Configuring the Dialer Interface

This example shows how to configure the dialer interface for 3G wireless modem connections.

The dialer interface for 3G wireless modems is no longer supported on SRX300, SRX320, SRX340, SRX345, and SRX550HM devices.

Requirements

Before you begin, install your SRX Series device and establish basic connectivity for your device. See “3G Wireless Modem Configuration Overview” on page 562.

Overview

In this example, you first configure the dialer interface as dl0, specify the PPP encapsulation dialer pool as 1, specify the dial string as 14691, and negotiate the address option for the interface IP address.

Configuration

Configuring a Dialer Interface

CLI Quick Configuration

To quickly configure this example, copy the following command, paste it into a text file, remove any line breaks, change any details necessary to match your network configuration,

copy and paste the command into the CLI at the **[edit]** hierarchy level, and then enter **commit** from configuration mode.

```
set interfaces dl0 description 3g-wireless encapsulation ppp unit 0 dialer-options pool 1
  dial-string 14691
set interfaces dl0 unit 0 family inet negotiate-address
```

Step-by-Step Procedure

1. Set the interface and specify the PPP encapsulation, dialer pool, and dial string.

```
[edit]
user@host# set interfaces dl0 description 3g-wireless encapsulation ppp unit 0
  dialer-options pool 1 dial-string 14691
```

2. Set the negotiate address option for the interface IP address.

```
[edit]
user@host# set interfaces dl0 unit 0 family inet negotiate-address
```

Results From configuration mode, confirm your configuration by entering the **show interfaces dl0** command. If the output does not display the intended configuration, repeat the configuration instructions in this example to correct it.

```
[edit]
  user@host# show interfaces dl0
description 3g-wireless;
encapsulation ppp;
  unit 0 {
family inet {
negotiate-address;
  }
dialer-options {
pool 1;
  dial-string 14691;
  }
}
```

If you are done configuring the device, enter **commit** from configuration mode.

Configuring PAP on the Dialer Interface

CLI Quick Configuration To quickly configure this example, copy the following command, paste it into a text file, remove any line breaks, change any details necessary to match your network configuration, copy and paste the command into the CLI at the **[edit]** hierarchy level, and then enter **commit** from configuration mode.

```
set access profile pap-1 client clientX pap-password 7a^6b%5c
set interfaces dl0 unit 0 ppp-options pap access-profile pap-1
```

Step-by-Step Procedure

1. Configure a PAP access profile.

```
[edit]
user@host# set access profile pap-1 client clientX pap-password 7a^6b%5c
```

2. Associate the PAP access profile with a dialer interface.

```
[edit]
user@host# set interfaces dl0 unit 0 ppp-options pap access-profile pap-1
```

Results

From configuration mode, confirm your configuration by entering the **show interfaces dl0** and **show access profile pap-1** commands. If the output does not display the intended configuration, repeat the configuration instructions in this example to correct it.

```
[edit]
  user@host# show interfaces dl0
unit 0 {
ppp-options {
  pap {
access-profile pap-1;
}
  }
}
[edit]
  user@host# show access profile pap-1
client clientX pap-password "$9$jnqTz3nCBESu01hSrKvZUDkqf"; ## SECRET-DATA
```

If you are done configuring the device, enter **commit** from configuration mode.

Configuring CHAP on the Dialer Interface

CLI Quick Configuration

With GSM HSDPA 3G wireless modem cards, you may need to configure CHAP for authentication with the service provider network. The service provider must supply the username and password, which you configure in an access profile. You then specify this access profile in a dialer interface.

To quickly configure this example, copy the following command, paste it into a text file, remove any line breaks, change any details necessary to match your network configuration, copy and paste the command into the CLI at the **[edit]** hierarchy level, and then enter **commit** from configuration mode.

```
set access profile chap-1 client clientX chap-secret 7a^6b%5c
set interfaces dl0 unit 0 ppp-options chap access-profile chap-1
```

Step-by-Step Procedure

1. Configure a CHAP access profile.

```
[edit]
user@host# set access profile chap-1 client clientX chap-secret 7a^6b%5c
```

2. Associate the CHAP access profile with a dialer interface.

```
[edit]
user@host# set interfaces dl0 unit 0 ppp-options chap access-profile chap-1
```

Results From configuration mode, confirm your configuration by entering the **show access profile chap-1** and **show interfaces dl0** commands. If the output does not display the intended configuration, repeat the configuration instructions in this example to correct it.

```
[edit]
  user@host# show access profile chap-1
client clientX chap-secret "$9$neYpCO1REyWx-Kv87-VsYQF39Cu"; ## SECRET-DATA
[edit]
  user@host# show interfaces dl0
unit 0 {
ppp-options {
  chap {
access-profile chap-1;
}
  }
}
```

If you are done configuring the device, enter **commit** from configuration mode.

Configuring the Dialer Interface as a Backup WAN Connection

CLI Quick Configuration To quickly configure this example, copy the following command, paste it into a text file, remove any line breaks, change any details necessary to match your network configuration, copy and paste the command into the CLI at the **[edit]** hierarchy level, and then enter **commit** from configuration mode.

```
set interfaces ge-0/0/1 unit 0 backup-options interface dl0
```

Step-by-Step Procedure

1. Set interface back up option.

```
[edit]
user@host# set interfaces ge-0/0/1 unit 0 backup-options interface dl0
```

Results From configuration mode, confirm your configuration by entering the **show interfaces ge-0/0/1** command. If the output does not display the intended configuration, repeat the configuration instructions in this example to correct it.

```
[edit]
  user@host# show interfaces ge-0/0/1
unit 0 {
backup-options {
  interface dl0.0;
```

```
   }
}
```

If you are done configuring the device, enter **commit** from configuration mode.

Configuring Dialer Watch for the 3G Wireless Modem Interface

CLI Quick Configuration

To quickly configure this example, copy the following command, paste it into a text file, remove any line breaks, change any details necessary to match your network configuration, copy and paste the command into the CLI at the **[edit]** hierarchy level, and then enter **commit** from configuration mode.

```
set interfaces dl0 description dialer-watch unit 0 dialer-options watch-list
   200.200.201.1/32
set interfaces dl0 description dialer-watch unit 0 dialer-options pool dw-pool
```

Step-by-Step Procedure

1. Create a dialer watch.

   ```
   [edit]
   user@host# set interfaces dl0 description dialer-watch unit 0 dialer-options
      watch-list 200.200.201.1/32
   ```

2. Set a dialer pool.

   ```
   [edit]
   user@host# set interfaces dl0 description dialer-watch unit 0 dialer-options pool
      dw-pool
   ```

Results

From configuration mode, confirm your configuration by entering the **show interfaces dl0** command. If the output does not display the intended configuration, repeat the configuration instructions in this example to correct it.

```
[edit]
   user@host# show interfaces dl0
description dialer-watch;
unit 0 {
   dialer-options {
watch-list {
200.200.201.1/32;
   }
   }
}
```

If you are done configuring the device, enter **commit** from configuration mode.

Configuring a Dialer Filter for the 3G Wireless Modem Interface

CLI Quick Configuration

To quickly configure this example, copy the following command, paste it into a text file, remove any line breaks, change any details necessary to match your network configuration, copy and paste the command into the CLI at the **[edit]** hierarchy level, and then enter **commit** from configuration mode.

```
set firewall family inet dialer-filter traffic-filter term term1 then note
```

Step-by-Step Procedure

1. Associate the dialer filter with a dialer interface.

   ```
   [edit]
   user@host# set firewall family inet dialer-filter traffic-filter term term1 then note
   ```

2. Check your other changes to the configuration before committing.

   ```
   [edit]
   user@host# commit check
   ```

Results

From configuration mode, confirm your configuration by entering the **show firewall** command. If the output does not display the intended configuration, repeat the configuration instructions in this example to correct it.

```
[edit]
user@host# show firewall
family inet {
   dialer-filter traffic-filter {
      term term-1 {
         then note;
      }
   }
}
```

If you are done configuring the device, enter **commit** from configuration mode.

Verification

Confirm that the configuration is working properly.

Verifying the Configuration

Purpose

Verify the configuration output.

Action

Verify the configuration output by entering the **show interfaces** command.

Related Documentation

- 3G Wireless Modem Overview on page 561
- 3G Wireless Modem Configuration Overview on page 562
- Understanding the Dialer Interface on page 564

Understanding the 3G Wireless Modem Physical Interface

You configure two types of interfaces for 3G wireless modem connectivity—the physical interface and a logical dialer interface.

The physical interface for the 3G wireless modem uses the name **cl-0/0/8**. This interface is automatically created when a 3G wireless modem is installed in the device.

The 3G wireless modem physical interface is no longer supported on SRX300, SRX320, SRX340, SRX345, and SRX550HM devices.

You configure the following properties for the physical interface:

- A dialer pool to which the physical interface belongs and the priority of the interface in the pool. A physical interface can belong to more than one dialer pool. The dialer pool priority has a range from **1** to **255**, with **1** designating the lowest-priority interfaces and **255** designating the highest-priority interfaces.
- Modem initialization string (optional). These strings begin with **AT** and execute Hayes modem commands that specify modem operation.
- GSM profile for establishing a data call with a GSM cellular network.

By default, the modem allows access to networks other than the home network.

Related Documentation

- 3G Wireless Modem Overview on page 561
- 3G Wireless Modem Configuration Overview on page 562
- Example: Configuring the 3G Wireless Modem Interface on page 572

Example: Configuring the 3G Wireless Modem Interface

This example shows how to configure the 3G wireless modem interface.

The 3G wireless modem physical interface is no longer supported on SRX300, SRX320, SRX340, SRX345, and SRX550HM devices.

Requirements

Before you begin, configure a dialer interface. See “Example: Configuring the Dialer Interface” on page 566.

Overview

In this example, you configure the physical interface as cl-0/0/8 for the 3G wireless modem to use dialer pool 1 and set the priority for the dialer pool to 25. You also configure a modem initialization string to autoanswer after two rings.

Configuration

Step-by-Step Procedure

To configure the 3G wireless modem interface:

1. Specify the dialer pool.

```
[edit]
user@host# set interfaces cl-0/0/8 dialer-options pool 1 priority 25
```

2. Specify the modem options.

```
[edit]
user@host# set interfaces cl-0/0/8 modem-options init-command-string
  “ATSO=2\n”
```

3. If you are done configuring the device, commit the configuration.

```
[edit]
user@host# commit
```

Verification

To verify the configuration is working properly, enter the **show interfaces cl-0/0/8 modem options** command.

Related Documentation

- 3G Wireless Modem Overview on page 561
- 3G Wireless Modem Configuration Overview on page 562
- Understanding the 3G Wireless Modem Physical Interface on page 572

Understanding the GSM Profile

To allow data calls to a Global System for Mobile Communications (GSM) network, you must obtain the following information from your service provider:

- Username and password

- Access point name (APN)
- Whether the authentication is Challenge Handshake Authentication Protocol (CHAP) or Password Authentication Protocol (PAP)

You configure this information in a GSM profile associated with the 3G wireless modem physical interface. You can configure up to 16 different GSM profiles, although only one profile can be active at a time.

NOTE: **You also need to configure a CHAP or PAP profile with the specified username and password for the dialer interface.**

Subscriber information is written to the Subscriber Identity Module (SIM) on the GSM HSDPA 3G wireless modem card. If the SIM is locked, you must unlock it before activation by using the master subsidy lock (MSL) value given by the service provider when you purchase the cellular network service.

Some service providers may preload subscriber profile information on a SIM card. The assigned subscriber information is stored in profile 1, while profile 0 is a default profile created during manufacturing. If this is the case, specify profile 1 for the GSM profile associated with the 3G wireless modem physical interface.

Configuring the information in a GSM profile associated with the 3G wireless modem physical interface is no longer supported on SRX300, SRX320, SRX340, SRX345, and SRX550HM devices.

Related Documentation

- 3G Wireless Modem Overview on page 561
- 3G Wireless Modem Configuration Overview on page 562
- Example: Configuring the GSM Profile on page 574

Example: Configuring the GSM Profile

This example shows how to configure the GSM profile for the 3G wireless modem interface with service provider networks such as AT&T and T-Mobile.

NOTE: **Configuring the information in a GSM profile associated with the 3G wireless modem physical interface is no longer supported on SRX300, SRX320, SRX340, SRX345, and SRX550HM devices.**

Requirements

Before you begin:

- Configure a dialer interface. See "Example: Configuring the Dialer Interface" on page 566
- Configure the 3G wireless modem interface. See "Example: Configuring the 3G Wireless Modem Interface" on page 572.

Overview

In this example, you configure the following information provided by a service provider in a GSM profile called juniper99 that is associated with the 3G wireless modem physical interface cl-0/0/8:

- Username—**juniper99**
- Password—**1@#6ahgfh**
- Access point name (APN)—**apn.service.com**
- Authentication method—**CHAP**

Then you activate the profile by specifying the profile ID as profile-id 1.

Configuration

Step-by-Step Procedure

To configure a GSM profile for the 3G wireless modem interface:

1. Create a GSM profile.

```
[edit]
user@host> request modem wireless gsm create-profile profile-id 1 sip-user-id
  juniper99 sip-password 16ahgfh access-point-name apn.service.com
  authentication-method chap
```

2. Activate the profile.

```
[edit]
user@host# set interface cl-0/0/8 cellular-options gsm-options select-profile
  profile-id 1
```

3. If you are done configuring the device, commit the configuration.

```
[edit]
user@host# commit
```

Verification

To verify the configuration is working properly, enter the **show interfaces cl-0/0/8** command.

Related Documentation

- 3G Wireless Modem Overview on page 561
- 3G Wireless Modem Configuration Overview on page 562
- Understanding the GSM Profile on page 573

CHAPTER 35

Configuring CDMA EV-DO Modem Cards

Understanding Account Activation for CDMA EV-DO Modem Cards

Account activation is the process of enabling the CDMA EV-DO wireless modem card to connect to your service provider's cellular network. This is a one-time process where your subscriber information is saved in nonvolatile memory on the card. The procedure you use to perform account activation depends upon the service provider network.

NOTE: **Activating an account for a CDMA EV-DO 3G wireless modem card is no longer supported on SRX300, SRX320, SRX340, SRX345, and SRX550HM devices.**

Before activating an account, you can verify the signal strength on the 3G wireless modem interface by using the **show modem wireless interface cl-0/0/8 rssi** command. The signal strength should be at least -90 dB and preferably better than -80 dB (-125 dB indicates nil signal strength). If the signal strength is below -90 dB, activation may not be possible from that location. For example:

```
user@host> show modem wireless interface cl-0/0/8 rssi
Current Radio Signal Strength (RSSI) = -98 dBm
```

This topic contains the following sections:

Obtaining Electronic Serial Number (ESN)

The service provider requires the electronic serial number (ESN) of the 3G wireless modem card to activate your account and to generate the necessary information you need to activate the card. You can obtain the ESN number of the modem card in the following ways:

- Inspect the modem card itself; the ESN is printed on the card.
- Use the CLI **show modem wireless interface cl-0/0/8 firmware** command, as shown in the following example, and note the value for the Electronic Serial Number (ESN) field:

  user@host> **show modem wireless interface cl-0/0/8 firmware**

```
Modem Firmware Version : p2005600

Modem Firmware built date : 12-09-07

Card type : Aircard 597E - CDMA EV-DO revA

Manufacturer : Sierra Wireless, Inc.

Hardware Version : 1.0

Electronic Serial Number (ESN) : 0x6032688F

Preferred Roaming List (PRL) Version : 20224

Supported Mode : 1xev-do rev-a, 1x

Current Modem Temperature : 32 degrees Celsius

Modem Activated : YES

Activation Date: 2-06-08

Modem PIN Security : Unlocked

Power-up lock : Disabled
```

Account Activation Modes

For the CDMA EV-DO 3G wireless modem card, account activation can be done through one or more of the following modes:

- Over the air service provisioning (OTASP)—protocol for programming phones over the air using Interim Standard 95 (IS-95) Data Burst Messages.

  To activate the 3G wireless modem card with OTASP, you need to obtain from the service provider the dial number that the modem will use to contact the network. Typically, OTASP dial numbers begin with the feature code *228 to indicate an activation call type to the cellular network's base transceiver station, followed by additional digits specified by the service provider.

- Internet-based over the air (IOTA) provisioning—method for programming phones for voice and data services
- Manually providing the required information by entering in a CLI operational mode command

Sprint uses manual and IOTA activation, whereas Verizon uses only OTASP.

NOTE: **The 3G wireless modem is set into Single-Carrier Radio Transmission Technology (1xRTT) mode automatically when it is activated for Verizon networks.**

Related Documentation

- 3G Wireless Modem Overview on page 561
- 3G Wireless Modem Configuration Overview on page 562
- Example: Configuring the GSM Profile on page 574

Activating the CDMA EV-DO Modem Card with IOTA Provisioning

Manual activation stores the supplied values in the 3G wireless modem card's nonvolatile memory. If the modem card is reset or you need to update Mobile IP (MIP) parameters, use the CLI operational mode command to activate the modem card with IOTA.

NOTE: **Activating a CDMA EV-DO 3G wireless modem card with IOTA provisioning is no longer supported on SRX300, SRX320, SRX340, SRX345, and SRX550HM devices.**

Before you begin, activate the CDMA EV-DO 3G wireless modem card. See "Understanding Account Activation for CDMA EV-DO Modem Cards" on page 577.

To activate the CDMA EV-DO 3G wireless modem card with IOTA:

```
user@host> request modem wireless interface cl-0/0/8 activate iota
Beginning IOTA Activation. It can take up to 5 minutes

Please check the trace logs for details.
```

To check the trace log for account activation details:

```
user@host> tail -f /var/log/wwand.log
Jun 25 04:42:55: IOTA cl-0/0/8 Event: IOTA Start... Success

Jun 25 04:43:45: IOTA cl-0/0/8 OTA SPL unlock...  Success

Jun 25 04:43:56: IOTA cl-0/0/8 Committing OTA Parameters to NVRAM... Success
```



```
Jun 25 04:44:02: IOTA cl-0/0/8 Over the air provisioning... Complete

Jun 25 04:44:04: IOTA cl-0/0/8 IOTA Event: IOTA End... Success
```

Related Documentation

- 3G Wireless Modem Overview on page 561
- Activating the CDMA EV-DO Modem Card with OTASP Provisioning on page 580
- Activating the CDMA EV-DO Modem Card Manually on page 581

Activating the CDMA EV-DO Modem Card with OTASP Provisioning

This topic describes the activation of the CDMA EV-DO 3G wireless modem card for use with service provider networks such as Verizon.

NOTE: **Activating a CDMA EV-DO 3G wireless modem card with OTASP provisioning is no longer supported on SRX300, SRX320, SRX340, SRX345, and SRX550HM devices.**

Before you begin:

- Obtain the dial number that the modem will use to contact the network from the service provider.
- The service provider must activate your account before OTASP provisioning can proceed.

Use the CLI operational mode command to activate the 3G wireless modem card.

In this example, the dial number from the service provider is ***22864**.

To activate the CDMA EV-DO 3G wireless modem card with OTASP provisioning:

```
user@host> request modem wireless interface cl-0/0/8 activate otasp dial-string *22864
OTASP number *22286*, Selecting NAM 0

Beginning OTASP Activation. It can take up to 5 minutes

Please check the trace logs for details.
```

To check the trace log for account activation details:

```
user@host> tail -f /var/log/wwand.log
Jun 25 04:42:55: OTASP cl-0/0/8 OTA SPL unlock... Success

Jun 25 04:43:42: OTASP cl-0/0/8 OTA PRL download... Success
```

```
Jun 25 04:43:55: OTASP cl-0/0/8 OTA Profile downloaded... Success

Jun 25 04:43:58: OTASP cl-0/0/8 OTA MDN download... Success

Jun 25 04:44:04: OTASP cl-0/0/8 Committing OTA Parameters to NVRAM... Success

Jun 25 04:44:45: Over the air provisioning... Complete
```

Related Documentation

- 3G Wireless Modem Overview on page 561
- Understanding Account Activation for CDMA EV-DO Modem Cards on page 577
- Activating the CDMA EV-DO Modem Card Manually on page 581
- Activating the CDMA EV-DO Modem Card with IOTA Provisioning on page 579

Activating the CDMA EV-DO Modem Card Manually

Manual activation stores the supplied values into the 3G wireless modem card's nonvolatile memory. This topic describes the activation of the CDMA EV-DO 3G wireless modem card for use with service provider networks such as Sprint.

NOTE: **Activating a CDMA EV-DO 3G wireless modem card manually is no longer supported on SRX300, SRX320, SRX340, SRX345, and SRX550HM devices.**

Before you begin, the service provider must activate your account before you can activate the CDMA EV-DO 3G wireless modem card.

Using the electronic serial number (ESN) you provided and your account information, the service provider supplies you with the following information for manual activation of the 3G wireless modem card:

- Master subsidy lock (MSL)—activation code
- Mobile directory number (MDN)—10-digit user phone number
- International mobile station identify (IMSI)—Mobile subscriber information
- Simple IP user identification (SIP-ID)—Username
- Simple IP password (SIP-Password)—Password

You also need to obtain the following information from the 3G wireless modem card itself for the activation:

- System identification (SID)—Number between 0 and 32767
- Network identification (NID)—Number between 0 and 65535

Use the CLI **show modem wireless interface cl-0/0/8 network** command to display the SID and NID, as shown in the following example:

`user@host>` **show modem wireless interface cl-0/0/8 network**

```
Running Operating mode : 1xEV-DO (Rev A) and 1xRTT

Call Setup Mode : Mobile IP only

System Identifier (SID) : 3421

Network Identifier (NID) : 91

Roaming Status(1xRTT) : Home

Idle Digital Mode : HDR

System Time : Wed Jun6 15:16:9 2008
```

Use the CLI operational mode command to manually activate the 3G wireless modem card.

This example uses the following values for manual activation:

- MSL (from service provider)—**43210**
- MDN (from service provider)—**0123456789**
- IMSI (from service provider)—**0123456789**
- SIP-ID (from service provider)—**jnpr**
- SIP-Password (from service provider)—**jn9rl**
- SID (from modem card)—**12345**
- NID (from modem card)—**12345**

To activate the CDMA EV-DO 3G wireless modem card manually:

`user@host>` **request modem wireless interface cl-0/0/8 activate manual msl 43210 mdn 0123456789 imsi 0123456789 sid 12345 nid 12345 sip-id jnpr sip-password jn9rl**

```
Checking status...

Modem current activation status: Not Activated

Starting activation...

Performing account activation step 1/6 : [Unlock] Done

Performing account activation step 2/6 : [Set MDN] Done
```



```
Performing account activation step 3/6 : [Set SIP Info] Done

Performing account activation step 4/6 : [Set IMSI] Done

Performing account activation step 5/6 : [Set SID/NID] Done

Performing account activation step 6/6 : [Commit/Lock] Done

Configuration Commit Result: PASS

Resetting the modem ... Done

Account activation in progress. It can take up to 5 minutes

Please check the trace logs for details.
```

To check the trace log for account activation details:

`user@host>` **tail -f /var/log/wwand.log**

```
Jun 25 04:42:55: IOTA cl-0/0/8 Event: IOTA Start... Success

Jun 25 04:43:45: IOTA cl-0/0/8 OTA SPL unlock...  Success

Jun 25 04:43:56: IOTA cl-0/0/8 Committing OTA Parameters to NVRAM... Success

Jun 25 04:44:02: IOTA cl-0/0/8 Over the air provisioning... Complete

Jun 25 04:44:04: IOTA cl-0/0/8 IOTA Event: IOTA End... Success
```

Related Documentation

- 3G Wireless Modem Overview on page 561
- Understanding Account Activation for CDMA EV-DO Modem Cards on page 577
- Activating the CDMA EV-DO Modem Card with OTASP Provisioning on page 580
- Activating the CDMA EV-DO Modem Card with IOTA Provisioning on page 579

Unlocking the GSM 3G Wireless Modem

The subscriber identity module (SIM) in the GSM 3G wireless modem card is a detachable smart card. Swapping out the SIM allows you to change the service provider network, however some service providers lock the SIM to prevent unauthorized access to the service provider's network. If this is the case, you will need to unlock the SIM by using an personal identification number (PIN), a four-digit number provided by the service provider.

NOTE: Unlocking the SIM in a 3G wireless modem card is not supported on SRX300, SRX320, SRX340, SRX345, and SRX550HM devices.

Before you begin, obtain the PIN from the service provider.

Use the CLI operational mode command to unlock the SIM on the GSM 3G wireless modem card.

This example uses the PIN **3210** from the service provider.

To unlock the SIM on the GSM 3G wireless modem card:

```
user@host> request modem wireless gsm sim-unlock cl-0/0/8 pin 3210
```

A SIM is blocked after three consecutive failed unlock attempts; this is a security feature to prevent brute force attempts to unlock the SIM. When the SIM is blocked, you need to unblock the SIM with an eight-digit PIN unlocking key (PUK) obtained from the service provider.

To unlock the SIM automatically on reboot:

```
user@host# set interfaces cl-0/0/8 cellular-options gsm-options sim-unlock-code
Enter PIN:
user@host#
```

NOTE: On SRX300, SRX320 devices, when you power on or reboot the device, the Subscriber Identity Module (SIM) will be locked. If the SIM Personal Identification Number (PIN) or the unlock code is configured in the **set interfaces cl-0/0/8 cellular-options gsm-options sim-unlock-code** configuration command, then Junos OS attempts to unlock the SIM only once. This is to keep the SIM from being blocked. If the SIM is blocked, you must provide a PIN Unblocking Key (PUK) obtained from the service provider. If the wrong SIM PIN is configured, the SIM will remain locked, and the administrator can unlock it by using the remaining two attempts.

Use the CLI operational mode command to unblock the SIM.

This example uses the PUK **76543210** from the service provider.

To unblock the SIM:

```
user@host> request modem wireless gsm sim-unblock cl-0/0/8 puk 76543210
```

NOTE: If you enter the PUK incorrectly ten times, you will need to return the SIM to the service provider for reactivation.

Related Documentation

- 3G Wireless Modem Overview on page 561
- 3G Wireless Modem Configuration Overview on page 562
- Understanding the Dialer Interface on page 564
- Understanding the 3G Wireless Modem Physical Interface on page 572
- Understanding the GSM Profile on page 573

CHAPTER 36

Configuring USB Modems for Dial Backup

USB Modem Interface Overview

Juniper Networks SRX Series devices support the use of USB modems for remote management. You can use Telnet or SSH to connect to the device from a remote location through two modems over a telephone network. The USB modem is connected to the USB port on the device, and a second modem is connected to a remote management device such as a PC or laptop computer.

NOTE: **USB modems are no longer supported for dial backup on SRX300, SRX320, SRX340, SRX345, SRX550HM devices.**

You can configure your device to fail over to a USB modem connection when the primary Internet connection experiences interruption.

A USB modem connects to a device through modem interfaces that you configure. The device applies its own modem AT commands to initialize the attached modem. Modem setup requires that you connect and configure the USB modem at the device and the modem at the user end of the network.

You use either the J-Web configuration editor or CLI configuration editor to configure the USB modem and its supporting dialer interfaces.

NOTE: **Low-latency traffic such as VoIP traffic is not supported over USB modem connections.**

NOTE: We recommend using a US Robotics USB 56k V.92 Modem, model number USR Model 5637.

USB Modem Interfaces

You configure two types of interfaces for USB modem connectivity:

- A physical interface which uses the naming convention **umd0**. The device creates this interface when a USB modem is connected to the USB port.
- A logical interface called the dialer interface. You use the dialer interface, **dl***n*, to configure dialing properties for USB modem connections. The dialer interface can be configured using Point-to-Point Protocol (PPP) encapsulation. You can also configure the dialer interface to support authentication protocols—PPP Challenge Handshake (CHAP) or Password Authentication Protocol (PAP). You can configure multiple dialer interfaces for different functions on the device. After configuring the dialer interface, you must configure a backup method such as a dialer backup, a dialer filter, or a dialer watch.

The USB modem provides a dial-in remote management interface, and supports dialer interface features by sharing the same dial pool as a dialer interface. The dial pool allows the logical dialer interface and the physical interface to be bound together dynamically on a per-call basis. You can configure the USB modem to operate either as a dial-in console for management or as a dial-in WAN backup interface. Dialer pool priority has a range from 1 to 255, with 1 designating the lowest priority interfaces and 255 designating the highest priority interfaces.

Dialer Interface Rules

The following rules apply when you configure dialer interfaces for USB modem connections:

- The dialer interface must be configured to use PPP encapsulation. You cannot configure Cisco High-Level Data Link Control (HDLC) or Multilink PPP (MLPPP) encapsulation on dialer interfaces.
- The dialer interface cannot be configured as a constituent link in a multilink bundle.
- The dialer interface can perform backup, dialer filter, and dialer watch functions, but these operations are mutually exclusive. You can configure a single dialer interface to operate in only one of the following ways:
  - As a backup interface—for one primary interface
  - As a dialer filter
  - As a dialer watch interface

The backup dialer interfaces are activated only when the primary interface fails. USB modem backup connectivity is supported on all interfaces except lsq-0/0/0.

The dial-on-demand routing backup method allows a USB modem connection to be activated only when network traffic configured as an “interesting packet” arrives on the network. Once the network traffic is sent, an inactivity timer is triggered and the connection is closed. You define an interesting packet using the dialer filter feature of the device. To configure dial-on-demand routing backup using a dialer filter, you first configure the dialer filter and then apply the filter to the dialer interface.

Dialer watch is a backup method that integrates backup dialing with routing capabilities and provides reliable connectivity without relying on a dialer filter to trigger outgoing USB modem connections. With dialer watch, the device monitors the existence of a specified route. If the route disappears, the dialer interface initiates the USB modem connection as a backup connection.

How the Device Initializes USB Modems

When you connect the USB modem to the USB port on the device, the device applies the modem AT commands configured in the **init-command-string** command to the initialization commands on the modem.

If you do not configure modem AT commands for the **init-command-string** command, the device applies the following default sequence of initialization commands to the modem: **AT S7=45 S0=0 V1 X4 &C1 E0 Q0 &Q8 %C0**. Table 42 on page 589 describes the commands. For more information about these commands, see the documentation for your modem.

Table 42: Default Modem Initialization Commands

Modem Command	Description
AT	Attention. Informs the modem that a command follows.
S7=45	Instructs the modem to wait 45 seconds for a telecommunications service provider (carrier) signal before terminating the call.
S0=0	Disables the auto answer feature, whereby the modem automatically answers calls.
V1	Displays result codes as words.
&C1	Disables reset of the modem when it loses the carrier signal.
E0	Disables the display on the local terminal of commands issued to the modem from the local terminal.
Q0	Enables the display of result codes.
&Q8	Enables Microcom Networking Protocol (MNP) error control mode.
%C0	Disables data compression.

When the device applies the modem AT commands in the **init-command-string** command or the default sequence of initialization commands to the modem, it compares them to the initialization commands already configured on the modem and makes the following changes:

- If the commands are the same, the device overrides existing modem values that do not match. For example, if the initialization commands on the modem include **S0=0** and the device's **init-command-string** command includes **S0=2**, the device applies **S0=2**.
- If the initialization commands on the modem do not include a command in the device's **init-command-string** command, the device adds it. For example, if the **init-command-string** command includes the command **L2**, but the modem commands do not include it, the device adds **L2** to the initialization commands configured on the modem.

NOTE: On SRX210 devices, the USB modem interface can handle bidirectional traffic of up to 19 Kbps. On oversubscription of this amount (that is, bidirectional traffic of 20 Kbps or above), keepalives do not get exchanged, and the interface goes down. (Platform support depends on the Junos OS release in your installation.)

USB Modem Configuration Overview

NOTE: USB modems are no longer supported for dial backup on SRX300, SRX320, SRX340, and SRX345 devices.

Before you begin:

1. Install device hardware. For more information, see the Getting Started Guide for your device.
2. Establish basic connectivity. For more information, see the Getting Started Guide for your device.
3. Order a US Robotics USB 56k V.92 Modem, model number USR Model 5637 (http://www.usr.com/).
4. Order a public switched telephone network (PSTN) line from your telecommunications service provider. Contact your service provider for more information.
5. Connect the USB modem to the device's USB port.

NOTE: When you connect the USB modem to the USB port on the device, the USB modem is initialized with the modem initialization string configured for the USB modem interface on the device.

a. Plug the modem into the USB port.

b. Connect the modem to your telephone network.

Suppose you have a branch office router and a head office router each with a USB modem interface and a dialer interface. This example shows you how to establish a backup connection between the branch office and head office routers. See Table 43 on page 591 for a summarized description of the procedure.

Table 43: Configuring Branch Office and Head Office Routers for USB Modem Backup Connectivity

Router Location	Configuration Requirement	Procedure
Branch Office	Configure the logical dialer interface on the branch office router for USB modem dial backup.	To configure the logical dialer interface, see "Example: Configuring a USB Modem Interface" on page 592.
	Configure the dialer interface **dl0** on the branch office router using one of the following backup methods: • Configure the dialer interface **dl0** as the backup interface on the branch office router's primary T1 interface **t1-1/0/0**. • Configure a dialer filter on the branch office router's dialer interface. • Configure a dialer watch on the branch office router's dialer interface.	Configure the dialer interface using one of the following backup methods: • To configure **dl0** as a backup for **t1-1/0/0** see "Example: Configuring Dialer Interfaces and Backup Methods for USB Modem Dial Backup" on page 595. • To configure a dialer filter on **dl0**, see "Example: Configuring Dialer Interfaces and Backup Methods for USB Modem Dial Backup" on page 595. • To configure a dialer watch on **dl0**, see "Example: Configuring Dialer Interfaces and Backup Methods for USB Modem Dial Backup" on page 595.
Head Office	Configure dial-in on the dialer interface **dl0** on the head office router.	To configure dial-in on the head office router, see "Example: Configuring a Dialer Interface for USB Modem Dial-In" on page 601.

If the dialer interface is configured to accept only calls from a specific caller ID, the device matches the incoming call's caller ID against the caller IDs configured on its dialer interfaces. If an exact match is not found and the incoming call's caller ID has more digits than the configured caller IDs, the device performs a right-to-left match of the incoming call's caller ID with the configured caller IDs and accepts the incoming call if a match is found. For example, if the incoming call's caller ID is 4085321091 and the caller ID configured on a dialer interface is 5321091, the incoming call is accepted. Each dialer interface accepts calls from only callers whose caller IDs are configured on it.

See Table 44 on page 592 for a list of available incoming map options.

Table 44: Incoming Map Options

Option	Description
accept-all	Dialer interface accepts all incoming calls. You can configure the **accept-all** option for only one of the dialer interfaces associated with a USB modem physical interface. The dialer interface with the **accept-all** option configured is used only if the incoming call's caller ID does not match the caller IDs configured on other dialer interfaces.
caller	Dialer interface accepts calls from a specific caller ID. You can configure a maximum of 15 caller IDs per dialer interface. The same caller ID must not be configured on different dialer interfaces. However, you can configure caller IDs with more or fewer digits on different dialer interfaces. For example, you can configure the caller IDs 14085551515, 4085551515, and 5551515 on different dialer interfaces.

You configure dialer interfaces to support PAP. PAP allows a simple method for a peer to establish its identity using a two-way handshake during initial link establishment. After the link is established, an ID and password pair are repeatedly sent by the peer to the authenticator until authentication is acknowledged or the connection is terminated.

Example: Configuring a USB Modem Interface

This example shows how to configure a USB modem interface for dial backup.

NOTE: USB modems are no longer supported for dial backup on SRX300, SRX320, SRX340, and SRX345 devices.

Requirements

No special configuration beyond device initialization is required before configuring this feature.

Overview

In this example, you create an interface called as umd0 for USB modem connectivity and set the dialer pool priority to 25. You also configure a modem initialization string to autoanswer after a specified number of rings. The default modem initialization string is **AT S7=45 S0=0 V1 X4 &C1 E0 Q0 &Q8 %C0**. The modem command **S0=0** disables the modem from autoanswering the calls. Finally, you set the modem to act as a dial-in WAN backup interface.

Configuration

CLI Quick Configuration

To quickly configure this example, copy the following command, paste it into a text file, remove any line breaks, change any details necessary to match your network configuration, copy and paste the command into the CLI at the **[edit]** hierarchy level, and then enter **commit** from configuration mode.

```
set interfaces umd0 dialer-options pool usb-modem-dialer-pool priority 25
set modem-options init-command-string "ATS0=2 \n" dialin routable
```

Step-by-Step Procedure

The following example requires you to navigate various levels in the configuration hierarchy. For instructions on how to do that, see *Using the CLI Editor in Configuration Mode* in the *CLI User Guide*.

To configure a USB modem interface for dial backup:

1. Create an interface.

   ```
   [edit]
   user@host# edit interfaces umd0
   ```

2. Set the dialer options and priority.

   ```
   [edit interfaces umd0]
   user@host# set dialer-options pool usb-modem-dialer-pool priority 25
   ```

3. Specify the modem options.

   ```
   [edit interfaces umd0]
   user@host# set modem-options init-command-string "ATS0=2 \n"
   ```

4. Set the modem to act as a dial-in WAN backup interface.

   ```
   [edit interfaces umd0]
   user@host# set modem-options dialin routable
   ```

Results

From configuration mode, confirm your configuration by entering the **show interface umd0** command. If the output does not display the intended configuration, repeat the configuration instructions in this example to correct it.

```
[edit]
  user@host# show interface umd0
modem-options {
init-command-string "ATS0=2 \n";
  dialin routable;
}
```



```
dialer-options {
  pool usb-modem-dialer-pool priority 25;
}
```

If you are done configuring the device, enter **commit** from configuration mode.

Verification

Confirm that the configuration is working properly.

Verifying the Configuration

Purpose Verify a USB modem interface for dial backup.

Action From configuration mode, enter the **show interfaces umd0 extensive** command. The output shows a summary of interface information and displays the modem status.

```
Physical interface:   umd0, Enabled, Physical link is Up
Interface index:      64, SNMP ifIndex: 33, Generation: 1
  Type: Async-Serial, Link-level type: PPP-Subordinate, MTU: 1504,
Clocking: Unspecified, Speed: MODEM
  Device flags   : Present Running
  Interface flags: Point-To-Point SNMP-Traps Internal: 0x4000
  Link flags     : None
  Hold-times     : Up 0 ms, Down 0 ms
  Last flapped   : Never
  Statistics last cleared: Never
 Traffic statistics:
   Input  bytes  :                21672
   Output bytes  :                22558
   Input  packets:                 1782
   Output packets:                 1832
  Input errors:
    Errors: 0, Drops: 0, Framing errors: 0, Runts: 0, Giants: 0, Policed discards:
 0,
Resource errors: 0
  Output errors:
    Carrier transitions: 63, Errors: 0, Drops: 0, MTU errors: 0, Resource errors:
 0
  MODEM status:
    Modem type                 : LT V.92 1.0 MT5634ZBA-USB-V92 Data/Fax Modem

(Dual Config) Version 2.27m
    Initialization command string : ATS0=2
    Initialization status         : Ok
    Call status                   : Connected to 4085551515
    Call duration                 : 13429 seconds
    Call direction                : Dialin
    Baud rate                     : 33600 bps
    Most recent error code        : NO CARRIER

  Logical interface umd0.0 (Index 2) (SNMP ifIndex 34) (Generation 1)
    Flags: Point-To-Point SNMP-Traps Encapsulation: PPP-Subordinate
```


Example: Configuring Dialer Interfaces and Backup Methods for USB Modem Dial Backup

This example shows how to configure a dialer interfaces and backup methods for USB modem dial backup.

NOTE: **USB modems are no longer supported for dial backup on SRX300, SRX320, SRX340, SRX345, and SRX550HM devices.**

Requirements

Before you begin, configure a USB modem for the device. See "Example: Configuring a USB Modem Interface" on page 592.

Overview

In this example, you configure a logical dialer interface on the branch office router for the USB modem dial backup. You then configure dial backup to allow one or more dialer interfaces to be configured as the backup link for the primary serial interface. To configure dialer watch, you first add a dialer watch interface and then configure the USB modem interface to participate as a dialer watch interface. The USB modem interface must have the same pool identifier to participate in dialer watch. Dialer pool name dw-pool is used when configuring the USB modem interface.

Configuration

Configuring a Dialer Interface for USB Modem Dial Backup

CLI Quick Configuration

To quickly configure this example, copy the following command, paste it into a text file, remove any line breaks, change any details necessary to match your network configuration, copy and paste the command into the CLI at the **[edit]** hierarchy level, and then enter **commit** from configuration mode.

```
set interfaces dl0 description USB-modem-backup encapsulation ppp
set interfaces dl0 unit 0 dialer-options activation-delay 60 deactivation-delay 30
  idle-timeout 30 initial-route-check 30 pool usb-modem-dialer-pool
set interfaces dl0 unit 0 dialer-options dial-string 5551212
```



```
set interfaces dl0 unit 0 family inet address 172.20.10.2 destination 172.20.10.1
```

Step-by-Step Procedure

The following example requires you to navigate various levels in the configuration hierarchy. For instructions on how to do that, see *Using the CLI Editor in Configuration Mode*.

To configure a logical dialer interface on the branch office router for the USB modem dial backup:

1. Create an interface.

   ```
   [edit]
   user@host# edit interfaces dl0
   ```

2. Specify a description.

   ```
   [edit interfaces dl0]
   user@host# set description USB-modem-backup
   ```

3. Configure PPP encapsulation.

   ```
   [edit interfaces dl0]
   user@host# set encapsulation ppp
   ```

   NOTE: You cannot configure Cisco High-Level Data Link Control (HDLC) or Multilink PPP (MLPPP) encapsulation on dialer interfaces used in USB modem connections.

4. Create the logical unit.

   ```
   [edit interfaces dl0]
   user@host# set unit 0
   ```

   NOTE: You can set the logical unit to 0 only.

5. Configure the dialer options.

   ```
   [edit interfaces dl0]
   user@host# edit unit 0 dialer-options
   user@host# set activation-delay 60
   user@host# set deactivation-delay 30
   user@host# set idle-timeout 30 initial-route-check 30 pool usb-modem-dialer-pool
   ```

6. Configure the telephone number of the remote destination.

```
[edit interfaces dl0 unit 0 dialer-options]
user@host# set dial-string 5551212
```

7. Configure source and destination IP addresses.

```
[edit]
user@host# edit interfaces dl0 unit 0
user@host# set family inet address 172.20.10.2 destination 172.20.10.1
```

Results

From configuration mode, confirm your configuration by entering the **show interfaces dl0** command. If the output does not display the intended configuration, repeat the configuration instructions in this example to correct it.

```
[edit]
  user@host# show interfaces dl0
  description USB-modem-backup;
encapsulation ppp;
unit 0 {
family inet {
  address 172.20.10.2/32 {
    destination 172.20.10.1;
    }
  }
    dialer-options {
      pool usb-modem-dialer-pool;
    dial-string 5551212;
      idle-timeout 30;
        activation-delay 60;
        deactivation-delay 30;
        initial-route-check 30;
        }
      }
```

If you are done configuring the device, enter **commit** from configuration mode.

Configuring a Dial Backup for a USB Modem Connection

CLI Quick Configuration

To quickly configure this example, copy the following command, paste it into a text file, remove any line breaks, change any details necessary to match your network configuration, copy and paste the command into the CLI at the **[edit]** hierarchy level, and then enter **commit** from configuration mode.

```
set interfaces t1-1/0/0 unit 0 backup-options interface dl0.0
```

Step-by-Step Procedure

To configure a dial backup for a USB modem connection:

1. Select the physical interface.

```
[edit]
user@host# edit interfaces t1-1/0/0 unit 0
```

2. Configure the backup dialer interface.

```
[edit]
user@host# set backup-options interface dl0.0
```

Results From configuration mode, confirm your configuration by entering the **show interfaces t1-1/0/0** command. If the output does not display the intended configuration, repeat the configuration instructions in this example to correct it.

```
[edit]
  user@host#  show interfaces t1-1/0/0
  encapsulation ppp;
  unit 0 {
    backup-options {
  interface dl0.0;
  }
}
```

If you are done configuring the device, enter **commit** from configuration mode.

Configuring a Dialer Filter for USB Modem Dial Backup

CLI Quick Configuration To quickly configure this example, copy the following command, paste it into a text file, remove any line breaks, change any details necessary to match your network configuration, copy and paste the command into the CLI at the **[edit]** hierarchy level, and then enter **commit** from configuration mode.

```
set firewall family inet dialer-filter interesting-traffic term term1 from source-address
  20.20.90.4/32
set firewall family inet dialer-filter interesting-traffic term term1 from destination-address
  200.200.201.1/32
set firewall family inet dialer-filter interesting-traffic term term1 then note
set interfaces dl0 unit 0 family inet filter dialer interesting-traffic
```

Step-by-Step Procedure To configure a dialer filter for USB modem dial backup:

1. Create an interface.

```
[edit]
user@host# edit firewall
```

2. Configure the dialer filter name.

```
[edit]
```



```
user@host# edit family inet
user@host# edit dialer-filter interesting-traffic
```

3. Configure the dialer filter rule name and term behavior.

```
[edit]
user@host# edit term term1
user@host# set from source-address 20.20.90.4/32
user@host# set from destination-address 200.200.201.1/32
```

4. Configure the then part of the dialer filter.

```
[edit]
user@host# set then note
```

5. Select the dialer interface to apply the filter.

```
[edit]
user@host# edit interfaces dl0 unit 0
```

6. Apply the dialer filter to the dialer interface.

```
[edit]
user@host# edit family inet filter
user@host# set dialer interesting-traffic
```

Results From configuration mode, confirm your configuration by entering the **show firewall family inet dialer-filter interesting-traffic** and **show interfaces dl0**commands. If the output does not display the intended configuration, repeat the configuration instructions in this example to correct it.

```
[edit]
  user@host# show firewall family inet dialer-filter interesting-traffic
  term term1 {
from {
  source-address {
    20.20.90.4/32;
  }
    destination-address {
      200.200.201.1/32;
    }
    }
      then note;
    }
[edit]
  user@host# show interfaces dl0
unit 0 {
```

```
family inet {
   filter {
dialer interesting-traffic;
   }
      }
   }
```

If you are done configuring the device, enter **commit** from configuration mode.

