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Junos® OS Interfaces Fundamentals for Routing Devices
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The information in this document is current as of the date on the title page.

YEAR 2000 NOTICE

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Use this guide to configure, monitor and troubleshoot various interfaces installed on a Juniper Networks router with the Junos OS command-line interface (CLI).

**Documentation and Release Notes**

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

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

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**Using the Examples in This Manual**

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

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

Merging a Full Example

To merge a full example, follow these steps:

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

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

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

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

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

To merge a snippet, follow these steps:

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

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

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

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

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

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

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

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

Documentation Conventions

Table 1 on page xviii defines notice icons used in this guide.
### Table 1: Notice Icons

<table>
<thead>
<tr>
<th>Icon</th>
<th>Meaning</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="Informational note icon" /></td>
<td>Informational note</td>
<td>Indicates important features or instructions.</td>
</tr>
<tr>
<td><img src="image" alt="Caution icon" /></td>
<td>Caution</td>
<td>Indicates a situation that might result in loss of data or hardware damage.</td>
</tr>
<tr>
<td><img src="image" alt="Warning icon" /></td>
<td>Warning</td>
<td>Alerts you to the risk of personal injury or death.</td>
</tr>
<tr>
<td><img src="image" alt="Laser warning icon" /></td>
<td>Laser warning</td>
<td>Alerts you to the risk of personal injury from a laser.</td>
</tr>
<tr>
<td><img src="image" alt="Tip icon" /></td>
<td>Tip</td>
<td>Indicates helpful information.</td>
</tr>
<tr>
<td><img src="image" alt="Best practice icon" /></td>
<td>Best practice</td>
<td>Alerts you to a recommended use or implementation.</td>
</tr>
</tbody>
</table>

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

### Table 2: Text and Syntax Conventions

<table>
<thead>
<tr>
<th>Convention</th>
<th>Description</th>
<th>Examples</th>
</tr>
</thead>
</table>
| **Bold text like this** | Represents text that you type. | To enter configuration mode, type the `configure` command:  
```  
user@host> configure  
``` |
| **Fixed-width text like this** | Represents output that appears on the terminal screen. | user@host> `show chassis alarms`  
No alarms currently active |
| **Italic text like this** | • Introduces or emphasizes important new terms.  
• Identifies guide names.  
• Identifies RFC and Internet draft titles. | • A policy term is a named structure that defines match conditions and actions.  
• *Junos OS CLI User Guide*  
• RFC 1997, *BGP Communities Attribute* |
<table>
<thead>
<tr>
<th>Convention</th>
<th>Description</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Italic text like this</em></td>
<td>Represents variables (options for which you substitute a value) in commands or configuration statements.</td>
<td>Configure the machine’s domain name:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>[edit] root@# set system domain-name domain-name</td>
</tr>
<tr>
<td><em>Text like this</em></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 <code>stub</code> statement at the <code>[edit protocols ospf area area-id]</code> hierarchy level.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• The console port is labeled <code>CONSOLE</code>.</td>
</tr>
<tr>
<td><code>&lt; &gt;</code> (angle brackets)</td>
<td>Encloses optional keywords or variables.</td>
<td>stub <code>&lt;default-metric metric&gt;</code>;</td>
</tr>
<tr>
<td><code>(pipe symbol)</code></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</td>
</tr>
<tr>
<td><code>#</code> (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><code>[ ]</code> (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>[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>
<td></td>
</tr>
</tbody>
</table>
### Table 2: Text and Syntax Conventions (continued)

<table>
<thead>
<tr>
<th>Convention</th>
<th>Description</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Bold text like this</strong></td>
<td>Represents graphical user interface (GUI) items you click or select.</td>
<td>• In the Logical Interfaces box, select <strong>All Interfaces</strong>.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• To cancel the configuration, click <strong>Cancel</strong>.</td>
</tr>
<tr>
<td>&gt; (bold right angle bracket)</td>
<td>Separates levels in a hierarchy of menu selections.</td>
<td>In the configuration editor hierarchy, select <strong>Protocols&gt;Osfp</strong>.</td>
</tr>
</tbody>
</table>

### Documentation Feedback

We encourage you to provide feedback so that we can improve our documentation. You can use either of the following methods:

- **Online feedback system**—Click TechLibrary Feedback, on the lower right of any page on the Juniper Networks TechLibrary site, and do one of the following:
  
  ![Feedback](image)

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

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

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

Creating a Service Request with JTAC

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

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

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

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CHAPTER 1

Router Interfaces Overview

IN THIS CHAPTER

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- Understanding Transient Interfaces | 5
- Understanding Services Interfaces | 7
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- TX Matrix Plus and T1600 Router (Routing Matrix) Management Ethernet Interfaces | 13
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Router Interfaces Overview

Routers typically contain several different types of interfaces suited to various functions. For the interfaces on a router to function, you must configure them. Specify the interface location (that is, the slot where the Flexible PIC Concentrator [FPC], Dense Port Concentrator [DPC], or Modular Port Concentrator [MPC] is installed. You must also specify the location of the Physical Interface Card [PIC] or Modular Interface Card [MIC], and the interface type, for example, SONET/SDH, Asynchronous Transfer Mode [ATM], or Ethernet). Finally, you must specify the encapsulation type and any interface-specific properties that may apply.

You can configure interfaces that are currently present in the router, as well as interfaces that are not currently present but that are expected to be added in the future. Junos OS detects the interface once the hardware has been installed and applies the pre-set configuration to it.

To see which interfaces are currently installed in the router, issue the `show interfaces terse` operational mode command. If an interface is listed in the output, it is physically installed in the router. If an interface is not listed in the output, it is not installed in the router.

For information about which interfaces are supported on your router, see your router’s Interface Module Reference.

You can configure Junos OS class-of-service (CoS) properties to provide a variety of classes of service for different applications, including multiple forwarding classes for managing packet transmission, congestion management, and CoS-based forwarding. For more information about configuring CoS properties, see the Class of Service User Guide (Routers and EX9200 Switches).

RELATED DOCUMENTATION

| Interfaces Fundamentals for Routing Devices |

Types of Interfaces Overview

Interfaces can be permanent or transient, and are used for networking or services:

- Permanent interfaces—Interfaces that are always present in the router.
  
  Permanent interfaces in the router consist of management Ethernet interfaces and internal Ethernet interfaces, which are described separately in the following topics:

  - Understanding Management Ethernet Interfaces
• Understanding Internal Ethernet Interfaces on page 15

• Transient interfaces—Interfaces that can be inserted into or removed from the router depending on your network configuration needs.

• Networking interfaces—Interfaces, such as Ethernet or SONET/SDH interfaces, that primarily provide traffic connectivity.

• Services interfaces—Interfaces that provide specific capabilities for manipulating traffic before it is delivered to its destination.

• Container interfaces—Interfaces that support automatic protection switching (APS) on physical SONET links using a virtual container infrastructure.

Junos OS internally generates nonconfigurable interfaces which are described in Interfaces Command Reference and Services Interfaces.

RELATED DOCUMENTATION

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<tr>
<td>Understanding Services Interfaces</td>
</tr>
<tr>
<td>Understanding Container Interfaces</td>
</tr>
</tbody>
</table>

See also the following sections regarding specific networking interface technologies used in your routers:

• ATM Interfaces Overview

• Channelized Interfaces Overview

• Circuit Emulation Interfaces: Understanding Mobile Backhaul

• E1 Interfaces Overview and E3 Interfaces Overview

• Ethernet Interfaces Overview

• Frame Relay Overview

• SONET/SDH Interfaces Overview

• T1 Interfaces Overview and T3 Interfaces Overview

Understanding Transient Interfaces

The M Series, MX Series, and T Series routers contain slots for installing Flexible PIC Concentrator [FPC] or Dense Port Concentrator [DPC] (for MX Series routers) or Modular Port Concentrator [MPC] (for MX Series routers). Physical Interface Card [PIC] can be installed in FPCs. Modular Interface Card [MIC] can be inserted into MPCs.
The number of PICs that can be installed varies by router and type of FPC. The PICs provide the actual physical interfaces to the network. The MX Series routers contain slots for installing either DPC boards that provide the physical interfaces to the network or for installing FPCs in which PICs can be installed.

You can insert any DPC or FPC into any slot that supports them in the appropriate router. Typically, you can place any combination of PICs, compatible with your router, in any location on an FPC. (You are limited by the total FPC bandwidth, and by the fact that some PICs physically require two or four of the PIC locations on the FPC. In some cases, power limitations or microcode limitations may also apply.) To determine DPC and PIC compatibility, see the see your router’s Interface Module Reference.

You can insert MPC into any slot that supports them in the appropriate router. You can install up to two MICs of different media types in the same MPC as long as the MPC supports those MICs.

These physical interfaces are transient interfaces of the router. They are referred to as transient because you can hot-swap a DPC or FPC or MPC and its PICs or MICs at any time.

You must configure each transient interface based on the slot in which the FPC or DPC or MPC is installed, the location in which the PIC or MIC is installed, and for multiple port PICs or MICs, the port to which you are connecting.

You can configure the interfaces on PICs or MICs that are already installed in the router as well as interfaces on PICs or MICs that you plan to install later. The Junos OS detects which interfaces are actually present, so when the software activates its configuration, it activates only the present interfaces and retains the configuration information for the interfaces that are not present. When the Junos OS detects that an FPC containing PICs or MPC containing MICs has been inserted into the router, the software activates the configuration for those interfaces.

RELATED DOCUMENTATION

| Types of Interfaces Overview | 4 |
| Understanding Permanent Interfaces |
| Understanding Management Ethernet Interfaces |
| Understanding Internal Ethernet Interfaces | 15 |
| Supported Routing Engines by Router |
| Understanding Services Interfaces | 7 |
| Understanding Container Interfaces | 8 |
| Interface Encapsulations Overview | 34 |
| Interface Descriptors Overview | 47 |
| Interface Naming Overview | 17 |
| Displaying Interface Configurations Overview | 51 |
Understanding Services Interfaces

Services interfaces enable you to incrementally add services to your network. The Junos OS supports the following services PICs:

- **Adaptive Services (AS) PICs**—Allow you to provide multiple services on a single PIC by configuring a set of services and applications. The AS PICs offer a special range of services you configure in one or more service sets.

- **ESPIC**—Provides a security suite for the IP version 4 (IPv4) and IP version 6 (IPv6) network layers. The suite provides functionality such as authentication of origin, data integrity, confidentiality, replay protection, and nonrepudiation of source. It also defines mechanisms for key generation and exchange, management of security associations, and support for digital certificates.

- **Monitoring Services PICs**—Enable you to monitor traffic flow and export the monitored traffic. Monitoring traffic allows you to gather and export detailed information about IPv4 traffic flows between source and destination nodes in your network; sample all incoming IPv4 traffic on the monitoring interface and present the data in cflowd record format; perform discard accounting on an incoming traffic flow; encrypt or tunnel outgoing cflowd records, intercepted IPv4 traffic, or both; and direct filtered traffic to different packet analyzers and present the data in its original format. On a Monitoring Services PIC, you can configure either monitoring interfaces or collector interfaces. A collector interface allows you to combine multiple cflowd records into a compressed ASCII data file and export the file to an FTP server.

- **Multilink Services, MultiServices, Link Services, and Voice Services PICs**—Enable you to split, recombine, and sequence datagrams across multiple logical data links. The goal of multilink operation is to coordinate multiple independent links between a fixed pair of systems, providing a virtual link with greater bandwidth than any of the members.

- **Tunnel Services PIC**—By encapsulating arbitrary packets inside a transport protocol, tunneling provides a private, secure path through an otherwise public network. Tunnels connect discontinuous subnetworks and enable encryption interfaces, virtual private networks (VPNs), and Multiprotocol Label Switching (MPLS).

- On M Series and T Series routers, logical tunnel interfaces allow you to connect logical systems, virtual routers, or VPN instances. For more information about VPNs, see the Junos OS VPNs Library for Routing Devices. For more information about configuring tunnels, see the Junos OS Services Interfaces Library for Routing Devices.

**RELATED DOCUMENTATION**

- Types of Interfaces Overview | 4
Understanding Container Interfaces

Container interfaces provide the following features:

- Automatic protection switching (APS) on SONET/SDH and ATM links are supported using the container infrastructure.
- Container physical interfaces and logical interfaces remain up on switchover.
- APS parameters are auto-copied from the container interface to the member links.

**NOTE:** Paired groups and true unidirectional APS are not currently supported.

For more information on SONET/SDH configuration, see Configuring Container Interfaces for APS on SONET Links.

Container interfaces features are described in the following sections:

**Understanding Traditional APS Concept**

Traditional APS is configured on two independent physical SONET/SDH interfaces: one configured as the working circuit and the other as the protect circuit (see Figure 1 on page 9). The circuit, named Circuit X in the figure, is the link between the two SONET interfaces.
Traditional APS uses routing protocols that run on each individual SONET/SDH interface (since circuit is an abstract construct, instead of being an actual interface). When the working link goes down, the APS infrastructure brings up the protect link and its underlying logical interfaces, and brings down the working link and its underlying logical interfaces, causing the routing protocols to reconverge. This consumes time and leads to traffic loss even though the APS infrastructure has performed the switch quickly.

**Container Interfaces Concept**

To solve this problem, the Junos OS provides a soft interface construct called a container interface (see **Figure 2 on page 9**).

The container interface allows routing protocols to run on the logical interfaces associated with a virtual container interface instead of on the physical SONET/SDH and ATM interfaces. When APS switches the underlying physical link based on a fault condition, the container interface remains up, and the logical interface on the container interface does not flap. The routing protocols remain unaware of the APS switching.
APS Support for Container-Based Interfaces

With the container interface, APS is configured on the container interface itself. Individual member SONET/SDH and ATM links are either marked as primary (corresponding to the working circuit) or standby (corresponding to the protect circuit) in the configuration. No circuit or group name is specified in the container interface model; physical SONET/SDH and ATM links are put in an APS group by linking them to a single container interface. APS parameters are specified at the container interface level, and are propagated to the individual SONET/SDH and ATM links by the APS daemon.

Autocopy of APS Parameters

Typical applications require copying APS parameters from the working circuit to the protect circuit, since most of the parameters must be the same for both circuits. This is automatically done in the container interface. APS parameters are specified only once under the container physical interface configuration, and are internally copied over to the individual physical SONET/SDH and ATM links.

RELATED DOCUMENTATION

- Configuring Container Interfaces for APS on SONET Links
- Displaying APS Using a Container Interface with ATM Encapsulation

Understanding Interfaces on ACX Series Universal Metro Routers

The ACX Series routers support time-division multiplexing (TDM) T1 and E1 interfaces and Ethernet (1 GbE copper, 1GbE, 10 GbE, and 40 GbE fiber) interfaces to support both the legacy and evolution needs of the mobile network. Support for Power over Ethernet (PoE+) at 65 watts per port mitigates the need for additional electrical cabling for microwaves or other access interfaces.

The ACX Series routers support the following:

- TDM T1 and E1 ports:
  - The ACX1000 router contains eight T1 or E1 ports.
  - The ACX2000 router contains 16 T1 or E1 ports.
- Inverse Multiplexing for ATM (IMA)

NOTE: ACX5048 and ACX5096 routers do not support T1 or E1 ports and Inverse Multiplexing for ATM (IMA).
• Gigabit Ethernet ports:

- The ACX1000 router contains eight Gigabit Ethernet ports. The ACX1000 router also supports either four RJ45 (Cu) ports or installation of four Gigabit Ethernet small form-factor pluggable (SFP) transceivers.

- The ACX2000 router contains 16 Gigabit Ethernet ports and two PoE ports. The ACX2000 router also supports installation of two Gigabit Ethernet SFP transceivers and two 10-Gigabit Ethernet SFP+ transceivers.

- The ACX5448 router is a 10-Gigabit Ethernet enhanced small form-factor pluggable (SFP+) top-of-rack router with 48 SFP+ ports, and four 100-Gigabit Ethernet QSFP28 ports. Each SFP+ port can operate as a native 10-Gigabit Ethernet port, or as a 1-Gigabit Ethernet port when 1-Gigabit optics are inserted. The 48 ports on ACX5448 router can be configured as 1GE or 10GE modes and these ports are represented by xe interface type. The PIC 1 of FPC 0 has 4x100GE ports, where each port can be channelized as 1x100GE, or 1x40GE, or 4x25GE modes and these ports are represented by et interface type. By default, the port speed in PIC 1 is 100GE.

  **NOTE:** The ACX5448 router do not support Pseudowire Services interface.

  **NOTE:** 40GbE is supported only on ACX5048, ACX5096, and ACX5448 routers. ACX5448 router support 40GbE channeling to 10GbE.

**T1 and E1 Time-Division Multiplexing (TDM) Interfaces**

On the ACX Series routers, existing Junos OS TDM features are supported without changes to statements or functionality. The following key TDM features for T1 (ct1) interfaces and E1 (ce1) interfaces are supported:

- T1 and E1 channelization
- T1 and E1 encapsulation
- Alarms, defects, and statistics
- External and internal loopback
- TDM class of service (CoS)

T1 and E1 mode selection is at the PIC level. To set the T1 or E1 mode at the PIC level, include the `framing` statement with the `t1` or `e1` option at the `[chassis fpc slot-number pic slot-number]` hierarchy level. All ports can be T1 or E1. Mixing T1s and E1s is not supported.
T1 or E1 BITS Interface (ACX2000)

The ACX2000 router has a T1 or E1 building-integrated timing supply (BITS) interface that you can connect to an external clock. After you connect the interface to the external clock, you can configure the BITS interface so that the BITS interface becomes a candidate source for chassis synchronization to the external clock. The frequency of the BITS interface depends on the Synchronous Ethernet equipment slave clock (EEC) selected with the `network-option` statement at the `[edit chassis synchronization]` hierarchy level.

**NOTE:** The ACX1000 router does not support the BITS interface.

Inverse Multiplexing for ATM (IMA)

Defined by the ATM Forum, IMA specification version 1.1 is a standardized technology used to transport ATM traffic over a bundle of T1 and E1 interfaces, also known as an IMA group. Up to eight links per bundle and 16 bundles per PIC are supported. The following key IMA features are supported:

- IMA Layer 2 encapsulation
- ATM CoS
- ATM policing and shaping
- Denied packets counter in the output for the `show interfaces at-fpc/pic/port extensive` command

Gigabit Ethernet interfaces

On the ACX Series routers, existing Junos OS Ethernet features are supported without changes to statements or functionality. The following key features are supported:

- Media type specification (ACX1000 router with Gigabit Ethernet SFP and RJ45 interfaces)
- Autonegotiation for RJ45 Gigabit Ethernet interfaces
- Event handling of SFP insertion and removal
- Explicit disabling of the physical interface
- Flow control

**NOTE:** The ACX Series router does not support flow control based on PAUSE frames.

- Loopback
- Loss of signal (LOS) alarm
• Media access control (MAC) layer features
• Maximum transmission unit (MTU)
• Remote fault notification for 10-Gigabit Ethernet interfaces
• Statistics collection and handling
• Power over Ethernet (PoE) (ACX2000 router)
• High power mode

The Gigabit Ethernet ports on the router have the capacity to work as a 1 or 10-Gigabit Ethernet interface, depending on the type of small form-factor pluggable (SFP) transceiver inserted. When you insert an SFP+ transceiver, the interface works at the 10-Gigabit speed. When you insert an SFP transceiver, the interface works at the 1-Gigabit speed. Configuration is not required because the speed is determined automatically based on the type of inserted SFP transceiver. The dual-speed interface is automatically created with the `xe` prefix, for example, `xe-4/0/0`.

The same configuration statements are used for both speeds and CoS parameters are scaled as a percentage of the port speed. To configure a dual-speed Gigabit Ethernet interface, include the `interface xe-fpc/pic/port` statement at the [edit interfaces] hierarchy level. To display the interface speed and other details, issue the `show interfaces` command.

NOTE: You need to use industrial grade of SFP below 0dC for ACX 1100 and ACX 2100 boards.

RELATED DOCUMENTATION

| Understanding Encapsulation on an Interface |
| Configuring Inverse Multiplexing for ATM (IMA) on ACX Series |
| Interface Names for ACX Series Universal Metro Routers | 49 |

TX Matrix Plus and T1600 Router (Routing Matrix) Management Ethernet Interfaces

For TX Matrix Plus Routers and for T1600 Core Routers with RE-C1800 configured in a routing matrix, the Junos OS automatically creates the router’s management Ethernet interface, `em0`. To use `em0` as a management port, you must configure its logical port, `em0.0`, with a valid IP address.
When you enter the `show interfaces` command on a TX Matrix Plus router, the management Ethernet interfaces (and logical interfaces) are displayed:

```
user@host> show interfaces ?
...
em0
em0.0
...
```

**NOTE:** The Routing Engines in the TX Matrix Plus router and in the T1600 routers with RE-C1800 configured in a routing matrix do not support the management Ethernet interface `fxp0`, or the internal Ethernet interfaces `fxp1` or `fxp2`.

**RELATED DOCUMENTATION**

- Understanding Internal Ethernet Interfaces | 15
- T1600 Routers (Routing Matrix) Internal Ethernet Interfaces | 17
- Displaying Internal Ethernet Interfaces for a Routing Matrix with a TX Matrix Plus Router
- `show interfaces` (M Series, MX Series, T Series Routers, and PTX Series Management and Internal Ethernet)
Understanding Internal Ethernet Interfaces

Within a router or packet transport router, internal Ethernet interfaces provide communication between the Routing Engine and the Packet Forwarding Engines. The Junos OS automatically configures internal Ethernet interfaces when the Junos OS boots. The Junos OS boots the packet-forwarding component hardware. When these components are running, the Control Board uses the internal Ethernet interface to transmit hardware status information to the Routing Engine. Information transmitted includes the internal router temperature, the condition of the fans, whether an FPC has been removed or inserted, and information from the LCD on the craft interface.

To determine the supported internal Ethernet interfaces for your router, see Supported Routing Engines by Router.

**NOTE:** Do not modify or remove the configuration for the internal Ethernet interface that the Junos OS automatically configures. If you do, the router or packet transport router will stop functioning.

- **M Series, and MX Series routers and T Series routers**—The Junos OS creates the internal Ethernet interface. The internal Ethernet interface connects the Routing Engine re0 to the Packet Forwarding Engines.
  
  If the router has redundant Routing Engines, another internal Ethernet interface is created on each Routing Engine (re0 and re1) in order to support fault tolerance, two physical links between re0 and re1 connect the independent control planes. If one of the links fails, both Routing Engines can use the other link for IP communication.

- **TX Matrix Plus routers**—On a TX Matrix Plus router, the Routing Engine and Control Board function as a unit, or host subsystem. For each host subsystem in the router, the Junos OS automatically creates two internal Ethernet interfaces, ixgbe0 and ixgbe1.
  
  The ixgbe0 and ixgbe1 interfaces connect the TX Matrix Plus Routing Engine to the Routing Engines of every line-card chassis (LCC) configured in the routing matrix.

  The TX Matrix Plus Routing Engine connects to a high-speed switch through a 10-Gbps link within the host subsystem. The switch provides a 1-Gbps link to each T1600 Routing Engine. The 1-Gbps links are provided through the UTP Category 5 Ethernet cable connections between the TXP-CBs and the LCC-CBs in the LCCs.

  - The TX Matrix Plus Routing Engine connects to a high-speed switch in the local Control Board through a 10-Gbps link within the host subsystem.
  
  - The Gigabit Ethernet switch connects the Control Board to the remote Routing Engines of every LCC configured in the routing matrix.
If a TX Matrix Plus router contains redundant host subsystems, the independent control planes are connected by two physical links between the two 10-Gigabit Ethernet ports on their respective Routing Engines.

- The primary link to the remote Routing Engine is at the \texttt{ixgbe0} interface; the 10-Gigabit Ethernet switch on the local Control Board also connects the Routing Engine to the 10-Gigabit Ethernet port accessed by the \texttt{ixgbe1} interface on the remote Routing Engine.

- The alternate link to the remote Routing Engine is the 10-Gigabit Ethernet port at the \texttt{ixgbe1} interface. This second port connects the Routing Engine to the 10-Gigabit Ethernet switch on the remote Control Board, which connects to the 10-Gigabit Ethernet port at the \texttt{ixgbe0} interface on the remote Routing Engine.

If one of the two links between the host subsystems fails, both Routing Engines can use the other link for IP communication.

- LCC in a routing matrix—On an LCC configured in a routing matrix, the Routing Engine and Control Board function as a unit, or host subsystem. For each host subsystem in the LCC, the Junos OS automatically creates two internal Ethernet interfaces, \texttt{bcm0} and \texttt{em1}, for the two Gigabit Ethernet ports on the Routing Engine.

  The \texttt{bcm0} interface connects the Routing Engine in each LCC to the Routing Engines of every other LCC configured in the routing matrix.

  - The Routing Engine connects to a Gigabit Ethernet switch on the local Control Board through a.

  - The switch connects the Control Board to the remote Routing Engines of every other LCC configured in the routing matrix.

If an LCC in a routing matrix contains redundant host subsystems, the independent control planes are connected by two physical links between the Gigabit Ethernet ports on their respective Routing Engines.

- The primary link to the remote Routing Engine is at the \texttt{bcm0} interface; the Gigabit Ethernet switch on the local Control Board also connects the Routing Engine to the Gigabit Ethernet port accessed by the \texttt{em1} interface on the remote Routing Engine.

- The alternate link to the remote Routing Engine is at the \texttt{em1} interface. This second port connects the Routing Engine to the Gigabit Ethernet switch on the remote Control Board, which connects to the Gigabit Ethernet port at the \texttt{bcm0} interface on the remote Routing Engine.

If one of the two links between the host subsystems fails, both Routing Engines can use the other link for IP communication.

Each router also has two serial ports, labeled \texttt{console} and \texttt{auxiliary}, for connecting tty type terminals to the router using standard PC-type tty cables. Although these ports are not network interfaces, they do provide access to the router.
T1600 Routers (Routing Matrix) Internal Ethernet Interfaces

On a T1600 router configured in a routing matrix, the Routing Engine (RE-TXP-LCC) and Control Board (LCC-CB) function as a unit, or host subsystem. For each host subsystem in the router, the Junos OS automatically creates two internal Ethernet interfaces, \texttt{bcm0} and \texttt{em1}, for the two Gigabit Ethernet ports on the Routing Engine.
Each interface has an interface name, which specifies the media type, the slot in which the FPC or DPC is located, the location on the FPC where the PIC is installed, and the PIC or DPC port. The interface name uniquely identifies an individual network connector in the system. You use the interface name when configuring interfaces and when enabling various functions and properties, such as routing protocols, on individual interfaces. The system uses the interface name when displaying information about the interface, for example, in the `show interfaces` command.

The interface name is represented by a physical part, a channel part, and a logical part in the following format:

```
physical:<channel>.logical
```

The channel part of the name is optional for all interfaces except channelized DS3, E1, OC12, and STM1 interfaces.

The EX Series, QFX Series, NFX Series, OCX1100, QFabric System, and EX4600 devices use a naming convention for defining the interfaces that are similar to that of other platforms running under Juniper Networks Junos OS. For more information, see *Understanding Interface Naming Conventions*.

The following sections provide interface naming configuration guidelines:

**Physical Part of an Interface Name**

The physical part of an interface name identifies the physical device, which corresponds to a single physical network connector.
NOTE:

The internal interface is dependent on the Routing Engine. To identify if the Routing Engine is using this type of interface, use the following command:

```
user@host> show interfaces terse
```

<table>
<thead>
<tr>
<th>Interface</th>
<th>Admin</th>
<th>Link</th>
<th>Proto</th>
<th>Local</th>
<th>Remote</th>
</tr>
</thead>
<tbody>
<tr>
<td>pfe-1/0/0</td>
<td>up</td>
<td>up</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>pfe-1/0/0.16383</td>
<td>up</td>
<td>up</td>
<td>inet</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>inet6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>pfh-1/0/0</td>
<td>up</td>
<td>up</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>pfh-1/0/0.16383</td>
<td>up</td>
<td>up</td>
<td>inet</td>
<td></td>
<td></td>
</tr>
<tr>
<td>[............]</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>bcm0</td>
<td>up</td>
<td>up</td>
<td>&lt;-------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>bcm0.0</td>
<td>up</td>
<td>up</td>
<td>inet 10.0.0.1/8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>[............]</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>lsi</td>
<td>up</td>
<td>up</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>mtun</td>
<td>up</td>
<td>up</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>pimd</td>
<td>up</td>
<td>up</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>pime</td>
<td>up</td>
<td>up</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>tap</td>
<td>up</td>
<td>up</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

For more information on the Routing Engines that each chassis supports, the first supported release for the Routing Engine in the specified chassis, the management Ethernet interface, and the internal Ethernet interfaces for each Routing Engine, please refer the link titled Supported Routing Engines by Chassis under Related Documentation section.

This part of the interface name has the following format:

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

**type** is the media type, which identifies the network device that can be one of the following:

- **ae**—Aggregated Ethernet interface. This is a virtual aggregated link and has a different naming format from most PICs; for more information, see Aggregated Ethernet Interfaces Overview.
- **as**—Aggregated SONET/SDH interface. This is a virtual aggregated link and has a different naming format from most PICs; for more information, see Configuring Aggregated SONET/SDH Interfaces.
- **at**—ATM1 or ATM2 intelligent queuing (IQ) interface or a virtual ATM interface on a circuit emulation (CE) interface.
• **bcm**—The bcm0 internal Ethernet process is supported on specific Routing engines for various M series and T series routers. For more information please refer the link titled *Supported Routing Engines by Chassis* under Related Documentation section.

• **cau4**—Channelized AU-4 IQ interface (configured on the Channelized STM1 IQ or IQE PIC or Channelized OC12 IQ and IQE PICs).

• **ce1**—Channelized E1 IQ interface (configured on the Channelized E1 IQ PIC or Channelized STM1 IQ or IQE PIC).

• **ci**—Container interface.

• **coc1**—Channelized OC1 IQ interface (configured on the Channelized OC12 IQ and IQE or Channelized OC3 IQ and IQE PICs).

• **coc3**—Channelized OC3 IQ interface (configured on the Channelized OC3 IQ and IQE PICs).

• **coc12**—Channelized OC12 IQ interface (configured on the Channelized OC12 IQ and IQE PICs).

• **coc48**—Channelized OC48 interface (configured on the Channelized OC48 and Channelized OC48 IQE PICs).

