Junos® OS

Interfaces Feature Guide for Security Devices

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About the Documentation

Documentation and Release Notes

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

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

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

Supported Platforms

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

- SRX Series
- vSRX

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

Table 2: Text and Syntax Conventions

Convention	Description	Examples
Bold text like this	Represents text that you type.	To enter configuration mode, type the **configure** command: user@host> **configure**

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

<table>
<tr><th>Convention</th><th>Description</th><th>Examples</th></tr>
<tr><td><code>Fixed-width text like this</code></td><td>Represents output that appears on the terminal screen.</td><td><code>user@host></code> show chassis alarms

<code>No alarms currently active</code></td></tr>
<tr><td>Italic text like this</td><td>• Introduces or emphasizes important new terms.
• Identifies guide names.
• Identifies RFC and Internet draft titles.</td><td>• A policy term is a named structure that defines match conditions and actions.
• Junos OS CLI User Guide
• RFC 1997, BGP Communities Attribute</td></tr>
<tr><td>Italic text like this</td><td>Represents variables (options for which you substitute a value) in commands or configuration statements.</td><td>Configure the machine’s domain name:

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

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

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

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

Documentation Feedback

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

- Online feedback rating system—On any page of the Juniper Networks TechLibrary site at http://www.juniper.net/techpubs/index.html, simply click the stars to rate the content, and use the pop-up form to provide us with information about your experience. Alternately, you can use the online feedback form at http://www.juniper.net/techpubs/feedback/.
- E-mail—Send your comments to techpubs-comments@juniper.net. Include the document or topic name, URL or page number, and software version (if applicable).

Requesting Technical Support

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

- JTAC policies—For a complete understanding of our JTAC procedures and policies, review the *JTAC User Guide* located at http://www.juniper.net/us/en/local/pdf/resource-guides/7100059-en.pdf.
- Product warranties—For product warranty information, visit http://www.juniper.net/support/warranty/.
- JTAC hours of operation—The JTAC centers have resources available 24 hours a day, 7 days a week, 365 days a year.

Self-Help Online Tools and Resources

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

- Find CSC offerings: http://www.juniper.net/customers/support/
- Search for known bugs: http://www2.juniper.net/kb/
- Find product documentation: http://www.juniper.net/techpubs/
- Find solutions and answer questions using our Knowledge Base: http://kb.juniper.net/

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

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

Opening a Case with JTAC

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

- Use the Case Management tool in the CSC at http://www.juniper.net/cm/.
- Call 1-888-314-JTAC (1-888-314-5822 toll-free in the USA, Canada, and Mexico).

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

PART 1

Overview

CHAPTER 1

Introduction to Interfaces

Understanding Interfaces

Supported Platforms SRX Series, vSRX

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 9
- Understanding Interface Logical Properties on page 19
- Understanding Interface Physical Properties on page 45
- Understanding the Data Link Layer on page 11

Network Interfaces

Supported Platforms SRX Series, vSRX

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 267.
at	ATM-over-ADSL or ATM-over-SHDSL WAN interface.
dl	Dialer interface for initiating USB modem connections. See "USB Modem Interface Overview" on page 509.
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 247.
ge	Gigabit Ethernet interface. See "Understanding Ethernet Interfaces" on page 247.
pt	VDSL2 interface. See "Example: Configuring VDSL2 Interfaces (Detail)" on page 216.
reth	For chassis cluster configurations only, redundant Ethernet interface. See "Understanding Ethernet Interfaces" on page 247.
se	Serial interface (either RS-232, RS-422/499, RS-530, V.35, or X.21). See "Serial Interfaces Overview" on page 539.
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 313.

NOTE: Starting in Junos OS Release 15.1X49-D10, support for multiple network interfaces is not available on SRX300, SRX320, SRX340, SRX345, and SRX550HM devices. 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-D10	Starting in Junos OS Release 15.1X49-D10, support for multiple network interfaces is not available on SRX300, SRX320, SRX340, SRX345, and SRX550HM devices.

Related Documentation

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

Services Interfaces

Supported Platforms SRX Series, vSRX

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 Feature Guide for Security Devices*.

Table 4: Configurable Services Interfaces *(continued)*

Interface Name	Description
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 369.
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 *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 512.

NOTE: **Starting in Junos OS Release 15.1X49-D10, the lsq-0/0/0 service interface is not configurable on SRX300, SRX320, SRX340, SRX345, and SRX550HM devices. These devices become configurable again in Junos OS Release 15.1X49-D40.**

Table 5 on page 8 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.
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.

Release History Table

Release	Description
15.1X49-D10	Starting in Junos OS Release 15.1X49-D10, the **lsq-0/0/0** service interface is not configurable on SRX300, SRX320, SRX340, SRX345, and SRX550HM devices.

Related Documentation

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

Special Interfaces

Supported Platforms SRX Series, vSRX

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 9 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

Supported Platforms SRX Series, vSRX

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.

Table 7: Network Interface Names *(continued)*

Name Part	Meaning	Possible Values
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
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 and SRX3600 devices: This number is always **0**. Only one IOC can be installed in a slot.
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 and SRX3600 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

Supported Platforms SRX Series, vSRX

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

Configuring IOC to NPC Mapping

An Input/Output card (IOC) to Network Processing Card (NPC) mapping requires you to map one IOC to one NPC. However, you can map multiple IOCs to a single NPC. To balance the processing power in the NPC on the SRX3400 and SRX3600 Services Gateways, the chassis process (daemon) runs an algorithm that performs the mapping. It maps an IOC to an NPC that has the least amount of IOCs mapped to it. You can also use the command-line interface (CLI) to assign a specific IOC to a specific NPC. When you configure the mapping, the chassis process will first use your configuration, then apply the least-number NPC algorithm for the rest of the IOCs.

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

To configure the IOC to NPC mapping:

```
[edit]
set chassis ioc-npc-connectivity {
    ioc slot-number npc (none | slot-number);
}
```

See Table 8 on page 13 for a description of the **set chassis ioc-npc-connectivity** options.

Table 8: IOC to NPC Connectivity Options

Option	Description
ioc *slot-number*	Specify the IOC slot number. Range is 0 through 7 for SRX3400 devices and 0 through 12 for SRX3600 devices.
npc *slot-number*	Specify the NPC slot number. Range is 0 through 7 for SRX3400 devices and 0 through 12 for SRX3600 devices.
none	The chassis process maps the connection for the particular IOC.

NOTE: **You must restart the chassis control after you commit the set chassis ioc-npc-connectivity command.**

Related Documentation

- Network Interfaces on page 4
- Interface Naming Conventions on page 9

Monitoring Interfaces

Supported Platforms SRX Series, vSRX

Purpose View general information about all physical and logical interfaces for a device.

Action Select **Monitor>Interfaces** in the J-Web user interface. The J-Web Interfaces page displays the following details about each device interface:

- Port—Indicates the interface name.
- Admin Status—Indicates whether the interface is enabled (Up) or disabled (Down).
- Link Status—Indicates whether the interface is linked (Up) or not linked (Down).
- Address—Indicates the IP address of the interface.
- Zone—Indicates whether the zone is an untrust zone or a trust zone.
- Services—Indicates services that are enabled on the device, such as HTTP and SSH.
- Protocols—Indicates protocols that are enabled on the device, such as BGP and IGMP.
- Input Rate graph—Displays interface bandwidth utilization. Input rates are shown in bytes per second.
- Output Rate graph—Displays interface bandwidth utilization. Output rates are shown in bytes per second.
- Error Counters chart—Displays input and output error counters in the form of a bar chart.
- Packet Counters chart—Displays the number of broadcast, unicast, and multicast packet counters in the form of a pie chart. (Packet counter charts are supported only for interfaces that support MAC statistics.)

To change the interface display, use the following options:

- Port for FPC—Controls the member for which information is displayed.
- Start/Stop button—Starts or stops monitoring the selected interfaces.
- Show Graph—Displays input and output packet counters and error counters in the form of charts.
- Pop-up button—Displays the interface graphs in a separate pop-up window.
- Details—Displays extensive statistics about the selected interface, including its general status, traffic information, IP address, I/O errors, class-of-service data, and statistics.
- Refresh Interval—Indicates the duration of time after which you want the data on the page to be refreshed.
- Clear Statistics—Clears the statistics for the selected interface.

Alternatively, you can enter the following **show** commands in the CLI to view interface status and traffic statistics:

- **show interfaces terse**

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.

- **show interfaces detail**
- **show interfaces extensive**
- **show interfaces *interface-name***

Understanding GRE Keepalive Time

Supported Platforms SRX Series

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.

Starting in Junos OS Release 15.1X49-D10, configuring keepalive times is no longer supported. 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.

Release History Table

Release	Description
15.1X49-D10	Starting in Junos OS Release 15.1X49-D10, configuring keepalive times is no longer supported.

Related Documentation

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

Configuring GRE Keepalive Time

Supported Platforms SRX Series

Starting in Junos OS Release 15.1X49-D10, configuring keepalive times is no longer supported. 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 on page 16
- Display GRE Keepalive Time Configuration on page 17
- Display Keepalive Time Information on a GRE Tunnel Interface on page 17

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.

Release History Table

Release	Description
15.1X49-D10	Starting in Junos OS Release 15.1X49-D10, configuring keepalive times is no longer supported.

Related Documentation

- Understanding GRE Keepalive Time on page 15

CHAPTER 2

Configuring Interface Logical Properties

Understanding Interface Logical Properties

Supported Platforms SRX Series, vSRX

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 23

- Understanding Virtual LANs on page 53

Understanding Protocol Families

Supported Platforms SRX Series, vSRX

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

Supported Platforms SRX Series, vSRX

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

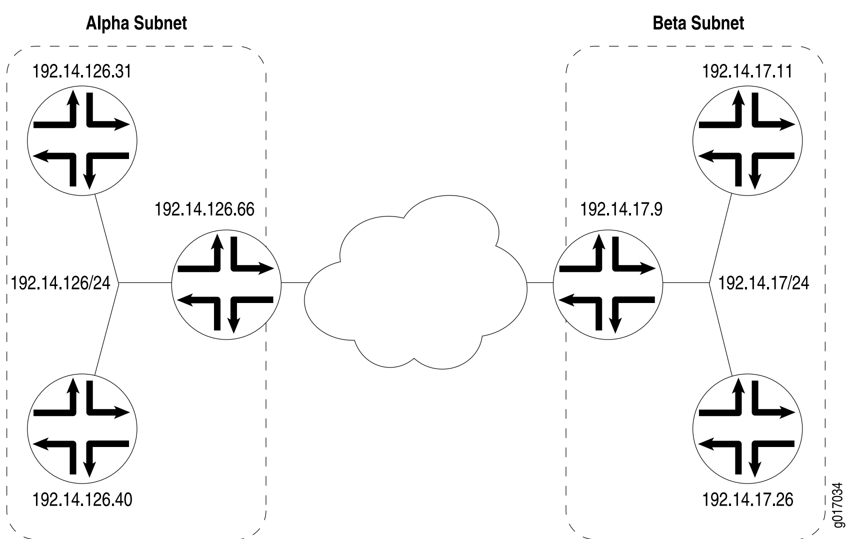


Figure 1 on page 22 shows three devices connected to one subnet and three more devices connected to a second subnet. Collectively, the six devices and two subnets make up the larger network. In this example, the network is assigned the network prefix **192.14.0.0**, a class B address. Each device has 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 23

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

Supported Platforms SRX Series, vSRX

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

Supported Platforms SRX Series, vSRX

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 23
- Enabling Flow-Based Processing for IPv6 Traffic on page 28

Enabling Flow-Based Processing for IPv6 Traffic

Supported Platforms SRX Series

You have the following options for handling IPv6 traffic:

- Drop—Do not forward IPv6 packets. This is the default behavior.
- Packet-based forwarding—Do not create a session and process according to packet-based features only (includes firewall filters and class of service).
- Flow-based forwarding—Create a session and process according to packet-based features (including firewall filters and class of service) but also flow-based security features, such as screens and firewall security policy.

To enable flow-based processing for IPv6 traffic, modify the **mode** statement at the [**edit security forwarding-options family inet6**] hierarchy level:

```
security {
  forwarding-options {
    family {
```

```
            inet6 {
                mode flow-based;
            }
        }
    }
}
```

The following example shows the CLI commands you use to configure forwarding for IPv6 traffic:

```
[edit]
user@host# set security forwarding-options family inet6 mode ?
Possible completions:
  drop                     Disable forwarding
  flow-based               Enable flow-based forwarding
  packet-based             Enable packet-based forwarding

[edit]
user@host# set security forwarding-options family inet6 mode flow-based
user@host# show security forwarding-options
family {
    inet6 {
        mode flow-based;
    }
}
```

If you change the forwarding option mode for IPv6, you might need to perform a reboot to initialize the configuration change. Table 9 on page 29 summarizes device status upon configuration change.

Table 9: Device Status Upon Configuration Change

Configuration Change	Commit Warning	Reboot Required	Impact on Existing Traffic Before Reboot	Impact on New Traffic Before Reboot
Drop to flow-based	Yes	Yes	Dropped	Dropped
Drop to packet-based	No	No	Packet-based	Packet-based
Flow-based to packet-based	Yes	Yes	None	Flow sessions created
Flow-based to drop	Yes	Yes	None	Flow sessions created
Packet-based to flow-based	Yes	Yes	Packet-based	Packet-based
Packet-based to drop	No	No	Dropped	Dropped

Related Documentation

- *Understanding IPv6 Addressing*
- Configuring the inet6 IPv6 Protocol Family on page 27

Configuring Flow Aggregation to Use Version 9 Flow Templates

Supported Platforms SRX Series

Use of version 9 allows you to define a flow record template suitable for IPv4 traffic, IPv6 traffic, or peer AS billing traffic. Templates and the fields included in the template are transmitted to the collector periodically, and the collector need not be aware of the router configuration.

NOTE: Version 9 requires that you install a services PIC, such as the Adaptive Services PIC or the Multiservices PIC, in the device. On MX Series routers, the Multiservices DPC fulfills this requirement.

The following sections contain additional information:

Configuring the Traffic to Be Sampled

To specify sampling of IPv4, IPv6, or peer AS billing traffic, include the appropriate configuration of the **family** statement at the **[edit forwarding-options sampling input]** hierarchy level:

```
[edit forwarding-options sampling input]
family (inet ) {
max-packets-per-second number;
rate number;
run-length number;
}
```

You can include **family inet**.

NOTE: If you specify sampling for peer AS billing traffic, the **family** statement supports only IPv4 and IPv6 traffic (inet). Peer AS billing traffic is enabled only at the global instance hierarchy level and is not available for per Packet Forwarding Engine instances.

Configuring the Version 9 Template Properties

To define the version 9 templates, include the following statements at the **[edit services flow-monitoring version9]** hierarchy level:

```
[edit services flow-monitoring version9]
template name {
  flow-active-timeout seconds;
```



```
    flow-inactive-timeout seconds;
    option-refresh-rate packets packets seconds seconds;
    template-refresh-rate packets packets seconds seconds;
    (ipv4-template (Services) | ipv6-template (Services) | mpls-ipv4-template |
      mpls-template | peer-as-billing-template) {
      label-position [ positions ];
    }
  }
```

The following details apply to the configuration statements:

- You assign each template a unique name by including the **template *name*** statement.
- You then specify each template for the appropriate type of traffic by including the **ipv4-template**, **ipv6–template**, **inet-ipv4-template**, **inet-template**, or **peer-as-billing-template**.
- If the template is used for inet traffic, you can also specify up to three label positions for the inet header label data by including the **label-position** statement; the default values are **[1 2 3]**.
- Within the template definition, you can optionally include values for the **flow-active-timeout** and **flow-inactive-timeout** statements. These statements have specific default and range values when they are used in template definitions; the default is 60 seconds and the range is from 10 through 600 seconds. Values you specify in template definitions override the global timeout values configured at the **[edit forwarding-options sampling output flow-server]** hierarchy level.

  NOTE: In active flow monitoring, the flow-server records are exported after a time period that is a multiple of 60 seconds and greater than or equal to the configured active timeout value. For example, if the active timeout value is 90 seconds, the flow-server records are exported at 120-second intervals. If the active timeout value is 150 seconds, the flow-server records are exported at 180-second intervals, and so forth.

- You can also include settings for the **option-refresh-rate** and **template-refresh-rate** statements within a template definition. For both of these properties, you can include a timer value (in seconds) or a packet count (in number of packets). For the **seconds** option, the default value is 60 and the range is from 10 through 600. For the **packets** option, the default value is 4800 and the range is from 1 through 480,000.
- To filter IPV6 traffic on a media interface, the following configuration is supported:

```
interfaces interface-name {
  unit 0 {
    family inet {
      sampling {
        input;
        output;
      }
    }
  }
}
```


Restrictions

The following restrictions apply to version 9 templates:

- You cannot apply the two different types of flow aggregation configuration (flow-server version 5/8 and flow aggregation version 9) at the same time.
- Flow export based on an **inet-ipv4** template assumes that the IPv4 header follows the inet header. In the case of Layer 2 VPNs, the packet on the provider router (P router) would look like this:

  inet | Layer 2 Header | IPv4

  In this case, **inet-ipv4** flows are not created on the PIC, because the IPv4 header does not directly follow the inet header. Packets are dropped on the PIC and are accounted as parser errors.
- Outbound Routing Engine traffic is not sampled. A firewall filter is applied as output on the egress interface, which samples packets and exports the data. For transit traffic, egress sampling works correctly. For internal traffic, the next hop is installed in the Packet Forwarding Engine but sampled packets are not exported.
- Flows are created on the monitoring PIC only after the route record resynchronization operation is complete, which is 60 seconds after the PIC comes up. Any packets sent to the PIC would be dropped until the synchronization process is complete.

On SRX300, SRX320, SRX340, SRX345, and SRX550HM devices, flow monitoring IPv6 version 9 has the following limitations:

- MPLS in not supported.
- User-defined version 9 templates are not supported.
- Routing Engine based flow monitoring version 9 is not supported.
- Flow monitoring and accounting are not supported in chassis cluster mode.
- Flow monitoring and accounting are not supported on an ae interface.
- J-Web for IPv6 sampled packets is not supported.
- SNMP queries for IPv6 sampled packets are not supported
- Flow monitoring can be configured in version 5, version 8, or version 9 export mode. Up to eight version 9 collectors are supported in export mode.
- Scope of accounting of IPv6 flow monitoring version 9 packets associated with pseudointerfaces (such as IRB, ML, LAG, VLAN, and GRE) is not supported.
- Creation of an SCTP session (parallel to TCP) between an exporter and a collector for gathering flow monitoring information is not supported.
- Maximum flow sessions that might be supported include:
  - A device with 1-GB RAM, such as an SRX320 device, might support up to 15,000 flow monitoring sessions at a time.

- A device with 2-GB RAM, such as an SRX650 device, might support up to 59,900 flow monitoring sessions at a time.

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

- Routing Engine based flow monitoring V5 or V8 mode is mutually exclusive with inline flow monitoring V9.
- SRX5400, SRX5600, and SRX5800 do not support multiple collectors like SRX300, SRX320, SRX340, SRX345, and SRX550HM devices. Only one V9 collector per IPv4 or IPv6 is supported
- Flow aggregation for V9 export is not supported.
- Only UDP over IPv4 or IPv6 protocol can be used as the transport protocol.
- Only the standard IPv4 or IPv6 template is supported for exporting flow monitoring records.
- User-defined or special templates are not supported for exporting flow monitoring records.
- Chassis cluster is supported without flow monitoring session synchronization.

Fields Included in Each Template Type

The following fields are common to all template types:

- Input interface
- Output interface
- Number of bytes
- Number of packets
- Flow start time
- Flow end time

The IPv4 template includes the following specific fields:

- IPv4 Source Address
- IPv4 Destination Address
- L4 Source Port
- L4 Destination Port
- IPv4 TOS
- IPv4 Protocol
- ICMP type and code

- TCP Flags
- IPv4 Next Hop Address

The IPv6 template includes the following specific fields:

- IPv6 Source Address and Mask
- IPv6 Destination Address and Mask
- L4 Source Port
- L4 Destination Port
- IPv6 TOS
- IPv6 Protocol
- TCP Flags
- IP Protocol Version
- IPv6 Next Hop Address
- Egress Interface Information
- Source Autonomous System (AS) number
- Destination AS number

The inet template includes the following specific fields:

- inet Label #1
- inet Label #2
- inet Label #3
- inet EXP Information
- FEC IP Address

The inet-IPv4 template includes all the fields found in the IPv4 and inet templates.

The peer AS billing template includes the following specific fields:

- IPV4 Class of Service (TOS)
- Ingress Interface
- BGP IPV4 Next Hop Address
- BGP Peer Destination AS Number

inet Sampling Behavior

This section describes the behavior when inet sampling is used on egress interfaces in various scenarios (label pop or swap) on provider routers (P routers).

1. You configure inet sampling on an egress interface on the P router and configure an inet flow aggregation template. The route action is label *pop* because penultimate hop popping (PHP) is enabled.

   Previously, IPv4 packets (only) would have been sent to the PIC for sampling even though you configured inet sampling. No flows should be created, with the result that the parser fails.

   With the current capability of applying inet templates, inet flows are created.

2. As in the first case, you configure inet sampling on an egress interface on the P router and configure an inet flow aggregation template. The route action is label swap and the swapped label is 0 (explicit null).

   The resulting behavior is that inet packets are sent to the PIC. The flow being sampled corresponds to the label before the swap.

3. You configure a Layer 3 VPN network, in which a customer edge router (CE-1) sends traffic to a provider edge router (PE-A), through the P router, to a similar provider edge router (PE-B) and customer edge router (CE-2) on the remote end.

   The resulting behavior is that you cannot sample inet packets on the PE-A to P router link.

Verification

To verify the configuration properties, you can use the **show services accounting aggregation template template-name *name*** operational mode command.

All other **show services accounting** commands also support version 9 templates, except for **show services accounting flow-detail** and **show services accounting aggregation aggregation-type**.

Examples: Configuring Version 9 Flow Templates

The following is a sample version 9 template configuration:

```
services {
  flow-monitoring {
    version9 {
      template ip-template {
        flow-active-timeout 20;
        flow-inactive-timeout 120;
        ipv4-template;
      }
      template inet-template-1 {
        inet-template {
          label-position [1 3 4];
        }
      }
      template inet-ipv4-template-1 {
        inet-ipv4-template {
          label-position [1 5 7];
        }
      }
```



```
            template peer-as-billing-template-1 {
                peer-as-billing-template;
                }
            }
        }
    }
}
```

The following is a sample firewall filter configuration for inet traffic:

```
firewall {
    family inet {
        filter inet_sample {
            term default {
                then {
                    accept;
                    sample;
                }
            }
        }
    }
}
```

The following sample configuration applies the inet sampling filter on a networking interface and configures the AS PIC to accept both IPv4 and inet traffic:

```
inline-jflows {
    at-0/1/1 {
        unit 0 {
            family inet {
                filter {
                    input inet_sample;
                }
            }
        }
    }
    sp-7/0/0 {
        unit 0 {
            family inet;
            family inet;
        }
    }
}
```

The following example applies the inet version 9 template to the sampling output and sends it to the AS PIC:

```
forwarding-options {
    sampling {
        input {
            family inet {
                rate 1;
            }
        }
        output {
            flow-active-timeout 60;
            flow-inactive-timeout 30;
```



```
         flow-server 1.2.3.4 {
            port 2055;
            version9 {
               template inet-ipv4-template-1;
            }
         }
         inline-jflow sp-7/0/0 {
            source-address 1.1.1.1;
         }
      }
   }
}
```

The following is a sample firewall filter configuration for the peer AS billing traffic:

```
firewall {
   family inet {
      filter peer-as-filter {
         term 0 {
               from {
                  destination-class dcu-1;
                  inline-jflow ge-2/1/0;
                  forwarding-class class-1;
               }
               then count count_team_0;
         }
         }
         term 1 {
               from {
                  destination-class dcu-2;
                  inline-jflow ge-2/1/0;
                  forwarding-class class-1;
               }
               then count count_team_1;
         }
         term 2 {
               from {
                  destination-class dcu-3;
                  inline-jflow ge-2/1/0;
                  forwarding-class class-1;
               }
               then count count_team_2;
         }
      }
   }
}
```

The following sample configuration applies the firewall filter as a filter attribute under the forwarding-options hierarchy for CoS-level data traffic usage information collection:

```
forwarding-options {
   family inet {
      filter output peer-as-filter;
   }
}
```

The following example applies the peer-as-billing version 9 template to enable sampling of traffic for billing purposes:

```
forwarding-options {
  sampling {
    }
    input {
      rate 1;
    }
    family inet {
      output {
        flow-server 10.209.15.58 {
          port 300;
          version9 {
            template {
              peer-as;
            }
          }
        }
        inline-jflow sp-5/2/0 {
          source-address 2.3.4.5;
        }
      }
    }
  }
}
family inet {
  filter {
    output peer-as-filter;
  }
}
```

Related Documentation

- Understanding Interface Logical Properties on page 19

Understanding IPv6 Support VDSL2 Interfaces

Supported Platforms SRX1500, SRX320, SRX340, SRX550M

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

Supported Platforms SRX210, SRX220, SRX240, SRX550

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

NOTE: **Starting in Junos OS Release 15.1X49-D10 the ADSL interface is no longer supported on SRX300, SRX320, SRX340, SRX345, and SRX550HM devices.**

Requirements

Before you begin, configure network interfaces as necessary. See “Understanding Ethernet Interfaces” on page 247.