Configuring a Dialer Watch for USB Modem Dial Backup

CLI Quick Configuration

To quickly configure this example, copy the following command, paste it into a text file, remove any line breaks, change any details necessary to match your network configuration, copy and paste the command into the CLI at the **[edit]** hierarchy level, and then enter **commit** from configuration mode.

```
set interfaces dl0 description dialer-watch unit 0 dialer-options watch-list
   200.200.201.1/32
set interfaces dl0 unit 0 dialer-options pool dw-pool
set interfaces umd0 dialer-options pool dw-pool
```

Step-by-Step Procedure

To configure a dialer watch for USB modem dial backup:

1. Create an interface.

   ```
   [edit]
   user@host# edit interfaces
   ```

2. Specify a description.

   ```
   [edit]
   user@host# edit dl0
   user@host# set description dialer-watch
   ```

3. Configure the route to the head office router for dialer watch.

   ```
   [edit]
   user@host# edit unit 0 dialer-options
   user@host# set watch-list 200.200.201.1/32
   ```

4. Configure the name of the dialer pool.

   ```
   [edit]
   user@host# set pool dw-pool
   ```

5. Select the USB modem physical interface.


```
[edit]
user@host# edit interfaces umd0 dialer-options pool dw-pool
```

Results From configuration mode, confirm your configuration by entering the **show interfaces dl0** and **show interfaces umd0** commands. If the output does not display the intended configuration, repeat the configuration instructions in this example to correct it.

```
[edit]
user@host# show interfaces dl0
  dialer-options {
    pool dw-pool;
  }
[edit]
user@host# show interfaces umd0
  description dialer-watch;
    unit 0 {
  dialer-options {
    pool dw-pool;
      watch-list {
    200.200.201.1/32;
  }
    }
  }
```

If you are done configuring the device, enter **commit** from configuration mode.

Verification

Confirm that the configuration is working properly.

Verifying the Configuration

Purpose Verify the configuration output.

Action From operational mode, enter the **show interface terse** command.

Related Documentation

- USB Modem Configuration Overview on page 590
- Example: Configuring a Dialer Interface for USB Modem Dial-In on page 601
- Example: Configuring PAP on Dialer Interfaces on page 603
- Example: Configuring CHAP on Dialer Interfaces on page 605

Example: Configuring a Dialer Interface for USB Modem Dial-In

This example shows how to configure a dialer interface for USB modem dial-in.

NOTE: USB modems are no longer supported for dial-in to a dialer interface on SRX300, SRX320, SRX340, and SRX345 devices.

Requirements

No special configuration beyond device initialization is required before configuring this feature.

Overview

To enable connections to the USB modem from a remote location, you must configure the dialer interfaces set up for USB modem use to accept incoming calls. You can configure a dialer interface to accept all incoming calls or accept only calls from one or more caller IDs.

If the dialer interface is configured to accept only calls from a specific caller ID, the system matches the incoming call's caller ID against the caller IDs configured on its dialer interfaces. If an exact match is not found and the incoming call's caller ID has more digits than the configured caller IDs, the system performs a right-to-left match of the incoming call's caller ID with the configured caller IDs and accepts the incoming call if a match is found. For example, if the incoming call's caller ID is 4085550115 and the caller ID configured on a dialer interface is 5550115, the incoming call is accepted. Each dialer interface accepts calls from only callers whose caller IDs are configured on it.

You can configure the following incoming map options for the dialer interface:

- **accept-all**—Dialer interface accepts all incoming calls.

  You can configure the **accept-all** option for only one of the dialer interfaces associated with a USB modem physical interface. The device uses the dialer interface with the **accept-all** option configured only if the incoming call's caller ID does not match the caller IDs configured on other dialer interfaces.

- **caller**—Dialer interface accepts calls from a specific caller ID— for example, **4085550115**. You can configure a maximum of 15 caller IDs per dialer interface.

  The same caller ID must not be configured on different dialer interfaces. However, you can configure caller IDs with more or fewer digits on different dialer interfaces. For example, you can configure the caller IDs 14085550115, 4085550115, and 5550115 on different dialer interfaces.

In this example, you configure the incoming map option as caller 4085550115 for dialer interface dl0.

Configuration

CLI Quick Configuration

To quickly configure this example, copy the following command, paste it into a text file, remove any line breaks, change any details necessary to match your network configuration, copy and paste the command into the CLI at the **[edit]** hierarchy level, and then enter **commit** from configuration mode.

```
set interfaces dl0 unit 0 dialer-options incoming-map caller 4085550115
```

Step-by-Step Procedure

To configure a dialer interface for USB modem dial-in:

1. Select a dialer interface.

   ```
   [edit]
   user@host# edit interfaces dl0
   ```

2. Configure the incoming map options.

   ```
   [edit]
   user@host# edit unit 0 dialer-options incoming-map caller 4085551515
   ```

3. If you are done configuring the device, commit the configuration.

   ```
   [edit]
   user@host# commit
   ```

Verification

To verify the configuration is working properly, enter the **show interface dl0** command.

Example: Configuring PAP on Dialer Interfaces

This example shows how to configure PAP on dialer interfaces.

NOTE: Configuring PAP on dialer interfaces is no longer supported on SRX300, SRX320, SRX340, SRX345, and SRX550HM devices.

- Requirements on page 604
- Overview on page 604
- Configuration on page 604
- Verification on page 604

Requirements

No special configuration beyond device initialization is required before configuring this feature.

Overview

In this example, you specify a PAP access profile with a client username and a PAP password and select a dialer interface. Finally, you configure PAP on the dialer interface and specify the local name and password.

Configuration

Step-by-Step Procedure

To configure PAP on the dialer interface:

1. Specify a PAP access profile.

```
[edit]
user@host# set access profile pap-access-profile client pap-access-user
  pap-password my-pap
```

2. Select a dialer interface.

```
[edit]
user@host# edit interfaces dl0 unit 0
```

3. Configure PAP on the dialer interface.

```
[edit]
user@host# set ppp-options pap local-name pap-access-user local-password
  my-pap
```

4. If you are done configuring the device, commit the configuration.

```
[edit]
user@host# commit
```

Verification

To verify the configuration is working properly, enter the **show interface dl0** command.

Related Documentation

- USB Modem Configuration Overview on page 590
- Example: Configuring a USB Modem Interface on page 592
- Example: Configuring Dialer Interfaces and Backup Methods for USB Modem Dial Backup on page 595
- Example: Configuring a Dialer Interface for USB Modem Dial-In on page 601

Example: Configuring CHAP on Dialer Interfaces

This example shows how to configure CHAP on dialer interfaces for authentication.

Requirements

No special configuration beyond device initialization is required before configuring this feature.

Overview

In this example, you configure dialer interfaces to support CHAP for authentication. CHAP is a server-driven, three-step authentication method that depends on a shared secret password residing on both the server and the client. You specify a CHAP access profile with a client username and a password. You then specify a dialer interface as dl0. Finally, you enable CHAP on a dialer interface and specify a unique profile name containing a client list and access parameters.

Configuration

Step-by-Step Procedure

To configure CHAP on a dialer interface:

1. Specify a CHAP access profile.

```
[edit]
user@host# set access profile usb-modem-access-profile client usb-modem-user
   chap-secret my-secret
```

2. Select a dialer interface.

```
[edit]
user@host# edit interfaces dl0 unit 0
```

3. Enable CHAP on the dialer interface.

```
[edit]
user@host# set ppp-options chap access-profile usb-modem-access-profile
```

4. If you are done configuring the device, commit the configuration.

```
[edit]
```

```
user@host# commit
```

Verification

To verify the configuration is working properly, enter the **show interface dl0** command.

Related Documentation

- USB Modem Configuration Overview on page 590
- Example: Configuring a USB Modem Interface on page 592
- Example: Configuring Dialer Interfaces and Backup Methods for USB Modem Dial Backup on page 595
- Example: Configuring a Dialer Interface for USB Modem Dial-In on page 601
- Example: Configuring PAP on Dialer Interfaces on page 603

CHAPTER 37

Configuring DOCSIS Mini-PIM Interfaces

DOCSIS Mini-PIM Interface Overview

Data over Cable Service Interface Specifications (DOCSIS) define the communications and operation support interface requirements for a data-over-cable system. Cable operators use DOCSIS to provide Internet access over their existing cable infrastructure for both residential and business customers. DOCSIS 3.0 is the latest interface standard, allowing channel bonding to deliver speeds higher than 100 Mbps throughput in either direction, far surpassing other WAN technologies such as T1/E1, ADSL2+, ISDN, and DS3.

NOTE: **On SRX210 Services Gateway, the DOCSIS Mini-PIM delivers speeds up to a maximum of 100 Mbps throughput in each direction.**

NOTE: **DOCSIS Mini-PIM interfaces are no longer supported on SRX300, SRX320, SRX340, SRX345, and SRX550HM devices.**

DOCSIS network architecture includes a cable modem on SRX Series Services Gateways with a DOCSIS Mini-Physical Interface Module (Mini-PIM) located at customer premises and a cable modem termination system (CMTS) located at the head-end or data center locations. Standards-based DOCSIS 3.0 Mini-PIM is interoperable with CMTS equipment. The DOCSIS Mini-PIM provides backward compatibility with CMTS equipment based on the following standards:

- DOCSIS 2.0
- DOCSIS 1.1
- DOCSIS 1.0

The cable modem interface of Mini-PIM is managed and monitored by CMTS through SNMP. This DOCSIS 3.0 Mini-PIM can be deployed in any multiple service operator (MSO) networks. The primary application is for distributed enterprise offices to connect to a

CMTS network through the DOCSIS 3.0 (backward compatible to 2.0, 1.1, and 1.0) interface. The DOCSIS Mini-PIM uses PIM infrastructure developed for third-party PIMs.

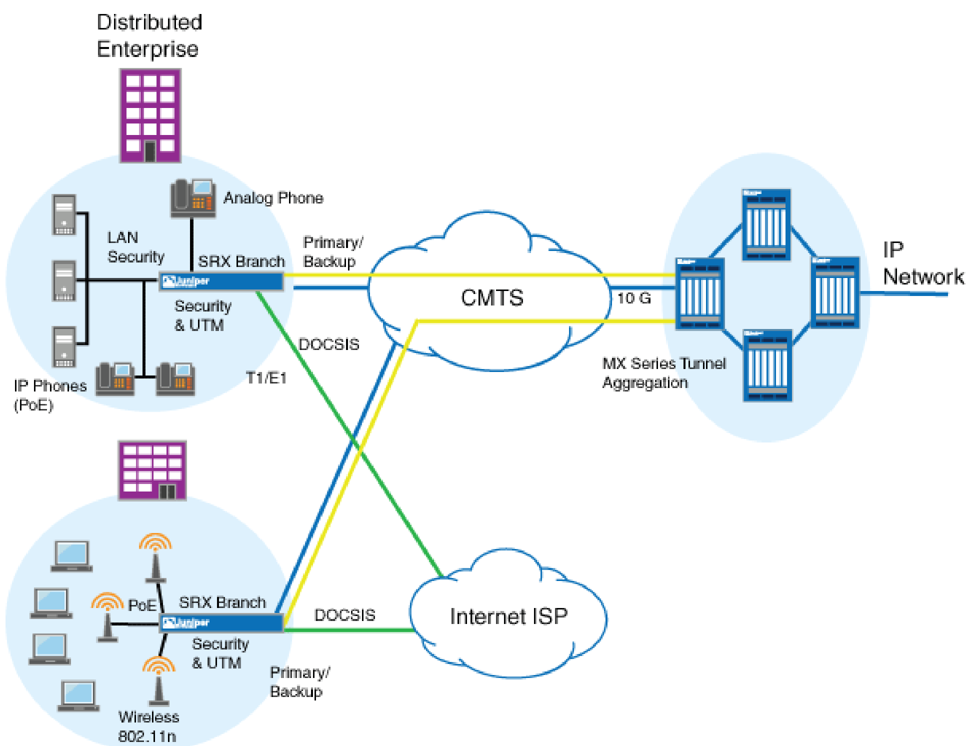
The Mini-PIM can also be used with encapsulations other than GRE, PPPoE, and IP-in-IP.

NOTE: The following interface trace options are supported:

- all—Enable all interface trace flags
- event—Trace interface events
- ipc—Trace interface IPC messages
- media—Trace interface media changes

CMTS manages and monitors the cable modem interface of then Mini-PIM through SNMP. This DOCSIS 3.0 Mini-PIM can be deployed in any multiple MSO network. Figure 37 on page 608 shows a typical use for this Mini-PIM in an MSO network.

Figure 37: Typical DOCSIS End-to-End Connectivity Diagram



Related Documentation

- Software Features Supported on DOCSIS Mini-PIMs on page 609
- Example: Configuring the DOCSIS Mini-PIM Interfaces on page 610

Software Features Supported on DOCSIS Mini-PIMs

NOTE: DOCSIS Mini-PIM interfaces are no longer supported on SRX300, SRX320, SRX340, SRX345, and SRX550HM devices.

Table 45 on page 609 lists the software features supported on DOCSIS Mini-PIMs.

Table 45: Software Features Supported on DOCSIS Mini-PIMs

Software Feature	Description
DHCP and DHCPv6 clients	The DHCP and DHCPv6 clients are used to get the IP address from the CMTS using the DHCP protocol. DHCP is supported on IPv4 and IPv6. One of the main components of the configuration file is the static public IP address, which CMTS assigns to the cable modem. The management IP address is configured on the Mini-PIM's hybrid fiber coaxial (HFC) interface, which performs the following tasks: • Allows CMTS to execute remote monitoring and management of the Mini-PIM's cable interface. • Downloads the configuration file from CMTS and uses it for configuring the cable interface.
QoS support	The SRX Series device's Routing Engine is configured through the existing QoS CLI. Because the configuration on the SRX Series device's Routing Engine and Mini-PIM is done together, the QoS configuration has to be consistent between the Routing Engine and the cable modem interface. The QoS mechanisms on the Routing Engine are decoupled from the QoS mechanisms on the Mini-PIM. The configuration file downloaded from CMTS contains parameters for primary and secondary flows. These parameters are programmed in the DOCSIS Mini-PIM. The Mini-PIM sends these parameters to the Routing Engine through the PIM infrastructure. The secondary flows are prioritized over primary flows in the DOCSIS Mini-PIM.
SNMP support	CMTS issues the SNMP requests that go to the cable modem. The DOCSIS MIB on the SRX Series device's Routing Engine displays the Ethernet interface of the cable modem. The following features are supported on the DOCSIS Mini-PIM: • NAT support • Dying gasp support • Back pressure information
MAC address	The MAC address of the DOCSIS Mini-PIM is statically set at the factory and cannot be changed. The MAC address is retrieved from the Mini-PIM and assigned to the cable modem interface in Junos OS.
Transparent bridging	The DOCSIS Mini-PIM performs transparent bridging by sending the packets received on the Ethernet interface with the SRX Series device to the HFC interface and vice versa, without any modifications to the packet. All the other services such as webserver, DHCP server, and DNS server are disabled on the DOCSIS Mini-PIM during transparent bridging.

Release History Table

Release	Description
15.1X49-D10	DOCSIS Mini-PIM interfaces are no longer supported on SRX300, SRX320, SRX340, SRX345, and SRX550HM devices.

Related Documentation

- DOCSIS Mini-PIM Interface Overview on page 607
- Example: Configuring the DOCSIS Mini-PIM Interfaces on page 610

Example: Configuring the DOCSIS Mini-PIM Interfaces

This example shows how to configure DOCSIS Mini-PIM network interfaces for SRX210, SRX220, and SRX240 devices.

NOTE: DOCSIS Mini-PIM interfaces are no longer supported on SRX300, SRX320, SRX340, SRX345, and SRX550HM devices.

Requirements

Before you begin:

- Establish basic connectivity. See the Quick Start for your device.
- Configure network interfaces as necessary. See “Example: Creating an Ethernet Interface” on page 261.

Overview

In this example, you configure the DOCSIS Mini-PIM interface as cm-2/0/0. You specify the physical properties by setting the interface trace options and the flag option. You then set the logical interface to unit 0 and specify the family protocol type as inet. Finally, you configure the DHCP client.

Configuration

CLI Quick Configuration

To quickly configure this example, copy the following command, paste it into a text file, remove any line breaks, change any details necessary to match your network configuration, copy and paste the command into the CLI at the **[edit]** hierarchy level, and then enter **commit** from configuration mode.

```
set interfaces cm-2/0/0 traceoptions flag all
```



```
set interfaces cm-2/0/0 unit 0 family inet dhcp
```

Step-by-Step Procedure

To configure the DOCSIS Mini-PIM network interfaces:

1. Configure the interface.

```
[edit]
user@host# edit interfaces cm-2/0/0
```

2. Set the interface trace options.

```
[edit]
user@host# set interfaces cm-2/0/0 traceoptions
```

3. Specify the flag option.

```
[edit]
user@host# set interfaces cm-2/0/0 traceoptions flag all
```

4. Set the logical interface.

```
[edit]
user@host# set interfaces cm-2/0/0 unit 0
```

5. Specify the family protocol type.

```
[edit]
user@host# set interfaces cm-2/0/0 unit 0 family inet
```

6. Configure the DHCP client.

```
[edit]
user@host# set interfaces cm-2/0/0 unit 0 family inet dhcp
```

Results

From configuration mode, confirm your configuration by entering the **show interfaces cm-2/0/0** command. If the output does not display the intended configuration, repeat the configuration instructions in this example to correct it.

```
[edit]
  user@host# show interfaces cm-2/0/0
  traceoptions {
  flag all;
  }
  unit 0 {
    family inet {
```

```
    dhcp;
  }
}
```

If you are done configuring the device, enter **commit** from configuration mode.

Verification

Confirm that the configuration is working properly.

- Verifying the DOCSIS Interface Properties on page 612

Verifying the DOCSIS Interface Properties

Purpose Verify that the DOCSIS interface properties are configured properly.

Action From operational mode, enter the **show interfaces cm-2/0/0** command.

user@host> **show interfaces cm-2/0/0 extensive**

```
Physical interface: cm-2/0/0, Enabled, Physical link is Up
  Interface index: 154, SNMP ifIndex: 522, Generation: 157
  Link-level type: Ethernet, MTU: 1518, Speed: 40mbps
  Link flags     : None
  Hold-times     : Up 0 ms, Down 0 ms
   State   : OPERATIONAL, Mode: 2.0, Upstream speed: 5120000 0 0 0
   Downstream scanning: CM_MEDIA_STATE_DONE, Ranging: CM_MEDIA_STATE_DONE
   Signal to noise ratio: 31.762909 21.390018  7.517472 14.924058
   Power: -15.756125 -31.840363 -31.840363 -31.840363
   Downstream buffers used          : 0
   Downstream buffers free          : 0
   Upstream buffers free            : 0
   Upstream buffers used            : 0
   Request opportunity burst        : 0 MSlots
  Physical burst                   : 0 MSlots
   Tuner frequency                  : 555 0 0 0 MHz
   Standard short grant             : 0 Slots
   Standard long grant              : 0 Slots
   Baseline privacy state: authorized, Encryption algorithm: ????, Key length: 0

  MAC statistics:                      Receive         Transmit
    Total octets                          1935             2036
    Total packets                            8                8
    CRC/Align errors                         0                0
    Oversized frames                         0
  CoS queues     : 8 supported, 8 maximum usable queues
  Current address: 00:24:dc:0d:76:19, Hardware address: 00:24:dc:0d:76:19
  Last flapped   : 2009-11-10 19:55:40 UTC (00:16:29 ago)
  Statistics last cleared: Never
  Traffic statistics:
   Input  bytes  :                710                    0 bps
   Output bytes  :                866                    0 bps
   Input  packets:                  2                    0 pps
   Output packets:                  4                    0 pps
  Packet Forwarding Engine configuration:
    Destination slot: 1
    Direction : Output
```

```
    CoS transmit queue               Bandwidth              Buffer Priority
Limit
                              %            bps     %           usec
    0 best-effort            95       38000000    95              0      low
none
    3 network-control         5        2000000     5              0      low
none
   Logical interface cm-2/0/0.0 (Index 69) (SNMP ifIndex 523) (Generation 134)
    Flags: Point-To-Point SNMP-Traps Encapsulation: ENET2
    Traffic statistics:
     Input  bytes  :                 710
     Output bytes  :                 806
     Input  packets:                   2
     Output packets:                   4
    Local statistics:
     Input  bytes  :                 710
     Output bytes  :                 806
     Input  packets:                   2
     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
    Security: Zone: Null
    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: 1504, Generation: 147, Route table: 0
      Flags: None
```

```
      Addresses, Flags: Is-Preferred Is-Primary
        Destination: 20.20.20/24, Local: 20.20.20.5, Broadcast: 20.20.20.255,
Generation: 144
```

The output shows a summary of DOCSIS interface properties. Verify the following information:

- The physical interface is **Enabled**. If the interface is shown as **Disabled**, do either of the following:
  - In the CLI configuration editor, delete the **disable** statement at the **[edit interfaces *interface-name*]** level of the configuration hierarchy.
  - In the J-Web configuration editor, clear the **Disable** check box on the **Interfaces>*interface-name*** page.
- The physical link is **Up**. A link state of **Down** indicates a problem with the interface module, interface port, or physical connection (link-layer errors).
- The **Last Flapped** time is an expected value. The **Last Flapped** time indicates the last time the physical interface became unavailable and then available again. Unexpected flapping indicates likely link-layer errors.
- The traffic statistics reflect the expected input and output rates. Verify that the number of inbound and outbound bytes and packets matches the expected throughput for the physical interface. To clear the statistics and see only new changes, use the **clear interfaces statistics *interface-name*** command.

Related Documentation

- DOCSIS Mini-PIM Interface Overview on page 607
- Software Features Supported on DOCSIS Mini-PIMs on page 609

CHAPTER 38

Configuring Serial Interfaces

Serial Interfaces Overview

Serial links are simple, bidirectional links that require very few control signals. In a basic serial setup, data communications equipment (DCE) installed in a user's premises is responsible for establishing, maintaining, and terminating a connection. A modem is a typical DCE device.

A serial cable connects the DCE to a telephony network where, ultimately, a link is established with data terminal equipment (DTE). DTE is typically where a serial link terminates.

The distinction between DCE and DTE is important because it affects the cable pinouts on a serial cable. A DCE cable uses a female 9-pin or 25-pin connector, and a DTE cable uses a male 9-pin or 25-pin connector, and .

To form a serial link, the cables are connected to each other. However, if the pins are identical, each side's transmit and receive lines are connected, which makes data transport impossible. To address this problem, each cable is connected to a null modem cable, which crosses the transmit and receive lines in the cable.

This section includes the following topics:

Serial Transmissions

In basic serial communications, nine signals are critical to the transmission. Each signal is associated with a pin in either the 9-pin or 25-pin connector. Table 46 on page 616 lists and defines serial signals and their sources.

Table 46: Serial Transmission Signals

Signal Name	Definition	Signal Source
TD	Transmitted data	DTE
RD	Received data	DCE
RTS	Request to send	DTE
CTS	Clear to send	DCE
DSR	Data set ready	DCE
Signal Ground	Grounding signal	–
CD	Carrier detect	–
DTR	Data terminal ready	DTE
RI	Ring indicator	–

When a serial connection is made, a serial line protocol—such as EIA-530, X.21, RS-422/449, RS-232, or V.35—begins controlling the transmission of signals across the line as follows:

1. The DCE transmits a DSR signal to the DTE, which responds with a DTR signal. After this handshake, the link is established and traffic can pass.
2. When the DTE device is ready to receive data, it sets its RTS signal to a marked state (all 1s) to indicate to the DCE that it can transmit data. (If the DTE is not able to receive data—because of buffer conditions, for example—it sets the RTS signal to all 0s.)
3. When the DCE device is ready to receive data, it sets its CTS signal to a marked state to indicate to the DTE that it can transmit data. (If the DCE is not able to receive data, it sets the CTS signal to all 0s.)
4. When the negotiation to send information has taken place, data is transmitted across the transmitted data (TD) and received data (RD) lines:
   - TD line—Line through which data from a DTE device is transmitted to a DCE device
   - RD line—Line through which data from a DCE device is transmitted to a DTE device

The name of the wire does not indicate the direction of data flow.

The DTR and DSR signals were originally designed to operate as a handshake mechanism. When a serial port is opened, the DTE device sets its DTR signal to a marked state. Similarly, the DCE sets its DSR signal to a marked state. However, because of the negotiation that takes place with the RTS and CTS signals, the DTR and DSR signals are not commonly used.

The carrier detect and ring indicator signals are used to detect connections with remote modems. These signals are not commonly used.

Signal Polarity

Serial interfaces use a balanced (also called differential) protocol signaling technique. Two serial signals are associated with a circuit: the A signal and the B signal. The A signal is denoted with a plus sign (for example, DTR+), and the B signal is denoted with a minus sign (for example, DTR–). If DTR is low, then DTR+ is negative with respect to DTR–. If DTR is high, then DTR+ is positive with respect to DTR–.

By default, all signal polarities are positive, but sometimes they might be reversed. For example, signals might be miswired as a result of reversed polarities.

Serial Clocking Modes

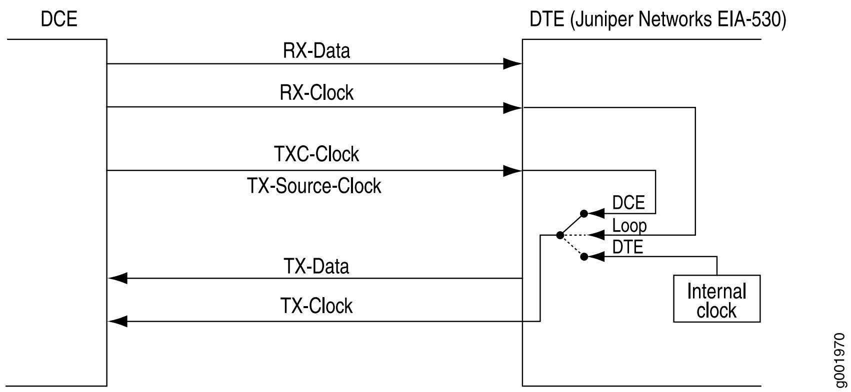
By default, a serial interface uses loop clocking to determine its timing source. For EIA-530 and V.35 interfaces, you can set each port independently to use one of the following clocking modes. X.21 interfaces can use only loop clocking mode.

- Loop clocking mode—Uses the DCE's receive (RX) clock to clock data from the DCE to the DTE.
- DCE clocking mode—Uses the transmit (TXC) clock, generated by the DCE specifically to be used by the DTE as the DTE's transmit clock.
- Internal clocking mode—Uses an internally generated clock. The speed of this clock is configured locally. Internal clocking mode is also known as line timing.

Both loop clocking mode and DCE clocking mode use external clocks generated by the DCE.

Figure 38 on page 618 shows the clock sources for loop, DCE, and internal clocking modes.

Figure 38: Serial Interface Clocking Modes



Serial Interface Transmit Clock Inversion

When an externally timed clocking mode (DCE or loop) is used, long cables might introduce a phase shift of the DTE-transmitted clock and data. At high speeds, this phase shift might cause errors. Inverting the transmit clock corrects the phase shift, thereby reducing error rates.

DTE Clock Rate Reduction

Although the serial interface is intended for use at the default clock rate of 16.384 MHz, you might need to use a slower rate under any of the following conditions:

- The interconnecting cable is too long for effective operation.
- The interconnecting cable is exposed to an extraneous noise source that might cause an unwanted voltage in excess of +1 volt.

  The voltage must be measured differentially between the signal conductor and the point in the circuit from which all voltages are measured ("circuit common") at the load end of the cable, with a 50-ohm resistor substituted for the generator.
- Interference with other signals must be minimized.
- Signals must be inverted.

Serial Line Protocols

Serial interfaces support the following line protocols:

- EIA-530 on page 619
- RS-232 on page 619
- RS-422/449 on page 620
- V.35 on page 620
- X.21 on page 621

EIA-530

EIA-530 is an Electronic Industries Association (EIA) standard for the interconnection of DTE and DCE using serial binary data interchange with control information exchanged on separate control circuits. EIA-530 is also known as RS-530.

The EIA-530 line protocol is a specification for a serial interface that uses a DB-25 connector and balanced equivalents of the RS-232 signals—also called V.24. The EIA-530 line protocol is equivalent to the RS-422 and RS-423 interfaces implemented on a 25-pin connector.

The EIA-530 line protocol supports both balanced and unbalanced modes. In unbalanced transmissions, voltages are transmitted over a single wire. Because only a single signal is transmitted, differences in ground potential can cause fluctuations in the measured voltage across the link. For example, if a 3-V signal is sent from one endpoint to another, and the receiving endpoint has a ground potential 1 V higher than the transmitter, the signal on the receiving end is measured as a 2-V signal.

Balanced transmissions use two wires instead of one. Rather than sending a single signal across the wire and having the receiving end measure the voltage, the transmitting device sends two separate signals across two separate wires. The receiving device measures the difference in voltage of the two signals (balanced sampling) and uses that calculation to evaluate the signal. Any differences in ground potential affect both wires equally, and the difference in the signals is still the same.

The EIA-530 interface supports asynchronous and synchronous transmissions at rates ranging from 20 Kbps to 2 Mbps.

RS-232

RS-232 is a Recommended Standard (RS) describing the most widely used type of serial communication. The RS-232 protocol is used for asynchronous data transfer as well as synchronous transfers using HDLC, Frame Relay, and X.25. RS-232 is also known as EIA-232.

The RS-232 line protocol is very popular for low-speed data signals. RS-232 signals are carried as single voltages referred to a common ground signal. The voltage output level of these signals varies between –12 V and +12 V. Within this range, voltages between –3 V and +3 V are considered inoperative and are used to absorb line noise. Control signals are considered operative when the voltage ranges from +3 V to +25 V.

The RS-232 line protocol is an unbalanced protocol, because it uses only one wire and is susceptible to signal degradation. Degradation can be extremely disruptive, particularly when a difference in ground potential exists between the transmitting and receiving ends of a link.

The RS-232 interface is implemented in a 25-pin D-shell connector and supports line rates up to 200 Kbps over lines shorter than 98 feet (30 meters).

NOTE: RS-232 serial interfaces cannot function error-free with a clock rate greater than 200 KHz.

RS-422/449

RS-422 is a Recommended Standard (RS) describing the electrical characteristics of balanced voltage digital interface circuits that support higher bandwidths than traditional serial protocols like RS-232. RS-422 is also known as EIA-422.

The RS-449 standard (also known as EIA-449) is compatible with RS-422 signal levels. The EIA created RS-449 to detail the DB-37 connector pinout and define a set of modem control signals for regulating flow control and line status.

The RS-422/499 line protocol runs in balanced mode, allowing serial communications to extend over distances of up to 4,000 feet (1.2 km) and at very fast speeds of up to 10 Mbps.

In an RS-422/499-based system, a single master device can communicate with up to 10 slave devices in the system. To accommodate this configuration, RS-422/499 supports the following kinds of transmission:

- Half-duplex transmission—In half-duplex transmission mode, transmissions occur in only one direction at a time. Each transmission requires a proper handshake before it is sent. This operation is typical of a balanced system in which two devices are connected by a single connection.
- Full-duplex transmission—In full duplex transmission mode, multiple transmissions can occur simultaneously so that devices can transmit and receive at the same time. This operation is essential when a single master in a point-to-multipoint system must communicate with multiple receivers.
- Multipoint transmission—RS-422/449 allows only a single master in a multipoint system. The master can communicate to all points in a multipoint system, and the other points must communicate with each other through the master.

V.35

V.35 is an ITU-T standard describing a synchronous, Physical Layer protocol used for communications between a network access device and a packet network. V.35 is most commonly used in the United States and Europe.

The V.35 line protocol is a mixture of balanced (RS-422) and common ground (RS-232) signal interfaces. The V.35 control signals DTR, DSR, DCD, RTS, and CTS are single-wire common ground signals that are essentially identical to their RS-232 equivalents. Unbalanced signaling for these control signals is sufficient, because the control signals are mostly constant, varying at very low frequency, which makes single-wire transmission suitable. Higher frequency data and clock signals are sent over balanced wires.

V.35 interfaces operate at line rates of 20 Kbps and above.

X.21

X.21 is an ITU-T standard for serial communications over synchronous digital lines. The X.21 protocol is used primarily in Europe and Japan.

The X.21 line protocol is a state-driven protocol that sets up a circuit-switched network using call setup. X.21 interfaces use a 15-pin connector with the following eight signals:

- Signal ground (G)—Reference signal used to evaluate the logic states of the other signals. This signal can be connected to the protective earth (ground).
- DTE common return (Ga)—Reference ground signal for the DCE interface. This signal is used only in unbalanced mode.
- Transmit (T)—Binary signal that carries the data from the DTE to the DCE. This signal can be used for data transfer or in call-control phases such as Call Connect or Call Disconnect.
- Receive (R)—Binary signal that carries the data from the DCE to the DTE. This signal can be used for data transfer or in call-control phases such as Call Connect or Call Disconnect.
- Control (C)—DTE-controlled signal that controls the transmission on an X.21 link. This signal must be on during data transfer, and can be on or off during call-control phases.
- Indication (I)—DCE-controlled signal that controls the transmission on an X.21 link. This signal must be on during data transfer, and can be on or off during call-control phases.
- Signal Element Timing (S)—Clocking signal that is generated by the DCE. This signal specifies when sampling on the line must occur.
- Byte Timing (B)—Binary signal that is on when data or call-control information is being sampled. When an 8-byte transmission is over, this signal switches to off.

Transmissions across an X.21 link require both the DCE and DTE devices to be in a ready state, indicated by an all 1s transmission on the T and R signals.

Related Documentation

- Example: Configuring a Serial Interface on page 621
- Example: Deleting a Serial Interface on page 624

Example: Configuring a Serial Interface

This example shows how to complete the initial configuration on a serial interface.

Requirements

Before you begin, install a serial PIM in the SRX Series device. See *SRX Series Services Gateways for the Branch Physical Interface Modules Hardware Guide*.

Overview

In this example, you create the interface se-1/0/0. You create the basic configuration for the new interface by setting the encapsulation type to ppp. Then you set the logical interface to 0. The logical unit number can range from 0 through 16,384. You can enter additional values for properties you need to configure on the logical interface, such as logical encapsulation or protocol family. Finally, you set IPv4 address 10.10.10.10/24 on the serial interface.

Configuration

CLI Quick Configuration

To quickly configure this example, copy the following command, paste it into a text file, remove any line breaks, change any details necessary to match your network configuration, copy and paste the command into the CLI at the **[edit]** hierarchy level, and then enter commit from configuration mode.

```
set interfaces se-1/0/0 encapsulation ppp unit 0 family inet address 10.10.10.10/24
```

Step-by-Step Procedure

The following example requires you to navigate various levels in the configuration hierarchy. For instructions on how to do that, see *Using the CLI Editor in Configuration Mode*.

To configure a serial interface:

1. Create the interface.

   ```
   [edit]
   user@host# edit interfaces se-1/0/0
   ```

2. Create the basic configuration for the new interface.

   ```
   [edit interfaces se-1/0/0]
   user@host# set encapsulation ppp
   ```

3. Add logical interfaces.

   ```
   [edit interfaces se-1/0/0]
   user@host# edit unit 0
   ```

4. Specify an IPv4 address for the interface.

   ```
   [edit interfaces se-1/0/0 unit 0]
   user@host# set family inet address 10.10.10.10/24
   ```

Results From configuration mode, confirm your configuration by entering the **show interfaces se-1/0/0** command. If the output does not display the intended configuration, repeat the configuration instructions in this example to correct it.

[edit]
user@host# show interfaces se-1/0/0

```
encapsulation ppp;
unit 0 {
    family inet {
        address 10.10.10.10/24;
    }
}
```

If you are done configuring the device, enter **commit** from configuration mode.

Verification

Confirm that the configuration is working properly.

- Verifying the Link State of All Interfaces on page 623
- Verifying Interface Properties on page 623

Verifying the Link State of All Interfaces

Purpose Use the ping tool on each peer address in the network to verify that all interfaces on the device are operational.

Action For each interface on the device:

1. In the J-Web interface, select **Troubleshoot>Ping Host**.
2. In the Remote Host box, type the address of the interface for which you want to verify the link state.
3. Click **Start**. The output appears on a separate page.

```
PING 10.10.10.10 : 56 data bytes
64 bytes from 10.10.10.10: icmp_seq=0 ttl=255 time=0.382 ms
64 bytes from 10.10.10.10: icmp_seq=1 ttl=255 time=0.266 ms
```

If the interface is operational, it generates an ICMP response. If this response is received, the round-trip time, in milliseconds, is listed in the time field.

Verifying Interface Properties

Purpose Verify that the interface properties are correct.

Action From operational mode, enter the **show interfaces detail** command.

The output shows a summary of interface information. Verify the following information:

- The physical interface is Enabled. If the interface is shown as Disabled, do one of the following:
  - In the CLI configuration editor, delete the **disable** statement at the [edit interfaces se-1/0/0] level of the configuration hierarchy.
  - In the J-Web configuration editor, clear the **Disable** check box on the Interfaces> se-1/0/0 page.
- The physical link is Up. A link state of Down indicates a problem with the interface module, interface port, or physical connection (link-layer errors).
- The Last Flapped time is an expected value. It indicates the last time the physical interface became unavailable and then available again. Unexpected flapping indicates likely link-layer errors.
- The traffic statistics reflect expected input and output rates. Verify that the number of inbound and outbound bytes and packets matches expected throughput for the physical interface. To clear the statistics and see only new changes, use the **clear interfaces statistics se-1/0/0** command.

Related Documentation

- Serial Interfaces Overview on page 615
- Example: Deleting a Serial Interface on page 624

Example: Deleting a Serial Interface

This example shows how to delete a serial interface.

NOTE: **Serial interfaces are no longer supported on SRX300, SRX320, SRX340, SRX345, and SRX550HM devices.**

Requirements

No special configuration beyond device initialization is required before configuring an interface.

Overview

In this example, you delete the se-1/0/0 interface.

NOTE: **Performing this action removes the interface from the software configuration and disables it. Network interfaces remain physically present, and their identifiers continue to appear on J-Web pages.**

Configuration

Step-by-Step Procedure

To delete a serial interface:

1. Specify the interface you want to delete.

```
[edit]
user@host# delete se-1/0/0
```

2. If you are done configuring the device, commit the configuration.

```
[edit]
user@host# commit
```

Verification

To verify the configuration is working properly, enter the **show interfaces** command.

Related Documentation

- Serial Interfaces Overview on page 615
- Example: Configuring a Serial Interface on page 621

Understanding the 8-Port Synchronous Serial GPIM

A Gigabit-Backplane Physical Interface Module (GPIM) is a network interface card (NIC) that installs in the front slots of the SRX550 Services Gateway to provide physical connections to a LAN or a WAN.

NOTE: **Serial interfaces, including the 8-port synchronous serial GPIM, are no longer supported on SRX300, SRX320, SRX340, SRX345, and SRX550HM devices.**

The 8-port synchronous serial GPIM provides the physical connection to serial network media types, receiving incoming packets from the network and transmitting outgoing packets to the network. Besides forwarding packets for processing, the GPIM performs framing and line-speed signaling. This GPIM provides 8 ports that operate in sync mode and supports a line rate of 64 Mbps or 8 Mbps per port.

Supported Features

Table 47 on page 626 lists the features supported on the 8-port synchronous serial GPIM.

Table 47: Supported Features

Features	Description
Operation modes (autoselection based on cable, no configuration required)	• DTE (data terminal equipment) • DCE (data communication equipment)

Clocking	• Tx clock modes
	  ◦ DCE clock (only valid in DTE mode)
	  ◦ Baud clock (internally generated)
	  ◦ Loop clock (external)
	• Rx clock modes
	  ◦ Baud clock (internally generated)
	  ◦ Loop clock (external)

Clock rates (baud rates)	1.2 KHz to 8.0 MHz NOTE: RS-232 serial interfaces might cause an error with a clock rate greater than 200 KHz.
MTU	9192 bytes, default value is 1504 bytes
HDLC features	• Idle flag/fill (0x7e or all ones), default idle flag is (0x7e) • Counters—giants, runts, FCS error, abort error, align error
Line encoding	NRZ and NRZI
Invert data	Enabled
Line protocol	EIA530/EIA530A, X.21, RS-449, RS-232, V.35
Data cables	Separate cable for each line protocol (both DTE/DCE mode)
Error counters (conformance to ANSI specification)	Enabled
Alarms and defects	• Rx clock absent • Tx clock absent • DCD absent • RTS/CTS absent • DSR/DTR absent
Data signal	Rx clock
Control signals	• To DTE: CTS, DCD, DSR • From DTE: DTR, RTS
Serial autoresync	• Configurable resync duration • Configurable resync interval

Table 47: Supported Features (continued)

Features	Description
Diagnostic features	• Loopback modes—local, remote, and dce-local loopback • Ability to ignore control signals
Layer 2 features	Encapsulation • PPP • Cisco HDLC • Frame Relay • MLPPP • MLFR
SNMP features	SNMP information receivable at each port • IF-MIB - rfc2863a.mib • jnx-chassis.mib
Anticounterfeit check	Enabled

Related Documentation

- Example: Configuring an 8-Port Synchronous Serial GPIM in Back-to-Back SRX650 Services Gateways on page 627

Example: Configuring an 8-Port Synchronous Serial GPIM in Back-to-Back SRX650 Services Gateways

This example shows how to perform a basic back-to-back device configuration with an 8-port synchronous serial GPIM. It describes the most common scenario in which a serial GPIM is deployed.

In this example, the SRX650 devices are shown as both data communication equipment (DCE) and data terminal equipment (DTE). In certain deployment scenarios, the DTE can be a serial modem or an encryptor or decryptor.

NOTE: **Serial interfaces, including the 8-port synchronous serial GPIM, are no longer supported on SRX300, SRX320, SRX340, SRX345, and SRX550HM devices.**

Requirements

This example uses the following hardware and software components:

- Junos OS Release 12.1 R2 or later for SRX Series Services Gateways.
- Two SRX650 devices connected back-to-back.
- Two 8-port synchronous serial GPIMs.
- Four pairs of DCE and DTE cables. The cable can be any type as mentioned in *8-Port Serial GPIM Interface Cables*.

Before you begin:

- Establish basic connectivity. See the Getting Started Guide for your device.
- Configure network interfaces as necessary. See "Example: Creating an Ethernet Interface" on page 261.

Overview and Topology

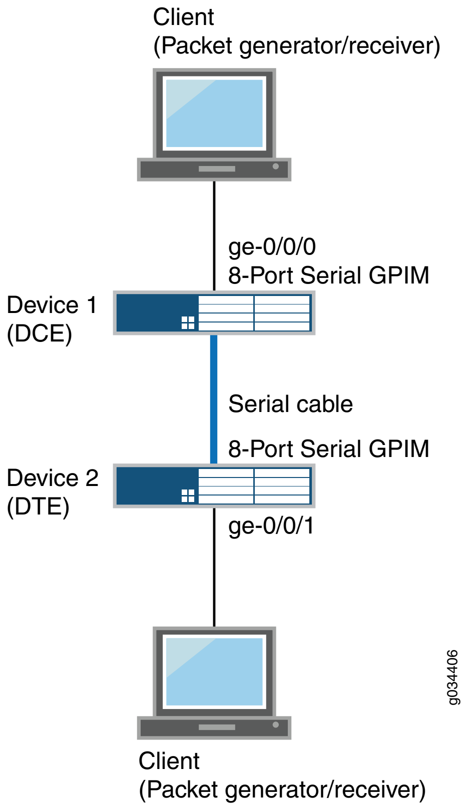
In this scenario, the configuration is done on two interfaces. All ports are configured with different encapsulations, such as Cisco High-Level Data Link Control (HDLC), Frame Relay, and Point-to-Point Protocol (PPP). When Frame Relay is set, then the data link connection identifier (in this example, 111) must also be set.

In this example, all eight ports on Device 1 (SRX650) are configured in DTE mode and their respective eight ports on Device 2 (SRX650) are configured in DCE mode.

For Device 1, you set the encapsulation type to **ppp**. Then you set the logical interface to **0**. The logical unit number can range from 0 through 16,384. You can enter additional values for properties you need to configure on the logical interface, such as logical encapsulation or protocol family. Finally, you set the IPv4 address to 10.10.10.1/24 on the serial port. For Device 2, you follow a procedure similar to Device 1, but you set the clocking mode to dce.

Figure 39 on page 629 shows the topology used in this example.

Figure 39: Basic Back-to-Back Device Configuration



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.