• **cp**—Collector interface (configured on the Monitoring Services II PIC).

• **cstm1**—Channelized STM1 IQ interface (configured on the Channelized STM1 IQ or IQE PIC).

• **cstm4**—Channelized STM4 IQ interface (configured on the Channelized OC12 IQ and IQE PICs).

• **cstm16**—Channelized STM16 IQ interface (configured on the Channelized OC48/STM16 and Channelized OC48/STM16 IQE PICs).

• **ct1**—Channelized T1 IQ interface (configured on the Channelized DS3 IQ and IQE PICs, Channelized OC3 IQ and IQE PICs, Channelized OC12 IQ and IQE PICs, or Channelized T1 IQ PIC).

• **ct3**—Channelized T3 IQ interface (configured on the Channelized DS3 IQ and IQE PICs, Channelized OC3 IQ and IQE PICs, or Channelized OC12 IQ and IQE PICs).

• **demux**—Interface that supports logical IP interfaces that use the IP source or destination address to demultiplex received packets. Only one demux interface (*demux0*) exists per chassis. All demux logical interfaces must be associated with an underlying logical interface.

• **dfc**—Interface that supports dynamic flow capture processing on T Series or M320 routers containing one or more Monitoring Services III PICs. Dynamic flow capture enables you to capture packet flows on the basis of dynamic filtering criteria. Specifically, you can use this feature to forward passively monitored packet flows that match a particular filter list to one or more destinations using an on-demand control protocol.

• **ds**—DS0 interface (configured on the Multichannel DS3 PIC, Channelized E1 PIC, Channelized OC3 IQ and IQE PICs, Channelized OC12 IQ and IQE PICs, Channelized DS3 IQ and IQE PICs, Channelized E1 IQ PIC, Channelized STM1 IQ or IQE PIC, or Channelized T1 IQ).

• **dsc**—Discard interface.

• **e1**—E1 interface (including channelized STM1-to-E1 interfaces).
• e3—E3 interface (including E3 IQ interfaces).

• em—Management and internal Ethernet interfaces. For M Series routers, MX Series routers, T Series routers, and TX Series routers, you can use the show chassis hardware command to display hardware information about the router, including its Routing Engine model. To determine which management interface is supported on your router and Routing Engine combination, see Understanding Management Ethernet Interfaces and Supported Routing Engines by Router.

• es—Encryption interface.

• et—100-Gigabit Ethernet interfaces (10, 40, and 100-Gigabit Ethernet interface for PTX Series Packet Transport Routers only).

• fe—Fast Ethernet interface.

• fxp—Management and internal Ethernet interfaces. For M Series routers, MX Series routers, T Series routers, and TX Series routers, you can use the show chassis hardware command to display hardware information about the router, including its Routing Engine model. To determine which management interface is supported on your router and Routing Engine combination, see Understanding Management Ethernet Interfaces and Supported Routing Engines by Router.

• ge—Gigabit Ethernet interface.
NOTE:

- The XENPAK 10-Gigabit Ethernet interface PIC, which is supported only on M series routers, is configured using the ge interface naming convention instead of the xe interface naming convention. Refer to the following show commands for more information:

```
user@host> show chassis hardware

..  
FPC 4   REV 02   710-015839   CZ1853   M120 FPC
Type 3
   PIC 0   REV 09   750-009567   NH1857   1x
   10GE(LAN),XENPAK
      Xcvr 0   REV 01   740-012045   535TFZX6   XENPAK-SR

user@host> show configuration interfaces ge-4/0/0

unit 0 {  
   family inet {  
      address 100.0.0.1/24;
   }
}
```

- In MX and SRX series devices, the 1 and 10-Gigabit SFP or SFP+ optical interfaces are always named as xe even if a 1-Gigabit SFP is inserted. However, in EX and QFX series devices, the interface name is shown as ge or xe based on the speed of the optical device inserted.

- **gr**—Generic routing encapsulation (GRE) tunnel interface.

- **gre**—Internally generated interface that is configurable only as the control channel for Generalized MPLS (GMPLS). For more information about GMPLS, see the **MPLS Applications User Guide**.

NOTE: You can configure GRE interfaces (gre-x/y/z) only for GMPLS control channels. GRE interfaces are not supported or configurable for other applications.

- **ip**—IP-over-IP encapsulation tunnel interface.

- **ipip**—Internally generated interface that is not configurable.

- **ixgbe**—The internal Ethernet process ixgbe0 and ixgbe1 are used by the RE-DUO-C2600-16G Routing Engine, which is supported on TX Matrix Plus and PTX5000.
• **iw**—Logical interfaces associated with the endpoints of Layer 2 circuit and Layer 2 VPN connections (pseudowire stitching Layer 2 VPNs). For more information about VPNs, see the *Junos OS VPNs Library for Routing Devices*.

• **lc**—Internally generated interface that is not configurable.

• **lo**—Loopback interface. The Junos OS automatically configures one loopback interface (lo0). The logical interface **lo0.16383** is a nonconfigurable interface for router control traffic.

• **ls**—Link services interface.

• **lsi**—Internally generated interface that is not configurable.

• **ml**—Multilink interface (including Multilink Frame Relay and MLPPP).

• **mo**—Monitoring services interface (including monitoring services and monitoring services II). The logical interface **mo-fpc/pic/port.16383** is an internally generated, nonconfigurable interface for router control traffic.

• **ms**—Multiservices interface.

• **mt**—Multicast tunnel interface (internal router interface for VPNs). If your router has a Tunnel PIC, the Junos OS automatically configures one multicast tunnel interface (mt) for each virtual private network (VPN) you configure. Although it is not necessary to configure multicast interfaces, you can use the **multicast-only** statement to configure the unit and family so that the tunnel can transmit and receive multicast traffic only. For more information, see **multicast-only**.

• **mtun**—Internally generated interface that is not configurable.

• **oc3**—OC3 IQ interface (configured on the Channelized OC12 IQ and IQE PICs or Channelized OC3 IQ and IQE PICs).

• **pd**—Interface on the rendezvous point (RP) that de-encapsulates packets.

• **pe**—Interface on the first-hop PIM router that encapsulates packets destined for the RP router.

• **pimd**—Internally generated interface that is not configurable.

• **pime**—Internally generated interface that is not configurable.

• **rlsq**—Container interface, numbered from 0 through 127, used to tie the primary and secondary LSQ PICs together in high availability configurations. Any failure of the primary PIC results in a switch to the secondary PIC and vice versa.

• **rms**—Redundant interface for two multiservices interfaces.

• **rsp**—Redundant virtual interface for the adaptive services interface.

• **se**—Serial interface (including EIA-530, V.35, and X.21 interfaces).

• **si**—Services-inline interface, which is hosted on a Trio-based line card.

• **so**—SONET/SDH interface.
- **sp**—Adaptive services interface. The logical interface `sp-fpc/pic/port.16383` is an internally generated, nonconfigurable interface for router control traffic.

- **stm1**—STM1 interface (configured on the OC3/STM1 interfaces).

- **stm4**—STM4 interface (configured on the OC12/STM4 interfaces).

- **stm16**—STM16 interface (configured on the OC48/STM16 interfaces).

- **t1**—T1 interface (including channelized DS3-to-DS1 interfaces).

- **t3**—T3 interface (including channelized OC12-to-DS3 interfaces).

- **tap**—Internally generated interface that is not configurable.

- **umd**—USB modem interface.

- **vsp**—Voice services interface.

- **vc4**—Virtually concatenated interface.

- **vt**—Virtual loopback tunnel interface.

- **xe**—10-Gigabit Ethernet interface. Some older 10-Gigabit Ethernet interfaces use the `ge` media type (rather than `xe`) to identify the physical part of the network device.

- **xt**—Logical interface for Protected System Domains to establish a Layer 2 tunnel connection.

`fpc` identifies the number of the FPC or DPC card on which the physical interface is located. Specifically, it is the number of the slot in which the card is installed.

M40, M40e, M160, M320, M120, T320, T640, and T1600 routers each have eight FPC slots that are numbered 0 through 7, from left to right as you are facing the front of the chassis. For information about compatible FPCs and PICs, see the hardware guide for your router.

On PTX1000 routers, the FPC number is always 0.

The M20 router has four FPC slots that are numbered 0 through 3, from top to bottom as you are facing the front of the chassis. The slot number is printed adjacent to each slot.

MX Series routers support DPCs, FPCs, and Modular Interface Cards (MICs). For information about compatible DPCs, FPCs, PICs, and MICs, see the [MX Series Interface Module Reference](#).

For M5, M7i, M10, and M10i routers, the FPCs are built into the chassis; you install the PICs into the chassis.

The M5 and M7i routers have space for up to four PICs. The M7i router also comes with an integrated Tunnel PIC, or an optional integrated AS PIC, or an optional integrated MS PIC.

The M10 and M10i routers have space for up to eight PICs.

A routing matrix can have up to 32 FPCs (numbered 0 through 31).
For more information about interface naming for a routing matrix, see "Interface Naming for a Routing Matrix Based on a TX Matrix Router" on page 26.

pic identifies the number of the PIC on which the physical interface is located. Specifically, it is the number of the PIC location on the FPC. FPCs with four PIC slots are numbered 0 through 3. FPCs with three PIC slots are numbered 0 through 2. The PIC location is printed on the FPC carrier board. For PICs that occupy more than one PIC slot, the lower PIC slot number identifies the PIC location.

port identifies a specific port on a PIC or DPC. The number of ports varies depending on the PIC. The port numbers are printed on the PIC.

Logical Part of an Interface Name

The logical unit part of the interface name corresponds to the logical unit number. The range of number available varies for different interface types. See unit for current range values.

In the virtual part of the name, a period (.) separates the port and logical unit numbers:

- Other platforms:

  type-fpc/pic/port.logical

Separators in an Interface Name

There is a separator between each element of an interface name.

In the physical part of the name, a hyphen (-) separates the media type from the FPC number, and a slash (/) separates the FPC, PIC, and port numbers.

In the virtual part of the name, a period (.) separates the channel and logical unit numbers.

A colon (:) separates the physical and virtual parts of the interface name.

Channel Part of an Interface Name

The channel identifier part of the interface name is required only on channelized interfaces. For channelized interfaces, channel 0 identifies the first channelized interface. For channelized IQ and channelized IQE interfaces, channel 1 identifies the first channelized interface. A nonconcatenated (that is, channelized) SONET/SDH OC48 interface has four OC12 channels, numbered 0 through 3.

To determine which types of channelized PICs are currently installed in the router, use the show chassis hardware command from the top level of the command-line interface (CLI). Channelized IQ and IQE PICs are listed in the output with "intelligent queuing IQ" or "enhanced intelligent queuing IQE" in the description. For more information, see Channelized Interfaces Overview.
For ISDN interfaces, you specify the B-channel in the form \texttt{bc-pim/0/port:n}. \( n \) is the B-channel ID and can be 1 or 2. You specify the D-channel in the form \texttt{dc-pim/0/port:0}.

\textbf{NOTE:} For ISDN, the B-channel and D-channel interfaces do not have any configurable parameters. However, when interface statistics are displayed, B-channel and D-channel interfaces have statistical values.

\textbf{NOTE:} In the Junos OS implementation, the term \textit{logical interfaces} generally refers to interfaces you configure by including the \texttt{unit} statement at the \texttt{[edit interfaces interface-name]} hierarchy level. Logical interfaces have the \texttt{.logical} descriptor at the end of the interface name, as in \texttt{ge-0/0/0.1} or \texttt{t1-0/0/0:0.1}, where the logical unit number is \texttt{1}.

Although channelized interfaces are generally thought of as logical or virtual, the Junos OS sees T3, T1, and NxDS0 interfaces within a channelized IQ or IQE PIC as physical interfaces. For example, both \texttt{t3-0/0/0} and \texttt{t3-0/0/0:1} are treated as physical interfaces by the Junos OS. In contrast, \texttt{t3-0/0/0.2} and \texttt{t3-0/0/0:1.2} are considered logical interfaces because they have the \texttt{.2} at the end of the interface names.

\textbf{Interface Naming for a Routing Matrix Based on a TX Matrix Router}

A routing matrix based on a Juniper Networks TX Matrix router is a multichassis architecture composed of one TX Matrix router and from one to four interconnected T640 routers. From the perspective of the user interface, the routing matrix appears as a single router. The TX Matrix router controls all the T640 routers, as shown in \textbf{Figure 3 on page 27}. 

A TX Matrix router is also referred to as a switch-card chassis (SCC). The CLI uses scc to refer to the TX Matrix router. A T640 router in a routing matrix is also referred to as a line-card chassis (LCC). The CLI uses lcc as a prefix to refer to a specific T640 router.

LCCs are assigned numbers 0 through 3, depending on the hardware setup and connectivity to the TX Matrix router. For more information, see the TX Matrix Router Hardware Guide. A routing matrix can have up to four T640 routers, and each T640 router has up to eight FPCs. Therefore, the routing matrix as a whole can have up to 32 FPCs (0 through 31).

In the Junos OS CLI, an interface name has the following format:

`type-fpc/pic/port`

When you specify the fpc number for a T640 router in a routing matrix, the Junos OS determines which T640 router contains the specified FPC based on the following assignment:

- On LCC 0, FPC hardware slots 0 through 7 are configured as 0 through 7.
- On LCC 1, FPC hardware slots 0 through 7 are configured as 8 through 15.
- On LCC 2, FPC hardware slots 0 through 7 are configured as 16 through 23.
- On LCC 3, FPC hardware slots 0 through 7 are configured as 24 through 31.

For example, the 1 in `se-1/0/0` refers to FPC hardware slot 1 on the T640 router labeled lcc0. The 11 in `t1-11/2/0` refers to FPC hardware slot 3 on the T640 router labeled lcc1. The 20 in `so-20/0/1` refers to FPC hardware slot 4 on the T640 router labeled lcc2. The 31 in `t3-31/1/0` refers to FPC hardware slot 7 on the T640 router labeled lcc3.

Table 3 on page 28 summarizes the FPC numbering for a T640 router in a routing matrix.
### Table 3: FPC Numbering for T640 Routers in a Routing Matrix

<table>
<thead>
<tr>
<th>LCC Numbers Assigned to the T640 Router</th>
<th>Configuration Numbers</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0 through 7</td>
</tr>
<tr>
<td>1</td>
<td>8 through 15</td>
</tr>
<tr>
<td>2</td>
<td>16 through 23</td>
</tr>
<tr>
<td>3</td>
<td>24 through 31</td>
</tr>
</tbody>
</table>

*Table 4 on page 28 lists each FPC hardware slot and the corresponding configuration numbers for LCCs 0 through 3.*

### Table 4: One-to-One FPC Numbering for T640 Routers in a Routing Matrix

<table>
<thead>
<tr>
<th>FPC Numbering</th>
<th>T640 Routers</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>LCC 0</td>
</tr>
<tr>
<td>Hardware Slots</td>
<td>0 1 2 3 4 5 6 7</td>
</tr>
<tr>
<td>Configuration Numbers</td>
<td>0 1 2 3 4 5 6 7</td>
</tr>
</tbody>
</table>

|               | LCC 1        |
| Hardware Slots| 0 1 2 3 4 5 6 7 |
| Configuration Numbers | 8 9 10 11 12 13 14 15 |

|               | LCC 2        |
| Hardware Slots| 0 1 2 3 4 5 6 7 |
| Configuration Numbers | 16 17 18 19 20 21 22 23 |

|               | LCC 3        |
| Hardware Slots| 0 1 2 3 4 5 6 7 |
Table 4: One-to-One FPC Numbering for T640 Routers in a Routing Matrix (continued)

<table>
<thead>
<tr>
<th>FPC Numbering</th>
<th>T640 Routers</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Configuration Numbers</strong></td>
<td>24</td>
</tr>
</tbody>
</table>

Interface Naming for a Routing Matrix Based on a TX Matrix Plus Router

A routing matrix based on a Juniper Networks TX Matrix Plus Router is a multichassis architecture composed of one TX Matrix Plus router and from one to four interconnected T1600 routers. From the perspective of the user interface, the routing matrix appears as a single router. The TX Matrix Plus router controls all the T1600 routers, as shown in Figure 4 on page 29.

Figure 4: Routing Matrix Based on a TX Matrix Plus Router

A TX Matrix Plus router is also referred to as a switch-fabric chassis (SFC). The CLI uses `sfc` to refer to the TX Matrix Plus router. A T1600 router in a routing matrix is also referred to as a line-card chassis (LCC). The CLI uses `lcc` as a prefix to refer to a specific T1600 router.

LCCs are assigned numbers, 0 through 3, depending on the hardware setup and connectivity to the TX Matrix Plus router. For more information, see the TX Matrix Plus Router Hardware Guide. A routing matrix based on a TX Matrix Plus router can have up to four T1600 routers, and each T1600 router has up to eight FPCs. Therefore, the routing matrix as a whole can have up to 32 FPCs (0 through 31).

In the Junos OS CLI, an interface name has the following format:
When you specify the `fpc` number for a T1600 router in a routing matrix, the Junos OS determines which T1600 router contains the specified FPC based on the following assignment:

- On LCC 0, FPC hardware slots 0 through 7 are configured as 0 through 7.
- On LCC 1, FPC hardware slots 0 through 7 are configured as 8 through 15.
- On LCC 2, FPC hardware slots 0 through 7 are configured as 16 through 23.
- On LCC 3, FPC hardware slots 0 through 7 are configured as 24 through 31.

For example, the 1 in `se-1/0/0` refers to FPC hardware slot 1 on the T1600 router labeled `lcc0`. The 11 in `t1-11/2/0` refers to FPC hardware slot 3 on the T1600 router labeled `lcc1`. The 20 in `so-20/0/1` refers to FPC hardware slot 4 on the T1600 router labeled `lcc2`. The 31 in `t3-31/1/0` refers to FPC hardware slot 7 on the T1600 router labeled `lcc3`.

Table 5 on page 30 summarizes the FPC numbering for a routing matrix based on a TX Matrix Plus router.

### Table 5: FPC Numbering for T1600 Routers in a Routing Matrix

<table>
<thead>
<tr>
<th>LCC Numbers Assigned to the T1600 Router</th>
<th>Configuration Numbers</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0 through 7</td>
</tr>
<tr>
<td>1</td>
<td>8 through 15</td>
</tr>
<tr>
<td>2</td>
<td>16 through 23</td>
</tr>
<tr>
<td>3</td>
<td>24 through 31</td>
</tr>
</tbody>
</table>

Table 6 on page 30 lists each FPC hardware slot and the corresponding configuration numbers for LCCs 0 through 3.

### Table 6: One-to-One FPC Numbering for T1600 Routers in a Routing Matrix

<table>
<thead>
<tr>
<th>FPC Numbering</th>
<th>T1600 Routers</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>LCC 0</td>
</tr>
<tr>
<td>Hardware Slots</td>
<td>0  1  2  3  4  5  6  7</td>
</tr>
<tr>
<td>Configuration Numbers</td>
<td>0  1  2  3  4  5  6  7</td>
</tr>
</tbody>
</table>
### Table 6: One-to-One FPC Numbering for T1600 Routers in a Routing Matrix (continued)

<table>
<thead>
<tr>
<th>FPC Numbering</th>
<th>T1600 Routers</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>LCC 1</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Hardware Slots</strong></td>
<td>0</td>
</tr>
<tr>
<td><strong>Configuration Numbers</strong></td>
<td>8</td>
</tr>
<tr>
<td><strong>LCC 2</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Hardware Slots</strong></td>
<td>0</td>
</tr>
<tr>
<td><strong>Configuration Numbers</strong></td>
<td>16</td>
</tr>
<tr>
<td><strong>LCC 3</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Hardware Slots</strong></td>
<td>0</td>
</tr>
<tr>
<td><strong>Configuration Numbers</strong></td>
<td>24</td>
</tr>
</tbody>
</table>

### Chassis Interface Naming

You configure some PIC properties, such as framing, at the `[edit chassis]` hierarchy level. Chassis interface naming varies depending on the routing hardware.

- To configure PIC properties for a standalone router, you must specify the FPC and PIC numbers, as follows:

```
[edit chassis]
fpc slot-number {
  pic pic-number {
    ...
  }
}
```

- To configure PIC properties for a T640 or T1600 router configured in a routing matrix, you must specify the LCC, FPC, and PIC numbers, as follows:

```
[edit chassis]
```
For the FPC slot in a T640 router in a routing matrix, specify the actual hardware slot number, as labeled on the T640 router chassis. Do not use the corresponding software FPC configuration numbers shown in Table 4 on page 28.

For the FPC slot in a T1600 router in a routing matrix, specify the actual hardware slot number, as labeled on the T1600 router chassis. Do not use the corresponding software FPC configuration numbers shown in Table 5 on page 30.

For more information about the [edit chassis] hierarchy, see the Junos OS Administration Library.

Examples: Interface Naming

This section provides examples of naming interfaces. For an illustration of where slots, PICs, and ports are located, see Figure 5 on page 32.

Figure 5: Interface Slot, PIC, and Port Locations
For an FPC in slot 1 with two OC3 SONET/SDH PICs in PIC positions 0 and 1, each PIC with two ports uses the following names:

<table>
<thead>
<tr>
<th>Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>so-1/0/0.0</td>
</tr>
<tr>
<td>so-1/0/1.0</td>
</tr>
<tr>
<td>so-1/1/0.0</td>
</tr>
<tr>
<td>so-1/1/1.0</td>
</tr>
</tbody>
</table>

An OC48 SONET/SDH PIC in slot 1 and in concatenated mode appears as a single FPC with a single PIC, which has a single port. If this interface has a single logical unit, it has the following name:

<table>
<thead>
<tr>
<th>Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>so-1/0/0.0</td>
</tr>
</tbody>
</table>

An OC48 SONET/SDH PIC in slot 1 and in channelized mode has a number for each channel. For example:

<table>
<thead>
<tr>
<th>Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>so-1/0/0:0</td>
</tr>
<tr>
<td>so-1/0/0:1</td>
</tr>
</tbody>
</table>

For an FPC in slot 1 with a Channelized OC12 PIC in PIC position 2, the DS3 channels have the following names:

<table>
<thead>
<tr>
<th>Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>t3-1/2/0:0</td>
</tr>
<tr>
<td>t3-1/2/0:1</td>
</tr>
<tr>
<td>t3-1/2/0:2</td>
</tr>
<tr>
<td>...</td>
</tr>
<tr>
<td>t3-1/2/0:11</td>
</tr>
</tbody>
</table>

For an FPC in slot 1 with four OC12 ATM PICs (the FPC is fully populated), the four PICs, each with a single port and a single logical unit, have the following names:

<table>
<thead>
<tr>
<th>Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>at-1/0/0.0</td>
</tr>
<tr>
<td>at-1/1/0.0</td>
</tr>
<tr>
<td>at-1/2/0.0</td>
</tr>
<tr>
<td>at-1/3/0.0</td>
</tr>
</tbody>
</table>

In a routing matrix on the T640 router labeled lcc1, for an FPC in slot 5 with four SONET OC192 PICs, the four PICs, each with a single port and a single logical unit, have the following names:

<table>
<thead>
<tr>
<th>Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>so-13/0/0.0</td>
</tr>
<tr>
<td>so-13/1/0.0</td>
</tr>
</tbody>
</table>
so-13/2/0.0
so-13/3/0.0

For an FPC in slot 1 with one 4-port ISDN BRI interface card, port 4 has the following name:

br-1/0/4

The first B-channel, the second B-channel, and the control channel have the following names:

bc-1/0/4:1
bc-1/0/4:2
dc-1/0/4:0

RELATED DOCUMENTATION

- Router Interfaces Overview | 4
- Physical Part of an Interface Name | 49
- Understanding Interface Naming Conventions
- Supported Routing Engines by Chassis

Interface Encapsulations Overview

Table 7 on page 35 lists encapsulation support by interface type.
<table>
<thead>
<tr>
<th>Interface Type</th>
<th>Physical Interface Encapsulation</th>
<th>Logical Interface Encapsulation</th>
</tr>
</thead>
<tbody>
<tr>
<td>ae—Aggregated Ethernet interface</td>
<td><strong>ethernet-ccc</strong>—Ethernet cross-connect</td>
<td><strong>dix</strong>—Ethernet DIXv2 (RFC 894)</td>
</tr>
<tr>
<td></td>
<td><strong>extended-vlan-ccc</strong>—Nonstandard TPID tagging for a cross-connect</td>
<td><strong>vlan-ccc</strong>—802.1Q tagging for a cross-connect</td>
</tr>
<tr>
<td></td>
<td><strong>extended-vlan-vpls</strong>—Extended VLAN virtual private LAN service</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>flexible-ethernet-services</strong>—Allows per-unit Ethernet encapsulation configuration</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>vlan-ccc</strong>—802.1Q tagging for a cross-connect</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>ethernet-vpls</strong>—Ethernet virtual private LAN service</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>vlan-vpls</strong>—VLAN virtual private LAN service</td>
<td></td>
</tr>
<tr>
<td>as—Aggregated SONET/SDH interface</td>
<td><strong>cisco-hdlc</strong>—Cisco-compatible HDLC framing</td>
<td>NA</td>
</tr>
<tr>
<td></td>
<td><strong>ppp</strong>—Serial PPP device</td>
<td></td>
</tr>
<tr>
<td>at—ATM1 interface</td>
<td><strong>atm-ccc-cell-relay</strong>—ATM cell relay encapsulation for a cross-connect</td>
<td><strong>atm-ccc-cell-relay</strong>—ATM cell relay for CCC</td>
</tr>
<tr>
<td></td>
<td><strong>atm-pvc</strong>—ATM permanent virtual circuits</td>
<td><strong>atm-ccc-vc-mux</strong>—ATM VC for CCC</td>
</tr>
<tr>
<td></td>
<td><strong>ethernet-over-atm</strong>—Ethernet over ATM encapsulation</td>
<td><strong>atm-cisco-nlpid</strong>—Cisco-compatible ATM NLPID encapsulation</td>
</tr>
<tr>
<td></td>
<td><strong>atm-snap</strong>—ATM LLC/SNAP encapsulation</td>
<td><strong>atm-nlpid</strong>—ATM NLPID encapsulation</td>
</tr>
<tr>
<td></td>
<td><strong>atm-tcc-snap</strong>—ATM LLC/SNAP for a translational cross-connect</td>
<td><strong>atm-snap</strong>—ATM LLC/SNAP encapsulation</td>
</tr>
<tr>
<td></td>
<td><strong>atm-tcc-vc-mux</strong>—ATM VC for a translational cross-connect</td>
<td><strong>atm-tcc-snap</strong>—ATM LLC/SNAP for a translational cross-connect</td>
</tr>
<tr>
<td></td>
<td><strong>atm-vc-mux</strong>—ATM VC multiplexing</td>
<td><strong>atm-tcc-snap</strong>—ATM LLC/SNAP for a translational cross-connect</td>
</tr>
<tr>
<td></td>
<td><strong>ether-over-atm-llc</strong>—Ethernet over ATM (LLC/SNAP) encapsulation</td>
<td><strong>atm-vc-mux</strong>—ATM VC multiplexing</td>
</tr>
<tr>
<td>Interface Type</td>
<td>Physical Interface Encapsulation</td>
<td>Logical Interface Encapsulation</td>
</tr>
<tr>
<td>--------------------------------------</td>
<td>----------------------------------------------------------------</td>
<td>-------------------------------------------------------</td>
</tr>
<tr>
<td>atm—ATM2 intelligent queuing (IQ) interface</td>
<td><strong>atm-ccc-cell-relay</strong>—ATM cell relay encapsulation for a cross-connect</td>
<td><strong>atm-ccc-cell-relay</strong>—ATM cell relay for CCC</td>
</tr>
<tr>
<td></td>
<td><strong>atm-pvc</strong>—ATM permanent virtual circuits</td>
<td><strong>atm-ccc-vc-mux</strong>—ATM VC for CCC</td>
</tr>
<tr>
<td></td>
<td><strong>ethernet-over-atm</strong>—Ethernet over ATM encapsulation</td>
<td><strong>atm-cisco-nlpid</strong>—Cisco-compatible ATM NLPID encapsulation</td>
</tr>
<tr>
<td>atm-ccc-cell-relay</td>
<td><strong>atm-mippp-llc</strong>—ATM MLPPP over AAL5/LLC</td>
<td></td>
</tr>
<tr>
<td>atm-cisco-nlpid</td>
<td><strong>atm-nlpid</strong>—ATM NLPID encapsulation</td>
<td></td>
</tr>
<tr>
<td>atm-ppp-llc</td>
<td><strong>atm-ppp-vc-mux</strong>—ATM PPP over raw AAL5</td>
<td></td>
</tr>
<tr>
<td>atm-vc-mux</td>
<td><strong>atm-snap</strong>—ATM LLC/SNAP encapsulation</td>
<td></td>
</tr>
<tr>
<td>atm-tcc-snap</td>
<td><strong>atm-tcc-vc-mux</strong>—ATM VC for a translational cross-connect</td>
<td></td>
</tr>
<tr>
<td>atm-tcc-vc-mux</td>
<td><strong>ether-over-atm-llc</strong>—Ethernet over ATM (LLC/SNAP) encapsulation</td>
<td></td>
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<tr>
<td>atm-vc-mux</td>
<td><strong>ether-vpls-over-atm-llc</strong>—Ethernet VPLS over ATM (bridging) encapsulation</td>
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<tr>
<td>bcm—Gigabit Ethernet internal interfaces</td>
<td>NA</td>
<td>NA</td>
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<tr>
<td>br—Integrated Services Digital Network (ISDN) interface</td>
<td>NA</td>
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<tr>
<td>ci—Container interface</td>
<td><strong>cisco-hdlc</strong>—Cisco-compatible HDLC framing</td>
<td><strong>aps</strong>—SONET interface required for APS configuration.</td>
</tr>
<tr>
<td></td>
<td><strong>ppp</strong>—Serial PPP device</td>
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</table>
Table 7: Encapsulation Support by Interface Type (continued)