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 27
- **show ipv6 neighbors on page 732**
- **clear ipv6 neighbors on page 651**

Understanding MAC Limiting on Layer 3 Routing Interfaces

Supported Platforms SRX1500, SRX300, SRX320, SRX340, vSRX

- Overview on page 41
- Limitations on page 43

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

Supported Platforms SRX Series

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 10 on page 45 summarizes some key physical properties of device interfaces.

Table 10: 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 46.
bert-period	Bit error rate test (BERT) time period over which bit errors are sampled. See “Understanding Bit Error Rate Testing” on page 46.

Table 10: Interface Physical Properties *(continued)*

Physical Property	Description
chap	Challenge Handshake Authentication Protocol (CHAP). Specifying **chap** enables CHAP authentication on the interface. See "Understanding CHAP Authentication on a PPPoE Interface" on page 387.
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 47.
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 361.
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. See "MTU Default and Maximum Values" on page 49.
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 387.
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 46
- Understanding Interface Clocking on page 47
- Understanding Frame Check Sequences on page 48
- MTU Default and Maximum Values on page 49

Understanding Bit Error Rate Testing

Supported Platforms SRX Series

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 45

Understanding Interface Clocking

Supported Platforms SRX Series

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 48
- Explicit Clocking Signal Transmission on page 48

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 45

Understanding Frame Check Sequences

Supported Platforms SRX Series

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 48
- Two-Dimensional Parity on page 49

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 45

MTU Default and Maximum Values

Supported Platforms SRX Series

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 11 on page 50 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 11 on page 50 lists MTU values for the SRX Series Services Gateways Physical Interface Modules (PIMs).

Table 11: 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 11: 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
G.SHDSL Mini-PIM PT mode	1514	1514	1500

Related Documentation

- Understanding Interface Physical Properties on page 45

Understanding Jumbo Frames Support for Ethernet Interfaces

Supported Platforms SRX Series

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 pacUsing the Enterprise-Specific Utility MIB to Enhance SNMP Coverageket size is 256 through 9192.

Related Documentation

- *MTU Default and Maximum Values*

CHAPTER 4

Configuring VLAN Tagging

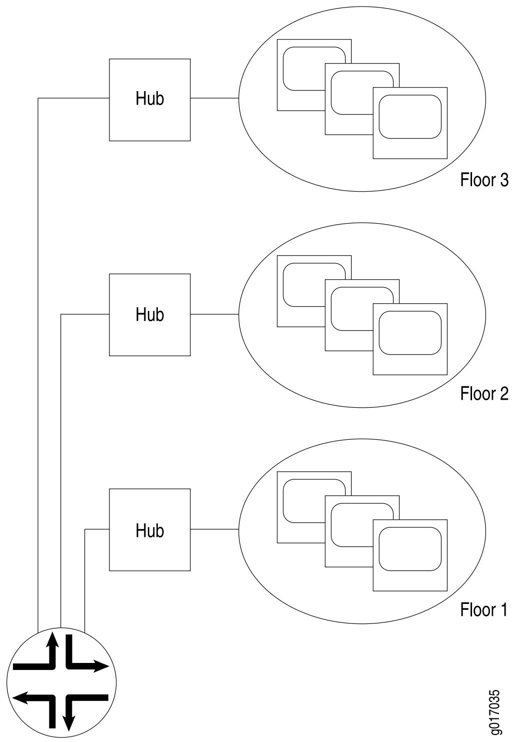
Understanding Virtual LANs

Supported Platforms SRX Series, vSRX

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 54 shows a typical LAN topology.

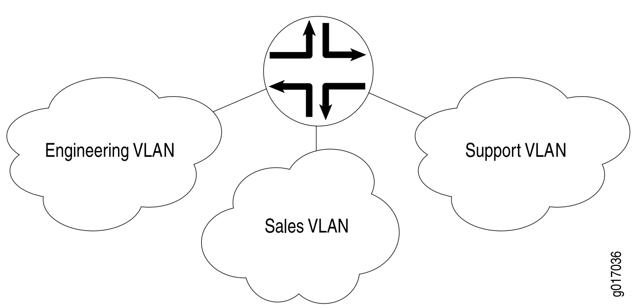
Figure 2: Typical LAN



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 54 shows a typical VLAN topology.

Figure 3: Typical VLAN



Related Documentation

- Understanding Interface Logical Properties on page 19
- *MPLS Feature Guide for Security Devices*

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

Supported Platforms SRX Series, vSRX

Table 12 on page 55 lists VLAN ID range by interface type supported on SRX Series devices:

Table 12: 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 45

Configuring VLAN Tagging

Supported Platforms SRX Series, vSRX

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 13 on page 55 for flexible VLANs.

Table 13: Flexible VLANs

Number of Tags	VLAN ID
0 (Untagged)	Native

Table 13: 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;
```

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 53

PART 2

Configuring DS1 Interfaces

CHAPTER 5

Configuring DS1 Interfaces

Understanding T1 and E1 Interfaces

Supported Platforms SRX1500, SRX320, SRX340

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 they use all 8 bits of a channel. 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 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.

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

Supported Platforms SRX1500, SRX320, SRX340

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 on page 65
- Verifying Interface Properties on page 66

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 66

Example: Deleting a T1 Interface

Supported Platforms SRX1500, SRX320, SRX340

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 6

Configuring DS3 Interfaces

Understanding T3 and E3 Interfaces

Supported Platforms SRX1500

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.

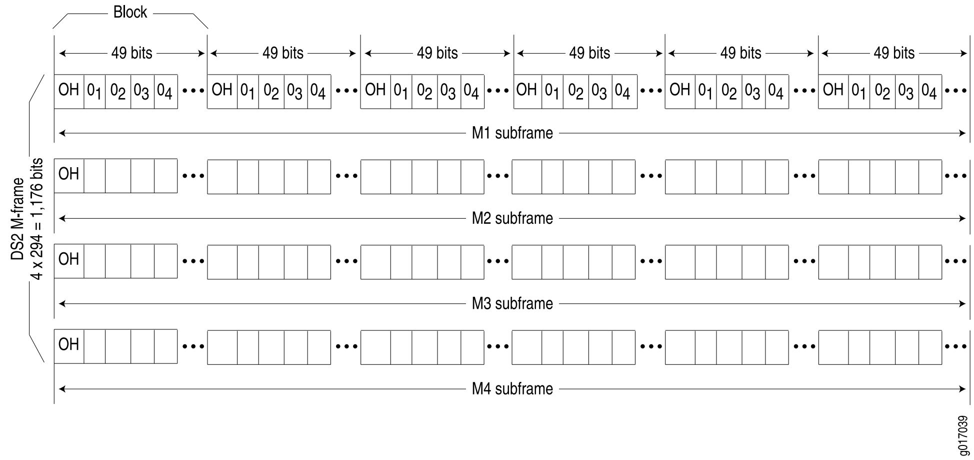
NOTE: Starting with Junos OS Release 15.1X49-D10, T3 and E3 interfaces are no longer supported on SRX550 devices.

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.

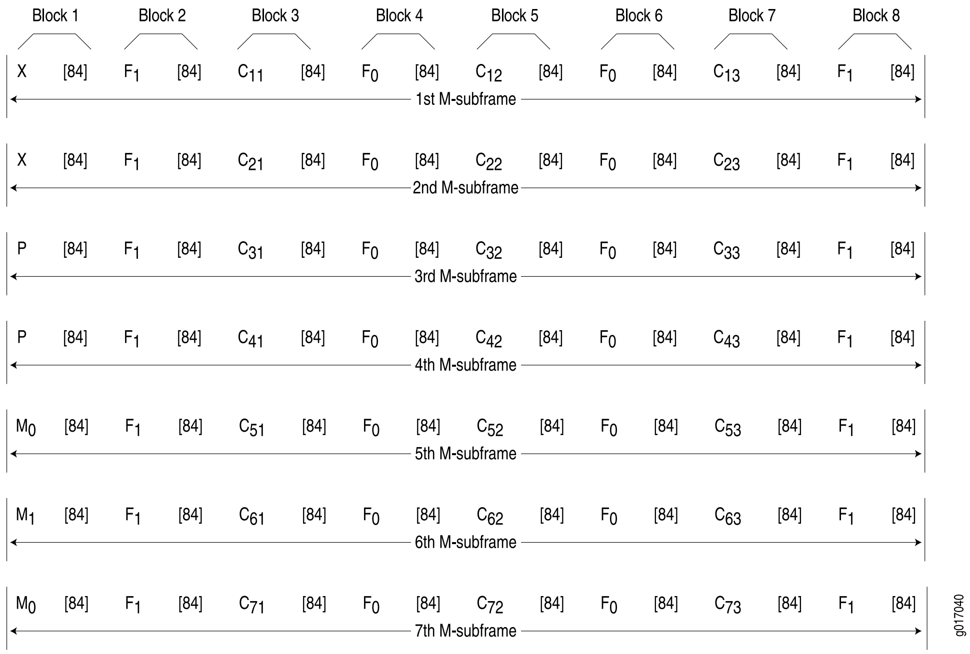
DS3 Framing

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.

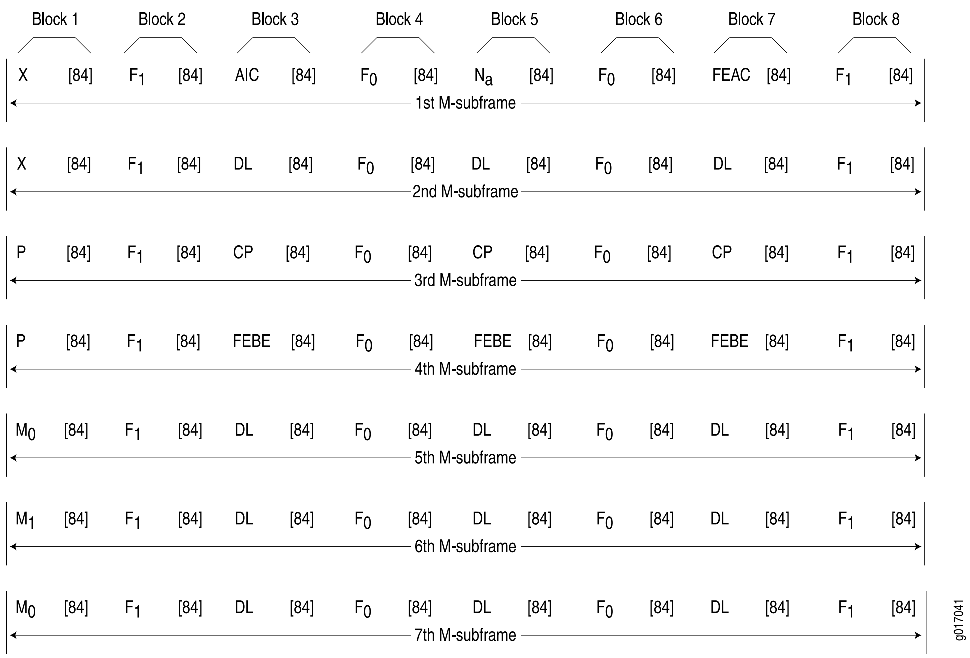
  If the previous DS3 frame contained an odd number of 1s, both P-bits are set to 1. If the previous DS3 contained an even number of 1s, both P-bits are set to 0. If, on the receiving side, the number of 1s for a given frame does not match the P-bits in the following frame, it indicates one or more bit 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 14 on page 73 lists some C-bit code words and the alarm or status condition indicated.

Table 14: 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.

Release History Table

Release	Description
15.1X49-D10	Starting with Junos OS Release 15.1X49-D10, T3 and E3 interfaces are no longer supported on SRX550 devices.

Related Documentation

- Example: Configuring a T3 Interface on page 74
- Example: Deleting a T3 Interface on page 77

Example: Configuring a T3 Interface

Supported Platforms SRX1500

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

NOTE: **Starting with Junos OS Release 15.1X49-D10, T3 and E3 interfaces are no longer supported on SRX550 devices.**

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.

Release History Table

Release	Description
15.1X49-D10	Starting with Junos OS Release 15.1X49-D10, T3 and E3 interfaces are no longer supported on SRX550 devices.

Related Documentation

- Understanding T3 and E3 Interfaces on page 69
- Example: Deleting a T3 Interface on page 77

Example: Deleting a T3 Interface

Supported Platforms SRX1500

This example shows how to delete a T3 interface.

NOTE: Starting with Junos OS Release 15.1X49-D10, T3 and E3 interfaces are no longer supported on SRX550 devices.

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.

Release History Table

Release	Description
15.1X49-D10	Starting with Junos OS Release 15.1X49-D10, T3 and E3 interfaces are no longer supported on SRX550 devices.

Related Documentation

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

CHAPTER 7

Configuring DS3 Interfaces

Understanding T3 and E3 Interfaces

Supported Platforms SRX1500

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.

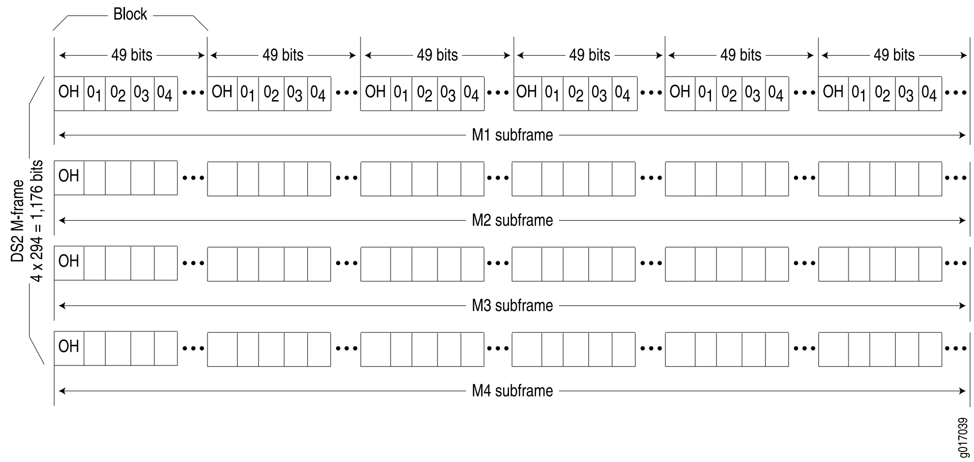
NOTE: Starting with Junos OS Release 15.1X49-D10, T3 and E3 interfaces are no longer supported on SRX550 devices.

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.

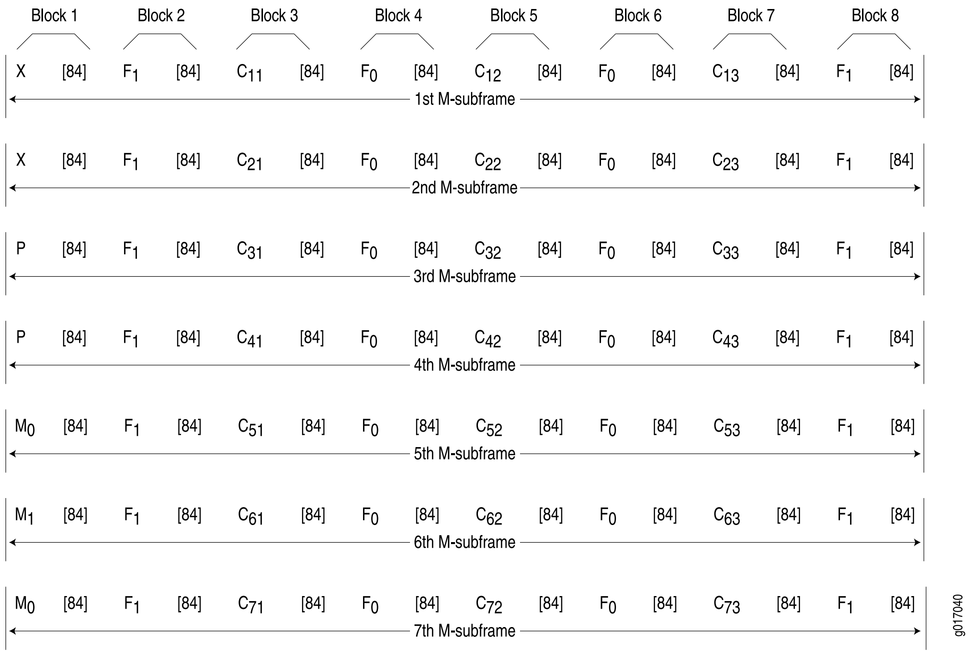
DS3 Framing

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.

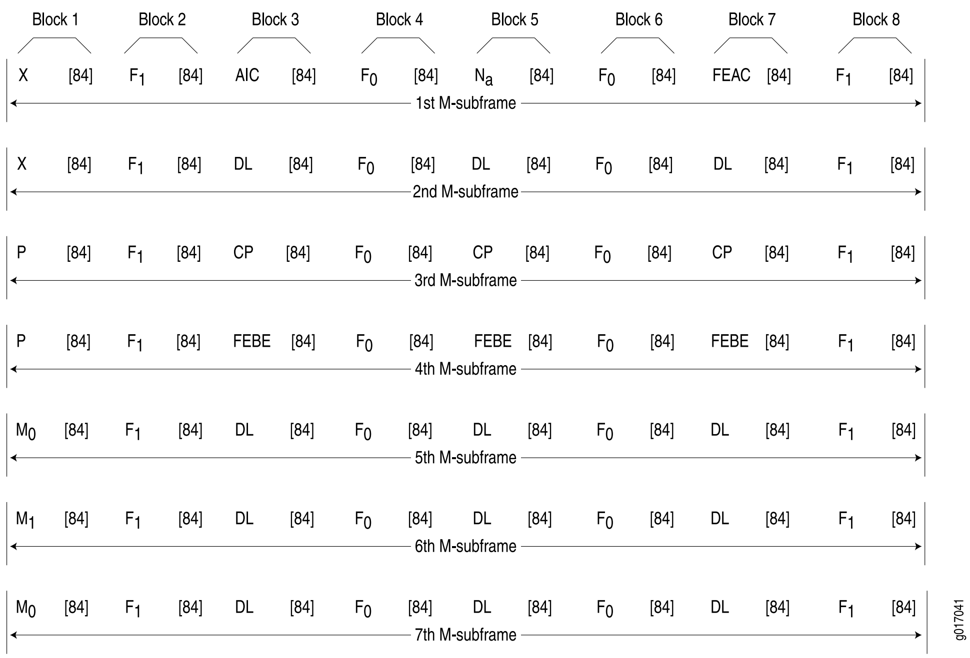
  If the previous DS3 frame contained an odd number of 1s, both P-bits are set to 1. If the previous DS3 contained an even number of 1s, both P-bits are set to 0. If, on the receiving side, the number of 1s for a given frame does not match the P-bits in the following frame, it indicates one or more bit 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 14 on page 73 lists some C-bit code words and the alarm or status condition indicated.

Table 15: 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.

Release History Table

Release	Description
15.1X49-D10	Starting with Junos OS Release 15.1X49-D10, T3 and E3 interfaces are no longer supported on SRX550 devices.

Related Documentation

- Example: Configuring a T3 Interface on page 74
- Example: Deleting a T3 Interface on page 77

Example: Configuring a T3 Interface

Supported Platforms SRX1500

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

NOTE: **Starting with Junos OS Release 15.1X49-D10, T3 and E3 interfaces are no longer supported on SRX550 devices.**

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.

Release History Table

Release	Description
15.1X49-D10	Starting with Junos OS Release 15.1X49-D10, T3 and E3 interfaces are no longer supported on SRX550 devices.

Related Documentation

- Understanding T3 and E3 Interfaces on page 69
- Example: Deleting a T3 Interface on page 77

Example: Deleting a T3 Interface

Supported Platforms SRX1500

This example shows how to delete a T3 interface.

NOTE: Starting with Junos OS Release 15.1X49-D10, T3 and E3 interfaces are no longer supported on SRX550 devices.

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.

Release History Table

Release	Description
15.1X49-D10	Starting with Junos OS Release 15.1X49-D10, T3 and E3 interfaces are no longer supported on SRX550 devices.

Related Documentation

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

CHAPTER 8

Configuring 1-Port Clear Channel DS3/E3 GPIM

Understanding the 1-Port Clear Channel DS3/E3 GPIM

Supported Platforms SRX1500

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

Table 16: 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)

Table 16: 1-Port Clear Channel DS3/E3 GPIM Interface Options *(continued)*

Description	DS3 Mode	E3 Mode
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)
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 9

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

Supported Platforms SRX1500

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

Supported Platforms SRX1500

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 95

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

Supported Platforms SRX1500

This example modifies the default configuration for an E3 environment.

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 96
- Overview on page 96
- Configuration on page 96

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
```

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

PART 3

Configuring DSL Interfaces

CHAPTER 9

Configuring ADSL Interfaces

ADSL Interface Overview

Supported Platforms SRX210, SRX220, SRX240

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.**

NOTE: **Starting with Junos OS Release 15.1X49-D10, ADSL interfaces are no longer supported on SRX300, SRX320, SRX340, SRX345, and SRX550HM devices.**

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 17 on page 102.

Table 17: 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
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.

Release History Table

Release	Description
15.1X49-D10	Starting with Junos OS Release 15.1X49-D10, ADSL interfaces are no longer supported on SRX300, SRX320, SRX340, SRX345, and SRX550HM devices.

Related Documentation

- Understanding Point-to-Point Protocol over Ethernet on page 369
- 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 121
- Example: Configuring MLPPP-over-ADSL Interfaces on page 115

ADSL and SHDSL Interfaces Configuration Overview

Supported Platforms SRX210, SRX220, SRX240

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.

NOTE: Starting with Junos OS Release 15.1X49-D10, ADSL interfaces are no longer supported on SRX300, SRX320, SRX340, SRX345, and SRX550HM devices.

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.

Release History Table

Release	Description
15.1X49-D10	Starting with Junos OS Release 15.1X49-D10, ADSL interfaces are no longer supported on SRX300, SRX320, SRX340, SRX345, and SRX550HM devices.