Device 1

```
set interfaces se-7/0/0 mtu 9192
set interfaces se-7/0/0 encapsulation ppp
set interfaces se-7/0/0 serial-options clocking-mode internal
set interfaces se-7/0/0 unit 0 family inet address 10.10.10.1/24
set interfaces se-7/0/1 mtu 9192
set interfaces se-7/0/1 encapsulation cisco-hdlc
set interfaces se-7/0/1 serial-options clocking-mode internal
set interfaces se-7/0/1 unit 0 family inet address 11.11.11.1/24
set interfaces se-7/0/2 dce
set interfaces se-7/0/2 mtu 9192
set interfaces se-7/0/2 encapsulation frame-relay
set interfaces se-7/0/2 serial-options clocking-mode internal
set interfaces se-7/0/2 unit 0 dlci 111
set interfaces se-7/0/2 unit 0 family inet address 12.12.12.1/24
set interfaces se-7/0/3 mtu 9192
set interfaces se-7/0/3 encapsulation ppp
set interfaces se-7/0/3 serial-options clocking-mode internal
```



```
set interfaces se-7/0/3 unit 0 family inet address 13.13.13.1/24
set interfaces se-7/0/4 mtu 9192
set interfaces se-7/0/4 encapsulation cisco-hdlc
set interfaces se-7/0/4 serial-options clocking-mode internal
set interfaces se-7/0/4 unit 0 family inet address 14.14.14.1/24
set interfaces se-7/0/5 dce
set interfaces se-7/0/5 mtu 9192
set interfaces se-7/0/5 encapsulation frame-relay
set interfaces se-7/0/5 serial-options clocking-mode internal
set interfaces se-7/0/5 unit 0 dlci 112
set interfaces se-7/0/5 unit 0 family inet address 15.15.15.1/24
set interfaces se-7/0/6 mtu 9192
set interfaces se-7/0/6 encapsulation cisco-hdlc
set interfaces se-7/0/6 serial-options clocking-mode internal
set interfaces se-7/0/6 unit 0 family inet address 16.16.16.1/24
set interfaces se-7/0/7 mtu 9192
set interfaces se-7/0/7 encapsulation ppp
set interfaces se-7/0/7 serial-options clocking-mode internal
set interfaces se-7/0/7 unit 0 family inet address 17.17.17.1/24
set routing-options static route 21.21.21.0/24 next-hop 10.10.10.2
set routing-options static route 23.23.23.0/24 next-hop 11.11.11.2
set routing-options static route 25.25.25.0/24 next-hop 12.12.12.2
set routing-options static route 27.27.27.0/24 next-hop 13.13.13.2
set routing-options static route 29.29.29.0/24 next-hop 14.14.14.2
set routing-options static route 31.31.31.0/24 next-hop 15.15.15.2
set routing-options static route 33.33.33.0/24 next-hop 16.16.16.2
set routing-options static route 35.35.35.0/24 next-hop 17.17.17.2
```

Device 2

```
set interfaces se-3/0/0 mtu 9192
set interfaces se-3/0/0 encapsulation ppp
set interfaces se-3/0/0 serial-options clocking-mode dce
set interfaces se-3/0/0 unit 0 family inet address 10.10.10.2/24
set interfaces se-3/0/1 mtu 9192
set interfaces se-3/0/1 encapsulation cisco-hdlc
set interfaces se-3/0/1 serial-options clocking-mode dce
set interfaces se-3/0/1 unit 0 family inet address 11.11.11.2/24
set interfaces se-3/0/2 dce
set interfaces se-3/0/2 mtu 9192
set interfaces se-3/0/2 encapsulation frame-relay
set interfaces se-3/0/2 serial-options clocking-mode dce
set interfaces se-3/0/2 unit 0 dlci 111
set interfaces se-3/0/2 unit 0 family inet address 12.12.12.2/24
set interfaces se-3/0/3 mtu 9192
set interfaces se-3/0/3 encapsulation ppp
set interfaces se-3/0/3 serial-options clocking-mode dce
set interfaces se-3/0/3 unit 0 family inet address 13.13.13.2/24
set interfaces se-3/0/4 mtu 9192
set interfaces se-3/0/4 encapsulation cisco-hdlc
set interfaces se-3/0/4 serial-options clocking-mode dce
set interfaces se-3/0/4 unit 0 family inet address 14.14.14.2/24
set interfaces se-3/0/5 dce
set interfaces se-3/0/5 mtu 9192
set interfaces se-3/0/5 encapsulation frame-relay
```



```
set interfaces se-3/0/5 serial-options clocking-mode dce
set interfaces se-3/0/5 unit 0 dlci 112
set interfaces se-3/0/5 unit 0 family inet address 15.15.15.2/24
set interfaces se-3/0/6 mtu 9192
set interfaces se-3/0/6 encapsulation cisco-hdlc
set interfaces se-3/0/6 serial-options clocking-mode dce
set interfaces se-3/0/6 unit 0 family inet address 16.16.16.2/24
set interfaces se-3/0/7 mtu 9192
set interfaces se-3/0/7 encapsulation ppp
set interfaces se-3/0/7 serial-options clocking-mode dce
set interfaces se-3/0/7 unit 0 family inet address 17.17.17.2/24
set routing-options static route 20.20.20.0/24 next-hop 10.10.10.1
set routing-options static route 22.22.22.0/24 next-hop 11.11.11.1
set routing-options static route 24.24.24.0/24 next-hop 12.12.12.1
set routing-options static route 26.26.26.0/24 next-hop 13.13.13.1
set routing-options static route 28.28.28.0/24 next-hop 14.14.14.1
set routing-options static route 30.30.30.0/24 next-hop 15.15.15.1
set routing-options static route 32.32.32.0/24 next-hop 16.16.16.1
set routing-options static route 34.34.34.0/24 next-hop 17.17.17.1
```

Step-by-Step Procedure

The following example requires you to navigate various levels in the configuration hierarchy. For instructions on how to do that, see *Using the CLI Editor in Configuration Mode*.

To configure the interfaces on Device 1:

1. Specify the maximum transmission unit (MTU) value for the interface.

   ```
   [edit interfaces]
   user@host# set se-7/0/0 mtu 9192
   ```

2. Configure the encapsulation type.

   ```
   [edit interfaces]
   user@host# set se-7/0/0 encapsulation ppp
   ```

3. Configure the serial options, such as the clocking mode.

   ```
   [edit interfaces]
   user@host# set se-7/0/0 serial-options clocking-mode internal
   ```

4. Set the IPv4 address on the serial port.

   ```
   [edit interfaces]
   user@host# set se-7/0/0 unit 0 family inet address 10.10.10.1/24
   ```

5. Configure the static route information.

   ```
   [edit routing-options]
   ```



```
user@host# set static route 21.21.21.0/24 next-hop 10.10.10.2
```

NOTE: Repeat the same configuration for the other seven ports on Device 1.

6. If you are done configuring the device, commit the configuration.

```
[edit]
user@host# commit
```

Step-by-Step Procedure

To configure the interfaces on Device 2:

1. Specify the MTU value for the interface.

```
[edit interfaces]
user@host# set se-3/0/0 mtu 9192
```

2. Configure the encapsulation type.

```
[edit interfaces]
user@host# set se-3/0/0 encapsulation ppp
```

3. Configure the serial options, such as the clocking mode.

```
[edit interfaces]
user@host# set se-3/0/0 serial-options clocking-mode dce
```

4. Set the IPv4 address on the serial port.

```
[edit interfaces]
user@host# set se-3/0/0 unit 0 family inet address 10.10.10.2/24
```

5. Configure the static route information.

```
[edit routing-options]
user@host# set static route 20.20.20.0/24 next-hop 10.10.10.1
```

NOTE: Repeat the same configuration for the other seven ports on Device 2.

6. If you are done configuring the device, commit the configuration.

```
[edit]
user@host# commit
```

Results

From configuration mode, confirm your configuration by entering the **show interfaces** command. If the output does not display the intended configuration, repeat the configuration instructions in this example to correct it.

Device 1

```
[edit]
user@host# show interfaces
se-7/0/0 {
  mtu 9192;
  encapsulation ppp;
  serial-options {
    clocking-mode internal;
  }
  unit 0 {
    family inet {
      address 10.10.10.1/24;
    }
  }
}
  se-7/0/1 {
    mtu 9192;
    encapsulation cisco-hdlc;
    serial-options {
      clocking-mode internal;
    }
    unit 0 {
      family inet {
        address 11.11.11.1/24;
      }
    }
  }
  se-7/0/2 {
    dce;
    mtu 9192;
    encapsulation frame-relay;
    serial-options {
      clocking-mode internal;
    }
    unit 0 {
      dlci 111;
      family inet {
        address 12.12.12.1/24;
      }
    }
  }
  se-7/0/3 {
```

```
    mtu 9192;
    encapsulation ppp;
    serial-options {
      clocking-mode internal;
    }
    unit 0 {
      family inet {
        address 13.13.13.1/24;
      }
    }
  }
  se-7/0/4 {
    mtu 9192;
    encapsulation cisco-hdlc;
    serial-options {
      clocking-mode internal;
    }
    unit 0 {
      family inet {
        address 14.14.14.1/24;
      }
    }
  }
  se-7/0/5 {
    dce;
    mtu 9192;
    encapsulation frame-relay;
    serial-options {
      clocking-mode internal;
    }
    unit 0 {
      dlci 112;
      family inet {
        address 15.15.15.1/24;
      }
    }
  }
  se-7/0/6 {
    mtu 9192;
    encapsulation cisco-hdlc;
    serial-options {
      clocking-mode internal;
    }
    unit 0 {
      family inet {
        address 16.16.16.1/24;
      }
    }
  }
  se-7/0/7 {
    mtu 9192;
    encapsulation ppp;
    serial-options {
      clocking-mode internal;
    }
```

```
    unit 0 {
      family inet {
        address 17.17.17.1/24;
      }
    }
  }
```

```
[edit]
user@host# show routing-options
static {
  route 21.21.21.0/24 next-hop 10.10.10.2;
  route 23.23.23.0/24 next-hop 11.11.11.2;
  route 25.25.25.0/24 next-hop 12.12.12.2;
  route 27.27.27.0/24 next-hop 13.13.13.2;
  route 29.29.29.0/24 next-hop 14.14.14.2;
  route 31.31.31.0/24 next-hop 15.15.15.2;
  route 33.33.33.0/24 next-hop 16.16.16.2;
  route 35.35.35.0/24 next-hop 17.17.17.2;
}
```

If you are done configuring the device, enter **commit** from configuration mode.

Device 2

```
[edit]
user@host# show interfaces
se-3/0/0 {
  mtu 9192;
  encapsulation ppp;
  serial-options {
    clocking-mode dce;
  }
  unit 0 {
    family inet {
      address 10.10.10.2/24;
    }
  }
}
  se-3/0/1 {
    mtu 9192;
    encapsulation cisco-hdlc;
    serial-options {
      clocking-mode dce;
    }
    unit 0 {
      family inet {
        address 11.11.11.2/24;
      }
    }
  }
  se-3/0/2 {
    dce;
    mtu 9192;
    encapsulation frame-relay;
    serial-options {
```

```
        clocking-mode dce;
    }
    unit 0 {
        dlci 111;
        family inet {
            address 12.12.12.2/24;
        }
    }
}
se-3/0/3 {
    mtu 9192;
    encapsulation ppp;
    serial-options {
        clocking-mode dce;
    }
    unit 0 {
        family inet {
            address 13.13.13.2/24;
        }
    }
}
se-3/0/4 {
    mtu 9192;
    encapsulation cisco-hdlc;
    serial-options {
        clocking-mode dce;
    }
    unit 0 {
        family inet {
            address 14.14.14.2/24;
        }
    }
}
se-3/0/5 {
    dce;
    mtu 9192;
    encapsulation frame-relay;
    serial-options {
        clocking-mode dce;
    }
    unit 0 {
        dlci 112;
        family inet {
            address 15.15.15.2/24;
        }
    }
}
se-3/0/6 {
    mtu 9192;
    encapsulation cisco-hdlc;
    serial-options {
        clocking-mode dce;
    }
    unit 0 {
        family inet {
```



```
          address 16.16.16.2/24;
        }
      }
    }
    se-3/0/7 {
      mtu 9192;
      encapsulation ppp;
      serial-options {
        clocking-mode dce;
      }
      unit 0 {
        family inet {
          address 17.17.17.2/24;
        }
      }
    }
```

```
[edit]
user@host# show routing-options
static {
  route 20.20.20.0/24 next-hop 10.10.10.1;
  route 22.22.22.0/24 next-hop 11.11.11.1;
  route 24.24.24.0/24 next-hop 12.12.12.1;
  route 26.26.26.0/24 next-hop 13.13.13.1;
  route 28.28.28.0/24 next-hop 14.14.14.1;
  route 30.30.30.0/24 next-hop 15.15.15.1;
  route 32.32.32.0/24 next-hop 16.16.16.1;
  route 34.34.34.0/24 next-hop 17.17.17.1;
}
```

If you are done configuring the device, enter **commit** from configuration mode.

Verification

Confirm that the configuration is working properly.

- Verifying Interface Link Status on page 637
- Verifying Interface Statistics for DCE on page 638
- Verifying Interface Statistics for DTE on page 640

Verifying Interface Link Status

Purpose Verify that the interface link status is up.

Action From operational mode, enter the **show interface terse se-7/0/*** command.

```
user@srx650-1> show interface terse se-7/0/*
```

```
Interface               Admin Link Proto    Local                 Remote
```

```
se-7/0/0                up    up
se-7/0/0.0              up    up   inet     10.10.10.1/24
se-7/0/1                up    up
se-7/0/1.0              up    up   inet     11.11.11.1/24
se-7/0/2                up    up
se-7/0/2.0              up    up   inet     12.12.12.1/24
se-7/0/3                up    up
se-7/0/3.0              up    up   inet     13.13.13.1/24
se-7/0/4                up    up
se-7/0/4.0              up    up   inet     14.14.14.1/24
se-7/0/5                up    up
se-7/0/5.0              up    up   inet     15.15.15.1/24
se-7/0/6                up    up
se-7/0/6.0              up    up   inet     16.16.16.1/24
se-7/0/7                up    up
se-7/0/7.0              up    up   inet     17.17.17.1/24
```

Meaning The output displays a list of all interfaces configured. If the Link column displays **up** for all interfaces, the configuration is working properly. This verifies that the GPIM is up and end-to-end ping is working.

Verifying Interface Statistics for DCE

Purpose Verify that the interfaces are configured properly for DCE.

Action From operational mode, enter the **show interface se-7/0/0 extensive | no-more** command.

```
user@srx650-1>show interface se-7/0/0 extensive | no-more
```

```
Physical interface: se-7/0/0, Enabled, Physical link is Up
  Interface index: 161, SNMP ifIndex: 592, Generation: 164
  Type: Serial, Link-level type: PPP, MTU: 1504, Maximum speed: 8mbps
  Device flags   : Present Running
  Interface flags: Point-To-Point Internal: 0x0
  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 : 123 (last seen 00:00:02 ago)
    Output: 123 (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
  PAP state: Closed
  CoS queues     : 8 supported, 8 maximum usable queues
  Last flapped   : 2011-06-27 22:57:24 PDT (00:20:59 ago)
  Statistics last cleared: Never
  Traffic statistics:
   Input  bytes  :                23792                  160 bps
   Output bytes  :                22992                  536 bps
   Input  packets:                  404                    0 pps
   Output packets:                  409                    0 pps
```



```
  Input errors:
    Errors: 3, Drops: 0, Framing errors: 3, 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
  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                 409                  409                    0

  Queue number:         Mapped forwarding classes
    0                   best-effort
    1                   expedited-forwarding
    2                   assured-forwarding
   3                   network-control
  Serial media information:
    Line protocol: eia530
    Resync history:
      Sync loss count: 0
    Data signal:
      Rx Clock: OK
    Control signals:
    Local mode: DCE
      To DTE: CTS: up, DCD: up, DSR: up
      From DTE: DTR: up, RTS: up
    DCE loopback override: Off
    Clocking mode: internal
    Loopback: none
    Tx clock: non-invert
    Line encoding: nrz
  Packet Forwarding Engine configuration:
    Destination slot: 7
  CoS information:
    Direction : Output
    CoS transmit queue               Bandwidth               Buffer Priority
Limit
                              %            bps     %           usec
    0 best-effort            95        7600000    95              0      low
none
    3 network-control         5         400000     5              0      low
none

  Logical interface se-7/0/0.0 (Index 82) (SNMP ifIndex 600) (Generation 147)
    Flags: Point-To-Point SNMP-Traps 0x0 Encapsulation: PPP
    Security: Zone: HOST
    Allowed host-inbound traffic : any-service bfd bgp dvmrp igmp ldp msdp nhrp
    ospf pgm pim rip router-discovery rsvp sap vrrp
    Flow Statistics :
    Flow Input statistics :
      Self packets :                     153
      ICMP packets :                     0
      VPN packets :                      0
      Multicast packets :                0
```

```
      Bytes permitted by policy :        13152
      Connections established :          1
    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: 162, Route table: 0
      Flags: Sendbcast-pkt-to-re
      Addresses, Flags: Is-Preferred Is-Primary
        Destination: 10.10.10/24, Local: 10.10.10.1, Broadcast: 10.10.10.255,
        Generation: 175
```

Meaning The output displays a list of all DCE verification parameters and the mode configured. If the local mode displays DCE, the configuration is working properly.

Verifying Interface Statistics for DTE

Purpose Verify that the interfaces are configured properly for DTE.

Action From operational mode, enter the **show interfaces se-3/0/0 extensive | no-more** command.

user@srx650-2>**show interfaces se-3/0/0 extensive | no-more**

```
Physical interface: se-3/0/0, Enabled, Physical link is Up
  Interface index: 168, SNMP ifIndex: 594, Generation: 171
  Type: Serial, Link-level type: PPP, MTU: 1504, Maximum speed: 8mbps
  Device flags   : Present Running
  Interface flags: Point-To-Point Internal: 0x0
  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 : 242 (last seen 00:00:09 ago)
    Output: 242 (last sent 00:00:10 ago)
  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   : 2011-06-27 22:52:06 PDT (00:40:41 ago)
  Statistics last cleared: Never
  Traffic statistics:
   Input  bytes  :                44582                    0 bps
   Output bytes  :                42872                    0 bps
   Input  packets:                  776                    0 pps
   Output packets:                  779                    0 pps
Input errors:
    Errors: 6, Drops: 0, Framing errors: 6, 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
  Egress queues: 8 supported, 4 in use
  Queue counters:       Queued packets  Transmitted packets      Dropped packets

    0 best-effort                    2                    2                    0

    1 expedited-fo                   0                    0                    0

    2 assured-forw                   0                    0                    0

    3 network-cont                 777                  777                    0

  Queue number:         Mapped forwarding classes
    0                   best-effort
    1                   expedited-forwarding
    2                   assured-forwarding
    3                   network-control
  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
    Loopback: none
    Tx clock: non-invert
    Line encoding: nrz
  Packet Forwarding Engine configuration:
    Destination slot: 3
  CoS information:
    Direction : Output
    CoS transmit queue               Bandwidth               Buffer Priority
Limit
                            %            bps     %           usec
    0 best-effort          95        7600000    95              0      low
none
```

```
    3 network-control         5         400000     5              0      low
none
Logical interface se-3/0/0.0 (Index 82) (SNMP ifIndex 602) (Generation 147)
    Flags: Point-To-Point SNMP-Traps 0x0 Encapsulation: PPP
    Security: Zone: HOST
    Allowed host-inbound traffic : any-service bfd bgp dvmrp igmp ldp msdp nhrp
    ospf pgm pim rip router-discovery rsvp sap vrrp
    Flow Statistics :
    Flow Input statistics :
      Self packets :                     287
      ICMP packets :                     0
      VPN packets :                      0
      Multicast packets :                0
      Bytes permitted by policy :        24044
      Connections established :          1
    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: 162, Route table: 0
      Flags: Sendbcast-pkt-to-re
      Addresses, Flags: Is-Preferred Is-Primary
        Destination: 10.10.10/24, Local: 10.10.10.2, Broadcast: 10.10.10.255,
        Generation: 175
```

Meaning The output displays a list of all DTE verification parameters and the mode configured. If the local mode displays DTE, the configuration is working properly.

Related Documentation

- Understanding the 8-Port Synchronous Serial GPIM on page 625

PART 9

Configuration Statements and Operational Commands

CHAPTER 39

Configuration Statements

accept-source-mac

Syntax

```
accept-source-mac {
  mac-address mac-address;
}
```

Hierarchy Level

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

Release Information

Statement introduced in Junos OS Release 11.4.

Description

For Gigabit Ethernet (GE), Fast Ethernet (FE), or 10 Gigabit Ethernet (XE) interfaces, specify the MAC addresses from which the interface can receive packets. Ensure that you update the MAC address if the remote Ethernet card is replaced. Replacing the interface card changes the MAC address. If you do not update the MAC address, the interface cannot receive packets from the new card.

NOTE:

- Software-based MAC limiting is supported on SRX300, SRX320, and SRX340 devices. A maximum of 32 MAC addresses is supported per device.

Options

mac-address —MAC address filter. You can specify the MAC address as six hexadecimal bytes in one of the following formats: ***nn:nn:nn:nn:nn:nn:nn*** (for example, **00:11:22:33:44:55**) or ***nnnn:nnnn:nnnn*** (for example, **0011.2233.4455**). You can configure up to 32 source addresses. To specify more than one address, include multiple ***mac-addresses*** in the **source-address-filter** statement.

Required Privilege Level

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

Related Documentation

- Understanding Ethernet Interfaces on page 255

access-point-name

Syntax

```
access-point-name apn;
```

Hierarchy Level

[edit interfaces *interface-name* cellular-options gsm-options profiles *profile-name*]

Release Information

Statement introduced in Junos OS Release 9.5.

Description

Configure the access point name (APN) provided by the service provider for connection to a Global System for Mobile Communications (GSM) cellular network.

Options

apn—Access point name.

Required Privilege Level

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

apply-groups

Syntax

```
apply-groups;
```

Hierarchy Level

[edit interfaces *interface-name* unit *logical-unit-number* radio-router]

Release Information

Statement introduced in Junos OS Release 9.6.
Statement modified in Junos OS Release 15.1.

Description

Apply the groups from which to inherit configuration data. If **radio-router** is set without any other attributes specified, the first four values become 100 and threshold stays at 10, and capacity, margin, and delay are deprecated. If **radio-router** is set, do not change the OSPF reference-bandwidth value because this generates an incorrect link cost.

Required Privilege Level

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

Related Documentation

- Configuring PPPoE-Based Radio-to-Router Protocols on page 458

arp-resp

Syntax

```
arp-resp (restricted|unrestricted);
```

Hierarchy Level

[edit interfaces *interfaces-name* unit *logical-unit-number*]

Release Information

Statement introduced in Junos OS Release 10.1.

Description

Configure Address Resolution Protocol (ARP) response on the interface.

Options

- **restricted**—Enable restricted proxy ARP response on the interface. This is the default.
- **unrestricted**—Enable unrestricted ARP response 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

- *Interfaces Feature Guide for Security Devices*

authentication-method (Interfaces)

Syntax

authentication-method (pap | chap | none);

Hierarchy Level

[edit interfaces *interface-name* **cellular-options gsm-options profiles** ***profile-name*****]**

Release Information

Statement introduced in Junos OS Release 9.5.

Description

Specify the authentication method for connection to a Global System for Mobile Communications (GSM) cellular network.

Options

- **pap**—Password Authentication Protocol.
- **chap**—Challenge Handshake Authentication Protocol.
- **none**—No authentication method is used.

Required Privilege Level

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

bandwidth (Interfaces)

Syntax

```
bandwidth bandwidth;
```

Hierarchy Level

```
[edit interfaces interface-name radio-router]
```

Release Information Statement introduced in Junos OS Release 10.1.

Description This option controls the weight of the current (vs. maximum) data rate (value 0–100).

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

Related Documentation
- PPPoE-Based Radio-to-Router Protocols Overview on page 455

bundle (Interfaces)

Syntax

```
bundle bundle-name;
```

Hierarchy Level

```
[edit interfaces interface-name unit logical-unit-number family mlppp ]
```

Release Information Statement introduced in Junos OS Release 9.5.

Description Specify the logical interface name the link joins.

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

Related Documentation
- Understanding Interfaces on page 3

cbr rate

Syntax

```
cbr rate;
```

Hierarchy Level

```
[edit interfaces interface-name atm-options vpi vpi-identifier shaping]
```

Release Information Command introduced in Release 9.5 of Junos OS.

Description For ATM encapsulation only, define a constant bit rate bandwidth utilization in the traffic-shaping profile.

Options

- CBR Value–Constant bandwidth utilization (range: 33,000 through 1,199,920)
- CDVT–Cell delay variation tolerance in microseconds (range: 1 through 9999)

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

Related Documentation

- *Junos OS Interfaces Configuration Guide for Security Devices*

cellular-options

Syntax

```
cellular-options {
  roaming-mode (home only | automatic)
  gsm-options {
    select-profile profile-name;
    profiles {
      profile-name {
        sip-user-id simple-ip-user-id;
        sip-password simple-ip-password;
        access-point-name apn;
        authentication-method (pap | chap | none);
      }
    }
  }
}
```

Hierarchy Level

```
[edit interfaces interface-name]
```

Release Information Statement introduced in Junos OS Release 9.5.

Description Configure options for connecting a 3G wireless modem interface to a cellular network.

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.

classifiers (CoS)

Syntax

```
classifiers {
  (dscp | dscp-ipv6 | exp | ieee-802.1 | ieee-802.1ad | inet-precedence) classifier-name {
    forwarding-class forwarding-class-name {
    loss-priority (high | low | medium-high | medium-low) {
      code-point alias-or-bit-string ;
    }
    import (default | user-defined;
  }
}
```

Hierarchy Level

```
[edit class-of-service]
```

Release Information Statement introduced in Junos OS Release 9.2

Description Configure a user-defined behavior aggregate (BA) classifier.

Options

- *classifier-name*—User-defined name for the classifier.
- import (default | *user-defined*)—Specify the template to use to map any code points not explicitly mapped in this configuration. For example, if the classifier is of type **dscp** and you specify **import default**, code points you do not map in your configuration will use the predefined DSCP default mapping; if you specify **import mymap**, for example, code points not mapped in the forwarding-class configuration would use the mappings in a user-defined classifier named **mymap**.
- forwarding-class *class-name*—Specify the name of the forwarding class. You can use the default forwarding class names or define new ones.
- loss-priority *level*—Specify a loss priority for this forwarding class: **high**, **low**, **medium-high**, **medium-low**.
- code-points (*alias* | *bits*)—Specify a code-point alias or the code points that map to this forwarding class.

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

Related Documentation

- Understanding Interfaces on page 3

client-identifier (Interfaces)

Syntax

```
client-identifier {
   (ascii string | hexadecimal string);
}
```

Hierarchy Level

[edit interfaces *interface-name* unit *logical-unit-number* family *family-name* dhcp]

Release Information

Statement introduced in Junos OS Release 9.2.

Description

Specify an ASCII or hexadecimal identifier for the Dynamic Host Configuration Protocol (DHCP) client. The DHCP server identifies a client by a client-identifier value.

Options

- **ascii** ***ascii*** —Identifier consisting of ASCII characters.
- **hexadecimal** ***hexadecimal*** —Identifier consisting of hexadecimal characters.

Required Privilege Level

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

Related Documentation

- Understanding Interfaces on page 3

code-points (CoS)

Syntax

```
code-points ([ aliases ] | [ bit-patterns ]);
```

Hierarchy Level

[edit class-of-service classifiers *type classifier-name* forwarding-class *class-name* loss-priority *level*]

Release Information

Statement introduced before Junos OS Release 7.4.
Statement introduced in Junos OS Release 9.2 for SRX Series devices.
Statement introduced in Junos OS Release 11.1 for the QFX Series.
Statement introduced in Junos OS Release 12.1X44 for the SRX Series.
Statement introduced in Junos OS Release 14.1X53-D20 for the OCX Series.
Statement introduced in Junos OS Release 14.2 for PTX Series Packet Transport Routers.

Description

Specify one or more DSCP code-point aliases or bit sets to apply to a forwarding class..

NOTE: OCX Series switches do not support MPLS, and therefore, do not support EXP code points or code point aliases.

Options

aliases—Name of the DSCP alias.

bit-patterns—Value of the code-point bits, in six-bit binary form.

Required Privilege Level

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

Related Documentation

- Understanding Interfaces on page 3
- *Understanding How Behavior Aggregate Classifiers Prioritize Trusted Traffic*
- *Example: Configuring Behavior Aggregate Classifiers*
- *Example: Configuring BA Classifiers on Transparent Mode Security Devices*

compression-device (Interfaces)

Syntax

```
compression-device name;
```

Hierarchy Level

```
[edit interfaces interface-name unit (Interfaces) logical-unit-number]
```

Release Information Statement introduced in Junos OS Release 9.2.

Description Specify the compression interface for voice services traffic.

Options *name*—Name of the AC.

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

Related Documentation

- Understanding Interfaces on page 3

credit (Interfaces)

Syntax

```
credit {
  interval number;
}
```

Hierarchy Level

```
[edit interfaces interface-name radio—router ]
```

Release Information Statement introduced in Junos OS Release 10.1.

Description This parameter controls credit-based scheduling parameters and includes an interval option to set the grant rate interval to a value between 1–60 seconds.

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

Related Documentation

- Understanding Interfaces on page 3

data-rate

Syntax data-rate *weight*;

Hierarchy Level [edit interfaces *interface-name* unit *logical-unit-number* radio-router]

Release Information Statement introduced in Release 10.2 of Junos OS .

Description Configure the weight of the resource factor when calculating an effective data rate.

Options ***weight***—Factor used to calculate data rate.

Range: 0 through 100

Default: 100

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

Related Documentation

- Configuring PPPoE-Based Radio-to-Router Protocols on page 458

disable (PoE)

Syntax

```
disable;
```

Hierarchy Level

[edit poe interface (all | *interface-name*)]
[edit poe interface (all | *interface-name*) telemetries]

Release Information

Statement introduced in Junos OS Release 9.5.

Description

Disables the PoE capabilities of the port. If PoE capabilities are disabled for a port, the port operates as a standard network access port. If the disable statement is specified after the telemetries statement, logging of PoE power consumption for the port is disabled. To disable monitoring and retain the stored interval and duration values for possible future use, you can specify the disable sub statement in the sub stanza for telemetries. Similarly for retaining the port configuration but disabling the PoE feature on the port, disable can be used in sub stanza for interface.

Default

The PoE capabilities are automatically enabled when a PoE interface is set. Specifying the telemetries statement enables monitoring of PoE per-port power consumption.

Required Privilege Level

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

Related Documentation

- Example: Disabling a PoE Interface on page 396

dhcp (Interfaces)

Syntax

```
dhcp {
  client-identifier {
    (ascii string | hexadecimal string);
  }
  lease-time (length | infinite);
  retransmission-attempt value;
  retransmission-interval seconds;
  server-address server-address;
  update-server;
  vendor-id vendor-id ;
}
```

Hierarchy Level

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

Release Information

Statement introduced in Junos OS Release 9.2.

Description

Configure the Dynamic Host Configuration Protocol (DHCP) client.

Options

The statements are explained separately.

Required Privilege Level

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

Related Documentation

- Understanding Interfaces on page 3

duration (PoE)

Syntax

duration *hours*;

Hierarchy Level

[edit poe interface (all | *interface-name*) telemetries]

Release Information

Statement introduced in Junos OS Release 9.5.

Description

Modifies the duration for which telemetry records are stored. If telemetry logging continues beyond the specified duration, the older records are discarded one by one as new records are collected.

Options

hours— Hours for which telemetry data should be retained.

Range: 1 through 24 hours

Default: 1 hour

Required Privilege Level

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

Related Documentation

- Example: Configuring PoE on All Interfaces on page 390

family inet (Interfaces)

Syntax

```
inet {
  accounting {
    destination-class-usage;
    source-class-usage {
      input;
      output;
    }
  }
  address (source–address/prefix) {
    arp destination-address {
      (mac mac-address | multicast-mac multicast-mac-address);
      publish publish-address;
    }
    broadcast address;
    preferred;
    primary;
    vrrp-group group-id {
      (accept-data | no-accept-data);
      advertise-interval seconds;
      advertisements-threshold number;
      authentication-key key-value;
      authentication-type (md5 | simple);
      fast-interval milliseconds;
      inet6-advertise-interval milliseconds
      (preempt <hold-time seconds> | no-preempt );
      priority value;
      track {
        interface interface-name {
          bandwidth-threshold bandwidth;
          priority-cost value;
        }
        priority-hold-time seconds;
        route route-address{
          routing-instance routing-instance;
          priority-cost value;
        }
      }
      virtual-address [address];
      virtual-link-local-address address;
      vrrp-inherit-from {
        active-group value;
        active-interface interface-name;
      }
    }
    web-authentication {
      http;
      https;
      redirect-to-https;
    }
  }
  dhcp {
```

```
    client-identifier {
        (ascii string | hexadecimal string);
    }
    lease-time (length | infinite);
    retransmission-attempt value;
    retransmission-interval seconds;
    server-address server-address;
    update-server;
    vendor-id vendor-id ;
}
dhcp-client {
    client-identifier {
        prefix {
            host-name;
            logical-system-name;
            routing-instance-name;
        }
        use-interface-description (device | logical);
        user-id (ascii string| hexadecimal string);
    }
    lease-time (length | infinite);
    retransmission-attempt value;
    retransmission-interval seconds;
    server-address server-address;
    update-server;
    vendor-id vendor-id ;
}
filter {
    group number;
    input filter-name;
    input-list [filter-name];
    output filter-name;
    output-list [filter-name];
}
mtu value;
no-neighbor-learn;
no-redirects;
policer {
    arp arp-name;
    input input-name;
    output output-name;
}
primary;
rpf-check {
    fail-filter filter-name;
    mode {
        loose;
    }
}
sampling {
    input;
    output;
    simple-filter;
}
targeted-broadcast {
```

```
    (forward-and-send-to-re |forward-only);
  }
  unnumbered-address {
    interface-name;
    preferred-source-address preferred-source-address;
  }
}
```

Hierarchy Level

```
[edit interfaces interface unit unit ]
```

Release Information Statement supported in Junos 10.2 for SRX Series devices.

Description Assign an IP address to a logical interface.

Options *ipaddress*—Specify the IP address for the interface. The remaining statements are explained separately.

NOTE: You use family **inet** to assign an IPv4 address. You use family **inet6** to assign an IPv6 address. An interface can be configured with both an IPv4 and IPv6 address.

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

Related Documentation
- Understanding Interfaces on page 3

family inet6

Syntax

```
inet6 {
  accounting {
    destination-class-usage;
    source-class-usage {
      input;
      ouput;
    }
  }
  address source–address/prefix {
    eui-64;
    ndp address {
      (mac mac-address | multicast-mac multicast-mac-address);
      publish;
    }
    preferred;
    primary;
    vrrp-inet6-group group_id {
      (accept-data | no-accept-data);
      advertisements-threshold number;
      authentication-key value;
      authentication-type (md5 | simple);
      fast-interval milliseconds;
      inet6-advertise-interval milliseconds;
      (preempt <hold-time seconds>| no-preempt );
      priority value;
      track {
        interface interface-name {
          bandwidth-threshold value;
          priority-cost value;
        }
        priority-hold-time seconds;
        route route-address{
          routing-instance routing-instance;
        }
      }
      virtual-inet6-address [address];
      virtual-link-local-address address;
      vrrp-inherit-from {
        active-group value;
        active-interface interface-name;
      }
    }
    web-authentication {
      http;
      https;
      redirect-to-https;
    }
  }
  (dad-disable | no-dad-disable);
  dhcpv6-client {
    client-ia-type (ia-na | ia-pd);
```

```
        client-identifier duid-type (duid-ll | duid-llt | vendor);
        client-type (autoconfig | stateful);
        rapid-commit;
        req-option (dns-server | domain | fqdn | nis-domain | nis-server | ntp-server | sip-domain
          | sip-server |time-zone | vendor-spec);
        retransmission-attempt number;
        update-router-advertisement {
          interface interface-name;
        }
        update-server;
      }
      filter {
        group number;
        input filter-name;
        input-list [filter-name];
        output filter-name;
        output-list [filter-name];
      }
      mtu value;
      nd6-stale-time seconds;
      no-neighbor-learn;
      policer {
        input input-name;
        output output-name;
      }
      rpf-check {
        fail-filter filter-name;
        mode {
          loose;
        }
      }
      sampling {
        input;
        output;
      }
      unnumbered-address {
        interface-name;
        preferred-source-address preferred-source-address;
      }
      ndp-proxy | dad-proxy {
        interface-restricted
        }
}
```

Hierarchy Level [edit interfaces *interface* unit *unit*]

Release Information Statement supported in Junos 10.2 for SRX Series devices.

Description Assign an IPV6 address to a logical interface.

Options *ipaddress*—Specify the IP address for the interface. The remaining statements are explained separately.

NOTE: You use family **inet6** to assign an IPv6 address. You use family **inet** to assign an IPv4 address. An interface can be configured with both an IPv4 and IPv6 address.

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

Related Documentation
- Understanding Interfaces on page 3

flag (Interfaces)

Syntax

```
flag
```

Hierarchy Level

```
[edit interfaces interface-name traceoptions]
```

Release Information Statement introduced in Junos OS Release 10.1.

Description Define tracing operations for individual interfaces. To specify more than one tracing operation, include multiple flag statements.

Options

- **all**—Enable all interface trace flags.
- **event** —Trace interface events.
- **cache**—Enable interface flags for Web filtering cache maintained on the routing table.
- **enhanced**—Enable interface flags for processing through Enhanced Web Filtering.
- **ipc**—Trace interface IPC messages.
- **media**—Trace interface media changes.
- **critical**—Trace critical events.
- **major**—Trace major events.

NOTE:

- MTU is limited to 1518 on this interface.
- Cache and enhanced options are applicable only to Enhanced Web Filtering.

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

Related Documentation

- Understanding Interfaces on page 3

flexible-vlan-tagging (Interfaces)

Syntax

```
flexible-vlan-tagging;
```

Hierarchy Level

```
[edit interfaces interface ]
```

Release Information Statement introduced in Junos OS Release 12.1X44-D10.

Description Simultaneously supports transmission of 802.1Q VLAN single-tag and dual-tag frames on logical interfaces on the same Ethernet port.

NOTE: The **flexible-vlan-tagging** is supported only with either no encapsulation or VPLS VLAN encapsulation.

Options **native-vlan-id**—Configures a VLAN identifier for single-tag frames, dual-tag frames, or a mixture of single-tag and dual-tag frames.

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

Related Documentation

- Configuring VLAN Tagging on page 45

flow-control (Interfaces)

Syntax

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

Hierarchy Level

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

Release Information Statement modified in Junos OS Release 9.2.

Description For Fast Ethernet, Gigabit Ethernet, and redundant Ethernet interfaces, flow control regulates the flow of packets from the device to the remote side of the connection.

Default Flow control is the default behavior for Fast Ethernet and Gigabit Ethernet interfaces. Flow control is disabled by default for redundant Ethernet interfaces

Required Privilege Level

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

Related Documentation

- Understanding Ethernet Interfaces on page 255

flow-monitoring (Services)

Syntax

```
flow-monitoring {
  version9 {
    template template-name {
      flow-active-timeout seconds;
      flow-inactive-timeout seconds;
      ipv4-template;
      ipv6-template;
      option-refresh-rate {
        packets packets;
        seconds seconds;
      }
      template-refresh-rate {
        packets packets;
        seconds seconds;
      }
    }
  }
}
```

Hierarchy Level

```
[edit services]
```

Release Information Statement introduced in Junos OS Release 10.4.

Description Configure flow monitoring.

Options **version9**—Version 9 configuration.

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

Related Documentation

- Understanding Interfaces on page 3

forwarding-classes (CoS)

Syntax

```
forwarding-classes {
  class class-name {
    priority (high | low);
    queue-num number;
    spu-priority (high | low | medium);
  }
  queue queue-number {
    class-name {
      priority (high | low);
    }
  }
}
```

Hierarchy Level

```
[edit class-of-service]
```

Release Information

Statement introduced in Junos OS Release 8.5. Statement updated in Junos OS Release 11.4. The **spu-priority** option introduced in Junos OS Release 11.4R2. Change from 2 to 4 queues was made in Junos OS Release 12.3X48-D40 and in Junos OS Release 15.1X49-D70. In Junos OS Release 19.1R1, **medium-high** and **medium-low** priorities for **spu-priority** are deprecated and **medium** priority is added.

Description

Command used to configure forwarding classes and assign queue numbers.

All traffic traversing the SRX Series device is passed to an SPC to have service processing applied. Junos OS provides a configuration option to enable packets with specific Differentiated Services (DiffServ) code points (DSCP) precedence bits to enter a high-priority queue or a medium-priority queue or low-priority queue on the SPC. The Services Processing Unit (SPU) draws packets from the highest priority queue first, then from the medium priority queue, last from the low priority queue. The processing of queue is weighted-based not strict-priority-based. This feature can reduce overall latency for real-time traffic, such as voice traffic.

Initially, the spu-priority queue options were "high" and "low". Then, these options (depending on the devices) were expanded to "high", "medium-high", "medium-low", and "low". The two middle options ("medium-high" and "medium-low") have now been deprecated (again, depending on the devices) and replaced with "medium". So, the available options for spu-priority queue are "high", "medium", and "low".

We recommend that the high-priority queue be selected for real-time and high-value traffic. The other options would be selected based on user judgement on the value or sensitivity of the traffic.

Options

- **class *class-name***—Display the forwarding class name assigned to the internal queue number.

NOTE: This option is supported only on SRX1500, SRX5400, SRX5600, and SRX5800.

NOTE: AppQoS forwarding classes must be different from those defined for interface-based rewriters.

- **priority**—Fabric priority value:
  - **high**—Forwarding class' fabric queuing has high priority.
  - **low**—Forwarding class' fabric queuing has low priority.

  The default **priority** is **low**.
- **queue queue-number**—Specify the internal queue number to which a forwarding class is assigned.
- **spu-priority**—Services Processing Unit (SPU) priority queue, **high**, **medium**, or **low**. The default **spu-priority** is **low**.

NOTE: The **spu-priority** option is supported only on SRX1500 devices and SRX5000 line devices.

Required Privilege Level

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

Related Documentation

- *Example: Configuring AppQoS*

fpc (Interfaces)

Syntax

```
fpc slot-number ;
```

Hierarchy Level

```
[edit interfaces pic-set pic-set-name]
```

Release Information Command introduced in Junos OS Release 9.6.

Description Sets the PIC bundle and the FPC slot.

The **pic-set** bundles all the PICs and corresponding logical interfaces. A PIC can only join only one pic-bundle, and cannot join multiple pic-bundles at same time. When the **pic-set** configuration changes, all the logical interfaces related to the PIC should be synchronized to all member IOC.

Options

- ***apply-groups***—Inherit configuration data from these groups.
- ***apply-groups-except***—Do not inherit configuration data from these groups.

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

Related Documentation

- Understanding Interfaces on page 3
- **interface (PIC Bundle) on page 681**

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 before Junos OS Release 7.4.
Statement introduced in Junos OS Release 9.0 in EX Series switches.
Statement introduced in Junos OS Release 12.2 for ACX Series Universal Metro Routers.

Description

For Ethernet interfaces, enable updating of the Address Resolution Protocol (ARP) cache for gratuitous ARPs.

Default

Updating of the ARP cache is disabled on all 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 Gratuitous ARP*
- *no-gratuitous-arp-request*

gsm-options

Syntax

```
gsm-options {
  select-profile profile-name;
  profiles {
    profile-name {
      sip-user-id simple-ip-user-id;
      sip-password simple-ip-password;
      access-point-name apn;
      authentication-method (pap | chap | none);
    }
  }
}
```

Hierarchy Level

```
[edit interfaces interface-name cellular-options]
```

Release Information Statement introduced in Junos OS Release 9.5.

Description Configure the 3G wireless modem interface to establish a data call with a Global System for Mobile Communications (GSM) cellular network.

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.

guard-band (PoE)

Syntax

```
guard-band watts;
```

Hierarchy Level

```
[edit poe]
```

Release Information Statement introduced in Junos OS Release 9.5.

Description Reserves the specified amount of power for the SRX Series device in case of a spike in PoE consumption.

Options ***watts***—Amount of power to be reserved for the SRX Series device in case of a spike in PoE consumption.

Range: 0 through 19 W

Default: 0 W

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

Related Documentation

- Understanding Power over Ethernet on page 387

hold-time (Redundant Ethernet Interfaces)

Syntax

```
hold-time (up | down) timer
```

Hierarchy Level

```
[edit interfaces interface-name ]
```

Release Information

Statement introduced in Junos OS Release 18.4R1 for the SRX Series.

Description

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 for a parent RETH interface and the primary child interface goes from up to down, the down hold-time timer is triggered. Every interface transition that occurs during the down hold-time is ignored. When the timer expires and the primary child interface state is still down, then the router begins to advertise the parent RETH interface as being down. Similarly, when a hold-up timer is configured for a parent RETH interface and the primary child interface goes from down to up, the up hold-time timer is triggered. Every interface transition that occurs during the up hold-time is ignored. When the timer expires and the primary child interface state is still up, then the router begins to advertise the parent RETH interface as being up.

The hold timer (both up and down) improves the flexibility and resilience of SRX devices. Specify the *timer* value in seconds to reduce unnecessary loss of traffic and downtime.

NOTE: **Starting in Junos OS release 18.4R1, all SRX devices have default delay timer of 11 seconds for both up hold-time and down hold-time.**

Options

down *seconds*—Hold time to use when an interface transitions from up to down.

up *seconds*—Hold time to use when an interface transitions from down to up.

Required Privilege Level

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

Related topics

[Warning: element unresolved in stylesheets: <title> (in <related-topics>). This is probably a new element that is not yet supported in the stylesheets.]
Related topics

- *Physical Interface Damping Overview*
- *hold-time*

hub-assist

Syntax

```
hub-assist weight;
```

Hierarchy Level

```
[edit interfaces interface-name unit logical-unit-number radio-router]
```

Release Information Statement introduced in Junos OS Release 10.2.

Description Configure the weight of the resource factor when calculating an effective interface bandwidth.

Options ***weight***—Factor used to calculate interface bandwidth.

Range: 0 through 100

Default: 100

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

Related Documentation

- Configuring PPPoE-Based Radio-to-Router Protocols on page 458

inline-jflow (Forwarding Options)

Syntax

```
inline-jflow {
   flow-export-rate number;
   source-address ip-address;
}
```

Hierarchy Level

```
[edit forwarding-options sampling instance instance- name family inet output]
[edit forwarding-options sampling instance instance- name family inet6 output]
```

Release Information Statement introduced in Junos OS Release 10.4. Support for family inet6 added in Junos OS Release 12.1X45-D10.

Description Specify Inline processing of sampled packets.

Options

- **flow-export-rate *value***—Flow export rate of monitored packets in kpps. The range is from 1 through 400.
- **source-address *address***—Address to use for generating monitored packets.

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

Related Documentation

- Understanding Interfaces on page 3

interface (PIC Bundle)

Syntax

interface *interface-name*;

Hierarchy Level

[edit interfaces pic-set pic-set-name]

Release Information

Command introduced in Junos OS Release 9.6.

Description

Sets the PIC bundle and the interface.

Options

- ***apply-groups***– Groups from which to inherit configuration data.
- ***apply-groups-except***– Do not inherit configuration data from these groups.

Required Privilege Level

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

Related Documentation

- Understanding Interfaces on page 3

interface (PoE)

Syntax

```
interface (all | interface-name) {
  disable;
  maximum-power watts;
  priority (high | low);
  telemetries {
    disable;
    duration hours;
    interval minutes;
  }
}
```

Hierarchy Level

```
[edit poe]
```

Release Information Statement introduced in Junos OS Release 9.5.

Description Enable a PoE interface for a PoE port. The PoE interface must be enabled in order for the port to provide power to a connected powered device.