<table>
<thead>
<tr>
<th>Interface Type</th>
<th>Physical Interface Encapsulation</th>
<th>Logical Interface Encapsulation</th>
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<tbody>
<tr>
<td>ds—DS0 interface</td>
<td>cisco-hdlc—Cisco-compatible HDLC framing</td>
<td>frame-relay-ccc—Frame Relay DLCI for CCC</td>
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<td></td>
<td>cisco-hdlc-ccc—Cisco-compatible HDLC framing for a cross-connect</td>
<td>frame-relay-ccc—Frame Relay DLCI for CCC</td>
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<tr>
<td></td>
<td>cisco-hdlc-tcc—Cisco-compatible HDLC framing for a translational cross-connect</td>
<td>frame-relay-ccc—Frame Relay DLCI for CCC</td>
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<tr>
<td></td>
<td>extended-frame-relay-ccc—Any Frame Relay DLCI for a cross-connect</td>
<td>frame-relay-ccc—Frame Relay DLCI for CCC</td>
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<td>extended-frame-relay-tcc—Any Frame Relay DLCI for a translational cross-connect</td>
<td>frame-relay-ccc—Frame Relay DLCI for CCC</td>
</tr>
<tr>
<td></td>
<td>flexible-frame-relay—Multiple Frame Relay encapsulations</td>
<td>frame-relay-ccc—Frame Relay DLCI for CCC</td>
</tr>
<tr>
<td></td>
<td>frame-relay—Frame Relay encapsulation</td>
<td>frame-relay-ccc—Frame Relay for a cross-connect</td>
</tr>
<tr>
<td></td>
<td>frame-relay-ccc—Frame Relay for a cross-connect</td>
<td>frame-relay-ccc—Frame Relay for a cross-connect</td>
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<tr>
<td></td>
<td>frame-relay-port-ccc—Frame Relay port encapsulation for a cross-connect</td>
<td>frame-relay-ccc—Frame Relay for a cross-connect</td>
</tr>
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<td></td>
<td>frame-relay-tcc—Frame Relay for a translational cross-connect</td>
<td>frame-relay-ccc—Frame Relay for a cross-connect</td>
</tr>
<tr>
<td></td>
<td>multilink-frame-relay-uni-nni—Multilink Frame Relay UNI NNI (FRF.16) encapsulation</td>
<td>frame-relay-ccc—Frame Relay for a cross-connect</td>
</tr>
<tr>
<td></td>
<td>ppp—Serial PPP device</td>
<td>ppp—Serial PPP device</td>
</tr>
<tr>
<td></td>
<td>ppp-ccc—Serial PPP device for a cross-connect</td>
<td>ppp—Serial PPP device</td>
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<tr>
<td></td>
<td>ppp-tcc—Serial PPP device for a translational cross-connect</td>
<td>ppp—Serial PPP device</td>
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<tr>
<td>dsc—Discard interface</td>
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<td>NA</td>
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<table>
<thead>
<tr>
<th>Interface Type</th>
<th>Physical Interface Encapsulation</th>
<th>Logical Interface Encapsulation</th>
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</thead>
<tbody>
<tr>
<td><strong>e1—E1 interface (including channelized STM1-to-E1 interfaces)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>cisco-hdlc—Cisco-compatible HDLC framing</td>
<td></td>
<td></td>
</tr>
<tr>
<td>cisco-hdlc-ccc—Cisco-compatible HDLC framing for a cross-connect</td>
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<td>cisco-hdlc-tcc—Cisco-compatible HDLC framing for a translational cross-connect</td>
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<td>extended-frame-relay-ccc—Any Frame Relay DLCI for a cross-connect</td>
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<td>extended-frame-relay-tcc—Any Frame Relay DLCI for a translational cross-connect</td>
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<tr>
<td>flexible-frame-relay—Multiple Frame Relay encapsulations</td>
<td></td>
<td></td>
</tr>
<tr>
<td>frame-relay—Frame Relay encapsulation</td>
<td></td>
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<td>frame-relay-ccc—Frame Relay for a cross-connect</td>
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<tr>
<td>frame-relay-port-ccc—Frame Relay port encapsulation for a cross-connect</td>
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<tr>
<td>frame-relay-tcc—Frame Relay for a translational cross-connect</td>
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<tr>
<td>ppp—Serial PPP device</td>
<td></td>
<td></td>
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<tr>
<td>ppp-ccc—Serial PPP device for a cross-connect</td>
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<td>ppp-tcc—Serial PPP device for a translational cross-connect</td>
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frame-relay-ccc—Frame Relay DLCI for CCC
frame-relay-ccc—Frame Relay DLCI for CCC
frame-relay-tcc—Frame Relay DLCI for a translational cross-connect
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<tbody>
<tr>
<td>e3—E3 interface (including E3 IQ and IQE interfaces)</td>
<td>cisco-hdlc—Cisco-compatible HDLC framing</td>
<td>frame-relay-ccc—Frame Relay DLCI for CCC</td>
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<td>cisco-hdlc-ccc—Cisco-compatible HDLC framing for a cross-connect</td>
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<td>cisco-hdlc-tcc—Cisco-compatible HDLC framing for a translational cross-connect</td>
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<td>extended-frame-relay-ccc—Any Frame Relay DLCI for a cross-connect</td>
<td>frame-relay-tcc—Frame Relay DLCI for a translational cross-connect</td>
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<tr>
<td></td>
<td>extended-frame-relay-tcc—Any Frame Relay DLCI for a translational cross-connect</td>
<td>frame-relay-tcc—Frame Relay DLCI for a translational cross-connect</td>
</tr>
<tr>
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<td>flexible-frame-relay—Multiple Frame Relay encapsulations</td>
<td>frame-relay-tcc—Frame Relay DLCI for a translational cross-connect</td>
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<tr>
<td></td>
<td>frame-relay—Frame Relay encapsulation</td>
<td>frame-relay-tcc—Frame Relay DLCI for a translational cross-connect</td>
</tr>
<tr>
<td></td>
<td>frame-relay-ccc—Frame Relay for a cross-connect</td>
<td>frame-relay-tcc—Frame Relay DLCI for a translational cross-connect</td>
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<td>frame-relay-port-ccc—Frame Relay port encapsulation for a cross-connect</td>
<td>frame-relay-tcc—Frame Relay DLCI for a translational cross-connect</td>
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<td>frame-relay-tcc—Frame Relay for a translational cross-connect</td>
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<td>ppp—Serial PPP device</td>
<td>frame-relay-tcc—Frame Relay DLCI for a translational cross-connect</td>
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<td>ppp-ccc—Serial PPP device for a cross-connect</td>
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<tr>
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<td>ppp-tcc—Serial PPP device for a translational cross-connect</td>
<td>frame-relay-tcc—Frame Relay DLCI for a translational cross-connect</td>
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<td>em—Management and internal Ethernet interfaces</td>
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<td>NA</td>
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<tr>
<td>Interface Type</td>
<td>Physical Interface Encapsulation</td>
<td>Logical Interface Encapsulation</td>
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<tr>
<td><strong>fe</strong>—Fast Ethernet interface</td>
<td><strong>ethernet-ccc</strong>—Ethernet cross-connect</td>
<td><strong>dix</strong>—Ethernet DIXv2 (RFC 894)</td>
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<td><strong>ethernet-tcc</strong>—Ethernet translational cross-connect</td>
<td><strong>vlan-ccc</strong>—802.1Q tagging for a cross-connect</td>
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<tr>
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<td><strong>ethernet-vpls</strong>—Ethernet virtual private LAN service</td>
<td><strong>vlan-vpls</strong>—VLAN virtual private LAN service</td>
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<tr>
<td></td>
<td><strong>extended-vlan-ccc</strong>—Nonstandard TPID tagging for a cross-connect</td>
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<td><strong>extended-vlan-tcc</strong>—802.1Q tagging for a translational cross-connect</td>
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<td></td>
<td><strong>extended-vlan-vpls</strong>—Extended VLAN virtual private LAN service</td>
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<td></td>
<td><strong>vlan-ccc</strong>—802.1Q tagging for a cross-connect</td>
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<td></td>
<td><strong>vlan-vpls</strong>—VLAN virtual private LAN service</td>
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<tr>
<td><strong>fxp</strong>—Management and internal Ethernet interfaces</td>
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<th>Interface Type</th>
<th>Physical Interface Encapsulation</th>
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<tbody>
<tr>
<td>ge—Gigabit Ethernet interface (including Gigabit Ethernet IQ interfaces)</td>
<td>ethernet-ccc—Ethernet cross-connect</td>
<td>dix—Ethernet DIXv2 (RFC 894)</td>
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<td>ethernet-tcc—Ethernet translational cross-connect</td>
<td>vlan-ccc—802.1Q tagging for a cross-connect</td>
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<tr>
<td></td>
<td>ethernet-vpls—Ethernet virtual private LAN service</td>
<td>vlan-tcc—802.1Q tagging for a translational cross-connect</td>
</tr>
<tr>
<td></td>
<td>extended-vlan-ccc—Nonstandard TPID tagging for a cross-connect</td>
<td>vlan-vpls—VLAN virtual private LAN service</td>
</tr>
<tr>
<td></td>
<td>extended-vlan-tcc—802.1Q tagging for a translational cross-connect</td>
<td></td>
</tr>
<tr>
<td></td>
<td>extended-vlan-vpls—Extended VLAN virtual private LAN service</td>
<td></td>
</tr>
<tr>
<td></td>
<td>flexible-ethernet-services—Allows per-unit Ethernet encapsulation configuration</td>
<td></td>
</tr>
<tr>
<td></td>
<td>vlan-ccc—802.1Q tagging for a cross-connect</td>
<td></td>
</tr>
<tr>
<td></td>
<td>vlan-vpls—VLAN virtual private LAN service</td>
<td></td>
</tr>
<tr>
<td>ixgbe—10-Gigabit Ethernet internal interfaces</td>
<td>NA</td>
<td>NA</td>
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<tr>
<td>lo—Loopback interface; the Junos OS automatically configures one loopback interface (lo0)</td>
<td>NA</td>
<td>NA</td>
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<tr>
<td>ls—Link services interface</td>
<td>multilink-frame-relay-uni-nni—Multilink Frame Relay UNI NNI (FRF.16) encapsulation</td>
<td>multilink-frame-relay-end-to-end—Multilink Frame Relay end-to-end (FRF.15)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>multilink-ppp—Multilink PPP</td>
</tr>
<tr>
<td>lsq—Link services IQ interface</td>
<td>multilink-frame-relay-uni-nni—Multilink Frame Relay UNI NNI (FRF.16) encapsulation</td>
<td>multilink-frame-relay-end-to-end—Multilink Frame Relay end-to-end (FRF.15)</td>
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<td>multilink-ppp—Multilink PPP</td>
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<td>Interface Type</td>
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<td>Logical Interface Encapsulation</td>
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<td>-----------------------------------------------------------------------------------------------</td>
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<tr>
<td>It—Logical tunnel interface</td>
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<td><strong>ethernet</strong>—Ethernet service</td>
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<tr>
<td></td>
<td></td>
<td><strong>ethernet-vpls</strong>—Ethernet virtual private LAN service</td>
</tr>
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<td></td>
<td><strong>ethernet-ccc</strong>—Ethernet cross-connect</td>
</tr>
<tr>
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<td></td>
<td><strong>frame-relay</strong>—Frame Relay encapsulation</td>
</tr>
<tr>
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<td><strong>frame-relay-ccc</strong>—Frame Relay for a cross-connect</td>
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<td></td>
<td><strong>vlan</strong>—VLAN service</td>
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<td></td>
<td><strong>vlan-ccc</strong>—802.1Q tagging for a cross-connect</td>
</tr>
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<td></td>
<td><strong>vlan-vpls</strong>—VLAN virtual private LAN service</td>
</tr>
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<td>ml—Multilink interface</td>
<td>NA</td>
<td><strong>multilink-frame-relay-end-to-end</strong>—Multilink Frame Relay end-to-end (FRF.15)</td>
</tr>
<tr>
<td>(including Multilink Frame Relay</td>
<td></td>
<td><strong>multilink-ppp</strong>—Multilink PPP</td>
</tr>
<tr>
<td>and MLPPP)</td>
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<th>Interface Type</th>
<th>Physical Interface Encapsulation</th>
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<tbody>
<tr>
<td>se—Serial interface (including EIA-530, V.35, and X.21 interfaces)</td>
<td>cisco-hdlc—Cisco-compatible HDLC framing</td>
<td>frame-relay-ccc—Frame Relay DLCI for CCC</td>
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<td>cisco-hdlc-ccc—Cisco-compatible HDLC framing for a cross-connect</td>
<td>frame-relay-ppp—PPP over Frame Relay</td>
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<td>cisco-hdlc-tcc—Cisco-compatible HDLC framing for a translational cross-connect</td>
<td>frame-relay-tcc—Frame Relay DLCI for a translational cross-connect</td>
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<td>frame-relay—Frame Relay encapsulation</td>
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<td>frame-relay-ccc—Frame Relay for a cross-connect</td>
<td></td>
</tr>
<tr>
<td></td>
<td>frame-relay-port-ccc—Frame Relay port encapsulation for a cross-connect</td>
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<td></td>
<td>frame-relay-tcc—Frame Relay for a translational cross-connect</td>
<td></td>
</tr>
<tr>
<td></td>
<td>ppp—Serial PPP device</td>
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<tr>
<td></td>
<td>ppp-ccc—Serial PPP device for a cross-connect</td>
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<td>ppp-tcc—Serial PPP device for a translational cross-connect</td>
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<tr>
<td>so—SONET/SDH interface</td>
<td>cisco-hdlc—Cisco-compatible HDLC framing</td>
<td>frame-relay-ccc—Frame Relay DLCI for CCC</td>
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<td>cisco-hdlc-ccc—Cisco-compatible HDLC framing for a cross-connect</td>
<td>frame-relay-ccc—Frame Relay DLCI for CCC</td>
</tr>
<tr>
<td></td>
<td>cisco-hdlc-tcc—Cisco-compatible HDLC framing for a translational cross-connect</td>
<td>frame-relay-tcc—Frame Relay DLCI for a translational cross-connect</td>
</tr>
<tr>
<td></td>
<td>extended-frame-relay-ccc—Any Frame Relay DLCI for a cross-connect</td>
<td>multilink-frame-relay-end-to-end—IQE</td>
</tr>
<tr>
<td></td>
<td>extended-frame-relay-tcc—Any Frame Relay DLCI for a translational cross-connect</td>
<td>SONET PICs support Multilink Frame Relay end-to-end (FRF.15)</td>
</tr>
<tr>
<td></td>
<td>flexible-frame-relay—Multiple Frame Relay encapsulations</td>
<td>multilink-ppp—IQE SONET PICs support Multilink PPP</td>
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<tr>
<td></td>
<td>frame-relay—Frame Relay encapsulation</td>
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<td>frame-relay-ccc—Frame Relay for a cross-connect</td>
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<td></td>
<td>frame-relay-port-ccc—Frame Relay port encapsulation for a cross-connect</td>
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<td>frame-relay-tcc—Frame Relay for a translational cross-connect</td>
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<td>ppp—Serial PPP device</td>
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<td>ppp-ccc—Serial PPP device for a cross-connect</td>
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</tr>
<tr>
<td><strong>t1</strong>—T1 interface (including channelized DS3-to-DS1 interfaces)</td>
<td>cisco-hdlc—Cisco-compatible HDLC framing</td>
<td>frame-relay-ccc—Frame Relay DLCI for CCC</td>
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<td>cisco-hdlc-ccc—Cisco-compatible HDLC framing for a cross-connect</td>
<td>frame-relay-ppp—PPP over Frame Relay</td>
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<td>cisco-hdlc-tcc—Cisco-compatible HDLC framing for a translational cross-connect</td>
<td>frame-relay-tcc—Frame Relay DLCI for a translational cross-connect</td>
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<td>extended-frame-relay-ccc—Any Frame Relay DLCI for a cross-connect</td>
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<td>extended-frame-relay-tcc—Any Frame Relay DLCI for a translational cross-connect</td>
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<td>frame-relay—Frame Relay encapsulation</td>
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<td>frame-relay-ccc—Frame Relay for a cross-connect</td>
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<td>frame-relay-port-ccc—Frame Relay port encapsulation for a cross-connect</td>
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<td>frame-relay-tcc—Frame Relay for a translational cross-connect</td>
<td></td>
</tr>
<tr>
<td></td>
<td>multilink-frame-relay-uni-nni—Multilink Frame Relay UNI NNI (FRF.16) encapsulation</td>
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<td></td>
<td>ppp—Serial PPP device</td>
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<td>ppp-ccc—Serial PPP device for a cross-connect</td>
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<tr>
<td>t3—T3 interface (including channelized OC12-to-DS3 interfaces)</td>
<td>cisco-hdlc—Cisco-compatible HDLC framing</td>
<td>frame-relay-ccc—Frame Relay DLCI for CCC</td>
</tr>
<tr>
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<td>cisco-hdlc-ccc—Cisco-compatible HDLC framing for a cross-connect</td>
<td>frame-relay-ccc—Frame Relay for a cross-connect</td>
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<td>cisco-hdlc-tcc—Cisco-compatible HDLC framing for a translational cross-connect</td>
<td>frame-relay-tcc—Frame Relay DLCI for a translational cross-connect</td>
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<tr>
<td></td>
<td>extended-frame-relay-ccc—Any Frame Relay DLCI for a cross-connect</td>
<td></td>
</tr>
<tr>
<td></td>
<td>extended-frame-relay-tcc—Any Frame Relay DLCI for a translational cross-connect</td>
<td></td>
</tr>
<tr>
<td></td>
<td>flexible-frame-relay—Multiple Frame Relay encapsulations</td>
<td></td>
</tr>
<tr>
<td></td>
<td>frame-relay—Frame Relay encapsulation</td>
<td></td>
</tr>
<tr>
<td></td>
<td>frame-relay-ccc—Frame Relay for a cross-connect</td>
<td></td>
</tr>
<tr>
<td></td>
<td>frame-relay-port-ccc—Frame Relay port encapsulation for a cross-connect</td>
<td></td>
</tr>
<tr>
<td></td>
<td>frame-relay-tcc—Frame Relay for a translational cross-connect</td>
<td></td>
</tr>
<tr>
<td></td>
<td>ppp—Serial PPP device</td>
<td></td>
</tr>
<tr>
<td></td>
<td>ppp-ccc—Serial PPP device for a cross-connect</td>
<td></td>
</tr>
<tr>
<td></td>
<td>ppp-tcc—Serial PPP device for a translational cross-connect</td>
<td></td>
</tr>
</tbody>
</table>

Controller-level channelized IQ interfaces (cau4, coc1, coc3, coc12, cstm1, ct1, ct3, ce1) | NA | NA |

Services interfaces (cp, gr, ip, mo, vt, es, mo, rsp, sp) | NA | NA |
### Table 7: Encapsulation Support by Interface Type (continued)

<table>
<thead>
<tr>
<th>Interface Type</th>
<th>Physical Interface Encapsulation</th>
<th>Logical Interface Encapsulation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unconfigurable, internally generated interfaces (gre, ipip, learning-chip (lc), lsi, tap, mt, mtun, pd, pe, pimd, pime)</td>
<td>NA</td>
<td>NA</td>
</tr>
</tbody>
</table>

**NOTE:** You can configure GRE interfaces (gre-x/y/z) only for GMPLS control channels. GRE interfaces are not supported or configurable for other applications. For more information about GMPLS, see the *MPLS Applications User Guide*.

### RELATED DOCUMENTATION

- Understanding Transient Interfaces | 5
- Router Interfaces Overview | 4
- Types of Interfaces Overview | 4

### Interface Descriptors Overview

When you configure an interface, you are effectively specifying the properties for a physical interface descriptor. In most cases, the physical interface descriptor corresponds to a single physical device and consists of the following parts:

- The interface name, which defines the media type
- The slot in which the FPC or DPC is located
- The location on the FPC in which the PIC is installed
- The PIC or DPC port
- The interface's channel and logical unit numbers (optional)

Each physical interface descriptor can contain one or more logical interface descriptors. These allow you to map one or more logical (or virtual) interfaces to a single physical device. Creating multiple logical
interfaces is useful for ATM, Frame Relay, and Gigabit Ethernet networks, in which you can associate multiple virtual circuits, data-link connections, or virtual LANs (VLANs) with a single interface device.

Each logical interface descriptor can have one or more family descriptors to define the protocol family that is associated with and allowed to run over the logical interface.

The following protocol families are supported:

- Internet Protocol version 4 (IPv4) suite (inet)
- Internet Protocol version 6 (IPv6) suite (inet6)
- Circuit cross-connect (CCC)
- Translational cross-connect (TCC)
- International Organization for Standardization (ISO)
- Multilink Frame Relay end-to-end (MLFR end-to-end)
- Multilink Frame Relay user-to-network interface network-to-network interface (MLFR UNI NNI)
- Multilink Point-to-Point Protocol (MLPPP)
- Multiprotocol Label Switching (MPLS)
- Trivial Network Protocol (TNP)
- (M Series, T Series, and MX Series routers only) Virtual private LAN service (VPLS)

Finally, each family descriptor can have one or more address entries, which associate a network address with a logical interface and hence with the physical interface.

You configure the various interface descriptors as follows:

- You configure the physical interface descriptor by including the `interfaces interface-name` statement.
- You configure the logical interface descriptor by including the `unit` statement within the `interfaces interface-name` statement or by including the `.logical` descriptor at the end of the interface name, as in `t3-0/0/0.1`, where the logical unit number is 1, as shown in the following examples:

```
[edit]
user@host# set interfaces t3-0/0/0 unit 1
[edit]
user@host# edit interfaces t3-0/0/0.1
[edit interfaces t3-0/0/0]
user@host# set unit 1
```

- You configure the family descriptor by including the `family` statement within the `unit` statement.
- You configure address entries by including the `address` statement within the `family` statement.
- You configure tunnels by including the `tunnel` statement within the `unit` statement.
NOTE: The address of a logical interface cannot be the same as a tunnel interface's source or destination address. If you try to configure a logical interface with a tunnel interface's address or vice versa, a commit failure will occur.

RELATED DOCUMENTATION

| Router Interfaces Overview | 4 |

Physical Part of an Interface Name

IN THIS SECTION

- Interface Names for ACX Series Universal Metro Routers | 49
- Interface Names for M Series and T Series Routers | 50
- MX Series Router Interface Names | 50
- Interface Names for PTX Series Routers | 51

Interface Names for ACX Series Universal Metro Routers

ACX Series routers do not have actual PIC devices. Instead they have built-in network ports on the front panel of the router. These ports are named using the same naming convention used for routers with PIC devices with the understanding that the FPC, PIC and port are pseudo devices. When you display information about one of these ports, you specify the interface type, the slot for the Flexible PIC Concentrator (FPC), the slot on the FPC for the Physical Interface Card (PIC), and the configured port number.

In the physical part of the interface name, a hyphen (-) separates the media type from the FPC number, and a slash (/) separates the FPC, PIC, and port numbers:

```
type-fpc/pic/port
```
Interface Names for M Series and T Series Routers

On M Series and T Series routers, when you display information about an interface, you specify the interface type, the slot in which the Flexible PIC Concentrator (FPC) is installed, the slot on the FPC in which the Physical Interface Card (PIC) is located, and the configured port number.

In the physical part of the interface name, a hyphen (-) separates the media type from the FPC number, and a slash (/) separates the FPC, PIC, and port numbers:

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

**NOTE:** Exceptions to the `type-fpc/pic/port` physical description include the aggregated Ethernet and aggregated SONET/SDH interfaces, which use the syntax `ae number` and `as number`, respectively.

MX Series Router Interface Names

On MX Series routers when you display information about an interface, you specify the interface type, the Dense Port Concentrator (DPC), Flexible PIC Concentrator (FPC), or Modular Port Concentrator (MPC) slot, the PIC or MIC slot, and the configured port number.

**NOTE:** Although the MX Series routers use DPCs, FPCs, MPCs, MICs, and PICs, command syntax in this book is shown as `fpc/pic/port` for simplicity.

In the physical part of the interface name, a hyphen (-) separates the media type from the FPC number, and a slash (/) separates the DPC, FPC or MPC, MIC or PIC, and port numbers:

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

- `fpc`—Slot in which the DPC, FPC, or MPC is installed.
- `pic`—Slot on the FPC in which the PIC is located.

For DPCs, MICs, and the 16-port MPC, the PIC value is a logical grouping of ports and varies on different platforms.
• port—Port number on the DPC, PIC, MPC, or MIC.

Interface Names for PTX Series Routers

On PTX Series Packet Transport Routers, when you display information about an interface, you specify the interface type, the slot in which the Flexible PIC Concentrator (FPC) is installed, the slot on the FPC in which the Physical Interface Card (PIC) is located, and the configured port number.

NOTE:
• The PTX router supports Ethernet type interfaces only. The media type portion of the physical interface name, type supports the Ethernet interface type only: et.
• In the CLI, all PTX3000 PICs are represented as pic0. For more information, see PTX3000 PIC Description

In the physical part of the interface name, a hyphen (-) separates the media type (et) from the FPC number, and a slash (/) separates the FPC, PIC, and port numbers:

\[\text{type-fpc/pic/port}\]

RELATED DOCUMENTATION

| Interface Naming Overview | 17 |
| Logical Part of an Interface Name | 25 |

Displaying Interface Configurations Overview

To display a configuration, use either the show command in configuration mode or the show configuration top-level command. Interfaces are listed in numerical order, from lowest to highest slot number, then from lowest to highest PIC number, and finally from lowest to highest port number.

RELATED DOCUMENTATION

| Router Interfaces Overview | 4 |
CHAPTER 2

Configuring Physical Interface Properties

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Physical Interface Configuration Statements Overview

The software driver for each network media type sets reasonable default values for general interface properties, such as the interface’s maximum transmission unit (MTU) size, receive and transmit leaky bucket properties, link operational mode, and clock source.

M Series, MX Series, and T Series routers are factory configured according to the specific router, its features, and its physical interfaces. This section includes a default configuration example showing the statements used to configure the physical interfaces properties. Additional statements are used to set properties for specific interface types and are described in “Physical Interfaces Properties Statements List” on page 66.

To modify any of the default general interface properties, include the appropriate statements at the [edit interfaces interface-name] hierarchy level:

```
interfaces {
  traceoptions {
    file filename <files number> <match regular-expression> <size size> <world-readable | no-world-readable>;
    flag flag <disable>;
  }
  interface-name {
    accounting-profile name;
    aggregated-ether-options {
      (flow-control | no-flow-control);
      lacp {
        (active | passive);
        link-protection {
          disable;
          (revertive | non-revertive (Interfaces));
          periodic interval;
          system-priority priority;
        }
        link-protection;
        link-speed speed;
        (loopback | no-loopback);
        minimum-links number;
        source-address-filter {
          mac-address
```
(source-filtering | no-source-filtering);

aggregated-sonet-options {
  link-speed speed | mixed;
  minimum-links number;
}

atm-options {
  cell-bundle-size cells;
  ilmi;
  linear-red-profiles profile-name {
    high-plp-max-threshold percent;
    low-plp-max-threshold percent;
    queue-depth cells high-plp-threshold percent low-plp-threshold percent;
  }
  mpls {
    pop-all-labels {
      required-depth number;
    }
  }
  pic-type (atm1 | atm2);
  plp-to-clp;
  promiscuous-mode {
    vpi vpi-identifier;
  }
  scheduler-maps map-name {
    forwarding-class class-name {
      epd-threshold cells plp1 cells;
      linear-red-profile profile-name;
      priority (high | low);
      transmit-weight (cells number | percent number);
    }
    vc-cos-mode (alternate | strict);
  }
  vpi vpi-identifier {
    maximum-vcs maximum-vcs;
    oam-liveness {
      up-count cells;
      down-count cells;
    }
    oam-period (seconds | disable);
    shaping {
      (cbr rate | rtvbr peak rate sustained rate burst length | vbr peak rate sustained rate burst length);
      queue-length number;
    }
  }
}
clocking clock-source;
data-input (system | interface interface-name);
dce;
serial-options {
clock-rate rate;
clocking-mode (dce | internal | loop);
control-polarity (negative | positive);
cts-polarity (negative | positive);
dcd-polarity (negative | positive);
dce-options {
control-signal (assert | de-assert | normal);
cts (ignore | normal | require);
dcd (ignore | normal | require);
dsr (ignore | normal | require);
dtr signal-handling-option;
ignore-all;
indication (ignore | normal | require);
rts (assert | de-assert | normal);
tm (ignore | normal | require);
}
}

dsr-polarity (negative | positive);
dte-options {
control-signal (assert | de-assert | normal);
cts (ignore | normal | require);
dcd (ignore | normal | require);
dsr (ignore | normal | require);
dtr signal-handling-option;
ignore-all;
indication (ignore | normal | require);
rts (assert | de-assert | normal);
tm (ignore | normal | require);
}

dtr-circuit (balanced | unbalanced);
dtr-polarity (negative | positive);
encoding (nrz | nrzi);
indication-polarity (negative | positive);
line-protocol protocol;
loopback mode;
rts-polarity (negative | positive);
tm-polarity (negative | positive);
transmit-clock invert;
description text;
dialer-options {
    pool pool-name <priority priority>;
}
disable;
ds0-options {
    bert-algorithm algorithm;
    bert-error-rate rate;
    bert-period seconds;
    byte-encoding (nx56 | nx64);
    fcs (16 | 32);
    idle-cycle-flag (flags | ones);
    invert-data;
    loopback payload;
    start-end-flag (filler | shared);
}
e1-options {
    bert-error-rate rate;
    bert-period seconds;
    fcs (16 | 32);
    framing (g704 | g704-no-crc4 | unframed);
    idle-cycle-flag (flags | ones);
    invert-data;
    loopback (local | remote);
    start-end-flag (filler | shared);
    timeslots time-slot-range;
}
e3-options {
    atm-encapsulation (direct | plcp);
    bert-algorithm algorithm;
    bert-error-rate rate;
    bert-period seconds;
    buildout feet;
    compatibility-mode (digital-link | kentrox | larscom) <subrate value>;
    fcs (16 | 32);
    framing (g.751 | g.832);
    idle-cycle-flag (filler | shared);
    invert-data;
    loopback (local | remote);
    (payload-scrambler | no-payload-scrambler);
    start-end-flag (filler | shared);
    (unframed | no-unframed);
}
encapsulation type;
es-options {
    backup-interface es-fpc/pic/port;
}
fastether-options {
    802.3ad aex;
    (flow-control | no-flow-control);
    ignore-l3-incompletes;
    ingress-rate-limit rate;
    (loopback | no-loopback);
    mpls {
        pop-all-labels {
            required-depth number;
        }
    }
    source-address-filter {
        mac-address;
    }
    (source-filtering | no-source-filtering);
}
flexible-vlan-tagging;
gigether-options {
    802.3ad aex;
    (asynchronous-notification | no-asynchronous-notification);
    (auto-negotiation | no-auto-negotiation) remote-fault <local-interface-online | local-interface-offline>;
    auto-reconnect seconds;
    (flow-control | no-flow-control);
    ignore-l3-incompletes;
    (loopback | no-loopback);
    mpls {
        pop-all-labels {
            required-depth number;
        }
    }
    source-address-filter {
        mac-address;
    }
    (source-filtering | no-source-filtering);
}
output-priority-map {
    classifier {
        premium {
            forwarding-class class-name {
                loss-priority (high | low);
            }
        }
    }
}

policer cos-policer-name {
    aggregate {
        bandwidth-limit bps;
        burst-size-limit bytes;
    }
    premium {
        bandwidth-limit bps;
        burst-size-limit bytes;
    }
}