Related Documentation

- Understanding Point-to-Point Protocol over Ethernet on page 369.
- 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 121
- Example: Configuring MLPPP-over-ADSL Interfaces on page 115

Example: Configuring ATM-over-SHDSL Network Interfaces

Supported Platforms SRX210, SRX220, SRX240

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

NOTE: **Starting with Junos OS Release 15.1X49-D10, ADSL interfaces are no longer supported on SRX300, SRX320, SRX340, SRX345, and SRX550HM devices.**

- Requirements on page 109
- Overview on page 109

- Configuration on page 109
- Verification on page 111

Requirements

Before you begin:

- Configure network interfaces as necessary. See "Understanding Ethernet Interfaces" on page 247.
- Configure PPPoE encapsulation on an Ethernet interface or on an ATM-over-ADSL interface. See "Understanding Point-to-Point Protocol over Ethernet" on page 369.

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.

Release History Table

Release	Description
15.1X49-D10	Starting with Junos OS Release 15.1X49-D10, ADSL interfaces are no longer supported on SRX300, SRX320, SRX340, SRX345, and SRX550HM devices.

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 121

Example: Configuring MLPPP-over-ADSL Interfaces

Supported Platforms SRX210, SRX220, SRX240

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

NOTE: **Starting with Junos OS Release 15.1X49-D10, ADSL interfaces are no longer supported on SRX300, SRX320, SRX340, SRX345, and SRX550HM devices.**

- Requirements on page 115
- Overview on page 115
- Configuration on page 116
- Verification on page 116

Requirements

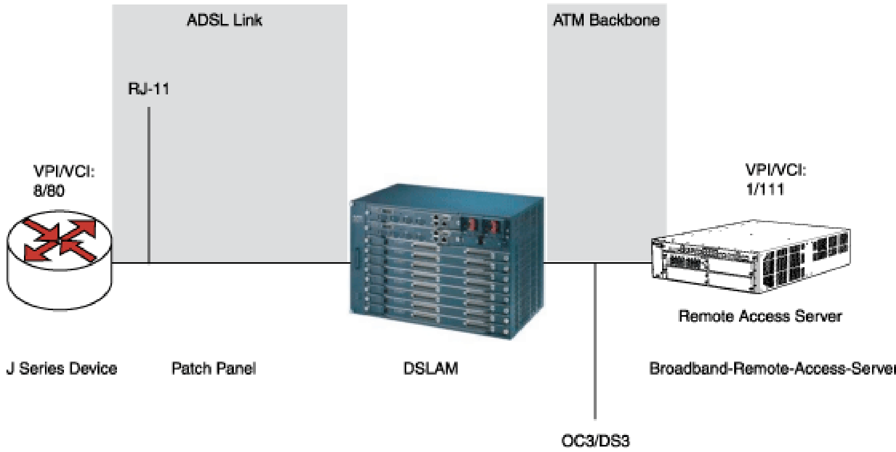
Before you begin, configure network interfaces as necessary. See "Understanding Ethernet Interfaces" on page 247.

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 116 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.

Release History Table

Release	Description
15.1X49-D10	Starting with Junos OS Release 15.1X49-D10, ADSL interfaces are no longer supported on SRX300, SRX320, SRX340, SRX345, and SRX550HM devices.

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

Supported Platforms SRX210, SRX220, SRX240

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).

NOTE: **Starting with Junos OS Release 15.1X49-D10, ADSL interfaces are no longer supported on SRX300, SRX320, SRX340, SRX345, and SRX550HM devices.**

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 253.

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 120
- 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
```


Release History Table

Release	Description
15.1X49-D10	Starting with Junos OS Release 15.1X49-D10, ADSL interfaces are no longer supported on SRX300, SRX320, SRX340, SRX345, and SRX550HM devices.

Related Documentation

- *DHCP Server Configuration Overview*
-

Example: Configuring CHAP on DSL Interfaces

Supported Platforms SRX210, SRX220, SRX240

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

NOTE: **Starting with Junos OS Release 15.1X49-D10, ADSL interfaces are no longer supported on SRX300, SRX320, SRX340, SRX345, and SRX550HM devices.**

- Requirements on page 121
- Overview on page 121
- Configuration on page 121
- Verification on page 123

Requirements

Before you begin, configure network interfaces as necessary. See "Understanding Ethernet Interfaces" on page 247.

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 123
- Verifying a PPPoA Configuration for an ATM-over-ADSL Interface on page 125
- Verifying an ATM-over-SHDSL Configuration on page 126

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.

Release History Table

Release	Description
15.1X49-D10	Starting with Junos OS Release 15.1X49-D10, ADSL interfaces are no longer supported on SRX300, SRX320, SRX340, SRX345, and SRX550HM devices.

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 115

Example: Configuring ATM-over-ADSL Network Interfaces

Supported Platforms SRX210, SRX220, SRX240

This example shows how to configure ATM-over-ADSL network interfaces for the devices.

NOTE: **Starting with Junos OS Release 15.1X49-D10, ADSL interfaces are no longer supported on SRX300, SRX320, SRX340, SRX345, and SRX550HM devices.**

- Requirements on page 129
- Overview on page 129
- Configuration on page 130
- Verification on page 132

Requirements

Before you begin:

- Configure network interfaces as necessary. See "Understanding Ethernet Interfaces" on page 247.
- Configure PPPoE encapsulation on an Ethernet interface or on an ATM-over-ADSL interface. See "Understanding Point-to-Point Protocol over Ethernet" on page 369.

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.

Release History Table

Release	Description
15.1X49-D10	Starting with Junos OS Release 15.1X49-D10, ADSL interfaces are no longer supported on SRX300, SRX320, SRX340, SRX345, and SRX550HM devices.

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 115

CHAPTER 10

Configuring G.SHDSL Interfaces

SHDSL Interface Overview

Supported Platforms SRX210, SRX220, SRX240

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 161

G.SHDSL Mini-PIM Overview

Supported Platforms SRX210, SRX220, SRX240, SRX550

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 18 on page 139 displays the traffic descriptors specified for an ATM network.

Table 18: 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 19 on page 140.

Table 19: 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 161

G.SHDSL Mini-PIM Configuration Overview

Supported Platforms SRX210, SRX220, SRX240, SRX550

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 161

Example: Configuring the G.SHDSL Interface

Supported Platforms SRX210, SRX220, SRX240, SRX550

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 247.

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

Supported Platforms SRX210, SRX220, SRX240

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 on page 150
- Overview on page 151
- Configuration on page 153
- Verification on page 160

Requirements

Before you begin:

- Configure the network interfaces as necessary. See "Understanding Ethernet Interfaces" on page 247.
- 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

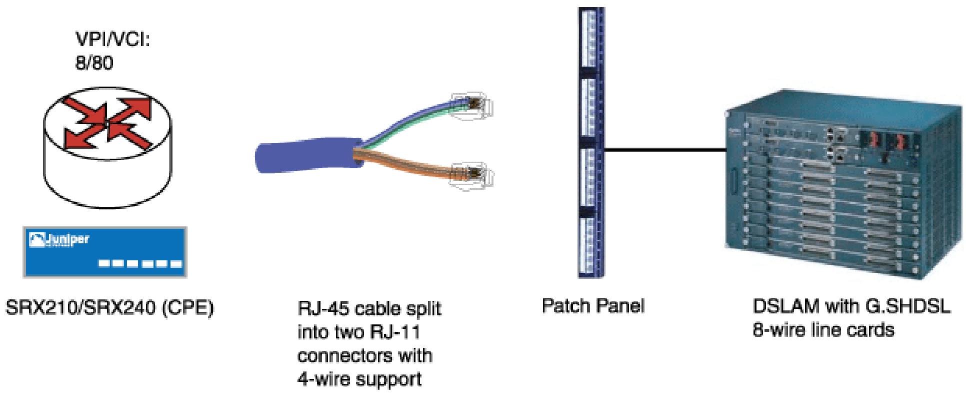


Figure 12 on page 151 shows the topology for the G.SHDSL Mini-PIM operating in 4X2-wire mode.

Figure 12: G.SHDSL Mini-PIM Operating in 4X2-Wire Mode

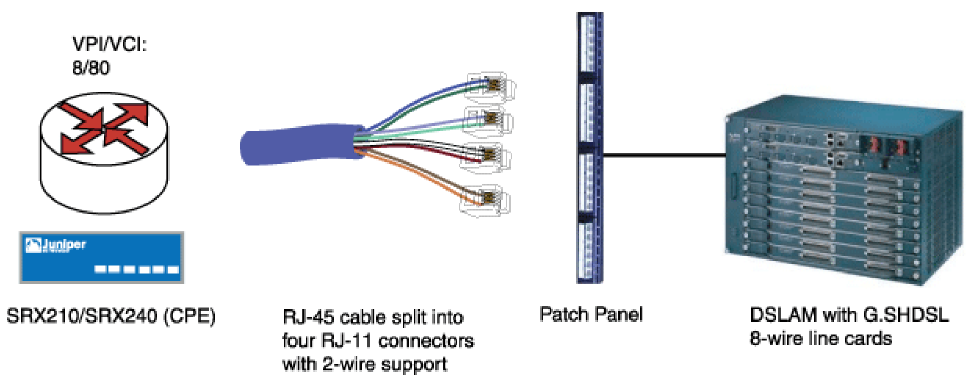
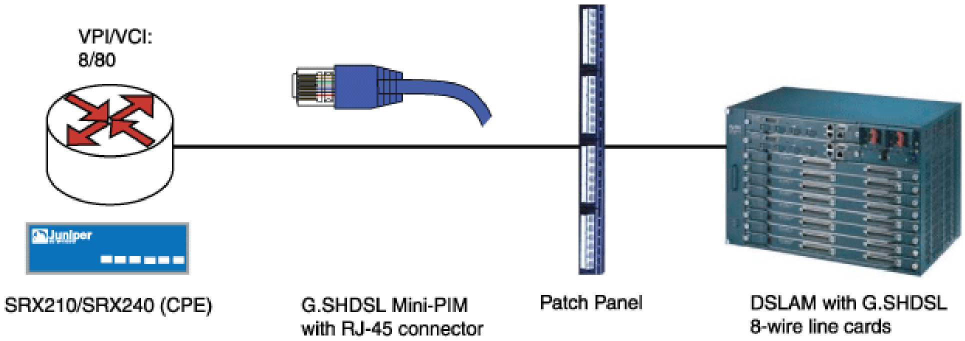


Figure 13 on page 152 shows the topology for the G.SHDSL Mini-PIM operating in 1X8-wire mode.

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 20 on page 152.

Table 20: 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
- G.SHDSL Mini-PIM Overview on page 138
- G.SHDSL Mini-PIM Configuration Overview on page 140

Example: Configuring the G.SHDSL Interface in EFM Mode

Supported Platforms SRX210, SRX220, SRX240, SRX550

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 247.
- 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 162 shows the topology for the G.SHDSL Mini-PIM operating in EFM mode.

Figure 14: G.SHDSL Mini-PIM Operating in EFM Mode

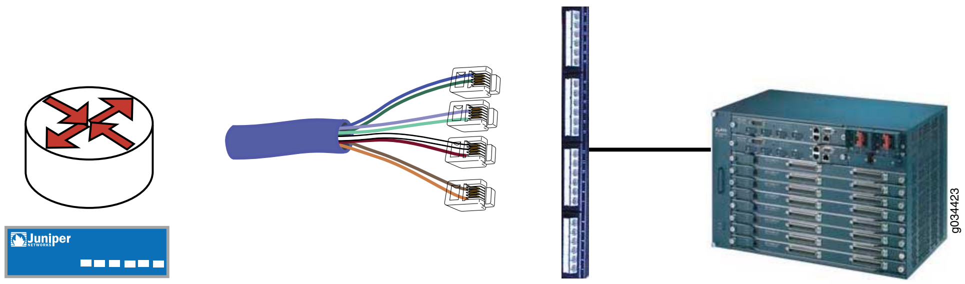


Table 21 on page 162 lists the operating wire mode for EFM and its corresponding CLI code.

Table 21: 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 162
- Configuring PPPoE and VLAN for the G.SHDSL EFM Interface on page 164

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 11

Configuring VDSL2 Interfaces

VDSL2 Interface Technology Overview

Supported Platforms SRX320, SRX340

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 172
- VDSL2 Interface Support on SRX Series Devices on page 174
- Example: Configuring VDSL2 Interfaces (Basic) on page 210
- Example: Configuring VDSL2 Interfaces (Detail) on page 216

VDSL2 Network Deployment Topology

Supported Platforms SRX320, SRX340

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 173.
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 173.

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 173 shows a typical VDSL2 network topology.

Figure 15: Typical VDSL2 End-to-End Connectivity and Topology Diagram

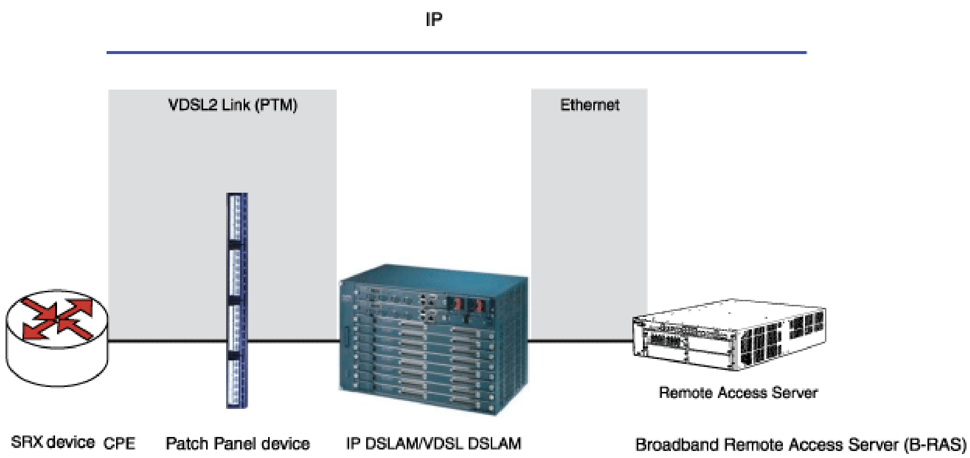
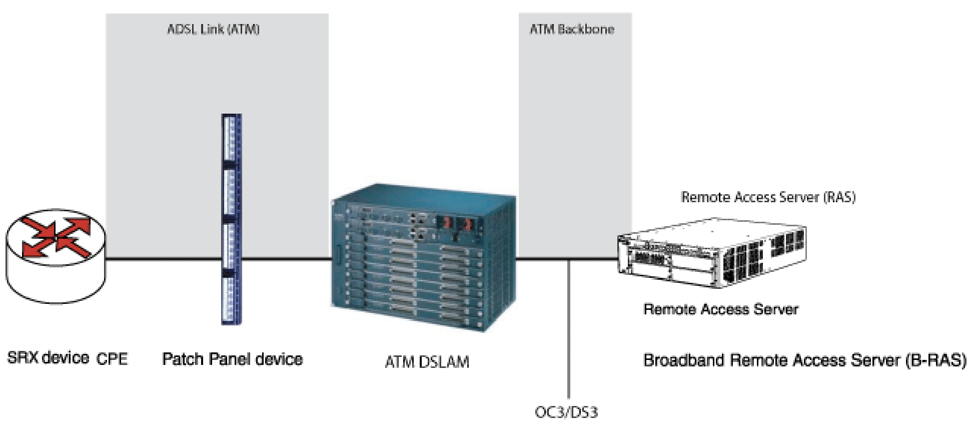


Figure 16 on page 173 shows a backward-compatible ADSL topology using ATM DSLAM.

Figure 16: Backward-Compatible ADSL Topology (ATM DSLAM)



Related Documentation

- VDSL2 Interface Technology Overview on page 171
- VDSL2 Interface Support on SRX Series Devices on page 174
- Example: Configuring VDSL2 Interfaces (Basic) on page 210
- Example: Configuring VDSL2 Interfaces (Detail) on page 216

VDSL2 Interface Support on SRX Series Devices

Supported Platforms SRX320, SRX340

The VDSL2 interface is supported on the SRX Series devices listed in Table 22 on page 174. (Platform support depends on the Junos OS release in your installation.)

Table 22: VDSL2 Annex A and Annex B Features

Features	POTS	ISDN
Devices	Integrated VDSL Module (SRX110-POTS, SRX320-POTS) VDSL Mini-PIM (SRX210, SRX220, SRX240, SRX320, SRX340)	Integrated VDSL Module (SRX110-ISDN, SRX320-ISDN)
Supported annex operating modes	Annex A and Annex B*	Annex B
Supported Bandplans	997/998	998
Supported standards	ITU-T G.993.2 and ITU-T G.993.5 (VDSL2)	ITU-T G.993.2 and ITU-T G.993.5 (VDSL2)
Used in	North American network implementations	European network implementations
ADSL backward compatibility	ADSL G992.5-A (ADSL Annex A)	ADSL G992.5-B (ADSL Annex B)

* 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 23 on page 175 lists VDSL2 operating modes and their backward compatibility with ADSL interface standards.

Table 23: VDLS2 Operating Mode Backward Compatibility with ADSL

VDSL2 Annex Type	Operating Modes	Description
VDSL2 Annex A interface (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 23: VDSL2 Operating Mode Backward Compatibility with ADSL *(continued)*

VDSL2 Annex Type	Operating Modes	Description
VDSL2 Annex B interface (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 24 on page 176 lists the different profiles supported on the VDSL2 interfaces and their properties.

Table 24: Supported Profiles on the VDSL2 Interfaces

Profiles	Data Rate
8a	50
8b	50
8c	50
8d	50
12a	68
12b	68
17a	100

Table 24: Supported Profiles on the VDSL2 Interfaces *(continued)*

Profiles	Data Rate
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 171
- VDSL2 Network Deployment Topology on page 172
- Example: Configuring VDSL2 Interfaces (Basic) on page 210
- Example: Configuring VDSL2 Interfaces (Detail) on page 216

Example: Configuring VDSL2 Interfaces in ADSL Mode (Basic)

Supported Platforms SRX320

This example shows how to configure the integrated VDSL2 interfaces for SRX320 (Annex B) in ADSL backward compatible mode.

NOTE: Starting with Junos OS Release 15.1X49-D10, ADSL interfaces are no longer supported on SRX300, SRX320, SRX340, SRX345, and SRX550HM devices.

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**.

Release History Table

Release	Description
15.1X49-D10	Starting with Junos OS Release 15.1X49-D10, ADSL interfaces are no longer supported on SRX300, SRX320, SRX340, SRX345, and SRX550HM devices.

Related Documentation

- Understanding Interfaces on page 3
- VDSL2 Interface Technology Overview on page 171
- Example: Configuring VDSL2 Interfaces (Detail) on page 216
- Example: Configuring VDSL2 Interfaces in ADSL Mode (Detail) on page 183

Example: Configuring VDSL2 Interfaces in ADSL Mode (Detail)

Supported Platforms SRX320, SRX340

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).

NOTE: **Starting with Junos OS Release 15.1X49-D10, ADSL interfaces are no longer supported on SRX300, SRX320, SRX340, SRX345, and SRX550HM devices.**

- Requirements on page 184
- Overview on page 184

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 on page 198
- Verifying PPPoA on the at-1/0/0 Interface with Negotiated IP and PAP Authentication on page 199
- Verifying PPPoA on the at-1/0/0 Interface with Negotiated IP and CHAP Authentication on page 200
- Verifying PPPoA on the at-1/0/0 Interface with Static IP and PAP Authentication on page 202
- Verifying PPPoA on the at-1/0/0 Interface with Static IP and CHAP Authentication on page 203
- Verifying PPPoA on the at-1/0/0 Interface with Unnumbered IP and PAP Authentication on page 204
- Verifying PPPoA on the at-1/0/0 Interface with Unnumbered IP and CHAP Authentication on page 206

- Verifying PPPoE over ATM on the at-1/0/0 Interface with Negotiated IP and PAP Authentication on page 207
- Verifying PPPoE over ATM on the at-1/0/0 Interface with Negotiated IP and CHAP Authentication on page 208

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#
```

Release History Table

Release	Description
15.1X49-D10	Starting with Junos OS Release 15.1X49-D10, ADSL interfaces are no longer supported on SRX300, SRX320, SRX340, SRX345, and SRX550HM devices.

Related Documentation

- VDSL2 Interface Technology Overview on page 171
- Example: Configuring VDSL2 Interfaces (Basic) on page 210

Example: Configuring VDSL2 Interfaces (Basic)

Supported Platforms SRX320, SRX340

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 253.

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 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 encapsulation ppp-over-ether
set interfaces pt-1/0/0 unit 0 family inet dhcp
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
```

5. To enable the DHCP client on the interface.

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

6. Specify the type of encapsulation on the VDSL2 logical interface.

```
[edit interfaces pt-1/0/0]
user@host# set unit 0 encapsulation ppp-over-ether
```

NOTE: The VDSL2 interface supports PPPoE. You can also set no encapsulation for the VDSL2 interface.

NOTE: To configure VLAN tagging, continue the configuration with the next step.

7. To enable VLAN tagging on the pt interface.

```
[edit interfaces pt-1/0/0]
user@host# set interface pt-1/0/0 vlan-tagging
```

8. 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 {
   encapsulation ppp-over-ether;
   Family inet {
      address 100.100.100.1/24;
      dhcp;
}
```

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 {
   encapsulation ppp-over-ether;
   vlan-id 100;
      Family inet {
      address 100.100.100.1/24;
      dhcp;
}
```

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 212
- Displaying the Configuration for VDSL2 Interface (When Connected to the DSLAM Operating in Annex B Mode) on page 215

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 171
- Example: Configuring VDSL2 Interfaces (Detail) on page 216
- Example: Configuring VDSL2 Interfaces in ADSL Mode (Detail) on page 183

Example: Configuring VDSL2 Interfaces (Detail)

Supported Platforms SRX320, SRX340

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 on page 217
- Overview on page 217
- Configuration on page 218
- Verification on page 229

Requirements

Before you begin:

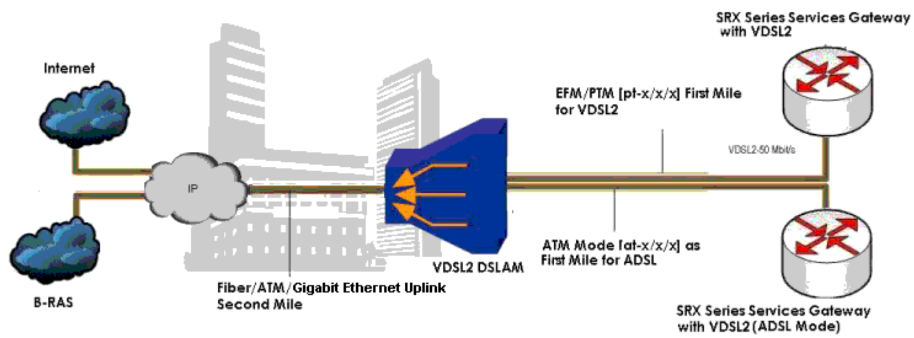
- Install Junos OS Release 10.1 or later on the SRX Series devices.
- Establish basic connectivity and set up and perform initial configuration. See the *Quick Start Guide* for your device for factory default settings.
- Install the VDSL2 Mini-PIM on the SRX210 or SRX320 device chassis.
- Connect the 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 217 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 on page 230
- Verifying the VDSL2 Mini-PIM for End-to-End Data Path on page 232
- Verifying PPPoE on the pt-1/0/0 Interface with a Static IP Address on page 235

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 171
- Example: Configuring VDSL2 Interfaces (Basic) on page 210
- Example: Configuring VDSL2 Interfaces in ADSL Mode (Detail) on page 183

Upgrading the VDSL PIC Firmware

Supported Platforms SRX320, SRX340, SRX345

Starting with Junos OS Release 15.51x49-D50, you can upgrade the VDSL PIC firmware on SRX Series 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 with Junos OS Release 15.51x49-D50, you can upgrade the VDSL PIC firmware on SRX Series devices.

PART 4

Configuring Ethernet Interfaces

CHAPTER 12

Performing Initial Configuration on Ethernet Interfaces

Understanding Ethernet Interfaces

Supported Platforms SRX Series, vSRX

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:

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 25 on page 249 shows collision rounds up to round 10.

Table 25: Collision Backoff Algorithm Rounds

Round	Size of Set	Elements in the Set
1	2	{0,1}
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

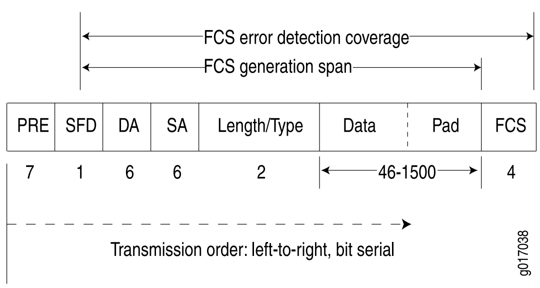
The combination of all the LAN segments within an Ethernet network is called a *broadcast domain*. In the absence of any signaling devices such as a repeater, bridge, or switch, the broadcast domain is simply the physical wire that makes up the connections in the network. If a bridge or switch is used, 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 250 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 253
- Example: Deleting an Ethernet Interface on page 254
- Understanding Static ARP Entries on Ethernet Interfaces on page 251
- Understanding Promiscuous Mode on Ethernet Interface on page 252

Understanding Static ARP Entries on Ethernet Interfaces

Supported Platforms SRX Series, vSRX

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 247
- Example: Configuring Static ARP Entries on Ethernet Interfaces on page 255

Understanding Promiscuous Mode on Ethernet Interface

Supported Platforms SRX1500, SRX5400, SRX5600, SRX5800, vSRX

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 247
- Enabling and Disabling Promiscuous Mode on Ethernet Interfaces (CLI Procedure) on page 258
- Example: Configuring Promiscuous Mode on the SRX5K-MPC on page 258

Understanding Port Mirroring on SRX Devices

Supported Platforms SRX1400, SRX3400, SRX3600, SRX5600, SRX5800

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 263

Example: Creating an Ethernet Interface

Supported Platforms SRX Series, vSRX

This example shows how to create an Ethernet interface.

- Requirements on page 253
- Overview on page 254
- Configuration on page 254

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 247
- Example: Deleting an Ethernet Interface on page 254

Example: Deleting an Ethernet Interface

Supported Platforms SRX Series, vSRX

This example shows how to delete an Ethernet interface.

- Requirements on page 254
- Overview on page 254
- Configuration on page 255

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 247
- Example: Creating an Ethernet Interface on page 253

Example: Configuring Static ARP Entries on Ethernet Interfaces

Supported Platforms SRX Series, vSRX

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 257
- Verifying the Link State of All Interfaces on page 257
- Verifying Interface Properties on page 257

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 10.10.10.10 : 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.