Default The PoE interface is enabled by default

Options

- **all**— Apply the configuration to all interfaces on the SRX Series device that have not been explicitly configured otherwise.
- **interface-name**— Explicitly configure a specific 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

- Understanding Power over Ethernet on page 387

interfaces (CoS)

Syntax

```
interfaces
  interface-name {
    input-scheduler-map map-name ;
    input-shaping-rate rate ;
    scheduler-map  map-name ;
    scheduler-map-chassis  map-name  ;
    shaping-rate rate ;
    unit  logical-unit-number  {
      adaptive-shaper  adaptive-shaper-name  ;
      classifiers {
        (dscp | dscp-ipv6 | exp | ieee-802.1 | inet-precedence)
        ( classifier-name  | default);
      }
      forwarding-class  class-name  ;
      fragmentation-map map-name ;
      input-scheduler-map map-name  ;
      input-shaping-rate (percent  percentage  |  rate  );
      input-traffic-control-profile  profiler-name  shared-instance  instance-name  ;
      loss-priority-maps {
        default;
        map-name ;
      }
      output-traffic-control-profile  profile-name  shared-instance  instance-name  ;
      rewrite-rules {
        dscp ( rewrite-name  | default);
        dscp-ipv6 ( rewrite-name  | default);
        exp ( rewrite-name  | default) protocol  protocol-types  ;
        frame-relay-de ( rewrite-name  | default);
        inet-precedence ( rewrite-name  | default);
      }
      scheduler-map map-name ;
      shaping-rate rate  ;
      virtual-channel-group group-name  ;
    }
  }
}
```

Hierarchy Level [edit class-of-service interface *interface-name* unit *number*]

Release Information Statement introduced in Junos OS Release 8.5.

Description Associate the class-of-service configuration elements with an interface.

Options interface *interface-name* unit *number*—The user-specified interface name and unit number.

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

Related Documentation

- *Class of Service Feature Guide (Security Devices)*

interval (Interfaces)

Syntax

```
interval seconds;
```

Hierarchy Level

```
[edit interfaces interface-name unit logical-unit-number radio-router credit]
```

Release Information

Statement introduced in Release 10.1 of Junos OS.

Description

Configure the frequency that the router generates credit announcement messages.

Options

seconds—Interval between PADG credit announcements for each session.

Range: 0 through 60

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 PPPoE-Based Radio-to-Router Protocols on page 458

interval (PoE)

Syntax

```
interval minutes;
```

Hierarchy Level

```
[edit poe interface (all | interface-name) telemetries]
```

Release Information Statement introduced in Junos OS Release 9.5.

Description Modifies the interval for logging telemetries if you are monitoring the per-port power consumption for PoE interfaces.

Options *minutes*—Interval at which data is logged.

Range: 1 through 30 minutes

Default: 5 minutes

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

Related Documentation

- Understanding Interfaces on page 3

ipv4-template (Services)

Syntax

```
ipv4-template;
```

Hierarchy Level

```
[edit services flow-monitoring version9 template template-name]
```

Release Information Statement introduced in Junos OS Release 10.4.

Description Specify that the flow monitoring version 9 template is used only for IPv4 records.

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

Related Documentation

- *Understanding Traffic Processing on Security Devices*
- Understanding Interfaces on page 3

ipv6-template (Services)

Syntax

```
ipv6-template;
```

Hierarchy Level

[edit services flow-monitoring version9 template *template-name*]

Release Information Statement introduced in Junos OS Release 12.1X45-D10.

Description Specify that the flow monitoring version 9 template is used only for IPv6 records.

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

Related Documentation

- *Understanding Traffic Processing on Security Devices*
- Understanding Interfaces on page 3

lacp (Interfaces)

Syntax

```
lacp {
   (active | passive);
   periodic;
}
```

Hierarchy Level

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

Release Information

Statement introduced in Junos OS Release 10.2.

Description

For redundant Ethernet interfaces in a chassis cluster only, configure Link Aggregation Control Protocol (LACP).

Options

- **active**—Initiate transmission of LACP packets.
- **passive**—Respond to LACP packets.
- **periodic**—Interval for periodic transmission of LACP packets.

Default: If you do not specify **lacp** as either **active** or **passive**, LACP remains off (the default).

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 LACP on Standalone Devices on page 291
- **periodic (Interfaces) on page 706**

latency (Interfaces)

Syntax

```
latency number;
```

Hierarchy Level

```
[edit interfaces interface-name unit logical-unit-number radio—router ]
```

Release Information Statement introduced in Junos OS Release 10.1.

Description This option controls the latency weight (value 0–100).

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

Related Documentation
- PPPoE-Based Radio-to-Router Protocols Overview on page 455

lease-time

Syntax

lease-time (*length* | infinite);

Hierarchy Level

[edit interfaces *interface-name* unit *logical-unit-number* family inet dhcp]

Release Information

Statement introduced in Junos OS Release 9.0 for EX Series switches.
Statement introduced in Junos OS Release 9.2 for SRX Series devices.
Statement introduced in Junos OS Release 14.1X53-D20 for the OCX Series.

Description

Request a specific lease time for the IP address. The lease time is the length of time in seconds that a client holds the lease for an IP address assigned by a DHCP server.

Default

If no lease time is requested by client, then the server sends the lease time. The default lease time on a Junos OS DHCP server is one day.

Options

seconds —Request a lease time of a specific duration.

Range: 60 through 2147483647 seconds

infinite—Request that the lease never expire.

Required Privilege Level

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

Related Documentation

- *Configuring a DHCP Client (CLI Procedure)*
- *interfaces*
- *unit*
- *family*

line-rate (Interfaces)

Syntax

```
line-rate
```

Hierarchy Level

[edit interfaces *interfaces name* shdsl-options]

Release Information Command introduced in Junos OS Release 10.0.

Description Specify a line rate for an G.SHDSL interface.

Options

- **auto**— Automatically selects a line rate.
- **value** — Select the values between 192 kbps and 22784 kbps for the speed of transmission of data on the G.SHDSL connection.

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

Related Documentation

- *Example: Configuring the G.SHDSL Interface on SRX Series Devices*

link-speed (Interfaces)

Syntax

link-speed *speed*;

Hierarchy Level

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

Release Information Statement modified in Release 9.0 of Junos OS.

Description For redundant Ethernet interfaces in a chassis cluster only, set the required link speed.

Options

speed —For redundant 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).

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

Related Documentation

- *Junos OS Interfaces Configuration Guide for Security Devices*

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 on page 3

loss-priority (CoS Loss Priority)

Syntax

```
loss-priority level code-points [values ];
```

Hierarchy Level

```
[edit class-of-service loss-priority-maps frame-relay-de map-name]
```

Release Information Statement introduced in Junos OS Release 9.2.

Description Map CoS values to a packet loss priority (PLP). In Junos OS, classifiers associate incoming packets with a forwarding class (FC) and PLP. PLPs allow you to set the priority for dropping packets. Typically, you mark packets exceeding some service level with a high loss priority—that is, a greater likelihood of being dropped.

Options *level* can be one of the following:

- **high**—Packet has high loss priority.
- **medium-high**—Packet has medium-high loss priority.
- **medium-low**—Packet has medium-low loss priority.
- **low**—Packet has low loss priority.

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

Related Documentation

- Understanding Interfaces on page 3
- *Understanding Packet Loss Priorities*

loss-priority (CoS Rewrite Rules)

Syntax

```
loss-priority level;
```

Hierarchy Level

```
[edit class-of-service rewrite-rules type rewrite-name forwarding-class class-name]
```

Release Information Statement introduced in Junos OS Release 9.2.

Description Specify a loss priority to which to apply a rewrite rule. The rewrite rule sets the code-point aliases and bit patterns for a specific forwarding class and packet loss priority (PLP). The inputs for the map are the forwarding class and the PLP. The output of the map is the code-point alias or bit pattern.

Options *level* can be one of the following:

- **high**—The rewrite rule applies to packets with high loss priority.
- **low**—The rewrite rule applies to packets with low loss priority.
- **medium-high**—The rewrite rule applies to packets with medium-high loss priority.
- **medium-low**—The rewrite rule applies to packets with medium-low loss priority.

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

Related Documentation

- *Class of Service Feature Guide (Security Devices)*

loss-priority-maps (CoS Interfaces)

Syntax

```
loss-priority-maps {
  frame-relay-de (map-name | default);
}
```

Hierarchy Level

[edit class-of-service interfaces *interface-name* unit *logical-unit-number*]

Release Information

Statement introduced in Junos OS Release 9.2.

Description

Assign the loss priority map to a logical interface.

Options

- **default**—Apply default loss priority map. The default map contains the following:

  ```
  loss-priority low code-point 0;
  loss-priority high code-point 1;
  ```

- ***map-name***—Name of loss priority map to be applied.

Required Privilege Level

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

Related Documentation

- Understanding Interfaces on page 3

loss-priority-maps (CoS)

Syntax

```
loss-priority-maps {
   frame-relay-de loss-priority-map-name {
      loss-priority (high | low | medium-high | medium-low) {
         code-points [bit-string];
      }
   }
}
```

Hierarchy Level

```
[edit class-of-service]
```

Release Information Statement introduced in Junos OS Release 9.2.

Description Map the loss priority of incoming packets based on CoS values.

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

Related Documentation

- Understanding Interfaces on page 3

management (PoE)

Syntax

```
management (class | static);
```

Hierarchy Level

```
[edit poe]
```

Release Information Statement introduced in Junos OS Release 9.5.

Description Designates how the SRX Series device allocates power to the PoE ports.

Default static

Options

- **static**—When a powered device is connected to a PoE port, the power allocated to it is equal to the maximum power configured for the port.
- **class**—When a powered device is connected to a PoE port, the power allocated to it is equal to the maximum power for the class as defined by the IEEE 802.3 AF standard.

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

Related Documentation

- Example: Configuring PoE on All Interfaces on page 390

maximum-power (PoE)

Syntax

```
maximum-power watts;
```

Hierarchy Level

```
[edit poe interface (all | interface-name)]
```

Release Information Statement introduced in Junos OS Release 9.5.

Description Maximum amount of power that can be supplied to the port.

Default 15.4 W

Options **Watts**—The maximum number of watts that can be supplied to the port.

Range —0 through 15.4

Default—15.4 W

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

Related Documentation

- Example: Configuring PoE on All Interfaces on page 390

media-type (Interfaces)

Syntax

```
media-type
```

Hierarchy Level

[edit interfaces *interface-name* media-type]

Release Information Command introduced in Junos OS Release 10.2.

Description Configure the operating modes for the 2-Port 10 Gigabit Ethernet XPIM.

Options

- copper
- fiber

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

Related Documentation

- Understanding Interfaces on page 3

minimum-links (Interfaces)

Syntax

```
minimum-links number;
```

Hierarchy Level

```
[edit interfaces interface-name redundant-ether-options]
```

Release Information

Statement added in Release 10.1 of Junos OS.

Description

For redundant Ethernet interfaces configured as 802.3ad redundant Ethernet interface link aggregation groups (LAGs) in a chassis cluster only, set the required minimum number of physical child links on the primary node that must be working to prevent the interface from being down. Interfaces configured as redundant Ethernet interface LAGs typically have between 4 and 16 physical interfaces, but only half, those on the primary node, are relevant to the minimum-links setting.

If the number of operating interfaces on the primary node falls below the configured value, it will cause the interface to be down even if some of the interfaces are still working.

Options

number—For redundant Ethernet interface link aggregation group links, specify the number of physical child links on the primary node in the redundant Ethernet interface that must be working. The default **minimum-links** value is 1. The maximum value is half of the total number of physical child interfaces bound to the redundant Ethernet interface being configured or 8, whichever is smaller.

Required Privilege Level

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

Related Documentation

- *Junos OS Interfaces Configuration Guide for Security Devices*

mtu

Syntax

```
mtu bytes;
```

Hierarchy Level

[edit interfaces *interface-name*],
[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.

Description Maximum transmission unit (MTU) size for the media or protocol. The default MTU size depends on the device type. Not all devices allow you to set an MTU value, and some devices have restrictions on the range of allowable MTU values.

Options ***bytes***—MTU size.

Range: 0 through 5012 bytes

Default: 1500 bytes (**inet**, **inet6**, and **iso** families), 1448 bytes (**mpls**)

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

Related Documentation

- *Configuring MRRU on Multilink and Link Services Logical Interfaces*
- *Junos OS Network Interfaces Library for Routing Devices*

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*
- Understanding Interfaces on page 3
- *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*
- *Junos OS Network Interfaces Configuration Guide*

next-hop-tunnel

Syntax

```
next-hop-tunnel gateway-address ipsec-vpn vpn-name;
```

Hierarchy Level

```
[edit interfaces interface-name unit logical-unit-number family family-name]
```

Release Information Statement introduced in Junos OS Release 9.5.

Description For the secure tunnel (**st**) interface, create entries in the Next-Hop Tunnel Binding (NHTB) table, which is used to map the next-hop gateway IP address to a particular IP Security (IPsec) Virtual Private Network (VPN) tunnel. NHTB allows the binding of multiple IPsec VPN tunnels to a single IPsec tunnel interface.

Options

- ***gateway-address***—Next-hop gateway IP address.
- **ipsec-vpn** ***vpn-name*** —VPN to which the next-hop gateway IP address is mapped.

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

Related Documentation

- Understanding Interfaces on page 3

no-dns-propagation

Syntax

```
no-dns-propagation;
```

Hierarchy Level

[edit interface *interface-name* unit *unit-number* family *inet* | *inet6 dhcp-client*]

Release Information

Statement introduced in Junos OS Release 12.1X47-D35.

Description

Disable the propagation of DNS information to the kernel.

Required Privilege Level

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

Related Documentation

- Understanding Interfaces on page 3

option-refresh-rate (Services)

Syntax

```
option-refresh-rate
```

Hierarchy Level

[edit services flow-monitoring version9 template *template-name*]

Release Information

Statement introduced in Junos OS Release 10.4.

Description

Specify the option refresh rate.

Options

- **packets**—Specify the number of packets. The range is from 1 through 480,000.
- **seconds**—Specify the number of seconds. The range is from 10 through 600.

Required Privilege Level

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

Related Documentation

- *Configuring Flow Aggregation to Use Version 9 Flow Templates*

pic-mode (Chassis T1 Mode)

Syntax

```
pic-mode (clear-channel);
```

Hierarchy Level

[edit chassis fpc *slot-number* pic *pic-number* ethernet]

Release Information Statement added in Junos OS Release 10.2.

Description Configure normal T1 mode or channelized T1 mode.

Options

- **clear-channel**—(default) Normal T1 mode.
- **ct1**—Channelized T1 mode.

NOTE: When chassis clustering is enabled, it is necessary to indicate in the command which node is being configured. In such circumstances, the **edit chassis fpc** command becomes **edit chassis node *node-id* fpc**.

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

Related Documentation

- Understanding Interfaces on page 3

periodic (Interfaces)

Syntax

periodic (fast | slow);

Hierarchy Level

[edit interfaces *interface-name* redundant-ether-options lacp]

Release Information

Statement introduced in Junos OS Release 10.2.

Description

For redundant Ethernet interfaces in a chassis cluster only, configure the interval at which the interfaces on the remote side of the link transmit link aggregation control protocol data units (PDUs) by configuring the **periodic** statement on the interfaces on the local side. It is the configuration on the local side that specifies the behavior of the remote side. That is, the remote side transmits link aggregation control PDUs at the specified interval.

Options

- **fast**—Transmit link aggregation control PDUs every second.
- **slow**—Transmit link aggregation control PDUs 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

- Understanding Ethernet Interfaces on page 255

ppp-over-ether

Syntax

```
ppp-over-ether;
```

Hierarchy Level

[edit interfaces *interface-name* unit *logical-unit-number encapsulation*]

Release Information

Statement introduced before Junos OS Release 11.2.
This encapsulation is supported for Redundant Ethernet interface in Junos OS Release 11.2.

Description

This encapsulation is used for underlying interfaces of pp0 interfaces. This encapsulation is supported on Fast Ethernet interface, Gigabit Ethernet interface, and Redundant Ethernet interface. When Redundant Ethernet interface is used as underlying interface, an existing pppoe session can be continued in case of failover.

Required Privilege Level

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

Related Documentation

- Understanding Ethernet Interfaces on page 255

pppoe

Syntax

```
pppoe {
  command binary-file-path;
  disable;
  failover (alternate-media | other-routing-engine);
}
```

Hierarchy Level

```
[edit system processes]
```

Release Information Statement introduced in Junos OS Release 9.2.

Description Enable users to connect to a network of hosts over a bridge or access concentrator.

Options

- **command *binary-file-path***—Path to the binary process.
- **disable**—Disable the Point-to-Point Protocol over Ethernet process.
- **failover**—Configure the device to reboot if the software process fails four times within 30 seconds, and specify the software to use during the reboot.
  - **alternate-media**—Configure the device to switch to backup media that contains a version of the system if a software process fails repeatedly.
  - **other-routing-engine**—Instruct the secondary Routing Engine to take mastership if a software process fails. If this statement is configured for a process, and that process fails four times within 30 seconds, then the device reboots from the secondary Routing Engine.

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

Related Documentation

- Understanding Ethernet Interfaces on page 255

pppoe-options

Syntax

```
pppoe-options {
  access-concentrator name ;
  auto-reconnect seconds;
  (client | server);
  ignore-eol-tag;
  service-name name;
  underlying-interface interface-name;
}
```

Hierarchy Level

```
[edit interfaces pp0 unit logical-unit-number],
[edit logical-systems logical-system-name interfaces pp0 unit logical-unit-number]
```

Release Information Statement modified in Junos OS Release 12.3X48 to include **ignore-eol-tag** statement.

Description Configure PPP over Ethernet-specific interface properties.

Options

access-concentrator *name*—(SRX Series devices with Point-to-Point Protocol over Ethernet (PPPoE) interfaces) Configure the name of the access concentrator. If you configure a specific access concentrator name on the client and the same access concentrator name server is available, then a PPPoE session is established. If there is a mismatch between the access concentrator names of the client and the server, the PPPoE session gets closed.

auto-reconnect *seconds*—Configure the amount of time to wait before reconnecting after a session has terminated.

client —Configure the device to operate in the PPPoE client mode.

idle-timeout *seconds*—Configure the maximum time that a session can be idle.

ignore-eol-tag—Disable the **End-of-List** tag to process the tags after the **End-of-List** tag in a PPPoE Active Discovery Offer (PADO) packet.

service-name *name*—Configure the service to be requested from the PPP over Ethernet server; that is, the access concentrator. For example, you can use this statement to indicate an Internet service provider (ISP) name or a class of service.

server—Configure the device to operate in the PPPoE server mode.

underlying-interface *interface-name*—Configure the interface on which PPP over Ethernet is running.

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

Related Documentation

- Example: Configuring PPPoE Interfaces on page 433

priority (PoE)

Syntax

```
priority (high | low);
```

Hierarchy Level

[edit poe interface (all | *interface-name*)]

Release Information

Statement introduced in Junos OS Release 9.5.

Description

Sets the priority of individual ports. When it is not possible to maintain power to all connected ports, lower-priority ports are powered off before higher priority ports. When a new device is connected on a higher-priority port, a lower-priority port will be powered off automatically if available power is insufficient to power on the higher-priority port. Note that for ports with the same priority configuration, ports on the left are given higher priority than the ports on the right.

Default

low

Options

value—high or low:

- **high**—Specify that this port is to be treated as high priority in terms of power allocation
- **low**—Specify that this port is to be treated as low priority in terms of power allocation.

Required Privilege Level

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

Related Documentation

- Example: Configuring PoE on All Interfaces on page 390

profile (Access)

Syntax

```
profile profile-name {
  accounting {
    accounting-stop-on-access-deny;
    accounting-stop-on-failure;
    coa-immediate-update;
    duplication;
    immediate-update;
    order [accounting-method];
    statistics (time | volume-time);
    update-interval minutes;
  }
  accounting-order [accounting-method];
  address-assignment pool pool-name;
  authentication-order [ldap | none | password | securid];
  authorization-order [jsrc];
  client client-name {
    chap-secret chap-secret;
    client-group [ group-names ];
    firewall-user {
      password password;
    }
    no-rfc2486;
    pap-password pap-password;
    x-auth ip-address;
  }
  client-name-filter {
    count number;
    domain-name domain-name;
    separator special-character;
  }
  ldap-options {
    assemble {
      common-name common-name;
    }
    base-distinguished-name base-distinguished-name;
    revert-interval seconds;
    search {
      admin-search {
        distinguished-name distinguished-name;
        password password;
      }
      search-filter search-filter-name;
    }
  }
  ldap-server server-address {
    port port-number;
    retry attempts;
    routing-instance routing-instance-name;
    source-address source-address;
    timeout seconds;
  }
```

```
  provisioning-order (gx-plus | jsrc);
  service {
    accounting-order {
      activation-protocol;
      radius;
    }
  }
  session-options {
    client-group [group-name];
    client-idle-timeout minutes;
    client-session-timeout minutes;
  }
}
```

Hierarchy Level [edit access]

Release Information Statement introduced in Junos OS Release 10.4.

Description Create a profile containing a set of attributes that define device management access.

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

Related Documentation

- Understanding Interfaces on page 3
- *Understanding User Authentication for Security Devices*
- *Ethernet Switching and Layer 2 Transparent Mode Overview*

profiles

Syntax

```
profiles {
  profile-name {
    sip-user-id simple-ip-user-id;
    sip-password simple-ip-password;
    access-point-name apn;
    authentication-method (pap | chap | none);
  }
}
```

Hierarchy Level

```
[edit interfaces interface-name cellular-options gsm-options]
```

Release Information Statement introduced in Junos OS Release 9.5.

Description Configure a profile to establish a data call with a Global System for Mobile Communications (GSM) cellular network. You can configure up to 16 profiles.

Options ***profile-name***—Name of the profile.

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 Ethernet Interfaces on page 255

promiscuous-mode (Interfaces)

Syntax

```
promiscuous-mode;
```

Hierarchy Level

[edit interfaces *interface-name*]

Release Information

Statement introduced in Junos OS Release 10.1.

Description

Enable promiscuous mode on Layer 3 Ethernet interfaces. When promiscuous mode is enabled on an interface, all packets received on the interface are sent to the central point or Services Processing Unit regardless of the destination MAC address of the packet.

You can also enable promiscuous mode on chassis cluster redundant Ethernet interfaces and on aggregated Ethernet interfaces. If you enable promiscuous mode on a redundant Ethernet interface, promiscuous mode is then enabled on any child physical interfaces. If you enable promiscuous mode on an aggregated Ethernet interface, promiscuous mode is then enabled on all member interfaces.

Required Privilege Level

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

Related Documentation

- Enabling and Disabling Promiscuous Mode on Ethernet Interfaces (CLI Procedure) on page 267

quality (Interfaces)

Syntax

```
quality <value>;
```

Hierarchy Level

[edit interfaces *interface-name* unit *logical-unit-number* radio—router]

Release Information

Statement introduced in Junos OS Release 10.1.

Description

This option controls relative link quality weight (value 0–100).

Required Privilege Level

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

Related Documentation

- PPPoE-Based Radio-to-Router Protocols Overview on page 455

r2cp

Syntax

```
r2cp {
  command binary-file-path;
  disable;
}
```

Hierarchy Level

```
[edit system processes]
```

Release Information Statement introduced in Junos OS Release 9.2.

Description Specify the Radio-to-Router Control Protocol (R2CP) used to exchange dynamic metric changes in the network that routers use to update the OSPF topologies.

Options

- **command** ***binary-file-path***—Path to the binary process.
- **disable**—Disable the Radio-to-Router Control Protocol process.

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

Related Documentation

- PPPoE-Based Radio-to-Router Protocols Overview on page 455

radio-router (Interfaces)

Syntax

```
radio-router {
  bandwidth number;
  credit {
    interval number;
  }
  data-rate number;
  latency number;
  quality number;
  resource number;
  threshold number;
}
```

Hierarchy Level

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

Release Information

Statement introduced in Junos OS Release 10.1.

Description

Point-to-Point Protocol over Ethernet (PPPoE)-based radio-to-router protocols include messages that define how an external system will provide the device with timely information about the quality of a link's connection. They also include a flow control mechanism to indicate how much data the device can forward. The device can then use the information provided in the PPPoE messages to dynamically adjust the interface speed of PPP links.

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

- PPPoE-Based Radio-to-Router Protocols Overview on page 455

redundancy-group (Interfaces)

Syntax

```
redundancy-group number ;
```

Hierarchy Level

```
[edit interfaces interface-name redundant-ether-options]
```

Release Information Statement introduced in Junos OS Release 9.0.

Description Specify the redundancy group that a redundant Ethernet interface belongs to.

Options ***number*** —Number of the redundancy group that the redundant interface belongs to. Failover properties of the interface are inherited from the redundancy group.

Range: 1 through 255

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

Related Documentation

- Interfaces Feature Guide for Security Devices

redundant-ether-options

Syntax

```
redundant-ether-options {
   (flow-control | no-flow-control);
   lacp {
      (active | passive);
      periodic (fast | slow);
   }
   link-speed speed;
   (loopback | no-loopback);
   minimum-links number;
   redundancy-group number;
   source-address-filter mac-address;
   (source-filtering | no-source-filtering);
}
```

Hierarchy Level

[edit interfaces *interface-name*]

Release Information

Statement introduced in Junos OS Release 9.2.

Description

Configure Ethernet redundancy options for a chassis cluster.

In a chassis cluster setup, a redundant Ethernet interface is a pseudointerface that includes at minimum one physical interface from each node of the cluster.

A reth is a special type of interface that has the characteristics of aggregated Ethernet interface.

Options

flow-control—Enable flow control.

link-speed—Link speed of individual interface that joins the reth interface.

Values:

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

loopback—Enable loopback.

minimum-links—Minimum number of active links.

Default: 1

Range: 1-8

no-flow-control—Do not enable flow control.

no-loopback—Do not enable loopback.

no-source-filtering—Do not enable source address filtering.

redundancy-group—Redundancy group of this interface.

Range: 1-128

source-filtering—Enable source address filtering.

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

Related Documentation

- *Example: Enabling Eight-Queue Class of Service on Redundant Ethernet Interfaces on SRX Series Devices in a Chassis Cluster*
- *Example: Configuring Chassis Cluster Redundant Ethernet Interfaces*

redundant-parent (Interfaces Fast Ethernet)

Syntax

```
redundant-parent interface-name;
```

Hierarchy Level

```
[edit interfaces interface-name fastether-options]
```

Release Information Statement introduced in Junos OS Release 9.2.

Description Configure Fast Ethernet-specific interface properties for Ethernet redundancy in a chassis cluster.

Options ***interface*** —Parent redundant interface of the Fast Ethernet interface.

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

Related Documentation

- Understanding Ethernet Interfaces on page 255

redundant-parent (Interfaces Gigabit Ethernet)

Syntax

```
redundant-parent interface-name;
```

Hierarchy Level

```
[edit interfaces interface-name gigether-options]
```

Release Information Statement introduced in Release 9.0 of Junos OS.

Description Configure Gigabit Ethernet-specific interface properties for Ethernet redundancy in a chassis cluster.

Options ***interface*** —Parent redundant interface of the Gigabit Ethernet interface.

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

Related Documentation

- *Junos OS Interfaces Configuration Guide for Security Devices*

request pppoe connect

Syntax

```
request pppoe connect
```

Release Information

Statement supported on SRX300, SRX320, SRX340, and SRX345 is introduced in Junos OS Release 15.1X49-D60.
Statement supported on SRX1500 and vSRX instances is introduced in Junos OS Release 15.1X49-D100.

Description

Connect all sessions that are down.

Options

pppoe interface name— (Optional) Connect to a specified session.

Required Privilege Level

maintenance

Related Documentation

- Understanding PPPoE Interfaces on page 432
- Example: Configuring PPPoE Interfaces on page 433

List of Sample Output

request pppoe connect on page 721

Output Fields

When you enter this command, this command returns no output.

Sample Output

request pppoe connect

```
user@host> request pppoe connect
```

request pppoe disconnect

Syntax

```
request pppoe disconnect
```

Release Information

Statement supported on SRX300, SRX320, SRX340, and SRX345 is introduced in Junos OS Release 15.1X49-D60.
Statement supported on SRX1500 and vSRX instances is introduced in Junos OS Release 15.1X49-D100.

Description

Disconnect all active sessions.

Options

session id — (Optional) Disconnect the session for which the session ID is specified.

pppoe interface name— (Optional) Disconnect the session for a specific pppoe interface name.

Required Privilege Level

maintenance

Related Documentation

- Understanding PPPoE Interfaces on page 432
- Example: Configuring PPPoE Interfaces on page 433

List of Sample Output

request pppoe disconnect on page 722

Output Fields

When you enter this command, this command returns no output.

Sample Output

request pppoe disconnect

```
user@host> request pppoe disconnect
```

resource (Interfaces)

Syntax

```
resource number;
```

Hierarchy Level

```
[edit interfaces interface-name radio—router ]
```

Release Information Statement introduced in Junos OS Release 10.1.

Description This option controls the resource weight (value 1–100).

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

Related Documentation
- PPPoE-Based Radio-to-Router Protocols Overview on page 455

retransmission-attempt

Syntax

retransmission-attempt *number*;

Hierarchy Level

[edit interfaces *interface-name* unit *logical-unit-number* family inet dhcp]

Release Information

Statement introduced in Junos OS Release 8.5 for J Series devices.
Statement introduced in Junos OS Release 9.0 for EX Series switches.
Statement introduced in Junos OS Release 9.2 for SRX Series devices.
Statement introduced in Junos OS Release 14.1X53-D20 for the OCX Series.

Description

Specify the number of times the device retransmits a Dynamic Host Control Protocol (DHCP) packet if a DHCP server fails to respond. After the specified number of attempts, no further attempts at reaching a server are made.

Options

number—Number of retransmit attempts.

Range: 0 through 6

Default: 4

Required Privilege Level

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

Related Documentation

- *Configuring a DHCP Client (CLI Procedure)*
- *interfaces*
- *unit*
- *family*

retransmission-interval (Interfaces)

Syntax

```
retransmission-interval seconds;
```

Hierarchy Level

```
[edit interfaces interface-name unit logical-unit-number family family-name dhcp]
```

Release Information Statement introduced in Release 8.5 of Junos OS.

Description Specify the time between successive retransmission attempts.

Options *seconds* —Number of seconds between successive retransmission.

Range: 4 through 64 seconds

Default: 4 seconds

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

Related Documentation

- *Junos OS Initial Configuration Guide for Security Devices*

roaming-mode

Syntax

```
roaming-mode (home-only | automatic)
```

Hierarchy Level

```
[edit interfaces interface-name cellular-options]
```

Release Information Statement introduced in Junos OS Release 9.5.

Description Specify whether the 3G wireless modem interface can access networks other than the home network.

Options

- **home-only**—No roaming is allowed.
- **automatic**—Allows access to networks other than the home network. This is the default.

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

Related Documentation

- Understanding Ethernet Interfaces on page 255

scheduler-map (CoS Virtual Channels)

Syntax

```
scheduler-map map-name;
```

Hierarchy Level

```
[edit class-of-service virtual-channel-groups group-name virtual-channel-name]
```

Release Information Statement introduced in Junos OS Release 9.2.

Description Apply a scheduler map to this virtual channel.

Options ***map-name***—Name of the scheduler map.

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

- *default (CoS)*
- *shaping-rate (CoS Virtual Channels)*
- *virtual-channel-group (CoS Interfaces)*
- *virtual-channel-groups*
- *virtual-channels*

select-profile

Syntax

select-profile *profile-name*

Hierarchy Level

[edit interfaces *interface-name* **cellular-options gsm-options]**

Release Information

Statement introduced in Junos OS Release 9.5.

Description

Select the active profile to establish a data call with a Global System for Mobile Communications (GSM) cellular network.

Options

profile-name—Name of a configured profile that is to be used to establish a data call.

Required Privilege Level

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

Related Documentation

- Understanding Ethernet Interfaces on page 255

server-address

Syntax

```
server-address ip-address;
```

Hierarchy Level

[edit interfaces *interface-name* unit *logical-unit-number* family inet dhcp]

Release Information

Statement introduced in Junos OS Release 8.5 for J Series devices.
Statement introduced in Junos OS Release 9.0 for EX Series switches.
Statement introduced in Junos OS Release 9.2 for SRX Series devices.
Statement introduced in Junos OS Release 14.1X53-D20 for the OCX Series.

Description

Specify the address of the DHCP server that the client should accept DHCP offers from. If this option is included in the DHCP configuration, the client accepts offers only from this server and ignores all other offers.

Default

The client accepts the first offer it receives from any DHCP server.

Options

ip-address—DHCP server address.

Required Privilege Level

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

Related Documentation

- *Configuring a DHCP Client (CLI Procedure)*
- *interfaces*
- *unit*
- *family*

shaping-rate (CoS Interfaces)

Syntax

```
shaping-rate rate <overhead bytes> ;
```

Hierarchy Level

```
[edit class-of-service interfaces interface-name],
[edit class-of-service interfaces interface-name unit logical-unit-number]
```

Release Information

Statement introduced in Junos OS Release 9.2.
overhead option introduced in Junos OS Release 18.1.

Description

For logical interfaces on which you configure packet scheduling, configure traffic shaping by specifying the amount of bandwidth to be allocated to the logical interface.

Logical and physical interface traffic shaping can be configured together. This means you can include the **shaping-rate** statement at the **[edit class-of-service interfaces interface *interface-name*]** hierarchy level *and* the **[edit class-of-service interfaces interface *interface-name* unit *logical-unit-number*]** hierarchy level. If you configure traffic shaping at both the logical and physical interface levels, the logical interface shaping credit is checked and updated before the physical interface shaping credit.

Alternatively, you can configure a shaping rate for a logical interface and oversubscribe the physical interface by including the **shaping-rate** statement at the **[edit class-of-service traffic-control-profiles]** hierarchy level. With this configuration approach, you can independently control the delay-buffer rate.

On the physical interface, you can set the Layer 2 overhead adjustment to the shaping rate calculation at egress.

Default

If you do not include this statement at the **[edit class-of-service interfaces interface *interface-name* unit *logical-unit-number*]** hierarchy level, the default logical interface bandwidth is the average of unused bandwidth for the number of logical interfaces that require default bandwidth treatment. If you do not include this statement at the **[edit class-of-service interfaces interface *interface-name*]** hierarchy level, the default physical interface bandwidth is the average of unused bandwidth for the number of physical interfaces that require default bandwidth treatment.

Options

rate—Peak rate, in bits per second (bps). 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).

Range: 1000 through 6,400,000,000,000 bps

overhead—Layer 2 shaping overhead adjustment to be applied at egress (bytes).

Range: -62 through 192

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

Related Documentation
- *policer-overhead*

simple-filter (Interfaces)

Syntax

```
simple-filter;
```

Hierarchy Level

[edit interfaces *interfaces-name* unit *logical-unit-number* family *family-name*]

Release Information
Statement introduced in Junos OS Release 9.5.

Description
Apply a simple filter to an interface. You can apply simple filters on ingress interfaces only.

Options
input ***filter-name***: Name of one filter to evaluate when packets are received 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
- Understanding Ethernet Interfaces on page 255

sip-password

Syntax **sip-password** *simple-ip-password*;

Hierarchy Level **[edit interfaces** *interface-name* **cellular-options gsm-options profiles** *profile-name***]**

Release Information Statement introduced in Junos OS Release 9.5.

Description Configure the password provided by the service provider for connection to a Global System for Mobile Communications (GSM) cellular network.

Options ***simple-ip-password***—Password.

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

Related Documentation
- Understanding Ethernet Interfaces on page 255

sip-user-id

Syntax **sip-user-id** *simple-ip-user-id*;

Hierarchy Level **[edit interfaces** *interface-name* **cellular-options gsm-options profiles** *profile-name***]**

Release Information Statement introduced in Junos OS Release 9.5.

Description Configure the username provided by the service provider for connection to a Global System for Mobile Communications (GSM) cellular network.

Options ***simple-ip-user-id***—Username.

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

source-address-filter (Interfaces)

Syntax

source-address-filter *mac-address*;

Hierarchy Level

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

Release Information

Statement modified in Junos OS Release 9.2.

Description

For redundant Ethernet interfaces, specify the MAC addresses from which the interface can receive packets. For this statement to have any effect, you must include the **source-filtering** statement in the configuration to enable source address filtering.

Be sure to update the MAC address if the remote Ethernet card is replaced. Replacing the interface card changes the MAC address. Otherwise, the interface cannot receive packets from the new card.

NOTE:

- Software based MAC limiting is supported on SRX300, SRX320, and SRX340 devices.

  A maximum of 32 devices are supported per device.

Options

mac-address —MAC address filter. You can specify the MAC address as six hexadecimal bytes in one of the following formats: ***nn:nn:nn:nn:nn:nn:nn*** (for example, **00:11:22:33:44:55**) or ***nnnn:nnnn:nnnn*** (for example, **0011.2233.4455**). You can configure up to 64 source addresses. To specify more than one address, include multiple ***mac-address*** options in the **source-address-filter** statement.

Required Privilege Level

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

Related Documentation

- Understanding Ethernet Interfaces on page 255

source-filtering (Interfaces)

Syntax (source-filtering | no-source-filtering);

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

Release Information Statement modified in Junos OS Release 9.2.

Description For redundant Ethernet interfaces, enable the filtering of MAC source addresses, which blocks all incoming packets to that interface. To allow the interface to receive packets from specific MAC addresses, include the **source-address-filter** statement.

If the remote Ethernet card is changed, the interface cannot receive packets from the new card because it has a different MAC address.

By default, source address filtering is disabled.

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

Related Documentation

- Understanding Ethernet Interfaces on page 255

speed (Interfaces)

Syntax

```
speed (100m |10m | 1g);
```

Hierarchy Level

[edit interfaces *interface-name* speed]

Release Information Command introduced in Junos OS Release 10.2.

Description Configure the operating speed for the 2-Port 10 Gigabit Ethernet XPIM.

Options

- 100m — Link speed of 100 Mbps
- 10g — Link speed of 10 Gbps
- 10m — Link speed of 10 Mbps
- 1g — Link speed of 1 Gbps

Required Privilege Level

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

Related Documentation

- Understanding Ethernet Interfaces on page 255
- Example: Configuring the 2-Port 10-Gigabit Ethernet XPIM Interface on page 326

speed (Gigabit Ethernet interface)

Syntax

```
speed (1g |10g);
```

Hierarchy Level

[edit interfaces *interface-name* gigether-options]

Release Information

Statement introduced in Junos OS Release 18.1R1 for SRX4600.

Description

Configure the operating speed of the 8-port 10-Gigabit Ethernet PIC from default 10-Gbps port speed to 1-Gbps port speed. Each of the interfaces in the 8-port 10-Gigabit Ethernet PIC can be independently configured to 1Gbps or 10Gbps speeds.

Following are the list of optics supported on SRX4600:

- SRX-SFP-1GE-LX
- SRX-SFP-1GE-LX-ET
- SRX-SFP-1GE-SX
- SRX-SFP-1GE-SX-ET
- SRX-SFP-1GE-T

Autonegotiation is automatically disabled when 1-Gbps speed is configured on the interfaces.

NOTE:

- The interface name for any xe interface remains same after converting its speed from 10G to 1G.
- If a speed configuration is changed, you cannot change it again in the next 180 seconds. The interface link might drop down, if you try to change the speed configuration again within 180 seconds of the first speed configuration change.
- The 8x10-Gbps ports supports multiple port speeds, that is, some ports operates at 10G speed and some at 1G speed.
- To view the speed configured for the interface, execute the **show interfaces extensive** command. The **Speed Configuration** field's value of **1G** or **AUTO** in the command output indicates whether the current operation speed of the interface is 1 Gbps or the default 10 Gbps, respectively.

Options

- 1g — Link speed of 1 Gbps
- 10g — Link speed of 10 Gbps

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

Related Documentation
- speed (Chassis Cluster) on page 737

speed (Chassis Cluster)

Syntax

```
speed (1g |10g);
```

Hierarchy Level

```
[edit chassis cluster control-port]
```

Release Information Statement introduced in Junos OS Release 18.1R1 for SRX4600.

Description The SRX4600 supports three different PIC types—8-port 10-Gigabit Ethernet PIC, 4-port 40-Gigabit or 100-Gigabit Ethernet PIC, and 4-port 10-Gigabit Ethernet PIC (in a chassis cluster). Out of the four ports on the 10-Gigabit Ethernet PIC in a chassis cluster, two ports are fabric ports and the other two ports are chassis cluster control ports. The two fabric ports do not support 1-Gbps speed. Only the two control ports of the chassis cluster support a port speed of 1 Gbps.

On chassis cluster control interfaces, you can configure the operating speed of the 4-port 10-Gigabit Ethernet PIC from default 10-Gbps port speed to 1-Gbps port speed. You must reboot the device for the changed configuration to take effect.

The chassis cluster control interfaces do not support multiple speeds.

Following are the list of optics supported on SRX4600:

- SRX-SFP-1GE-LX
- SRX-SFP-1GE-LX-ET
- SRX-SFP-1GE-SX
- SRX-SFP-1GE-SX-ET

Autonegotiation is automatically disabled when 1-Gbps speed is configured on the interfaces.

NOTE:

- The interface name for any xe interface remains same after converting its speed from 10G to 1G.
- To view the speed configured for the interface, execute the **show interfaces extensive** command. The **Speed Configuration** field's value of **1G** or **AUTO** in the command output indicates whether the current operation speed of the interface is 1 Gbps or the default 10 Gbps, respectively.

Options

- 1g — Link speed of 1 Gbps
- 10g — Link speed of 10 Gbps

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

Related Documentation
- speed (Gigabit Ethernet interface) on page 735

telemetries (PoE)

Syntax

```
telemetries {
  disable;
  duration hours;
  interval minutes;
}
```

Hierarchy Level

```
[edit poe interface (all | interface-name)]
```

Release Information
Statement introduced in Junos OS Release 9.5.

Description
Allow logging of per-port PoE power consumption. The telemetries section must be explicitly specified to enable logging. If left unspecified, telemetries is disabled by default.

Default
If the telemetries statement is specified, logging is enabled with the default values for interval and duration.

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

Related Documentation
- Example: Configuring PoE on All Interfaces on page 390

template-refresh-rate (Services)

Syntax template-refresh-rate;

Hierarchy Level [edit services flow-monitoring version9 template *template-name*]

Release Information Statement introduced in Junos OS Release 10.4.

Description Specify the template refresh rate.

Options

- **packets**—Specify the number of packets. The range is from 1 through 480,000.
- **seconds**—Specify the number of seconds. The range is from 10 through 600.

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

Related Documentation

- Understanding Interfaces on page 3

threshold (Interfaces)

Syntax threshold <*value*>;

Hierarchy Level [edit interfaces *interface-name* radio–router]

Release Information Statement introduced in Junos OS Release 10.1.

Description This option controls the percentage of bandwidth change required for routing updates.

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

Related Documentation

- PPPoE-Based Radio-to-Router Protocols Overview on page 455

traceoptions (Interfaces)

Syntax

```
traceoptions
```

Hierarchy Level

```
[edit interfaces interface-name traceoptions]
```

Release Information Command introduced in Junos OS Release 10.1.

Description Define tracing operations for individual interfaces. To specify more than one tracing operation, include multiple flag statements.

Options **flag** - Tracing parameters

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

Related Documentation

• PPPoE-Based Radio-to-Router Protocols Overview on page 455

update-server

Syntax

```
update-server;
```

Hierarchy Level

[edit interfaces *interface-name* unit *logical-unit-number* family inet dhcp]

Release Information

Statement introduced in Junos OS Release 8.5 for J Series devices.
Statement introduced in Junos OS Release 9.0 for EX Series switches.
Statement introduced in Junos OS Release 9.2 for SRX Series devices.
Statement introduced in Junos OS Release 14.1X53-D20 for the OCX Series.

Description

Propagate TCP/IP settings learned from an external DHCP server to the DHCP server running on the switch, router, or device.

Required Privilege Level

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

Related Documentation

- *Configuring a DHCP Client (CLI Procedure)*
- *Example: Configuring the Device as a DHCP Client*
- *interfaces*
- *unit*
- *family*

vbr rate

Syntax

```
vbr rate;
```

Hierarchy Level

```
[edit interfaces interface-name atm-options vpi vpi-identifier shaping]
```

Release Information Command introduced in Junos OS Release 9.5.

Description For ATM encapsulation only, define a variable bit rate bandwidth utilization in the traffic-shaping profile.

Options

- Burst Size–The maximum burst size that can be sent at the peak rate.
- Peak Rate–The maximum instantaneous rate at which the user will transmit.
- Sustained Rate–The average rate as measured over a long interval.
- CDVT–Cell Delay Variation Tolerance in microseconds (range: 1 – 9999).

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

Related Documentation

- Understanding Interfaces on page 3

vdsl-profile

Syntax

```
vdsl-profile
```

Hierarchy Level

```
[edit interfaces interface-name vdsl-options]
```

Release Information Command introduced in Junos OS Release 10.1.

Description Configure the type of VDSL2 profiles. A profile is a table that contains a list of preconfigured VDSL2 settings.

Options

- Auto (default)
- 8a
- 8b
- 8c
- 8d
- 12a
- 12b
- 17a

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

Related Documentation

- VDSL2 Interface Support on SRX Series Devices on page 178

vendor-id (Interfaces)

Syntax

```
vendor-id vendor-id ;
```

Hierarchy Level

```
[edit interfaces interface-name unit logical-unit-number family family-name dhcp]
```

Release Information Statement introduced in Junos OS Release 9.2.

Description Configure a vendor class ID for the Dynamic Host Configuration Protocol (DHCP) client.

Options ***vendor-id*** —vendor class ID.

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

Related Documentation

- Understanding Interfaces on page 3

web-authentication (Interfaces)

Syntax

```
web-authentication {
  http;
  https;
  redirect-to-https;
}
```

Hierarchy Level

[edit interfaces *interface-name* unit *logical-unit-number* family *family-name* address *address*]

Release Information

Statement introduced in Junos OS Release 9.2.
Support for **https** and **redirect-to-https** introduced for SRX5400, SRX5600, and SRX5800 Services Gateways starting from Junos OS Release 12.1X44-D10 and on vSRX, SRX300, SRX320, SRX340, SRX345, SRX550, and SRX1500 Services Gateways starting from Junos OS Release 15.1X49-D40.