(gratuitous-arp-reply | no-gratuitous-arp-reply);
hold-time up milliseconds down milliseconds;
interface-set interface-set-name {
    interface ethernet-interface-name {
        (unit unit-number | vlan-tags-outer vlan-tag);
    }
}

isdn-options {
    bchannel-allocation (ascending | descending);
    calling-number number;
    pool pool-name <priority priority>;
    spid1 spid-string;
    spid2 spid-string;
    static-tei-val value;
    switch-type (att5e | etsi | ni1 | ntdms100 | ntt);
    t310 seconds;
    tei-option (first-call | power-up);
}
keepalives <down-count number> <interval seconds> <up-count number>;
link-mode mode;
lmi {
lmi-type (ansi | itu | c-lmi);
n391dte number;
n392dce number;
n392dte number;
n393dce number;
n393dte number;
t391dte seconds;
t392dce seconds;
}
lsq-failure-options {
  no-termination-request;
  [ trigger-link-failure interface-name ];
}
mac mac-address;
mlfr-uni-nni-bundle-options {
  acknowledge-retries number;
  acknowledge-timer milliseconds;
  action-red-differential-delay (disable-tx | remove-link);
  cisco-interoperability send-lip-remove-link-for-link-reject;
  drop-timeout milliseconds;
  fragment-threshold bytes;
  hello-timer milliseconds;
  link-layer-overhead percent;
  lmi-type (ansi | itu | c-lmi);
  minimum-links number;
  mrru bytes;
  n391 number;
  n392 number;
  n393 number;
  red-differential-delay milliseconds;
  t391 seconds;
  t392 seconds;
  yellow-differential-delay milliseconds;
  encapsulation type;
}
modem-options {
  dialin (console | routable);
  init-command-string initialization-command-string;
}
mtu bytes;
multiservice-options {
  (core-dump | no-core-dump);
  (syslog | no-syslog);
  (dump-on-flow-control);
flow-control-options {
  down-on-flow-control;
  dump-on-flow-control;
  reset-on-flow-control;
}
}
native-vlan-id number;
no-gratuitous-arp-request;
no-keepalives;
no-partition {
  interface-type type;
}
optics-options {
  wavelength nm;
  alarm-alarm-name {
    (syslog | link-down);
  }
  warning-warning-name {
    (syslog | link-down);
  }
}
partition partition-number oc-slice oc-slice-range interface-type type;
timeslots time-slot-range;
passive-monitor-mode;
per-unit-scheduler;
ppp-options {
  chap {
    access-profile name;
    default-chap-secret name;
    local-name name;
    passive;
  }
  compression {
    acfc;
    pfc;
  }
  dynamic-profile profile-name;
  no-termination-request;
pap {
  access-profile name;
  local-name name;
  local-password password;
  passive;
}
receive-bucket {
  overflow (discard | tag);
  rate percentage;
  threshold bytes;
}
redundancy-options {
  primary sp-fpc/pic/port;
  secondary sp-fpc/pic/port;
}
schedulers number;
serial-options {
  clock-rate rate;
  clocking-mode (dce | internal | loop);
  control-polarity (negative | positive);
  cts-polarity (negative | positive);
  dcd-polarity (negative | positive);
  dce-options {
    control-signal (assert | de-assert | normal);
    cts (ignore | normal | require);
    dcd (ignore | normal | require);
    dsr (ignore | normal | require);
    dtr signal-handling-option;
    ignore-all;
    indication (ignore | normal | require);
    rts (assert | de-assert | normal);
    tm (ignore | normal | require);
  }
  dsr-polarity (negative | positive);
  dte-options {
    control-signal (assert | de-assert | normal);
    cts (ignore | normal | require);
    dcd (ignore | normal | require);
    dsr (ignore | normal | require);
    dtr signal-handling-option;
    ignore-all;
    indication (ignore | normal | require);
    rts (assert | de-assert | normal);
    tm (ignore | normal | require);
  }
  dtr-circuit (balanced | unbalanced);
  dtr-polarity (negative | positive);
  encoding (nrz | nrzi);
  indication-polarity (negative | positive);
line-protocol protocol;
loopback mode;
rts-polarity (negative | positive);
tm-polarity (negative | positive);
transmit-clock invert;
}
services-options {
inactivity-timeout seconds;
open-timeout seconds;
syslog {
    host hostname {
        facility-override facility-name;
        log-prefix prefix-number;
        services priority-level;
    }
}
}
shdsl-options {
    annex (annex-a | annex-b);
    line-rate line-rate;
    loopback (local | remote);
    snr-margin {
        snext margin;
    }
}
sonet-options {
    aggregate asx;
    aps {
        advertise-interval milliseconds;
        authentication-key key;
        force;
        hold-time milliseconds;
        lockout;
        neighbor address;
        paired-group group-name;
        preserve-interface;
        protect-circuit group-name;
        request;
        revert-time seconds;
        switching-mode (bidirectional | unidirectional);
        working-circuit group-name;
    }
    bytes {
        c2 value;
e1-quiet value;
f1 value;
f2 value;
s1 value;
z3 value;
z4 value;
}
fcs (16 | 32);
loopback (local | remote);
mpls {
  pop-all-labels {
    required-depth number;
  }
}
path-trace trace-string;
(payload-scrambler | no-payload-scrambler);
rfc-2615;
trigger {
  defect ignore;
  hold-time up milliseconds down milliseconds;
}
vtmapping (itu-t | klm);
(z0-increment | no-z0-increment);
}
(speed (10m | 100m | 1g | auto) | speed (auto | 1Gbps | 100Mbps | 10Mbps) | speed (oc3 | oc12 | oc48));
stacked-vlan-tagging;
switch-options {
  switch-port port-number {
    (auto-negotiation | no-auto-negotiation);
    speed (10m | 100m | 1g);
    link-mode (full-duplex | half-duplex);
  }
}
multicast-statistics


t1-options {
  bert-algorithm algorithm;
  bert-error-rate rate;
  bert-period seconds;
  buildout value;
  byte-encoding (nx56 | nx64);
  crc-major-alarm-threshold (1e-3 | 5e-4 | 1e-4 | 5e-5 | 1e-5);
  crc-minor-alarm-threshold (1e-3 | 5e-4 | 1e-4 | 5e-5 | 1e-5 | 5e-6 | 1e-6);
  fcs (16 | 32);
  framing (esf | sf);
idle-cycle-flag (flags | ones);
invert-data;
line-encoding (ami | b8zs);
loopback (local | payload | remote);
remote-loopback-respond;
start-end-flag (filler | shared);
timeslots time-slot-range;
}
t3-options {
atm-encapsulation (direct | plcp);
bert-algorithm algorithm;
bert-error-rate rate;
bert-period seconds;
buillout feet;
(cbit-parity | no-cbit-parity);
compatibility-mode (adtran | digital-link | kentrox | larscom | verilink) <subrate value>;
fcs (16 | 32);
(feac-loop-respond | no-feac-loop-respond);
idle-cycle-flag value;
(long-buildout | no-long-buildout);
(loop-timing | no-loop-timing);
loopback (local | payload | remote);
(mac | no-mac);
(payload-scrambler | no-payload-scrambler);
start-end-flag (filler | shared);
}
traceoptions {
flag flag <flag-modifier> <disable>;
}
transmit-bucket {
overflow discard;
rate percentage;
threshold bytes;
}
(traps | no-traps);
unidirectional;
vlan-tagging;
vlan-vci-tagging;
unit logical-unit-number {
logical-interface-statements;
}

}
### Physical Interfaces Properties Statements List

Table 8 on page 66 lists statements that you can use to configure physical interfaces.

#### Table 8: Statements for Physical Interface Properties

<table>
<thead>
<tr>
<th>Statement</th>
<th>Interface Types</th>
<th>Usage Guidelines</th>
</tr>
</thead>
<tbody>
<tr>
<td>802.3ad aex</td>
<td>Aggregated Ethernet interfaces</td>
<td>Aggregated Ethernet Interfaces Overview</td>
</tr>
<tr>
<td>access-profile name</td>
<td>Interfaces with Point-to-Point Protocol (PPP) encapsulation</td>
<td>Configuring the PPP Challenge Handshake Authentication Protocol</td>
</tr>
<tr>
<td>accounting-profile name</td>
<td>All</td>
<td>&quot;Configuring Accounting for the Physical Interface&quot; on page 161</td>
</tr>
<tr>
<td>acfc</td>
<td>Interfaces with PPP encapsulation</td>
<td>Identifying the Access Concentrator</td>
</tr>
<tr>
<td>acknowledge-retries number</td>
<td>Link services and voice services interfaces</td>
<td>Junos OS Services Interfaces Library for Routing Devices</td>
</tr>
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</table>

RELATED DOCUMENTATION

Junos OS Services Interfaces Library for Routing Devices

Configuring Interface Ranges

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

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

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- Expanding Interface Range Member and Member Range Statements | 91
- Configuration Inheritance for Member Interfaces | 92
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### Configuring Interface Ranges

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

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

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

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

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

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

To specify interfaces in lexical order, use the `member-range start-range to end-range` statement.
A range for a member statement should contain the following:

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

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

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

**Example: Specifying an Interface Range Member Range**

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

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

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

**Example: Specifying an Interface Range Member**

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

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

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

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

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

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

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

**Example: Interface-Range foo Used Under the Protocols Hierarchy**

```plaintext
protocols {
    dot1x {
        authenticator {
            interface foo{
                retries 1;
            }
        }
    }
}
```
foo should be an interface-range defined at the [interfaces] hierarchy level. In the above example, the interface node can accept both individual interfaces and interface ranges.

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

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

- protocols dot1x authentication interface
- protocols dvmrp interface
- protocols oam ethernet lmi interface
- protocols esis interface
- protocols igmp interface
- protocols igmp-host client num interface
- protocols mld-host client num interface
- protocols router-advertisement interface
- protocols isis interface
- protocols ldp interface
- protocols oam ethernet link-fault-management interface
- protocols lldp interface
- protocols link-management peer lmp-control-channel interface
- protocols link-management peer control-channel
- protocols link-management te-link name interface
- protocols mld interface
- protocols ospf area id interface
- protocols pim interface
- protocols router-discovery interface
- protocols rip group name neighbour
- protocols ripng group name neighbour
- protocols rsvp interface
- protocols snmp interface
- protocols layer2-control bpdu-block interface
- protocols layer2-control mac-rewrite interface
- protocols mpls interface
- protocols stp interface
- protocols rstp interface
- protocols mstp interface
- protocols vstp interface
- protocols mstp msti id interface
- protocols mstp msti vlan id interface
- protocols vstp vlan name interface
- protocols gvrp interface
- protocols igmp-snooping vlan name interface
- protocols lldp interface
- protocols lldp-med interface
- protocols sflow interfaces
- ethernet-switching-options analyzer name input [egress | ingress ] interface
- ethernet-switching-options analyzer name output interface
- ethernet-switching-options secure-access-port interface
- ethernet-switching-options interfaces ethernet-switching-options voip interface
- ethernet-switching-options redundant-trunk-group group g1 interface
- ethernet-switching-options redundant-trunk-group group g1 interface
- ethernet-switching-options bpdu-block interface
- poe interface vlans pro-bng-mc1-bsd1 interface

SEE ALSO

- Expanding Interface Range Member and Member Range Statements
- Configuration Inheritance for Member Interfaces
- Member Interfaces Inheriting Configuration from Configuration Groups
- Interfaces Inheriting Common Configuration
- Configuring Inheritance Range Priorities
Expanding Interface Range Member and Member Range Statements

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

Example: Expanding Interface Range Member and Member Range Statements

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

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

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

expands to:

```
[ge-0/0/0, ge-0/0/1 ... ge-0/0/max_ports
 ge-0/1/0 ge-0/1/1 ... ge-0/1/max_ports
 ge-0/2/0 ge-0/2/1 ... ge-0/2/max_ports
.
.
```
The following member statement:

ge-5/[0-5]/*

expands to:

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

The following member statement:

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

expands to:

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

Configuration Inheritance for Member Interfaces

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

Example: Configuration Priorities
Foreground interface configuration takes priority compared to configuration inherited by the interface through the `interface-range`.

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

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

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

```
user@host: # show interfaces | display inheritance

## 'ge-1/0/0' was expanded from interface-range 'range-1'
##
ge-1/0/0 {
    ##
    ## '256' was expanded from interface-range 'range-1'
    ##
    mtu 256;
}
ge-1/0/1 {
    mtu 1024;
}
##
## 'ge-1/0/2' was expanded from interface-range 'range-1'
##
ge-1/0/2 {
    ##
    ## '256' was expanded from interface-range 'range-1'
    ##
    mtu 256;
}

```

Member Interfaces Inheriting Configuration from Configuration Groups

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

```
groups {
global {
  interfaces {
    <*> {
      hold-time up 10;
    }
  }
}
apply-groups [global];
  interfaces {
    interface-range range-1 {
      member-range ge-1/0/0 to ge-10/0/47;
      mtu 256;
    }
  }
}
The **hold-time** configuration is applied to all members of **interface-range range-1**.

This can be verified with **show interfaces | display inheritance** as follows:
```
user@host# show interfaces | display inheritance
```

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

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

SEE ALSO

Using Wildcards with Configuration Groups

Interfaces Inheriting Common Configuration

If an interface is a member of several interface ranges, that interface will inherit the common configuration from all of those interface ranges.
interfaces {
  interface-range range-1 {
    member-range ge-1/0/0 to ge-10/0/47;
    mtu 256;
  }
}

interfaces {
  interface-range range-1 {
    member-range ge-10/0/0 to ge-10/0/47;
    hold-time up 10;
  }
}

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

Configuring Inheritance Range Priorities

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

[edit]

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

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

Interface ge-1/1/1 exists in both interface-range int-grp-one and interface-range int-grp-two. This interface inherits mtu 256 from interface-range int-grp-one because it was defined first.
Configuration Expansion Where Interface Range Is Used

In this example, \texttt{interface-range range-1} is used under the \texttt{protocols} hierarchy:

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

The \texttt{interface} node present under \texttt{authenticator} is expanded into member interfaces of the \texttt{interface-range range-1} as follows:

```
protocols {
    dot1x {
        authenticator {
            interface ge-10/1/1 {
                retries 1;
            }
            interface ge-5/5/1 {
                retries 1;
            }
        }
    }
```
The **interface range-1** statement is expanded into two interfaces, ge-10/1/1 and ge-5/5/1, and configuration **retries 1** is copied under those two interfaces.

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

### RELATED DOCUMENTATION

- Physical Interfaces

### Specifying an Aggregated Interface

The M Series, MX Series, and T Series routers support aggregated interfaces. To specify an aggregated interface assign a number with the aggregated interface name. For example, configure **ae x** at the [edit interfaces] hierarchy level, where x is an integer ranging 0 through 127 for M Series and T Series routers and 0 through 479 on MX Series routers.

For aggregated SONET/SDH interfaces, configure **as x** at the [edit interfaces] hierarchy level.

**NOTE:** SONET/SDH aggregation is proprietary to the Junos OS and might not work with other software.

If you are configuring VLANs for aggregated Ethernet interfaces, you must include the **vlan-tagging** statement at the [edit interfaces ae x] hierarchy level to complete the association.

### RELATED DOCUMENTATION

- Aggregated Ethernet Interfaces Overview
- Configuring Aggregated SONET/SDH Interfaces
Media MTU Overview

The media maximum transmission unit (MTU) is the largest data unit that can be forwarded without fragmentation.

The default media MTU size used on a physical interface depends on the encapsulation used on that interface. In some cases, the default IP Protocol MTU depends on whether the protocol used is IP version 4 (IPv4) or International Organization for Standardization (ISO).

The default media MTU is calculated as follows:

\[
\text{Default media MTU} = \text{Default IP MTU} + \text{encapsulation overhead}
\]

When you are configuring point-to-point connections, the MTU sizes on both sides of the connections must be the same. Also, when you are configuring point-to-multipoint connections, all interfaces in the subnet must use the same MTU size.

NOTE: The actual frames transmitted also contain cyclic redundancy check (CRC) bits, which are not part of the media MTU. For example, the media MTU for a Gigabit Ethernet Version 2 interface is specified as 1514 bytes, but the largest possible frame size is actually 1518 bytes; you need to consider the extra bits in calculations of MTUs for interoperability.

The physical MTU for Ethernet interfaces does not include the 4-byte frame check sequence (FCS) field of the Ethernet frame.

A SONET/SDH interface operating in concatenated mode has a “c” added to the rate descriptor. For example, a concatenated OC48 interface is referred to as OC48c.

If you do not configure an MPLS MTU, the Junos OS derives the MPLS MTU from the physical interface MTU. From this value, the software subtracts the encapsulation-specific overhead and space for the maximum number of labels that might be pushed in the Packet Forwarding Engine. Currently, the software provides for three labels of four bytes each, for a total of 12 bytes.

In other words, the formula used to determine the MPLS MTU is the following:

\[
\text{MPLS MTU} = \text{physical interface MTU} - \text{encapsulation overhead} - 12
\]

RELATED DOCUMENTATION

Configuring the Media MTU | 118
Media MTU Sizes by Interface Type

The media maximum transmission unit (MTU) is the largest data unit that can be forwarded without fragmentation.

If you change the size of the media MTU, you must ensure that the size is equal to or greater than the sum of the protocol MTU and the encapsulation overhead.

This topic includes following information:
**Media MTU Sizes by Interface Type for M5 and M7i Routers with CFEB, M10 and M10i Routers with CFEB, and M20 and M40 Routers**

Table 9: Media MTU Sizes by Interface Type for M5 and M7i Routers with CFEB, M10 and M10i Routers with CFEB, and M20 and M40 Routers

<table>
<thead>
<tr>
<th>Interface Type</th>
<th>Default Media MTU (Bytes)</th>
<th>Maximum MTU (Bytes)</th>
<th>Default IP Protocol MTU (Bytes)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adaptive Services</td>
<td>9192</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>ATM</td>
<td>4482</td>
<td>9192</td>
<td>4470</td>
</tr>
<tr>
<td>E1/T1</td>
<td>1504</td>
<td>9192</td>
<td>1500</td>
</tr>
<tr>
<td>E3/T3</td>
<td>4474</td>
<td>9192</td>
<td>4470</td>
</tr>
<tr>
<td>Fast Ethernet</td>
<td>1514</td>
<td>1533 (4-port)</td>
<td>1500 (IPv4), 1497 (ISO)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1532 (8-port)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>1532 (12-port)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>NOTE: The maximum MTU for two 100Base-TX Fast Ethernet port FIC is 9192 bytes.</td>
<td></td>
</tr>
<tr>
<td>Gigabit Ethernet</td>
<td>1514</td>
<td>9192</td>
<td>1500 (IPv4), 1497 (ISO)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>NOTE: The maximum MTU for one Gigabit Ethernet port FIC is 9192 bytes.</td>
<td></td>
</tr>
<tr>
<td>Serial</td>
<td>1504</td>
<td>9192</td>
<td>1500 (IPv4), 1497 (ISO)</td>
</tr>
<tr>
<td>SONET/SDH</td>
<td>4474</td>
<td>9192</td>
<td>4470</td>
</tr>
</tbody>
</table>
## Media MTU Sizes by Interface Type for M40e Routers

Table 10: Media MTU Sizes by Interface Type for M40e Routers

<table>
<thead>
<tr>
<th>Interface Type</th>
<th>Default Media MTU (Bytes)</th>
<th>Maximum MTU (Bytes)</th>
<th>Default IP Protocol MTU (Bytes)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adaptive Services (MTU size not configurable)</td>
<td>9192</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>ATM</td>
<td>4482</td>
<td>9192</td>
<td>4470</td>
</tr>
<tr>
<td>E1/T1</td>
<td>1504</td>
<td>4500</td>
<td>1500</td>
</tr>
<tr>
<td>E3/T3</td>
<td>4474</td>
<td>4500</td>
<td>4470</td>
</tr>
<tr>
<td></td>
<td></td>
<td>9192 (4-port)</td>
<td></td>
</tr>
<tr>
<td>E3/DS3 IQ</td>
<td>4474</td>
<td>9192</td>
<td>4470</td>
</tr>
<tr>
<td>Fast Ethernet</td>
<td>1514</td>
<td>1533</td>
<td>1500 (IPv4), 1497 (ISO)</td>
</tr>
<tr>
<td>Gigabit Ethernet</td>
<td>1514</td>
<td>9192 (1- or 2-port)</td>
<td>1500 (IPv4), 1497 (ISO)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>9192 (4-port)</td>
<td></td>
</tr>
<tr>
<td>Serial</td>
<td>1504</td>
<td>9192</td>
<td>1500 (IPv4), 1497 (ISO)</td>
</tr>
</tbody>
</table>
## Table 10: Media MTU Sizes by Interface Type for M40e Routers (continued)

| Interface Type     | Default Media MTU (Bytes) | Maximum MTU (Bytes)                      | Default IP Protocol MTU (Bytes) |
|--------------------|---------------------------|------------------------------------------|--------------------------------
| SONET/SDH          | 4474                      | 4500 (1-port nonconcatenated)            | 4470                           |
|                    |                           | 9192 (4-port OC3)                        |                                |
|                    |                           | 9192 (4-port OC3c)                       |                                |
|                    |                           | 4500 (1-port OC12)                       |                                |
|                    |                           | 4500 (4-port OC12)                       |                                |
|                    |                           | 4500 (4-port OC12c)                      |                                |
|                    |                           | 4500 (1-port OC48)                       |                                |
|                    |                           | 9192 (2-port OC3)                        |                                |
|                    |                           | 9192 (2-port OC3c)                       |                                |
|                    |                           | 9192 (1-port OC12c)                      |                                |
|                    |                           | 9192 (1-port OC48c)                      |                                |
|                    |                           | 4500 (1-port OC192)                      |                                |
|                    |                           | 9192 (1-port OC192c)                     |                                |

## Media MTU Sizes by Interface Type for M160 Routers

### Table 11: Media MTU Sizes by Interface Type for M160 Routers

<table>
<thead>
<tr>
<th>Interface Type</th>
<th>Default Media MTU (Bytes)</th>
<th>Maximum MTU (Bytes)</th>
<th>Default IP Protocol MTU (Bytes)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adaptive Services (MTU size not configurable)</td>
<td>9192</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>ATM</td>
<td>4482</td>
<td>9192</td>
<td>4470</td>
</tr>
<tr>
<td>E1/T1</td>
<td>1504</td>
<td>4500</td>
<td>1500</td>
</tr>
</tbody>
</table>
### Table 11: Media MTU Sizes by Interface Type for M160 Routers (continued)

<table>
<thead>
<tr>
<th>Interface Type</th>
<th>Default Media MTU (Bytes)</th>
<th>Maximum MTU (Bytes)</th>
<th>Default IP Protocol MTU (Bytes)</th>
</tr>
</thead>
<tbody>
<tr>
<td>E3/T3</td>
<td>4474</td>
<td>4500</td>
<td>4470</td>
</tr>
<tr>
<td>E3/DS3 IQ</td>
<td>4474</td>
<td>9192</td>
<td>4470</td>
</tr>
<tr>
<td>Fast Ethernet</td>
<td>1514</td>
<td>1533</td>
<td>1500 (IPv4), 1497 (ISO)</td>
</tr>
<tr>
<td>Gigabit Ethernet</td>
<td>1514</td>
<td>9192 (1- or 2-port)</td>
<td>1500 (IPv4), 1497 (ISO)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4500 (4-port)</td>
<td></td>
</tr>
<tr>
<td>Serial</td>
<td>1504</td>
<td>9192</td>
<td>1500 (IPv4), 1497 (ISO)</td>
</tr>
<tr>
<td>SONET/SDH</td>
<td>4474</td>
<td>4500 (1-port nonconcatenated)</td>
<td>4470</td>
</tr>
<tr>
<td></td>
<td></td>
<td>9192 (1- or 2-port)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>4500 (4-port)</td>
<td></td>
</tr>
</tbody>
</table>

### Media MTU Sizes by Interface Type for M7i Routers with CFEB-E, M10i Routers with CFEB-E, and M320 and M120 Routers

### Table 12: Media MTU Sizes by Interface Type for M7i Routers with CFEB-E, M10i Routers with CFEB-E, and M320 and M120 Routers

<table>
<thead>
<tr>
<th>Interface Type</th>
<th>Default Media MTU (Bytes)</th>
<th>Maximum MTU (Bytes)</th>
<th>Default IP Protocol MTU (Bytes)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ATM2 IQ</td>
<td>4482</td>
<td>9192</td>
<td>4470</td>
</tr>
<tr>
<td>Channelized DS3 IQ</td>
<td>4471</td>
<td>4500</td>
<td>4470</td>
</tr>
<tr>
<td>Channelized E1 IQ</td>
<td>1504</td>
<td>4500</td>
<td>1500</td>
</tr>
<tr>
<td>Channelized OC12 IQ</td>
<td>4474</td>
<td>9192</td>
<td>4470</td>
</tr>
</tbody>
</table>
Table 12: Media MTU Sizes by Interface Type for M7i Routers with CFEB-E, M10i Routers with CFEB-E, and M320 and M120 Routers (continued)

<table>
<thead>
<tr>
<th>Interface Type</th>
<th>Default Media MTU (Bytes)</th>
<th>Maximum MTU (Bytes)</th>
<th>Default IP Protocol MTU (Bytes)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Channelized STM1 IQ</td>
<td>4474</td>
<td>9192</td>
<td>4470</td>
</tr>
<tr>
<td>DS3</td>
<td>4471</td>
<td>4500</td>
<td>4470</td>
</tr>
<tr>
<td>E1</td>
<td>1504</td>
<td>4500</td>
<td>1500</td>
</tr>
<tr>
<td>E3 IQ</td>
<td>4471</td>
<td>4500</td>
<td>4470</td>
</tr>
<tr>
<td>Fast Ethernet</td>
<td>1514</td>
<td>1533 (4-port)</td>
<td>1500 (IPv4), 1497 (ISO)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1532 (8-, 12- and 48-port)</td>
<td></td>
</tr>
<tr>
<td>Gigabit Ethernet</td>
<td>1514</td>
<td>9192</td>
<td>1500 (IPv4), 1497 (ISO)</td>
</tr>
<tr>
<td>SONET/SDH</td>
<td>4474</td>
<td>9192</td>
<td>4470</td>
</tr>
<tr>
<td>T1</td>
<td>1504</td>
<td>4500</td>
<td>1500</td>
</tr>
<tr>
<td>CT3 IQ (excluding M120)</td>
<td>4474</td>
<td>9192</td>
<td>4470</td>
</tr>
</tbody>
</table>

Media MTU Sizes by Interface Type for MX Series Routers

Table 13: Media MTU Sizes by Interface Type for MX Series Routers

<table>
<thead>
<tr>
<th>Interface Type</th>
<th>Default Media MTU (Bytes)</th>
<th>Maximum MTU (Bytes)</th>
<th>Default IP Protocol MTU (Bytes)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gigabit Ethernet</td>
<td>1514</td>
<td>• 9192</td>
<td>1500 (IPv4), 1488 (MPLS), 1497 (ISO)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• 9500 (Junos OS 16.1R1 and later releases)</td>
<td></td>
</tr>
</tbody>
</table>
Table 13: Media MTU Sizes by Interface Type for MX Series Routers (continued)

<table>
<thead>
<tr>
<th>Interface Type</th>
<th>Default Media MTU (Bytes)</th>
<th>Maximum MTU Protocol Bytes</th>
<th>Default IP Protocol MTU (Bytes)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10-Gigabit Ethernet</td>
<td>1514</td>
<td>• 9192</td>
<td>1500 (IPv4), 1488 (MPLS), 1497 (ISO)</td>
</tr>
<tr>
<td>Multi-Rate Ethernet</td>
<td>1514</td>
<td>• 9192 • 9500 (Junos OS 16.1R1 and later releases)</td>
<td>1500 (IPv4), 1488 (MPLS), 1497 (ISO)</td>
</tr>
<tr>
<td>Tri-Rate Ethernet</td>
<td>1514</td>
<td>• 9192 • 9500 (Junos OS 16.1R1 and later releases)</td>
<td>1500 (IPv4), 1488 (MPLS), 1497 (ISO)</td>
</tr>
<tr>
<td>Channelized SONET/SDH OC3/STM1 (Multi-Rate)</td>
<td>1514</td>
<td>9192</td>
<td>1500 (IPv4), 1488 (MPLS), 1497 (ISO)</td>
</tr>
<tr>
<td>DS3/E3 (Multi-Rate)</td>
<td>1514</td>
<td>9192</td>
<td>1500 (IPv4), 1488 (MPLS), 1497 (ISO)</td>
</tr>
</tbody>
</table>

NOTE: Starting in Junos OS Release 16.1R1, the MTU size for a media or protocol is increased from 9192 to 9500 for Ethernet interfaces on the following MX Series MPCs:

- MPC1
- MPC2
- MPC2E
- MPC3E
- MPC4E
- MPC5E
- MPC6E
NOTE: Starting in Junos OS Release 16.1R1, the MTU size for a media or protocol is increased from 9192 to 9500 for Ethernet interfaces on the following MX Series MPCs:

- MPC1
- MPC2
- MPC2E
- MPC3E
- MPC4E
- MPC5E
- MPC6E

Starting in Junos OS Release 16.1R1, the MTU size has been increased to 16,000 bytes for certain MPCs. The MTU size for the following MPCs has been increased to 16000 bytes:

- MPC7E (MPC7E-MRATE and MP7E-10G)
- MPC8E (MX2K-MPC8E)
- MPC9E (MX2K-MPC9E)

Starting in Junos OS Release 17.3R1, the MTU size for MX10003 MPC is 16,000 bytes.

Starting in Junos OS Release 17.4R1, the MTU size for MX204 is 16,000 bytes.

In all Junos OS releases, the maximum MTU size for MX5, MX10, MX40, and MX80 routers is 9192 bytes.

In all Junos OS releases, the maximum MTU size for MPC2E-NG and MPC3E-NG is 9500 bytes.

### Media MTU Sizes by Interface Type for T320 Routers

**Table 14: Media MTU Sizes by Interface Type for T320 Routers**

<table>
<thead>
<tr>
<th>Interface Type</th>
<th>Default Media MTU (Bytes)</th>
<th>Maximum MTU (Bytes)</th>
<th>Default IP Protocol MTU (Bytes)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ATM</td>
<td>4482</td>
<td>9192</td>
<td>4470</td>
</tr>
<tr>
<td>ATM2 IQ</td>
<td>4482</td>
<td>9192</td>
<td>4470</td>
</tr>
<tr>
<td>Channelized OC12 IQ</td>
<td>4474</td>
<td>9192</td>
<td>4470</td>
</tr>
</tbody>
</table>
### Table 14: Media MTU Sizes by Interface Type for T320 Routers (continued)

<table>
<thead>
<tr>
<th>Interface Type</th>
<th>Default Media MTU (Bytes)</th>
<th>Maximum MTU (Bytes)</th>
<th>Default IP Protocol MTU (Bytes)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Channelized STM1 IQ</td>
<td>4474</td>
<td>9192</td>
<td>4470</td>
</tr>
<tr>
<td>DS3</td>
<td>4471</td>
<td>4500</td>
<td>4470</td>
</tr>
<tr>
<td>Fast Ethernet</td>
<td>1514</td>
<td>1533 (4-port)</td>
<td>1500 (IPv4), 1497 (ISO)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1532 (12- and 48-port)</td>
<td></td>
</tr>
<tr>
<td>Gigabit Ethernet</td>
<td>1514</td>
<td>9192</td>
<td>1500 (IPv4), 1497 (ISO)</td>
</tr>
<tr>
<td>SONET/SDH</td>
<td>4474</td>
<td>9192</td>
<td>4470</td>
</tr>
<tr>
<td>CT3 IQ</td>
<td>4474</td>
<td>9192</td>
<td>4470</td>
</tr>
</tbody>
</table>

### Media MTU Sizes by Interface Type for T640 Platforms

### Table 15: Media MTU Sizes by Interface Type for T640 Platforms

<table>
<thead>
<tr>
<th>Interface Type</th>
<th>Default Media MTU (Bytes)</th>
<th>Maximum MTU (Bytes)</th>
<th>Default IP Protocol MTU (Bytes)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ATM2 IQ</td>
<td>4482</td>
<td>9192</td>
<td>4470</td>
</tr>
<tr>
<td>48-port Fast Ethernet</td>
<td>1514</td>
<td>1532</td>
<td>1500 (IPv4), 1497 (ISO)</td>
</tr>
<tr>
<td>Gigabit Ethernet</td>
<td>1514</td>
<td>9192</td>
<td>1500 (IPv4), 1497 (ISO)</td>
</tr>
<tr>
<td>SONET/SDH</td>
<td>4474</td>
<td>9192</td>
<td>4470</td>
</tr>
<tr>
<td>CT3 IQ</td>
<td>4474</td>
<td>9192</td>
<td>4470</td>
</tr>
</tbody>
</table>
### Media MTU Sizes by Interface Type for EX Series Switches and ACX Series Routers

**Table 16: Media MTU Sizes by Interface Type for EX Series Switches and ACX Series Routers**

<table>
<thead>
<tr>
<th>Interface Type</th>
<th>Default Media MTU (Bytes)</th>
<th>Maximum MTU (Bytes)</th>
<th>Default IP Protocol MTU (Bytes)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gigabit Ethernet</td>
<td>1514</td>
<td>9192</td>
<td>1500 (IPv4), 1497 (ISO)</td>
</tr>
<tr>
<td>10-Gigabit Ethernet</td>
<td>1514</td>
<td>9192</td>
<td>1500 (IPv4), 1497 (ISO)</td>
</tr>
</tbody>
</table>

**NOTE:** On ACX Series routers, you can configure the protocol MTU by including the `mtu` statement at the `[edit interfaces interface-name unit logical-unit-number family inet]` or `[edit interfaces interface-name unit logical-unit-number family inet6]` hierarchy level.

- If you configure the protocol MTU at any of these hierarchy levels, the configured value is applied to all families that are configured on the logical interface.
- If you are configuring the protocol MTU for both `inet` and `inet6` families on the same logical interface, you must configure the same value for both the families. It is not recommended to configure different MTU size values for `inet` and `inet6` families that are configured on the same logical interface.

### Media MTU Sizes by Interface Type for PTX Series Packet Transport Routers

**Table 17: Media MTU Sizes by Interface Type for PTX Series Packet Transport Routers**

<table>
<thead>
<tr>
<th>Interface Type</th>
<th>Default Media MTU (Bytes)</th>
<th>Maximum MTU (Bytes)</th>
<th>Default IP Protocol MTU (Bytes)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10-Gigabit Ethernet</td>
<td>1514</td>
<td>9500</td>
<td>1500 (IPv4), 1488 (MPLS), 1497 (ISO)</td>
</tr>
<tr>
<td>40-Gigabit Ethernet</td>
<td>1514</td>
<td>9500</td>
<td>1500 (IPv4), 1488 (MPLS), 1497 (ISO)</td>
</tr>
</tbody>
</table>
Table 17: Media MTU Sizes by Interface Type for PTX Series Packet Transport Routers (continued)

<table>
<thead>
<tr>
<th>Interface Type</th>
<th>Default Media MTU (Bytes)</th>
<th>Maximum MTU (Bytes)</th>
<th>Default IP Protocol MTU (Bytes)</th>
</tr>
</thead>
<tbody>
<tr>
<td>100-Gigabit Ethernet</td>
<td>1514</td>
<td>9500</td>
<td>1500 (IPv4), 1488 (MPLS), 1497 (ISO)</td>
</tr>
</tbody>
</table>

Release History Table

<table>
<thead>
<tr>
<th>Release</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>17.4R1</td>
<td>Starting in Junos OS Release 17.4R1, the MTU size for MX204 is 16,000 bytes.</td>
</tr>
<tr>
<td>17.3R1</td>
<td>Starting in Junos OS Release 17.3R1, the MTU size for MX10003 MPC is 16,000 bytes.</td>
</tr>
<tr>
<td>16.1R1</td>
<td>Starting in Junos OS Release 16.1R1, the MTU size has been increased to 16,000 bytes for certain MPCs.</td>
</tr>
</tbody>
</table>

RELATED DOCUMENTATION

- Encapsulation Overhead by Interface Encapsulation Type | 114
- Configuring the Media MTU | 118
- Media MTU Overview | 99
- Setting the Protocol MTU | 221

Configuring the Media MTU on ACX Series Routers

IN THIS SECTION

- Media MTU Overview | 111
- How to Configure the Media MTU | 111
- Encapsulation Overhead by Encapsulation Type | 112
- Media MTU Sizes by Interface Type for ACX Series Routers | 114
**Media MTU Overview**

The default media MTU size used on a physical interface depends on the encapsulation used on that interface. In some cases, the default IP Protocol MTU depends on whether the protocol used is IP version 4 (IPv4) or International Organization for Standardization (ISO).

The default media MTU is calculated as follows:

\[
\text{Default media MTU} = \text{Default IP MTU} + \text{encapsulation overhead}
\]

When you are configuring point-to-point connections, the MTU sizes on both sides of the connections must be the same. Also, when you are configuring point-to-multipoint connections, all interfaces in the subnet must use the same MTU size. For details about encapsulation overhead, see “Encapsulation Overhead by Encapsulation Type” on page 112.

**NOTE:** The actual frames transmitted also contain cyclic redundancy check (CRC) bits, which are not part of the media MTU. For example, the media MTU for a Gigabit Ethernet Version 2 interface is specified as 1514 bytes, but the largest possible frame size is actually 1518 bytes; you need to consider the extra bits in calculations of MTUs for interoperability.

The physical MTU for Ethernet interfaces does not include the 4-byte frame check sequence (FCS) field of the Ethernet frame.

If you do not configure an MPLS MTU, the Junos OS derives the MPLS MTU from the physical interface MTU. From this value, the software subtracts the encapsulation-specific overhead and space for the maximum number of labels that might be pushed in the Packet Forwarding Engine. Currently, the software provides for three labels of four bytes each, for a total of 12 bytes.

In other words, the formula used to determine the MPLS MTU is the following:

\[
\text{MPLS MTU} = \text{physical interface MTU} - \text{encapsulation overhead} - 12
\]

If you configure an MTU value by including the `mtu` statement at the `[edit interfaces interface-name unit logical-unit-number family mpls]` hierarchy level, the configured value is used. Junos OS Release 16.2R1.6 and later releases do not support `family mpls` MTU.

**How to Configure the Media MTU**

To modify the default media MTU size for a physical interface, include the `mtu` statement at the `[edit interfaces interface-name]` hierarchy level:
If you change the size of the media MTU, you must ensure that the size is equal to or greater than the sum of the protocol MTU and the encapsulation overhead.

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

You configure the protocol MTU by including the `mtu` statement at the following hierarchy levels:

- `[edit interfaces interface-name unit logical-unit-number family inet]`
- `[edit interfaces interface-name unit logical-unit-number family inet6]`

If you configure the protocol MTU at any of these hierarchy levels, the configured value is applied to all families that are configured on the logical interface.

NOTE: If you are configuring the protocol MTU for both `inet` and `inet6` families on the same logical interface, you must configure the same value for both the families. It is not recommended to configure different MTU size values for `inet` and `inet6` families that are configured on the same logical interface.

### Encapsulation Overhead by Encapsulation Type

**Table 18: Encapsulation Overhead by Encapsulation Type**

<table>
<thead>
<tr>
<th>Interface Encapsulation</th>
<th>Encapsulation Overhead (Bytes)</th>
</tr>
</thead>
<tbody>
<tr>
<td>802.1Q/Ethernet 802.3</td>
<td>21</td>
</tr>
<tr>
<td>802.1Q/Ethernet Subnetwork Access Protocol (SNAP)</td>
<td>26</td>
</tr>
<tr>
<td>802.1Q/Ethernet version 2</td>
<td>18</td>
</tr>
<tr>
<td>ATM Cell Relay</td>
<td>4</td>
</tr>
<tr>
<td>ATM permanent virtual connection (PVC)</td>
<td>12</td>
</tr>
<tr>
<td>Interface Encapsulation</td>
<td>Encapsulation Overhead (Bytes)</td>
</tr>
<tr>
<td>-------------------------------------------------------------</td>
<td>--------------------------------</td>
</tr>
<tr>
<td>Cisco HDLC</td>
<td>4</td>
</tr>
<tr>
<td>Ethernet 802.3</td>
<td>17</td>
</tr>
<tr>
<td>Ethernet circuit cross-connect (CCC) and virtual private LAN service (VPLS)</td>
<td>4</td>
</tr>
<tr>
<td>Ethernet over ATM</td>
<td>32</td>
</tr>
<tr>
<td>Ethernet SNAP</td>
<td>22</td>
</tr>
<tr>
<td>Ethernet translational cross-connect (TCC)</td>
<td>18</td>
</tr>
<tr>
<td>Ethernet version 2</td>
<td>14</td>
</tr>
<tr>
<td>Extended virtual local area network (VLAN) CCC and VPLS</td>
<td>4</td>
</tr>
<tr>
<td>Extended VLAN TCC</td>
<td>22</td>
</tr>
<tr>
<td>Frame Relay</td>
<td>4</td>
</tr>
<tr>
<td>PPP</td>
<td>4</td>
</tr>
<tr>
<td>VLAN CCC</td>
<td>4</td>
</tr>
<tr>
<td>VLAN VPLS</td>
<td>4</td>
</tr>
<tr>
<td>VLAN TCC</td>
<td>22</td>
</tr>
</tbody>
</table>
### Media MTU Sizes by Interface Type for ACX Series Routers

Table 19: Media MTU Sizes by Interface Type for ACX Series Routers

<table>
<thead>
<tr>
<th>Interface Type</th>
<th>Default Media MTU (Bytes)</th>
<th>Maximum MTU (Bytes)</th>
<th>Default IP Protocol MTU (Bytes)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gigabit Ethernet</td>
<td>1514</td>
<td>9192</td>
<td>1500 (IPv4), 1497 (ISO)</td>
</tr>
<tr>
<td>10-Gigabit Ethernet</td>
<td>1514</td>
<td>9192</td>
<td>1500 (IPv4), 1497 (ISO)</td>
</tr>
</tbody>
</table>

### Encapsulation Overhead by Interface Encapsulation Type

If you change the size of the media MTU, you must ensure that the size is equal to or greater than the sum of the protocol MTU and the encapsulation overhead. The following table lists the interface encapsulation and corresponding encapsulation overhead.

Table 20: Encapsulation Overhead by Encapsulation Type

<table>
<thead>
<tr>
<th>Interface Encapsulation</th>
<th>Encapsulation Overhead (Bytes)</th>
</tr>
</thead>
<tbody>
<tr>
<td>802.1Q/Ethernet 802.3</td>
<td>21</td>
</tr>
<tr>
<td>802.1Q/Ethernet Subnetwork Access Protocol (SNAP)</td>
<td>26</td>
</tr>
<tr>
<td>802.1Q/Ethernet version 2</td>
<td>18</td>
</tr>
<tr>
<td>ATM Cell Relay</td>
<td>4</td>
</tr>
<tr>
<td>ATM permanent virtual connection (PVC)</td>
<td>12</td>
</tr>
</tbody>
</table>
Table 20: Encapsulation Overhead by Encapsulation Type (continued)

<table>
<thead>
<tr>
<th>Interface Encapsulation</th>
<th>Encapsulation Overhead (Bytes)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cisco HDLC</td>
<td>4</td>
</tr>
<tr>
<td>Ethernet 802.3</td>
<td>17</td>
</tr>
<tr>
<td>Ethernet circuit cross-connect (CCC) and virtual private LAN service (VPLS)</td>
<td>4</td>
</tr>
<tr>
<td>Ethernet over ATM</td>
<td>32</td>
</tr>
<tr>
<td>Ethernet SNAP</td>
<td>22</td>
</tr>
<tr>
<td>Ethernet translational cross-connect (TCC)</td>
<td>18</td>
</tr>
<tr>
<td>Ethernet version 2</td>
<td>14</td>
</tr>
<tr>
<td>Extended virtual local area network (VLAN) CCC and VPLS</td>
<td>4</td>
</tr>
<tr>
<td>Extended VLAN TCC</td>
<td>22</td>
</tr>
<tr>
<td>Frame Relay</td>
<td>4</td>
</tr>
<tr>
<td>PPP</td>
<td>4</td>
</tr>
<tr>
<td>VLAN CCC</td>
<td>4</td>
</tr>
<tr>
<td>VLAN VPLS</td>
<td>4</td>
</tr>
<tr>
<td>VLAN TCC</td>
<td>22</td>
</tr>
</tbody>
</table>

RELATED DOCUMENTATION

- Media MTU Overview | 99
- Configuring the Media MTU | 118
- Encapsulation Overhead by Interface Encapsulation Type | 114
- Setting the Protocol MTU | 221
Configuring Interface Description

You can include a text description of each physical interface in the configuration file. Any descriptive text you include is displayed in the output of the show interfaces commands, and is also exposed in the ifAlias Management Information Base (MIB) object. It has no impact on the interface’s configuration.

To add a text description, include the description statement at the [edit interfaces interface-name] hierarchy level:

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

For example:

```
[edit]
user@host# set interfaces fe-0/0/1 description "Backbone connection to PHL01"
```

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

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

For information about describing logical units, see “Adding a Logical Unit Description to the Configuration” on page 183.

To display the description from the router or switch CLI, use the show interfaces command:

```
user@host> show interfaces fe-0/0/1
```

Physical interface: fe-0/0/1, Enabled, Physical link is Up
  Interface index: 129, SNMP ifIndex: 23
  Description: Backbone connection to PHL01
  ...
To display the interface description from the interfaces MIB, use the `snmpwalk` command from a server. To isolate information for a specific interface, search for the interface index shown in the SNMP `ifIndex` field of the `show interfaces` command output. The `ifAlias` object is in `ifXTable`.

```
user-server> snmpwalk host-fxp0.mylab public ifXTable | grep -e '^.23'

ifMIB.ifMIBObjects.ifXTable.ifXEntry.ifName.23 = fe-0/0/1
ifMIB.ifMIBObjects.ifXTable.ifXEntry.ifInMulticastPkts.23 = Counter32: 0
ifMIB.ifMIBObjects.ifXTable.ifXEntry.ifInBroadcastPkts.23 = Counter32: 0
ifMIB.ifMIBObjects.ifXTable.ifXEntry.ifOutMulticastPkts.23 = Counter32: 0
ifMIB.ifMIBObjects.ifXTable.ifXEntry.ifOutBroadcastPkts.23 = Counter32: 0
ifMIB.ifMIBObjects.ifXTable.ifXEntry.ifHCInOctets.23 = Counter64: 0
ifMIB.ifMIBObjects.ifXTable.ifXEntry.ifHCInUcastPkts.23 = Counter64: 0
ifMIB.ifMIBObjects.ifXTable.ifXEntry.ifHCInMulticastPkts.23 = Counter64: 0
ifMIB.ifMIBObjects.ifXTable.ifXEntry.ifHCInBroadcastPkts.23 = Counter64: 0
ifMIB.ifMIBObjects.ifXTable.ifXEntry.ifHCOutOctets.23 = Counter64: 42
ifMIB.ifMIBObjects.ifXTable.ifXEntry.ifHCOutUcastPkts.23 = Counter64: 0
ifMIB.ifMIBObjects.ifXTable.ifXEntry.ifHCOutMulticastPkts.23 = Counter64: 0
ifMIB.ifMIBObjects.ifXTable.ifXEntry.ifHCOutBroadcastPkts.23 = Counter64: 0
ifMIB.ifMIBObjects.ifXTable.ifXEntry.ifLinkUpDownTrapEnable.23 = enabled(1)
ifMIB.ifMIBObjects.ifXTable.ifXEntry.ifHighSpeed.23 = Gauge32: 100
ifMIB.ifMIBObjects.ifXTable.ifXEntry.ifPromiscuousMode.23 = false(2)
ifMIB.ifMIBObjects.ifXTable.ifXEntry.ifConnectorPresent.23 = true(1)
ifMIB.ifMIBObjects.ifXTable.ifXEntry.ifAlias.23 = Backbone connection to PHL01
ifMIB.ifMIBObjects.ifXTable.ifXEntry.ifCounterDiscontinuityTime.23 = Timeticks: (0) 0:00:00.00
```
Configuring the Media MTU

The media maximum transmission unit (MTU) is the largest data unit that can be forwarded without fragmentation. The default media MTU size used on a physical interface depends on the encapsulation being used on that interface. For a listing of MTU sizes for each encapsulation type, see "Media MTU Sizes by Interface Type" on page 100.

To configure the media-MTU size:

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

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

2. Include the mtu statement.

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

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

  - [edit interfaces interface-name unit logical-unit-number family family]
NOTE:

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

RELATED DOCUMENTATION

| Media MTU Overview | 99 |
| Media MTU Sizes by Interface Type | 100 |
| Encapsulation Overhead by Interface Encapsulation Type | 114 |

Configuring the Interface Speed

IN THIS SECTION

- Configuring the Interface Speed on Ethernet Interfaces | 120
- Configuring Aggregated Ethernet Link Speed | 121
- Configuring SONET/SDH Interface Speed | 124
You can configure the interface speed in following ways:

**Configuring the Interface Speed on Ethernet Interfaces**

For M Series and T Series Fast Ethernet 12-port and 48-port PIC interfaces, the management Ethernet interface (fxp0 or em0), and the MX Series Tri-Rate Ethernet copper interfaces, you can explicitly set the interface speed. The Fast Ethernet, fxp0, and em0 interfaces can be configured for 10 Mbps or 100 Mbps (10m | 100m). The MX Series Tri-Rate Ethernet copper interfaces can be configured for 10 Mbps, 100 Mbps, or 1 Gbps (10m | 100m | 1g). For information about management Ethernet interfaces and to determine the management Ethernet interface type for your router, see *Understanding Management Ethernet Interfaces* and *Supported Routing Engines by Router*. MX Series routers, with MX-DPC and Tri-Rate Copper SFPs, support 20x1 Copper to provide backwards compatibility with 100/10BASE-T and 1000BASE-T operation through an Serial Gigabit Media Independent Interface (SGMII) interface.

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

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

2. To configure the speed, include the `speed` statement at the `[edit interfaces interface-name]` hierarchy level.

   ```
   [edit interfaces interface-name]
   user@host# set speed (10m | 100m | 1g | auto | auto-10m-100m);
   ```
NOTE:

- By default, the M Series and T Series routers management Ethernet interface autonegotiates whether to operate at 10 megabits per second (Mbps) or 100 Mbps. All other interfaces automatically choose the correct speed based on the PIC type and whether the PIC is configured to operate in multiplexed mode (using the no-concatenate statement in the [edit chassis] configuration hierarchy.

- Starting with Junos OS Release 14.2 the auto-10m-100m option allows the fixed tri-speed port to auto negotiate with ports limited by 100m or 10m maximum speed. This option must be enabled only for Tri-rate MPC port, that is, 3D 40x 1GE (LAN) RJ45 MIC on MX platform. This option does not support other MICs on MX platform.

- When you manually configure Fast Ethernet interfaces on the M Series and T Series routers, link mode and speed must both be configured. If both these values are not configured, the router uses autonegotiation for the link and ignores the user-configured settings.

- If the link partner does not support autonegotiation, configure either Fast Ethernet port manually to match its link partner’s speed and link mode. When the link mode is configured, autonegotiation is disabled.

- On MX Series routers with tri-rate copper SFP interfaces, if the port speed is negotiated to the configured value and the negotiated speed and interface speed do not match, the link will not be brought up.

- When you configure the Tri-Rate Ethernet copper interface to operate at 1 Gbps, autonegotiation must be enabled.

- Starting with Junos OS Release 11.4, half-duplex mode is not supported on Tri-Rate Ethernet copper interfaces. When you include the speed statement, you must include the link-mode full-duplex statement at the same hierarchy level.

SEE ALSO

| speed |

Configuring Aggregated Ethernet Link Speed

On aggregated Ethernet interfaces, you can set the required link speed for all interfaces included in the bundle. Generally, all interfaces that make up a bundle must have the same speed. If you include in the aggregated Ethernet interface an individual link that has a speed different from the speed that you specify in the link-speed parameter, an error message is logged. However, there are exceptions.
Starting with Junos OS Release 13.2, aggregated Ethernet supports mixed rates and mixed modes on T640, T1600, T4000, and TX Matrix Plus routers. For example, these mixes are supported:

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

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

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

**NOTE:**

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

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

To set the required link speed:

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

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

2. Configure the link speed.

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

   *speed* can be in bits per second either as a complete decimal number or as a decimal number followed by the abbreviation *k* (1000), *m* (1,000,000), or *g* (1,000,000,000).
Aggregated Ethernet interfaces on the M120 router can have one of the following speeds:

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

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

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

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

- **100g**—Links are 100 Gbps.
- **100m**—Links are 100 Mbps.
- **10g**—Links are 10 Gbps.
- **1g**—Links are 1 Gbps.
- **40g**—Links are 40 Gbps.
- **50g**—Links are 50 Gbps.
- **80g**—Links are 80 Gbps.
- **8g**—Links are 8 Gbps.
- **mixed**—Links are of various speeds.
- **oc192**—Links are OC192.

SEE ALSO

| aggregated-ether-options |
Configuring SONET/SDH Interface Speed

To configure the speed of SONET/SDH interfaces in concatenated mode:

1. In configuration mode, go to the `[edit interfaces interface-name]` hierarchy level, where the `interface-name` is `so-fpc/pic/port`.

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

2. Configure interface speed in concatenated mode.

   For example, each port of 4-port OC12 PIC can be configured to be in OC3 or OC12 speed independently when this PIC is in 4xOC12 concatenated mode.

   ```
   [edit interfaces so-fpc/pic/port]
   user@host# set speed (oc3 | oc12 | oc48)
   ```

To configure the speed of SONET/SDH interfaces in nonconcatenated mode:

1. In configuration mode, go to the `[edit interfaces interface-name]` hierarchy level, where the `interface-name` is `so-fpc/pic/port`.

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

2. Configure interface speed in nonconcatenated mode.

   For example, each port of 4-port OC12 PIC can be configured to be in OC3 or OC12 speed independently when this PIC is in 4xOC12 concatenated mode.

   ```
   [edit interfaces so-fpc/pic/port]
   user@host# set speed (oc3 | oc12)
   ```

To configure the PIC to operate in channelized (multiplexed) mode:

1. In configuration mode, go to the `[edit chassis fpc slot-number pic pic-number]` hierarchy level.

   ```
   [edit]
   user@host# [edit chassis fpc slot-number pic pic-number]
   ```
2. Configure the **no-concatenate** option.

```
[edit interfaces so-fpc/pic/port]
user@host# set no-concatenate
```

**NOTE:** On SONET/SDH OC3/STM1 (Multi-Rate) MIC with SFP, Channelized SONET/SDH OC3/STM1 (Multi-Rate) MIC with SFP, and Channelized OC3/STM1 (Multi-Rate) Circuit Emulation MIC with SFP, you cannot set the interface speed at the [edit interfaces] hierarchy level. To enable the speed on these MICs, you need to set the port speed at the [edit chassis fpc slot-number pic pic-number port port-number] hierarchy level.

For more information about using the **non-concatenate** statement, see the *Junos OS Administration Library*.

**SEE ALSO**

- *Configuring SONET/SDH Physical Interface Properties*
- *SONET/SDH Interface Speed Overview*
- *SONET/SDH Interfaces Overview*
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</tr>
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<tr>
<td>14.1</td>
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<td>13.2</td>
<td>Starting with Junos OS Release 13.2, 100-Gigabit Ethernet member links can be configured using the two 50-Gigabit Ethernet interfaces of 100-Gigabit Ethernet PIC with CFP.</td>
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<tr>
<td>11.4</td>
<td>Starting with Junos OS Release 11.4, half-duplex mode is not supported on Tri-Rate Ethernet copper interfaces. When you include the <strong>speed</strong> statement, you must include the <strong>link-mode full-duplex</strong> statement at the same hierarchy level.</td>
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### RELATED DOCUMENTATION

**Configuring the Link Characteristics**

By default, the router’s management Ethernet interface, **fxp0** or **em0**, autonegotiates whether to operate in full-duplex or half-duplex mode. Fast Ethernet interfaces can operate in either full-duplex or half-duplex mode, and all other interfaces can operate only in full-duplex mode. For Gigabit Ethernet, the link partner must also be set to full duplex.

**NOTE:** When you configure the Tri-Rate Ethernet copper interface to operate at 1 Gbps, autonegotiation must be enabled.
NOTE: When you manually configure Fast Ethernet interfaces on the M Series and T Series routers, link mode and speed must both be configured. If both these values are not configured, the router uses autonegotiation for the link and ignores the user-configured settings.

NOTE: When the Fast Ethernet interface on Juniper Networks routers with autonegotiation enabled interoperates with a device configured to operate in half-duplex mode (autonegotiation disabled), the interface defaults to half-duplex mode after the PIC is taken offline and brought back online. This results in packet loss and cyclic redundancy check (CRC) errors.

To explicitly configure an Ethernet interface to operate in either full-duplex or half-duplex mode, include the `link-mode` statement at the `[edit interfaces interface-name]` hierarchy level:

```
[edit interfaces interface-name]
  link-mode (full-duplex | half-duplex);
```

## Interface Alias Names Overview

You can configure a textual description of a logical unit on a physical interface to be the alias of an interface name. Interface aliasing is supported only at the unit level. If you configure an alias name, the alias name is displayed instead of the interface name in the output of all `show`, `show interfaces`, and other operational mode commands. In Junos OS Release 12.3R8 and later, display of the alias can be suppressed in favor of the actual interface name by using the `display no-interface-alias` parameter along with the `show` command. Configuring an alias for a logical unit of an interface has no effect on how the interface on the router or switch operates.

When you configure the alias name of an interface, the CLI saves the alias name as the value of the `interface-name` variable in the configuration database. To enable backward compatibility with Junos OS releases in which the support for interface aliases is not available, when the Junos OS processes query the configuration database for the `interface-name` variable, the actual, exact value of the `interface-name` variable is returned instead of the alias name for system operations and computations.

This capability to define interface alias names for physical and logical interfaces is useful in a Junos Node Unifier (JNU) environment that contains a Juniper Networks MX Series 5G Universal Routing Platform as a controller and EX Series Ethernet switches, QFX Series devices, and ACX Series Universal Metro Routers as satellite devices. The following are the benefits of configuring an alias name, which enables a meaningful, single, and easily identifiable name to be allocated to an interface:
• You can group physical interfaces as one aggregated interface (link aggregation group or LAG bundle) and name that bundle as a satellite connection interface (for example, sat1).

• You can select a logical interface as a member of the LAG bundle or the entire LAG, and name that interface to represent a satellite device port or a service instance (for example, ge-0/0/1).

• You can combine the satellite name and the interface name aliases to wholly represent the satellite port name (for example, sat1:ge-0/0/1 or ge-sat1/0/0/1 or ge-1/0/0/1) in the most easily distinguishable format that denotes a combination of port and satellite parts of the name.

To specify an interface alias, you can use the `alias` statement at the `[edit interfaces interface-name unit logical-unit-number]` and `[edit logical-systems logical-system-name interfaces interface-name unit logical-unit-number]` hierarchy levels.

**NOTE:** In Juniper Networks M Series Multiservice Edge Routers, if the same alias name is configured on more than one logical interface, the router displays an error message and commit fails.

**RELATED DOCUMENTATION**

- Example: Adding an Interface Alias Name | 128
  alias | 337

**Example: Adding an Interface Alias Name**

**IN THIS SECTION**

- Requirements | 129
- Overview | 129
- Configuration | 129
- Verification | 132
This example shows how to add an alias to the logical unit of an interface. Using an alias to identify interfaces as they appear in the output for operational commands can allow for more meaningful naming conventions and easier identification.

Requirements

This example uses the following hardware and software components:

- One MX Series router that acts as a controller
- One EX4200 switch that acts as a satellite device
- Junos OS Release 13.3R1 or later

Overview

You can create an alias for each logical unit on a physical interface. The descriptive text you define for the alias is displayed in the output of the `show interfaces` commands. In Junos OS Release 12.3R8 and later, display of the alias can be suppressed in favor of the actual interface name by using the `display no-interface-alias` parameter along with the show command. The alias configured for a logical unit of an interface has no effect on how the interface on the router or switch operates – it is only a cosmetic label.

Configuration

Consider a scenario in which alias names are configured on the interfaces of a JNU controller that are connected to a satellite, sat1, in the downlink direction in the JNU management network by using two links. The alias names enable effective, streamlined identification of these interfaces in the operational mode commands that are run on the controller and satellites.

CLI Quick Configuration

To quickly configure this example, copy the following commands, paste them in a text file, remove any line breaks, change any details necessary to match your network configuration, and then copy and paste the commands into the CLI at the `[edit]` hierarchy level:
Configuring Alias Names for the Controller Interfaces

Step-by-Step Procedure

The following example requires you to navigate various levels in the configuration hierarchy. For information about navigating the CLI, see Using the CLI Editor in Configuration Mode in the CLI User Guide.

To add an alias name to the controller interfaces that are used to connect to the satellite devices in the downlink direction:

1. Configure an alias name for the logical unit of an aggregated Ethernet interface that is used to connect to a satellite, sat1, in the downlink direction. Configure inet family and address for the interface.

   ```
   [edit]
   user@host# set interfaces ae0 unit 0 alias "controller-sat1-downlink1"
   user@host# set interfaces ae0.0 family inet address 10.0.0.1/24
   ```

2. Configure an alias name for the logical unit of another aggregated Ethernet interface that is used to connect to the same satellite, sat1, in downlink direction. Configure INET family and address for the interface.

   ```
   [edit]
   user@host# set interfaces ae0 unit 1 alias "controller-sat1-downlink2"
   user@host# set interfaces ae0.0 family inet address 10.0.0.3/24
   ```

3. Configure an alias name for the Gigabit Ethernet interface on the controller and configure its parameters.

   ```
   [edit]
   user@host# set interfaces ge-0/0/0 vlan-tagging
   user@host# set interfaces ge-0/0/0 unit 0 alias "ge-to-corp-gw1"
   user@host# set interfaces ge-0/0/0.0 vlan-id 101
   ```
4. Configure Gigabit Ethernet interfaces to be member links of an ae- logical interface.

[edit]
user@host# set interfaces ge-0/0/0 family inet address 1.1.1.1/23

5. Configure RIP in the network between the controller and the firewall gateway.

[edit]
user@host# set protocols rip group corporate-firewall neighbor ge-to-corp-gw1

Results

In 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]
interfaces {
    ae0 {
        unit 0 {
            alias "controller-sat1-downlink1";
            family inet {
                address 10.0.0.1/24;
            }
        }
        unit 1 {
            alias "controller-sat1-downlink2";
            family inet {
                address 10.0.0.3/24;
            }
        }
    }
    ge-0/0/0 {
        vlan-tagging;
        unit 0 {
            alias "ge-to-corp-gw1";
            vlan-id 101;
            family inet {
After you have confirmed that the interfaces are configured, enter the `commit` command in configuration mode.

**NOTE:** In Juniper Networks M Series Multiservice Edge Routers, if the same alias name is configured on more than one logical interface, the router displays an error message and commit fails.

**Verification**

**IN THIS SECTION**

- Verifying the Configuration of the Alias Name for the Controller Interfaces | 133

To verify that the alias name is displayed instead of the interface name, perform these steps:
Verifying the Configuration of the Alias Name for the Controller Interfaces

Purpose
Verify that the alias name is displayed instead of the interface name.

Action
Display information about all RIP neighbors.