```
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 251

Enabling and Disabling Promiscuous Mode on Ethernet Interfaces (CLI Procedure)

Supported Platforms SRX1400, SRX3400, SRX3600, SRX5600, SRX5800

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 252
- Understanding Ethernet Interfaces on page 247

Example: Configuring Promiscuous Mode on the SRX5K-MPC

Supported Platforms SRX5400, SRX5600, SRX5800

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 260
- Verifying the Status of Promiscuous Mode on page 261
- Verifying That Promiscuous Mode Is Disabled on page 262

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 interface traffic** command.

```
user@host> monitor interface traffic
```

```
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 252
- Enabling and Disabling Promiscuous Mode on Ethernet Interfaces (CLI Procedure) on page 258

Configuring Port Mirroring on SRX Devices

Supported Platforms SRX1400, SRX3400, SRX3600, SRX5600, SRX5800

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 252

CHAPTER 13

Configuring Aggregated Ethernet Interfaces

Understanding Aggregated Ethernet Interfaces

Supported Platforms SRX5400, SRX5600, SRX5800

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 and Layer 2 Transparent Mode Feature Guide for Security Devices*.

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 and Layer 2 Transparent Mode Feature Guide for Security Devices*.

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 247

- Aggregated Ethernet Interfaces Configuration Overview on page 270
- Understanding LACP on Standalone Devices on page 283
- Understanding LACP on Chassis Clusters on page 289
- Understanding VLAN Tagging for Aggregated Ethernet Interfaces on page 280
- Understanding Promiscuous Mode for Aggregated Ethernet Interfaces on page 281

Aggregated Ethernet Interfaces Configuration Overview

Supported Platforms SRX Series

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 271.
2. Associate a physical interface with the aggregated Ethernet interface. See "Example: Associating Physical Interfaces with Aggregated Ethernet Interfaces" on page 272.
3. (Optional) Set the required link speed for all the interfaces included in the bundle. See "Example: Configuring Aggregated Ethernet Link Speed" on page 274.
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 276.
5. (Optional) Enable or disable VLAN tagging. See "Understanding VLAN Tagging for Aggregated Ethernet Interfaces" on page 280.
6. (Optional) Enable promiscuous mode. See "Understanding Promiscuous Mode for Aggregated Ethernet Interfaces" on page 281.

Related Documentation

- *Ethernet Switching and Layer 2 Transparent Mode Feature Guide for Security Devices*
- Understanding Aggregated Ethernet Interfaces on page 267
- *Example: Configuring LACP on Standalone Devices*
- Example: Configuring LACP on Chassis Clusters on page 291

Understanding the Aggregated Ethernet Interfaces Device Count

Supported Platforms SRX Series

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 267
- Example: Configuring the Number of Aggregated Ethernet Interfaces on a Device on page 271
- Example: Deleting Aggregated Ethernet Interfaces on page 277

Example: Configuring the Number of Aggregated Ethernet Interfaces on a Device

Supported Platforms SRX Series

This example shows how to configure the number of aggregated Ethernet interfaces on a device.

- Requirements on page 271
- Overview on page 271
- Configuration on page 271
- Verification on page 272

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 270
- Aggregated Ethernet Interfaces Configuration Overview on page 270
- Example: Deleting Aggregated Ethernet Interfaces on page 277
- Verifying Aggregated Ethernet Interfaces on page 279

Understanding Physical Interfaces for Aggregated Ethernet Interfaces

Supported Platforms SRX Series

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.

Related Documentation

- Understanding Aggregated Ethernet Interfaces on page 267
- Example: Associating Physical Interfaces with Aggregated Ethernet Interfaces on page 272

Example: Associating Physical Interfaces with Aggregated Ethernet Interfaces

Supported Platforms SRX Series

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 271.

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 272
- Aggregated Ethernet Interfaces Configuration Overview on page 270
- Verifying Aggregated Ethernet Interfaces on page 279

Understanding Aggregated Ethernet Interface Link Speed

Supported Platforms SRX Series

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 267
- Example: Configuring Aggregated Ethernet Link Speed on page 274
- Understanding Minimum Links for Aggregated Ethernet Interfaces on page 275

Example: Configuring Aggregated Ethernet Link Speed

Supported Platforms SRX Series

This example shows how to configure the aggregated Ethernet link speed.

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 271.
- Associate physical interfaces with the aggregated Ethernet Interfaces. See “Example: Associating Physical Interfaces with Aggregated Ethernet Interfaces” on page 272.

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 274
- Aggregated Ethernet Interfaces Configuration Overview on page 270
- Verifying Aggregated Ethernet Interfaces on page 279

Understanding Minimum Links for Aggregated Ethernet Interfaces

Supported Platforms SRX Series

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 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 267
- Example: Configuring Aggregated Ethernet Minimum Links on page 276
- Understanding Aggregated Ethernet Interface Link Speed on page 274

Example: Configuring Aggregated Ethernet Minimum Links

Supported Platforms SRX Series

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 271.
- Associate physical interfaces with the aggregated Ethernet Interfaces. See "Example: Associating Physical Interfaces with Aggregated Ethernet Interfaces" on page 272.
- Configure the aggregated Ethernet link speed. See "Example: Configuring Aggregated Ethernet Link Speed" on page 274.

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 274
- Aggregated Ethernet Interfaces Configuration Overview on page 270
- Verifying Aggregated Ethernet Interfaces on page 279

Understanding Aggregated Ethernet Interface Removal

Supported Platforms SRX Series

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 267
- Example: Deleting Aggregated Ethernet Interfaces on page 277
- Example: Deleting Aggregated Ethernet Interface Contents on page 278

Example: Deleting Aggregated Ethernet Interfaces

Supported Platforms SRX Series

This example shows how to delete aggregated Ethernet interfaces using the device count.

- Requirements on page 277
- Overview on page 277
- Configuration on page 277
- Verification on page 278

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 271.

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 270
- Example: Deleting Aggregated Ethernet Interface Contents on page 278
- Verifying Aggregated Ethernet Interfaces on page 279

Example: Deleting Aggregated Ethernet Interface Contents

Supported Platforms SRX Series

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 271.
- Associate a physical interface with the aggregated Ethernet interface. See "Example: Associating Physical Interfaces with Aggregated Ethernet Interfaces" on page 272.
- Set the required link speed for all the interfaces included in the bundle. See "Example: Configuring Aggregated Ethernet Link Speed" on page 274.
- 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 276.

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 270
- Example: Deleting Aggregated Ethernet Interfaces on page 277
- Verifying Aggregated Ethernet Interfaces on page 279

Verifying Aggregated Ethernet Interfaces

Supported Platforms SRX Series

- Verifying Aggregated Ethernet Interfaces (terse) on page 279
- Verifying Aggregated Ethernet Interfaces (extensive) on page 279

Verifying Aggregated Ethernet Interfaces (terse)

Supported Platforms SRX Series

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.

Verifying Aggregated Ethernet Interfaces (extensive)

Supported Platforms SRX Series

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.

Related Documentation

- Aggregated Ethernet Interfaces Configuration Overview on page 270

Understanding VLAN Tagging for Aggregated Ethernet Interfaces

Supported Platforms SRX1500, SRX5400, SRX5600, SRX5800

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 267
- Aggregated Ethernet Interfaces Configuration Overview on page 270

Understanding Promiscuous Mode for Aggregated Ethernet Interfaces

Supported Platforms SRX1500, SRX5400, SRX5600, SRX5800

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 267
- Aggregated Ethernet Interfaces Configuration Overview on page 270

CHAPTER 14

Configuring Link Aggregation Control Protocol

Understanding LACP on Standalone Devices

Supported Platforms SRX Series

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: **On SRX5400, SRX5600, and SRX5800, the LACP is not supported on Layer 2 interfaces.**

Related Documentation

- Understanding Aggregated Ethernet Interfaces on page 267
- Understanding LACP on Chassis Clusters on page 289
- *Example: Configuring LACP on Standalone Devices*

Example: Configuring Link Aggregation Control Protocol (CLI Procedure)

Supported Platforms SRX Series

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*

Verifying LACP on Standalone Devices

Supported Platforms SRX Series

Verifying LACP Statistics

Supported Platforms SRX Series

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**

Verifying LACP Aggregated Ethernet Interfaces

Supported Platforms SRX Series

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.

Related Documentation

- *Example: Configuring LACP on Standalone Devices*
- Verifying LACP on Redundant Ethernet Interfaces on page 294

Understanding LACP on Chassis Clusters

Supported Platforms SRX Series

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 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 291.

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.

Related Documentation

- Example: Configuring LACP on Chassis Clusters on page 291

Example: Configuring LACP on Chassis Clusters

Supported Platforms SRX Series

This example shows how to configure LACP on chassis clusters.

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 271.
- Associate physical interfaces with the aggregated Ethernet Interfaces. See "Example: Associating Physical Interfaces with Aggregated Ethernet Interfaces" on page 272.
- Configure the aggregated Ethernet link speed. See "Example: Configuring Aggregated Ethernet Link Speed" on page 274.
- Configure the aggregated Ethernet minimum links speed. See "Example: Configuring Aggregated Ethernet Minimum Links" on page 276.
- Configure the LACP on standalone devices. See *Example: Configuring LACP on Standalone Devices*.

Overview

In this example, you set LACP to passive mode for the reth0 interface. 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.

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. Set the first LACP on primary node1.

   ```
   [edit interfaces]
   user@host# set reth0 redundant-ether-options lacp passive
   ```

2. Set the second LACP.

   ```
   [edit interfaces]
   user@host# set reth1 redundant-ether-options lacp active
   user@host# set reth1 redundant-ether-options lacp periodic slow
   ```

3. 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 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

- Understanding LACP on Chassis Clusters on page 289
- Verifying LACP on Redundant Ethernet Interfaces on page 294

Verifying LACP on Redundant Ethernet Interfaces

Supported Platforms SRX Series

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 291
- Verifying LACP on Standalone Devices on page 287

LAG and LACP Support on SRX5000 Line Devices with I/O Cards (IOCs)

Supported Platforms SRX5400, SRX5600, SRX5800

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 270
- *Example: Configuring LACP on Standalone Devices*
- Example: Configuring LACP on Chassis Clusters on page 291

Example: Configuring LAG Interface on an SRX5000 Line Device with IOC2 or IOC3

Supported Platforms SRX5400, SRX5600, SRX5800

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 on page 297
- Overview on page 297
- Configuration on page 297
- Verification on page 300

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 289
- Verifying LACP on Redundant Ethernet Interfaces on page 294

Example: Configuring Aggregated Ethernet Device with LAG and LACP (CLI Procedure)

Supported Platforms SRX Series, vSRX

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 267
- Understanding LACP on Standalone Devices on page 283
- *Example: Configuring LACP on Standalone Devices*

CHAPTER 15

Configuring Gigabit Ethernet Physical Interface Modules

Understanding the 1-Port Gigabit Ethernet SFP Mini-PIM

Supported Platforms SRX300, SRX320, SRX340, SRX550M

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 247
- Example: Configuring the 1-Port Gigabit Ethernet SFP Mini-PIM Interface on page 307

Example: Configuring the 1-Port Gigabit Ethernet SFP Mini-PIM Interface

Supported Platforms SRX300, SRX320, SRX340, SRX550M

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 253.

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 311
- Verifying the FPC Status on page 312
- Verifying the Interface Settings on page 312

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 247
- Understanding the 1-Port Gigabit Ethernet SFP Mini-PIM on page 305

Understanding the 2-Port 10-Gigabit Ethernet XPIM

Supported Platforms SRX1500

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 247
- Example: Configuring the 2-Port 10-Gigabit Ethernet XPIM Interface on page 316

Example: Configuring the 2-Port 10-Gigabit Ethernet XPIM Interface

Supported Platforms SRX5400, SRX5600, SRX5800

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 253.

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 on page 318
- Verifying the FPC Status on page 318
- Verifying the Interface Settings on page 319

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 313
- Understanding Ethernet Interfaces on page 247

Understanding the 8-Port Gigabit Ethernet SFP XPIM

Supported Platforms SRX1500, SRX550

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 322

Example: Configuring 8-Port Gigabit Ethernet SFP XPIMs

Supported Platforms LN Series, SRX550, SRX650

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:

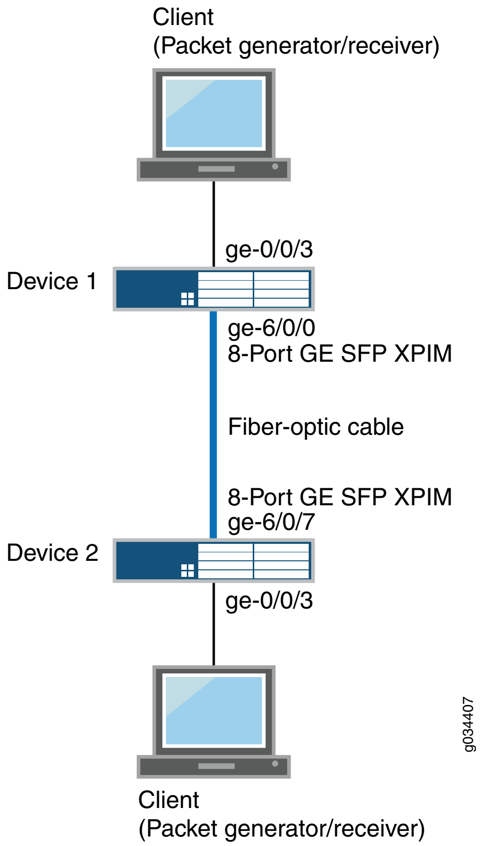
- Establish basic connectivity. See the Getting Started Guide for your device.
- Configure network interfaces as necessary. See "Example: Creating an Ethernet Interface" on page 253.

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 19 on page 323 shows the topology used in this example.

Figure 19: 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 on page 327
- Verifying the FPC Status on page 328
- Verifying Interface Link Status on Device 1 on page 329
- Verifying the Interface Settings on Device 1 on page 329
- Verifying Interface Link Status on Device 2 on page 332
- Verifying the Interface Settings on Device 2 on page 333

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 319

CHAPTER 16

Configuring Port Mirroring

Understanding Port Mirroring on SRX Devices

Supported Platforms SRX1400, SRX3400, SRX3600, SRX5600, SRX5800

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 263

Configuring Port Mirroring on SRX Devices

Supported Platforms SRX1400, SRX3400, SRX3600, SRX5600, SRX5800

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 252

CHAPTER 17

Configuring Ethernet OAM Link Fault Management

Understanding Ethernet OAM Link Fault Management for SRX Series Services Gateways

Supported Platforms SRX Series

NOTE: 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.

NOTE: Starting in Junos OS Release 15.1X49-D40, Ethernet OAM link fault management for SRX Series services gateways is not supported. In prior Junos OS releases, the feature is supported on SRX100, SRX210, SRX220, SRX240, SRX550, and SRX650 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.

NOTE: For SRX550M devices, LFM is supported only on devices that have 16-port or 24-port GPIMs.

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 26 on page 343 lists the interfaces modes supported.

Table 26: 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
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

Release History Table

Release	Description
15.1X49-D70	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.
15.1X49-D40	Starting in Junos OS Release 15.1X49-D40, Ethernet OAM link fault management for SRX Series services gateways is not supported.

Related Documentation

- Example: Configuring Ethernet OAM Link Fault Management on page 344

Example: Configuring Ethernet OAM Link Fault Management

Supported Platforms SRX Series

NOTE: 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.

NOTE: Starting in Junos OS Release 15.1X49-D40, configuring Ethernet OAM link fault management is not supported.

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 253.
- 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 341

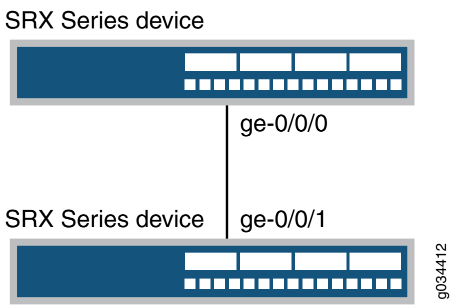
Overview

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 341.

Figure 20 on page 345 shows the topology used in this example.

Figure 20: 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

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.

Release History Table

Release	Description
15.1X49-D70	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.
15.1X49-D40	Starting in Junos OS Release 15.1X49-D40, configuring Ethernet OAM link fault management is not supported.

Related Documentation

- Understanding Ethernet OAM Link Fault Management for SRX Series Services Gateways on page 341

CHAPTER 18

Configuring Power over Ethernet

Understanding Power over Ethernet

Supported Platforms SRX1500, SRX320, SRX340

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 27 on page 350 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 27: 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**, **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 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 27: 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 28 on page 351 lists the classes and their power ratings as specified by the IEEE standards.

Table 28: 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 247
- Example: Configuring PoE on All Interfaces on page 352
- Example: Configuring PoE on an Individual Interface on page 354
- Example: Disabling a PoE Interface on page 357

Example: Configuring PoE on All Interfaces

Supported Platforms SRX1500, SRX320, SRX340

This example shows how to configure PoE on all interfaces.

- Requirements on page 353
- Overview on page 353
- Configuration on page 353
- Verification on page 354

Requirements

Before you begin, configure Ethernet interfaces. See “Example: Creating an Ethernet Interface” on page 253.

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 349
- Example: Configuring PoE on an Individual Interface on page 354
- Example: Disabling a PoE Interface on page 357

Example: Configuring PoE on an Individual Interface

Supported Platforms SRX1500, SRX210, SRX220, SRX240

This example shows how to configure PoE on an individual interface.

- Requirements on page 355
- Overview on page 355

- Configuration on page 355
- Verification on page 356

Requirements

Before you begin:

- Configure Ethernet interfaces. See “Example: Creating an Ethernet Interface” on page 253.
- Configure PoE on all interfaces. See “Example: Configuring PoE on All Interfaces” on page 352.

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 356
- Verifying the Telemetry Data (History) for the Specified Interface on page 356
- Verifying PoE Global Parameters on page 357

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-0/0/1 5
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 349
- Example: Configuring PoE on All Interfaces on page 352
- Example: Disabling a PoE Interface on page 357

Example: Disabling a PoE Interface

Supported Platforms SRX1500, SRX320, SRX340

This example shows how to disable PoE on all interfaces or on a specific interface.

- Requirements on page 358
- Overview on page 358

Requirements

Before you begin:

- Configure PoE on all interfaces. See "Example: Configuring PoE on All Interfaces" on page 352.
- Configure PoE on an individual interface. See "Example: Configuring PoE on an Individual Interface" on page 354.

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 349

PART 5

Configuring Interface Encapsulation

CHAPTER 19

Interface Encapsulation Overview

Understanding Physical Encapsulation on an Interface

Supported Platforms SRX1500, SRX300, SRX320, SRX340

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 362.
- Point-to-Point Protocol. See "Understanding Point-to-Point Protocol" on page 364.
- Point-to-Point Protocol over Ethernet. See "Understanding Point-to-Point Protocol over Ethernet" on page 369.
- High-Level Data Link Control. See "Understanding High-Level Data Link Control" on page 366.

Related Documentation

- Understanding Interfaces on page 3
- Understanding Frame Relay Encapsulation on an Interface on page 362
- Understanding Point-to-Point Protocol on page 364
- Understanding High-Level Data Link Control on page 366

Understanding Frame Relay Encapsulation on an Interface

Supported Platforms SRX1500, SRX320, SRX340

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 21 on page 362 shows a typical Frame Relay network.

Figure 21: Frame Relay Network

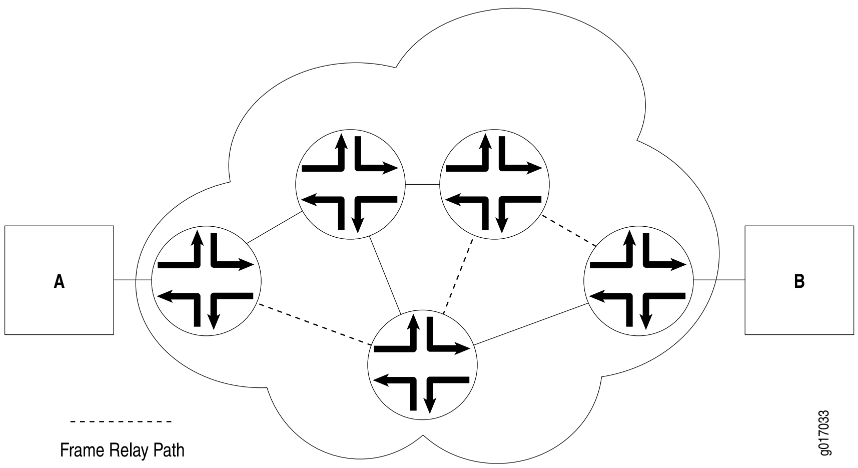


Figure 21 on page 362 shows multiple paths from Host A to Host B. In a typical routed network, traffic is sent from device to device with each device making routing decisions based on its own routing table. In a packet-switched network, the paths are predefined. Devices switch a packet through the network 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 361

Understanding Point-to-Point Protocol

Supported Platforms SRX1500, SRX300, SRX320, SRX340

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 361

Understanding High-Level Data Link Control

Supported Platforms SRX1500, SRX320, SRX340

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

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 361

CHAPTER 20

Configuring Point-to-Point Protocol over Ethernet

Understanding Point-to-Point Protocol over Ethernet

Supported Platforms SRX1500, SRX300, SRX320, SRX340

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 370
- PPPoE Session Stage on page 371

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. For PPPoE, an MTU greater than 1492 cannot be achieved.

Related Documentation

- Understanding Physical Encapsulation on an Interface on page 361
- Understanding PPPoE Interfaces on page 372
- Understanding PPPoE Ethernet Interfaces on page 379
- Understanding PPPoE ATM-over-ADSL and ATM-over-SHDSL Interfaces on page 380
- Understanding CHAP Authentication on a PPPoE Interface on page 387
- Understanding the PPPoE-Based Radio-to-Router Protocol on page 396

Understanding PPPoE Interfaces

Supported Platforms SRX1500, SRX300, SRX320, SRX340

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 364
- Example: Configuring PPPoE Interfaces on page 373

Example: Configuring PPPoE Interfaces

Supported Platforms SRX1500, SRX300, SRX320, SRX340, SRX550M

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 253.

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
   ```

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 on page 375
- Verifying PPPoE Sessions on page 376

- Verifying the PPPoE Version on page 376
- Verifying PPPoE Statistics on page 377

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

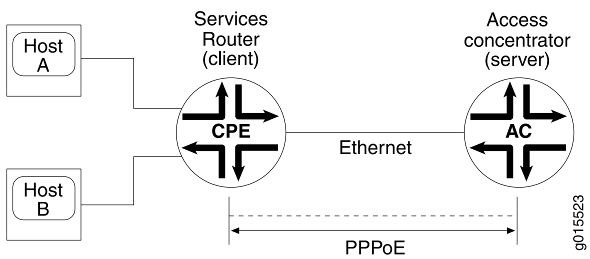
- Understanding PPPoE Interfaces on page 372

Understanding PPPoE Ethernet Interfaces

Supported Platforms SRX1500, SRX300, SRX320, SRX340

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 22 on page 379 shows a typical PPPoE session between a device and an access concentrator on the Ethernet loop.