Description

Enable the Web authentication process for firewall user authentication.

Options

http—Enable HTTP service.

https—Enable authentication through HTTPS.

redirect-to-https—Redirect Web authentication to HTTPS.

Required Privilege Level

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

Related Documentation

- Understanding Interfaces on page 3

CHAPTER 40

Operational Commands

- show oam ethernet link-fault-management
- show poe controller (View)
- show pppoe interfaces
- show pppoe statistics
- show poe telemetries
- show services accounting
- show services accounting aggregation (View)
- show services accounting aggregation template (View)
- show services accounting flow-detail (View)

clear oam ethernet connectivity-fault-management path-database

Syntax

clear oam ethernet connectivity-fault-management path-database maintenance-domain *md-name* maintenance-association *ma-name* host <*mac-addr*>

Release Information

Statement introduced in Junos OS Release 12.1X44-D10.

Description

Clear the relevant path information from the database for the specified remote host.

Options

host—MAC address of remote host in xx:xx:xx:xx:xx:xx format.

maintenance-association —Name of the maintenance association.

maintenance-domain —Name of the maintenance domain.

Required Privilege Level

clear

Related Documentation

- *show oam ethernet connectivity-fault-management path-database*

List of Sample Output

clear oam ethernet connectivity-fault- management path-database on page 749

Sample Output

clear oam ethernet connectivity-fault- management path-database

user@host> **clear oam ethernet connectivity-fault-management path-database maintenance-domain private maintenance-association private-ma 00:00:5E:00:53:AA**

```
Path database entries cleared for the remote-host
```

clear dhcpv6 server binding (Local Server)

Syntax

```
clear dhcpv6 server binding
<all | client-id | ip-address | session-id>
<interface interface-name>
<routing-instance routing-instance-name>
```

Release Information Command introduced in Junos OS Release 10.4.

Description Clear the binding state of a DHCPv6 client from the client table on the DHCPv6 local server.

Options

- all—(Optional) Clear the binding state for all DHCPv6 clients.
- *client-id*—(Optional) Clear the binding state for the DHCPv6 client with the specified client ID (option 1).
- *ip-address*—(Optional) Clear the binding state for the DHCPv6 client with the specified address.
- *session-id*—(Optional) Clear the binding state for the DHCPv6 client with the specified session ID.
- interface *interface-name*—(Optional) Clear the binding state for DHCPv6 clients on the specified interface.
- routing-instance *routing-instance-name*—(Optional) Clear the binding state for DHCPv6 clients on the specified routing instance.

Required Privilege Level clear

Related Documentation

- *show dhcpv6 server binding (View)*

clear ethernet-switching statistics mac-learning

Syntax clear ethernet-switching statistics mac-learning

Release Information Command introduced in Junos OS Release 10.1.

Description Clear the media access control (MAC) learning statistics.

Options

- **none**—Clear MAC learning statistics on all interfaces.
- **interface** ***interface-name***—(Optional) Clear MAC learning statistics on the specified interface.

Required Privilege Level view

Related Documentation

- show ethernet-switching table on page 792show ethernet-switching table

List of Sample Output

clear ethernet-switching statistics mac-learning on page 751
clear ethernet-switching statistics mac-learning interface interface-name on page 751

Sample Output

clear ethernet-switching statistics mac-learning

```
user@host> clear ethernet-switching statistics mac-learning
```

clear ethernet-switching statistics mac-learning interface interface-name

```
user@host> clear ethernet-switching statistics mac-learning interface interface-name
```


clear interfaces statistics swfabx

Syntax

```
clear interfaces statistics <swfab0 | swfab1>
```

Release Information Command introduced in Junos OS Release 11.1.

Description Clear interface statistics for the specified swfab interface.

Required Privilege Level clear

Related Documentation

- *show interfaces swfabx*

List of Sample Output clear interfaces statistics <swfab0 | swfab1> on page 752

Output Fields When you enter this command, interface statistics for swfab0 and swfab1 are cleared.

Sample Output

clear interfaces statistics <swfab0 | swfab1>

```
user@host> clear interfaces statistics <swfab0 | swfab1>
```


clear ipv6 neighbors

Syntax

```
clear ipv6 neighbors
<all | host hostname>
```

Release Information Command introduced in Junos OS Release 12.1X45-D10.

Description Clear IPv6 neighbor cache information.

Options

none—Clear all IPv6 neighbor cache information.

all—(Optional) Clear all IPv6 neighbor cache information.

host *hostname*—(Optional) Clear the information for the specified IPv6 neighbors.

Required Privilege Level clear

Related Documentation

- show ipv6 neighbors on page 913

List of Sample Output clear ipv6 neighbors on page 753

Sample Output

clear ipv6 neighbors

```
user@host> clear ipv6 neighbors
11:11::2           00:19:e2:4b:61:83  deleted
   12:12::2           00:19:e2:4b:61:83  deleted
   10:1::2            00:00:0a:00:00:00  deleted
```


clear lacp statistics interfaces

Syntax

clear lacp statistics interfaces <*interface-name*>

Release Information

Command modified in Junos OS Release 10.2.

Description

Clear the LACP statistics. If you do not specify an interface name, LACP statistics for all interfaces are cleared.

Options

interface-name—(Optional) Name of an interface.

Required Privilege Level

clear

Related Documentation

- show lacp statistics interfaces (View) on page 919
- Verifying LACP on Redundant Ethernet Interfaces on page 303

Output Fields

This command produces no output.

restart (Reset)

Syntax

```
restart
<application-identification |application-security |audit-process |commitd-service
  |chassis-control | class-of-service |database-replication |datapath-trace-service |ddns
  |dhcp |dhcp-service |dynamic-flow-capture |disk-monitoring |event-processing |
  ethernet-connectivity-fault-management |ethernet-link-fault-management
  |extensible-subscriber-services |fipsd |firewall |firewall-authentication-service
  |general-authentication-service |gracefully |gprs-process |idp-policy |immediately
  |interface-control | ipmi |ipsec-key-management |jflow-service |jnu-management
  |jnx-wmicd-service |jsrp-service |kernel-replication |l2-learning |l2cpd-service |lacp
  |license-service |logical-system-service |mib-process |mountd-service |named-service
  |network-security |network-security-trace |nfsd-service |ntpd-service |pgm
  |pic-services-logging |profilerd |pki-service |remote-operations |rest-api |routing |sampling
  |sampling-route-record |scc-chassisd |secure-neighbor-discovery |security-intelligence
  |security-log |services |service-deployment |simple-mail-client-service |soft |snmp
  |static-routed |statistics-service |subscriber-management |subscriber-management-helper
  |system-log-vital |tunnel-oamd |uac-service |user-ad-authentication |vrrp
  |web-management >
```

Release Information Command introduced before Junos OS Release 9.2

Description Restart a Junos OS process.

CAUTION: Never restart a software process unless instructed to do so by a customer support engineer. A restart might cause the router to drop calls and interrupt transmission, resulting in possible loss of data.

Options

- application-identification—(Optional) Restart the process that identifies an application using intrusion detection and prevention (IDP) to allow or deny traffic based on applications running on standard or nonstandard ports.
- application-security—(Optional) Restart the application security process.
- audit-process—(Optional) Restart the RADIUS accounting process that gathers statistical data that can be used for general network monitoring, for analyzing and tracking usage patterns, and for billing a user based upon the amount of time used or the type of services accessed.
- chassis-control—(Optional) Restart the chassis management process.
- class-of-service—(Optional) Restart the class-of-service (CoS) process, which controls the router's or switch's CoS configuration.
- commitd-service—(Optional) Restart the committed services.
- database-replication—(Optional) Restart the database replication process.
- datapath-trace-service—(Optional) Restart the Restart the packet path tracing process.

- ddns—(Optional) Restart the dynamic domain name system, which dynamically updates IP addresses for registered domain names.
- dhcp—(Optional) Restart the software process for a Dynamic Host Configuration Protocol (DHCP) server. A DHCP server allocates network IP addresses and delivers configuration settings to client hosts without user intervention.
- dhcp-service—(Optional) Restart the Dynamic Host Configuration Protocol process.
- disk-monitoring—(Optional) Restart disk monitoring, which checks the health of the hard disk drive on the Routing Engine.
- dynamic-flow-capture—(Optional) Restart the dynamic flow capture (DFC) process, which controls DFC configurations on PIC3 monitoring services cards.
- ethernet-connectivity-fault-management—(Optional) Restart the process that provides IEEE 802.1ag Operation, Administration, and Maintenance (OAM) connectivity fault management (CFM) database information for CFM maintenance association end points (MEPs) in a CFM session.
- ethernet-link-fault-management—(Optional) Restart the process that provides the OAM link fault management (LFM) information for Ethernet interfaces.
- event-processing—(Optional) Restart the event process (eventd).
- extensible-subscriber-services—(Optional) Restart the extensible subscriber services process.
- fipsd—(Optional) Restart the fipsd services.
- firewall—(Optional) Restart the firewall management process, which manages the firewall configuration and accepts or rejects packets that are transiting an interface on a router or switch.
- firewall-authentication-service—(Optional) Restart the firewall authentication service process.
- general-authentication-service—(Optional) Restart the general authentication process.
- gprs-process—(Optional) Restart the General Packet Radio Service (GPRS) process.
- gracefully—(Optional) Restart the software process.
- idp-policy—(Optional) Restart the intrusion detection and prevention (IDP) protocol process.
- immediately—(Optional) Immediately restart the software process.
- interface-control—(Optional) Restart the interface process, which controls the router's or switch’s physical interface devices and logical interfaces.
- ipmi—(Optional) Restart the intelligent platform management interface process.
- ipsec-key-management—(Optional) Restart the IPsec key management process.
- jflow-service—(Optional) Restart jflow service process.
- jnu-management—(Optional) Restart jnu management process.
- jnx-wmicd-service—(Optional) Restart jnx wmicd service process.

- jsrp-service—(Optional) Restart the Juniper Services Redundancy Protocol (jsrdp) process, which controls chassis clustering.
- kernel-replication—(Optional) Restart the kernel replication process, which replicates the state of the backup Routing Engine when graceful Routing Engine switchover (GRES) is configured.
- lacp—(Optional) Restart the Link Aggregation Control Protocol (LACP) process. LACP provides a standardized means for exchanging information between partner systems on a link. The LACP process allows link aggregation control instances to reach agreement on the identity of the LAG to which a link belongs, moves the link to that LAG, and enables the transmission and reception processes for the link to function in an orderly manner.
- l2cpd-service—(SRX5400, SRX5600, and SRX5800 devices only) (Optional) Restart the Layer 2 Control Protocol (L2CP) process, which enables features such as L2 protocol tunneling and nonstop bridging.
- l2-learning—(Optional) Restart the Layer 2 (L2) address flooding and learning process.
- license-service—(Optional) Restart the feature license management process.
- logical-system-service—(Optional) Restart the logical system service process.
- mib-process—(Optional) Restart the MIB version II process, which provides the router's MIB II agent.
- mountd-service—(Optional) Restart the service for Network File System (NFS) mount requests.
- named-service—(Optional) Restart the DNS Server process, which is used by a router or a switch to resolve hostnames into addresses.
- network-security—(Optional) Restart the network security process.
- network-security-trace—(Optional) Restart the network security trace process.
- nfsd-service—(Optional) Restart the remote NFS server process, which provides remote file access for applications that need NFS-based transport.
- ntpd-service—(Optional) Restart the Network Time Protocol (NTP) process.
- pgm—(Optional) Restart the process that implements the Pragmatic General Multicast (PGM) protocol for assisting in the reliable delivery of multicast packets.
- pic-services-logging—(Optional) Restart the logging process for some PICs. With this process, also known as fsad (the file system access daemon), PICs send special logging information to the Routing Engine for archiving on the hard disk.
- pki-service—(Optional) Restart the public key infrastructure (PKI) service process.
- profilerd—(Optional) Restart the profiler process.
- remote-operations—(Optional) Restart the remote operations process, which provides the ping and traceroute MIBs.
- rest-api—(Optional) Restart the rest api process.
- routing—(Optional) Restart the routing protocol process (rpd).

- sampling—(Optional) Restart the sampling process, which performs packet sampling based on particular input interfaces and various fields in the packet header.
- sampling-route-record—(Optional) Restart the sampling route record process.
- scc-chassisd—(Optional) Restart the scc chassisd process.
- secure-neighbor-discovery—(Optional) Restart the secure Neighbor Discovery Protocol (NDP) process, which provides support for protecting NDP messages.
- security-intelligence—(Optional) Restart security intelligence process.
- security-log—(Optional) Restart the security log process.
- service-deployment—(Optional) Restart the service deployment process, which enables Junos OS to work with the Session and Resource Control (SRC) software.
- services—(Optional) Restart a service.
- simple-mail-client-service—(Optional) Restart the simple mail client service process.
- snmp—(Optional) Restart the SNMP process, which enables the monitoring of network devices from a central location and provides the router's or switch’s SNMP master agent.
- static-routed—(Optional) Restart the static routed process.
- soft—(Optional) Reread and reactivate the configuration without completely restarting the software processes. For example, BGP peers stay up and the routing table stays constant. Omitting this option results in a graceful restart of the software process.
- statistics-service—(Optional) Restart the process that manages the Packet Forwarding Engine statistics.
- subscriber-management—(Optional) Restart the subscriber management process.
- subscriber-management-helper—(Optional) Restart the subscriber management helper process.
- system-log-vital—(Optional) Restart system log vital process.
- tunnel-oamd—(Optional) Restart the tunnel OAM process for L2 tunneled networks.
- uac-service—(Optional) Restart the Unified Access Control (UAC) process.
- user-ad-authentication—(Optional) Restart User ad Authentication process
- vrrp—(Optional) Restart the Virtual Router Redundancy Protocol (VRRP) process, which enables hosts on a LAN to make use of redundant routing platforms on that LAN without requiring more than the static configuration of a single default route on the hosts.
- web-management—(Optional) Restart the Web management process.

Required Privilege Level reset

Related Documentation

- *Restart Commands Overview*

List of Sample Output

restart interfaces on page 759

Output Fields

When you enter this command, you are provided feedback on the status of your request.

Sample Output

restart interfaces

```
user@host> restart interfaces
```

```
interfaces process terminated
interfaces process restarted
```

request modem wireless create-profile

Syntax

```
request modem wireless create-profile interface-name access-point-name access-point-name
   authentication-method authentication-method profile-id profile-id sip-password
   sip-password sip-user-id sip-id slot sim-slot-number
```

Release Information

Command introduced in Junos OS 9.5. The **slot *sim-slot-number*** option is introduced in Junos OS 15.1X49-D100.

Description

Create a profile. The Subscriber Identity Module (SIM) uses a profile to establish a connection with the network. You can configure up to 16 profiles for each SIM card. The LTE Mini-PIM supports two SIM cards and so you can configure a total of 32 profiles, although only one profile can be active at a time.

To create a profile, you must obtain the following information from the service provider:

- Username and password
- Access point name (APN)
- Authentication (Challenge Handshake Authentication Protocol (CHAP) or Password Authentication Protocol (PAP))

Options

- *interface-name*—The LTE interface is **cl-*x*/0/0**, where ***x*** is the slot number in which the LTE Mini-PIM is installed.
- **access-point-name *access-point-name***—Access point name (APN). Obtain the APN from the service provider. You can specify only a single APN in a profile.
- **authentication-method**—The authentication protocol that the SIM card uses to authenticate with the wireless network. Obtain the authentication information from the service provider. The authentication protocol used by the SIM card must match the protocol used by the service provider. The **authentication-method** can be one of the following:
  - CHAP
  - PAP
  - None
- **profile-id *profile-id***—Profile identification number for the profile. The default value is 1. The range of possible values is from 1 through 16.
- **sip-password *sip-password***—Simple IP password. Obtain the password from the service provider.
- **sip-user-id *sip-id***—Simple IP user identification. Obtain the username from the service provider.
- **slot *sim-slot-number***—The slot in which the SIM card is inserted. The value can be either 1 or 2.

Required Privilege Level

maintenance

Related Documentation

- show modem wireless profiles on page 927

List of Sample Output

request modem wireless create-profile on page 761

Sample Output

request modem wireless create-profile

user@host> **request modem wireless create-profile cl-1/0/0 access-point-name apn authentication-method pap profile-id 2 sip-password 123 sip-user-id userid slot 1**

```
Issued create profile request successfully.
Please use 'show modem wireless profiles' to check profile status
```

request modem wireless fota

Syntax

request modem wireless fota *interface-name* (enable | disable)

Release Information

Command introduced in Junos OS 15.1X49-D100.

Description

Enable or disable over-the-air (OTA) firmware upgrade for the modem on the LTE Mini-PIM. OTA firmware upgrade enables automatic and timely upgrade of modem firmware when new firmware versions are available. The OTA upgrade can be enabled or disabled on the LTE Mini-PIM. OTA is disabled by default.

Required Privilege Level

maintenance

Related Documentation

- show modem wireless firmware on page 921

List of Sample Output

request modem wireless fota (enable) on page 762
request modem wireless fota (disable) on page 762

Sample Output

request modem wireless fota (enable)

user@host> **request modem wireless fota cl-1/0/0 enable**

```
Set FOTA on modem succeeded
```

request modem wireless fota (disable)

user@host> **request modem wireless fota cl-1/0/0 disable**

```
Set FOTA on modem succeeded
```

request modem wireless sim-lock

Syntax

request modem wireless sim-lock enable *interface-name* pin *pin*

Release Information

Command introduced in Junos OS Release 9.5.

Description

Lock the Subscriber Identity Module (SIM) on the Mini-PIM. The SIM lock does not take effect until the next reboot of the services gateway. You can verify the locked mode using the **show modem wireless firmware** command.

NOTE: If there are two SIMs installed on the LTE Mini-PIM, then only the active SIM is locked. After the SIM is locked, it cannot connect to the network. The SIM must be unlocked before it is used to connect to the network.

Options

- *interface-name*—The LTE Mini-PIM is denoted as cl-*x*/0/0, where *x* is the slot number in which the LTE Mini-PIM is installed.
- **pin** *pin*—Four-digit personal identification number (PIN). Obtain the PIN from the service provider.

  NOTE: If the PIN is entered incorrectly three consecutive times, the SIM card is blocked. Obtain a PIN unblocking key (PUK) from the service provider.

Required Privilege Level

maintenance

Related Documentation

- request modem wireless sim-unlock on page 764

List of Sample Output

request modem wireless sim-lock on page 763

Sample Output

request modem wireless sim-lock

user@host> **request modem wireless sim-lock enable cl-1/0/0 pin 4321**

```
Issued SIM 2 lock state request successfully.
Please use 'show modem wireless firmware' to check SIM status
```

request modem wireless sim-unlock

Syntax

```
request modem wireless sim-unlock interface-name pin unlock-code
```

Release Information Command introduced in Junos OS Release 9.5.

Description Unlock the Subscriber Identity Module (SIM) on the LTE Mini-PIM. Some service providers lock the SIM to prevent unauthorized access to the service provider's network. If this is the case, you will need to unlock the SIM by using an personal identification number (PIN), which is provided by the service provider. You can verify the unlocked mode using the **show modem wireless firmware** command.

NOTE: If there are two SIM cards installed on the Mini-PIM, then only the active SIM card is unlocked.

The SIM must be unlocked before it can be used to connect to the service provider's network.

Options

- *interface-name*—The LTE interface is denoted as cl-*x*/0/0, where *x* is the slot number in which the LTE Mini-PIM is installed.
- **pin** *unlock-code*—Four-digit personal identification number (PIN). Obtain the PIN from the service provider.

NOTE: If the PIN is entered incorrectly three consecutive times, the SIM card is blocked. Obtain a PIN unblocking key (PUK) from the service provider.

Required Privilege Level maintenance

Related Documentation

- request modem wireless sim-lock on page 763

List of Sample Output request modem wireless sim-unlock on page 764

Sample Output

request modem wireless sim-unlock

```
user@host> request modem wireless sim-unlock cl-1/0/0 pin 1234
```

```
Issued SIM 2 unlock request successfully.
Please use 'show modem wireless firmware' to check SIM status
```

show chassis fpc (View)

Syntax

```
show chassis fpc
<detail < fpc-slot >| <node ( node-id | local | primary)>> |
<node ( node-id | local | primary)> |
<pic-status < fpc-slot >| <node ( node-id | local | primary)>>
```

Release Information

Command modified in Junos OS Release 9.2.
Starting with Junos OS Release 15.1X49-D10 and Junos OS Release 17.3R1, the SRX5K-MPC3-100G10G (IOC3) and the SRX5K-MPC3-40G10G (IOC3) are introduced.

NOTE: On SRX5K-MPC3-40G10G (IOC3), all four PICs cannot be powered on. A maximum of two PICs can be powered on at the same time. By default, PIC0 and PIC1 are online.

Use the **set chassis fpc <slot> pic <pic> power off** command to choose the PICs you want to power on.
When you use the **set chassis fpc <slot> pic <pic> power off** command to power off PIC0 and PIC1, PIC2 and PIC3 are automatically turned on.
When you switch from one set of PICs to another set of PICs using the **set chassis fpc <slot> pic <pic> power off** command again, ensure that there is 60 seconds duration between the two actions, otherwise core files are seen during the configuration.
The Table 48 on page 766 summarizes the SRX5K-MPC3-40G10G (IOC3) PICs selected for various configuration scenarios.

Table 48: SRX5K-MPC3-40G10G (IOC3) PIC Selection Summary

CLI Configuration	PIC Selection
Default (i.e. no CLI configuration)	Online: PIC-0, PIC-1 Offline: PIC-2, PIC-3
PIC-1, PIC-2 and PIC-3 powered OFF	Online: PIC-0 Offline: PIC-1, PIC-2, PIC-3
PIC-0, PIC-2 and PIC-3 powered OFF	Online: PIC-1 Offline: PIC-0, PIC-2, PIC-3
PIC-0, PIC-1 and PIC-3 powered OFF	Online: PIC-2 Offline: PIC-0, PIC-1, PIC-3
PIC-0, PIC-1 and PIC-2 powered OFF	Online: PIC-3 Offline: PIC-0, PIC-1, PIC-2

Table 48: SRX5K-MPC3-40G10G (IOC3) PIC Selection Summary (continued)

CLI Configuration	PIC Selection
PIC-2 and PIC-3 powered OFF	Online: PIC-0, PIC-1 Offline: PIC-2, PIC-3
PIC-2 and PIC-3 powered OFF	Online: PIC-0, PIC-1 Offline: PIC-2, PIC-3
PIC-1 and PIC-2 powered OFF	Online: PIC-0, PIC-3 Offline: PIC-1, PIC-2
PIC-0 and PIC-3 powered OFF	Online: PIC-2, PIC-1 Offline: PIC-0, PIC-3
PIC-0 and PIC-1 powered OFF	Online: PIC-2, PIC-3 Offline: PIC-0, PIC-1
All other combinations of PICs being powered OFF (Invalid)	Online: PIC-0, PIC-1 Offline: PIC-2, PIC-3 Default PICs will be selected for the invalid combinations. Also, a system log message will be displayed to indicate the invalid combination PIC selection.

Description Display status information about the installed Flexible PIC Concentrators (FPCs) and PICs.

Options

- none—Display status information for all FPCs.
- **detail**—(Optional) Display detailed FPC status information.
- ***fpc-slot*** —(Optional) Display information about the FPC in this slot.
- **node**—(Optional) For chassis cluster configurations, display status information for all FPCs or for the specified FPC on a specific node (device) in the cluster.
  - ***node-id*** —Identification number of the node. It can be 0 or 1.
  - **local**—Display information about the local node.
  - **primary**—Display information about the primary node.

- **pic-status**—(Optional) Display status information for all FPCs or for the FPC in the specified slot (see ***fpc-slot***).

Required Privilege Level view

Related Documentation

- Understanding Interfaces on page 3

List of Sample Output

Output Fields Table 49 on page 768 lists the output fields for the **show chassis fpc** command. Output fields are listed in the approximate order in which they appear.

Table 49: show chassis fpc Output Fields

Field Name	Field Description
Slot or Slot State	Slot number and state. The state can be one of the following conditions: • **Dead**—Held in reset because of errors. • **Diag**—Slot is being ignored while the device is running diagnostics. • **Dormant**—Held in reset. • **Empty**—No FPC is present. • **Online**—FPC is online and running. • **Present**—FPC is detected by the device, but is either not supported by the current version of Junos OS or inserted in the wrong slot. The output also states either **Hardware Not Supported** or **Hardware Not In Right Slot**. FPC is coming up but not yet online. • **Probed**—Probe is complete; awaiting restart of the Packet Forwarding Engine (PFE). • **Probe-wait**—Waiting to be probed.
Temp (C) or Temperature	Temperature of the air passing by the FPC, in degrees Celsius or in both Celsius and Fahrenheit.

Table 49: show chassis fpc Output Fields (continued)

Field Name	Field Description
Total CPU Utilization (%)	Total percentage of CPU being used by the FPC's processor.
Interrupt CPU Utilization (%)	Of the total CPU being used by the FPC's processor, the percentage being used for interrupts.
Memory DRAM (MB)	Total DRAM, in megabytes, available to the FPC's processor.
Heap Utilization (%)	Percentage of heap space (dynamic memory) being used by the FPC's processor. If this number exceeds 80 percent, there may be a software problem (memory leak).
Buffer Utilization (%)	Percentage of buffer space being used by the FPC's processor for buffering internal messages.
Start Time	Time when the Routing Engine detected that the FPC was running.
Uptime	How long the Routing Engine has been connected to the FPC and, therefore, how long the FPC has been up and running.
PIC type	(**pic-status** output only) Type of FPC.

Sample Output

show chassis fpc

user@host> **show chassis fpc**

```
                     Temp   CPU Utilization (%)     Memory    Utilization (%)
     Slot State       (C)     Total  Interrupt        DRAM (MB) Heap  Buffer
       0  Online          -------------------- CPU less FPC --------------------
       1  Online          ---------------------  Not Usable --------------------
       2  Online          -------------------- CPU less FPC --------------------
```

show chassis fpc (SRX5600 and SRX5800 devices)

user@host> **show chassis fpc**

```
                      Temp   CPU Utilization (%)       Memory    Utilization (%)
Slot State            (C)    Total   Interrupt        DRAM (MB)  Heap      Buffer
  0  Empty
  1  Empty
  2  Empty
  3  Online            37        3           0           1024          7      42
  4  Empty
  5  Empty
  6  Online            30        8           0          1024          23     30
  7  Empty
  8  Empty
  9  Empty
 10  Empty
 11  Empty
```

show chassis fpc (SRX5400, SRX5600, and SRX5800 devices with SRX5K-MPC3-100G10G (IOC3) or SRX5K-MPC3-40G10G (IOC3)

user@host> **show chassis fpc**

```
                      Temp  CPU Utilization (%)   CPU Utilization (%)  Memory

                                 Utilization (%)
Slot State             (C)  Total  Interrupt      1min   5min   15min  DRAM (MB)

                                      Heap      Buffer
  0  Online             36     20          0        20     19     19    1024

                                        4         26
  1  Online             35      8          0         8      8      8    2048

                                       12         14
  2  Online             40     21          0        20     20     20    3584

                                        5         13
```

Sample Output

show chassis fpc detail 2

user@host> **show chassis fpc detail 2**

```
Slot 2 information:
  State                                  Online
  Temperature                             37
  Total CPU DRAM                      1024 MB
  Total RLDRAM                          0 MB
  Total DDR DRAM                        0 MB
  Start time:                            2012-07-18 07:18:50 PDT
  Uptime:                                4 days, 21 hours, 51 minutes, 59 seconds

  Max Power Consumption                 0 Watts
```

Sample Output

show chassis fpc pic-status (SRX5600 and SRX5800 devices)

user@host> **show chassis fpc pic-status**

```
Slot 3   Online       SRX5k SPC
  PIC 0  Online       SPU Cp
  PIC 1  Online       SPU Flow
Slot 6   Online       SRX5k DPC 4x 10GE
  PIC 0  Online       1x 10GE(LAN/WAN) RichQ
  PIC 1  Online       1x 10GE(LAN/WAN) RichQ
  PIC 2  Online       1x 10GE(LAN/WAN) RichQ
  PIC 3  Online       1x 10GE(LAN/WAN) RichQ
```

show chassis fpc pic-status (SRX5600 and SRX5800 devices with SPC2)

user@host> **show chassis fpc pic-status**

```
Slot 0   Online       SRX5k DPC 40x 1GE
  PIC 0  Online       10x 1GE RichQ
  PIC 1  Online       10x 1GE RichQ
  PIC 2  Online       10x 1GE RichQ
  PIC 3  Online       10x 1GE RichQ
Slot 2   Online       SRX5k SPC II
  PIC 0  Online       SPU Cp
  PIC 1  Online       SPU Flow
  PIC 2  Online       SPU Flow
  PIC 3  Online       SPU Flow
Slot 3   Online       SRX5k SPC II
  PIC 0  Online       SPU Flow
  PIC 1  Online       SPU Flow
  PIC 2  Online       SPU Flow
  PIC 3  Online       SPU Flow
Slot 5   Online       SRX5k SPC
  PIC 0  Online       SPU Flow
  PIC 1  Online       SPU Flow
```

show chassis fpc pic-status (SRX5600 and SRX5800 devices with SRX5K-MPC)

`user@host>` **show chassis fpc pic-status**

```
Slot 0   Online       SRX5k SPC II
  PIC 0  Online       SPU Cp
  PIC 1  Online       SPU Flow
  PIC 2  Online       SPU Flow
  PIC 3  Online       SPU Flow
Slot 1   Online       SRX5k SPC II
  PIC 0  Online       SPU Flow
  PIC 1  Online       SPU Flow
  PIC 2  Online       SPU Flow
  PIC 3  Online       SPU Flow
Slot 2   Online       SRX5k DPC 4X 10GE
  PIC 0  Online       1x 10GE(LAN/WAN) RichQ
  PIC 1  Online       1x 10GE(LAN/WAN) RichQ
  PIC 2  Online       1x 10GE(LAN/WAN) RichQ
  PIC 3  Online       1x 10GE(LAN/WAN) RichQ
Slot 6   Offline      SRX5k SPC II
Slot 9   Online       SRX5k SPC II
  PIC 0  Online       SPU Flow
  PIC 1  Online       SPU Flow
  PIC 2  Online       SPU Flow
  PIC 3  Online       SPU Flow
Slot 10  Online       SRX5k IOC II
  PIC 0  Online       10x 10GE SFP+
  PIC 2  Online       1x 100GE CFP
Slot 11  Online       SRX5k IOC II
  PIC 0  Online       1x 100GE CFP
  PIC 2  Online       2x 40GE QSFP+
```

show chassis fpc pic-status (SRX5600 and SRX5800 devices when Express Path [formerly known as services offloading] is configured)

`user@host>` **show chassis fpc pic-status**


```
Slot 0   Offline     SRX5k DPC 40x 1GE
Slot 1   Online      SRX5k SPC II
  PIC 0  Online      SPU Cp
  PIC 1  Online      SPU Flow
  PIC 2  Online      SPU Flow
  PIC 3  Online      SPU Flow
Slot 2   Offline     SRX5k SPC
Slot 4   Online      SRX5k IOC3 24XGE+6XLG
  PIC 2  Online      3x 40GE QSFP+- np-cache/services-offload
  PIC 3  Online      3x 40GE QSFP+- np-cache/services-offload
Slot 5   Online      SRX5k IOC II
  PIC 0  Online      10x 1GE(LAN) SFP- np-cache/services-offload
  PIC 1  Online      10x 1GE(LAN) SFP- np-cache/services-offload
  PIC 2  Online      10x 10GE SFP+- np-cache/services-offload
```

show chassis fpc pic-status (with 20-Gigabit Ethernet MIC with SFP)

user@host> **show chassis fpc pic-status**

```
node0:
--------------------------------------------------------------------------
Slot 0   Online      SRX5k SPC II
  PIC 0  Online      SPU Cp
  PIC 1  Online      SPU Flow
  PIC 2  Online      SPU Flow
  PIC 3  Online      SPU Flow
Slot 1   Offline     SRX5k SPC II
Slot 2   Online      SRX5k DPC 4X 10GE
  PIC 0  Online      1x 10GE(LAN/WAN) RichQ
  PIC 1  Online      1x 10GE(LAN/WAN) RichQ
  PIC 2  Online      1x 10GE(LAN/WAN) RichQ
  PIC 3  Online      1x 10GE(LAN/WAN) RichQ
Slot 9   Online      SRX5k IOC II
  PIC 0  Online      10x 1GE(LAN) SFP
  PIC 1  Online      10x 1GE(LAN) SFP
  PIC 2  Online      10x 1GE(LAN) SFP
  PIC 3  Online      10x 1GE(LAN) SFP
Slot 10  Online      SRX5k IOC II
  PIC 0  Online      10x 10GE SFP+
  PIC 2  Online      1x 100GE CFP
Slot 11  Offline     SRX5k IOC II
```

show chassis fpc pic-status (SRX5400, SRX5600, and SRX5800 devices with SRX5K-MPC3-100G10G (IOC3) or SRX5K-MPC3-40G10G (IOC3 and when Express Path [formerly known as services offloading] is configured)

user@host> **show chassis fpc pic-status**

```
Slot 0   Offline     SRX5k DPC 40x 1GE
Slot 1   Online      SRX5k SPC II
  PIC 0  Online      SPU Cp
  PIC 1  Online      SPU Flow
  PIC 2  Online      SPU Flow
  PIC 3  Online      SPU Flow
Slot 2   Offline     SRX5k SPC
Slot 4   Online      SRX5k IOC3 24XGE+6XLG
  PIC 2  Online      3x 40GE QSFP+- np-cache/services-offload
```



```
  PIC 3   Online       3x 40GE QSFP+- np-cache/services-offload
Slot 5    Online       SRX5k IOC II
  PIC 0   Online       10x 1GE(LAN) SFP- np-cache/services-offload
  PIC 1   Online       10x 1GE(LAN) SFP- np-cache/services-offload
  PIC 2   Online       10x 10GE SFP+- np-cache/services-offload
```

Sample Output

show chassis fpc pic-status for HA (SRX5600 and SRX5800 devices)

user@host> **show chassis fpc pic-status**

```
node0:
------------------------------------------------------------
Slot 4    Online       SRX5k DPC 40x 1GE
  PIC 0   Online       10x 1GE RichQ
  PIC 1   Online       10x 1GE RichQ
  PIC 2   Online       10x 1GE RichQ
  PIC 3   Online       10x 1GE RichQ
Slot 5    Online       SRX5k SPC
  PIC 0   Online       SPU Cp-Flow
  PIC 1   Online       SPU Flow

node1:
--------------------------------------------------------------
Slot 4    Online       SRX5k DPC 40x 1GE
  PIC 0   Online       10x 1GE RichQ
  PIC 1   Online       10x 1GE RichQ
  PIC 2   Online       10x 1GE RichQ
  PIC 3   Online       10x 1GE RichQ
Slot 5    Online       SRX5k SPC
  PIC 0   Online       SPU Cp-Flow
  PIC 1   Online       SPU Flow
```

show chassis fpc pic-status for HA (SRX5400, SRX5600, and SRX5800 devices with SRX5K-MPC3-100G10G (IOC3) or SRX5K-MPC3-40G10G (IOC3)

user@host> **show chassis fpc pic-status**

```
user@host> show chassis fpc pic-status
node0:
---------------------------------------------------------------------------
Slot 2    Online       SRX5k IOC3 24XGE+6XLG
  PIC 0   Online       12x 10GE SFP+
  PIC 1   Online       12x 10GE SFP+
  PIC 2   Offline      3x 40GE QSFP+
  PIC 3   Offline      3x 40GE QSFP+
Slot 4    Online       SRX5k IOC II
  PIC 2   Online       10x 10GE SFP+
Slot 5    Online       SRX5k SPC II
  PIC 0   Online       SPU Cp
  PIC 1   Online       SPU Flow
  PIC 2   Offline
  PIC 3   Offline

node1:
---------------------------------------------------------------------------
```

```
Slot 2   Online       SRX5k IOC3 24XGE+6XLG
  PIC 0  Online       12x 10GE SFP+
  PIC 1  Online       12x 10GE SFP+
  PIC 2  Offline      3x 40GE QSFP+
  PIC 3  Offline      3x 40GE QSFP+
Slot 4   Online       SRX5k IOC II
  PIC 2  Online       10x 10GE SFP+
Slot 5   Online       SRX5k SPC II
  PIC 0  Online       SPU Cp
  PIC 1  Online       SPU Flow
  PIC 2  Offline
  PIC 3  Offline
```


show chassis hardware (View)

Syntax

```
show chassis hardware
<clei-models | detail  |  extensive |  models | node ( node-id  | all | local | primary)>
```

Release Information Command introduced in Junos OS Release 9.2. Command modified in Junos OS Release 9.2 to include **node** option.

Description Display chassis hardware information.

Options

- **clei-models**—(Optional) Display Common Language Equipment Identifier Code (CLEI) barcode and model number for orderable field-replaceable units (FRUs).
- **detail | extensive**—(Optional) Display the specified level of output.
- **models**—(Optional) Display model numbers and part numbers for orderable FRUs.
- **node**—(Optional) For chassis cluster configurations, display chassis hardware information on a specific node (device) in the cluster.
  - ***node-id*** —Identification number of the node. It can be 0 or 1.
  - **local**—Display information about the local node.
  - **primary**—Display information about the primary node.

Required Privilege Level view

Related Documentation

- *Understanding Traffic Processing on Security Devices*
- Interface Naming Conventions on page 8

Output Fields Table 50 on page 775 lists the output fields for the **show chassis hardware** command. Output fields are listed in the approximate order in which they appear.

Table 50: show chassis hardware Output Fields

Field Name	Field Description
Item	Chassis component—Information about the backplane; power supplies; fan trays; Routing Engine; each Physical Interface Module (PIM)—reported as FPC and PIC—and each fan, blower, and impeller.
Version	Revision level of the chassis component.
Part Number	Part number for the chassis component.

Table 50: show chassis hardware Output Fields (continued)

Field Name	Field Description
Serial Number	Serial number of the chassis component. The serial number of the backplane is also the serial number of the device chassis. Use this serial number when you need to contact Juniper Networks Customer Support about the device chassis.
Assb ID or Assembly ID	Identification number that describes the FRU hardware.
FRU model number	Model number of FRU hardware component.
CLEI code	Common Language Equipment Identifier code. This value is displayed only for hardware components that use ID EEPROM format v2. This value is not displayed for components that use ID EEPROM format v1.
EEPROM Version	ID EEPROM version used by hardware component: 0x01 (version 1) or 0x02 (version 2).

Table 50: show chassis hardware Output Fields (continued)

Field Name	Field Description
Description	Brief description of the hardware item: • Type of power supply. • Switch Control Board (SCB) Starting with Junos OS Release 12.1X47-D15 and Junos OS Release 17.3R1, the SRX5K-SCBE (SCB2) is introduced. • There are three SCB slots in SRX5800 devices. The third slot can be used for an SCB or an FPC. When an SRX5K-SCB was used , the third SCB slot was used as an FPC. SCB redundancy is provided in chassis cluster mode. • With an SCB2, a third SCB is supported. If a third SCB is plugged in, it provides intra-chassis fabric redundancy. • The Ethernet switch in the SCB2 provides the Ethernet connectivity among all the FPCs and the Routing Engine. The Routing Engine uses this connectivity to distribute forwarding and routing tables to the FPCs. The FPCs use this connectivity to send exception packets to the Routing Engine. • Fabric connects all FPCs in the data plane. The Fabric Manager executes on the Routing Engine and controls the fabric system in the chassis. Packet Forwarding Engines on the FPC and fabric planes on the SCB are connected through HSL2 channels. • SCB2 supports HSL2 with both 3.11 Gbps and 6.22 Gbps (SerDes) link speed and various HSL2 modes. When an FPC is brought online, the link speed and HSL2 mode are determined by the type of FPC. Starting with Junos OS Release 15.1X49-D10 and Junos OS Release 17.3R1, the SRX5K-SCB3 (SCB3) with enhanced midplane is introduced. • All existing SCB software that is supported by SCB2 is supported on SCB3. • SRX5K-RE-1800X4 (RE2). Mixed Routing Engine use is not supported. • SCB3 works with the SRX5K-MPC (IOC2), SRX5K-MPC3-100G10G (IOC3), SRX5K-MPC3-40G10G (IOC3), and SRX5K-SPC-4-15-320 (SPC2) with current midplanes and the new enhanced midplanes. • Mixed SCB use is not supported. If an SCB2 and an SCB3 are used, the system will only power on the master Routing Engine's SCB and will power off the other SCBs. Only the SCB in slot 0 is powered on and a system log is generated. • SCB3 supports up to 400 Gbps per slot with old midplanes and up to 500 Gbps per slot with new midplanes. • SCB3 supports fabric intra-chassis redundancy. • SCB3 supports the same chassis cluster function as the SRX5K-SCB (SCB1) and the SRX5K-SCBE (SCB2), except for in-service software upgrade (ISSU) and in-service hardware upgrade (ISHU). • SCB3 has a second external Ethernet port. • Fabric bandwidth increasing mode is not supported.