```
user@router> show rip neighbor
     Neighbor  Local  Source          Destination     Send   Receive   In
             State  Address         Address         Mode   Mode     Met
ge-to-corp-gw1    DN (null)          255.255.255.255 mcast  both       1
```

Meaning
The output displays the details of the benchmarking test that was performed. For more information about the `show rip neighbor` operational command, see `show rip neighbor` in the CLI Explorer.

RELATED DOCUMENTATION

| Interface Alias Names Overview | 127 |
| alias | 337 |
Clock Source Overview

For both the router and interfaces, the clock source can be an external clock that is received on the interface or the router’s internal Stratum 3 clock.

For example, interface A can transmit on interface A’s received clock (external, loop timing) or the Stratum 3 clock (internal, line timing, or normal timing). Interface A cannot use a clock from any other source. For interfaces such as SONET/SDH that can use different clock sources, you can configure the source of the transmit clock on each interface.

The clock source resides on the System Control Board (SCB) for M40 routers, the System and Switch Board (SSB) for M20 routers, the Control Board (CB) for M120 routers, and the Miscellaneous Control Subsystem (MCS) for M40e and M160 routers. M7i and M10i routers have a clock source on the Compact Forwarding Engine Board (CFEB) and Enhanced Compact Forwarding Engine Board (CFEB-E).

For T Series and MX Series, the clock source internal Stratum 3 clock resides on the SONET Clock Generator and Switch Control Board (SCB) respectively. By default, the 19.44-MHz Stratum 3 reference clock generates the clock signal for all serial PICs (SONET/SDH) and Plesiochronous Digital Hierarchy (PDH) PICs. PDH PICs include DS3, E3, T1, and E1 PICs.

NOTE: M7i and M10i routers do not support external clocking of SONET interfaces.

For information about clocking on channelized interfaces, see Channelized IQ and IQE Interfaces Properties. Also see Configuring the Clock Source on SONET/SDH Interfaces and Configuring the Channelized T3 Loop Timing.

For information about configuring an external synchronization interface that can be used to synchronize the internal Stratum 3 clock to an external source on the M40e, M120, M320, routers and T Series routers, see Junos OS Administration Library, Configuring Junos OS to Support an External Clock Synchronization Interface for M Series, MX Series, and T Series Routers.

For information about configuring Synchronous Ethernet on MX 80, MX240, MX480, and MX960 Universal Routing Platforms, see Junos OS Administration Library, Synchronous Ethernet Overview and Configuring Clock Synchronization Interface on MX Series Routers.

RELATED DOCUMENTATION

- Configuring an External Synchronization Interface
- Configuring the Clock Source | 135
- Configuring Junos OS to Support an External Clock Synchronization Interface for M Series, MX Series, and T Series Routers
Configuring the Clock Source

For both the router and interfaces, the clock source can be an external clock that is received on the interface or the router’s internal Stratum 3 clock.

To set the clock source as external or internal:

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

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

2. Configure the `clocking` option as external or internal.

   ```
   [edit interfaces interface-name]
   user@host# set clocking (external | internal)
   ```

   **NOTE:** M7i and M10i routers do not support external clocking of SONET interfaces.

   **NOTE:** On Channelized SONET/SDH PICs, if you set the parent (or the master) controller clock to `external`, then you must set the child controller clocks to the default value—that is, `internal`.

   For example, on the Channelized STM1 PIC, if the clock on the Channelized STM1 interface (which is the master controller) is set to `external`, then you must not configure the CE1 interface (which is the child controller) clock to `external`. Instead you must configure the CE1 interface clock to `internal`.

For information about clocking on channelized interfaces, see *Channelized IQ and IQE Interfaces Properties*. Also see *Configuring the Clock Source on SONET/SDH Interfaces* and *Configuring the Channelized T3 Loop Timing*.

For information about configuring an external synchronization interface that can be used to synchronize the internal Stratum 3 clock to an external source on the M40e, M120, and M320 routers and on the T
Series routers, see Junos OS Administration Library, Configuring Junos OS to Support an External Clock Synchronization Interface for M Series, MX Series, and T Series Routers.

For information about configuring Synchronous Ethernet on MX80, MX240, MX480, and MX960 Universal Routing Platforms, see Junos OS Administration Library, Synchronous Ethernet Overview and Configuring Clock Synchronization Interface on MX Series Routers.

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Configuring Interface Encapsulation on Physical Interfaces

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- Encapsulation Capabilities of Physical Interfaces | 137
- Configuring the Encapsulation on a Physical Interface | 138
- Displaying the Encapsulation on a Physical SONET/SDH Interface | 139

Understanding Interface Encapsulation on Physical Interfaces

Point-to-Point Protocol (PPP) encapsulation is the default encapsulation type for physical interfaces. You need not configure encapsulation for any physical interfaces that support PPP encapsulation. If you do not configure encapsulation, PPP is used by default.

For physical interfaces that do not support PPP encapsulation, you must configure an encapsulation to use for packets transmitted on the interface. You can optionally configure an encapsulation on a logical interface, which is the encapsulation used within certain packet types.
Encapsulation Capabilities of Physical Interfaces

When you configure a point-to-point encapsulation (such as PPP or Cisco HDLC) on a physical interface, the physical interface can have only one logical interface (that is, only one unit statement) associated with it. When you configure a multipoint encapsulation (such as Frame Relay), the physical interface can have multiple logical units, and the units can be either point-to-point or multipoint.

Ethernet CCC encapsulation for Ethernet interfaces with standard TPID tagging requires that the physical interface have only a single logical interface. Ethernet interfaces in VLAN mode can have multiple logical interfaces.

For Ethernet interfaces in VLAN mode, VLAN IDs are applicable as follows:

- VLAN ID 0 is reserved for tagging the priority of frames.
- For encapsulation type `vlan-ccc`, VLAN IDs 1 through 511 are reserved for normal VLANs. VLAN IDs 512 and above are reserved for VLAN CCCs.
- For encapsulation type `vlan-vpls`, VLAN IDs 1 through 511 are reserved for normal VLANs, and VLAN IDs 512 through 4094 are reserved for VPLS VLANs. For 4-port Fast Ethernet interfaces, you can use VLAN IDs 512 through 1024 for VPLS VLANs.
- For Gigabit Ethernet interfaces and Gigabit Ethernet IQ and IQE PICs with SFPs (except the 10-port Gigabit Ethernet PIC and the built-in Gigabit Ethernet port on the M7i router), you can configure flexible Ethernet services encapsulation on the physical interface. For interfaces with `flexible-ethernet-services` encapsulation, all VLAN IDs are valid. VLAN IDs from 1 through 511 are not reserved.
- For encapsulation types `extended-vlan-ccc` and `extended-vlan-vpls`, all VLAN IDs are valid.

The upper limits for configurable VLAN IDs vary by interface type.

When you configure a TCC encapsulation, some modifications are needed to handle VPN connections over unlike Layer 2 and Layer 2.5 links and terminate the Layer 2 and Layer 2.5 protocol locally.

The router performs the following media-specific changes:

- PPP TCC—Both Link Control Protocol (LCP) and Network Control Protocol (NCP) are terminated on the router. Internet Protocol Control Protocol (IPCP) IP address negotiation is not supported. The Junos OS strips all PPP encapsulation data from incoming frames before forwarding them. For output, the next hop is changed to PPP encapsulation.
- Cisco HDLC TCC—Keepalive processing is terminated on the router. The Junos OS strips all Cisco HDLC encapsulation data from incoming frames before forwarding them. For output, the next hop is changed to Cisco HDLC encapsulation.
• Frame Relay TCC—All Local Management Interface (LMI) processing is terminated on the router. The Junos OS strips all Frame Relay encapsulation data from incoming frames before forwarding them. For output, the next hop is changed to Frame Relay encapsulation.

• ATM—Operation, Administration, and Maintenance (OAM) and Interim Local Management Interface (ILMI) processing is terminated at the router. Cell relay is not supported. The Junos OS strips all ATM encapsulation data from incoming frames before forwarding them. For output, the next hop is changed to ATM encapsulation.

Configuring the Encapsulation on a Physical Interface

By default, PPP is the encapsulation type for physical interfaces. To configure the encapsulation on a physical interface, include the encapsulation statement at the [edit interfaces interface-name] hierarchy level:

To configure encapsulation on a physical interface:

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

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

2. Configure the encapsulation type as described in encapsulation.

```
[edit interfaces mo-fpc/pic/port]
user@host# set encapsulation encapsulation-type
```

**NOTE:**
- When you configure a point-to-point encapsulation (such as PPP or Cisco HDLC) on a physical interface, the physical interface can have only one logical interface (that is, only one unit statement) associated with it. When you configure a multipoint encapsulation (such as Frame Relay), the physical interface can have multiple logical units, and the units can be either point-to-point or multipoint.

- When the encapsulation type is set to **Cisco-compatible Frame Relay** encapsulation, ensure that the LMI type is set to ANSI or Q933-A.

- When **vlan-vpls** encapsulation is set at the physical interface level, commit check will validate that there should not be any **inet** family configured within it.
Displaying the Encapsulation on a Physical SONET/SDH Interface

Purpose
To display the configured encapsulation and its associated set options on a physical interface when the following are set at the [edit interfaces interface-name] hierarchy level:

- interface-name—so-7/0/0
- Encapsulation—ppp
- Unit—0
- Family—inet
- Address—192.168.1.113/32
- Destination—192.168.1.114
- Family—iso and mpls

Action
Run the show command at the [edit interfaces interface-name] hierarchy level.

```
[edit interfaces so-7/0/0]
user@host# show
encapsulation ppp;
unit 0 {
    point-to-point;
    family inet {
        address 192.168.1.113/32 {
            destination 192.168.1.114;
        }
    }
    family iso;
    family mpls;
}
```

Meaning
The configured encapsulation and its associated set options are displayed as expected. Note that the second set of two family statements allow IS-IS and MPLS to run on the interface.

RELATED DOCUMENTATION

*encapsulation*

*Configuring the Media MTU* | 118
Configuring Interface Encapsulation on PTX Series Packet Transport Routers

This topic describes how to configure interface encapsulation on PTX Series Packet Transport Routers. Use the `flexible-ethernet-services` configuration statement to configure different encapsulation for different logical interfaces under a physical interface. With flexible Ethernet services encapsulation, you can configure each logical interface encapsulation without range restrictions for VLAN IDs.

Supported encapsulations for physical interfaces include:

- `flexible-ethernet-services`
- `ethernet-ccc`
- `ethernet-tcc`

Supported encapsulations for logical interfaces include:

- `ethernet`
- `vlan-ccc`
- `vlan-tcc`

**NOTE:** PTX Series Packet Transport Routers do not support `extended-vlan-cc` and `extended-vlan-tcc` encapsulation on logical interfaces. Instead, you can configure a tag protocol ID (TPID) value of 0x9100 to achieve the same results.

To configure flexible Ethernet services encapsulation, include the `encapsulation flexible-ethernet-services` statement at the `[edit interfaces et-fpc/pic/port]` hierarchy level. For example:

```plaintext
interfaces {
    et-fpc/pic/port {
        vlan-tagging;
        encapsulation flexible-ethernet-services;
        unit 0 {
            vlan-id 1000;
            family inet {
                address 11.0.0.20/24;
            };
        }
        unit 1 {
            encapsulation vlan-ccc;
            vlan-id 1010;
        }
        unit 2 {
```

```
encapsulation vlan-tcc;
  vlan-id 1020;
  family tcc {
    proxy {
      inet-address 11.0.2.160;
    }
    remote {
      inet-address 11.0.2.10;
    }
  }
}

RELATED DOCUMENTATION

Configuring Interface Encapsulation on Physical Interfaces | 136

Configuring Keepalives

By default, physical interfaces configured with Cisco HDLC or PPP encapsulation send keepalive packets at 10-second intervals. The Frame Relay term for keepalives is LMI packets; the Junos OS supports both ANSI T1.617 Annex D LMIs and ITU Q933 Annex A LMIs. On ATM networks, OAM cells perform the same function. You configure OAM cells at the logical interface level; for more information, see Defining the ATM OAM F5 Loopback Cell Period.

To disable the sending of keepalives:

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

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

2. Include the no-keepalives statement at the [edit interfaces interface-name] hierarchy level.

   [edit interfaces interface-name]
   no-keepalives;
To disable the sending of keepalives on a physical interface configured with Cisco HDLC encapsulation for a translational cross-connection:

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

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

2. Include the no-keepalives statement with the encapsulation cisco-hdlc-tcc statement at the [edit interfaces interface-name] hierarchy level.

```
[edit interfaces interface-name]
  encapsulation cisco-hdlc-tcc;
  no-keepalives;
```

To disable the sending of keepalives on a physical interface configured with PPP encapsulation for a translational cross-connection:

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

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

2. Include the no-keepalives statement with the encapsulation ppp-tcc statement at the [edit interfaces interface-name] hierarchy level.

```
[edit interfaces interface-name]
  encapsulation ppp-tcc;
  no-keepalives;
```

For more information about translation cross-connections, see Circuit and Translational Cross-Connects Overview.

When you configure PPP over ATM or Multilink PPP over ATM encapsulation, you can enable or disable keepalives on the logical interface. For more information, see Configuring PPP over ATM2 Encapsulation.

To explicitly enable the sending of keepalives:

1. In configuration mode, go to the [edit interfaces interface-name] hierarchy level.
2. Include the `keepalives` statement at the `[edit interfaces interface-name]` hierarchy level.

    [edit interfaces interface-name]
    keepalives;

To change one or more of the default keepalive values:

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

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

2. Include the `keepalives` statement with the appropriate option as `interval seconds`, `down-count number`, and the `up-count number`.

    [edit interfaces interface-name]
    keepalives;
    keepalives <interval seconds> <down-count number> <up-count number>;

On interfaces configured with Cisco HDLC or PPP encapsulation, you can include the following three keepalive statements; note that Frame Relay encapsulation is not affected by these statements:

- **interval seconds**—The time in seconds between successive keepalive requests. The range is from 1 second through 32767 seconds, with a default of 10 seconds.

- **down-count number**—The number of keepalive packets a destination must fail to receive before the network takes a link down. The range is from 1 through 255, with a default of 3.

- **up-count number**—The number of keepalive packets a destination must receive to change a link’s status from down to up. The range is from 1 through 255, with a default of 1.

**CAUTION:** If interface keepalives are configured on an interface that does not support the `keepalives` configuration statement (for example, 10-Gigabit Ethernet), the link layer may go down when the PIC is restarted. Avoid configuring the keepalives on interfaces that do not support the `keepalives` configuration statement.

For information about Frame Relay keepalive settings, see Configuring Frame Relay Keepalives.
On MX Series routers with Modular Port Concentrators/Modular Interface Cards (MPCs/MICs), the Packet Forwarding Engine on an MPC/MIC processes and responds to Link Control Protocol (LCP) Echo-Request keepalive packets that the PPP subscriber (client) initiates and sends to the router. The mechanism by which LCP Echo-Request packets are processed by the Packet Forwarding Engine instead of by the Routing Engine is referred to as **PPP fast keepalive**. For more information about how PPP fast keepalive works on an MX Series router with MPCs/MICs, see the **Junos OS Subscriber Access Configuration Guide**.

### RELATED DOCUMENTATION

- Defining the ATM OAM F5 Loopback Cell Period
- Disabling the Sending of PPPoE Keepalive Messages
- Understanding How the Router Processes Subscriber-Initiated PPP Fast Keepalive Requests
- keepalives
- no-keepalives
- Configuring Frame Relay Keepalives
- Circuit and Translational Cross-Connects Overview
- Configuring PPP over ATM2 Encapsulation Overview
Understanding Unidirectional Traffic Flow on Physical Interfaces

By default, physical interfaces are bidirectional; that is, they both transmit and receive traffic. You can configure unidirectional link mode on a 10-Gigabit Ethernet interface that creates two new physical interfaces that are unidirectional. The new transmit-only and receive-only interfaces operate independently, but both are subordinate to the original parent interface.

The unidirectional interfaces enable the configuration of a unidirectional link topology. Unidirectional links are useful for applications such as broadband video services where almost all traffic flow is in one direction, from the provider to the user. Unidirectional link mode conserves bandwidth by enabling it to be differentially dedicated to transmit and receive interfaces. In addition, unidirectional link mode conserves ports for such applications because the transmit-only and receive-only interfaces act independently. Each can be connected to different routers, for example, reducing the total number of ports required.

NOTE: Unidirectional link mode is currently supported on only the following hardware:

- 4–port 10–Gigabit Ethernet DPC on the MX960 router
- 10–Gigabit Ethernet IQ2 PIC and 10–Gigabit Ethernet IQ2E PIC on the T Series router

The transmit-only interface is always operationally up. The operational status of the receive-only interface depends only on local faults; it is independent of remote faults and of the status of the transmit-only interface.

On the parent interface, you can configure attributes common to both interfaces, such as clocking, framing, gigether-options, and sonet-options. On each of the unidirectional interfaces, you can configure encapsulation, MAC address, MTU size, and logical interfaces.

Unidirectional interfaces support IP and IPv6. Packet forwarding takes place by means of static routes and static ARP entries, which you can configure independently on both unidirectional interfaces.

Only transmit statistics are reported on the transmit-only interface (and shown as zero on the receive-only interface). Only receive statistics are reported on the receive-only interface (and shown as zero on the transmit-only interface). Both transmit and receive statistics are reported on the parent interface.

RELATED DOCUMENTATION

- unidirectional
- Enabling Unidirectional Traffic Flow on Physical Interfaces
Enabling Unidirectional Traffic Flow on Physical Interfaces

By default, physical interfaces are bidirectional; that is, they both transmit and receive traffic. You can configure unidirectional link mode on a 10-Gigabit Ethernet interface that creates two new physical interfaces that are unidirectional. The new transmit-only and receive-only interfaces operate independently, but both are subordinate to the original parent interface.

To enable unidirectional link mode on a physical interface, perform the following steps:

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

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

2. Configure the unidirectional option to create two new, unidirectional (transmit-only and receive-only) physical interfaces subordinate to the original parent interface.

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

   **NOTE:** Unidirectional link mode is currently supported on only the following hardware:

   - 4-port 10-Gigabit Ethernet DPC on the MX960 router
   - 10-Gigabit Ethernet IQ2 PIC and 10-Gigabit Ethernet IQ2E PIC on the T Series router

RELATED DOCUMENTATION

unidirectional

Understanding Unidirectional Traffic Flow on Physical Interfaces | 145
Physical Interface Damping Overview

IN THIS SECTION

- Damping Overview for Shorter Physical Interface Transitions | 147
- Damping Overview for Longer Physical Interface Transitions | 148

Physical interface damping limits the advertisement of the up and down transitions (flapping) on an interface. Each time a transition occurs, the interface state is changed, which generates an advertisement to the upper-level routing protocols. Damping helps reduce the number of these advertisements.

From the viewpoint of network deployment, physical interface flaps fall into the following categories:

- Nearly instantaneous multiple flaps of short duration (milliseconds).
- Periodic flaps of long duration (seconds).

Figure 6 on page 147 is used to describe these types of interface flaps and the damping configuration that you can use in each case.

Figure 6: Two Router Interfaces Connected Through Transport Equipment

NOTE: We recommend that you use similar damping configurations on both ends of the physical interface. Configuring damping on one end and not having interface damping on the other end can result in undesired behavior.

The following sections describe the types of interface damping depending upon the transition time length.

Damping Overview for Shorter Physical Interface Transitions

Figure 6 on page 147 shows two routers with two transport devices between them. If a redundant link between the two transport devices fails, link switching is performed. Link switching takes a number of milliseconds. As shown in Figure 7 on page 148, during switching, both router interfaces might encounter
multiple flaps with an up-and-down duration of several milliseconds. These multiple flaps, if advertised to
the upper-level routing protocols, might result in undesired route updates. This is why you might want to
damp these interface flaps.

NOTE: Damping is suitable only with routing protocols.

For shorter physical interface transitions, you configure interface damping with the hold-time statement
on the interface. The hold timer enables interface damping by not advertising interface transitions until
the hold timer duration has passed. When a hold-down timer is configured and the interface goes from
up to down, the down hold-time timer is triggered. Every interface transition that occurs during the
hold-time is ignored. When the timer expires and the interface state is still down, then the router begins
to advertise the interface as being down. Similarly, when a hold-up timer is configured and an interface
goes from down to up, the up hold-time timer is triggered. Every interface transition that occurs during
the hold-time is ignored. When the timer expires and the interface state is still up, then the router begins
to advertise the interface as being up.

Figure 7: Multiple Flaps of Short Duration (Milliseconds)

Damping Overview for Longer Physical Interface Transitions

When the link between a router interface and the transport devices is not stable, this can lead to periodic
flapping, as shown in Figure 8 on page 149. Flaps occur in the order of seconds or more, with an up-and-down
flap duration in the order of a second or more. In this case, using the hold timer feature might not produce
optimal results as it cannot suppress the relatively longer and repeated interface flaps. Increasing the hold
time duration to seconds still allows the system to send route updates on the flapping interface, so fails to suppress periodically flapping interfaces on the system.

Figure 8: Periodic Flaps of Long Duration (Seconds)

For longer periodic interface flaps, you configure interface damping with the **damping** statement on the interface. This damping method uses an exponential back-off algorithm to suppress interface up-and-down event reporting to the upper-level protocols. Every time an interface goes down, a penalty is added to the interface penalty counter. If at some point the accumulated penalty exceeds the suppress level, the interface is placed in the suppress state, and further interface link up and down events are not reported to the upper-level protocols.
NOTE:

- Only PTX Series routers, T Series routers, MX960 routers, MX480 routers, MX240 routers, MX80 routers, and M10i routers support interface damping for longer periodic interface flaps on all the line cards.

- Penalty added on every interface flap is 1000.

- The system does not indicate whether an interface is down because of suppression or that is the actual state of the physical interface. Because of this, SNMP link traps and Operation, Administration, and Maintenance (OAM) protocols cannot differentiate the damped version of the link state from the real version. Therefore, the traps and protocols might not work as expected.

- You can verify suppression by viewing the information in the **Damping** field of the **show interface extensive** command output.

At all times, the interface penalty counter follows an exponential decay process. **Figure 9 on page 151** and **Figure 10 on page 152** show the decay process as it applies to recovery when the physical level link is down or up. As soon as the accumulated penalty reaches the lower boundary of the reuse level, the interface is marked as unsuppressed, and further changes in the interface link state are again reported to the upper-level protocols. You use the **max-suppress** option to configure the maximum time for restricting the accumulation of the penalty beyond the value of the maximum penalty. The value of the maximum penalty is calculated by the software. The maximum penalty corresponds to the time it would take max-suppress to decay and reach the reuse level. The penalty continues to decay after crossing the reuse level.

**Figure 9 on page 151** and **Figure 10 on page 152** show the accumulated penalty, and the decay over time as a curve. Whenever the penalty is below the reuse level and the physical level link changes state, state changes are advertised to the system and cause SNMP state changes.

**Figure 9 on page 151** shows the penalty dropping below the reuse level when the physical link is down. The system is notified of a state change only after the physical level link transitions to up.
Figure 9: Physical-Level Link Is Down When the Penalty Falls Below the Reuse Level

Figure 10 on page 152 shows the penalty dropping below the reuse level when the physical link is up. The system is notified of a state change immediately.
Figure 10: Physical-Level Link Is Up When the Penalty Falls Below the Reuse Level

RELATED DOCUMENTATION

- Damping Shorter Physical Interface Transitions | 153
- Damping Longer Physical Interface Transitions | 155
Damping Shorter Physical Interface Transitions

By default, when an interface changes from being up to being down, or from down to up, this transition is advertised immediately to the hardware and Junos OS. In some situations—for example, when an interface is connected to an add/drop multiplexer (ADM) or wavelength-division multiplexer (WDM), or to protect against SONET/SDH framer holes—you might want to damp interface transitions. This means not advertising the interface’s transition until a certain period of time has passed, called the hold-time. When you have damped interface transitions and the interface goes from up to down, the down hold-time timer is triggered. Every interface transition that occurs during the hold-time is ignored. When the timer expires and the interface state is still down, then the router begins to advertise the interface as being down. Similarly, when an interface goes from down to up, the up hold-time timer is triggered. Every interface transition that occurs during the hold-time is ignored. When the timer expires and the interface state is still up, then the router begins to advertise the interface as being up. For information about physical interface damping, see "Physical Interface Damping Overview" on page 147.

This task applies to damping shorter physical interface transitions in milliseconds. To damp longer physical interface transitions in seconds, see "Damping Longer Physical Interface Transitions" on page 155.

To configure damping of shorter physical interface transitions:

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

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

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

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

The hold time can be a value from 0 through 4,294,967,295 milliseconds. The default value is 0, which means that interface transitions are not damped. Junos OS advertises the transition within 100 milliseconds of the time value you specify.
For most Ethernet interfaces, hold timers are implemented using a one-second polling algorithm. For 1-port, 2-port, and 4-port Gigabit Ethernet interfaces with small form-factor pluggable transceivers (SFPs), hold timers are interrupt-driven.

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

RELATED DOCUMENTATION

- Physical Interface Damping Overview | 147
- Damping Longer Physical Interface Transitions | 155
- SONET/SDH Defect Hold Times for Damping Interface Transitions Overview
- Configuring SONET/SDH Defect Triggers

hold-time
Damping Longer Physical Interface Transitions

Physical interface damping limits the advertisement of the up and down transitions (flapping) on an interface. An unstable link between a router Interface and the transport devices can lead to periodic flapping. Longer flaps occur with a period of about five seconds or more, with an up-and-down duration of one second. For these longer periodic interface flaps, you configure interface damping with the `damping` statement on the interface. This damping method uses an exponential back-off algorithm to suppress interface up and down event reporting to the upper-level protocols. Every time an interface goes down, a penalty is added to the interface penalty counter. If at some point the accumulated penalty exceeds the suppress level `max-suppress`, the interface is placed in the suppress state, and further interface state up and down transitions are not reported to the upper-level protocols.

NOTE:
- Only PTX Series routers, T Series routers, MX2010 routers, MX2020 routers, MX960 routers, MX480 routers, MX240 routers, MX80 routers, and M10i routers support interface damping for longer periodic interface flaps.
- The system does not indicate whether an interface is down because of suppression or that is the actual state of the physical interface. Because of this, SNMP link traps and Operation, Administration, and Maintenance (OAM) protocols cannot differentiate the damped version of the link state from the real version. Therefore, the traps and protocols might not work as expected.
- You can verify suppression by viewing the information in the Damping field of the `show interfaces extensive` command output.