Figure 22: 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 369
- Example: Configuring PPPoE Encapsulation on an Ethernet Interface on page 379

Example: Configuring PPPoE Encapsulation on an Ethernet Interface

Supported Platforms SRX1500, SRX300, SRX320, SRX340

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 253.
- Configure a PPPoE encapsulation interface. See “Example: Configuring PPPoE Interfaces” on page 373.

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 379

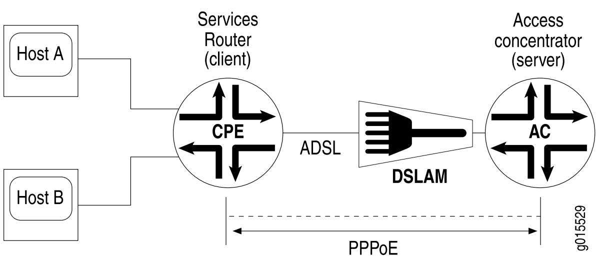
Understanding PPPoE ATM-over-ADSL and ATM-over-SHDSL Interfaces

Supported Platforms SRX210, SRX220, SRX240

NOTE: Starting with Junos OS Release 15.1X49-D10, ADSL interfaces are no longer supported on SRX300, SRX320, SRX340, SRX345, and SRX550HM devices.

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 23 on page 381 shows a typical PPPoE over ATM session between a device and an access concentrator on an ADSL loop.

Figure 23: 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.

Release History Table

Release	Description
15.1X49-D10	Starting with Junos OS Release 15.1X49-D10, ADSL interfaces are no longer supported on SRX300, SRX320, SRX340, SRX345, and SRX550HM devices.

Related Documentation

- Understanding Point-to-Point Protocol over Ethernet on page 369
- Example: Configuring PPPoE Encapsulation on an ATM-over-ADSL Interface on page 381

Example: Configuring PPPoE Encapsulation on an ATM-over-ADSL Interface

Supported Platforms SRX210, SRX220, SRX240

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.

NOTE: Starting with Junos OS Release 15.1X49-D10, ADSL interfaces are no longer supported on SRX300, SRX320, SRX340, SRX345, and SRX550HM devices.

Requirements

Before you begin:

- Configure network interfaces. See “Example: Creating an Ethernet Interface” on page 253.
- Configure PPPoE interfaces. See “Example: Configuring PPPoE Interfaces” on page 373.
- Configure PPPoE encapsulation on an Ethernet interface. See “Example: Configuring PPPoE Encapsulation on an Ethernet Interface” on page 379.

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 383

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.

Release History Table

Release	Description
15.1X49-D10	Starting with Junos OS Release 15.1X49-D10, ADSL interfaces are no longer supported on SRX300, SRX320, SRX340, SRX345, and SRX550HM devices.

Related Documentation

- Understanding PPPoE ATM-over-ADSL and ATM-over-SHDSL Interfaces on page 380

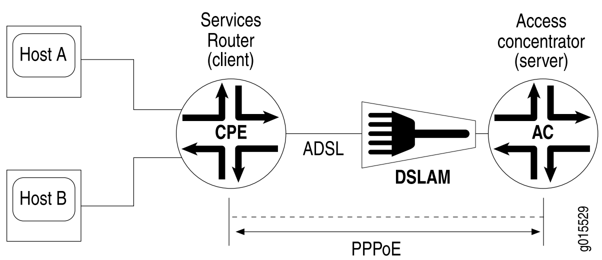
Understanding PPPoE ATM-over-ADSL and ATM-over-SHDSL Interfaces

Supported Platforms SRX210, SRX220, SRX240

NOTE: **Starting with Junos OS Release 15.1X49-D10, ADSL interfaces are no longer supported on SRX300, SRX320, SRX340, SRX345, and SRX550HM devices.**

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 23 on page 381 shows a typical PPPoE over ATM session between a device and an access concentrator on an ADSL loop.

Figure 24: 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.

Release History Table

Release	Description
15.1X49-D10	Starting with Junos OS Release 15.1X49-D10, ADSL interfaces are no longer supported on SRX300, SRX320, SRX340, SRX345, and SRX550HM devices.

Related Documentation

- Understanding Point-to-Point Protocol over Ethernet on page 369
- Example: Configuring PPPoE Encapsulation on an ATM-over-ADSL Interface on page 381

Example: Configuring PPPoE Encapsulation on an ATM-over-ADSL Interface

Supported Platforms SRX210, SRX220, SRX240

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.

NOTE: **Starting with Junos OS Release 15.1X49-D10, ADSL interfaces are no longer supported on SRX300, SRX320, SRX340, SRX345, and SRX550HM devices.**

Requirements

Before you begin:

- Configure network interfaces. See "Example: Creating an Ethernet Interface" on page 253.
- Configure PPPoE interfaces. See "Example: Configuring PPPoE Interfaces" on page 373.
- Configure PPPoE encapsulation on an Ethernet interface. See "Example: Configuring PPPoE Encapsulation on an Ethernet Interface" on page 379.

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 387

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.

Release History Table

Release	Description
15.1X49-D10	Starting with Junos OS Release 15.1X49-D10, ADSL interfaces are no longer supported on SRX300, SRX320, SRX340, SRX345, and SRX550HM devices.

Related Documentation

- Understanding PPPoE ATM-over-ADSL and ATM-over-SHDSL Interfaces on page 380

Understanding CHAP Authentication on a PPPoE Interface

Supported Platforms SRX1500, SRX300, SRX320, SRX340

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 369
- Example: Configuring CHAP Authentication on a PPPoE Interface on page 387

Example: Configuring CHAP Authentication on a PPPoE Interface

Supported Platforms SRX1500, SRX300, SRX320, SRX340

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 253.
- Configure a PPPoE interface. See "Example: Configuring PPPoE Interfaces" on page 373.
- Configure PPPoE encapsulation on an ATM-over-ADSL interface. See "Example: Configuring PPPoE Encapsulation on an ATM-over-ADSL Interface" on page 381.

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 387

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 387
- Verifying Credit-Flow Control on page 389

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 372
- Example: Configuring PPPoE Interfaces on page 373

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 372
- Example: Configuring PPPoE Interfaces on page 373

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 387
- Verifying Credit-Flow Control on page 389

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 372
- Example: Configuring PPPoE Interfaces on page 373

CHAPTER 21

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 396

Understanding the PPPoE-Based Radio-to-Router Protocol

Supported Platforms SRX Series

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 369
- Example: Configuring the PPPoE-Based Radio-to-Router Protocol on page 398

Configuring PPPoE-Based Radio-to-Router Protocols

Supported Platforms SRX Series

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 396
- Example: Configuring the PPPoE-Based Radio-to-Router Protocol on page 398

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 253.
2. Configure PPPoE interfaces. See “Example: Configuring PPPoE Interfaces” on page 373.
3. Configure PPPoE encapsulation on an Ethernet interface. See “Example: Configuring PPPoE Encapsulation on an Ethernet Interface” on page 379.
4. Configure PPPoE encapsulation on an ATM-over-ADSL interface. See “Example: Configuring PPPoE Encapsulation on an ATM-over-ADSL Interface” on page 381.
5. Configure CHAP authentication on a PPPoE interface. See “Example: Configuring CHAP Authentication on a PPPoE Interface” on page 387.

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 396

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 395
- Understanding the PPPoE-Based Radio-to-Router Protocol on page 396
- Configuring PPPoE-Based Radio-to-Router Protocols on page 398

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 396
- Configuring PPPoE-Based Radio-to-Router Protocols on page 398

CHAPTER 22

Configuring R2CP Radio-to-Router Protocol

R2CP Radio-to-Router Protocol Overview

Supported Platforms SRX Series

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 404

Configuring the R2CP Radio-to-Router Protocol

Supported Platforms SRX Series

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 403

PART 6

Configuring Link Services and Special Interfaces

CHAPTER 23

Configuring Link Services Interfaces

Link Services Interfaces Overview

Supported Platforms SRX1500, SRX300, SRX320, SRX340, vSRX

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.

NOTE: Starting with Junos OS Release 15.1X49-D10, link services interfaces are no longer supported on SRX300, SRX320, SRX340, SRX345, and SRX550HM devices.

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.

Services Available on a Link Services Interface

The link services interface is a logical interface available by default. Table 29 on page 412 summarizes the services available on the interface.

Table 29: 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 454 • Example: Configuring Multilink Frame Relay FRF.15 on page 460 • Example: Configuring Multilink Frame Relay FRF.16 on page 464
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 435
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 415

Table 29: Services Available on a Link Services Interface *(continued)*

Services	Purpose	More Information
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 450 • Configuring Fragmentation by Forwarding Class on page 416

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 415.
- 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-name***multilink-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

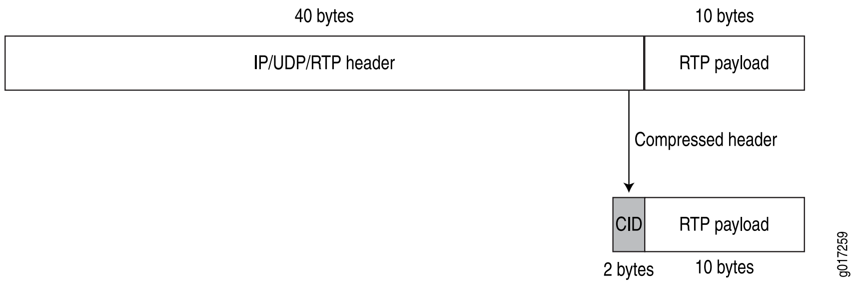
When using class of service on a multilink bundle, all Q2 traffic from the multilink bundle is queued to Q2 of constituent links based on a hash computed from the source address, destination address, and the IP protocol of the packet. If the IP payload is TCP or UDP traffic, the hash also includes the 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 25 on page 416 shows how CRTP compresses the RTP header in a voice packet by reducing a 40-byte header to a 2-byte header.

Figure 25: CRTP



You can configure CRTP with MLPPP or PPP logical interface encapsulation on link services interfaces. See "Example: Configuring an MLPPP Bundle" on page 454.

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 435.

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.

Release History Table

Release	Description
15.1X49-D10	Starting with Junos OS Release 15.1X49-D10, link services interfaces are no longer supported on SRX300, SRX320, SRX340, SRX345, and SRX550HM devices.

Related Documentation

- Link Services Configuration Overview on page 418
- Understanding the Internal Interface LSQ-0/0/0 Configuration on page 473
- Verifying the Link Services Interface on page 419

Link Services Configuration Overview

Supported Platforms SRX1500, SRX300, SRX320, SRX340, vSRX

NOTE: **Starting with Junos OS Release 15.1X49-D10, link services interfaces are no longer supported on SRX300, SRX320, SRX340, SRX345, and SRX550HM devices.**

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 411.

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 436.
2. Configure classifiers and forwarding classes. See "Example: Defining Classifiers and Forwarding Classes" on page 440.
3. Configure scheduler maps. See "Understanding How to Define and Apply Scheduler Maps" on page 443.
4. Configure interface shaping rates. See "Example: Configuring Interface Shaping Rates" on page 450
5. Configure an MLPPP bundle. See "Example: Configuring an MLPPP Bundle" on page 454.
6. To configure MLFR, see "Example: Configuring Multilink Frame Relay FRF.15" on page 460 or "Example: Configuring Multilink Frame Relay FRF.16" on page 464
7. To configure CRTP, see "Example: Configuring the Compressed Real-Time Transport Protocol" on page 470

Release History Table

Release	Description
15.1X49-D10	Starting with Junos OS Release 15.1X49-D10, link services interfaces are no longer supported on SRX300, SRX320, SRX340, SRX345, and SRX550HM devices.

Related Documentation

- Link Services Interfaces Overview on page 411
- Understanding Multilink Frame Relay FRF.15 on page 459
- Understanding Multilink Frame Relay FRF.16 on page 463
- Understanding Compressed Real-Time Transport Protocol on page 469
- Understanding the Internal Interface LSQ-0/0/0 Configuration on page 473
- Verifying the Link Services Interface on page 419

Verifying the Link Services Interface

Supported Platforms SRX1500, SRX300, SRX320, SRX340, vSRX

Confirm that the configuration is working properly.

NOTE: **Starting with Junos OS Release 15.1X49-D10, link services interfaces are no longer supported on SRX300, SRX320, SRX340, SRX345, and SRX550HM devices.**

- Verifying Link Services Interface Statistics on page 420
- Verifying Link Services CoS Configuration on page 422

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 454. 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 454.
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.