Table 50: show chassis hardware Output Fields (continued)

Field Name	Field Description
	• Type of Flexible PIC Concentrator (FPC), Physical Interface Card (PIC), Modular Interface Cards (MICs), and PIMs. • IOCs Starting with Junos OS Release 15.1X49-D10 and Junos OS Release 17.3R1, the SRX5K-MPC3-100G10G (IOC3) and the SRX5K-MPC3-40G10G (IOC3) are introduced. ◦ IOC3 has two types of IOC3 MPCs, which have different built-in MICs: the 24x10GE + 6x40GE MPC and the 2x100GE + 4x10GE MPC. ◦ IOC3 supports SCB3 and SRX5000 line backplane and enhanced backplane. ◦ IOC3 can only work with SRX5000 line SCB2 and SCB3. If an SRX5000 line SCB is detected, IOC3 is offline, an FPC misconfiguration alarm is raised, and a system log message is generated. ◦ IOC3 interoperates with SCB2 and SCB3. ◦ IOC3 interoperates with the SRX5K-SPC-4-15-320 (SPC2) and the SRX5K-MPC (IOC2). ◦ The maximum power consumption for one IOC3 is 645W. An enhanced power module must be used. ◦ The IOC3 does not support the following command to set a PIC to go offline or online: **request chassis pic fpc-slot <fpc-slot> pic-slot <pic-slot> <offline | online>** . ◦ IOC3 supports 240 Gbps of throughput with the enhanced SRX5000 line backplane. ◦ Chassis cluster functions the same as for the SRX5000 line IOC2. ◦ IOC3 supports intra-chassis and inter-chassis fabric redundancy mode. ◦ IOC3 supports ISSU and ISHU in chassis cluster mode. ◦ IOC3 supports intra-FPC and and Inter-FPC Express Path (previously known as *services offloading*) with IPv4. ◦ NAT of IPv4 and IPv6 in normal mode and IPv4 for Express Path mode. ◦ All four PICs on the 24x10GE + 6x40GE cannot be powered on. A maximum of two PICs can be powered on at the same time. Use the **set chassis fpc <slot> pic <pic> power off** command to choose the PICs you want to power on. NOTE: Fabric bandwidth increasing mode is not supported on IOC3. • SRX Clustering Module (SCM) • Fan tray • For hosts, the Routing Engine type. ◦ Starting with Junos OS Release 12.1X47-D15 and Junos OS Release 17.3R1, the SRX5K-RE-1800X4 (RE2) Routing Engine is introduced. ◦ The RE2 has an Intel Quad core Xeon processor, 16 GB of DRAM, and a 128-GB solid-state drive (SSD). The number 1800 refers to the speed of the processor (1.8 GHz). The maximum required power for this Routing Engine is 90W. NOTE: The RE2 provides significantly better performance than the previously used Routing Engine, even with a single core.

show chassis hardware

show chassis hardware

user@host> **show chassis hardware**

```
node0:
--------------------------------------------------------------------------
Hardware inventory:
Item             Version  Part number  Serial number     Description
Chassis                                JN11B190FAGB      SRX5600
Midplane         REV 01   710-024804   ABAB5282          SRX5600 Midplane
FPM Board        REV 01   710-024631   YG0211            Front Panel Display
PEM 0            Rev 03   740-034701   QCS13090901H      PS 1.4-2.6kW; 90-264V
AC in
PEM 1            Rev 02   740-034701   QCS130309005      PS 1.4-2.6kW; 90-264V
AC in
PEM 2            Rev 01   740-034701   QCS12190901A      PS 1.4-2.6kW; 90-264V
AC in
Routing Engine 0 REV 01   740-056658   9009150226        SRX5k RE-1800X4
CB 0             REV 05   750-066337   CAJS6543          SRX5k SCB3
  Xcvr 0
FPC 0            REV 01   750-077373   CAKC4112          SPC3
  CPU                     BUILTIN      BUILTIN           SRX5k vCPP Broadwell
FPC 5            REV 08   750-043157   CABL8327          SRX5k IOC II
  CPU            REV 03   711-043360   CABJ0770          SRX5k MPC PMB
  MIC 1          REV 01   750-055732   ZM8169            20x 1GE(LAN) SFP
    PIC 2                 BUILTIN      BUILTIN           10x 1GE(LAN) SFP
      Xcvr 0     REV 02   740-013111   A514696           SFP-T
    PIC 3                 BUILTIN      BUILTIN           10x 1GE(LAN) SFP
      Xcvr 0     REV 01   740-013111   70173027          SFP-T
      Xcvr 9     REV 01   740-030658   AD1130A01S2       UNSUPPORTED
Fan Tray                                                 Enhanced Fan Tray

node1:
--------------------------------------------------------------------------
Hardware inventory:
Item             Version  Part number  Serial number     Description
Chassis                                JN11ADC7CAGB      SRX5600
Midplane         REV 01   710-024804   ABAB5357          SRX5600 Midplane
FPM Board        REV 01   710-024631   YF2474            Front Panel Display
PEM 0            Rev 03   740-034701   QCS133309019      PS 1.4-2.6kW; 90-264V
AC in
PEM 1            Rev 03   740-034701   QCS133209023      PS 1.4-2.6kW; 90-264V
AC in
PEM 2            Rev 02   740-034701   QCS130309013      PS 1.4-2.6kW; 90-264V
AC in
Routing Engine 0 REV 03   740-049603   9013079642        RE-S-EX9200-1800X4
CB 0             REV 01   750-056587   CACC9541          SRX5k SCB II
  Xcvr 0
FPC 0            REV 01   750-077373   CAKC4097          SPC3
  CPU                     BUILTIN      BUILTIN           SRX5k vCPP Broadwell
FPC 5            REV 11   750-043157   CACA8792          SRX5k IOC II
  CPU            REV 04   711-043360   CACA8809          SRX5k MPC PMB
  MIC 1          REV 01   750-055732   CACF9067          20x 1GE(LAN) SFP
    PIC 2                 BUILTIN      BUILTIN           10x 1GE(LAN) SFP
      Xcvr 0     REV 01   740-013111   8512082           SFP-T
    PIC 3                 BUILTIN      BUILTIN           10x 1GE(LAN) SFP
      Xcvr 0     REV 01   740-013111   70113020          SFP-T
      Xcvr 9     REV 01   740-021308   AJQ0S8Y           UNSUPPORTED
```



```
Fan Tray                                                Enhanced Fan Tray

{primary:node0}
```

show chassis hardware (SRX5600 and SRX5800 devices for SRX5K-MPC)

user@host> **show chassis hardware**

```
Hardware inventory:
Item             Version  Part number  Serial number     Description
Chassis                                JN12170EAAGA      SRX 5800
Midplane         REV 01   710-041799   ACAX3849          SRX 5800 Backplane
FPM Board        REV 01   710-024632   CAAX7297          Front Panel Display
PDM              Rev 03   740-013110   QCS170250DU       Power Distribution Modu
le
PEM 0            Rev 03   740-034724   QCS17020203F      PS 4.1kW; 200-240V AC i
n
PEM 1            Rev 03   740-034724   QCS17020203C      PS 4.1kW; 200-240V AC i
n
PEM 2            Rev 04   740-034724   QCS17100200A      PS 4.1kW; 200-240V AC i
n
PEM 3            Rev 03   740-034724   QCS17080200M      PS 4.1kW; 200-240V AC i
n
Routing Engine 0 REV 11   740-023530   9012047437        SRX5k RE-13-20
CB 0             REV 09   710-024802   CAAX7202          SRX5k SCB
CB 1             REV 09   710-024802   CAAX7157          SRX5k SCB
FPC 0            REV 07   750-044175   CAAD0791          SRX5k SPC II
  CPU                     BUILTIN      BUILTIN           SRX5k DPC PPC
  PIC 0                   BUILTIN      BUILTIN           SPU Cp
  PIC 1                   BUILTIN      BUILTIN           SPU Flow
  PIC 2                   BUILTIN      BUILTIN           SPU Flow
  PIC 3                   BUILTIN      BUILTIN           SPU Flow
FPC 1            REV 07   750-044175   CAAD0751          SRX5k SPC II
  CPU                     BUILTIN      BUILTIN           SRX5k DPC PPC
  PIC 0                   BUILTIN      BUILTIN           SPU Flow
  PIC 1                   BUILTIN      BUILTIN           SPU Flow
  PIC 2                   BUILTIN      BUILTIN           SPU Flow
  PIC 3                   BUILTIN      BUILTIN           SPU Flow
FPC 2            REV 28   750-020751   CAAW1817          SRX5k DPC 4X 10GE
  CPU            REV 04   710-024633   CAAZ5269          SRX5k DPC PMB
  PIC 0                   BUILTIN      BUILTIN           1x 10GE(LAN/WAN) RichQ
    Xcvr 0       REV 02   740-014289   T10A00404         XFP-10G-SR
  PIC 1                   BUILTIN      BUILTIN           1x 10GE(LAN/WAN) RichQ
  PIC 2                   BUILTIN      BUILTIN           1x 10GE(LAN/WAN) RichQ
  PIC 3                   BUILTIN      BUILTIN           1x 10GE(LAN/WAN) RichQ
FPC 6            REV 02   750-044175   ZY2552            SRX5k SPC II
  CPU                     BUILTIN      BUILTIN           SRX5k DPC PPC
FPC 9            REV 10   750-044175   CAAP5932          SRX5k SPC II
  CPU                     BUILTIN      BUILTIN           SRX5k DPC PPC
  PIC 0                   BUILTIN      BUILTIN           SPU Flow
  PIC 1                   BUILTIN      BUILTIN           SPU Flow
  PIC 2                   BUILTIN      BUILTIN           SPU Flow
  PIC 3                   BUILTIN      BUILTIN           SPU Flow
FPC 10           REV 22   750-043157   ZH8192            SRX5k IOC II   CPU
      REV 08   711-043360    YX3879             SRX5k MPC PMB
  MIC 0          REV 01   750-049488   YZ2084            10x 10GE SFP+
    PIC 0                 BUILTIN      BUILTIN           10x 10GE SFP+
      Xcvr 0     REV 01   740-031980   AMB0HG3           SFP+-10G-SR
      Xcvr 1     REV 01   740-031980   AM20B6F           SFP+-10G-SR
```



```
  MIC 1          REV 19    750-049486    CAAH3504          1x 100GE CFP
    PIC 2                  BUILTIN       BUILTIN           1x 100GE CFP
      Xcvr 0     REV 01    740-035329    X000D375          CFP-100G-SR10
FPC 11           REV 07.04.07 750-043157 CAAJ8771          SRX5k IOC II    CPU
      REV 08   711-043360    CAAJ3881          SRX5k MPC PMB
  MIC 0          REV 19    750-049486    CAAH0979          1x 100GE CFP
    PIC 0                  BUILTIN       BUILTIN           1x 100GE CFP
      Xcvr 0     REV 01    740-035329    UP1020Z           CFP-100G-SR10
  MIC 1          REV 08    750-049487    CAAM1160          2x 40GE QSFP+
    PIC 2                  BUILTIN       BUILTIN           2x 40GE QSFP+
      Xcvr 0     REV 01    740-032986    QB151094          QSFP+-40G-SR4
      Xcvr 1     REV 01    740-032986    QB160509          QSFP+-40G-SR4
Fan Tray 0       REV 04    740-035409    ACAE0875          Enhanced Fan Tray
Fan Tray 1       REV 04    740-035409    ACAE0876          Enhanced Fan Tray
```

show chassis hardware (with 20-Gigabit Ethernet MIC with SFP)

`user@host>` **show chassis hardware**

```
Hardware inventory:
Item             Version  Part number  Serial number     Description
Chassis                                JN108DA5AAGA      SRX 5800
Midplane         REV 02   710-013698   TR0037            SRX 5600 Midplane
FPM Board        REV 02   710-014974   JY4635            Front Panel Display
PDM             Rev 02   740-013110   QCS10465005       Power Distribution Module
PEM 0            Rev 03   740-023514   QCS11154040       PS 1.7kW; 200-240VAC in
PEM 2            Rev 02   740-023514   QCS10504014       PS 1.7kW; 200-240VAC in
Routing Engine 0 REV 05   740-015113   1000681023        RE-S-1300
CB 0             REV 05   710-013385   JY4775            SRX5k SCB
FPC 1            REV 17   750-020751   WZ6349            SRX5k DPC 4X 10GE
  CPU            REV 02   710-024633   WZ0718            SRX5k DPC PMB
  PIC 0                   BUILTIN      BUILTIN           1x 10GE(LAN/WAN) RichQ
    Xcvr 0                NON-JNPR     C724XM088         XFP-10G-SR
  PIC 1                   BUILTIN      BUILTIN           1x 10GE(LAN/WAN) RichQ
    Xcvr 0       REV 02   740-011571   C831XJ08S         XFP-10G-SR
  PIC 2                   BUILTIN      BUILTIN           1x 10GE(LAN/WAN) RichQ
  PIC 3                   BUILTIN      BUILTIN           1x 10GE(LAN/WAN) RichQ
FPC 3            REV 22   750-043157   ZH8189            SRX5k IOC II
  CPU            REV 06   711-043360   YX3912            SRX5k MPC PMB
  MIC 0          REV 01   750-055732   CACF9115          20x 1GE(LAN) SFP
    PIC 0                 BUILTIN      BUILTIN           10x 1GE(LAN) SFP
      Xcvr 2     REV 02   740-013111   B358549           SFP-T
      Xcvr 9     REV 02   740-011613   PNB1FQS           SFP-SX
    PIC 1                 BUILTIN      BUILTIN           10x 1GE(LAN) SFP
      Xcvr 9     REV 02   740-011613   PNB1FFF           SFP-SX
FPC 5            REV 01   750-027945   JW9665            SRX5k FIOC
  CPU
FPC 8            REV 08   750-023996   XA7234            SRX5k SPC
  CPU            REV 02   710-024633   XA1599            SRX5k DPC PMB
  PIC 0                   BUILTIN      BUILTIN           SPU Cp-Flow
  PIC 1                   BUILTIN      BUILTIN           SPU Flow
Fan Tray 0       REV 03   740-014971   TP0902            Fan Tray
Fan Tray 1       REV 01   740-014971   TP0121            Fan Tray
```

show chassis hardware (SRX5600 and SRX5800 devices with SRX5000 line SRX5K-SCBE [SCB2] and SRX5K-RE-1800X4 [RE2])

`user@host>` **show chassis hardware**


```
node0:
--------------------------------------------------------------------------
Hardware inventory:
Item             Version  Part number  Serial number     Description
Chassis                                JN1251EA1AGB      SRX5600
Midplane        REV 01   760-063936   ACRE2657         Enhanced SRX5600 Midplane
FPM Board        REV 01   710-024631   CABY3551          Front Panel Display
PEM 0            Rev 03   740-034701   QCS13380901P      PS 1.4-2.6kW; 90-264V
AC in
PEM 1            Rev 03   740-034701   QCS133809019      PS 1.4-2.6kW; 90-264V
AC in
Routing Engine 0 REV 02   740-056658   9009210105        SRX5k RE-1800X4
Routing Engine 1 REV 02   740-056658   9013115551        SRX5k RE-1800X4
CB 0             REV 01   750-062257   CADW3663          SRX5k SCB3
CB 1             REV 01   750-062257   CADZ3263          SRX5k SCB3
FPC 0            REV 18   750-054877   CABG6043          SRX5k SPC II
  CPU                     BUILTIN      BUILTIN           SRX5k DPC PPC
  PIC 0                   BUILTIN      BUILTIN           SPU Cp
  PIC 1                   BUILTIN      BUILTIN           SPU Flow
  PIC 2                   BUILTIN      BUILTIN           SPU Flow
  PIC 3                   BUILTIN      BUILTIN           SPU Flow
FPC 1            REV 01   750-062243   CAEE5918          SRX5k IOC3 24XGE+6XLG
  CPU            REV 02   711-062244   CADX8509          RMPC PMB
  PIC 0                   BUILTIN      BUILTIN           12x 10GE SFP+
    Xcvr 0       REV 01   740-031980   273363A01891      SFP+-10G-SR
    Xcvr 1       REV 01   740-031980   273363A01915      SFP+-10G-SR
    Xcvr 2       REV 01   740-031980   ANA0BK6           SFP+-10G-SR
    Xcvr 3       REV 01   740-031980   AP407GA           SFP+-10G-SR
    Xcvr 9       REV 01   740-021308   MUC20G1           SFP+-10G-SR
  PIC 1                   BUILTIN      BUILTIN           12x 10GE SFP+
  PIC 2                   BUILTIN      BUILTIN           3x 40GE QSFP+
  PIC 3                   BUILTIN      BUILTIN           3x 40GE QSFP+
  WAN MEZZ       REV 15   750-049136   CAEE5845          MPC5E 24XGE OTN Mezz
FPC 3            REV 11   750-043157   CACL7452          SRX5k IOC II
  CPU            REV 04   711-043360   CACP1977          SRX5k MPC PMB
  MIC 0          REV 04   750-049488   CABL4759          10x 10GE SFP+
    PIC 0                 BUILTIN      BUILTIN           10x 10GE SFP+
      Xcvr 0     REV 01   740-021308   CF36KM0SY         SFP+-10G-SR
      Xcvr 1     REV 01   740-021308   MUC0MF2           SFP+-10G-SR
      Xcvr 2     REV 01   740-021308   CF36KM01S         SFP+-10G-SR
      Xcvr 3     REV 01   740-021308   MUC229N           SFP+-10G-SR
FPC 5            REV 07   750-044175   CAAD0764          SRX5k SPC II
  CPU                     BUILTIN      BUILTIN           SRX5k DPC PPC
  PIC 0                   BUILTIN      BUILTIN           SPU Flow
  PIC 1                   BUILTIN      BUILTIN           SPU Flow
  PIC 2                   BUILTIN      BUILTIN           SPU Flow
  PIC 3                   BUILTIN      BUILTIN           SPU Flow
Fan Tray                                                 Enhanced Fan Tray

node1:
--------------------------------------------------------------------------
Hardware inventory:
Item             Version  Part number  Serial number     Description
Chassis                                JN124FE77AGB      SRX5600
Midplane        REV 01   760-063936   ACRE2970         Enhanced SRX5600 Midplane
FPM Board        REV 01   710-024631   CABY3552          Front Panel Display
PEM 0            Rev 03   740-034701   QCS133809028      PS 1.4-2.6kW; 90-264V
AC in
PEM 1            Rev 03   740-034701   QCS133809027      PS 1.4-2.6kW; 90-264V
AC in
```

```
Routing Engine 0 REV 02   740-056658   9009218294        SRX5k RE-1800X4
Routing Engine 1 REV 02   740-056658   9013104758        SRX5k RE-1800X4
CB 0             REV 01   750-062257   CAEB8180          SRX5k SCB3
CB 1             REV 01   750-062257   CADZ3334          SRX5k SCB3
FPC 0            REV 18   750-054877   CACJ9834          SRX5k SPC II
  CPU                     BUILTIN      BUILTIN           SRX5k DPC PPC
  PIC 0                   BUILTIN      BUILTIN           SPU Cp
  PIC 1                   BUILTIN      BUILTIN           SPU Flow
  PIC 2                   BUILTIN      BUILTIN           SPU Flow
  PIC 3                   BUILTIN      BUILTIN           SPU Flow
FPC 1            REV 01   750-062243   CAEB0981          SRX5k IOC3 24XGE+6XLG
  CPU            REV 02   711-062244   CAEA4644          RMPC PMB
  PIC 0                   BUILTIN      BUILTIN           12x 10GE SFP+
    Xcvr 0       REV 01   740-031980   AP41BLH           SFP+-10G-SR
    Xcvr 1       REV 01   740-031980   AQ400SL           SFP+-10G-SR
    Xcvr 2       REV 01   740-031980   AP422LJ           SFP+-10G-SR
    Xcvr 3       REV 01   740-021308   AMG0RBT           SFP+-10G-SR
    Xcvr 9       REV 01   740-021308   MUC2FRG           SFP+-10G-SR
  PIC 1                   BUILTIN      BUILTIN           12x 10GE SFP+
  PIC 2                   BUILTIN      BUILTIN           3x 40GE QSFP+
  PIC 3                   BUILTIN      BUILTIN           3x 40GE QSFP+
  WAN MEZZ       REV 15   750-049136   CAEA4837          MPC5E 24XGE OTN Mezz
FPC 3            REV 11   750-043157   CACA8784          SRX5k IOC II
  CPU            REV 04   711-043360   CACA8820          SRX5k MPC PMB
  MIC 0          REV 05   750-049488   CADF0521          10x 10GE SFP+
    PIC 0                 BUILTIN      BUILTIN           10x 10GE SFP+
      Xcvr 0     REV 01   740-030658   AD1130A00PV       SFP+-10G-USR
      Xcvr 1     REV 01   740-031980   AN40MVV           SFP+-10G-SR
      Xcvr 2     REV 01   740-021308   CF36KM37B         SFP+-10G-SR
      Xcvr 3     REV 01   740-021308   AD153830DSZ       SFP+-10G-SR
  MIC 1          REV 01   750-049487   CABB5961          2x 40GE QSFP+
    PIC 2                 BUILTIN      BUILTIN           2x 40GE QSFP+
      Xcvr 1     REV 01   740-032986   QB160513          QSFP+-40G-SR4
FPC 5            REV 02   750-044175   ZY2569            SRX5k SPC II
  CPU                     BUILTIN      BUILTIN           SRX5k DPC PPC
  PIC 0                   BUILTIN      BUILTIN           SPU Flow
  PIC 1                   BUILTIN      BUILTIN           SPU Flow
  PIC 2                   BUILTIN      BUILTIN           SPU Flow
  PIC 3                   BUILTIN      BUILTIN           SPU Flow
Fan Tray                                                 Enhanced Fan Tray
```

show chassis hardware (SRX5400, SRX5600, and SRX5800 devices with SRX5000 line SRX5K-SCB3 [SCB3] with enhanced midplanes and SRX5K-MPC3-100G10G [IOC3] or SRX5K-MPC3-40G10G [IOC3])

user@host> **show chassis hardware**

```
node0:
--------------------------------------------------------------------------
Hardware inventory:
Item             Version  Part number  Serial number     Description
Chassis                                JN1250870AGB      SRX5600
Midplane        REV 01   760-063936   ACRE2578         Enhanced SRX5600 Midplane


FPM Board        REV 02   710-017254   KD9027            Front Panel Display
PEM 0            Rev 03   740-034701   QCS13090900T      PS 1.4-2.6kW; 90-264V A

                                     C in
PEM 1            Rev 03   740-034701   QCS13090904T      PS 1.4-2.6kW; 90-264V A
```

```
                                     C in
Routing Engine 0 REV 01   740-056658   9009196496        SRX5k RE-1800X4
CB 0             REV 01   750-062257   CAEC2501          SRX5k SCB3
FPC 0            REV 10   750-056758   CADC8067          SRX5k SPC II
  CPU                     BUILTIN      BUILTIN           SRX5k DPC PPC
  PIC 0                   BUILTIN      BUILTIN           SPU Cp
  PIC 1                   BUILTIN      BUILTIN           SPU Flow
  PIC 2                   BUILTIN      BUILTIN           SPU Flow
  PIC 3                   BUILTIN      BUILTIN           SPU Flow
FPC 2            REV 01   750-062243   CAEE5924          SRX5k IOC3 24XGE+6XLG
  CPU            REV 01   711-062244   CAEB4890          SRX5k IOC3 PMB
  PIC 0                   BUILTIN      BUILTIN           12x 10GE SFP+
  PIC 1                   BUILTIN      BUILTIN           12x 10GE SFP+
  PIC 2                   BUILTIN      BUILTIN           3x 40GE QSFP+
    Xcvr 0       REV 01   740-038623   MOC13156230449    QSFP+-40G-CU1M
    Xcvr 2       REV 01   740-038623   MOC13156230449    QSFP+-40G-CU1M
  PIC 3                   BUILTIN      BUILTIN           3x 40GE QSFP+
  WAN MEZZ       REV 01   750-062682   CAEE5817          24x 10GE SFP+ Mezz
FPC 4            REV 11   750-043157   CACY1595          SRX5k IOC II
  CPU            REV 04   711-043360   CACZ8879          SRX5k MPC PMB
  MIC 1          REV 04   750-049488   CACM6062          10x 10GE SFP+
    PIC 2                 BUILTIN      BUILTIN           10x 10GE SFP+
      Xcvr 7     REV 01   740-021308   AD1439301TU       SFP+-10G-SR
      Xcvr 8     REV 01   740-021308   AD1439301SD       SFP+-10G-SR
      Xcvr 9     REV 01   740-021308   AD1439301TS       SFP+-10G-SR
FPC 5            REV 05   750-044175   ZZ1371            SRX5k SPC II
  CPU                     BUILTIN      BUILTIN           SRX5k DPC PPC
  PIC 0                   BUILTIN      BUILTIN           SPU Flow
  PIC 1                   BUILTIN      BUILTIN           SPU Flow
  PIC 2                   BUILTIN      BUILTIN           SPU Flow
  PIC 3                   BUILTIN      BUILTIN           SPU Flow
Fan Tray                                                 Enhanced Fan Tray

node1:
--------------------------------------------------------------------------
Hardware inventory:
Item             Version  Part number  Serial number     Description
Chassis                                JN124FEC0AGB      SRX5600
Midplane        REV 01   760-063936   ACRE2946         Enhanced SRX5600 Midplane
FPM Board        test     710-017254   test              Front Panel Display
PEM 0            Rev 01   740-038514   QCS114111003      DC 2.6kW Power Entry
Module
PEM 1            Rev 01   740-038514   QCS12031100J      DC 2.6kW Power Entry
Module
Routing Engine 0 REV 01   740-056658   9009186342        SRX5k RE-1800X4
CB 0             REV 01   750-062257   CAEB8178          SRX5k SCB3
FPC 0            REV 07   750-044175   CAAD0769          SRX5k SPC II
  CPU                     BUILTIN      BUILTIN           SRX5k DPC PPC
  PIC 0                   BUILTIN      BUILTIN           SPU Cp
  PIC 1                   BUILTIN      BUILTIN           SPU Flow
  PIC 2                   BUILTIN      BUILTIN           SPU Flow
  PIC 3                   BUILTIN      BUILTIN           SPU Flow
FPC 4            REV 11   750-043157   CACY1592          SRX5k IOC II
  CPU            REV 04   711-043360   CACZ8831          SRX5k MPC PMB
  MIC 1          REV 04   750-049488   CACN0239          10x 10GE SFP+
    PIC 2                 BUILTIN      BUILTIN           10x 10GE SFP+
      Xcvr 7     REV 01   740-031980   ARN23HW           SFP+-10G-SR
      Xcvr 8     REV 01   740-031980   ARN2FVW           SFP+-10G-SR
      Xcvr 9     REV 01   740-031980   ARN2YVM           SFP+-10G-SR
```



```
FPC 5            REV 10   750-056758   CADA8736          SRX5k SPC II
  CPU                     BUILTIN      BUILTIN           SRX5k DPC PPC
  PIC 0                   BUILTIN      BUILTIN           SPU Flow
  PIC 1                   BUILTIN      BUILTIN           SPU Flow
  PIC 2                   BUILTIN      BUILTIN           SPU Flow
  PIC 3                   BUILTIN      BUILTIN           SPU Flow
Fan Tray                                                 Enhanced Fan Tray
```

show chassis hardware (SRX4200)

user@host> **show chassis hardware**

```
Hardware inventory:
Item             Version  Part number  Serial number     Description
Chassis                                DK2816AR0020      SRX4200
Mainboard        REV 01   650-071675   16061032317       SRX4200
Routing Engine 0          BUILTIN      BUILTIN           SRX Routing Engine
FPC 0                     BUILTIN      BUILTIN           FEB
  PIC 0                   BUILTIN      BUILTIN           8x10G-SFP
    Xcvr 0       REV 01   740-038153   MOC11511530020    SFP+-10G-CU3M
    Xcvr 1       REV 01   740-038153   MOC11511530020    SFP+-10G-CU3M
    Xcvr 2       REV 01   740-038153   MOC11511530020    SFP+-10G-CU3M
    Xcvr 3       REV 01   740-038153   MOC11511530020    SFP+-10G-CU3M
    Xcvr 4       REV 01   740-021308   04DZ06A00364      SFP+-10G-SR
    Xcvr 5       REV 01   740-031980   233363A03066      SFP+-10G-SR
    Xcvr 6       REV 01   740-021308   AL70SWE           SFP+-10G-SR
    Xcvr 7       REV 01   740-031980   ALN0N6C           SFP+-10G-SR
    Xcvr 8       REV 01   740-030076   APF16220018NK1    SFP+-10G-CU1M
Power Supply 0   REV 04   740-041741   1GA26241849       JPSU-650W-AC-AFO
Power Supply 1   REV 04   740-041741   1GA26241846       JPSU-650W-AC-AFO
Fan Tray 0                                              SRX4200 0, Front to Back
 Airflow - AFO
Fan Tray 1                                              SRX4200 1, Front to Back
 Airflow - AFO
Fan Tray 2                                              SRX4200 2, Front to Back
 Airflow - AFO
Fan Tray 3                                              SRX4200 3, Front to Back
 Airflow - AFO
```

show chassis hardware clei-models

show chassis hardware clei-models (SRX5600 and SRX5800 devices with SRX5000 line SRX5K-SCBE [SCB2] and SRX5K-RE-1800X4 [RE2])

user@host> **show chassis hardware clei-models node 1**

```
node1:
--------------------------------------------------------------------------
Hardware inventory:
Item             Version  Part number  CLEI code         FRU model number
Midplane         REV 01   710-024803                     SRX5800-BP-A
FPM Board        REV 01   710-024632                     SRX5800-CRAFT-A
PEM 0            Rev 04   740-034724                     SRX5800-PWR-4100-AC
PEM 1            Rev 05   740-034724                     SRX5800-PWR-4100-AC
Routing Engine 0 REV 01   740-056658   COUCATTBAA        SRX5K-RE-1800X4
CB 0             REV 01   750-056587   COUCATSBAA        SRX5K-SCBE
CB 1             REV 01   750-056587   COUCATSBAA        SRX5K-SCBE
```

```
CB 2             REV 01   750-056587   COUCATSBAA         SRX5K-SCBE
FPC 0            REV 18   750-054877   COUCATLBAA         SRX5K-SPC-4-15-320
  CPU                     BUILTIN
FPC 1            REV 18   750-054877   COUCATLBAA         SRX5K-SPC-4-15-320
  CPU                     BUILTIN
FPC 2            REV 18   750-054877   COUCATLBAA         SRX5K-SPC-4-15-320
  CPU                     BUILTIN
FPC 3            REV 11   750-043157   COUIBCWBAA         SRX5K-MPC
  MIC 0          REV 05   750-049486   COUIBCYBAA         SRX-MIC-1X100G-CFP
  MIC 1          REV 04   750-049488   COUIBCXBAA         SRX-MIC-10XG-SFPP
FPC 4            REV 18   750-054877   COUCATLBAA         SRX5K-SPC-4-15-320
  CPU                     BUILTIN
FPC 7            REV 18   750-054877   COUCATLBAA         SRX5K-SPC-4-15-320
  CPU                     BUILTIN
FPC 8            REV 11   750-043157   COUIBCWBAA         SRX5K-MPC
  MIC 0          REV 05   750-049486   COUIBCYBAA         SRX-MIC-1X100G-CFP
FPC 9            REV 18   750-054877   COUCATLBAA         SRX5K-SPC-4-15-320
  CPU                     BUILTIN
FPC 10           REV 18   750-054877   COUCATLBAA         SRX5K-SPC-4-15-320
  CPU                     BUILTIN
Fan Tray 0       REV 04   740-035409                      SRX5800-HC-FAN
Fan Tray 1       REV 04   740-035409                      SRX5800-HC-FAN
```


show ethernet-switching mac-learning-log

Syntax

```
show ethernet-switching mac-learning-log
```

Release Information

Command introduced in Junos OS Release 9.0 for EX Series switches.
Command introduced in Junos OS Release 9.5 for SRX Series devices.
Command introduced in Junos OS Release 11.1 for the QFX Series.

Description

Displays the event log of learned MAC addresses.

Required Privilege Level

view

Related Documentation

- show ethernet-switching table on page 792
- *show ethernet-switching interfaces*
- show ethernet-switching table on page 792
- *show ethernet-switching interfaces*
- *Example: Setting Up Basic Bridging and a VLAN for an EX Series Switch*
- *Example: Setting Up Bridging with Multiple VLANs for EX Series Switches*
- *Example: Connecting an EX Series Access Switch to a Distribution Switch*

List of Sample Output

show ethernet-switching mac-learning-log (EX Series switch) on page 789
show ethernet-switching mac-learning-log (QFX Series Switches, QFabric, NFX Series Devices and EX4600) on page 789
show ethernet-switching mac-learning-log (SRX Series devices) on page 790

Output Fields

Output fields for EX Series switches:

The following table lists the output fields for the **show ethernet-switching mac-learning-log** command. Output fields are listed in the approximate order in which they appear.

Table 51: show ethernet-switching mac-learning-log Output Fields

Field Name	Field Description
Date and Time	Timestamp when the MAC address was added or deleted from the log.
vlan_name	VLAN name. A value defined by the user for all user-configured VLANs.
MAC	Learned MAC address.
Deleted | Added	MAC address deleted or added to the MAC learning log.

Table 51: show ethernet-switching mac-learning-log Output Fields (continued)

Field Name	Field Description
Blocking	The forwarding state of the interface: • **blocked**—Traffic is not being forwarded on the interface. • **unblocked**—Traffic is forwarded on the interface.
Flags	Displays the MAC address flags in which the MAC event occurred. This option is for debugging purposes.

Output fields for QFX Series switches, QFabric, NFX Series devices and EX4600:

Table 52 on page 788 lists the output fields for the **show ethernet-switching mac-learning-log** command. Output fields are listed in the approximate order in which they appear.

Table 52: show ethernet-switching mac-learning-log Output Fields

Field Name	Field Description
Date and Time	Timestamp in UTC when the MAC operation occurred.
vlan_name	VLAN name. A value defined by the user for all user-configured VLANs. The name of the VLAN on which the MAC is learned.
MAC	Learned MAC address.
Event op	MAC address that are added, learned, deleted, changed or moved from one interface to another interface.
Interface Name	The name of the interface on which the MAC address is learned. When a MAC address is moved, there is another field with the name of the interface. The log displays the name of the interface from where the MAC address moved, and the name of the interface to where the MAC address moved.
Flags	Displays the MAC address flags in which the MAC event occurred. This option is for debugging purposes.

Output fields for SRX Series devices:

Table 53 on page 788 lists the output fields for the show ethernet-switching mac-learning-log command on SRX Series devices. Output fields are listed in the approximate order in which they appear.

Table 53: show ethernet-switching-mac-learning-log Output Fields

Field Name	Field Description
Date and Time	Timestamp when the MAC address was added or deleted from the log.
VLAN-IDX	VLAN index. An internal value assigned by Junos OS for each VLAN.
MAC	Learned MAC address.

Table 53: show ethernet-switching-mac-learning-log Output Fields (continued)

Field Name	Field Description
Deleted | Added	MAC address deleted or added to the MAC learning log.
Blocking	The forwarding state of the interface: • blocked—Traffic is not being forwarded on the interface. • unblocked—Traffic is forwarded on the interface.

Sample Output

show ethernet-switching mac-learning-log (EX Series switch)

user@switch> **show ethernet-switching mac-learning-log**

```
Mon Feb 25 08:07:05 2008
 vlan_name v1 mac 00:00:00:00:00:00 was deleted
Mon Feb 25 08:07:05 2008
 vlan_name v9 mac 00:00:00:00:00:00 was deleted
Mon Feb 25 08:07:05 2008
 vlan_name HR_vlan mac 00:00:00:00:00:00 was deleted
Mon Feb 25 08:07:05 2008
 vlan_name v3 mac 00:00:00:00:00:00 was deleted
Mon Feb 25 08:07:05 2008
 vlan_name v12 mac 00:00:00:00:00:00 was deleted
Mon Feb 25 08:07:05 2008
 vlan_name v13 mac 00:00:00:00:00:00 was deleted
Mon Feb 25 08:07:05 2008
 vlan_name sales_vlan mac 00:00:00:00:00:00 was deleted
Mon Feb 25 08:07:05 2008
 vlan_name employee1 mac 00:00:00:00:00:00 was deleted
Mon Feb 25 08:07:05 2008
 vlan_name employee2 mac 00:00:00:00:00:00 was deleted
Mon Feb 25 08:07:05 2008
 vlan_name v3 mac 00:00:00:00:00:00 was added
Mon Feb 25 08:07:05 2008
 vlan_name HR_vlan mac 00:00:00:00:00:00 was added
Mon Feb 25 08:07:05 2008
 vlan_name employee2 mac 00:00:00:00:00:00 was added
Mon Feb 25 08:07:05 2008
 vlan_name employee1 mac 00:00:00:00:00:00 was added
Mon Feb 25 08:07:05 2008
 vlan_name employee2 mac 00:00:05:00:00:05 was learned
Mon Feb 25 08:07:05 2008
 vlan_name employee1 mac 00:30:48:90:54:89 was learned
Mon Feb 25 08:07:05 2008
 vlan_name HR_vlan mac 00:00:5e:00:01:00 was learned
Mon Feb 25 08:07:05 2008
 vlan_name sales_vlan mac 00:00:5e:00:01:08 was learned
[output truncated]
```

show ethernet-switching mac-learning-log (QFX Series Switches, QFabric, NFX Series Devices and EX4600)

user@switch> **show ethernet-switching mac-learning-log**

```
Mon Jun 30 13:49:49 2014 vlan_name v11+11 mac 00:10:94:00:00:02 was learned on
ge-1/0/22.0 with flags: 0x2001f     << MAC address that as dynamically learned
Mon Jun 30 13:50:29 2014 vlan_name v11+11 mac 00:10:94:00:00:02 was deleted from
 ge-1/0/22.0 with flags: 0x1080  << MAC address that was deleted
Mon Jun 30 13:51:28 2014 vlan_name v11+11 mac 00:00:00:01:01:01 was added to
ge-1/0/22.0 with flags: 0x2013f        << Static MAC address that was added
Mon Jun 30 13:51:46 2014 vlan_name v11+11 mac 00:00:00:01:01:01 was deleted from
 ge-1/0/22.0 with flags: 0x1120   << delete of Static MAC address that was deleted
Mon Jun 30 13:52:03 2014 vlan_name v11+11 mac 00:10:94:00:00:02 was learned on
ge-1/0/22.0 with flags: 0x2001f    << MAC address that was dynamically learned
Mon Jun 30 13:52:11 2014 vlan_name v11+11 mac 00:10:94:00:00:02 was moved from
ge-1/0/22.0 to ge-1/0/21.0 with flags: 0x2101f    << MAC address that was moved
Mon Jun 30 13:54:24 2014 vlan_name v11+11 mac 00:10:94:00:00:02 was changed on
ge-1/0/21.0 with flags: 0x2113f   << MAC address that changed from a dynamic
address to a static address
```

show ethernet-switching mac-learning-log (SRX Series devices)

user@host> **show ethernet-switching mac-learning-log**

```
Wed Mar 18 08:07:05 2009
vlan_idx 7 mac 00:00:5E:00:53:00 was deleted
Wed Mar 18 08:07:05 2009
vlan_idx 9 mac 00:00:5E:00:53:00 was deleted
Wed Mar 18 08:07:05 2009
vlan_idx 10 mac 00:00:5E:00:53:00 was deleted
Wed Mar 18 08:07:05 2009
vlan_idx 11 mac 00:00:5E:00:53:00 was deleted
Wed Mar 18 08:07:05 2009
vlan_idx 12 mac 00:00:5E:00:53:00 was deleted
Wed Mar 18 08:07:05 2009
vlan_idx 13 mac 00:00:5E:00:53:00 was deleted
Wed Mar 18 08:07:05 2009
vlan_idx 14 mac 00:00:5E:00:53:00 was deleted
Wed Mar 18 08:07:05 2009
vlan_idx 15 mac 00:00:5E:00:53:00 was deleted
Wed Mar 18 08:07:05 2009
vlan_idx 16 mac 00:00:5E:00:53:00 was deleted
Wed Mar 18 08:07:05 2009
vlan_idx 4 mac 00:00:5E:00:53:00 was added
Wed Mar 18 08:07:05 2009
vlan_idx 6 mac 00:00:5E:00:53:00 was added
Wed Mar 18 08:07:05 2009
vlan_idx 7 mac 00:00:5E:00:53:00 was added
Wed Mar 18 08:07:05 2009
vlan_idx 9 mac 00:00:5E:00:53:00 was added
Wed Mar 18 08:07:05 2009
vlan_idx 10 mac 00:00:5E:00:53:00 was added
Wed Mar 18 08:07:05 2009
vlan_idx 11 mac 00:00:5E:00:53:00 was added
Wed Mar 18 08:07:05 2009
vlan_idx 12 mac 00:00:5E:00:53:00 was added
Wed Mar 18 08:07:05 2009
vlan_idx 13 mac 00:00:5E:00:53:00 was added
Wed Mar 18 08:07:05 2009
vlan_idx 14 mac 00:00:5E:00:53:00 was added
Wed Mar 18 08:07:05 2009
vlan_idx 15 mac 00:00:5E:00:53:00 was added
Wed Mar 18 08:07:05 2009
vlan_idx 16 mac 00:00:5E:00:53:00 was added
```

```
Wed Mar 18 08:07:05 2009
vlan_idx 5 mac 00:00:5E:00:53:00 was added
Wed Mar 18 08:07:05 2009
vlan_idx 18 mac 00:00:5E:00:53:AA was learned
Wed Mar 18 08:07:05 2009
vlan_idx 5 mac 00:00:5E:00:53:AB was learned
Wed Mar 18 08:07:05 2009
vlan_idx 6 mac 00:00:5E:00:53:AC was learned
Wed Mar 18 08:07:05 2009
vlan_idx 16 mac 00:00:5E:00:53:AD was learned
Wed Mar 18 08:07:05 2009
vlan_idx 7 mac 00:00:5E:00:53:AE was learned
Wed Mar 18 08:07:05 2009
vlan_idx 8 mac 00:00:5E:00:53:AF was learned
Wed Mar 18 08:07:05 2009
vlan_idx 12 mac 00:00:5E:00:53:AG was learned
[output truncated]
```

show ethernet-switching table

List of Syntax

Syntax (QFX Series, QFabric, NFX Series and EX4600) on page 792
Syntax (EX Series) on page 792
Syntax (EX Series, MX Series and QFX Series) on page 792
Syntax (SRX Series) on page 792

Syntax (QFX Series, QFabric, NFX Series and EX4600)

show ethernet-switching table
<brief | detail | extensive | summary>
<interface *interface-name*>
<management-vlan>
<sort-by (*name* | *tag*)>
<vlan *vlan-name*>

Syntax (EX Series)

show ethernet-switching table
<brief | detail | extensive | summary>
<interface *interface-name*>
<management-vlan>
<persistent-mac <interface *interface-name*>>
<sort-by (*name* | *tag*)>
<vlan *vlan-name*>

Syntax (EX Series, MX Series and QFX Series)

show ethernet-switching table
<brief | count | detail | extensive | summary>
<*address*>
<instance *instance-name*>
<interface *interface-name*>
isid *isid*
<logical-system *logical-system-name*>
<persistent-learning (interface *interface-name* | mac *mac-address*)>
<*address*>
<vlan-id (all-vlan | *vlan-id*)>
<vlan-name (all | *vlan-name*)>

Syntax (SRX Series)

show ethernet-switching table (brief |detail |extensive) interface *interface-name*

Release Information

Command introduced in Junos OS Release 9.0 for EX Series switches.
Command introduced in Junos OS Release 9.5 for SRX Series.
Options **summary**, **management-vlan**, and **vlan *vlan-name*** introduced in Junos OS Release 9.6 for EX Series switches.
Option **sort-by** and field name **tag** introduced in Junos OS Release 10.1 for EX Series switches.
Command introduced in Junos OS Release 11.1 for the QFX Series.
Output for private VLANs introduced in Junos OS Release 12.1 for the QFX Series.
Option **persistent-mac** introduced in Junos OS Release 11.4 for EX Series switches.
Command introduced in Junos OS Release 12.3R2.

Command introduced in Junos OS Release 12.3R2 for EX Series switches.
Options **logical-system**, **persistent-learning**, and **summary** introduced in Junos OS Release 13.2X50-D10 (ELS).

Description Displays the Ethernet switching table.

(MX Series routers,EX Series switches only) Displays Layer 2 MAC address information.

Options For QFX Series, QFabric, NFX Series and EX4600:

none—(Optional) Display brief information about the Ethernet switching table.

brief | detail | extensive | summary—(Optional) Display the specified level of output.

interface ***interface-name***—(Optional) Display the Ethernet switching table for a specific interface.

management-vlan—(Optional) Display the Ethernet switching table for a management VLAN.

persistent-mac <interface ***interface-name*****>**—(Optional) Display the persistent MAC addresses learned for all interfaces or a specified interface. You can use this command to view entries that you want to clear for an interface that you intentionally disabled.

sort-by (***name*** **|** ***tag*****)**—(Optional) Display VLANs in ascending order of VLAN IDs or VLAN names.

vlan ***vlan-name***—(Optional) Display the Ethernet switching table for a specific VLAN.

For EX Series, MX Series and QFX Series:

none—Display all learned Layer 2 MAC address information.

brief | count | detail | extensive | summary—(Optional) Display the specified level of output.

address—(Optional) Display the specified learned Layer 2 MAC address information.

instance ***instance-name***—(Optional) Display learned Layer 2 MAC addresses for the specified routing instance.

interface ***interface-name***—(Optional) Display learned Layer 2 MAC addresses for the specified interface.

isid ***isid***—(Optional) Display learned Layer 2 MAC addresses for the specified ISID.

logical-system ***logical-system-name***—(Optional) Display Ethernet-switching statistics information for the specified logical system.

persistent-learning (interface ***interface-name*** **| mac** ***mac-address*****)**—(Optional) Display dynamically learned MAC addresses that are retained despite device restarts and interface failures for a specified interface, or information about a specified MAC address.

vlan-id (all-vlan | ***vlan-id*****)**—(Optional) Display learned Layer 2 MAC addresses for all VLANs or for the specified VLAN.

vlan-name (all | ***vlan-name*****)**—(Optional) Display learned Layer 2 MAC addresses for all VLANs or for the specified VLAN.

For SRX Series:

- **none**—(Optional) Display brief information about the Ethernet switching table.
- **brief** | **detail** | **extensive**—(Optional) Display the specified level of output.
- **interface-name**—(Optional) Display the Ethernet switching table for a specific interface.

Additional Information

When Layer 2 protocol tunneling is enabled, the tunneling MAC address 01:00:0c:cd:cd:d0 is installed in the MAC table. When the Cisco Discovery Protocol (CDP), Spanning Tree Protocol (STP), or VLAN Trunk Protocol (VTP) is configured for Layer 2 protocol tunneling on an interface, the corresponding protocol MAC address is installed in the MAC table.

Required Privilege Level

view

Related Documentation

- *Example: Setting Up Basic Bridging and a VLAN on Switches*
- *Example: Setting Up Bridging with Multiple VLANs*
- *Example: Setting Up Basic Bridging and a VLAN for an EX Series Switch*
- *Example: Setting Up Bridging with Multiple VLANs for EX Series Switches*
- *Example: Setting Up Q-in-Q Tunneling on EX Series Switches*
- *clear ethernet-switching table*
- show ethernet-switching mac-learning-log on page 787

List of Sample Output

show ethernet-switching table (Enhanced Layer 2 Software on QFX Series, QFabric, NFX Series and EX460) on page 798
show ethernet-switching table (QFX Series, QFabric, NFX Series and EX460) on page 799
show ethernet-switching table (Private VLANs on QFX Series, QFabric, NFX Series and EX460) on page 800
show ethernet-switching table (Junos Fusion Data Center with EVPN on QFX Series switches) on page 800
show ethernet-switching table brief (QFX Series, QFabric, NFX Series and EX460) on page 801
show ethernet-switching table detail (QFX Series, QFabric, NFX Series and EX460) on page 802
show ethernet-switching table extensive (QFX Series, QFabric, NFX Series and EX460) on page 803

Output Fields

For QFX Series, QFabric, NFX Series and EX4600:

The following table lists the output fields for the **show ethernet-switching table** command on QFX Series, QFabric, NFX Series and EX4600. Output fields are listed in the approximate order in which they appear.

Table 54: show ethernet-switching table Output Fields

Field Name	Field Description	Level of Output
VLAN	Name of a VLAN.	All levels
MAC address	MAC address associated with the VLAN.	All levels
Type	Type of MAC address: • **static**—The MAC address is manually created. • **learn**—The MAC address is learned dynamically from a packet's source MAC address. • **flood**—The MAC address is unknown and flooded to all members.	All levels
Age	Time remaining before the entry ages out and is removed from the Ethernet switching table.	All levels
Interfaces	Interface associated with learned MAC addresses or with the **All-members** option (flood entry).	All levels
Learned	For learned entries, the time at which the entry was added to the Ethernet switching table.	**detail**, **extensive**

For EX Series switches:

The following table lists the output fields for the **show ethernet-switching table** command on EX Series switches. Output fields are listed in the approximate order in which they appear.

Table 55: show ethernet-switching table Output Fields

Field Name	Field Description	Level of Output
VLAN	The name of a VLAN.	All levels
Tag	The VLAN ID tag name or number.	**extensive**
MAC or **MAC address**	The MAC address associated with the VLAN.	All levels
Type	The type of MAC address. Values are: • **static**—The MAC address is manually created. • **learn**—The MAC address is learned dynamically from a packet's source MAC address. • **flood**—The MAC address is unknown and flooded to all members. • **persistent**—The learned MAC addresses that will persist across restarts of the switch or interface-down events.	All levels except **persistent-mac**
Type	The type of MAC address. Values are: • **installed**—addresses that are in the Ethernet switching table. • **uninstalled**—addresses that could not be installed in the table or were uninstalled in an interface-down event and will be reinstalled in the table when the interface comes back up.	**persistent-mac**
Age	The time remaining before the entry ages out and is removed from the Ethernet switching table.	All levels
Interfaces	Interface associated with learned MAC addresses or **All-members** (flood entry).	All levels
Learned	For learned entries, the time which the entry was added to the Ethernet switching table.	**detail**, **extensive**
Nexthop index	The next-hop index number.	**detail**, **extensive**
persistent-mac	**installed** indicates MAC addresses that are in the Ethernet switching table and **uninstalled** indicates MAC addresses that could not be installed in the table or were uninstalled in an interface-down event (and will be reinstalled in the table when the interface comes back up).	

For EX Series, MX Series and QFX Series:

The table describes the output fields for the **show ethernet-switching table** command on EX Series, MX Series and QFX Series. Output fields are listed in the approximate order in which they appear.

Table 56: show ethernet-switching table Output fields

Field Name	Field Description
Routing instance	Name of the routing instance.
VLAN name	Name of the VLAN.