You can view the damping parameters with the `show interfaces extensive` command.

To configure damping of longer physical interface transitions:

1. Select the interface to damp, where the interface name is `interface-type-fpc/pic/port` or an interface range:

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

2. Enable longer interface transition damping on a physical interface:

   ```
   [edit interfaces interface-name damping]
   user@host# set enable
   ```
3. (Optional) Set the maximum time in seconds that an interface can be suppressed no matter how unstable the interface has been.

   **NOTE:** Configure **max-suppress** to a value that is greater than the value of **half-life**; otherwise, the configuration is rejected.

   ```
   [edit interfaces interface-name damping]
   user@host# set max-suppress maximum-seconds
   ```

4. (Optional) Set the decay half-life in seconds, which is the interval after which the accumulated interface penalty counter is reduced by half if the interface remains stable.

   **NOTE:** Configure **max-suppress** to a value that is greater than the value of **half-life**; otherwise, the configuration is rejected.

   ```
   [edit interfaces interface-name damping]
   user@host# set half-life seconds
   ```

5. (Optional) Set the reuse threshold (no units). When the accumulated interface penalty counter falls below this value, the interface is no longer suppressed.

   ```
   [edit interfaces interface-name damping]
   user@host# set reuse number
   ```

6. (Optional) Set the suppression threshold (no units). When the accumulated interface penalty counter exceeds this value, the interface is suppressed.

   ```
   [edit interfaces interface-name damping]
   user@host# set suppress number
   ```

**RELATED DOCUMENTATION**

- Physical Interface Damping Overview | 147
Example: Configuring Physical Interface Damping

This example shows how to configure damping for a physical interface on a PTX Series Packet Transport Router.

Requirements

This example uses the following hardware and software components:

- One PTX Series Packet Transport Router
- One or more routers that provide input packets and receive output packets
- Junos OS Release 14.1 or later

Overview

Physical interface damping provides a smoothing of the up and down transitions (flapping) on an interface. Each time a transition occurs, the interface state is changed, which generates an advertisement to the upper-level routing protocols. Damping helps reduce the number of these advertisements.

From the viewpoint of network deployment, physical interface flaps fall into these categories:

- Nearly instantaneous multiple flaps of short duration (milliseconds). For shorter physical interface transitions, you configure interface damping with the **hold-time** statement on the interface. The hold timer enables interface damping by not advertising interface transitions until the hold timer duration has passed. When a hold-down timer is configured and the interface goes from up to down, the interface...
is not advertised to the rest of the system as being down until it has remained down for the hold-down timer period. Similarly, when a hold-up timer is configured and an interface goes from down to up, it is not advertised as being up until it has remained up for the hold-up timer period.

- Periodic flaps of long duration (seconds). For longer periodic interface flaps, you configure interface damping with the `damping` statement on the interface. This damping method uses an exponential back-off algorithm to suppress interface up and down event reporting to the upper-level protocols. Every time an interface goes down, a penalty is added to the interface penalty counter. If at some point the accumulated penalty exceeds the suppress level, the interface is placed in the suppress state, and further interface state up transitions are not reported to the upper-level protocols.

**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 xe-6/0/0 damping half-life 11 max-suppress 2222 reuse 3333 suppress 4444 enable
```

**Step-by-Step Procedure**

To configure damping on the PTX Series Packet Transport Router:

1. Set the half-life interval, maximum suppression, reuse, suppress values, and enable:

   ```
   [edit interface]
   user@router# set xe-6/0/0 damping half-life 11 max-suppress 2222 reuse 3333 suppress 4444 enable
   
   [edit]
   user@router# commit
   ```

2. Commit configuration:

   ````
   user@router# show interfaces
   ```
Verifying Interface Damping on xe-6/0/0

Purpose
Verify that damping is enabled on the interface and that the damping parameter values are correctly set.

Action
From operational mode, run the `show interfaces extensive` command.

```
user@router# run show interfaces xe-6/0/0 extensive
```

Physical interface: xe-6/0/0, Enabled, Physical link is Up
   Interface index: 158, SNMP ifIndex: 535, Generation: 161
   Link-level type: Ethernet, MTU: 1514, LAN-PHY mode, Speed: 10Gbps, BPDU Error:
   None, Loopback: None,
   Source filtering: Disabled, Flow control: Enabled
   Device flags   : Present Running
   Interface flags: SNMP-Traps Internal: 0x4000
   Link flags     : None
   CoS queues     : 8 supported, 8 maximum usable queues
   Hold-times     : Up 0 ms, Down 0 ms
   Damping        : half-life: 11 sec, max-suppress: 2222 sec, reuse: 3333, suppress: 4444, state: unsuppressed
Meaning
Damping is enabled and configured successfully on the xe-6/0/0 interface.

RELATED DOCUMENTATION

Physical Interface Damping Overview | 147
damping | 346

Enabling or Disabling SNMP Notifications on Physical Interfaces

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

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

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

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

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

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

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

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

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

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

   [edit interfaces interface-name]
   user@host# set no-traps
Accounting Profiles Overview

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

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

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

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

Configuring Accounting for the Physical Interface

Before you begin

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

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

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

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

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

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

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

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

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

   **NOTE:** The minimum interval allowed is 1 minute. Configuring a low interval in an accounting profile for a large number of interfaces might cause serious performance degradation.
4. To configure the interfaces on which the accounting needs to be performed, apply the interface profile to a physical interface by including the `accounting-profile` statement at the `[edit interfaces interface-name]` hierarchy level.

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

SEE ALSO

| Configuring Accounting-Data Log Files |

Displaying Accounting Profile for the Physical Interface

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

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

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

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

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

```plaintext
interface-profile if_profile {
    interval 15;
    file if_stats {
        fields {
            input-bytes;
            output-bytes;
            input-packets;
            output-packets;
            input-errors;
        }
    }
}
```
Meaning
The configured accounting and its associated set options are displayed as expected.

Disabling a Physical Interface

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

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

To disable a physical interface:

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

```
[edit]
user@host# edit interfaces ge-fpc/pic/port
```
2. Include the `disable` statement.

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

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

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

---

**Example: Disabling a Physical Interface**

Sample interface configuration:

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

Disabling the interface:

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

Verifying the interface configuration:

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

Effect of Disabling Interfaces on T series PICs

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

Table 21: Effect of `set interfaces disable <interface_name>` on T series PICs

<table>
<thead>
<tr>
<th>PIC Model Number</th>
<th>PIC Description</th>
<th>Type of PIC</th>
<th>Behaviour</th>
</tr>
</thead>
<tbody>
<tr>
<td>PF-12XGE-SFPP</td>
<td>10-Gigabit Ethernet LAN/WAN PIC with SFP+ (T4000 Router)</td>
<td>5</td>
<td>Tx laser disabled</td>
</tr>
<tr>
<td>PF-24XGE-SFPP</td>
<td>10-Gigabit Ethernet LAN/WAN PIC with Oversubscription and SFP+ (T4000 Router)</td>
<td>5</td>
<td>Tx laser disabled</td>
</tr>
<tr>
<td>PF-1CGE-CFP</td>
<td>100-Gigabit Ethernet PIC with CFP (T4000 Router)</td>
<td>5</td>
<td>Tx laser disabled</td>
</tr>
<tr>
<td>PD-4XGE-XFP</td>
<td>10-Gigabit Ethernet, 4-port LAN/WAN XFP</td>
<td>4</td>
<td>Tx laser disabled</td>
</tr>
<tr>
<td>PD-5-10XGE-SFPP</td>
<td>10-Gigabit LAN/WAN with SFP+</td>
<td>4</td>
<td>Tx laser disabled</td>
</tr>
<tr>
<td>PD-1XLE-CFP</td>
<td>40-Gigabit with CFP</td>
<td>4</td>
<td>Tx laser disabled</td>
</tr>
<tr>
<td>PD-1CE-CFP-FPC4</td>
<td>100-Gigabit with CFP</td>
<td>4</td>
<td>Tx laser disabled</td>
</tr>
<tr>
<td>PD-TUNNEL</td>
<td>40-Gigabit Tunnel Services</td>
<td>4</td>
<td>NA</td>
</tr>
<tr>
<td>PD-4OC192-SON-XFP</td>
<td>OC192/STM64, 4-port XFP</td>
<td>4</td>
<td>Tx laser not disabled</td>
</tr>
<tr>
<td>PD-1OC768-SON-SR</td>
<td>OC768c/STM256, 1-port</td>
<td>4</td>
<td>Tx laser not disabled</td>
</tr>
</tbody>
</table>
RELATED DOCUMENTATION

*disable*
CHAPTER 3

Configuring Logical Interface Properties

IN THIS CHAPTER

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- Logical Interfaces Statements List | 174
- Specifying the Logical Interface Number | 182
- Adding a Logical Unit Description to the Configuration | 183
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- Configuring Interface Encapsulation on Logical Interfaces | 184
- Configuring Interface Encapsulation on PTX Series Packet Transport Routers | 187
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Logical Interfaces Configuration Properties Overview

For a physical interface device to function, you must configure at least one logical interface on that device. For each logical interface, you must specify the protocol family that the interface supports. You can also configure other logical interface properties. These vary by Physical Interface Card (PIC) and encapsulation type, but include the IP address of the interface, and whether the interface supports multicast traffic, data-link connection identifiers (DLCIs), virtual channel identifiers (VCIs) and virtual path identifiers (VPIs), and traffic shaping.

RELATED DOCUMENTATION
Logical Interfaces Configuration Statements

To configure logical interface properties, include the following statements:

```plaintext
unit logical-unit-number {
    accept-source-mac {
        mac-address mac-address {
            policer {
                input cos-policer-name;
                output cos-policer-name;
            }
        }
    }
    accounting-profile name;
    allow-any-vci;
    atm-scheduler-map (map-name | default);
    backup-options {
        interface interface-name;
    }
    bandwidth rate;
    cell-bundle-size cells;
    clear-dont-fragment-bit;
    compression {
        rtp {
            f-max-period number;
            queues [ queue-numbers ];
            port {
                minimum port-number;
                maximum port-number;
            }
        }
    }
    compression-device interface-name;
    copy-tos-to-outer-ip-header;
    demux-destination family;
    demux-source family;
    demux-options {
        underlying-interface interface-name;
    }
    description text;
```
interface {
    l2tp-interface-id name;
    (dedicated | shared);
}
dialer-options {
    activation-delay seconds;
    callback;
    callback-wait-period time;
    deactivation-delay seconds;
    dial-string [ dial-string-numbers ];
    idle-timeout seconds;
    incoming-map {
        caller (caller-id accept-all);
        initial-route-check seconds;
        load-interval seconds;
        load-threshold number;
        pool pool-name;
        redial-delay time;
        watch-list {
            [ routes ];
        }
    }
    disable;
    disable-mlppp-inner-ppp-pfc;
    dlci dlci-identifier;
    drop-timeout milliseconds;
    dynamic-call-admission-control {
        activation-priority priority;
        bearer-bandwidth-limit kilobits-per-second;
    }
    encapsulation type;
    epd-threshold ptp1 cells;
    filter filter-name;
    fragment-threshold bytes;
    inner-vlan-id-range start start-id end end-id;
    input-vlan-map {
        inner-tag-protocol-id;
        inner-vlan-id;
        (pop | pop-pop | pop-swap | push | push-push | swap | swap-push | swap-swap);
        tag-protocol-id tpid;
        vlan-id number;
    }
    interleave-fragments;
inverse-arp;
link-layer-overhead percent;
layer2-policer {
    input-policer policer-name;
    input-three-color policer-name;
    output-policer policer-name;
    output-three-color policer-name;
}
minimum-links number;
mrru bytes;
multicast-dlci dlci-identifier;
multicast-vci vpi-identifier.vci-identifier;
multilink-max-classes number;
multipoint;
oam-liveness {
    up-count cells;
    down-count cells;
}
oam-period (seconds | disable);
output-vlan-map {
    inner-tag-protocol-id;
    inner-vlan-id;
    (pop | pop-pop | pop-swap | push | push-push | swap |swap-push | swap-swap);
    tag-protocol-id tpid;
    vlan-id number;
}
passive-monitor-mode;
peer-unit unit-number;
plp-to-clp;
point-to-point;
ppp-options {
    chap {
        access-profile name;
        default-chap-secret name;
        local-name name;
        passive;
    }
    compression {
        acfc;
        pfc;
    }
    dynamic-profile profile-name;
lcp-restart-timer milliseconds;
loopback-clear-timer seconds;
ncp-restart-timer milliseconds;
pap {  
default-pap-password password;
local-name name;
local-password password;
passive;
}
pppoe-options {
   access-concentrator name;
   auto-reconnect seconds;
   (client | server);
   service-name name;
   underlying-interface interface-name;
}
proxy-arp;
service-domain (inside | outside);
shaping {
   (cbr rate | rtvbr peak rate sustained rate burst length | vbr peak rate sustained rate burst length);
   queue-length number;
}
short-sequence;
transmit-weight number;
(traps | no-traps);
trunk-bandwidth rate;
trunk-id number;
tunnel {
   backup-destination address;
   destination address;
   key number;
   routing-instance {
      destination routing-instance-name;
   }
   source source-address;
   ttl number;
}
vci vpi-identifier.vci-identifier;
vci-range start start-vci end end-vci;
vpi vpi-identifier;
vlan-id number;
vlan-id-range number-number;
vlan-tags inner tpid.vlan-id outer tpid.vlan-id;
family family {
   [ family-statements ];
}
You can include these statements at the following hierarchy levels:

- [edit interfaces interface-name]
- [edit logical-systems logical-system-name interfaces interface-name]

For information about interface-specific logical properties, see Table 22 on page 174.

### Logical Interfaces Statements List

Table 22 on page 174 lists statements that you can use to configure logical interfaces.

<table>
<thead>
<tr>
<th>Statement</th>
<th>Interface Types</th>
<th>Usage Guidelines</th>
</tr>
</thead>
<tbody>
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<td>access-profile name</td>
<td>ATM2 IQ interfaces</td>
<td>Configuring the PPP Password Authentication Protocol On a Logical Interface</td>
</tr>
<tr>
<td>accept-source-mac</td>
<td>Gigabit Ethernet intelligent queuing (IQ) interfaces</td>
<td>Configuring Gigabit Ethernet Policers</td>
</tr>
<tr>
<td>accounting-profile name</td>
<td>All</td>
<td>&quot;Configuring Accounting for the Logical Interface&quot; on page 190</td>
</tr>
<tr>
<td>allow-any-vci</td>
<td>Asynchronous Transfer Mode (ATM) interfaces</td>
<td>Configuring ATM Interface Encapsulation</td>
</tr>
<tr>
<td>atm-scheduler-map (map-name</td>
<td>ATM2 IQ interfaces</td>
<td>ATM2 IQ VC Tunnel CoS Components Overview</td>
</tr>
<tr>
<td></td>
<td>default)</td>
<td></td>
</tr>
<tr>
<td>backup-destination address</td>
<td>Encryption interfaces</td>
<td>Class of Service User Guide (Routers and EX9200 Switches)</td>
</tr>
<tr>
<td>bandwidth rate</td>
<td>All interfaces, except multilink and aggregated</td>
<td>&quot;Configuring the Interface Bandwidth&quot; on page 183</td>
</tr>
<tr>
<td>cbr rate</td>
<td>ATM interfaces</td>
<td>Defining the ATM Traffic-Shaping Profile Overview</td>
</tr>
</tbody>
</table>
Table 22: Statements for Logical Interface Properties (continued)

<table>
<thead>
<tr>
<th>Statement</th>
<th>Interface Types</th>
<th>Usage Guidelines</th>
</tr>
</thead>
<tbody>
<tr>
<td>cell-bundle-size cells</td>
<td>ATM2 IQ interfaces</td>
<td>Configuring the Layer 2 Circuit Cell-Relay Cell Maximum Overview</td>
</tr>
<tr>
<td>clear-dont-fragment-bit</td>
<td>Adaptive services interfaces</td>
<td>Junos OS Services Interfaces Library for Routing Devices</td>
</tr>
<tr>
<td>compression</td>
<td>AS PIC or MultiServices PIC link services IQ interfaces (lsq) and voice services interfaces</td>
<td>Junos OS Services Interfaces Library for Routing Devices</td>
</tr>
<tr>
<td>copy-tos-to-outer-ip-header</td>
<td>GRE tunnel interfaces</td>
<td>Class of Service User Guide (Routers and EX9200 Switches)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>demux-destination family</td>
<td>IP demux interfaces</td>
<td>&quot;Configuring an IP Demultiplexing Interface&quot; on page 255</td>
</tr>
<tr>
<td>demux-options family</td>
<td>IP demux interfaces</td>
<td>&quot;Configuring an IP Demultiplexing Interface&quot; on page 255</td>
</tr>
<tr>
<td>demux-source family</td>
<td>IP demux interfaces</td>
<td>&quot;Configuring an IP Demultiplexing Interface&quot; on page 255</td>
</tr>
<tr>
<td>description text</td>
<td>All</td>
<td>&quot;Adding a Logical Unit Description to the Configuration&quot; on page 183</td>
</tr>
<tr>
<td>destination (address</td>
<td>routing-instance-name)</td>
<td>Encryption generic routing encapsulation (GRE) tunnel, and IP tunnel interfaces</td>
</tr>
<tr>
<td>disable</td>
<td>All</td>
<td>&quot;Disabling a Logical Interface&quot; on page 193</td>
</tr>
<tr>
<td>disable-mlppp-inner-ppp-pfc</td>
<td>MLPPP interfaces</td>
<td>Junos OS Services Interfaces Library for Routing Devices</td>
</tr>
<tr>
<td>dlici dlici-identifier</td>
<td>Point-to-point interfaces with Frame Relay encapsulation</td>
<td>Configuring Frame Relay DLCIs</td>
</tr>
<tr>
<td>drop-timeout milliseconds</td>
<td>Multilink interfaces</td>
<td>Junos OS Services Interfaces Library for Routing Devices</td>
</tr>
<tr>
<td>Statement</td>
<td>Interface Types</td>
<td>Usage Guidelines</td>
</tr>
<tr>
<td>-------------------------------</td>
<td>---------------------------------------------------------------------------------</td>
<td>-----------------------------------------------------------------------------------</td>
</tr>
<tr>
<td><code>dynamic-profile profile-name</code></td>
<td>1-Gigabit Ethernet and 10-Gigabit Ethernet interfaces configured with PPP over Ethernet on M120 and M320 routers</td>
<td>Junos Subscriber Access Configuration Guide</td>
</tr>
<tr>
<td><code>encapsulation type</code></td>
<td>All interfaces, except aggregated SONET/SDH and loopback</td>
<td>Configuring Interface Encapsulation on Logical Interfaces</td>
</tr>
<tr>
<td><code>epd-threshold cells</code></td>
<td>ATM2 IQ interfaces</td>
<td>Configuring the ATM2 IQ EPD Threshold</td>
</tr>
<tr>
<td><code>f-max-period number</code></td>
<td>AS PIC or MultiServices link services IQ interfaces (lsq-) and voice services interfaces</td>
<td>Junos OS Services Interfaces Library for Routing Devices</td>
</tr>
<tr>
<td><code>family</code></td>
<td>All</td>
<td>“Configuring the Protocol Family” on page 201</td>
</tr>
<tr>
<td><code>fragment-threshold bytes</code></td>
<td>Multilink interfaces</td>
<td>Junos OS Services Interfaces Library for Routing Devices</td>
</tr>
<tr>
<td><code>inner-tag-protocol-id</code></td>
<td>Gigabit Ethernet IQ interfaces</td>
<td>802.1Q VLANs Overview</td>
</tr>
<tr>
<td><code>inner-vlan-id</code></td>
<td>Gigabit Ethernet IQ interfaces</td>
<td>802.1Q VLANs Overview</td>
</tr>
<tr>
<td><code>inner-vlan-id-range</code></td>
<td>Gigabit Ethernet, 10-Gigabit Ethernet, and aggregated Ethernet IQ interfaces</td>
<td>Configuring ATM-to-Ethernet Interworking</td>
</tr>
<tr>
<td><code>input</code></td>
<td>AS PIC or MultiServices link services</td>
<td>Junos OS Services Interfaces Library for Routing Devices</td>
</tr>
<tr>
<td><code>input-policer policer-name</code></td>
<td>For 1-Gigabit Ethernet and 10-Gigabit Ethernet IQ2 and IQ2-E interfaces on M Series and T Series routers</td>
<td>Junos OS Services Interfaces Library for Routing Devices and Configuring Gigabit Ethernet Two-Color and Tricolor Policers</td>
</tr>
<tr>
<td><code>input-three-color policer-name</code></td>
<td>For 1-Gigabit Ethernet and 10-Gigabit Ethernet IQ2 and IQ2-E interfaces on M Series and T Series routers</td>
<td>Class of Service User Guide (Routers and EX9200 Switches) and Configuring Gigabit Ethernet Two-Color and Tricolor Policers</td>
</tr>
<tr>
<td>Statement</td>
<td>Interface Types</td>
<td>Usage Guidelines</td>
</tr>
<tr>
<td>------------------------</td>
<td>---------------------------------------------------------------------------------</td>
<td>-----------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>input-vlan-map</td>
<td>Gigabit Ethernet IQ interfaces</td>
<td>Stacking and Rewriting Gigabit Ethernet VLAN Tags Overview</td>
</tr>
<tr>
<td>interleave-fragments</td>
<td>Link services interfaces</td>
<td>Junos OS Services Interfaces Library for Routing Devices</td>
</tr>
<tr>
<td>inverse-arp</td>
<td>Interfaces with ATM and Frame Relay encapsulation</td>
<td>Configuring Inverse ATM1 or ATM2 ARP and Configuring Inverse Frame Relay ARP</td>
</tr>
<tr>
<td>key number</td>
<td>GRE tunnel interfaces on Adaptive Services PICs</td>
<td>Junos OS Services Interfaces Library for Routing Devices</td>
</tr>
<tr>
<td>layer2-policer</td>
<td>1-Gigabit Ethernet and 10-Gigabit Ethernet IQ2 and IQ2-E interfaces</td>
<td>Configuring Gigabit Ethernet Two-Color and Tricolor Policers</td>
</tr>
<tr>
<td>lcp-restart-timer</td>
<td>Interfaces with PPP encapsulation</td>
<td>Configuring the PPP Restart Timers</td>
</tr>
<tr>
<td>l2tp-interface-id name</td>
<td>Adaptive services interfaces</td>
<td>Junos OS Services Interfaces Library for Routing Devices</td>
</tr>
<tr>
<td>link-layer-overhead percent</td>
<td>AS PIC or MultiServices link services IQ interfaces (lsq)</td>
<td>Junos OS Services Interfaces Library for Routing Devices</td>
</tr>
<tr>
<td>local-name name</td>
<td>ATM2 IQ interfaces</td>
<td>Configuring PPP CHAP Authentication and Configuring the PPP Password Authentication Protocol On a Logical Interface</td>
</tr>
<tr>
<td>mac-address mac-address</td>
<td>Gigabit Ethernet interfaces and Gigabit Ethernet IQ and IQE interfaces with small form-factor pluggable transceivers (SFPs) (except the 10-port Gigabit Ethernet PIC and the built-in Gigabit Ethernet port on the M7i router)</td>
<td>Configuring Gigabit Ethernet Policers</td>
</tr>
<tr>
<td>minimum-links number</td>
<td>Multilink interfaces</td>
<td>Junos OS Services Interfaces Library for Routing Devices</td>
</tr>
<tr>
<td>Statement</td>
<td>Interface Types</td>
<td>Usage Guidelines</td>
</tr>
<tr>
<td>-----------</td>
<td>----------------</td>
<td>------------------</td>
</tr>
<tr>
<td>mrru bytes</td>
<td>Multilink interfaces</td>
<td>Junos OS Services Interfaces Library for Routing Devices</td>
</tr>
<tr>
<td>multicast-dlci <em>dlci-identifier</em></td>
<td>Point-to-multipoint Frame Relay interfaces</td>
<td>Configuring a Multicast-Capable Frame Relay Connection</td>
</tr>
<tr>
<td>multicast-vci *vpi-identifier</td>
<td>vci-identifier*</td>
<td>Point-to-multipoint ATM1 and ATM2 IQ interfaces</td>
</tr>
<tr>
<td>multilink-max-classes <em>number</em></td>
<td>AS PIC or MultiServices link services IQ interfaces <em>(lsq-)</em></td>
<td>Junos OS Services Interfaces Library for Routing Devices</td>
</tr>
<tr>
<td><strong>multipoint</strong></td>
<td>All</td>
<td>&quot;Configuring a Multipoint Connection&quot; on page 189</td>
</tr>
<tr>
<td><strong>ncp-restart-timer</strong></td>
<td>Interfaces with PPP encapsulation</td>
<td>Configuring the PPP Restart Timers</td>
</tr>
<tr>
<td>oam-liveness</td>
<td>ATM1 and ATM2 IQ interfaces</td>
<td>Configuring the ATM OAM F5 Loopback Cell Threshold</td>
</tr>
<tr>
<td>oam-period *(disable</td>
<td>seconds)*</td>
<td>ATM1 and ATM2 IQ interfaces</td>
</tr>
<tr>
<td><strong>output</strong></td>
<td>All</td>
<td>Junos OS Services Interfaces Library for Routing Devices</td>
</tr>
<tr>
<td><strong>output-policer</strong> <em>policer-name</em></td>
<td>For 1-Gigabit Ethernet and 10-Gigabit Ethernet IQ2 and IQ2-E interfaces on M Series and T Series routers</td>
<td>Class of Service User Guide (Routers and EX9200 Switches) and Configuring Gigabit Ethernet Two-Color and Tricolor Policers</td>
</tr>
<tr>
<td><strong>output-three-color</strong> <em>policer-name</em></td>
<td>For 1-Gigabit Ethernet and 10-Gigabit Ethernet IQ2 and IQ2-E interfaces on M Series and T Series routers</td>
<td>Class of Service User Guide (Routers and EX9200 Switches) and Configuring Gigabit Ethernet Two-Color and Tricolor Policers</td>
</tr>
<tr>
<td><strong>output-vlan-map</strong></td>
<td>Gigabit Ethernet IQ interfaces</td>
<td>Stacking and Rewriting Gigabit Ethernet VLAN Tags Overview</td>
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Specifying the Logical Interface Number

Each logical interface must have a logical unit number. The logical unit number corresponds to the logical unit part of the interface name. For more information, see “Interface Naming Overview” on page 17.

Point-to-Point Protocol (PPP), Cisco High-level Data Link Control (HDLC), and Ethernet circuit cross-connect (CCC) encapsulations support only a single logical interface, whose logical unit number must be 0. Frame Relay and ATM encapsulations support multiple logical interfaces, so you can configure one or more logical unit numbers.

You specify the logical unit number by including the `unit` statement:

```plaintext
unit logical-unit-number {
  ...
}
```

You can include this statement at the following hierarchy levels:

- `[edit interfaces interface-name]`
- `[edit logical-systems logical-system-name interfaces interface-name]`

The range of number available for the logical unit number varies for different interface types. See `unit` for current range values.
Adding a Logical Unit Description to the Configuration

You can include a text description of each logical unit in the configuration file. Any descriptive text you include is displayed in the output of the `show interfaces` commands, and is also exposed in the `ifAlias` Management Information Base (MIB) object. It has no impact on the interface’s configuration. To add a text description, include the `description` statement:

```
description text;
```

You can include this statement at the following hierarchy levels:

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

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

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

For information about describing physical interfaces, see "Configuring Interface Description" on page 116.

Configuring the Interface Bandwidth

By default, the Junos OS uses the physical interface’s speed for the MIB-II object, `ifSpeed`. You can configure the logical unit to populate the `ifSpeed` variable by configuring a bandwidth value for the logical interface. The `bandwidth` statement sets an informational-only parameter; you cannot adjust the actual bandwidth of an interface with this statement.
NOTE: We recommend that you be careful when setting this value. Any interface bandwidth value that you configure using the `bandwidth` statement affects how the interface cost is calculated for a dynamic routing protocol, such as OSPF. By default, the interface cost for a dynamic routing protocol is calculated using the following formula:

\[
\text{cost} = \frac{\text{reference-bandwidth}}{\text{bandwidth}},
\]

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

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

```
bandwidth rate;
```

You can include this statement at the following hierarchy levels:

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

`rate` is the peak rate, in bps or cps. You can specify a value in bits per second either as a complete decimal number or as a decimal number followed by the abbreviation `k` (1000), `m` (1,000,000), or `g` (1,000,000,000). You can also specify a value in cells per second by entering a decimal number followed by the abbreviation `c`; values expressed in cells per second are converted to bits per second using the formula \(1 \text{ cps} = 384 \text{ bps}\). The value can be any positive integer. The `bandwidth` statement is valid for all logical interfaces, except multilink interfaces.

### Configuring Interface Encapsulation on Logical Interfaces

#### IN THIS SECTION

- Understanding Interface Encapsulation on Logical Interfaces | 185
- Configuring the Encapsulation on a Logical Interface | 185
- Displaying the Encapsulation on a Logical Interface | 186
Understanding Interface Encapsulation on Logical Interfaces

You can configure an encapsulation on a logical interface, which is the encapsulation used within certain packet types.

The following restrictions apply to logical interface encapsulation:

- With the atm-nlpid, atm-cisco-nlpid, and atm-vc-mux encapsulations, you can configure the inet family only.
- With the CCC circuit encapsulations, you cannot configure a family on the logical interface.
- A logical interface cannot have frame-relay-ccc encapsulation unless the physical device also has frame-relay-ccc encapsulation.
- A logical interface cannot have frame-relay-tcc encapsulation unless the physical device also has frame-relay-tcc encapsulation. In addition, you must assign this logical interface a DLCI from 512 through 1022 and configure it as point-to-point.
- A logical interface cannot have frame-relay-ether-type or frame-relay-ether-type-tcc encapsulation unless the physical interface has flexible-frame-relay encapsulation and is on an IQ or IQE PIC.
- For frame-relay-ether-type-tcc encapsulation, you must assign this logical interface a DLCI from 512 through 1022.
- For interfaces that carry IP version 6 (IPv6) traffic, you cannot configure ether-over-atm-llc encapsulation.
- When you use ether-over-atm-llc encapsulation, you cannot configure multipoint interfaces.
- A logical interface cannot have vlan-ccc or vlan-vpls encapsulation unless the physical device also has vlan-ccc or vlan-vpls encapsulation, respectively. In addition, you must assign this logical interface a VLAN ID from 512 through 1023; if the VLAN ID is 511 or lower, it is subject to the normal destination filter lookups in addition to source address filtering. For more information, see Configuring VLAN and Extended VLAN Encapsulation.
- You can create an ATM cell-relay circuit by configuring an entire ATM physical device or an individual virtual circuit (VC). When you configure an entire device, only cell-relay encapsulation is allowed on the logical interfaces. For more information, see Configuring an ATM1 Cell-Relay Circuit Overview.

Configuring the Encapsulation on a Logical Interface

Generally, you configure an interface’s encapsulation at the [edit interfaces interface-name] hierarchy level. However, for some encapsulation types, such as Frame Relay, ATM, and Ethernet virtual local area network (VLAN) encapsulations, you can also configure the encapsulation type that is used inside the Frame Relay, ATM, or VLAN circuit itself.
To configure encapsulation on a logical interface:

1. In configuration mode, go to the [edit interfaces interface-name unit logical-unit-number] or [edit logical-systems logical-system-name interfaces interface-name unit logical-unit-number] hierarchy level.

   [edit]
   user@host# set interfaces at-fpc/pic/port unit logical-unit-number

2. Configure the encapsulation type as described in encapsulation (Logical Interface).

   [edit interfaces at-fpc/pic/port unit logical-unit-number]
   user@host# set encapsulation encapsulation-type

Displaying the Encapsulation on a Logical Interface

**Purpose**

To display the configured encapsulation and its associated set options on a physical interface when the following are set at the [edit interfaces interface-name] or [edit logical-systems logical-system-name interfaces interface-name] hierarchy level:

- interface-name—at-1/1/0
- Encapsulation—atm-ccc-cell-relay
- Unit—120

**Action**

Run the `show` command at the [edit interfaces interface-name] hierarchy level.