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 454.

```
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.

Release History Table

Release	Description
15.1X49-D10	Starting with Junos OS Release 15.1X49-D10, link services interfaces are no longer supported on SRX300, SRX320, SRX340, SRX345, and SRX550HM devices.

Troubleshooting the Link Services Interface

Supported Platforms SRX1500, SRX300, SRX320, SRX340, vSRX

NOTE: **Starting with Junos OS Release 15.1X49-D10, link services interfaces are no longer supported on SRX300, SRX320, SRX340, and SRX1500 devices.**

To solve configuration problems on a link services interface:

- Determine Which CoS Components Are Applied to the Constituent Links on page 424
- Determine What Causes Jitter and Latency on the Multilink Bundle on page 426
- Determine If LFI and Load Balancing Are Working Correctly on page 426
- Determine Why Packets Are Dropped on a PVC Between a Juniper Networks Device and a Third-Party Device on page 433

Determine Which CoS Components Are Applied to the Constituent Links

Supported Platforms SRX1500, SRX300, SRX320, SRX340, vSRX

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 30 on page 425 shows the CoS components to be applied on a multilink bundle and its constituent links.

Table 30: 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 30: 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.

Determine What Causes Jitter and Latency on the Multilink Bundle

Supported Platforms SRX1500, SRX300, SRX320, SRX340, vSRX

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).

Determine If LFI and Load Balancing Are Working Correctly

Supported Platforms SRX1500, SRX300, SRX320, SRX340, vSRX

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:

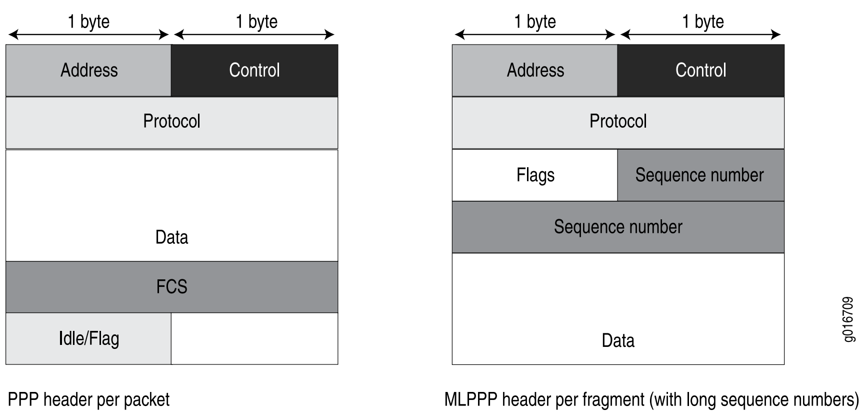
  4 bytes of header+2 bytes of frame check sequence (FCS)+1 byte that is idle or contains a flag

- MLPPP encapsulation adds between 6 and 8 bytes:

  4 bytes of PPP header+2 to 4 bytes of multilink header

Figure 26 on page 429 shows the overhead added to PPP and MLPPP headers.

Figure 26: 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 31 on page 429 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 31: 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 31: 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 32 on page 432 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 32: 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.

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.

Release History Table

Release	Description
15.1X49-D10	Starting with Junos OS Release 15.1X49-D10, link services interfaces are no longer supported on SRX300, SRX320, SRX340, and SRX1500 devices.

CHAPTER 24

Configuring Link Fragmentation and Interleaving

Understanding Link Fragmentation and Interleaving Configuration

Supported Platforms SRX1500, SRX300, SRX320, SRX340, vSRX

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.

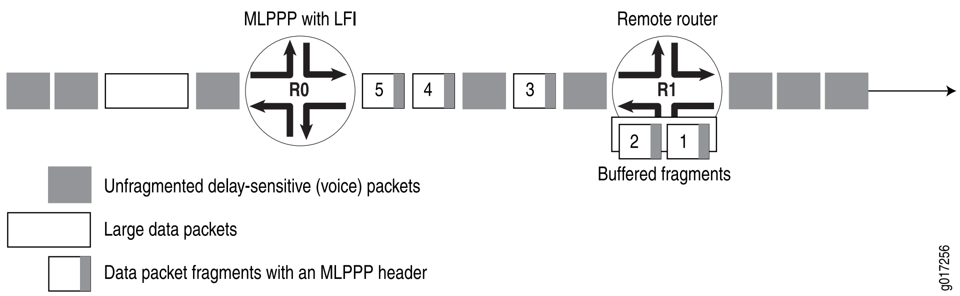
NOTE: **Starting with Junos OS Release 15.1X49-D10, link fragmentation and interleaving are no longer supported on SRX300, SRX320, SRX340, SRX345, and SRX550HM devices.**

Figure 27 on page 436 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 27: 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.

Release History Table

Release	Description
15.1X49-D10	Starting with Junos OS Release 15.1X49-D10, link fragmentation and interleaving are no longer supported on SRX300, SRX320, SRX340, SRX345, and SRX550HM devices.

Related Documentation

- Link Services Interfaces Overview on page 411
- Example: Configuring Link Fragmentation and Interleaving on page 436

Example: Configuring Link Fragmentation and Interleaving

Supported Platforms SRX1500, SRX300, SRX320, SRX340

This example shows how to configure LFI.

NOTE: Starting with Junos OS Release 15.1X49-D10, link fragmentation and interleaving are no longer supported on SRX300, SRX320, SRX340, SRX345, and SRX550HM devices.

- Configuration on page 437
- Verification on page 437

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.

Release History Table

Release	Description
15.1X49-D10	Starting with Junos OS Release 15.1X49-D10, link fragmentation and interleaving are no longer supported on SRX300, SRX320, SRX340, SRX345, and SRX550HM devices.

Related Documentation

- Understanding Link Fragmentation and Interleaving Configuration on page 435
- Troubleshooting the Link Services Interface on page 424
- Verifying the Link Services Interface on page 419

CHAPTER 25

Configuring Class-of-Service on Link Services Interfaces

Understanding How to Define Classifiers and Forwarding Classes

Supported Platforms SRX Series, vSRX

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.

NOTE: Starting with Junos OS Release 15.1X49-D10, classifiers on link services interfaces and forwarding classes are no longer supported on SRX300, SRX320, SRX340, SRX345, and SRX550HM devices.

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.

Release History Table

Release	Description
15.1X49-D10	Starting with Junos OS Release 15.1X49-D10, classifiers on link services interfaces and forwarding classes are no longer supported on SRX300, SRX320, SRX340, SRX345, and SRX550HM devices.

Related Documentation

- Link Services Interfaces Overview on page 411
- Example: Defining Classifiers and Forwarding Classes on page 440

Example: Defining Classifiers and Forwarding Classes

Supported Platforms SRX Series

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.

NOTE: Starting with Junos OS Release 15.1X49-D10, classifiers on link services interfaces and forwarding classes are no longer supported on SRX300, SRX320, SRX340, SRX345, and SRX550HM devices.

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 443

Verifying Classifiers and Forwarding Classes

Purpose Verify the classifiers and the forwarding classes.

Action From operational mode, enter the **show class-of-service** command.

Release History Table

Release	Description
15.1X49-D10	Starting with Junos OS Release 15.1X49-D10, classifiers on link services interfaces and forwarding classes are no longer supported on SRX300, SRX320, SRX340, SRX345, and SRX550HM devices.

Related Documentation

- *Junos OS Feature Support Reference for SRX Series and J Series Devices*
- Understanding How to Define Classifiers and Forwarding Classes on page 439
- Link Services Interfaces Overview on page 411
- Troubleshooting the Link Services Interface on page 424
- Verifying the Link Services Interface on page 419

Understanding How to Define and Apply Scheduler Maps

Supported Platforms SRX Series, vSRX

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.

NOTE: Starting with Junos OS Release 15.1X49-D10, scheduler maps on link services interfaces are no longer supported on SRX300, SRX320, SRX340, SRX345, and SRX550HM devices.

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 33 on page 444 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 33: 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.

Release History Table

Release	Description
15.1X49-D10	Starting with Junos OS Release 15.1X49-D10, scheduler maps on link services interfaces are no longer supported on SRX300, SRX320, SRX340, SRX345, and SRX550HM devices.

Related Documentation

- Link Services Interfaces Overview on page 411
- Example: Configuring Scheduler Maps on page 446
- Example: Configuring an MLPPP Bundle on page 454
- Understanding Interface Shaping Rates on page 449

Example: Configuring Scheduler Maps

Supported Platforms SRX Series

This example shows how to configure scheduler maps to determine the transmission service level for each output queue.

NOTE: Starting with Junos OS Release 15.1X49-D10, scheduler maps on link services interfaces are no longer supported on SRX300, SRX320, SRX340, SRX345, and SRX550HM devices.

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 449

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.

Release History Table

Release	Description
15.1X49-D10	Starting with Junos OS Release 15.1X49-D10, scheduler maps on link services interfaces are no longer supported on SRX300, SRX320, SRX340, SRX345, and SRX550HM devices.

Related Documentation

- *Junos OS Feature Support Reference for SRX Series and J Series Devices*
- Understanding How to Define and Apply Scheduler Maps on page 443
- Troubleshooting the Link Services Interface on page 424
- Verifying the Link Services Interface on page 419

Understanding Interface Shaping Rates

Supported Platforms SRX210, SRX220, SRX240, vSRX

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.

NOTE: Starting with Junos OS Release 15.1X49-D10, shaping rates on link services interfaces are no longer supported on SRX300, SRX320, SRX340, SRX345, and SRX550HM devices.

Release History Table

Release	Description
15.1X49-D10	Starting with Junos OS Release 15.1X49-D10, shaping rates on link services interfaces are no longer supported on SRX300, SRX320, SRX340, SRX345, and SRX550HM devices.

Related Documentation

- Link Services Interfaces Overview on page 411
- Example: Configuring Interface Shaping Rates on page 450
- Understanding How to Define and Apply Scheduler Maps on page 443

Example: Configuring Interface Shaping Rates

Supported Platforms SRX210, SRX220, SRX240

This example shows how to configure interface shaping rates to control the maximum rate of traffic transmitted on an interface.

NOTE: **Starting with Junos OS Release 15.1X49-D10, shaping rates on link services interfaces are no longer supported on SRX300, SRX320, SRX340, SRX345, and SRX550HM devices.**

- Requirements on page 450
- Overview on page 450
- Configuration on page 451
- Verification on page 451

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 539.
- 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 446.

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.

Release History Table

Release	Description
15.1X49-D10	Starting with Junos OS Release 15.1X49-D10, shaping rates on link services interfaces are no longer supported on SRX300, SRX320, SRX340, SRX345, and SRX550HM devices.

Related Documentation

- *Junos OS Feature Support Reference for SRX Series and J Series Devices*
- Link Services Interfaces Overview on page 411
- Understanding Interface Shaping Rates on page 449
- Troubleshooting the Link Services Interface on page 424
- Verifying the Link Services Interface on page 419

CHAPTER 26

Achieving Greater Bandwidth, Load Balancing, and Redundancy with Multilink Bundles

Understanding MLPPP Bundles and Link Fragmentation and Interleaving (LFI) on Serial Links

Supported Platforms SRX1500, SRX300, SRX320, SRX340

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: **Starting with Junos OS Release 15.1X49-D10, multilink bundles on link services interfaces are no longer supported on SRX300, SRX320, SRX340, SRX345, and SRX550HM devices.**

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.

Release History Table

Release	Description
15.1X49-D10	Starting with Junos OS Release 15.1X49-D10, multilink bundles on link services interfaces are no longer supported on SRX300, SRX320, SRX340, SRX345, and SRX550HM devices.

Related Documentation

- Link Services Interfaces Overview on page 411
- Example: Configuring an MLPPP Bundle on page 454
- Example: Configuring Multilink Frame Relay FRF.15 on page 460
- Example: Configuring Multilink Frame Relay FRF.16 on page 464

Example: Configuring an MLPPP Bundle

Supported Platforms SRX1500, SRX300, SRX320, SRX340

This example shows how to configure an MLPPP bundle to increase traffic bandwidth.

NOTE: Starting with Junos OS Release 15.1X49-D10, multilink bundles on link services interfaces are no longer supported on SRX300, SRX320, SRX340, SRX345, and SRX550HM devices.

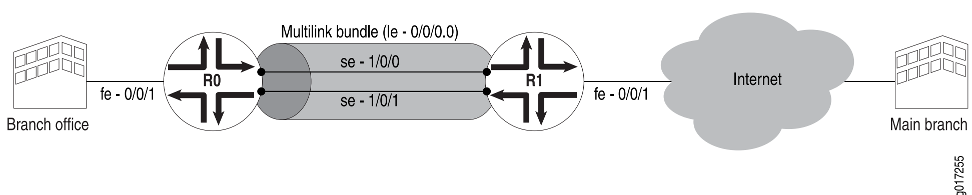
Requirements

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 28 on page 455, 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 28: 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.

Release History Table

Release	Description
15.1X49-D10	Starting with Junos OS Release 15.1X49-D10, multilink bundles on link services interfaces are no longer supported on SRX300, SRX320, SRX340, SRX345, and SRX550HM devices.

Related Documentation

- Understanding MLPPP Bundles and Link Fragmentation and Interleaving (LFI) on Serial Links on page 453
- Troubleshooting the Link Services Interface on page 424
- Verifying the Link Services Interface on page 419

CHAPTER 27

Configuring Multilink Frame Relay

Understanding Multilink Frame Relay FRF.15

Supported Platforms SRX1500, SRX210, SRX220, SRX240

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.

NOTE: **Starting with Junos OS Release 15.1X49-D10, Multilink Frame Relay on link services interfaces is no longer supported on SRX300, SRX320, SRX340, SRX345, and SRX550HM devices.**

Release History Table

Release	Description
15.1X49-D10	Starting with Junos OS Release 15.1X49-D10, Multilink Frame Relay on link services interfaces is no longer supported on SRX300, SRX320, SRX340, SRX345, and SRX550HM devices.

Related Documentation

- Understanding MLPPP Bundles and Link Fragmentation and Interleaving (LFI) on Serial Links on page 453
- Example: Configuring an MLPPP Bundle on page 454
- Link Services Interfaces Overview on page 411

Example: Configuring Multilink Frame Relay FRF.15

Supported Platforms SRX1500, SRX210, SRX220, SRX240

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.

NOTE: **Starting with Junos OS Release 15.1X49-D10, Multilink Frame Relay on link services interfaces is no longer supported on SRX300, SRX320, SRX340, SRX345, and SRX550HM devices.**

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.

Release History Table

Release	Description
15.1X49-D10	Starting with Junos OS Release 15.1X49-D10, Multilink Frame Relay on link services interfaces is no longer supported on SRX300, SRX320, SRX340, SRX345, and SRX550HM devices.

Related Documentation

- Understanding Multilink Frame Relay FRF.15 on page 459
- Link Services Configuration Overview on page 418

Understanding Multilink Frame Relay FRF.16

Supported Platforms SRX1500, SRX210, SRX220, SRX240

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.

NOTE: **Starting with Junos OS Release 15.1X49-D10, Multilink Frame Relay on link services interfaces is no longer supported on SRX300, SRX320, SRX340, SRX345, and SRX550HM devices.**

Release History Table

Release	Description
15.1X49-D10	Starting with Junos OS Release 15.1X49-D10, Multilink Frame Relay on link services interfaces is no longer supported on SRX300, SRX320, SRX340, SRX345, and SRX550HM devices.

Related Documentation

- Understanding MLPPP Bundles and Link Fragmentation and Interleaving (LFI) on Serial Links on page 453
- Example: Configuring an MLPPP Bundle on page 454
- Link Services Interfaces Overview on page 411
- Example: Configuring Multilink Frame Relay FRF.16 on page 464

Example: Configuring Multilink Frame Relay FRF.16

Supported Platforms SRX1500, SRX210, SRX220, SRX240

This example shows how to configure MLFR FRF.16 for additional bandwidth, load balancing, and redundancy.

NOTE: **Starting with Junos OS Release 15.1X49-D10, Multilink Frame Relay on link services interfaces is no longer supported on SRX300, SRX320, SRX340, SRX345, and SRX550HM devices.**

- Requirements on page 464
- Overview on page 464
- Configuration on page 464
- Verification on page 467

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.

Release History Table

Release	Description
15.1X49-D10	Starting with Junos OS Release 15.1X49-D10, Multilink Frame Relay on link services interfaces is no longer supported on SRX300, SRX320, SRX340, SRX345, and SRX550HM devices.

Related Documentation

- Link Services Interfaces Overview on page 411
- Understanding Multilink Frame Relay FRF.16 on page 463
- Link Services Configuration Overview on page 418

CHAPTER 28

Configuring Compressed Real-Time Transport Protocol

Understanding Compressed Real-Time Transport Protocol

Supported Platforms SRX300, SRX320, SRX340, vSRX

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.

NOTE: Starting with Junos OS Release 15.1X49-D10, the Compressed Real-Time Transport Protocol (CRTP) on link services interfaces is no longer supported on SRX300, SRX320, SRX340, SRX345, and SRX550HM devices.

Release History Table

Release	Description
15.1X49-D10	Starting with Junos OS Release 15.1X49-D10, the Compressed Real-Time Transport Protocol (CRTP) on link services interfaces is no longer supported on SRX300, SRX320, SRX340, SRX345, and SRX550HM devices.

Related Documentation

- Link Services Interfaces Overview on page 411
- Example: Configuring the Compressed Real-Time Transport Protocol on page 470

Example: Configuring the Compressed Real-Time Transport Protocol

Supported Platforms SRX300, SRX320, SRX340, vSRX

This example shows how to configure CRTP to improve packet transmission, especially for time-sensitive voice packets.

NOTE: **Starting with Junos OS Release 15.1X49-D10, the Compressed Real-Time Transport Protocol (CRTP) on link services interfaces is no longer supported on SRX300, SRX320, SRX340, SRX345, and SRX550HM devices.**

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.

Release History Table

Release	Description
15.1X49-D10	Starting with Junos OS Release 15.1X49-D10, the Compressed Real-Time Transport Protocol (CRTP) on link services interfaces is no longer supported on SRX300, SRX320, SRX340, SRX345, and SRX550HM devices.

Related Documentation

- Link Services Interfaces Overview on page 411
- Understanding Compressed Real-Time Transport Protocol on page 469

CHAPTER 29

Configuring Link Services Queuing Interface

Understanding the Internal Interface LSQ-0/0/0 Configuration

Supported Platforms SRX1500, SRX300, SRX320, SRX340, vSRX

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.

NOTE: **Starting with Junos OS Release 15.1X49-D10, lsq-0/0/0 as the link services queuing interface is no longer supported on SRX300, SRX320, SRX340, SRX345, and SRX550HM devices.**

Release History Table

Release	Description
15.1X49-D10	Starting with Junos OS Release 15.1X49-D10, lsq-0/0/0 as the link services queuing interface is no longer supported on SRX300, SRX320, SRX340, SRX345, and SRX550HM devices.

Related Documentation

- Link Services Interfaces Overview on page 411
- Example: Upgrading from ls-0/0/0 to lsq-0/0/0 for Multilink Services on page 473

Example: Upgrading from ls-0/0/0 to lsq-0/0/0 for Multilink Services

Supported Platforms SRX1500, SRX300, SRX320, SRX340, vSRX

This example shows how to upgrade from ls-0/0/0 to lsq-0/0/0 (or to reverse the change) for multilink services.

NOTE: **Starting with Junos OS Release 15.1X49-D10, lsq-0/0/0 as the link services queuing interface is no longer supported on SRX300, SRX320, SRX340, SRX345, and SRX550HM devices.**

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.

Release History Table

Release	Description
15.1X49-D10	Starting with Junos OS Release 15.1X49-D10, lsq-0/0/0 as the link services queuing interface is no longer supported on SRX300, SRX320, SRX340, SRX345, and SRX550HM devices.

Related Documentation

- Link Services Interfaces Overview on page 411
- Understanding the Internal Interface LSQ-0/0/0 Configuration on page 473

CHAPTER 30

Understanding Special Interfaces

Understanding Management Interfaces

Supported Platforms SRX Series, vSRX

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.

NOTE: **Starting with Junos OS Release 15.1X49-D10, special management interfaces are no longer supported on SRX300, SRX320, SRX340, SRX345, and SRX550HM devices.**

Release History Table

Release	Description
15.1X49-D10	Starting with Junos OS Release 15.1X49-D10, special management interfaces are no longer supported on SRX300, SRX320, SRX340, SRX345, and SRX550HM devices.

Related Documentation

- Understanding Interfaces on page 3
- Understanding the Discard Interface on page 478
- Understanding the Loopback Interface on page 479

Understanding the Discard Interface

Supported Platforms SRX Series, vSRX

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.

NOTE: **Starting with Junos OS Release 15.1X49-D10, the special discard interface is no longer supported on SRX300, SRX320, SRX340, SRX345, and SRX550HM devices.**

Release History Table

Release	Description
15.1X49-D10	Starting with Junos OS Release 15.1X49-D10, the special discard interface is no longer supported on SRX300, SRX320, SRX340, SRX345, and SRX550HM devices.

Related Documentation

- Understanding Interfaces on page 3
- Understanding Management Interfaces on page 477
- Understanding the Loopback Interface on page 479

Understanding the Loopback Interface

Supported Platforms SRX Series, vSRX

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.

NOTE: **Starting with Junos OS Release 15.1X49-D10, the special loopback interface is no longer supported on SRX300, SRX320, SRX340, SRX345, and SRX550HM devices.**

Release History Table

Release	Description
15.1X49-D10	Starting with Junos OS Release 15.1X49-D10, the special loopback interface is no longer supported on SRX300, SRX320, SRX340, SRX345, and SRX550HM devices.

Related Documentation

- Configuring a Loopback Interface on page 480
- Understanding Interfaces on page 3
- Understanding Management Interfaces on page 477
- Understanding the Discard Interface on page 478

Configuring a Loopback Interface

Supported Platforms ACX Series, M Series, MX Series, PTX Series, T Series

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, thus avoiding any unnecessary allocation of address space.

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 192.0.2.0/24
   ```

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 192.0.2.0/24 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 198.51.100.0/24
   user@host# set address 198.51.101.0/24
   ```

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 479

PART 7

Configuring Modem Interfaces

CHAPTER 31

Configuring 3G Wireless Modems for WAN Connections

3G Wireless Modem Overview

Supported Platforms SRX300, SRX320

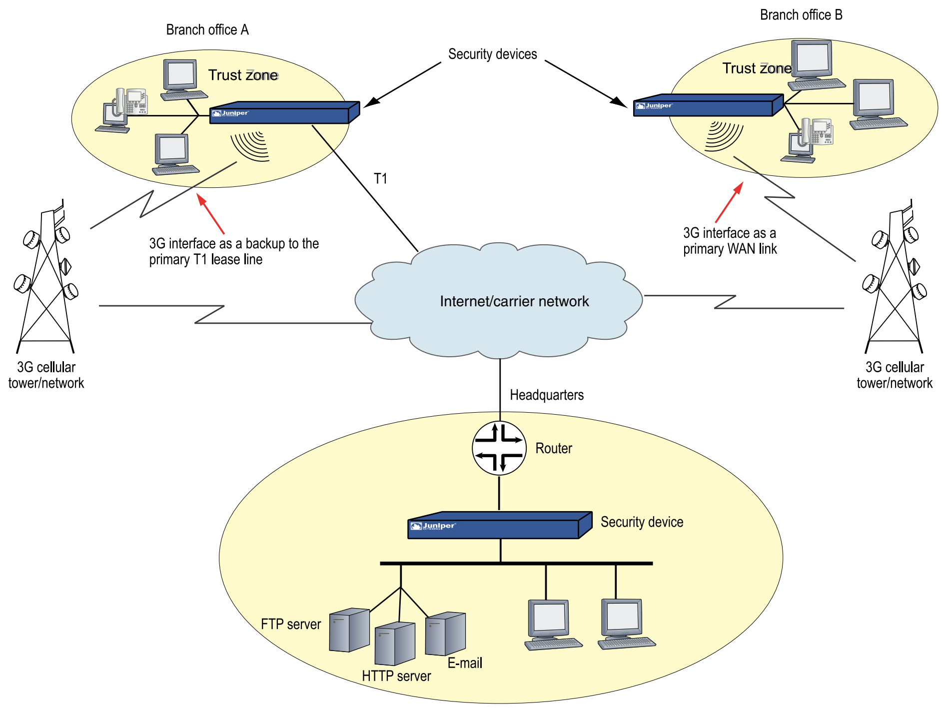
3G refers to the third generation of mobile phone standards and technology based on the International Telecommunication Union (ITU) International Mobile Telecommunications-2000 (IMT-2000) global standard. 3G networks are wide area cellular telephone networks that have evolved to include high-data rate 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.

NOTE: **Starting with Junos OS Release 15.1X49-D10, 3G wireless modem interfaces are no longer supported on SRX300, SRX320, SRX340, SRX345, and SRX550HM devices.**

Figure 29 on page 486 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 29: Wireless WAN Connections for Branch Offices



Release History Table

Release	Description
15.1X49-D10	Starting with Junos OS Release 15.1X49-D10, 3G wireless modem interfaces are no longer supported on SRX300, SRX320, SRX340, SRX345, and SRX550HM devices.

Related Documentation

- 3G Wireless Modem Configuration Overview on page 486

3G Wireless Modem Configuration Overview

Supported Platforms SRX300, SRX320

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.

NOTE: Starting with Junos OS Release 15.1X49-D10, 3G wireless modem interfaces are no longer supported on SRX300, SRX320, SRX340, SRX345, and SRX550HM devices.

To configure and activate the 3G wireless modem card:

1. Configure a dialer interface. See "Example: Configuring the Dialer Interface" on page 490.
2. Configure the 3G wireless modem interface. See "Example: Configuring the 3G Wireless Modem Interface" on page 497.
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 *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.

Release History Table

Release	Description
15.1X49-D10	Starting with Junos OS Release 15.1X49-D10, 3G wireless modem interfaces are no longer supported on SRX300, SRX320, SRX340, SRX345, and SRX550HM devices.

Related Documentation

- 3G Wireless Modem Overview on page 485
- Understanding the GSM Profile on page 498
- Unlocking the GSM 3G Wireless Modem on page 507
- Understanding Account Activation for CDMA EV-DO Modem Cards on page 501

Understanding the Dialer Interface

Supported Platforms SRX110, SRX210

The *dialer interface*, **dl*n***, 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.

NOTE: **Starting with Junos OS Release 15.1X49-D10, 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 on page 488
- Dialer Interface Authentication Support for GSM HSDPA 3G Wireless Modems on page 489
- Dialer Interface Functions on page 489
- Dialer Interface Operating Parameters on page 490

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.

Release History Table

Release	Description
15.1X49-D10	Starting with Junos OS Release 15.1X49-D10, the dialer interface for 3G wireless modems is no longer supported on SRX300, SRX320, SRX340, SRX345, and SRX550HM devices.

Related Documentation

- 3G Wireless Modem Overview on page 485
- 3G Wireless Modem Configuration Overview on page 486
- Example: Configuring the Dialer Interface on page 490

Example: Configuring the Dialer Interface

Supported Platforms SRX110, SRX210

This example shows how to configure the dialer interface for 3G wireless modem connections.

NOTE: Starting with Junos OS Release 15.1X49-D10, the dialer interface for 3G wireless modems is no longer supported on SRX300, SRX320, SRX340, SRX345, and SRX550HM devices.

- Requirements on page 491
- Overview on page 491

Requirements

Before you begin, install your SRX Series device and establish basic connectivity for your device. See "3G Wireless Modem Configuration Overview" on page 486.

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.

Release History Table

Release	Description
15.1X49-D10	Starting with Junos OS Release 15.1X49-D10, the dialer interface for 3G wireless modems is no longer supported on SRX300, SRX320, SRX340, SRX345, and SRX550HM devices.

Related Documentation

- 3G Wireless Modem Overview on page 485
- 3G Wireless Modem Configuration Overview on page 486
- Understanding the Dialer Interface on page 488

Understanding the 3G Wireless Modem Physical Interface

Supported Platforms SRX210, SRX300

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.

NOTE: **Starting with Junos OS Release 15.1X49-D10, 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.

Release History Table

Release	Description
15.1X49-D10	Starting with Junos OS Release 15.1X49-D10, 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 485
- 3G Wireless Modem Configuration Overview on page 486

Example: Configuring the 3G Wireless Modem Interface

Supported Platforms SRX110, SRX210

This example shows how to configure the 3G wireless modem interface.

NOTE: **Starting with Junos OS Release 15.1X49-D10, 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 490.

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.

Release History Table

Release	Description
15.1X49-D10	Starting with Junos OS Release 15.1X49-D10, 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 485
- 3G Wireless Modem Configuration Overview on page 486
- Understanding the 3G Wireless Modem Physical Interface on page 496

Understanding the GSM Profile

Supported Platforms SRX110, SRX210

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.

NOTE: **Starting with Junos OS Release 15.1X49-D10, 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.**

Release History Table

Release	Description
15.1X49-D10	Starting with Junos OS Release 15.1X49-D10, 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 485
- 3G Wireless Modem Configuration Overview on page 486
- Example: Configuring the GSM Profile on page 499

Example: Configuring the GSM Profile

Supported Platforms SRX110, SRX210

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: **Starting with Junos OS Release 15.1X49-D10, 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 490
- Configure the 3G wireless modem interface. See "Example: Configuring the 3G Wireless Modem Interface" on page 497.

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.

Release History Table

Release	Description
15.1X49-D10	Starting with Junos OS Release 15.1X49-D10, 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 485
- 3G Wireless Modem Configuration Overview on page 486
- Understanding the GSM Profile on page 498

CHAPTER 32

Configuring CDMA EV-DO Modem Cards

Understanding Account Activation for CDMA EV-DO Modem Cards

Supported Platforms SRX210

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: **Starting with Junos OS Release 15.1X49-D10, 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) on page 502
- Account Activation Modes on page 502

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.

Release History Table

Release	Description
15.1X49-D10	Starting with Junos OS Release 15.1X49-D10, activating an account for a CDMA EV-DO 3G wireless modem card is no longer supported on SRX300, SRX320, SRX340, SRX345, and SRX550HM devices.

Related Documentation

- 3G Wireless Modem Overview on page 485
- 3G Wireless Modem Configuration Overview on page 486
- Example: Configuring the GSM Profile on page 499

Activating the CDMA EV-DO Modem Card with IOTA Provisioning

Supported Platforms SRX210

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: Starting with Junos OS Release 15.1X49-D10, 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 501.

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
```

Release History Table

Release	Description
15.1X49-D10	Starting with Junos OS Release 15.1X49-D10, activating a CDMA EV-DO 3G wireless modem card with IOTA provisioning is no longer supported on SRX300, SRX320, SRX340, SRX345, and SRX550HM devices.

Related Documentation

- 3G Wireless Modem Overview on page 485
- Activating the CDMA EV-DO Modem Card with OTASP Provisioning on page 504
- Activating the CDMA EV-DO Modem Card Manually on page 505

Activating the CDMA EV-DO Modem Card with OTASP Provisioning

Supported Platforms SRX210

This topic describes the activation of the CDMA EV-DO 3G wireless modem card for use with service provider networks such as Verizon.

NOTE: **Starting with Junos OS Release 15.1X49-D10, 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
```

Release History Table

Release	Description
15.1X49-D10	Starting with Junos OS Release 15.1X49-D10, activating a CDMA EV-DO 3G wireless modem card with OTASP provisioning is no longer supported on SRX300, SRX320, SRX340, SRX345, and SRX550HM devices.

Related Documentation

- 3G Wireless Modem Overview on page 485
- Understanding Account Activation for CDMA EV-DO Modem Cards on page 501
- Activating the CDMA EV-DO Modem Card Manually on page 505
- Activating the CDMA EV-DO Modem Card with IOTA Provisioning on page 503

Activating the CDMA EV-DO Modem Card Manually

Supported Platforms SRX210

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: **Starting with Junos OS Release 15.1X49-D10, 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
```

Release History Table

Release	Description
15.1X49-D10	Starting with Junos OS Release 15.1X49-D10, activating a CDMA EV-DO 3G wireless modem card manually is no longer supported on SRX300, SRX320, SRX340, SRX345, and SRX550HM devices.

Related Documentation

- 3G Wireless Modem Overview on page 485
- Understanding Account Activation for CDMA EV-DO Modem Cards on page 501
- Activating the CDMA EV-DO Modem Card with OTASP Provisioning on page 504
- Activating the CDMA EV-DO Modem Card with IOTA Provisioning on page 503

Unlocking the GSM 3G Wireless Modem

Supported Platforms SRX320

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: **Starting with Junos OS Release 15.1X49-D10, unlocking the SIM in a 3G wireless modem card is no longer 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.

Release History Table

Release	Description
15.1X49-D10	Starting with Junos OS Release 15.1X49-D10, unlocking the SIM in a 3G wireless modem card is no longer supported on SRX300, SRX320, SRX340, SRX345, and SRX550HM devices.