Table 56: show ethernet-switching table Output fields (continued)

Field Name	Field Description
MAC address	MAC address or addresses learned on a logical interface.
MAC flags	Status of MAC address learning properties for each interface: • **S**—Static MAC address is configured. • **D**—Dynamic MAC address is configured. • **L**—Locally learned MAC address is configured. • **SE**—MAC accounting is enabled. • **NM**—Non-configured MAC. • **R**—Locally learned MAC address is configured.
Age	This field is not supported.
Logical interface	Name of the logical interface.
Active source	IP address of remote entity on which MAC address is learned.
MAC count	Number of MAC addresses learned on the specific routing instance or interface.
Learning interface	Name of the logical interface on which the MAC address was learned.
Learning VLAN	VLAN ID of the routing instance or VLAN in which the MAC address was learned.
Layer 2 flags	Debugging flags signifying that the MAC address is present in various lists.
Epoch	Spanning-tree-protocolepoch number identifying when the MAC address was learned. Used for debugging.
Sequence number	Sequence number assigned to this MAC address. Used for debugging.
Learning mask	Mask of the Packet Forwarding Engines where this MAC address was learned. Used for debugging.
IPC generation	Creation time of the logical interface when this MAC address was learned. Used for debugging.

For SRX Series:

Table 57 on page 797 lists the output fields for the **show ethernet-switching table** command. Output fields are listed in the approximate order in which they appear.

Table 57: show ethernet-switching table Output Fields

Field Name	Field Description
VLAN	The name of a VLAN.

Table 57: show ethernet-switching table Output Fields (continued)

Field Name	Field Description
MAC address	The MAC address associated with the VLAN.
Type	The type of MAC address. Values are: • static—The MAC address is manually created. • learn—The MAC address is learned dynamically from a packet's source MAC address. • flood—The MAC address is unknown and flooded to all members.
Age	The time remaining before the entry ages out and is removed from the Ethernet switching table.
Interfaces	Interface associated with learned MAC addresses or All-members (flood entry).
Learned	For learned entries, the time which the entry was added to the Ethernet switching table.

Sample Output

show ethernet-switching table (Enhanced Layer 2 Software on QFX Series, QFabric, NFX Series and EX460)

user@switch> **show ethernet-switching table**

```
MAC flags (S - static MAC, D - dynamic MAC, L - locally learned, P - Persistent
static
           SE - statistics enabled, NM - non configured MAC, R - remote PE MAC,
O - ovsdb MAC)


Ethernet switching table : 2 entries, 2 learned
Routing instance : default-switch
    Vlan                MAC                 MAC         Age    Logical
    name                address             flags              interface
    vlan1               b0:c6:9a:ca:3c:01   D             -   ae1.0

    vlan1               b0:c6:9a:ca:3c:03   D             -   ae1.0


MAC flags (S - static MAC, D - dynamic MAC, L - locally learned, P - Persistent
static
           SE - statistics enabled, NM - non configured MAC, R - remote PE MAC,
O - ovsdb MAC)

Ethernet switching table : 2 entries, 2 learned

Routing instance : default-switch
    Vlan                MAC                 MAC         Age    Logical
    name                address             flags              interface
    vlan10              b0:c6:9a:ca:3c:01   D             -   ae1.0

    vlan10              b0:c6:9a:ca:3c:03   D             -   ae1.0


MAC flags (S - static MAC, D - dynamic MAC, L - locally learned, P - Persistent
static
```

```
          SE - statistics enabled, NM - non configured MAC, R - remote PE MAC,
O - ovsdb MAC)


Ethernet switching table : 2 entries, 2 learned
Routing instance : default-switch
    Vlan                MAC                 MAC         Age    Logical
    name                address             flags              interface
    vlan2               b0:c6:9a:ca:3c:01   D             -   ae1.0

    vlan2               b0:c6:9a:ca:3c:03   D             -   ae1.0


MAC flags (S - static MAC, D - dynamic MAC, L - locally learned, P - Persistent
static
          SE - statistics enabled, NM - non configured MAC, R - remote PE MAC,
O - ovsdb MAC)


Ethernet switching table : 2 entries, 2 learned
Routing instance : default-switch
    Vlan                MAC                 MAC         Age    Logical
    name                address             flags              interface
    vlan3               b0:c6:9a:ca:3c:01   D             -   ae1.0

    vlan3               b0:c6:9a:ca:3c:03   D             -   ae1.0


MAC flags (S - static MAC, D - dynamic MAC, L - locally learned, P - Persistent
static
          SE - statistics enabled, NM - non configured MAC, R - remote PE MAC,
O - ovsdb MAC)


Ethernet switching table : 2 entries, 2 learned
Routing instance : default-switch
    Vlan                MAC                 MAC         Age    Logical
    name                address             flags              interface
    vlan4               b0:c6:9a:ca:3c:01   D             -   ae1.0

    vlan4               b0:c6:9a:ca:3c:03   D             -   ae1.0
```

show ethernet-switching table (QFX Series, QFabric, NFX Series and EX460)

`user@switch>` **show ethernet-switching table**

```
Ethernet-switching table: 57 entries, 17 learned
  VLAN              MAC address       Type         Age Interfaces
  F2                *                 Flood          - All-members
  F2                00:00:05:00:00:03 Learn          0 xe-0/0/44.0
  F2                00:19:e2:50:7d:e0 Static         - Router
  Linux             *                 Flood          - All-members
  Linux             00:19:e2:50:7d:e0 Static         - Router
  Linux             00:30:48:90:54:89 Learn          0 xe-0/0/47.0
  T1                *                 Flood          - All-members
  T1                00:00:05:00:00:01 Learn          0 xe-0/0/46.0
  T1                00:00:5e:00:01:00 Static         - Router
  T1                00:19:e2:50:63:e0 Learn          0 xe-0/0/46.0
  T1                00:19:e2:50:7d:e0 Static         - Router
  T10               *                 Flood          - All-members
```

```
  T10              00:00:5e:00:01:09 Static         - Router
  T10              00:19:e2:50:63:e0 Learn          0 xe-0/0/46.0
  T10              00:19:e2:50:7d:e0 Static         - Router
  T111             *                 Flood          - All-members
  T111             00:19:e2:50:63:e0 Learn          0 xe-0/0/15.0
  T111             00:19:e2:50:7d:e0 Static         - Router
  T111             00:19:e2:50:ac:00 Learn          0 xe-0/0/15.0
  T2               *                 Flood          - All-members
  T2               00:00:5e:00:01:01 Static         - Router
  T2               00:19:e2:50:63:e0 Learn          0 xe-0/0/46.0
  T2               00:19:e2:50:7d:e0 Static         - Router
  T3               *                 Flood          - All-members
  T3               00:00:5e:00:01:02 Static         - Router
  T3               00:19:e2:50:63:e0 Learn          0 xe-0/0/46.0
  T3               00:19:e2:50:7d:e0 Static         - Router
  T4               *                 Flood          - All-members
  T4               00:00:5e:00:01:03 Static         - Router
  T4               00:19:e2:50:63:e0 Learn          0 xe-0/0/46.0
[output truncated]
```

show ethernet-switching table (Private VLANs on QFX Series, QFabric, NFX Series and EX460)

user@switch> **show ethernet-switching table**

```
Ethernet-switching table: 10 entries, 3 learned
  VLAN             MAC address       Type         Age Interfaces
  pvlan            *                 Flood          - All-members
  pvlan            00:10:94:00:00:02 Replicated       - xe-0/0/28.0
  pvlan            00:10:94:00:00:35 Replicated       - xe-0/0/46.0
  pvlan            00:10:94:00:00:46 Replicated       - xe-0/0/4.0
  c2               *                 Flood          - All-members
  c2               00:10:94:00:00:02 Learn          0 xe-0/0/28.0
  c1               *                 Flood          - All-members
  c1               00:10:94:00:00:46 Learn          0 xe-0/0/4.0
  __pvlan_pvlan_xe-0/0/46.0__ *       Flood          - All-members
  __pvlan_pvlan_xe-0/0/46.0__ 00:10:94:00:00:35 Learn        0 xe-0/0/46.0
```

show ethernet-switching table (Junos Fusion Data Center with EVPN on QFX Series switches)

user@switch> **show ethernet-switching table**

```
MAC flags (S - static MAC, D - dynamic MAC, L - locally learned, P - Persistent
static
           SE - statistics enabled, NM - non configured MAC, R - remote PE MAC,
O - ovsdb MAC)

Ethernet switching table : 30 entries, 30 learned
Routing instance : default-switch
   Vlan                MAC                 MAC      Logical               Active

   name                address             flags    interface             source

   v100                00:31:46:e8:f9:d6   D        vtep.32768
192.168.2.22
   v100                7c:e2:ca:e2:75:7c   D        vtep.32771
192.168.4.44
   v100                7c:e2:ca:e4:05:9a   D        vtep.32770
192.168.3.33
   v101                00:31:46:e8:f9:d6   D        vtep.32768
```

```
192.168.2.22
   v101                7c:e2:ca:e2:75:7c   D        vtep.32771
192.168.4.44
   v101                7c:e2:ca:e4:05:9a   D        vtep.32770
192.168.3.33
   v102                00:31:46:e8:f9:d6   D        vtep.32768
192.168.2.22
   v102                7c:e2:ca:e2:75:7c   D        vtep.32771
192.168.4.44
   v102                7c:e2:ca:e4:05:9a   D        vtep.32770
192.168.3.33
   v103                00:31:46:e8:f9:d6   D        vtep.32768
192.168.2.22
   v103                7c:e2:ca:e2:75:7c   D        vtep.32771
192.168.4.44
   v103                7c:e2:ca:e4:05:9a   D        vtep.32770
192.168.3.33
   v3001               00:31:46:e8:f9:d6   D        vtep.32768
192.168.2.22
   v3001               28:c0:da:6a:9f:c2   DL       ae11.0
   v3001               7c:e2:ca:e2:75:7c   D        vtep.32771
192.168.4.44
   v3001               7c:e2:ca:e4:05:9a   D        vtep.32770
192.168.3.33
   v3002               00:31:46:e8:f9:d6   D        vtep.32768
192.168.2.22
   v3002               7c:e2:ca:e2:75:7c   D        vtep.32771
192.168.4.44
   v3002               7c:e2:ca:e4:05:9a   D        vtep.32770
192.168.3.33
   v3003               00:31:46:e8:f9:d6   D        vtep.32768
192.168.2.22
   v3003               28:c0:da:6a:9f:c2   DL       ae11.0
   v3003               7c:e2:ca:e2:75:7c   D        vtep.32771
192.168.4.44
   v3003               7c:e2:ca:e4:05:9a   D        vtep.32770
192.168.3.33
   v3004               00:31:46:e8:f9:d6   D        vtep.32768
192.168.2.22
   v3004               7c:e2:ca:e2:75:7c   D        vtep.32771
192.168.4.44
   v3004               7c:e2:ca:e4:05:9a   D        vtep.32770
192.168.3.33
   v3005               00:31:46:e8:f9:d6   D        vtep.32768
192.168.2.22
   v3005               28:c0:da:6a:9f:c2   DL       ae11.0
   v3005               7c:e2:ca:e2:75:7c   D        vtep.32771
192.168.4.44
   v3005               7c:e2:ca:e4:05:9a   D        vtep.32770
192.168.3.33
```

show ethernet-switching table brief (QFX Series, QFabric, NFX Series and EX4600)

user@switch> **show ethernet-switching table brief**

```
Ethernet-switching table: 57 entries, 17 learned
  VLAN              MAC address       Type         Age Interfaces
  F2                *                 Flood          - All-members
  F2                00:00:05:00:00:03 Learn          0 xe-0/0/44.0
  F2                00:19:e2:50:7d:e0 Static         - Router
```

```
  Linux            *                 Flood          - All-members
  Linux            00:19:e2:50:7d:e0 Static         - Router
  Linux            00:30:48:90:54:89 Learn          0 xe-0/0/47.0
  T1               *                 Flood          - All-members
  T1               00:00:05:00:00:01 Learn          0 xe-0/0/46.0
  T1               00:00:5e:00:01:00 Static         - Router
  T1               00:19:e2:50:63:e0 Learn          0 xe-0/0/46.0
  T1               00:19:e2:50:7d:e0 Static         - Router
  T10              *                 Flood          - All-members
  T10              00:00:5e:00:01:09 Static         - Router
  T10              00:19:e2:50:63:e0 Learn          0 xe-0/0/46.0
  T10              00:19:e2:50:7d:e0 Static         - Router
  T111             *                 Flood          - All-members
  T111             00:19:e2:50:63:e0 Learn          0 xe-0/0/15.0
  T111             00:19:e2:50:7d:e0 Static         - Router
  T111             00:19:e2:50:ac:00 Learn          0 xe-0/0/15.0
  T2               *                 Flood          - All-members
  T2               00:00:5e:00:01:01 Static         - Router
  T2               00:19:e2:50:63:e0 Learn          0 xe-0/0/46.0
  T2               00:19:e2:50:7d:e0 Static         - Router
  T3               *                 Flood          - All-members
  T3               00:00:5e:00:01:02 Static         - Router
  T3               00:19:e2:50:63:e0 Learn          0 xe-0/0/46.0
  T3               00:19:e2:50:7d:e0 Static         - Router
  T4               *                 Flood          - All-members
  T4               00:00:5e:00:01:03 Static         - Router
  T4               00:19:e2:50:63:e0 Learn          0 xe-0/0/46.0
[output truncated]
```

show ethernet-switching table detail (QFX Series, QFabric, NFX Series and EX460)

`user@switch>` **show ethernet-switching table detail**

```
Ethernet-switching table: 57 entries, 17 learned
  F2, *
    Interface(s): xe-0/0/44.0
    Type: Flood
    Nexthop index: 0

  F2, 00:00:05:00:00:03
    Interface(s): xe-0/0/44.0
    Type: Learn, Age: 0, Learned: 2:03:09
    Nexthop index: 0

  F2, 00:19:e2:50:7d:e0
    Interface(s): Router
    Type: Static
    Nexthop index: 0

  Linux, *
    Interface(s): xe-0/0/47.0
    Type: Flood
    Nexthop index: 0

  Linux, 00:19:e2:50:7d:e0
    Interface(s): Router
    Type: Static
    Nexthop index: 0

  Linux, 00:30:48:90:54:89
```

```
    Interface(s): xe-0/0/47.0
    Type: Learn, Age: 0, Learned: 2:03:08
    Nexthop index: 0

  T1, *
    Interface(s): xe-0/0/46.0
    Type: Flood
    Nexthop index: 0

  T1, 00:00:05:00:00:01
    Interface(s): xe-0/0/46.0
    Type: Learn, Age: 0, Learned: 2:03:07
    Nexthop index: 0

  T1, 00:00:5e:00:01:00
    Interface(s): Router
    Type: Static
    Nexthop index: 0

  T1, 00:19:e2:50:63:e0
    Interface(s): xe-0/0/46.0
    Type: Learn, Age: 0, Learned: 2:03:07
    Nexthop index: 0

  T1, 00:19:e2:50:7d:e0
    Interface(s): Router
    Type: Static
    Nexthop index: 0

  T10, *
    Interface(s): xe-0/0/46.0
    Type: Flood
    Nexthop index: 0

  T10, 00:00:5e:00:01:09
    Interface(s): Router
    Type: Static
    Nexthop index: 0

  T10, 00:19:e2:50:63:e0
    Interface(s): xe-0/0/46.0
    Type: Learn, Age: 0, Learned: 2:03:08
    Nexthop index: 0

  T10, 00:19:e2:50:7d:e0
    Interface(s): Router
    Type: Static
    Nexthop index: 0

  T111, *
    Interface(s): xe-0/0/15.0
    Type: Flood
    Nexthop index: 0
[output truncated]
```

show ethernet-switching table extensive (QFX Series, QFabric, NFX Series and EX460)

`user@switch>` **show ethernet-switching table extensive**


```
Ethernet-switching table: 57 entries, 17 learned
  F2, *
    Interface(s): xe-0/0/44.0
    Type: Flood
    Nexthop index: 0

  F2, 00:00:05:00:00:03
    Interface(s): xe-0/0/44.0
    Type: Learn, Age: 0, Learned: 2:03:09
    Nexthop index: 0

  F2, 00:19:e2:50:7d:e0
    Interface(s): Router
    Type: Static
    Nexthop index: 0

  Linux, *
    Interface(s): xe-0/0/47.0
    Type: Flood
    Nexthop index: 0

  Linux, 00:19:e2:50:7d:e0
    Interface(s): Router
    Type: Static
    Nexthop index: 0

  Linux, 00:30:48:90:54:89
    Interface(s): xe-0/0/47.0
    Type: Learn, Age: 0, Learned: 2:03:08
    Nexthop index: 0

  T1, *
    Interface(s): xe-0/0/46.0
    Type: Flood
    Nexthop index: 0

  T1, 00:00:05:00:00:01
    Interface(s): xe-0/0/46.0
    Type: Learn, Age: 0, Learned: 2:03:07
    Nexthop index: 0

  T1, 00:00:5e:00:01:00
    Interface(s): Router
    Type: Static
    Nexthop index: 0

  T1, 00:19:e2:50:63:e0
    Interface(s): xe-0/0/46.0
    Type: Learn, Age: 0, Learned: 2:03:07
    Nexthop index: 0

  T1, 00:19:e2:50:7d:e0
    Interface(s): Router
    Type: Static
    Nexthop index: 0

  T10, *
    Interface(s): xe-0/0/46.0
    Type: Flood
    Nexthop index: 0
```



```
  T10, 00:00:5e:00:01:09
    Interface(s): Router
    Type: Static
    Nexthop index: 0

  T10, 00:19:e2:50:63:e0
    Interface(s): xe-0/0/46.0
    Type: Learn, Age: 0, Learned: 2:03:08
    Nexthop index: 0

  T10, 00:19:e2:50:7d:e0
    Interface(s): Router
    Type: Static
    Nexthop index: 0

  T111, *
    Interface(s): xe-0/0/15.0
    Type: Flood
    Nexthop index: 0
[output truncated]
```

show ethernet-switching table interface (QFX Series, QFabric, NFX Series and EX460)

`user@switch>` **show ethernet-switching table interface xe-0/0/1**

```
Ethernet-switching table: 1 unicast entries
  VLAN              MAC address       Type         Age Interfaces
  V1                *                 Flood          - All-members
  V1                00:00:05:00:00:05 Learn          0 xe-0/0/1.0
```

show ethernet-switching table (EX Series switches)

`user@switch>` **show ethernet-switching table**

```
Ethernet-switching table: 57 entries, 15 learned, 2 persistent
  VLAN              MAC address       Type         Age Interfaces
  F2                *                 Flood          - All-members
  F2                00:00:05:00:00:03 Learn          0 ge-0/0/44.0
  F2                00:19:e2:50:7d:e0 Static         - Router
  Linux             *                 Flood          - All-members
  Linux             00:19:e2:50:7d:e0 Static         - Router
  Linux             00:30:48:90:54:89 Learn          0 ge-0/0/47.0
  T1                *                 Flood          - All-members
  T1                00:00:05:00:00:01 Persistent     0 ge-0/0/46.0
  T1                00:00:5e:00:01:00 Static         - Router
  T1                00:19:e2:50:63:e0 Persistent     0 ge-0/0/46.0
  T1                00:19:e2:50:7d:e0 Static         - Router
  T10               *                 Flood          - All-members
  T10               00:00:5e:00:01:09 Static         - Router
  T10               00:19:e2:50:63:e0 Learn          0 ge-0/0/46.0
  T10               00:19:e2:50:7d:e0 Static         - Router
  T111              *                 Flood          - All-members
  T111              00:19:e2:50:63:e0 Learn          0 ge-0/0/15.0
  T111              00:19:e2:50:7d:e0 Static         - Router
  T111              00:19:e2:50:ac:00 Learn          0 ge-0/0/15.0
  T2                *                 Flood          - All-members
  T2                00:00:5e:00:01:01 Static         - Router
  T2                00:19:e2:50:63:e0 Learn          0 ge-0/0/46.0
```

```
  T2                00:19:e2:50:7d:e0 Static          - Router
  T3                *                 Flood           - All-members
  T3                00:00:5e:00:01:02 Static          - Router
  T3                00:19:e2:50:63:e0 Learn           0 ge-0/0/46.0
  T3                00:19:e2:50:7d:e0 Static          - Router
  T4                *                 Flood           - All-members
  T4                00:00:5e:00:01:03 Static          - Router
  T4                00:19:e2:50:63:e0 Learn           0 ge-0/0/46.0
[output truncated]
```

show ethernet-switching table brief (EX Series switches)

user@switch> **show ethernet-switching table brief**

```
Ethernet-switching table: 57 entries, 15 learned, 2 persistent entries
  VLAN              MAC address       Type         Age Interfaces
  F2                *                 Flood           - All-members
  F2                00:00:05:00:00:03 Learn           0 ge-0/0/44.0
  F2                00:19:e2:50:7d:e0 Static          - Router
  Linux             *                 Flood           - All-members
  Linux             00:19:e2:50:7d:e0 Static          - Router
  Linux             00:30:48:90:54:89 Learn           0 ge-0/0/47.0
  T1                *                 Flood           - All-members
  T1                00:00:05:00:00:01 Persistent      0 ge-0/0/46.0
  T1                00:00:5e:00:01:00 Static          - Router
  T1                00:19:e2:50:63:e0 Persistent      0 ge-0/0/46.0
  T1                00:19:e2:50:7d:e0 Static          - Router
  T10               *                 Flood           - All-members
  T10               00:00:5e:00:01:09 Static          - Router
  T10               00:19:e2:50:63:e0 Learn           0 ge-0/0/46.0
  T10               00:19:e2:50:7d:e0 Static          - Router
  T111              *                 Flood           - All-members
  T111              00:19:e2:50:63:e0 Learn           0 ge-0/0/15.0
  T111              00:19:e2:50:7d:e0 Static          - Router
  T111              00:19:e2:50:ac:00 Learn           0 ge-0/0/15.0
  T2                *                 Flood           - All-members
  T2                00:00:5e:00:01:01 Static          - Router
  T2                00:19:e2:50:63:e0 Learn           0 ge-0/0/46.0
  T2                00:19:e2:50:7d:e0 Static          - Router
  T3                *                 Flood           - All-members
  T3                00:00:5e:00:01:02 Static          - Router
  T3                00:19:e2:50:63:e0 Learn           0 ge-0/0/46.0
  T3                00:19:e2:50:7d:e0 Static          - Router
  T4                *                 Flood           - All-members
  T4                00:00:5e:00:01:03 Static          - Router
  T4                00:19:e2:50:63:e0 Learn           0 ge-0/0/46.0
[output truncated]
```

show ethernet-switching table detail (EX Series switches)

user@switch> **show ethernet-switching table detail**

```
Ethernet-switching table: 5 entries, 2 learned entries
 VLAN: default, Tag: 0, MAC: *, Interface: All-members
  Interfaces:
   ge-0/0/11.0, ge-0/0/20.0, ge-0/0/30.0, ge-0/0/36.0, ge-0/0/3.0
  Type: Flood
  Nexthop index: 1307
```



```
VLAN: default, Tag: 0, MAC: 00:1f:12:30:b8:83, Interface: ge-0/0/3.0
  Type: Learn, Age: 0, Learned: 20:09:26
  Nexthop index: 1315

VLAN: v1, Tag: 101, MAC: *, Interface: All-members
 Interfaces:
  ge-0/0/31.0
 Type: Flood
 Nexthop index: 1313

VLAN: v1, Tag: 101, MAC: 00:1f:12:30:b8:89, Interface: ge-0/0/31.0
 Type: Learn, Age: 0, Learned: 20:09:25
 Nexthop index: 1312

VLAN: v2, Tag: 102, MAC: *, Interface: All-members
 Interfaces:
  ae0.0
 Type: Flood
 Nexthop index: 1317
```

show ethernet-switching table extensive (EX Series switches)

user@switch> **show ethernet-switching table extensive**

```
Ethernet-switching table: 3 entries, 1 learned, 5 persistent entries

    VLAN: v1, Tag: 10, MAC: *, Interface: All-members
    Interfaces:
                ge-0/0/14.0, ge-0/0/1.0, ge-0/0/2.0, ge-0/0/3.0, ge-0/0/4.0,
                ge-0/0/5.0, ge-0/0/6.0, ge-0/0/7.0, ge-0/0/8.0, ge-0/0/10.0,
                ge-0/0/0.0
    Type: Flood
    Nexthop index: 567

    VLAN: v1, Tag: 10, MAC: 00:21:59:c6:93:22, Interface: Router
    Type: Static
    Nexthop index: 0

    VLAN: v1, Tag: 10, MAC: 00:21:59:c9:9a:4e, Interface: ge-0/0/14.0
    Type: Learn, Age: 0, Learned: 18:40:50
    Nexthop index: 564
```

show ethernet-switching table persistent-mac (EX Series switches)

user@switch> **show ethernet-switching table persistent-mac**

```
VLAN              MAC address       Type       Interface
default           00:10:94:00:00:02 installed    ge-0/0/42.0
default           00:10:94:00:00:03 installed    ge-0/0/42.0
default           00:10:94:00:00:04 installed    ge-0/0/42.0
default           00:10:94:00:00:05 installed    ge-0/0/42.0
default           00:10:94:00:00:06 installed    ge-0/0/42.0
default           00:10:94:00:05:02 uninstalled ge-0/0/16.0
default           00:10:94:00:06:03 uninstalled ge-0/0/16.0
default           00:10:94:00:07:04 uninstalled ge-0/0/16.0
```

show ethernet-switching table persistent-mac interface ge-0/0/16.0 (EX Series switches)

```
VLAN              MAC address       Type        Interface
default           00:10:94:00:05:02 uninstalled ge-0/0/16.0
default           00:10:94:00:06:03 uninstalled ge-0/0/16.0
default           00:10:94:00:07:04 uninstalled ge-0/0/16.0
```

show ethernet-switching table (EX Series, MX Series and QFX Series)

user@host> **show ethernet-switching table**

```
MAC flags (S - static MAC, D - dynamic MAC, L - locally learned
           SE - statistics enabled, NM - non configured MAC, R - remote PE MAC)

Routing instance : default-switch
    Vlan                MAC                 MAC         Age    Logical
    name                address             flags              interface
    VLAN101             88:e0:f3:bb:07:f0   D             -   ae20.0


MAC flags (S - static MAC, D - dynamic MAC, L - locally learned
           SE - statistics enabled, NM - non configured MAC, R - remote PE MAC)

Routing instance : default-switch
    Vlan                MAC                 MAC         Age    Logical
    name                address             flags              interface
    VLAN102             88:e0:f3:bb:07:f0   D             -   ae20.0


MAC flags (S - static MAC, D - dynamic MAC, L - locally learned
           SE - statistics enabled, NM - non configured MAC, R - remote PE MAC)

Routing instance : default-switch
    Vlan                MAC                 MAC         Age    Logical
    name                address             flags              interface
    VLAN103             88:e0:f3:bb:07:f0   D             -   ae20.0


MAC flags (S - static MAC, D - dynamic MAC, L - locally learned
           SE - statistics enabled, NM - non configured MAC, R - remote PE MAC)

Routing instance : default-switch
    Vlan                MAC                 MAC         Age    Logical
    name                address             flags              interface
    VLAN104             88:e0:f3:bb:07:f0   D             -   ae20.0


MAC flags (S - static MAC, D - dynamic MAC, L - locally learned
           SE - statistics enabled, NM - non configured MAC, R - remote PE MAC)

Routing instance : default-switch
    Vlan                MAC                 MAC         Age    Logical
    name                address             flags              interface
    VLAN1101            00:1f:12:32:f5:c1   D             -   ae0.0


MAC flags (S - static MAC, D - dynamic MAC, L - locally learned
           SE - statistics enabled, NM - non configured MAC, R - remote PE MAC)
```

```
Routing instance : default-switch
    Vlan                MAC                 MAC         Age    Logical
    name                address             flags              interface
    VLAN1102            00:1f:12:32:f5:c1   D             -   ae0.0


MAC flags (S - static MAC, D - dynamic MAC, L - locally learned
           SE - statistics enabled, NM - non configured MAC, R - remote PE MAC)

Routing instance : default-switch
    Vlan                MAC                 MAC         Age    Logical
    name                address             flags              interface
    VLAN1103            00:1f:12:32:f5:c1   D             -   ae0.0


MAC flags (S - static MAC, D - dynamic MAC, L - locally learned
           SE - statistics enabled, NM - non configured MAC, R - remote PE MAC)

Routing instance : default-switch
    Vlan                MAC                 MAC         Age    Logical
    name                address             flags              interface
    VLAN1104            00:1f:12:32:f5:c1   D             -   ae0.0


MAC flags (S - static MAC, D - dynamic MAC, L - locally learned
           SE - statistics enabled, NM - non configured MAC, R - remote PE MAC)

Routing instance : default-switch
    Vlan                MAC                 MAC         Age    Logical
    name                address             flags              interface
    VLAN1105            00:1f:12:32:f5:c1   D             -   ae0.0


MAC flags (S - static MAC, D - dynamic MAC, L - locally learned
           SE - statistics enabled, NM - non configured MAC, R - remote PE MAC)

Routing instance : default-switch
    Vlan                MAC                 MAC         Age    Logical
    name                address             flags              interface
    VLAN1106            00:1f:12:32:f5:c1   D             -   ae0.0
[...output truncated...]
```

show ethernet-switching table brief

`user@host>` **show ethernet-switching table brief**

```
MAC flags (S - static MAC, D - dynamic MAC, L - locally learned
           SE - statistics enabled, NM - non configured MAC, R - remote PE MAC)

Routing instance : default-switch
    Vlan                MAC                 MAC         Age    Logical
    name                address             flags              interface
    VLAN101             88:e0:f3:bb:07:f0   D             -   ae20.0


MAC flags (S - static MAC, D - dynamic MAC, L - locally learned
           SE - statistics enabled, NM - non configured MAC, R - remote PE MAC)

Routing instance : default-switch
    Vlan                MAC                 MAC         Age    Logical
```



```
    name                address             flags            interface
    VLAN102             88:e0:f3:bb:07:f0   D              -   ae20.0


MAC flags (S - static MAC, D - dynamic MAC, L - locally learned
           SE - statistics enabled, NM - non configured MAC, R - remote PE MAC)

Routing instance : default-switch
    Vlan                MAC                 MAC         Age    Logical
    name                address             flags              interface
    VLAN103             88:e0:f3:bb:07:f0   D              -   ae20.0


MAC flags (S - static MAC, D - dynamic MAC, L - locally learned
           SE - statistics enabled, NM - non configured MAC, R - remote PE MAC)

Routing instance : default-switch
    Vlan                MAC                 MAC         Age    Logical
    name                address             flags              interface
    VLAN104             88:e0:f3:bb:07:f0   D              -   ae20.0


MAC flags (S - static MAC, D - dynamic MAC, L - locally learned
           SE - statistics enabled, NM - non configured MAC, R - remote PE MAC)

Routing instance : default-switch
    Vlan                MAC                 MAC         Age    Logical
    name                address             flags              interface
    VLAN1101            00:1f:12:32:f5:c1   D              -   ae0.0
[...output truncated...]
```

show ethernet-switching table count

user@host> **show ethernet-switching table count**

```
0 MAC address learned in routing instance default-switch VLAN VLAN1000
ae26.0:1000

1 MAC address learned in routing instance default-switch VLAN VLAN101
ae20.0:101

  MAC address count per learn VLAN within routing instance:
    Learn VLAN ID      MAC count      Static MAC count
           101              1                 0

1 MAC address learned in routing instance default-switch VLAN VLAN102
ae20.0:102

  MAC address count per learn VLAN within routing instance:
    Learn VLAN ID      MAC count      Static MAC count
           102              1                 0

1 MAC address learned in routing instance default-switch VLAN VLAN103
ae20.0:103

  MAC address count per learn VLAN within routing instance:
    Learn VLAN ID      MAC count      Static MAC count
           103              1                 0

1 MAC address learned in routing instance default-switch VLAN VLAN104
```



```
ae20.0:104

  MAC address count per learn VLAN within routing instance:
    Learn VLAN ID      MAC count      Static MAC count
           104              1                 0

0 MAC address learned in routing instance default-switch VLAN VLAN105
ae20.0:105

0 MAC address learned in routing instance default-switch VLAN VLAN106
ae20.0:106

0 MAC address learned in routing instance default-switch VLAN VLAN107
ae20.0:107

0 MAC address learned in routing instance default-switch VLAN VLAN108
ae20.0:108

0 MAC address learned in routing instance default-switch VLAN VLAN109
ae20.0:109

0 MAC address learned in routing instance default-switch VLAN VLAN110
ae20.0:110

1 MAC address learned in routing instance default-switch VLAN VLAN1101
ae0.0:1101

  MAC address count per learn VLAN within routing instance:
    Learn VLAN ID      MAC count      Static MAC count
          1101              1                 0

1 MAC address learned in routing instance default-switch VLAN VLAN1102
ae0.0:1102

  MAC address count per learn VLAN within routing instance:
    Learn VLAN ID      MAC count      Static MAC count
          1102              1                 0
[...output truncated...]
```

show ethernet-switching table extensive

user@host> **show ethernet-switching table extensive**

```
MAC address: 88:e0:f3:bb:07:f0
  Routing instance: default-switch
VLAN ID: 101
   Learning interface: ae20.0
   Layer 2 flags: in_hash,in_ifd,in_ifl,in_vlan,in_rtt,kernel,in_ifbd
   Epoch: 0                            Sequence number: 2
   Learning mask: 0x00000008

MAC address: 88:e0:f3:bb:07:f0
  Routing instance: default-switch
VLAN ID: 102
   Learning interface: ae20.0
   Layer 2 flags: in_hash,in_ifd,in_ifl,in_vlan,in_rtt,kernel,in_ifbd
   Epoch: 0                            Sequence number: 2
   Learning mask: 0x00000008
```

```
MAC address: 88:e0:f3:bb:07:f0
  Routing instance: default-switch
VLAN ID: 103
   Learning interface: ae20.0
   Layer 2 flags: in_hash,in_ifd,in_ifl,in_vlan,in_rtt,kernel,in_ifbd
   Epoch: 0                            Sequence number: 2
   Learning mask: 0x00000008

MAC address: 88:e0:f3:bb:07:f0
  Routing instance: default-switch
VLAN ID: 104
   Learning interface: ae20.0
   Layer 2 flags: in_hash,in_ifd,in_ifl,in_vlan,in_rtt,kernel,in_ifbd
   Epoch: 0                            Sequence number: 2
   Learning mask: 0x00000008

MAC address: 00:1f:12:32:f5:c1
  Routing instance: default-switch
VLAN ID: 1101
   Learning interface: ae0.0
   Layer 2 flags: in_hash,in_ifd,in_ifl,in_vlan,in_rtt,kernel,in_ifbd
   Epoch: 0                            Sequence number: 2
   Learning mask: 0x00000008

MAC address: 00:1f:12:32:f5:c1
  Routing instance: default-switch
VLAN ID: 1102
   Learning interface: ae0.0
   Layer 2 flags: in_hash,in_ifd,in_ifl,in_vlan,in_rtt,kernel,in_ifbd
   Epoch: 0                            Sequence number: 2
   Learning mask: 0x00000008

MAC address: 00:1f:12:32:f5:c1
  Routing instance: default-switch
VLAN ID: 1103
   Learning interface: ae0.0
   Layer 2 flags: in_hash,in_ifd,in_ifl,in_vlan,in_rtt,kernel,in_ifbd
   Epoch: 0                            Sequence number: 2
   Learning mask: 0x00000008

MAC address: 00:1f:12:32:f5:c1
  Routing instance: default-switch
VLAN ID: 1104
   Learning interface: ae0.0
   Layer 2 flags: in_hash,in_ifd,in_ifl,in_vlan,in_rtt,kernel,in_ifbd
   Epoch: 0                            Sequence number: 2
   Learning mask: 0x00000008
```

Sample Output

show ethernet-switching table detail (SRX Series)

user@host> **show ethernet-switching table detail**

```
Ethernet-switching table: 57 entries, 17 learned
F2, *
Interface(s): ge-0/0/44.0
Type: Flood
F2, 00:00:5E:00:53:AC
Interface(s): ge-0/0/44.0
```

```
Type: Learn, Age: 0, Learned: 2:03:09
F2, 00:00:5E:00:53:AA
Interface(s): Router
Type: Static
Linux, *
Interface(s): ge-0/0/47.0
Type: Flood
Linux, 00:00:5E:00:53:AB
Interface(s): Router
Type: Static
Linux, 00:00:5E:00:53:AC
Interface(s): ge-0/0/47.0
Type: Learn, Age: 0, Learned: 2:03:08
T1, *
Interface(s): ge-0/0/46.0
Type: Flood
T1, 00:00:5E:00:53:AD
Interface(s): ge-0/0/46.0
Type: Learn, Age: 0, Learned: 2:03:07
T1, 00:00:5E:00:53:AE
Interface(s): Router
Type: Static
T1, 00:00:5E:00:53:AF
Interface(s): ge-0/0/46.0
Type: Learn, Age: 0, Learned: 2:03:07
T1, 00:00:5E:00:53:AG
Interface(s): Router
Type: Static
T10, *
Interface(s): ge-0/0/46.0
Type: Flood
T10, 00:00:5E:00:53:AH
Interface(s): Router
Type: Static
T10, 00:00:5E:00:53:AI
Interface(s): ge-0/0/46.0
Type: Learn, Age: 0, Learned: 2:03:08
T10, 00:00:5E:00:53:AJ
Interface(s): Router
Type: Static
T111, *
Interface(s): ge-0/0/15.0
Type: Flood
[output truncated]
```

Sample Output

show ethernet-switching table extensive (SRX Series)

user@host> **show ethernet-switching table extensive**

```
Ethernet-switching table: 57 entries, 17 learned
F2, *
Interface(s): ge-0/0/44.0
Type: Flood
F2, 00:00:5E:00:53:AC
Interface(s): ge-0/0/44.0
Type: Learn, Age: 0, Learned: 2:03:09
F2, 00:00:5E:00:53:AA
Interface(s): Router
```

```
Type: Static
Linux, *
Interface(s): ge-0/0/47.0
Type: Flood
Linux, 00:00:5E:00:53:AB
Interface(s): Router
Type: Static
Linux, 00:00:5E:00:53:AC
Interface(s): ge-0/0/47.0
Type: Learn, Age: 0, Learned: 2:03:08
T1, *
Interface(s): ge-0/0/46.0
Type: Flood
T1, 00:00:5E:00:53:AD
Interface(s): ge-0/0/46.0
Type: Learn, Age: 0, Learned: 2:03:07
T1, 00:00:5E:00:53:AE
Interface(s): Router
Type: Static
T1, 00:00:5E:00:53:AF
Interface(s): ge-0/0/46.0
Type: Learn, Age: 0, Learned: 2:03:07
T1, 00:00:5E:00:53:AG
Interface(s): Router
Type: Static
T10, *
Interface(s): ge-0/0/46.0
Type: Flood
T10, 00:00:5E:00:53:AH
Interface(s): Router
Type: Static
T10, 00:00:5E:00:53:AI
Interface(s): ge-0/0/46.0
Type: Learn, Age: 0, Learned: 2:03:08
T10, 00:00:5E:00:53:AJ
Interface(s): Router
Type: Static
T111, *
Interface(s): ge-0/0/15.0
Type: Flood
[output truncated]
```

Sample Output

show ethernet-switching table interface ge-0/0/1 (SRX Series)

user@host> **show ethernet-switching table interface ge-0/0/1**

```
Ethernet-switching table: 1 unicast entries
VLAN     MAC address        Type     Age Interfaces
V1       *                  Flood     - All-members
V1       00:00:5E:00:53:AF  Learn     0 ge-0/0/1.0
```


show igmp-snooping route (View)

Syntax

```
show igmp-snooping route ( brief | detail | ethernet-switching | inet | vlan)
```

Release Information

Command introduced in Junos OS Release 9.5.

Description

Display IGMP snooping route information.

Options

- **none**—Display general parameters.
- **brief** | **detail**—(Optional) Display the specified level of output.
- **ethernet-switching**—(Optional) Display Ethernet switching information.
- **inet**—(Optional) Display inet information.
- **vlan** *vlan-id* |*vlan-name*—(Optional) Display route information for the specified VLAN.

Required Privilege Level

view

Related Documentation

- Understanding Interfaces on page 3

Output Fields

Table 58 on page 815 lists the output fields for the **show igmp-snooping route** command. Output fields are listed in the approximate order in which they appear.

Table 58: show igmp-snooping route Output Fields

Field Name	Field Description
VLAN	Name of the VLAN.
Group	Multicast group address.
Next-hop	ID associated with the next-hop device.

Sample Output

show igmp-snooping route

```
user@host> show igmp-snooping route
VLAN       Group           Next-hop
v11         203.0.113.0, *    533
Interfaces: ge-0/0/13.0, ge-0/0/1.0
v12         203.0.113.1, *    534
Interfaces: ge-0/0/13.0, ge-0/0/0.0
```


show igmp-snooping route vlan v1

user@host> **show igmp-snooping route vlan v1**

```
Table: 0
VLAN      Group              Next-hop
v1        203.0.113.2, *       1266
Interfaces: ge-0/0/0.0
v1        203.0.113.3, *       1266
Interfaces: ge-0/0/0.0
v1        203.0.113.4, *       1266
Interfaces: ge-0/0/0.0
v1        203.0.113.5, *       1266
Interfaces: ge-0/0/0.0
v1        203.0.113.6, *       1266
Interfaces: ge-0/0/0.0
v1        203.0.113.6, *      1266
Interfaces: ge-0/0/0.0
```

show interfaces

List of Syntax

Syntax (Gigabit Ethernet) on page 817
Syntax (10 Gigabit Ethernet) on page 817
Syntax (SRX Series Devices) on page 817

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.

Starting in Junos OS Release 18.4R1, Output fields **Next-hop** and **vpls-status** is displayed in the **show interfaces** ***interface name*** **detail** command, only for Layer 2 protocols on MX480 routers.

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

Release History Table

Release	Description
18.4R1	Starting in Junos OS Release 18.4R1, Output fields **Next-hop** and **vpls-status** is displayed in the **show interfaces *interface name* detail** command, only for Layer 2 protocols on MX480 routers.

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

Output Fields

Table 59 on page 822 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 60 on page 849.

Table 59: 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*.	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*.	All levels
Interface flags	Information about the interface. Possible values are described in the “Interface Flags” section under *Common Output Fields Description*.	All levels

Table 59: 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*.	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 (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**

Table 59: 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 31 under the show interfaces command.	**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 (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 59: 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 59: 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 59: 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 59: 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 interface MTU, 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 59: 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 59: 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 59: 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 59: 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 59: 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*.	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

Table 59: show interfaces (Gigabit Ethernet) Output Fields (continued)

Field Name	Field Description	Level of Output
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**
Protocol	Protocol family. Possible values are described in the "Protocol Field" section under *Common Output Fields Description*.	**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

Table 59: show interfaces (Gigabit Ethernet) Output Fields (continued)

Field Name	Field Description	Level of Output
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**
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*.	**detail extensive**

Table 59: show interfaces (Gigabit Ethernet) Output Fields (continued)

Field Name	Field Description	Level of Output
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*.	**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*.	**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**

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*.	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*.	All levels
Interface flags	Information about the interface. Possible values are described in the “Interface Flags” section under *Common Output Fields Description*.	All levels
Link flags	Information about the link. Possible values are described in the “Links Flags” section under *Common Output Fields Description*.	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
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**
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**
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*.	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*.	**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*.	**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*.	**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*.	**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 60: 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 61 on page 850 lists the output fields for the **show interfaces** command. Output fields are listed in the approximate order in which they appear.

Table 61: 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 61: 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 61: 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 61: 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 61: 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 61: 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 61: 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 59 on page 822.

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   ................
  Received SAPI:
  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   ................
  Transmitted SAPI:
  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 diagnostics optics

Syntax

show interfaces diagnostics optics *interface-name*

Release Information

Command introduced in Junos OS Release 10.1.

Description

Display diagnostics data and alarms for Gigabit Ethernet optical transceivers (SFP) installed in SRX Series Services Gateways. 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.

NOTE: In a chassis cluster, the **show interfaces diagnostics optics** command works only on the node that is primary in redundancy group 0 (RG0).

Options

interface-name—Name of the interface associated with the port in which the transceiver is installed: **ge-*fpc/pic/port*** .

Required Privilege Level

view

Related Documentation

• Understanding Interfaces on page 3

List of Sample Output

show interfaces diagnostics optics on page 900

Output Fields

Table 62 on page 897 lists the output fields for the show interfaces diagnostics optics command. Output fields are listed in the general order in which they appear.

Table 62: 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	Displays the laser output power, in milliwatts (mW) and decibels referred to 1.0 mW (dBm).

Table 62: show interfaces diagnostics optics Output Fields (continued)

Field Name	Field Description
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**.
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**.

Table 62: show interfaces diagnostics optics Output Fields (continued)

Field Name	Field Description
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 62: show interfaces 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 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 flow-statistics

Syntax

```
show interfaces flow-statistics <interface-name>
```

Release Information Command introduced in Junos OS Release 9.2.

Description Display interfaces flow statistics.

Options ***Interface-name*** —(Optional) Display flow statistics about the specified interface. Following is a list of typical interface names. Replace *pim* with the PIM slot and *port* with the port number. For a complete list, see the "Interface Naming Conventions" on page 8.

- **at-*pim/0/port***—ATM-over-ADSL or ATM-over-SHDSL interface.
- **br-*pim/0/port***—Basic Rate Interface for establishing ISDN connections.
- **ce1-*pim/0/port***—Channelized E1 interface.
- **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).

Required Privilege Level view

Related Documentation

- *Understanding Traffic Processing on Security Devices*
- Understanding Interfaces on page 3

List of Sample Output **show interfaces flow-statistics (Gigabit Ethernet) on page 905**

Output Fields Table 63 on page 903 lists the output fields for the **show interfaces flow-statistics** command. Output fields are listed in the approximate order in which they appear.

Table 63: show interfaces flow-statistics Output Fields

Field Name	Field Description
Traffic statistics	Number of packets and bytes transmitted and received on the physical interface.
Local statistics	Number of packets and bytes transmitted and received on the physical interface.
Transit statistics	Number of packets and bytes transiting the physical interface.
Flow input statistics	Statistics on packets received by flow module.
Flow output statistics	Statistics on packets sent by flow module.
Flow error statistics	Packet drop statistics for the flow module. For further details, see Table 64 on page 903.

Table 64: Flow Error Statistics (Packet Drop Statistics for the Flow Module)

Error	Error Description
Screen:	
Address spoofing	The packet was dropped when the screen module detected address spoofing.
Syn-attack protection	The packet was dropped because of SYN attack protection or SYN cookie protection.
VPN:	
Authentication failed	The packet was dropped because the IPsec Encapsulating Security Payload (ESP) or Authentication Header (AH) authentication failed.
No SA for incoming SPI	The packet was dropped because the incoming IPsec packet's security parameter index (SPI) does not match any known SPI.
Security association not active	The packet was dropped because an IPsec packet was received for an inactive SA.
NAT:	
Incoming NAT errors	The source NAT rule search failed, an invalid source NAT binding was found, or the NAT allocation failed.
Multiple incoming NAT	Sometimes packets are looped through the system more than once; if source NAT is specified more than once, the packet will be dropped.
Auth:	
Multiple user authentications	Sometimes packets are looped through the system more than once. Each time a packet passes through the system, that packet must be permitted by a policy. If the packet matches more than one policy that specifies user authentication, then it will be dropped.

Table 64: Flow Error Statistics (Packet Drop Statistics for the Flow Module) (continued)

User authentication errors	Packet was dropped because policy requires authentication; however: • Only Telnet, FTP, and HTTP traffic can be authenticated. • The corresponding authentication entry could not be found, if web-auth is specified. • The maximum number of authenticated sessions per user was exceeded.
Flow:	
No one interested in self packets	This counter is incremented for one of the following reasons: • The outbound interface is a self interface, but the packet is not marked as a to-self packet and the destination address is in a source NAT pool. • No service is interested in the to-self packet • When a zone has ident-reset service enabled, the TCP RST to IDENT request for port 113 is sent back and this counter is incremented.
No minor session	The packet was dropped because no minor sessions are available and a minor session was requested. Minor sessions are allocated for storing additional TCP state information.
No more sessions	The packet was dropped because there were no more free sessions available.
No route present	The packet was dropped because a valid route was not available to forward the packet. For new sessions, the counter is incremented for one of the following reasons: • No valid route was found to forward the packet. • A discard or reject route was found. • The route could not be added due to lack of memory. • The reverse path forwarding check failed for an incoming multicast packet. For existing sessions, the prior route was changed or deleted, or a more specific route was added. The session is rerouted, and this reroute could fail because: • A new route could not be found; either the previous route was removed, or the route was changed to discard or reject. • Multiple packets may concurrently force rerouting to occur, and only one packet can successfully complete the rerouting process. Other packets will be dropped. • The route table was locked for updates by the Routing Engine. Packets that match a new session are retried, whereas packets that match an existing session are not.
No tunnel found	The packet was dropped because a valid tunnel could not be found
No session for a gate	This counter is incremented when a packet is destined for an ALG, and the ALG decides to drop this packet.
No zone or NULL zone binding	The packet was dropped because its incoming interface was not bound to any zone.
Policy denied	The error counter is incremented for one of the following reasons: • Source and/or destination NAT has occurred and policy says to drop the packet. • Policy specifies user authentication, which failed. • Policy was configured to deny this packet.

Table 64: Flow Error Statistics (Packet Drop Statistics for the Flow Module) (continued)

TCP sequence number out of window	A TCP packet with a sequence number failed the TCP sequence number check that was received.
Counters Not Currently in Use	
No parent for a gate	-
Invalid zone received packet	-
No NAT gate	-

Sample Output

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 igmp 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 queue

Syntax

```
show interfaces queue
<both-ingress-egress>
<egress>
<forwarding-class forwarding-class>
<ingress>
<interface-name interface-name>
<l2-statistics>
```

Release Information

Command introduced in Junos OS Release 15.1X49-D30 for vSRX.

Description

Display class-of-service (CoS) queue information for physical interfaces.

NOTE: **The queue depth information is only available on vSRX and SRX1500, SRX4100, SRX4200 and SRX4600 platforms.**

Options

none—Show detailed CoS queue statistics for all physical interfaces.

both-ingress-egress—Display both ingress and egress queue statistics.

egress—Display egress queue statistics.

forwarding-class *forwarding-class*—(Optional) Forwarding class name for this queue. Show detailed CoS statistics for the queue that is associated with the specified forwarding class.

ingress—Display ingress queue statistics.

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.

Required Privilege Level

view

Related Documentation

- Understanding Class of Service

List of Sample Output

show interfaces queue (vSRX) on page 909

Output Fields

Table 65 on page 908 lists the output fields for the **show interfaces queue** command. Output fields are listed in the approximate order in which they appear.

Table 65: show interfaces queue Output Fields

Field Name	Field Description
Physical interface	Name of the physical interface.
Enabled	State of the interface. Possible values are described in the “Enabled Field” section under *Common Output Fields Description*.
Interface index	Index number of the physical interface. The number reflects the interface’s 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.
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.
The following output fields are applicable to both the interface component and Packet Forwarding Engine component in the **show interfaces queue** command:	
Queue	Queue number.
Forwarding classes	Forwarding class name.
Queued Packets	Number of packets in this queue.
Queued Bytes	Number of bytes in this queue.
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.
Transmitted Bytes	Number of bytes transmitted by this queue.
Tail-dropped packets	Number of packets dropped because of tail drop.
RL-dropped bytes	Number of bytes dropped because of rate limiting.
RED-dropped packets	Number of packets dropped because of random early detection (RED).

Table 65: show interfaces queue Output Fields (continued)

Field Name	Field Description
RED-dropped bytes	Number of bytes dropped because of RED. • **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.
Queue Buffer Usage:	• **Reserved buffer**—The size of the memory buffer that is allocated for storing packets • **Current**—The amount of buffer memory that is currently in use on this queue.
Queue-Depth	**Current**—The maximum number of bytes in this queue, that is currently in use on this queue.

Sample Output

show interfaces queue (vSRX)

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: 135, SNMP ifIndex: 510
Forwarding classes: 8 supported, 4 in use
Egress queues: 8 supported, 4 in use
Queue: 0, Forwarding classes: best-effort
  Queued:
    Packets              :                14686                     0 pps
    Bytes                :               616812                     0 bps
  Transmitted:
    Packets              :                14686                     0 pps
    Bytes                :               616812                     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: 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 Buffer Usage:
    Reserved buffer      :                  9192 bytes
  Queue-depth bytes      :
    Current              :                     0
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 Buffer Usage:
    Reserved buffer      :                  9192 bytes
  Queue-depth bytes      :
    Current              :                     0
...
```


show interfaces statistics (View)

Syntax show interfaces statistics *interface-name*

Release Information Command introduced in Junos OS Release 10.1.

Description Displays the interface input and output statistics for physical and logical interface.

Required Privilege Level view

Related Documentation
- Understanding Interfaces on page 3

List of Sample Output show interfaces statistics on page 911

Sample Output

show interfaces statistics

user@host> **show interfaces statistics st0.1**

```
Logical interface st0.1 (Index 91) (SNMP ifIndex 268)
     Flags: Point-To-Point SNMP-Traps Encapsulation: Secure-Tunnel
     Input packets : 2743333
     Output packets: 6790470992
     Security: Zone: untrust
     Allowed host-inbound traffic : bootp bfd bgp dns dvmrp igmp ldp msdp nhrp
ospf pgm pim rip router-discovery rsvp sap vrrp dhcp finger ftp tftp ident-reset
 http https ike netconf ping reverse-telnet
    reverse-ssh rlogin rpm rsh snmp snmp-trap ssh telnet traceroute xnm-clear-text
 xnm-ssl lsping ntp sip
     Protocol inet, MTU: 9192
       Addresses, Flags: Is-Preferred Is-Primary
         Destination: 192.167.1.0/30, Local: 192.167.1.1
```

show interfaces terse zone

Syntax

```
show interfaces terse zone
```

Release Information Command introduced in Junos OS Release 12.3X48-D20.

Description Display summary information about zone interfaces.

Options This command has no options.

Required Privilege Level view

Sample Output

show interface terse zone

user@host> **show interface terse zone**

```
Interface      Admin     Link    Proto      Local            Remote      Zone
ge-0/0/0.0      up        up      inet      1.4.253.251/16               trust
```

show ipv6 neighbors

Syntax

```
show ipv6 neighbors
```

Release Information Command introduced in Junos OS Release 12.1X45-D10.

Description Display information about the IPv6 neighbor cache.

Options This command has no options.

Required Privilege Level view

Related Documentation

- clear ipv6 neighbors on page 753

List of Sample Output show ipv6 neighbors on page 913

Output Fields Table 66 on page 913 lists the output fields for the **show ipv6 neighbors** command. Output fields are listed in the approximate order in which they appear.

Table 66: show ipv6 neighbors Output Fields

Field Name	Field Description
IPv6 Address	Name of the IPv6 interface.
Linklayer Address	Link-layer address.
State	State of the link: up, down, incomplete, reachable, stale, or unreachable.
Exp	Number of seconds until the entry expires.
Rtr	Whether the neighbor is a routing device: yes or no.
Secure	Whether this entry was created using the Secure Neighbor Discovery (SEND) protocol: yes or no.
Interface	Name of the interface.

Sample Output

show ipv6 neighbors

user@host> **show ipv6 neighbors**

```
IPv6 Address     Linklayer Address    State       Exp Rtr Secure  Interface
   10:1::2          00:00:0a:00:00:00    reachable   17   yes  no      reth0.0
```

```
11:11::2        00:19:e2:4b:61:83   stale       1197 yes  no     at-1/0/0.0
12:12::2        00:19:e2:4b:61:83   stale       1188 yes  no     at-3/0/0.0
```

show lacp interfaces (View)

Syntax

`show lacp interfaces *interface-name*`

Release Information

Command modified in Junos OS Release 10.2.

Description

Display Link Aggregation Control Protocol (LACP) information about the specified aggregated Ethernet interface, redundant Ethernet interface, Gigabit Ethernet interface, or 10-Gigabit Ethernet interface. If you do not specify an interface name, LACP information for all interfaces is displayed.

Options

none—Display LACP information for all interfaces.

interface-name—(Optional) Display LACP information for the specified interface:

- Aggregated Ethernet—**ae*number***
- Redundant Ethernet—**reth*number***
- Gigabit Ethernet—**ge-*fpc/pic/port***
- 10-Gigabit Ethernet—**xe-*fpc/pic/port***

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

- Verifying LACP on Redundant Ethernet Interfaces on page 303

List of Sample Output

show lacp interfaces (Aggregated Ethernet) on page 917
show lacp interfaces (Redundant Ethernet) on page 918
show lacp interfaces (Gigabit Ethernet) on page 918

Output Fields

Table 67 on page 915 lists the output fields for the **show lacp interfaces** command. Output fields are listed in the approximate order in which they appear.

Table 67: show lacp interfaces Output Fields

Field Name	Field Description
Aggregated interface	Aggregated interface value.

Table 67: show lacp interfaces Output Fields (continued)

Field Name	Field Description

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 a link aggregation control protocol data unit (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 link aggregation control 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 link aggregation control PDUs unless its partner's control value is **Active**. **Active** indicates the port's preference to participate in the protocol regardless of the partner's control value.

Table 67: show lacp interfaces Output Fields (continued)

Field Name	Field Description

LACP Protocol	LACP protocol information for each aggregated interface:
	• Link state (active or standby) indicated in parentheses next to the interface when link protection is configured.
	• **Receive State**—One of the following values:
	  • **Current**—The state machine receives a link aggregation control PDU and enters the **Current** state.
	  • **Defaulted**—If no link aggregation control PDU is received before the timer for the **Current** state expires a second time, the state machine enters the **Defaulted** state.
	  • **Expired**—If no link aggregation control 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 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.
	  • **Waiting**—Multiplexer state machine is in a holding process, awaiting an outcome.

Sample Output

show lacp interfaces (Aggregated Ethernet)

user@host> **show lacp interfaces ae0**

```
Aggregated interface: ae0
    LACP state:        Role    Exp   Def  Dist  Col  Syn  Aggr  Timeout  Activity
      ge-2/0/0        Actor     No    No   Yes  Yes  Yes   Yes     Fast    Active
      ge-2/0/0      Partner     No    No   Yes  Yes  Yes   Yes     Fast    Active
      ge-2/0/1        Actor     No    No   Yes  Yes  Yes   Yes     Fast    Active
      ge-2/0/1      Partner     No    No   Yes  Yes  Yes   Yes     Fast    Active
      ge-2/2/0        Actor     No    No   Yes  Yes  Yes   Yes     Fast    Active
      ge-2/2/0      Partner     No    No   Yes  Yes  Yes   Yes     Fast    Active
      ge-2/2/1        Actor     No    No   Yes  Yes  Yes   Yes     Fast    Active
      ge-2/2/1      Partner     No    No   Yes  Yes  Yes   Yes     Fast    Active
```

```
    LACP protocol:        Receive State  Transmit State          Mux State
      ge-2/0/0                  Current   Fast periodic Collecting distributing
      ge-2/0/1                  Current   Fast periodic Collecting distributing
      ge-2/2/0                  Current   Fast periodic Collecting distributing
      ge-2/2/1                  Current   Fast periodic Collecting distributing
```

show lacp interfaces (Redundant Ethernet)

user@host> **show lacp interfaces reth0**

```
Aggregated interface: reth0
    LACP state:       Role   Exp   Def  Dist  Col  Syn  Aggr  Timeout  Activity
      ge-11/0/0      Actor    No    No   Yes  Yes  Yes   Yes     Fast    Active
      ge-11/0/0    Partner    No    No   Yes  Yes  Yes   Yes     Fast    Active
      ge-11/0/1      Actor    No    No   Yes  Yes  Yes   Yes     Fast    Active
      ge-11/0/1    Partner    No    No   Yes  Yes  Yes   Yes     Fast    Active
      ge-11/0/2      Actor    No    No   Yes  Yes  Yes   Yes     Fast    Active
      ge-11/0/2    Partner    No    No   Yes  Yes  Yes   Yes     Fast    Active
      ge-11/0/3      Actor    No    No   Yes  Yes  Yes   Yes     Fast    Active
      ge-11/0/3    Partner    No    No   Yes  Yes  Yes   Yes     Fast    Active
      ge-3/0/0       Actor    No    No   Yes  Yes  Yes   Yes     Fast    Active
      ge-3/0/0     Partner    No    No   Yes  Yes  Yes   Yes     Fast    Active
      ge-3/0/1       Actor    No    No   Yes  Yes  Yes   Yes     Fast    Active
      ge-3/0/1     Partner    No    No   Yes  Yes  Yes   Yes     Fast    Active
      ge-3/0/2       Actor    No    No   Yes  Yes  Yes   Yes     Fast    Active
      ge-3/0/2     Partner    No    No   Yes  Yes  Yes   Yes     Fast    Active
      ge-3/0/3       Actor    No    No   Yes  Yes  Yes   Yes     Fast    Active
      ge-3/0/3     Partner    No    No   Yes  Yes  Yes   Yes     Fast    Active
    LACP protocol:        Receive State  Transmit State          Mux State
      ge-11/0/0                 Current   Fast periodic Collecting distributing
      ge-11/0/1                 Current   Fast periodic Collecting distributing
      ge-11/0/2                 Current   Fast periodic Collecting distributing
      ge-11/0/3                 Current   Fast periodic Collecting distributing
      ge-3/0/0                  Current   Fast periodic Collecting distributing
      ge-3/0/1                  Current   Fast periodic Collecting distributing
      ge-3/0/2                  Current   Fast periodic Collecting distributing
      ge-3/0/3                  Current   Fast periodic Collecting distributing
{primary:node1}
```

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 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 on page 303
- *Verifying the Status of a LAG Interface*
- *Verifying That LACP Is Configured Correctly and Bundle Members Are Exchanging LACP Protocol Packets*
- *Example: Configuring Link Aggregation Between a QFX Series Product and an Aggregation Switch*
- *Example: Configuring Link Aggregation with LACP Between a QFX Series Product and an Aggregation Switch*

List of Sample Output

show lacp statistics interfaces on page 920

Output Fields

Table 68 on page 919 lists the output fields for the **show lacp statistics interfaces** command. Output fields are listed in the approximate order in which they appear.

Table 68: show lacp statistics interfaces Output Fields

Field Name	Field Description
Aggregated interface	Aggregated interface value.

Table 68: show lacp statistics interfaces Output Fields (continued)

Field Name	Field Description
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. NOTE: Starting in Junos OS Evolved Release 18.3R1, the **clear interfaces statistics** command clears LACP statistics as well as the counters displayed in the **show lacp statistics interfaces** command.

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 modem wireless firmware

Syntax

```
show modem wireless firmware interface-name
```

Release Information Command introduced in Junos OS 15.1X49-D100

Description Display modem firmware details for the LTE Mini-PIM.

Options

- *interface-name*—The LTE interface is **cl-*x*/0/0**, where ***x*** is the slot number in which the LTE Mini-PIM is installed.

Required Privilege Level view

Related Documentation

- show modem wireless network on page 924

List of Sample Output show modem wireless firmware on page 922

Output Fields Table 69 on page 921 lists some of the output fields for the **show modem wireless firmware** command. Output fields are listed in the approximate order in which they appear.

Table 69: show modem wireless firmware Output Fields

Field Name	Description
LTE mPIM firmware details	Displays the details of the firmware installed on the LTE Mini-PIM.
Wireless modem firmware details	Displays the details of the modem firmware.
OTA status	Displays the status of over-the-air (OTA) upgrade. The OTA upgrade can be enabled or disabled on the LTE Mini-PIM. OTA upgrade is disabled by default.

Table 69: show modem wireless firmware Output Fields (continued)

Field Name	Description

Status of SIM	• **Number of SIM**—Number of SIM cards installed.
	• **Slot of active**—The slot in which the active SIM card is installed.
	• **SIM state**—Indicates whether the SIM card is present in the slot.
	• **Modem PIN security status**—Indicates the security status of the SIM. If the SIM is locked by using the **request modem wireless sim-lock enable** command, then the security status is displayed as enabled.
	• **SIM status**—Status of the Subscriber Identity Module (SIM) in the LTE Mini-PIM. The status can be one of the following:
	  ◦ **SIM Okay**
	  ◦ **No status**—The device is being powered on or powered off, or the SIM card has been removed from the slot.
	  ◦ **SIM init failure**—There is a problem with the SIM; the SIM might need to be replaced.
	  ◦ **SIM locked**
	  ◦ **PIN1 blocked**—Obtain a PIN unblocking key (PUK) to unblock the SIM.
	  ◦ **PIN1 rejected**—The wrong PIN was entered.
	  ◦ **PIN2 rejected**—The wrong PIN was entered.
	  ◦ **Network rejected**
	• **SIM user operation needed**—Action required by the user. This can be one of the following:
	  ◦ **No op**—No user operation required.
	  ◦ **Enter PIN**—Enter the personal identification number (PIN) to unlock the SIM card.
	  ◦ **Enter PUK**—Enter the PUK to unblock the SIM card.
	• **Retries remaining**—If the value of **SIM user operation needed** is **Enter PIN**, this is the number of PIN unlock attempts remaining before the modem is blocked. If the PIN is entered incorrectly three consecutive times, the SIM card is blocked.
	If the value of **SIM user operation needed** is **Enter PUK**, this is the number of unblock attempts remaining before the modem is unusable. If the PUK is entered incorrectly ten times, the SIM card must be returned to the service provider for reactivation.

Sample Output

show modem wireless firmware

user@host> **show modem wireless firmware cl-1/0/0**

```
 LTE mPIM firmware details
  Product name: Junos LTE mPIM
  Serial number: AG50071852
  Hardware version: AcceleratedConcepts/sprite
  Firmware version: 17.4.3
  MAC: 00:00:5e:00:a0:61
  System uptime: 3430 seconds
Wireless modem firmware details
  Modem firmware version:
9999999_9904609_SWI9X30C_02.23.00.00_00_GENERIC_002.018_000
  Modem Firmware build date: 22/10/2016
  Card type: MC7430
  Modem manufacturer: Sierra Wireless, Inc
  Hardware version: 1.0
  Power & Temperature: Normal 3343 mV, Normal 30.00 C
OTA status
```



```
  State: Enabled
  New firmware available: No
Number of SIM: 2
Slot of active: 2
Status of SIM 1
  SIM state: SIM present
  Modem PIN security status: Disabled
  SIM status: SIM Okay
  SIM user operation needed: No Op
  Retries remaining: 3
Status of SIM 2
  SIM state: SIM present
  Modem PIN security status: Disabled
  SIM status: SIM Okay
  SIM user operation needed: No Op
  Retries remaining: 3
```

show modem wireless network

Syntax

```
show modem wireless network interface-name
```

Release Information Command introduced in Junos OS Release 15.1X49-D100.

Description Display the status of the modem and the status of the network connection for the LTE Mini-PIM.

Options

- *interface-name*—The LTE interface is **cl-*x*/0/0**, where ***x*** is the slot number in which the LTE Mini-PIM is installed.

Required Privilege Level view

Related Documentation

- show modem wireless profiles on page 927
- show modem wireless firmware on page 921

List of Sample Output show modem wireless network on page 925

Output Fields Table 70 on page 924 lists some of the output fields for the **show modem wireless network** command. Output fields are listed in the approximate order in which they appear.

Table 70: show modem wireless network Output Fields

Field Name	Field Description
Current Modem Status	Status of the modem on the Mini-PIM. The status can be one of the following states: • Disconnected • Calling • Connected
Current Service Status	Status of the network connection. The status can be one of the following states: • Normal • Emergency Call Only • No Service Available • Unable To Register • Forbidden PLMN • Forbidden Area • Roaming Not Permitted • Account Not Permitted • Modem Not Permitted • Unknown IMSI • Authentication Failure

Table 70: show modem wireless network Output Fields (continued)

Field Name	Field Description
Current Service Type	One of the following: • Circuit switched (CS) • Packet switched (PS) • Combo (CS, PS) • Invalid
Current Service Mode	One of the following: • Unknown • LTE • DC-HSPA+ • HSPA+ • HSPA • UMTS
Current Band	Current radio band in use.
Mobile Country Code (MCC)	Number that uniquely identifies the country.
Mobile Network Code	Number that uniquely identifies a network within a country.

Sample Output

show modem wireless network

```
user@host> show modem wireless network cl-1/0/0
```

```
LTE Connection details
Connected time: 147
IP: 172.16.52.4
Gateway: 172.16.52.5
DNS: 123.123.123.123
Input bps: 0
Output bps: 0
Bytes Received: 1308
Bytes Transferred: 1164
Packets Received: 10
Packets Transferred: 10
Wireless Modem Network Info
Current Modem Status: Connected
Current Service Status: Normal
Current Service Type: PS
Current Service Mode: LTE
Current Band: B3
Network: UNICOM
Mobile Country Code (MCC): 460
Mobile Network Code (MNC): 1
Location Area Code (LAC): 65534
Routing Area Code (RAC): 0
Cell Identification: 4865903
```



```
Access Point Name (APN): abcde
Public Land Mobile Network (PLMN): CHN-UNICOM
Physical Cell ID (PCI): 333
International Mobile Subscriber Identification (IMSI): ***************
International Mobile Equipment Identification (IMEI/MEID): ***************
Integrate Circuit Card Identity (ICCID): 89860114721100697502
Reference Signal Receiving Power (RSRP): -97
Reference Signal Receiving Quality (RSRQ): -16
Signal to Interference-plus-Noise Ratio (SiNR): 0
Signal Noise Ratio (SNR): 0
Energy per Chip to Interference (ECIO): 0
```

show modem wireless profiles

Syntax show modem wireless profiles *interface-name* slot *slot-number*

Release Information Command introduced in Junos OS Release 15.1X49-D100.

Description Display the profiles configured on the LTE Mini-PIM.

Options

- ***interface-name***—The LTE interface is **cl-*x*/0/0**, where ***x*** is the slot number in which the LTE Mini-PIM is installed.
- ***slot-number***—The slot in which the SIM card is inserted. The value can be either 1 or 2.

Required Privilege Level view

Related Documentation

- show modem wireless firmware on page 921
- show modem wireless network on page 924

List of Sample Output show modem wireless profiles on page 927

Output Fields Table 70 on page 924 lists some of the output fields for the **show modem wireless profiles** command. Output fields are listed in the approximate order in which they appear.

Table 71: show modem wireless profiles Output Fields

Field Name	Field Description
Max profiles	The maximum number of profiles available for each SIM card. This value is always 16. The LTE Mini-PIM supports two SIM cards and so you can configure a total of 32 profiles, although only one profile can be active at a time.
Default profile Id	The profile used to connect to the network when there is no profile selected. The default profile ID is always 1.
Profile details	• **Username**—The username provided by the service provider. • **Password**—The password provided by the service provider. • **Access point name (APN)**—The APN provided by the service provider. • **Authentication**—The protocol used for authentication.

Sample Output

show modem wireless profiles

`user@host>` **show modem wireless profiles cl-1/0/0 slot 1**

```
Profile details
  Max profiles: 16
  Default profile Id: 1

Profile 1: ACTIVE
  Valid: TRUE
  Access point name (APN): ctnet
  Authentication: None
Profile 2: Inactive
  Valid: TRUE
  Username: myuser
  Password: 123456
  Access point name (APN): testapn
  Authentication: PAP
Profile 3: Invalid
Profile 4: Invalid
Profile 5: Invalid
Profile 6: Invalid
Profile 7: Invalid
Profile 8: Invalid
Profile 9: Invalid
Profile 10: Invalid
Profile 11: Invalid
Profile 12: Invalid
Profile 13: Invalid
Profile 14: Invalid
Profile 15: Invalid
Profile 16: Invalid
```


show oam ethernet link-fault-management

Syntax

```
show oam ethernet link-fault-management
<brief | detail>
<interface-name>
```

Release Information

Statement for SRX Series devices introduced in Junos OS Release 9.5.

Description

Display 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

- clear oam ethernet connectivity-fault-management path-database on page 749
- *clear oam ethernet connectivity-fault-management statistics*
- Understanding Ethernet OAM Link Fault Management for SRX Series Services Gateways on page 353
- Example: Configuring Ethernet OAM Link Fault Management on a Security Device on page 355

List of Sample Output

show oam ethernet link-fault-management brief on page 933
show oam ethernet link-fault-management detail on page 933

Output Fields

Table 72 on page 929 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 72: show oam ethernet link-fault-management Output Fields

Field Name	Field Description	Level of Output
Status	Status of the established link. • **Fail**—A link fault condition exists. • **Running**—A link fault condition does not exist.	All levels

Table 72: show oam ethernet link-fault-management Output Fields (continued)

Field Name	Field Description	Level of Output
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
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 (type, length, values) of received Information OAM PDUs. **False** indicates that the OAM client has not seen remote state information. **True** indicates that the OAM client has seen remote state information.	All levels
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 the 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 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

Table 72: show oam ethernet link-fault-management Output Fields (continued)

Field Name	Field Description	Level of Output
Information	Number of information PDUs received.	**detail**
Event	Number of loopback control PDUs received.	**detail**
Variable request	Number of variable request PDUs received.	**detail**
Variable response	Number of variable response PDUs received.	**detail**
Loopback control	Number of loopback control PDUs received.	**detail**
Organization specific	Number of vendor organization specific PDUs received.	**detail**
OAM Transmit Statistics		
Information	Number of information PDUs transmitted.	**detail**
Event	Number of event notification PDUs transmitted.	**detail**
Variable request	Number of variable request PDUs transmitted.	**detail**
Variable response	Number of variable response PDUs transmitted.	**detail**
Loopback control	Number of loopback control PDUs transmitted.	**detail**
Organization specific	Number of vendor organization specific PDUs transmitted.	**detail**
OAM Received Symbol Error Event information		
Events	Number of symbol error event TLVs that have been received after the OAM sublayer was reset.	**detail**
Window	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	Number of errored symbols in the period required for the event to be generated.	**detail**
Errors in period	Number of symbol errors in the period reported in the received event PDU.	**detail**
Total errors	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	Number of errored frame event TLVs that have been received after the OAM sublayer was reset.	**detail**

Table 72: show oam ethernet link-fault-management Output Fields (continued)

Field Name	Field Description	Level of Output
Window	Duration of the window in terms of the number of 100 ms period intervals.	**detail**
Threshold	Number of detected errored frames required for the event to be generated.	**detail**
Errors in period	Number of detected errored frames in the period.	**detail**
Total errors	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	Number of frame seconds errors event TLVs that have been received after the OAM sublayer was reset.	**detail**
Window	Duration of the frame seconds window.	**detail**
Threshold	Number of frame seconds errors in the period.	**detail**
Errors in period	Number of frame seconds errors in the period.	**detail**
Total errors	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	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	Number of errored symbols in the period required for the event to be generated.	**detail**
Errors in period	Number of symbol errors in the period reported in the transmitted event PDU.	**detail**
Total errors	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	Number of errored frame event TLVs that have been transmitted after the OAM sublayer was reset.	**detail**
Window	Duration of the window in terms of the number of 100-ms period intervals.	**detail**
Threshold	Number of detected errored frames required for the event to be generated.	**detail**
Errors in period	Number of detected errored frames in the period.	**detail**

Table 72: show oam ethernet link-fault-management Output Fields (continued)

Field Name	Field Description	Level of Output
Total errors	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: 2001:bd8:00:31
  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: 2001:bd8:00:31
    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 poe controller (View)

Syntax

```
show poe controller
```

Release Information Command introduced in Junos OS Release 9.5.

Description Display the status of the Power over Ethernet (PoE) controller.

Options **none**—Display general parameters of the PoE software module controller.

Required Privilege Level View

Related Documentation

- Example: Configuring PoE on All Interfaces on page 390

Output Fields Table 73 on page 935 lists the output fields for the **show poe controller** command. Output fields are listed in the approximate order in which they appear.

Table 73: show poe controller Output Fields

Field name	Field Description
Controller-index	Identifies the controller.
Maximum-power	Specifies the maximum power that can be provided by the SRX Series device to PoE ports.
Power-consumption	Specifies the total amount of power allocated to the PoE ports.
Guard-band	Shows the guard band configured on the controller.
Management	Shows the power management mode.

Sample Output

show poe controller

user@host>show poe controller

```
Controller  Maximum   Power              Guard band  Management
index       power     consumption
   0        150.0 W    0.0 W               0 W         Static
```


show pppoe interfaces

Syntax

```
show pppoe interfaces
<brief | detail | extensive>
<pp0.logical>
```

Release Information Command introduced in Junos OS Release 9.5.

Description Display session-specific information about PPPoE interfaces.

Options

none—Display interface information for all PPPoE interfaces.

brief | detail—(Optional) Display the specified level of output.

extensive—(Optional) Display information about the number of packets sent and received and the number of timeouts during a PPPoE session.

pp0.*logical*—(Optional) Name of an interface. The logical unit number for static interfaces can be a value from 0 through 16,385. The logical unit number for dynamic interfaces can be a value from 1,073,741,824 through the maximum number of logical interfaces supported on your SRX300, SRX320, and SRX340, and SRX550M devices.

Required Privilege Level view

Related Documentation

- Understanding Ethernet Interfaces on page 255

List of Sample Output

show pppoe interfaces on page 938
show pppoe interfaces brief on page 938
show pppoe interfaces detail on page 938
show pppoe interfaces extensive on page 938

Output Fields Table 74 on page 936 lists the output fields for the **show pppoe interfaces** command. Output fields are listed in the approximate order in which they appear.

Table 74: show pppoe interfaces Output Fields

Field Name	Field Description
Index	Index number of the logical interface, which reflects its initialization sequence.
State	State of the logical interface: **up** or **down**.
Session ID	Session ID.
Service name	Type of service required (can be used to indicate an ISP name, a class, or quality of service).

Table 74: show pppoe interfaces Output Fields (continued)

Field Name	Field Description
Configured AC name	Configured access concentrator name.
Session AC name	Name of the access concentrator.
Remote MAC address or **Remote MAC**	MAC address of the remote side of the connection, either the access concentrator or the PPPoE client.
Auto-reconnect timeout	Timeout value for reconnecting after a PPPoE session is terminated (in seconds).
Idle timeout	Length of time (in seconds) that a connection can be idle before disconnecting.
Session uptime	Length of time the session has been up, in *hh:mm:ss*.
Ignore End-Of-List tag	Disables the **End-of-List** tag to continue processing of other tags after the **End-of-List** tag in a PPPoE Active Discovery Offer (PADO) packet.
Underlying interface	Interface on which PPPoE is running.
Packet Type	Number of packets sent and received during the PPPoE session, categorized by packet type and packet errors: • **PADI**—PPPoE Active Discovery Initiation packets. • **PADO**—PPPoE Active Discovery Offer packets. • **PADR**—PPPoE Active Discovery Request packets. • **PADS**—PPPoE Active Discovery Session-Confirmation packets. • **PADT**—PPPoE Active Discovery Termination packets. • **Service name error**—Packets for which the Service-Name request could not be honored. • **AC system error**—Packets for which the access concentrator experienced an error in performing the host request. For example, the host had insufficient resources to create a virtual circuit. • **Generic error**—Packets that indicate an unrecoverable error occurred. • **Malformed packets**—Malformed or short packets that caused the packet handler to discard the frame as unreadable. • **Unknown packets**—Unrecognized packets.
Timeout	Timeouts that occur during the PPPoE session: • **PADI**—No PADI packets received within the timeout period. • **PADO**—No PADO packets received within the timeout period. (This value is always zero and is not supported.) • **PADR**—No PADR packets received within the timeout period.

Table 74: show pppoe interfaces Output Fields (continued)

Field Name	Field Description
Receive Error Counters	Error counters received during the PPPoE session: • **PADI**—No PADI error counters received during the session. • **PADO**—No PADO error counters received during the session. • **PADR**—No PADR error counters received during the session. • **PADS**—No PADS error counters received during the session.

Sample Output

show pppoe interfaces

user@host> **show pppoe interfaces**

```
pp0.0 Index 71
  State: Session up, Session ID: 4,
  Service name: None,
  Session AC name: srx-pppoe-ac, Configured AC name: None,
  Remote MAC address: b0:c6:9a:74:5e:c1,
  Session uptime: 5d 15:21 ago,
  Auto-reconnect timeout: Never, Idle timeout: Never,
  Underlying interface: ge-0/0/1.0 Index 70
```

show pppoe interfaces brief

user@host> **show pppoe interfaces brief**

```
Interface       Underlying             State       Session    Remote
                interface                          ID         MAC
pp0.0           ge-0/0/1.0             Session up  4          b0:c6:9a:74:5e:c1
```

show pppoe interfaces detail

user@host> **show pppoe interfaces detail**

```
pp0.0 Index 71
  State: Session up, Session ID: 4,
  Service name: None,
  Session AC name: srx-pppoe-ac, Configured AC name: None,
  Remote MAC address: b0:c6:9a:74:5e:c1,
  Session uptime: 5d 15:21 ago,
  Auto-reconnect timeout: Never, Idle timeout: Never,
  Underlying interface: ge-0/0/1.0 Index 70
  Ignore End-Of-List tag: Enable
```

show pppoe interfaces extensive

user@host> **show pppoe interfaces extensive**

```
pp0.0 Index 71
  State: Session up, Session ID: 4,
  Service name: None,
  Session AC name: srx-pppoe-ac, Configured AC name: None,
  Remote MAC address: b0:c6:9a:74:5e:c1,
```



```
Session uptime: 5d 15:22 ago,
Auto-reconnect timeout: Never, Idle timeout: Never,
Underlying interface: ge-0/0/1.0 Index 70
PacketType                        Sent         Received
  PADI                               1                0
  PADO                               0                1
  PADR                               1                0
  PADS                               0                1
  PADT                               0                0
  Service name error                 0                0
  AC system error                    0                0
  Generic error                      0                0
  Malformed packets                  0                0
  Unknown packets                    0                0
Timeout
  PADI                               0
  PADO                               0
  PADR                               0
Receive Error Counters
  PADI                               0
  PADO                               0
  PADR                               0
  PADS                               0
```


show pppoe statistics

Syntax

```
show pppoe statistics
<logical-interface-name>
```

Release Information Command is t introduced in Junos OS Release 9.5.

Description Display statistics information about PPPoE interfaces.

Options **none**—Display PPPoE statistics for all interfaces.

logical-interface-name—(Optional) Name of an underlying PPPoE logical interface.

Required Privilege Level view

Related Documentation

- show pppoe interfaces on page 936
- Understanding Ethernet Interfaces on page 255

List of Sample Output show pppoe statistics on page 941

Output Fields Table 75 on page 940 lists the output fields for the **show pppoe statistics** command. Output fields are listed in the approximate order in which they appear.

Table 75: show pppoe statistics Output Fields

Field Name	Field Description
Active PPPoE sessions	Total number of active PPPoE sessions.
Packet Type	Number of packets sent and received during the PPPoE session, categorized by packet type and packet errors: • **PADI**—PPPoE Active Discovery Initiation packets. • **PADO**—PPPoE Active Discovery Offer packets. • **PADR**—PPPoE Active Discovery Request packets. • **PADS**—PPPoE Active Discovery Session-Confirmation packets. • **PADT**—PPPoE Active Discovery Termination packets. • **Service name error**—Packets for which the Service-Name request could not be honored. • **AC system error**—Packets for which the access concentrator experienced an error in performing the host request. For example, the host had insufficient resources to create a virtual circuit. • **Generic error**—Packets that indicate an unrecoverable error occurred. • **Malformed packets**—Malformed or short packets that caused the packet handler to discard the frame as unreadable. • **Unknown packets**—Unrecognized packets.

Table 75: show pppoe statistics Output Fields (continued)

Field Name	Field Description
Timeout	Timeouts that occur during the PPPoE session: • **PADI**—No PADI packets received within the timeout period. • **PADO**—No PADO packets received within the timeout period. (This value is always zero and is not supported.) • **PADR**—No PADR packets received within the timeout period.
Receive Error Counters	Error counters received during the PPPoE session: • **PADI**—No PADI error counters received during the session. • **PADO**—No PADO error counters received during the session. • **PADR**—No PADR error counters received during the session. • **PADS**—No PADS error counters received during the session.

Sample Output

show pppoe statistics

```
user@host> show pppoe statistics
Active PPPoE sessions: 0

  PacketType                         Sent         Received
    PADI                                0                0
    PADO                                0                0
    PADR                                0                0
    PADS                                0                0
    PADT                                0                0
    Service name error                  0                0
    AC system error                     0                0
    Generic error                       0                0
    Malformed packets                   0                0
    Unknown packets                     0                0
  Timeout
    PADI                                0
    PADO                                0
    PADR                                0
  Receive Error Counters
    PADI                                0
    PADO                                0
    PADR                                0
    PADS                                0
```

show poe telemetries

Syntax

```
show poe telemetries
<interface interface-name count number>
<count number interface interface-name>
```

Release Information Command modified in Junos OS Release 12.3X48-D10.

Description Display a history of power consumption on the specified interface. Telemetries must be enabled on the interface before you can display a history of power consumption.

Options

- **Interface *interface-name***—Display telemetries for the specified PoE interface.
- **count *number***—Display the specified number of telemetries records for the specified PoE interface.

Required Privilege Level View

Related Documentation

- Example: Configuring PoE on All Interfaces on page 390

Output Fields Table 76 on page 942 lists the output fields for the **show poe telemetries interface** command. Output fields are listed in the approximate order in which they appear.

Table 76: show poe telemetries interface Output Fields

Field name	Field Description
Sl No	Number of the record for the specified port. The last record is the most is the most recent.
Timestamp	Time that the power-consumption data was gathered.
Power	Amount of power provided by the specified port at the time the data was gathered.
Voltage	Voltage on the specified port at the time the data was gathered.

Sample Output

show poe telemetries interface

user@host>show poe telemetries interface ge-0/0/1 count 8

```
Sl No     Timestamp                Power     Voltage
   1      Fri Jan 04 11:41:15 2009 6.6 W     47.2 V
   2      Fri Jan 04 11:40:15 2009 6.6 W     47.2 V
   3      Fri Jan 04 11:39:15 2009 6.6 W     47.2 V
```



```
   4     Fri Jan 04 11:38:15 2009 6.6 W    47.2 V
   5     Fri Jan 04 11:37:15 2009 6.6 W    47.2 V
   6     Fri Jan 04 11:36:15 2009 6.6 W    47.2 V
   7     Fri Jan 04 11:35:15 2009 6.6 W    47.2 V
   8     Fri Jan 04 11:34:15 2009 6.6 W    47.2 V
```

user@host>show poe telemetries count 5 interface ge-0/0/1

```
Sl No    Timestamp                Power    Voltage
   1     Fri Jan 04 11:47:15 2009 6.6 W    47.2 V
   2     Fri Jan 04 11:38:15 2009 6.6 W    47.2 V
   3     Fri Jan 04 11:29:15 2009 6.6 W    47.2 V
   4     Fri Jan 04 11:11:15 2009 6.6 W    47.2 V
   5     Fri Jan 04 11:10:15 2009 6.6 W    47.2 V
```

show services accounting

Syntax

```
show services accounting
aggregation
errors
<inline-jflow | inline-jflow fpc-slot slot number>
flow
<inline-jflow | inline-jflow fpc-slot slot number>
flow-detail
memory
packet-size-distribution
status
<inline-jflow | inline-jflow fpc-slot slot number>
usage
```

Release Information Command introduced in Junos OS Release 10.4. The **inline-jflow** and **fpc-slot** options are added in Junos OS Release 12.1X45-D10.

Description Display sampled accounting service.

Options

- aggregation—Display aggregation information.
- errors —Display error statistics.
  - inline-jflow — Display service accounting inline flow monitoring parameters.
  - fpc-slot *slot number*— Display Flexible PIC Concentrator (FPC) slot for inline flow monitoring.
- flow—Display flow information.
  - inline-jflow — Display service accounting inline flow monitoring parameters.
  - fpc-slot *slot number*— Display Flexible PIC Concentrator (FPC) slot for inline flow monitoring.
- flow-detail—Display flow detail.
- memory—Display memory information.
- packet-size-distribution—Display packet size distribution.
- status–Display service accounting parameters.
  - inline-jflow — Display service accounting inline flow monitoring parameters.
  - fpc-slot *slot number*— Display Flexible PIC Concentrator (FPC) slot for inline flow monitoring.
- usage–Display CPU usage.

Required Privilege Level view

Related Documentation
- *Configuring Flow Aggregation to Use Version 9 Flow Templates*

List of Sample Output
show services accounting status inline-jflow on page 945
show services accounting errors inline-jflow on page 945
show service accounting flow inline-jflow on page 945

Output Fields Lists the output fields for the **show services accounting** command.

Sample Output

show services accounting status inline-jflow

user@host> **show services accounting status inline-jflow**

```
Status information
    FPC Slot: 5
    Export format: IP-FIX(V9)
    IPv4 Route Record Count: 16, IPv6 Route Record Count: 5
    Route Record Count: 21, AS Record Count: 1
    Route-Records Set: Yes, Config Set: Yes
```

show services accounting errors inline-jflow

user@host> **show services accounting errors inline-jflow**

```
Error Information
  FPC Slot:  5
  PIC Slot:  0
  Flow Creation Failures: 0
  Route Record Lookup Failures: 0
  AS Lookup Failures: 0
  Export Packet Failures: 0
  Memory Overload: No

  IPv4 Errors:
  IPv4 Flow Creation Failures: 0
  IPv4 Route Record Lookup Failures: 0
  IPv4 AS Lookup Failures: 0
  IPv4 Export Packet Failures: 0

  IPv6 Errors:
  IPv6 Flow Creation Failures: 0
  IPv6 Route Record Lookup Failures: 0
  IPv6 AS Lookup Failures: 0
  IPv6 Export Packet Failures: 0
```

show service accounting flow inline-jflow

user@host> **show service accounting flow inline-jflow**

```
Flow Information
FPC Slot:  5
PIC Slot:  0
Flow Packets: 2  Flow Bytes: 0
```

```
Active Flows: 1  Total Flows: 2
Flows Exported: 0 Flow Packets Exported: 231
Flows Inactive Timed Out: 1 Flows Active Timed Out: 2

IPv4 Flows:
IPv4 Flow Packets: 1  IPv4 Flow Bytes: 0
IPv4 Active Flows: 1  IPv4 Total Flows: 1
IPv4 Flows Exported: 0 IPv4 Flow Packets Exported: 132
IPv4 Flows Inactive Timed Out: 0 IPv4 Flows Active Timed Out: 1

IPv6 Flows:
IPv6 Flow Packets: 1  IPv6 Flow Bytes: 0
IPv6 Active Flows: 0  IPv6 Total Flows: 1
IPv6 Flows Exported: 0 IPv6 Flow Packets Exported: 99
IPv6 Flows Inactive Timed Out: 1 IPv6 Flows Active Timed Out: 1
```


show services accounting aggregation (View)

Syntax

```
show services accounting aggregation
```

Release Information

Command introduced in Junos OS Release 10.4.

Description

Display aggregation information for the accounting service.

Options

- as—Display aggregation type AS.
- destination-prefix—Display aggregation type destination-prefix.
- protocol-port—Display aggregation type protocol-port.
- source-destination-prefix—Display aggregation type source-destination-prefix.
- source-prefix—Display aggregation type source-prefix.
- template—Display aggregation type template.

Required Privilege Level

view

Related Documentation

- *Configuring Flow Aggregation to Use Version 9 Flow Templates*

show services accounting aggregation template (View)

Syntax

```
show services accounting aggregation template
```

Release Information Command introduced in Junos OS Release 10.4.

Description Display aggregation type template.

Options

- detail—Display detailed output.
- extensive—Display extensive output.
- template-name—Display name of the template.
- terse—Display terse output (default).

Required Privilege Level view

Related Documentation

- *Configuring Flow Aggregation to Use Version 9 Flow Templates*

show services accounting flow-detail (View)

Syntax

```
show services accounting flow-detail
```

Release Information Command introduced in Junos OS Release 10.4.

Description Display flow detail

Options

- destination-as—Filter term destination AS.
- destination-port—Filter term destination port.
- destination-prefix—Filter term destination prefix.
- detail—Display detailed output.
- extensive–Display extensive output.
- input-snmp-interface-index–Filter term input SNMP interface index.
- limit–Display maximum number of flows to display.
- name-Display name of the service, wildcard, or “all”.
- order–Display order for displaying flows.
- output-snmp-interface-index–Filter term output SNMP interface index.
- proto–Filter term protocol.
- source-as–Filter term source AS.

Required Privilege Level view

Related Documentation

- *Configuring Flow Aggregation to Use Version 9 Flow Templates*