Related Documentation

- 3G Wireless Modem Overview on page 485
- 3G Wireless Modem Configuration Overview on page 486
- Understanding the Dialer Interface on page 488
- Understanding the 3G Wireless Modem Physical Interface on page 496
- Understanding the GSM Profile on page 498

CHAPTER 33

Configuring USB Modems for Dial Backup

USB Modem Interface Overview

Supported Platforms SRX Series

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: **Starting with Junos OS Release 15.1X49-D10, 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 34 on page 511 describes the commands. For more information about these commands, see the documentation for your modem.

Table 34: 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.)

Release History Table

Release	Description
15.1X49-D10	Starting with Junos OS Release 15.1X49-D10, USB modems are no longer supported for dial backup on SRX300, SRX320, SRX340, SRX345, SRX550HM devices.

Related Documentation

- USB Modem Configuration Overview on page 512
- Example: Configuring a USB Modem Interface on page 515
- Example: Configuring a Dialer Interface for USB Modem Dial-In on page 524

USB Modem Configuration Overview

Supported Platforms SRX Series

NOTE: Starting with Junos OS Release 15.1X49-D10, 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 35 on page 513 for a summarized description of the procedure.

Table 35: 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 515.
	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 517. • To configure a dialer filter on **dl0**, see "Example: Configuring Dialer Interfaces and Backup Methods for USB Modem Dial Backup" on page 517. • To configure a dialer watch on **dl0**, see "Example: Configuring Dialer Interfaces and Backup Methods for USB Modem Dial Backup" on page 517.

Table 35: Configuring Branch Office and Head Office Routers for USB Modem Backup Connectivity *(continued)*

Router Location	Configuration Requirement	Procedure
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 524.

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 36 on page 514 for a list of available incoming map options.

Table 36: 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.

Release History Table

Release	Description
15.1X49-D10	Starting with Junos OS Release 15.1X49-D10, USB modems are no longer supported for dial backup on SRX300, SRX320, SRX340, and SRX345 devices.

Related Documentation

- USB Modem Interface Overview on page 509
- Example: Configuring a USB Modem Interface on page 515

Example: Configuring a USB Modem Interface

Supported Platforms SRX Series

This example shows how to configure a USB modem interface for dial backup.

NOTE: **Starting with Junos OS Release 15.1X49-D10, 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
```

Release History Table

Release	Description
15.1X49-D10	Starting with Junos OS Release 15.1X49-D10, USB modems are no longer supported for dial backup on SRX300, SRX320, SRX340, and SRX345 devices.

Related Documentation

- USB Modem Configuration Overview on page 512
- USB Modem Interface Overview on page 509
- Example: Configuring a Dialer Interface for USB Modem Dial-In on page 524

Example: Configuring Dialer Interfaces and Backup Methods for USB Modem Dial Backup

Supported Platforms SRX300, SRX320, SRX340

This example shows how to configure a dialer interfaces and backup methods for USB modem dial backup.

NOTE: Starting with Junos OS Release 15.1X49-D10, 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 515.

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.

Release History Table

Release	Description
15.1X49-D10	Starting with Junos OS Release 15.1X49-D10, USB modems are no longer supported for dial backup on SRX300, SRX320, SRX340, SRX345, and SRX550HM devices.

Related Documentation

- USB Modem Configuration Overview on page 512
- Example: Configuring a Dialer Interface for USB Modem Dial-In on page 524
- Example: Configuring PAP on Dialer Interfaces on page 526
- Example: Configuring CHAP on Dialer Interfaces on page 527

Example: Configuring a Dialer Interface for USB Modem Dial-In

Supported Platforms SRX Series

This example shows how to configure a dialer interface for USB modem dial-in.

NOTE: **Starting with Junos OS Release 15.1X49-D10, USB modems are no longer supported for dial-in to a dialer interface on SRX300, SRX320, SRX340, and SRX345 devices.**

- Requirements on page 524
- Overview on page 524
- Configuration on page 525
- Verification on page 525

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.

Release History Table

Release	Description
15.1X49-D10	Starting with Junos OS Release 15.1X49-D10, USB modems are no longer supported for dial-in to a dialer interface on SRX300, SRX320, SRX340, and SRX345 devices.

Related Documentation

- USB Modem Configuration Overview on page 512
- Example: Configuring a USB Modem Interface on page 515

Example: Configuring PAP on Dialer Interfaces

Supported Platforms SRX300, SRX320, SRX340

This example shows how to configure PAP on dialer interfaces.

NOTE: **Starting with Junos OS Release 15.1X49-D10, configuring PAP on dialer interfaces is no longer supported on SRX300, SRX320, SRX340, SRX345, and SRX550HM devices.**

- Requirements on page 526
- Overview on page 526
- Configuration on page 526
- Verification on page 527

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.

Release History Table

Release	Description
15.1X49-D10	Starting with Junos OS Release 15.1X49-D10, configuring PAP on dialer interfaces is no longer supported on SRX300, SRX320, SRX340, SRX345, and SRX550HM devices.

Related Documentation

- USB Modem Configuration Overview on page 512
- Example: Configuring a USB Modem Interface on page 515
- Example: Configuring Dialer Interfaces and Backup Methods for USB Modem Dial Backup on page 517
- Example: Configuring a Dialer Interface for USB Modem Dial-In on page 524
- Example: Configuring CHAP on Dialer Interfaces on page 527

Example: Configuring CHAP on Dialer Interfaces

Supported Platforms SRX300, SRX320, SRX340

This example shows how to configure CHAP on dialer interfaces for authentication.

NOTE: Starting with Junos OS Release 15.1X49-D10, configuring CHAP on dialer interfaces for authentication is no longer supported on SRX300, SRX320, SRX340, SRX345, and SRX550HM devices.

- Requirements on page 528
- Overview on page 528
- Configuration on page 528
- Verification on page 528

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.

Release History Table

Release	Description
15.1X49-D10	Starting with Junos OS Release 15.1X49-D10, configuring CHAP on dialer interfaces for authentication is no longer supported on SRX300, SRX320, SRX340, SRX345, and SRX550HM devices.

Related Documentation

- USB Modem Configuration Overview on page 512
- Example: Configuring a USB Modem Interface on page 515
- Example: Configuring Dialer Interfaces and Backup Methods for USB Modem Dial Backup on page 517

- Example: Configuring a Dialer Interface for USB Modem Dial-In on page 524
- Example: Configuring PAP on Dialer Interfaces on page 526

CHAPTER 34

Configuring DOCSIS Mini-PIM Interfaces

DOCSIS Mini-PIM Interface Overview

Supported Platforms SRX210, SRX220, SRX240

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: **Starting with Junos OS Release 15.1X49-D10, 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.

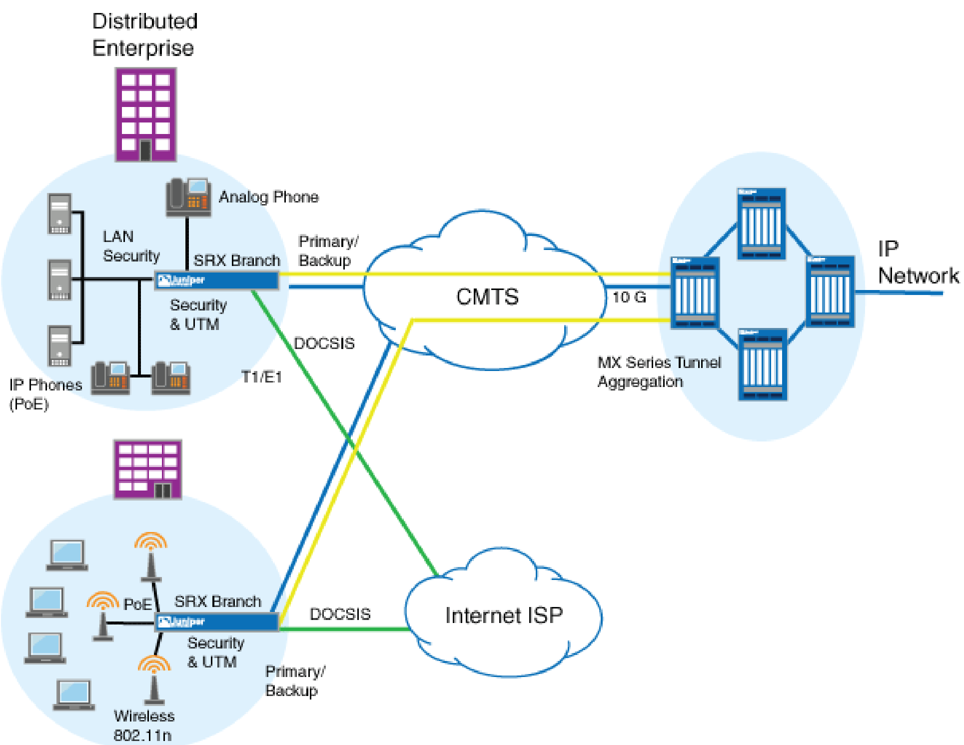
The Mini-PIM can also be used with encapsulations other than GRE, PPPoE, and IP-in-IP.

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 30 on page 532 shows a typical use for this Mini-PIM in an MSO network.

Figure 30: Typical DOCSIS End-to-End Connectivity Diagram



Release History Table

Release	Description
15.1X49-D10	Starting with Junos OS Release 15.1X49-D10, DOCSIS Mini-PIM interfaces are no longer supported on SRX300, SRX320, SRX340, SRX345, and SRX550HM devices.

Related Documentation

- Software Features Supported on DOCSIS Mini-PIMs on page 533
- Example: Configuring the DOCSIS Mini-PIM Interfaces on page 534

Software Features Supported on DOCSIS Mini-PIMs

Supported Platforms SRX210, SRX220, SRX240

NOTE: **Starting with Junos OS Release 15.1X49-D10, DOCSIS Mini-PIM interfaces are no longer supported on SRX300, SRX320, SRX340, SRX345, and SRX550HM devices.**

Table 37 on page 533 lists the software features supported on DOCSIS Mini-PIMs.

Table 37: 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

Table 37: Software Features Supported on DOCSIS Mini-PIMs *(continued)*

Software Feature	Description
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	Starting with Junos OS Release 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 531
- Example: Configuring the DOCSIS Mini-PIM Interfaces on page 534

Example: Configuring the DOCSIS Mini-PIM Interfaces

Supported Platforms SRX210, SRX220, SRX240

This example shows how to configure DOCSIS Mini-PIM network interfaces for SRX210, SRX220, and SRX240 devices.

NOTE: Starting with Junos OS Release 15.1X49-D10, 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 253.

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 536

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.

Release History Table

Release	Description
15.1X49-D10	Starting with Junos OS Release 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 531
- Software Features Supported on DOCSIS Mini-PIMs on page 533

CHAPTER 35

Configuring Serial Interfaces

Serial Interfaces Overview

Supported Platforms SRX210, SRX220, SRX240, vSRX

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.

NOTE: **Starting with Junos OS Release 15.1X49-D10, serial interfaces are no longer supported on SRX300, SRX320, SRX340, SRX345, and SRX550HM devices.**

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 38 on page 540 lists and defines serial signals and their sources.

Table 38: 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

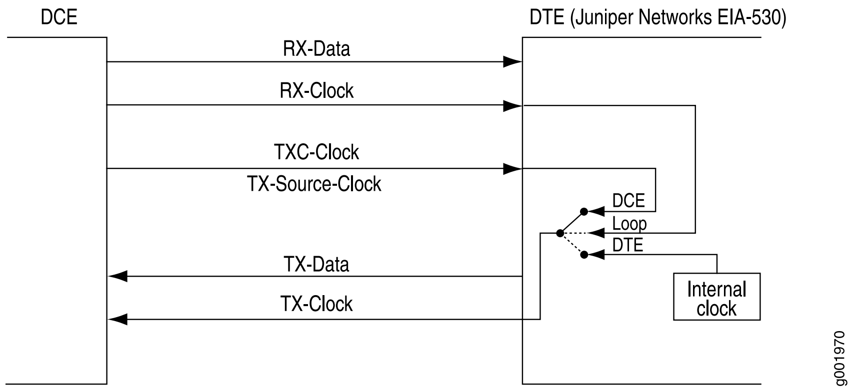
By default, a serial interface uses loop clocking to determine its timing source. For EIA-530 and V.35 interfaces, you can set each port independently to use one of the following clocking modes. X.21 interfaces can use only loop clocking mode.

- 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 31 on page 542 shows the clock sources for loop, DCE, and internal clocking modes.

Figure 31: 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 543
- RS-232 on page 543
- RS-422/449 on page 544
- V.35 on page 544
- X.21 on page 545

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.

Release History Table

Release	Description
15.1X49-D10	Starting with Junos OS Release 15.1X49-D10, serial interfaces are no longer supported on SRX300, SRX320, SRX340, SRX345, and SRX550HM devices.

Related Documentation

- Example: Configuring a Serial Interface on page 545
- Example: Deleting a Serial Interface on page 548

Example: Configuring a Serial Interface

Supported Platforms SRX210, SRX220, SRX240

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

NOTE: **Starting with Junos OS Release 15.1X49-D10, serial interfaces are no longer supported on SRX300, SRX320, SRX340, SRX345, and SRX550HM devices.**

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 547
- Verifying Interface Properties on page 547

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.

Release History Table

Release	Description
15.1X49-D10	Starting with Junos OS Release 15.1X49-D10, serial interfaces are no longer supported on SRX300, SRX320, SRX340, SRX345, and SRX550HM devices.

Related Documentation

- Serial Interfaces Overview on page 539
- Example: Deleting a Serial Interface on page 548

Example: Deleting a Serial Interface

Supported Platforms SRX210, SRX220, SRX240

This example shows how to delete a serial interface.

NOTE: **Starting with Junos OS Release 15.1X49-D10, 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.

Release History Table

Release	Description
15.1X49-D10	Starting with Junos OS Release 15.1X49-D10, serial interfaces are no longer supported on SRX300, SRX320, SRX340, SRX345, and SRX550HM devices.

Related Documentation

- Serial Interfaces Overview on page 539
- Example: Configuring a Serial Interface on page 545

Understanding the 8-Port Synchronous Serial GPIM

Supported Platforms SRX1500, SRX550

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: **Starting with Junos OS Release 15.1X49-D10, 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 39 on page 550 lists the features supported on the 8-port synchronous serial GPIM.

Table 39: 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)

Table 39: Supported Features *(continued)*

Features	Description
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
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

Release History Table

Release	Description
15.1X49-D10	Starting with Junos OS Release 15.1X49-D10, serial interfaces, including the 8-port synchronous serial GPIM, are no longer supported on SRX300, SRX320, SRX340, SRX345, and SRX550HM devices.

Related Documentation

- Example: Configuring an 8-Port Synchronous Serial GPIM in Back-to-Back SRX650 Services Gateways on page 552

Example: Configuring an 8-Port Synchronous Serial GPIM in Back-to-Back SRX650 Services Gateways

Supported Platforms SRX550, SRX650

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: **Starting with Junos OS Release 15.1X49-D10, 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 253.

Overview and Topology

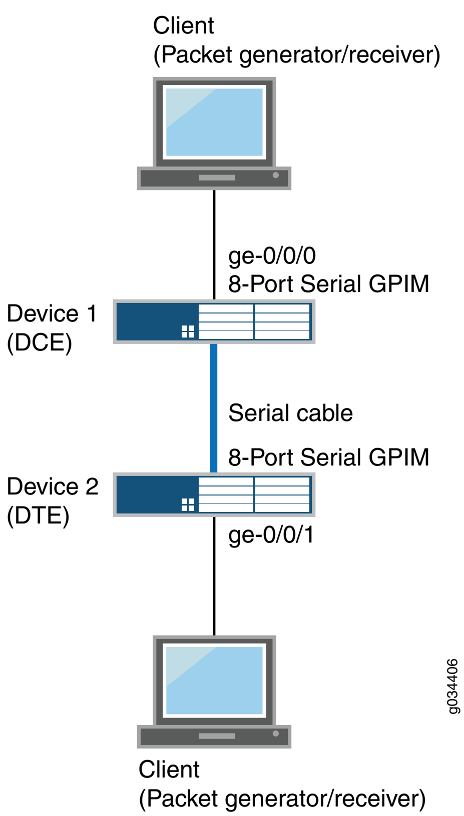
In this scenario, the configuration is done on two interfaces. All ports are configured with different encapsulations, such as Cisco High-Level Data Link Control (HDLC), Frame Relay, and Point-to-Point Protocol (PPP). When Frame Relay is set, then the data link connection identifier (in this example, 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 32 on page 553 shows the topology used in this example.

Figure 32: 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

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.

Release History Table

Release	Description
15.1X49-D10	Starting with Junos OS Release 15.1X49-D10, serial interfaces, including the 8-port synchronous serial GPIM, are no longer supported on SRX300, SRX320, SRX340, SRX345, and SRX550HM devices.

Related Documentation

- Understanding the 8-Port Synchronous Serial GPIM on page 549

PART 8

Configuration Statements and Operational Commands

CHAPTER 36

Configuration Statements

accept-source-mac

Supported Platforms SRX1500, SRX1500, SRX300, SRX320, SRX340, vSRX

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 247

access-point-name

Supported Platforms SRX300, SRX320, vSRX

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

Supported Platforms MX Series, vSRX

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 398

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)

Supported Platforms SRX300, SRX320, vSRX

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)

Supported Platforms SRX Series, vSRX

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 395

bundle (Interfaces)

Supported Platforms SRX Series, vSRX

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

Supported Platforms SRX Series

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

Supported Platforms SRX300, SRX320

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)

Supported Platforms SRX Series, vSRX

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)

Supported Platforms SRX Series, vSRX

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)

Supported Platforms NFX Series, SRX Series, vSRX

Syntax code-points [*aliases*] [*bit-patterns*];

Hierarchy Level [edit class-of-service classifiers (dscp) *classifier-name* forwarding-class *class-name* loss-priority *level*]

Release Information Statement introduced in Junos OS Release 12.1X44 for the SRX Series.
Statement introduced in Junos OS Release 11.1 for the QFX Series.
Statement introduced in Junos OS Release 14.1X53-D20 for the OCX Series.

Description Configure one or more 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 alias or aliases.

bit-patterns—Value of the code-point bits, in decimal form.

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

Related Documentation

- Understanding Interfaces on page 3
- *Example: Configuring BA Classifiers on Transparent Mode Devices*

compression-device (Interfaces)

Supported Platforms SRX Series, vSRX

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)

Supported Platforms SRX Series, vSRX

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

Supported Platforms LN Series

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 398

disable (PoE)

Supported Platforms SRX1500, SRX320, SRX340, SRX5400, SRX550M

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 357

dhcp (Interfaces)

Supported Platforms SRX Series, vSRX

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)

Supported Platforms SRX1500, SRX320, SRX340, SRX5400, SRX550M

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 352

encapsulation (Interfaces)

Supported Platforms SRX Series, vSRX

Syntax encapsulation (ether-vpls-ppp | ethernet-bridge | ethernet-ccc | ethernet-tcc | ethernet-vpls | extended-frame-relay-ccc | extended-frame-relay-tcc | extended-vlan-bridge | extended-vlan-ccc | extended-vlan-tcc | extended-vlan-vpls | frame-relay-port-ccc | vlan-ccc | vlan-vpls);

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

Release Information Statement introduced in Junos OS Release 9.5.

Description Specify logical link layer encapsulation.

Options

- **frame-relay**—Configure a Frame Relay encapsulation when the physical interface has multiple logical units, and the units are either point to point or multipoint.
- **multilink-frame-relay-uni-nni**—Link services interfaces functioning as FRF.16 bundles can use Multilink Frame Relay UNI NNI encapsulation.
- **ppp**—For normal mode (when the device is using only one ISDN B-channel per call). Point-to-Point Protocol is for communication between two computers using a serial interface.
- **ppp-over-ether**—This encapsulation is used for underlying interfaces of pp0 interfaces.

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

Related Documentation

- Understanding Physical Encapsulation on an Interface on page 361

family inet (Interfaces)

Supported Platforms SRX Series, vSRX

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

Supported Platforms SRX Series, vSRX

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;
      }
    }
```

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)

Supported Platforms SRX Series, vSRX

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)

Supported Platforms SRX1500, SRX300, SRX320, SRX340, vSRX

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.

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 55

flow-control (Interfaces)

Supported Platforms SRX Series, vSRX

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 only, explicitly enable flow control, which regulates the flow of packets from the device to the remote side of the connection. Enabling flow control is useful when the device is a Gigabit Ethernet switch.

Default Flow control is the default behavior.

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 247

flow-monitoring (Services)

Supported Platforms SRX Series, vSRX

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)

Supported Platforms SRX Series, vSRX

Syntax

```
forwarding-classes {
  class class-name {
    priority (high | low);
    queue-num number;
    spu-priority (high | low | medium-high | medium-low);
  }
  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.

Description Configure forwarding classes and assign queue numbers.

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-high**, **medium-low**, or **low**. The default **spu-priority** is **low**.

NOTE: The **spu-priority** option is only supported 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)

Supported Platforms vSRX

Syntax fpc;

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.

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

gratuitous-arp-reply

Supported Platforms ACX Series, EX Series, M Series, MX Series, SRX Series, T Series

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 Access 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

Supported Platforms SRX300, SRX320

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)

Supported Platforms SRX1500, SRX320, SRX340, SRX5400, SRX550M

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 349

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 398

inline-jflow (Forwarding Options)

Supported Platforms SRX Series, vSRX

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)

Supported Platforms vSRX

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)

Supported Platforms SRX1500, SRX320, SRX340, SRX5400, SRX550M

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 349

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 for Security Devices*

interval (Interfaces)

Supported Platforms LN Series

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 398

interval (PoE)

Supported Platforms SRX1500, SRX320, SRX340, SRX5400, SRX550M

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)

Supported Platforms SRX Series, vSRX

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

- *Juniper Networks Devices Processing Overview*
- Understanding Interfaces on page 3

ipv6-template (Services)

Supported Platforms SRX Series, vSRX

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

- *Juniper Networks Devices Processing Overview*
- Understanding Interfaces on page 3

lacp (Interfaces)

Supported Platforms SRX Series

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 283
- **periodic (Interfaces) on page 615**

latency (Interfaces)

Supported Platforms SRX Series, vSRX

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 395

lease-time

Supported Platforms EX Series, QFX Series, SRX Series, vSRX

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)

Supported Platforms SRX Series, vSRX

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 (Interfaces)

Supported Platforms SRX Series, vSRX

Syntax **(loopback | no-loopback);**

Hierarchy Level **[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, enable or disable loopback mode.

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

- Understanding Interfaces on page 3

loss-priority (CoS Loss Priority)

Supported Platforms SRX Series, vSRX

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 loss priority.

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

loss-priority (CoS Rewrite Rules)

Supported Platforms SRX Series, vSRX

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 for Security Devices*

loss-priority-maps (CoS Interfaces)

Supported Platforms SRX Series, vSRX

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)

Supported Platforms SRX Series, vSRX

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)

Supported Platforms SRX1500, SRX320, SRX340, SRX5400, SRX550M

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 352

maximum-power (PoE)

Supported Platforms SRX1500, SRX320, SRX340, SRX5400, SRX550M

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 352

media-type (Interfaces)

Supported Platforms SRX1500, SRX550M

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*

native-vlan-id (Interfaces)

Supported Platforms SRX Series, vSRX

Syntax native-vlan-id*vlan-id*;

Hierarchy Level [edit interfaces *interface-name*]

Release Information Statement introduced in Junos OS Release 9.5.

Description Configure VLAN identifier for untagged packets received on the physical interface of a trunk mode interface.

Options *vlan-id*—Configure a VLAN identifier for untagged packets. Enter a number from 0 through 4094.

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

next-hop-tunnel

Supported Platforms SRX Series, vSRX

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

Supported Platforms SRX Series

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)

Supported Platforms SRX Series, vSRX

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 on page 29

pic-mode (Chassis T1 Mode)

Supported Platforms SRX1500

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)

Supported Platforms SRX Series, vSRX

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 247

ppp-over-ether

Supported Platforms SRX1500, SRX300, SRX320, SRX340, SRX550M

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 247

pppoe

Supported Platforms SRX Series

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 247

pppoe-options

Supported Platforms SRX1500, SRX300, SRX320, SRX340, SRX550M

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 373

priority (PoE)

Supported Platforms SRX1500, SRX320, SRX340, SRX5400, SRX550M

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 352

profile (Access)

Supported Platforms SRX Series, vSRX

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

Supported Platforms SRX300, SRX320

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 247

promiscuous-mode (Interfaces)

Supported Platforms SRX Series, vSRX

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 258

quality (Interfaces)

Supported Platforms SRX Series, vSRX

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 395

r2cp

Supported Platforms SRX1500, SRX300, SRX320, SRX340, SRX550M

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 395

radio-router (Interfaces)

Supported Platforms SRX Series

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 395

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

Supported Platforms SRX Series, vSRX

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.

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

- *Example: Enabling Eight Queue Class of Service on Redundant Ethernet Interfaces*
- *Example: Configuring Chassis Cluster Redundant Ethernet Interfaces for IPv4 and IPv6 Addresses*

redundant-parent (Interfaces Fast Ethernet)

Supported Platforms SRX Series, vSRX

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 247

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*

resource (Interfaces)

Supported Platforms SRX Series, vSRX

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 395

retransmission-attempt

Supported Platforms EX Series, J Series, QFX Series, SRX Series

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

Supported Platforms SRX320

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 247

scheduler-map (CoS Virtual Channels)

Supported Platforms SRX Series, vSRX

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

Supported Platforms SRX Series, vSRX

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 247

server-address

Supported Platforms EX Series, QFX Series, SRX Series

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)

Supported Platforms SRX Series, vSRX

Syntax shaping-rate *rate*;

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.

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 is mutually exclusive. This means you can include the **shaping-rate** statement at the **[edit class-of-service interfaces interface *interface-name*]** hierarchy level or the **[edit class-of-service interfaces interface *interface-name* unit *logical-unit-number*]** hierarchy level, but not both.

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.

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: For logical interfaces, 1000 through 32,000,000,000 bps.

For physical interfaces, 1000 through 160,000,000,000 bps.

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 for Security Devices

simple-filter (Interfaces)

Supported Platforms SRX Series, vSRX

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 247

sip-password

Supported Platforms SRX300, SRX320

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 247

sip-user-id

Supported Platforms	SRX300, SRX320
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)

Supported Platforms SRX1500, SRX300, SRX320, SRX340, SRX550M, vSRX

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 247

source-filtering (Interfaces)

Supported Platforms SRX1500, SRX300, SRX320, SRX340, SRX550M, vSRX

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 247

speed (Interfaces)

Supported Platforms SRX1500, SRX550M

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 247
- Example: Configuring the 2-Port 10-Gigabit Ethernet XPIM Interface on page 316

telemetries (PoE)

Supported Platforms SRX1500, SRX320, SRX340, SRX5400, SRX550M

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 352

template-refresh-rate (Services)

Supported Platforms SRX Series, vSRX

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)

Supported Platforms SRX Series, vSRX

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 395

traceoptions (Interfaces)

Supported Platforms SRX Series, vSRX

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 395

update-server

Supported Platforms EX Series, J Series, QFX Series, SRX Series

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

Supported Platforms SRX Series, vSRX

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

Supported Platforms SRX320, SRX340, SRX550M

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 174

vendor-id (Interfaces)

Supported Platforms SRX Series, vSRX

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

vlan-tagging (Interfaces)

Supported Platforms SRX Series, vSRX

Syntax vlan-tagging native-vlan-id *vlan-id*;

Hierarchy Level [edit interfaces *interface*]

Release Information Statement introduced in Junos OS Release 9.5.

Description Configure VLAN identifier for untagged packets received on the physical interface of a trunk mode interface.

Options **native-vlan-id**—Configures a VLAN identifier for untagged packets. Enter a number from 0 through 4094.

NOTE: **The native-vlan-id can be configured only when either flexible-vlan-tagging mode or interface-mode trunk is configured.**

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

Related Documentation

- Configuring VLAN Tagging on page 55

web-authentication (Interfaces)

Supported Platforms SRX Series, vSRX

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 37

Operational Commands

- show services accounting aggregation template (View)
- show services accounting flow-detail (View)

clear oam ethernet connectivity-fault-management path-database

Supported Platforms SRX Series

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 647

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)

Supported Platforms SRX Series

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

Supported Platforms SRX1500, SRX300, SRX320, SRX340, SRX550M, vSRX

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 (View) on page 679show ethernet-switching table

List of Sample Output

clear ethernet-switching statistics mac-learning on page 649
clear ethernet-switching statistics mac-learning interface interface-name on page 649

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

Supported Platforms SRX1500, SRX300, SRX320, SRX340, SRX550M, vSRX

Syntax clear interfaces statistics <swfab0 | swfab1>

Release Information Command introduced in Junos OS Release 11.1.

Description Clears 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 650

Output Fields When you enter this command, you are provided feedback on the status of your request.

Sample Output

clear interfaces statistics <swfab0 | swfab1>

```
user@host> clear interfaces statistics <swfab0 | swfab1>
```


clear ipv6 neighbors

Supported Platforms SRX1500, SRX320, SRX340, SRX550M, vSRX

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 732

List of Sample Output clear ipv6 neighbors on page 651

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

Supported Platforms SRX Series, vSRX

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 738**
- Verifying LACP on Redundant Ethernet Interfaces on page 294

Output Fields This command produces no output.

restart (Reset)

Supported Platforms SRX Series, vSRX

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 657

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
```

show chassis fpc (View)

Supported Platforms SRX Series

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, 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 40 on page 658 summarizes the SRX5K-MPC3-40G10G (IOC3) PICs selected for various configuration scenarios.

Table 40: 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 40: 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

show chassis fpc on page 661
show chassis fpc (SRX5600 and SRX5800 devices) on page 661
show chassis fpc (SRX5400, SRX5600, and SRX5800 devices with SRX5K-MPC3-100G10G (IOC3) or SRX5K-MPC3-40G10G (IOC3) on page 661
show chassis fpc detail 2 on page 662
show chassis fpc pic-status (SRX5600 and SRX5800 devices) on page 662
show chassis fpc pic-status (SRX5600 and SRX5800 devices with SPC2) on page 662
show chassis fpc pic-status (SRX5600 and SRX5800 devices with SRX5K-MPC) on page 663
show chassis fpc pic-status (SRX5600 and SRX5800 devices when Express Path [formerly known as services offloading] is configured) on page 663
show chassis fpc pic-status (with 20-Gigabit Ethernet MIC with SFP) on page 664
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) on page 664
show chassis fpc pic-status for HA (SRX5600 and SRX5800 devices) on page 664
show chassis fpc pic-status for HA(SRX5400, SRX5600, and SRX5800 devices with SRX5K-MPC3-100G10G (IOC3) or SRX5K-MPC3-40G10G (IOC3) on page 665

Output Fields

Table 41 on page 660 lists the output fields for the **show chassis fpc** command. Output fields are listed in the approximate order in which they appear.

Table 41: 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.
Total CPU Utilization (%)	Total percentage of CPU being used by the FPC's processor.

Table 41: show chassis fpc Output Fields *(continued)*

Field Name	Field Description
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)

Supported Platforms SRX Series

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

- *Juniper Networks Devices Processing Overview*
- Interface Naming Conventions on page 9

Output Fields Table 42 on page 666 lists the output fields for the **show chassis hardware** command. Output fields are listed in the approximate order in which they appear.

Table 42: 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.
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.

Table 42: show chassis hardware Output Fields *(continued)*

Field Name	Field Description
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 42: 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, 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, 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 42: 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, 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, 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
Hardware inventory:
Item             Version  Part number  Serial number     Description
Chassis                                CM0715AK0021      SRX1500
Midplane         REV 08   750-058562   ACMA4255          SRX1500
CB 0             REV 08   711-053838   ACMA7529          CPU Board SRX700E
Routing Engine 0          BUILTIN      BUILTIN           SRX Routing Engine
FPC 0            REV 07   711-053832   ACMA3311          FEB
  PIC 0                   BUILTIN      BUILTIN           12x1G-T-4x1G-SFP-4x10G
    Xcvr 12      REV 01   740-014132   61521013          SFP-T
    Xcvr 13      REV 02   740-013111   A281604           SFP-T
    Xcvr 14      REV 02   740-011613   NRN30NV           SFP-SX
    Xcvr 15      REV 02   740-011613   NRN2PWV           SFP-SX
    Xcvr 16      REV 01   740-021308   AJA17B5           SFP+-10G-SR
    Xcvr 17      REV 01   740-021308   MSP056B           SFP+-10G-SR
    Xcvr 18      REV 01   740-031980   AS920WJ           SFP+-10G-SR
    Xcvr 19      REV 01   740-031980   AS92W5N           SFP+-10G-SR
Power Supply 0   REV 01   740-055217   1EDP42500JZ       PS 400W 90-264V AC in
Fan Tray 0                                              SRX1500 0, Front to Back
 Airflow - AFO
Fan Tray 1                                              SRX1500 1, Front to Back
 Airflow - AFO
Fan Tray 2                                              SRX1500 2, Front to Back
 Airflow - AFO
Fan Tray 3                                              SRX1500 3, Front to Back
 Airflow - AFO
```

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 (View)

Supported Platforms SRX Series

Syntax **show ethernet-switching mac-learning-log**

Release Information Command introduced in Junos OS Release 9.5.

Description Displays the event log of learned MAC addresses.

Required Privilege Level view

Related Documentation

- show ethernet-switching table (View) on page 679

Output Fields Table 43 on page 677 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 43: 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.
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

```
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 (View)

Supported Platforms SRX Series

Syntax **show ethernet-switching table (brief |detail |extensive) interface** ***interface-name***

Release Information Command introduced in Junos OS Release 9.5.

Description Displays the Ethernet switching table.

Options

- **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.

Required Privilege Level view

Related Documentation

- show ethernet-switching mac-learning-log (View) on page 677

Output Fields Table 44 on page 679 lists the output fields for the **show ethernet-switching table** command. Output fields are listed in the approximate order in which they appear.

Table 44: show ethernet-switching table Output Fields

Field Name	Field Description
VLAN	The name of a VLAN.
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

```
user@host> show ethernet-switching table
Ethernet-switching table: 57 entries, 17 learned
VLAN MAC address Type Age Interfaces
```



```
F2 * Flood - All-members
F2 00:00:5E:00:53:AC Learn 0 ge-0/0/44.0
F2 00:00:5E:00:53:AD Static - Router
Linux * Flood - All-members
Linux 00:00:5E:00:53:AE Static - Router
Linux 00:00:5E:00:53:AF Learn 0 ge-0/0/47.0
T1 * Flood - All-members
T1 00:00:5E:00:53:AA Learn 0 ge-0/0/46.0
T1 00:00:5E:00:53:AB Static - Router
T1 00:00:5E:00:53:AC Learn 0 ge-0/0/46.0
T1 00:00:5E:00:53:AD Static - Router
T10 * Flood - All-members
T10 00:00:5E:00:53:AE Static - Router
T10 00:00:5E:00:53:AF Learn 0 ge-0/0/46.0
T10 00:00:5E:00:53:AG Static - Router
T111 * Flood - All-members
T111 00:00:5E:00:53:AH Learn 0 ge-0/0/15.0
T111 00:00:5E:00:53:AI Static - Router
T111 00:00:5E:00:53:AJ Learn 0 ge-0/0/15.0
T2 * Flood - All-members
T2 00:00:5E:00:53:AK Static - Router
T2 00:00:5E:00:53:AL Learn 0 ge-0/0/46.0
T2 00:00:5E:00:53:AM Static - Router
T3 * Flood - All-members
T3 00:00:5E:00:53:AN Static - Router
T3 00:00:5E:00:53:AO Learn 0 ge-0/0/46.0
T3 00:00:5E:00:53:AP Static - Router
T4 * Flood - All-members
T4 00:00:5E:00:53:AQ Static - Router
T4 00:00:5E:00:53:AR Learn 0 ge-0/0/46.0
[output truncated]
```

Sample Output

show ethernet-switching table brief

```
user@host> show ethernet-switching table brief
Ethernet-switching table: 57 entries, 17 learned
VLAN MAC address Type Age Interfaces
F2 * Flood - All-members
F2 00:00:5E:00:53:AC Learn 0 ge-0/0/44.0
F2 00:00:5E:00:53:AE Static - Router
Linux * Flood - All-members
Linux 00:00:5E:00:53:AA Static - Router
Linux 00:00:5E:00:53:AB Learn 0 ge-0/0/47.0
T1 * Flood - All-members
T1 00:00:5E:00:53:AC Learn 0 ge-0/0/46.0
T1 00:00:5E:00:53:AD Static - Router
T1 00:00:5E:00:53:AE Learn 0 ge-0/0/46.0
T1 00:00:5E:00:53:AF Static - Router
T10 * Flood - All-members
T10 00:00:5E:00:53:AG Static - Router
T10 00:00:5E:00:53:AH Learn 0 ge-0/0/46.0
T10 00:00:5E:00:53:AI Static - Router
T111 * Flood - All-members
T111 00:00:5E:00:53:AJ Learn 0 ge-0/0/15.0
T111 00:00:5E:00:53:AK Static - Router
T111 00:00:5E:00:53:AL Learn 0 ge-0/0/15.0
T2 * Flood - All-members
T2 00:00:5E:00:53:AM Static - Router
T2 00:00:5E:00:53:AN Learn 0 ge-0/0/46.0
```



```
T2 00:00:5E:00:53:AO Static - Router
T3 * Flood - All-members
T3 00:00:5E:00:53:AP Static - Router
T3 00:00:5E:00:53:AQ Learn 0 ge-0/0/46.0
T3 00:00:5E:00:53:AR Static - Router
T4 * Flood - All-members
T4 00:00:5E:00:53:AS Static - Router
T4 00:00:5E:00:53:AT Learn 0 ge-0/0/46.0
[output truncated]
```

Sample Output

show ethernet-switching table detail

```
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

```
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

```
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)

Supported Platforms SRX1500, SRX300, SRX320, SRX340, SRX550M, vSRX

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 45 on page 684 lists the output fields for the **show igmp-snooping route** command. Output fields are listed in the approximate order in which they appear.

Table 45: 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 (SRX Series)

Supported Platforms SRX Series, vSRX

Syntax

show interfaces {
  <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 modified in Junos OS Release 9.5.

Description Display status information and statistics about interfaces on SRX Series appliance running Junos OS.

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

Options

- **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).

- **brief | detail | extensive | terse**—(Optional) Display the specified level of output.
- **controller**—(Optional) Show controller information.
- **descriptions**—(Optional) Display interface description strings.
- **destination-class**—(Optional) Show statistics for destination class.
- **diagnostics**—(Optional) Show interface diagnostics information.
- **far-end-interval**—(Optional) Show far end interval statistics.
- **filters**—(Optional) Show interface filters information.
- **flow-statistics**—(Optional) Show security flow counters and errors.
- **interval**—(Optional) Show interval statistics.
- **load-balancing**—(Optional) Show load-balancing status.
- **mac-database**—(Optional) Show media access control database information.
- **mc-ae**—(Optional) Show MC-AE configured interface information.
- **media**—(Optional) Display media information.
- **policers**—(Optional) Show interface policers information.
- **queue**—(Optional) Show queue statistics for this interface.
- **redundancy**—(Optional) Show redundancy status.
- **routing**—(Optional) Show routing status.
- **routing-instance**—(Optional) Name of routing instance.
- **snmp-index**—(Optional) SNMP index of interface.
- **source-class**—(Optional) Show statistics for source class.
- **statistics**—(Optional) Display statistics and detailed output.
- **switch-port**—(Optional) Front end port number (0..15).
- **transport**—(Optional) Show interface transport information.
- **zone**—(Optional) Interface's zone.

Required Privilege Level view

Related Documentation

- *Understanding Layer 2 Interfaces*

List of Sample Output

Output Fields Table 46 on page 689 lists the output fields for the **show interfaces** command. Output fields are listed in the approximate order in which they appear.

Table 46: 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 46: 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 46: 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 46: 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 46: 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 46: 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 46: 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

show interfaces 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: 00:1f:12:e4:b1:01, Hardware address: 00:1f:12:e4:b1:01
  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

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
```

Sample Output

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: 00:1f:12:e4:b1:01, Hardware address: 00:1f:12:e4:b1:01
 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
```

Sample Output

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: 00:1f:12:e4:b1:01, Hardware address: 00:1f:12:e4:b1:01
  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
```

Sample Output

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
```

Sample Output

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
```

Sample Output

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
```

Sample Output

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)
```

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
```

Sample Output

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:
```

Sample Output

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
....
```

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  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
```

Sample Output

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)

```
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:
.....
```

Sample Output

show interfaces load-balancing

```
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

```
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
```


Sample Output

show interfaces mac-database (All MAC Addresses on a Port)

```
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)

```
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  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
```

Sample Output

show interfaces mc-ae

```
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
```

Sample Output

show interfaces policers

```
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

```
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
```

Sample Output

show interfaces queue

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
..
..
```

Sample Output

show interfaces redundancy

```
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)

```
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

```
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
```

Sample Output

show interfaces routing brief

```
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

```
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
...
```

Sample Output

show interfaces routing-instance all

```
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
```

Sample Output

show interfaces snmp-index

```
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
```

Sample Output

show interfaces source-class all

```
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)
```

Sample Output

show interfaces statistics (Fast Ethernet)

```
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
```

Sample Output

show interfaces switch-port

```
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
```

Sample Output

show interfaces transport pm

```
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
```

Sample Output

show security zones

```
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

Supported Platforms SRX Series, vSRX

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.

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 720

Output Fields Table 47 on page 717 lists the output fields for the show interfaces diagnostics optics command. Output fields are listed in the general order in which they appear.

Table 47: 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).
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).

Table 47: show interfaces diagnostics optics Output Fields *(continued)*

Field Name	Field Description
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**.
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**.

Table 47: show interfaces diagnostics optics Output Fields *(continued)*

Field Name	Field Description
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.
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.

Table 47: show interfaces diagnostics optics Output Fields *(continued)*

Field Name	Field Description
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

Supported Platforms SRX Series, vSRX

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 9.

- **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
- *Juniper Networks Devices Processing Overview*
- Understanding Interfaces on page 3

List of Sample Output show interfaces flow-statistics (Gigabit Ethernet) on page 725

Output Fields Table 48 on page 723 lists the output fields for the **show interfaces flow-statistics** command. Output fields are listed in the approximate order in which they appear.

Table 48: 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 49 on page 723.

Table 49: 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 49: 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 49: 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

Supported Platforms vSRX

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.

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 729

Output Fields Table 50 on page 727 lists the output fields for the **show interfaces queue** command. Output fields are listed in the approximate order in which they appear.

Table 50: 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*.

Table 50: show interfaces queue Output Fields *(continued)*

Field Name	Field 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).
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.

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: 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 statistics (View)

Supported Platforms SRX Series, vSRX

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 730

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

Supported Platforms SRX Series

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

Supported Platforms SRX1500, SRX320, SRX340, SRX550M, vSRX

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 651

List of Sample Output show ipv6 neighbors on page 732

Output Fields Table 51 on page 732 lists the output fields for the **show ipv6 neighbors** command. Output fields are listed in the approximate order in which they appear.

Table 51: 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)

Supported Platforms SRX Series

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 294

List of Sample Output

show lacp interfaces (Aggregated Ethernet) on page 736
show lacp interfaces (Redundant Ethernet) on page 737
show lacp interfaces (Gigabit Ethernet) on page 737

Output Fields Table 52 on page 734 lists the output fields for the **show lacp interfaces** command. Output fields are listed in the approximate order in which they appear.

Table 52: show lacp interfaces Output Fields

Field Name	Field Description
Aggregated interface	Aggregated interface value.

Table 52: 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 52: 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)

Supported Platforms EX Series, MX Series, NFX Series, OCX1100, PTX Series, QFabric System, QFX Series, T Series

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 294
- *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 739

Output Fields Table 53 on page 738 lists the output fields for the **show lacp statistics interfaces** command. Output fields are listed in the approximate order in which they appear.

Table 53: show lacp statistics interfaces Output Fields

Field Name	Field Description
Aggregated interface	Aggregated interface value.
LACP Statistics	LACP statistics provide the following information: • **LACP Rx**—LACP received counter that increments for each normal hello. • **LACP Tx**—Number of LACP transmit packet errors logged. • **Unknown Rx**—Number of unrecognized packet errors logged. • **Illegal Rx**—Number of invalid packets received.

Sample Output

show lacp statistics interfaces

```
user@host> show lacp statistics interfaces ae0
Aggregated interface: ae0
    LACP Statistics:       LACP Rx     LACP Tx   Unknown Rx   Illegal Rx
      ge-2/0/0                1352        2035            0            0
      ge-2/0/1                1352        2056            0            0
      ge-2/2/0                1352        2045            0            0
      ge-2/2/1                1352        2043            0            0
```

show oam ethernet link-fault-management

Supported Platforms SRX Series

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 647**
- *clear oam ethernet connectivity-fault-management statistics*
- Understanding Ethernet OAM Link Fault Management for SRX Series Services Gateways on page 341
- Example: Configuring Ethernet OAM Link Fault Management on page 344

List of Sample Output

show oam ethernet link-fault-management brief on page 744
show oam ethernet link-fault-management detail on page 744

Output Fields Table 54 on page 740 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 54: 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
Discovery state	State of the discovery mechanism: • **Passive Wait** • **Send Any** • **Send Local Remote** • **Send Local Remote Ok**	All levels

Table 54: show oam ethernet link-fault-management Output Fields *(continued)*

Field Name	Field Description	Level of Output
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		
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**

Table 54: show oam ethernet link-fault-management Output Fields *(continued)*

Field Name	Field Description	Level of Output
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**
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 54: 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 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**
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)

Supported Platforms SRX1500, SRX320, SRX340, SRX550M

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 352

Output Fields Table 55 on page 745 lists the output fields for the **show poe controller** command. Output fields are listed in the approximate order in which they appear.

Table 55: 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

Supported Platforms SRX1500, SRX300, SRX320, SRX340, SRX550M

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 247

List of Sample Output

show pppoe interfaces on page 748
show pppoe interfaces brief on page 748
show pppoe interfaces detail on page 748
show pppoe interfaces extensive on page 748

Output Fields Table 56 on page 746 lists the output fields for the **show pppoe interfaces** command. Output fields are listed in the approximate order in which they appear.

Table 56: 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).
Configured AC name	Configured access concentrator name.

Table 56: show pppoe interfaces Output Fields *(continued)*

Field Name	Field Description
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.
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

Supported Platforms SRX1500, SRX300, SRX320, SRX340

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 746
- Understanding Ethernet Interfaces on page 247

List of Sample Output show pppoe statistics on page 751

Output Fields Table 57 on page 750 lists the output fields for the **show pppoe statistics** command. Output fields are listed in the approximate order in which they appear.

Table 57: 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 57: 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

Supported Platforms SRX1500, SRX320, SRX340, SRX550M

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 352

Output Fields Table 58 on page 752 lists the output fields for the **show poe telemetries interface** command. Output fields are listed in the approximate order in which they appear.

Table 58: 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

Supported Platforms SRX Series, vSRX

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 on page 29

List of Sample Output

show services accounting status inline-jflow on page 755
show services accounting errors inline-jflow on page 755
show service accounting flow inline-jflow on page 755

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)

Supported Platforms SRX1500, SRX300, SRX320, SRX340, SRX550M, vSRX

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 on page 29

show services accounting aggregation template (View)

Supported Platforms SRX1500, SRX300, SRX320, SRX340, SRX550M, vSRX

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 on page 29

show services accounting flow-detail (View)

Supported Platforms SRX1500, SRX300, SRX320, SRX340, SRX550M, vSRX

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 on page 29