```
[edit interfaces at-1/1/0]
user@host# show
encapsulation atm-ccc-cell-relay;
unit 120 {
  encapsulation atm-ccc-cell-relay;
}
```

**Meaning**

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

**RELATED DOCUMENTATION**
Configuring Interface Encapsulation on PTX Series Packet Transport Routers

This topic describes how to configure interface encapsulation on PTX Series Packet Transport Routers. Use the `flexible-ethernet-services` configuration statement to configure different encapsulation for different logical interfaces under a physical interface. With flexible Ethernet services encapsulation, you can configure each logical interface encapsulation without range restrictions for VLAN IDs.

Supported encapsulations for physical interfaces include:

- `flexible-ethernet-services`
- `ethernet-ccc`
- `ethernet-tcc`

Supported encapsulations for logical interfaces include:

- `ethernet`
- `vlan-ccc`
- `vlan-tcc`

**NOTE:** PTX Series Packet Transport Routers do not support `extended-vlan-cc` and `extended-vlan-tcc` encapsulation on logical interfaces. Instead, you can configure a tag protocol ID (TPID) value of 0x9100 to achieve the same results.

To configure flexible Ethernet services encapsulation, include the `encapsulation flexible-ethernet-services` statement at the `[edit interfaces et-fpc/pic/port]` hierarchy level. For example:

```
interfaces {
  et-fpc/pic/port {
    vlan-tagging;
    encapsulation flexible-ethernet-services;
    unit 0 {
      vlan-id 1000;
      family inet {
        address 11.0.0.20/24;
      }
    }
  }
}
```
By default, all interfaces are assumed to be point-to-point connections. You must ensure that the maximum transmission unit (MTU) sizes on both sides of the connection are the same.

For all interfaces except aggregated Ethernet, Fast Ethernet, and Gigabit Ethernet, you can explicitly configure an interface to be a point-to-point connection by including the `point-to-point` statement:

```
point-to-point;
```

You can include this statement at the following hierarchy levels:

- `[edit interfaces interface-name unit logical-unit-number]`
- `[edit logical-systems logical-system-name interfaces interface-name unit logical-unit-number]`
Configuring a Multipoint Connection

By default, all interfaces are assumed to be point-to-point connections. To configure an interface to be a multipoint connection, include the `multipoint` statement:

```
multipoint;
```

You can include this statement at the following hierarchy levels:

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

Configuring Dynamic Profiles for PPP

A dynamic profile acts as a template that enables you to create, update, or remove a configuration that includes attributes for client access (for example, interface or protocol) or service (for example, IGMP). Using these profiles you can consolidate all of the common attributes of a client (and eventually a group of clients) and apply the attributes simultaneously.

After they are created, the profiles reside in a profile library on the router. You can then use the `dynamic-profile` statement to attach profiles to interfaces. To assign a dynamic profile to a PPP interface, you can include the `dynamic-profile` statement at the `[edit interfaces interface-name unit logical-unit-number ppp-options]` hierarchy level:

```
[edit interfaces interface-name unit logical-unit-number ppp-options]
dynamic-profile profile-name;
```

To monitor the configuration, issue the `show interfaces interface-name` command.

For information about dynamic profiles, see Dynamic Profiles Overview in the Junos Subscriber Access Configuration Guide.

For information about creating dynamic profiles, see Configuring a Basic Dynamic Profile in the Junos Subscriber Access Configuration Guide.

For information about assigning a dynamic profile to a PPP interface, see Attaching Dynamic Profiles to Static PPP Subscriber Interfaces in the Junos Subscriber Access Configuration Guide.

For information about using dynamic profiles to authenticate PPP subscribers, see Configuring Dynamic Authentication for PPP Subscribers.
Configuring Accounting for the Logical Interface

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- Accounting Profiles Overview | 190
- Configuring Accounting for the Logical Interface | 191
- Displaying Accounting Profile for the Logical Interface | 192

Accounting Profiles Overview

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

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

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

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

Before you begin

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

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

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

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

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

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

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

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

   ```
   [edit accounting-options interface-profile profile-name]
   user@host# set interval minutes
   ```
NOTE: The minimum interval allowed is 1 minute. Configuring a low interval in an accounting profile for a large number of interfaces might cause serious performance degradation.

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

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

SEE ALSO

- Accounting Options Overview
- Configuring Accounting-Data Log Files

Displaying Accounting Profile for the Logical Interface

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

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

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

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

- Run the `show` command at the `[edit accounting-options]` hierarchy level.
Meaning
The configured accounting and its associated set options are displayed as expected.

Enabling or Disabling SNMP Notifications on Logical Interfaces

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

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

You can include these statements at the following hierarchy levels:

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

Disabling a Logical Interface

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

```
disable;
```
You can include this statement at the following hierarchy levels:

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

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

**Example: Disabling a Logical Interface**

Sample interface configuration:

```
[edit interfaces]
user@host# show
et-2/1/1 {  
  vlan-tagging;
  encapsulation flexible-ethernet-services;
  unit 0 {  
    vlan-id 1000;
    family inet {  
      address 11.0.0.20/24;
    }
  }
}
```

Disabling the interface:

```
[edit interfaces et-2/1/1 unit 0]
user@host# set disable
```

Verifying the interface configuration:

```
[edit interfaces et-2/1/1]
user@host# show
disable; # Interface is marked as disabled.
  unit 0 {  
    vlan-id 1000;
    family inet {  
      address 11.0.0.20/24;
    }
  }
```
Configuring Logical System Interface Properties

With Junos OS, you can partition a single physical router into multiple logical devices that perform independent routing tasks. Because logical systems perform a subset of the tasks once handled by the physical router, logical systems offer an effective way to maximize the use of a single router.

1. Configure the physical interface that needs to be partitioned into multiple logical systems.

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

2. Create the logical system interface on the logical unit.

   ```
   [edit]
   user@host# set logical-systems name interfaces interface-name unit logical-unit-number description description
   ```

3. Configure the required properties for the logical system.

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

RELATED DOCUMENTATION

- Setting Up Logical Systems
CHAPTER 4

Configuring Protocol Family and Interface Address Properties

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Protocol Family Configuration and Interface Address Statements

For each logical interface, you must configure one or more protocol families. You can also configure interface address properties. To do this, include the following statements:

```plaintext
family family {
    accounting {
        destination-class-usage;
        source-class-usage {
            direction;
        }
    }
}
```
address address {
    destination address;
}
bundle interface-name;
filter {
    dialer filter-name;
    input filter-name;
    output filter-name;
    group filter-group-number;
}
interface-mode (access | trunk);
ipsec-sa so-name;
keep-address-and-control;
mtu bytes;
multicast-only;
negotiate-address;
no-redirects:
policer {
    arp policer-template-name;
    input policer-template-name;
    output policer-template-name;
}
primary;
protocols [inet isompls];
proxy inet-address address;
receive-options-packets;
receive-ttl-exceeded;
remote (inet-address address | mac-address address);
rpf-check <fail-filter filter-name>;
sampling {
    direction;
}
service {
    input {
        service-set service-set-name <service-filter filter-name>;
        post-service-filter filter-name;
    }
    output {
        service-set service-set-name <service-filter filter-name>;
    }
}
targeted-broadcast {
    forward-and-send-to-re;
forward-only;

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

You can include these statements at the following hierarchy levels:

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

For information about interface-specific protocol and address properties, see Configuring T1 and NxDS0 Interfaces.

RELATED DOCUMENTATION

| Configuring T1 and NxDS0 Interfaces |
**Configuring the Protocol Family**

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.

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.

In addition to the common protocol suites, JUNOS protocol families sometimes use the following protocol suites. For more information see, *family*.

To configure the logical interface's protocol family, include the `family` statement, specifying the selected family. To configure the protocol family, following are the minimum configuration tasks under the `[edit interfaces interface-name unit logical-unit-number family family]` hierarchy.

**Table 23: Protocol Family Configuration Tasks**

<table>
<thead>
<tr>
<th>Task</th>
<th>Find Details Here</th>
</tr>
</thead>
<tbody>
<tr>
<td>Configure MTU</td>
<td>&quot;Configuring the Media MTU&quot; on page 118</td>
</tr>
<tr>
<td>Configure the unit and family so that the interface can transmit and receive multicast traffic only</td>
<td>Restricting Tunnels to Multicast Traffic</td>
</tr>
<tr>
<td>Disable the sending of redirect messages by the router</td>
<td>Configuring Junos OS to Disable Protocol Redirect Messages on the Router or Switch</td>
</tr>
<tr>
<td>Assign an address to an interface</td>
<td>&quot;Configuring the Interface Address&quot; on page 202</td>
</tr>
</tbody>
</table>

**RELATED DOCUMENTATION**

*family*
Configuring the Interface Address

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

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

To assign an address to an interface, perform the following steps:
1. Configure the interface address at the \texttt{[edit interfaces interface-name unit logical-unit-number family family]} hierarchy level.

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

You can also assign multiple IPv4 addresses on the same interface.

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

**NOTE:**
- Juniper Networks routers and switches support /31 destination prefixes when used in point-to-point Ethernet configurations; however, they are not supported by many other devices, such as hosts, hubs, routers, or switches. You must determine if the peer system also supports /31 destination prefixes before configuration.

- You can configure the same IPv4 address on multiple physical interfaces. When you assign the same IPv4 address to multiple physical interfaces, the operational behavior of those interfaces differs, depending on whether they are implicitly or explicitly point-to-point.

- By default, all interfaces are assumed to be point-to-point (PPP) interfaces. For all interfaces except aggregated Ethernet, Fast Ethernet, and Gigabit Ethernet, you can explicitly configure an interface to be a point-to-point connection.

- If you configure the same IP address on multiple interfaces in the same routing instance, Junos OS uses only the first configuration. The remaining IP address configurations are ignored, leaving some interfaces without an assigned address. Interfaces without an assigned address cannot be used as a donor interface for an unnumbered Ethernet interface.

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

```
[edit interfaces ]
user@host# set interface-name unit logical-unit-number family inet6 address aaaa:bbbb::zzzz/nn
```
NOTE:
• You represent IP version 6 (IPv6) addresses in hexadecimal notation using a colon-separated list of 16-bit values. The double colon (::) represents all bits set to 0.
• You must manually configure the router or switch advertisement and advertise the default prefix for autoconfiguration to work on a specific interface.

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

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

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

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

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

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

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

RELATED DOCUMENTATION

| Configuring Default, Primary, and Preferred Addresses and Interfaces | 205 |
Configuring Default, Primary, and Preferred Addresses and Interfaces

Default, Primary, and Preferred Addresses and Interfaces

The router has a default address and a primary interface, and interfaces have primary and preferred addresses.

The default address of the router is used as the source address on unnumbered interfaces. The routing protocol process tries to pick the default address as the router ID, which is used by protocols, including OSPF and internal BGP (IBGP).

The primary interface for the router is the interface that packets go out when no interface name is specified and when the destination address does not imply a particular outgoing interface.

An interface's primary address is used by default as the local address for broadcast and multicast packets sourced locally and sent out the interface. An interface's preferred address is the default local address used for packets sourced by the local router to destinations on the subnet.

The default address of the router is chosen using the following sequence:

1. The primary address on the loopback interface lo0 that is not 127.0.0.1 is used.
2. The primary address on the primary interface is used.

Configuring the Primary Interface for the Router

The primary interface for the router has the following characteristics:

- It is the interface that packets go out when you type a command such as ping 255.255.255.255—that is, a command that does not include an interface name (there is no interface type-0/0/0.0 qualifier) and where the destination address does not imply any particular outgoing interface.

- It is the interface on which multicast applications running locally on the router, such as Session Announcement Protocol (SAP), do group joins by default.
It is the interface from which the default local address is derived for packets sourced out an unnumbered interface if there are no non-127 addresses configured on the loopback interface, lo0.

By default, the multicast-capable interface with the lowest-index address is chosen as the primary interface. If there is no such interface, the point-to-point interface with the lowest index address is chosen. Otherwise, any interface with an address could be picked. In practice, this means that, on the router, the fxp0 or em0 interface is picked by default.

To configure a different interface to be the primary interface, include the `primary` statement:

```plaintext
primary;
```

You can include this statement at the following hierarchy levels:

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

Configuring the Primary Address for an Interface

The primary address on an interface is the address that is used by default as the local address for broadcast and multicast packets sourced locally and sent out the interface. For example, the local address in the packets sent by a `ping interface so-0/0/0.0 255.255.255.255` command is the primary address on interface so-0/0/0.0. The primary address flag also can be useful for selecting the local address used for packets sent out unnumbered interfaces when multiple non-127 addresses are configured on the loopback interface, lo0. By default, the primary address on an interface is selected as the numerically lowest local address configured on the interface.

To set a different primary address, include the `primary` statement:

```plaintext
primary;
```

You can include this statement at the following hierarchy levels:

- `[edit interfaces interface-name unit logical-unit-number family family address address]`
- `[edit logical-systems logical-system-name interfaces interface-name unit logical-unit-number family family address address]`

Configuring the Preferred Address for an Interface

The preferred address on an interface is the default local address used for packets sourced by the local router to destinations on the subnet. By default, the numerically lowest local address is chosen. For example, if the addresses `172.16.1.1/12`, `172.16.1.2/12`, and `172.16.1.3/12` are configured on the same interface,
the preferred address on the subnet (by default, 172.16.1.1) would be used as a local address when you issue a `ping 172.16.1.5` command.

To set a different preferred address for the subnet, include the `preferred` statement:

```
preferred;
```

You can include this statement at the following hierarchy levels:

- `[edit interfaces interface-name unit logical-unit-number family family address address]`
- `[edit logical-systems logical-system-name interfaces interface-name unit logical-unit-number family family address address]`

SEE ALSO

`Configuring the Interface Address | 202`

*Junos OS Administration Library*

**Operational Behavior of Interfaces When the Same IPv4 Address Is Assigned to Them**

You can configure the same IPv4 address on multiple physical interfaces. When you assign the same IPv4 address to multiple physical interfaces, the operational behavior of those interfaces differs, depending on whether they are implicitly or explicitly point-to-point.

**NOTE:** By default, all interfaces are assumed to be point-to-point (PPP) interfaces. For all interfaces except aggregated Ethernet, Fast Ethernet, and Gigabit Ethernet, you can explicitly configure an interface to be a point-to-point connection.
NOTE: If you configure the same IP address on multiple interfaces in the same routing instance, Junos OS uses only the first configuration. The remaining IP address configurations are ignored, leaving some interfaces without an assigned address. Interfaces without an assigned address cannot be used as a donor interface for an unnumbered Ethernet interface.

In the following example, the IP address configuration for interface xe-0/0/1.0 is ignored:

```
interfaces {
    xe-0/0/0 {
        unit 0 {
            family inet {
                address 192.168.1.1/24;
            }
        }
    }
    xe-0/0/1 {
        unit 0 {
            family inet {
                address 192.168.1.1/24;
            }
        }
    }
}
```

The following examples show the sample configuration of assigning the same IPv4 address to implicitly and explicitly point-to-point interfaces, and their corresponding `show interfaces terse` command outputs to see their operational status.

**Configuring same IPv4 address on implicitly PPP interfaces:**

```
[edit]
user@host# show
ge-0/1/0 {
    unit 0 {
        family inet {
            address 200.1.1.1/24;
        }
    }
}
```
ge-3/0/1 {  
  unit 0 {  
    family inet {  
      address 200.1.1.1/24;  
    }  
  }  
}

The sample output shown below for the above configuration reveals that only ge-0/1/0.0 was assigned the same IPv4 address 200.1.1.1/24 and its link state was up, while ge-3/0/1.0 was not assigned the IPv4 address, though its link state was up, which means that it will be operational only when it gets a unique IPv4 address other than 200.1.1.1/24.

```
user@host> show interfaces terse ge*
```

<table>
<thead>
<tr>
<th>Interface</th>
<th>Admin</th>
<th>Link</th>
<th>Proto</th>
<th>Local</th>
<th>Remote</th>
</tr>
</thead>
<tbody>
<tr>
<td>ge-0/1/0</td>
<td>up</td>
<td>up</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ge-0/1/0.0</td>
<td>up</td>
<td>up</td>
<td>inet</td>
<td>200.1.1.1/24</td>
<td>multiservice</td>
</tr>
<tr>
<td>ge-0/1/1</td>
<td>up</td>
<td>down</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ge-3/0/0</td>
<td>up</td>
<td>down</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ge-3/0/1</td>
<td>up</td>
<td>up</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ge-3/0/1.0</td>
<td>up</td>
<td>up</td>
<td>inet</td>
<td></td>
<td>multiservice</td>
</tr>
</tbody>
</table>

**Configuring same IPv4 address on explicitly PPP interfaces:**

```
[edit]  
user@host# show  
so-0/0/0 {  
  unit 0 {  
    family inet {  
      address 200.1.1.1/24;  
    }  
  }  
}  
so-0/0/3 {  
  unit 0 {  
    family inet {  
      address 200.1.1.1/24;  
    }  
  }  
}
```
The sample output shown below for the above configuration reveals that both so-0/0/0 and so-0/0/3.0 were assigned the same IPv4 address 200.1.1.1/24 and that their link states were down, which means that to make them operational at least one of them will have to be configured with a unique IPv4 address other than 200.1.1.1/24.

```
user@host>  show interfaces terse so*

<table>
<thead>
<tr>
<th>Interface</th>
<th>Admin</th>
<th>Link</th>
<th>Proto</th>
<th>Local</th>
<th>Remote</th>
</tr>
</thead>
<tbody>
<tr>
<td>so-0/0/0</td>
<td>up</td>
<td>up</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>so-0/0/0.0</td>
<td>up</td>
<td>down</td>
<td>inet</td>
<td>200.1.1.1/24</td>
<td></td>
</tr>
<tr>
<td>so-0/0/1</td>
<td>up</td>
<td>up</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>so-0/0/2</td>
<td>up</td>
<td>down</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>so-0/0/3</td>
<td>up</td>
<td>up</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>so-0/0/3.0</td>
<td>up</td>
<td>down</td>
<td>inet</td>
<td>200.1.1.1/24</td>
<td></td>
</tr>
<tr>
<td>so-1/1/0</td>
<td>up</td>
<td>down</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>so-1/1/1</td>
<td>up</td>
<td>down</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>so-1/1/2</td>
<td>up</td>
<td>up</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>so-1/1/3</td>
<td>up</td>
<td>up</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>so-2/0/0</td>
<td>up</td>
<td>up</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>so-2/0/1</td>
<td>up</td>
<td>up</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>so-2/0/2</td>
<td>up</td>
<td>up</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>so-2/0/3</td>
<td>up</td>
<td>down</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
```

RELATED DOCUMENTATION

- Configuring IPCP Options for Interfaces with PPP Encapsulation  | 211
- Configuring Default, Primary, and Preferred Addresses and Interfaces  | 205
Configuring IPCP Options for Interfaces with PPP Encapsulation

For interfaces with PPP encapsulation, you can configure IPCP to negotiate IP address assignments and to pass network-related information such as Windows Name Service (WINS) and Domain Name System (DNS) servers, as defined in RFC 1877, *PPP Internet Protocol Control Protocol Extensions for Name Server Addresses*.

When you enable a PPP interface, you can configure an IP address, enable the interface to negotiate an IP address assignment from the remote end, or allow the interface to be unnumbered. You can also assign a destination profile to the remote end. The destination profile includes PPP properties, such as primary and secondary DNS and NetBIOS Name Servers (NBNSs). These options are described in the following sections:

**NOTE:** The Junos OS does not request name servers from the remote end; the software does, however, send name servers to the remote end if requested.

**Before you begin**

You must configure the PPP encapsulation on the interface before configuring the IPCP option. On the logical interface, the following PPP encapsulation types are supported:

- `atm-mlppp-llc`
- `atm-ppp-llc`
- `atm-ppp-vc-mux`
- `multilink-ppp`

For more information about PPP encapsulation, see "Configuring Interface Encapsulation on Logical Interfaces" on page 184 and *Configuring ATM Interface Encapsulation*
• To configure an IP address for the interface, include the **address** statement in the configuration. For more information, see "Configuring the Interface Address" on page 202.

If you include the **address** statement in the configuration, you cannot include the **negotiate-address** or **unnumbered-address** statement in the configuration.

When you include the **address** statement in the interface configuration, you can assign PPP properties to the remote end.

> NOTE: The option to negotiate an IP address is not allowed in MLFR and MFR encapsulations.

• To enable the interface to obtain an IP address from the remote end, include the **negotiate-address** statement at the [edit interfaces interface-name unit logical-unit-number family inet] hierarchy level.

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

> NOTE: If you include the **negotiate-address** statement in the configuration, you cannot include the **address** or **unnumbered-address** statement in the configuration.

• To configure an interface to be unnumbered, include the **unnumbered-address** and **destination** statements in the configuration.

```
[edit interfaces interface-name unit logical-unit-number family inet]
user@host# set unnumbered-address interface-name
user@host# set destination address
```

> NOTE:

- The **unnumbered-address** statement enables the local address to be derived from the specified interface. The interface name must include a logical unit number and must have a configured address (see "Configuring the Interface Address" on page 202). Specify the IP address of the remote interface with the **destination** statement.

- If you include the **unnumbered-address** statement in the configuration, you cannot include the **address** or **negotiate-address** statement in the interface configuration.

• To assign PPP properties to the remote end include the **destination-profile** statement:
NOTE:

- You can assign PPP properties to the remote end, after you include the `address` or `unnumbered-address` statement in the interface configuration.
- You define the profile at the `[edit access group-profile name ppp]` hierarchy level. For more information, see `Example: PPP MP for L2TP`
This topic includes the following information:

**Overview of Unnumbered Interfaces**

When you need to conserve IP addresses, you can configure unnumbered interfaces. Setting up an unnumbered interface enables IP processing on the interface without assigning an explicit IP address to the interface. For IPv6, in which conserving addresses is not a major concern, you can configure unnumbered interfaces to share the same subnet across multiple interfaces. IPv6 unnumbered interfaces are only supported on Ethernet interfaces. The statements you use to configure an unnumbered interface depend on the type of interface you are configuring: a point-to-point interface or an Ethernet interface:

**Configuring an Unnumbered Point-to-Point Interface**

1. In configuration mode, go to the `edit interfaces interface-name unit logical-unit-number` hierarchy level.

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

2. To configure an unnumbered point-to-point interface, configure the protocol family, but do not include the `address` statement.

   ```
   [edit interfaces interface-name unit logical-unit-number]
   user@host# set family
   ```

**NOTE:**

- For interfaces with PPP encapsulation, you can configure an unnumbered interface by including the `unnumbered-interface` statement in the configuration. For more information, see “Configuring IPCP Options for Interfaces with PPP Encapsulation” on page 211.

- When configuring unnumbered interfaces, you must ensure that a source address is configured on some interface in the router. This address is the default address. We recommend that you do this by assigning an address to the loopback interface (lo0), as described in “Loopback Interface Configuration” on page 270. If you configure an address (other than a martian) on the lo0 interface, that address is always the default address, which is preferable because the loopback interface is independent of any physical interfaces and therefore is always accessible.
Configuring an Unnumbered Ethernet or Demux Interface

1. In configuration mode, go to the [edit interfaces interface-name unit logical-unit-number family family-name] hierarchy level.

   ```
   [edit ]
   user@host# edit interfaces interface-name unit logical-unit-number family family-name
   ```

2. To configure an unnumbered Ethernet or demultiplexing interface, include the unnumbered-address statement in the configuration.

   ```
   [edit interfaces interface-name unit logical-unit-number family family-name]
   user@host# set unnumbered-address interface-name
   ```

3. (Optional) To specify the unnumbered Ethernet interface as the next-hop interface for a configured static route, include the qualified-next-hop statement at the [edit routing-options static route destination-prefix] hierarchy level. This feature enables you to specify independent preferences and metrics for static routes on a next-hop basis.

   ```
   [edit routing-options static route destination-prefix]
   user@host# set qualified-next-hop (address | interface-name)
   ```
NOTE:

- The **unnumbered-address** statement currently supports configuration of unnumbered demux interfaces only for the IPv4 address family. You can configure unnumbered Ethernet interfaces for both IPv4 and IPv6 address families.

- The interface that you configure to be unnumbered borrows an assigned IP address from another interface, and is referred to as the **borrower interface**. The interface from which the IP address is borrowed is referred to as the **donor interface**. In the **unnumbered-address** statement, **interface-name** specifies the donor interface. For an unnumbered Ethernet interface, the donor interface can be an Ethernet, ATM, SONET, or loopback interface that has a logical unit number and configured IP address and is not itself an unnumbered interface. For an unnumbered IP demultiplexing interface, the donor interface can be an Ethernet or loopback interface that has a logical unit number and configured IP address and is not itself an unnumbered interface. In addition, for either Ethernet or demux, the donor interface and the borrower interface must be members of the same routing instance and the same logical system.

- When you configure an unnumbered Ethernet or demux interface, the IP address of the donor interface becomes the source address in packets generated by the unnumbered interface.

- You can configure a host route that points to an unnumbered Ethernet or demux interface. For information about host routes, see the *MPLS Applications User Guide*.

**Configuring a Preferred Source Address for Unnumbered Ethernet or Demux Interfaces**

When a loopback interface with multiple secondary IP addresses is configured as the donor interface for an unnumbered Ethernet or demux interface, you can optionally specify any one of the loopback interface’s secondary addresses as the preferred source address for the unnumbered Ethernet or demux interface. This feature enables you to use an IP address other than the primary IP address on some of the unnumbered Ethernet or demux interfaces in your network.

1. In configuration mode, go to the [edit interfaces interface-name unit logical-unit-number family family-name] hierarchy level.

```
[edit ]
user@host# edit interfaces interface-name unit logical-unit-number family family-name
```

2. To configure a secondary address on a loopback donor interface as the preferred source address for an unnumbered Ethernet or demux interface, include the **preferred-source-address** option in the **unnumbered-address** statement:
NOTE:
The following considerations apply when you configure a preferred source address on an unnumbered Ethernet or demux interface:

- The **unnumbered-address** statement currently supports the configuration of a preferred source address only for the IPv4 address family for demux interfaces, and for IPv4 and IPv6 address families for Ethernet interfaces.

- If you do not specify the preferred source address, the router uses the default primary IP address of the donor interface.

- You cannot delete an address on a donor loopback interface while it is being used as the preferred source address for an unnumbered Ethernet or demux interface.

Restrictions for Configuring Unnumbered Ethernet Interfaces

The following restrictions apply when you configure unnumbered Ethernet interfaces:

- The **unnumbered-address** statement currently supports the configuration of unnumbered Ethernet interfaces for IPv4 and IPv6 address families.

- You cannot assign an IP address to an Ethernet interface that is already configured as an unnumbered interface.

- The donor interface for an unnumbered Ethernet interface must have one or more configured IP addresses.

- The donor interface for an unnumbered Ethernet interface cannot be configured as unnumbered.

- An unnumbered Ethernet interface does not support configuration of the following **address** statement options: **arp**, **broadcast**, **primary**, **preferred**, and **vrrp-group**. For information about these options, see “Configuring the Interface Address” on page 202.

- Running IGMP and PIM are supported only on unnumbered Ethernet interfaces that directly face the host and have no downstream PIM neighbors. IGMP and PIM are not supported on unnumbered Ethernet interfaces that act as upstream interfaces in a PIM topology.

- Running OSPF and IS-IS on unnumbered Ethernet interfaces is not supported. However, you can run OSPF over unnumbered Ethernet interfaces configured as a Point-to-Point connection.

For link-state distribution using an interior gateway protocol (IGP), ensure that OSPF is enabled on the donor interface for an unnumbered interface configuration, so the donor IP address is reachable to establish OSPF sessions.
NOTE: If you configure the same address on multiple interfaces in the same routing instance, Junos OS uses only the first configuration, the remaining address configurations are ignored and can leave interfaces without an address. Interfaces that do not have an assigned address cannot be used as a donor interface for an unnumbered Ethernet interface.

For example, in the following configuration the address configuration of interface xe-0/0/1.0 is ignored:

```plaintext
interfaces {
  xe-0/0/0 {
    unit 0 {
      family inet {
        address 192.168.1.1/24;
      }
    }
  }
  xe-0/0/1 {
    unit 0 {
      family inet {
        address 192.168.1.1/24;
      }
    }
  }
}
```

For more information on configuring the same address on multiple interfaces, see “Configuring the Interface Address” on page 202.

Displaying the Unnumbered Ethernet Interface Configuration

**Purpose**
To display the configured unnumbered interface at the `[edit interfaces interface-name unit logical-unit-number]` hierarchy level:

- Unnumbered interface — ge-1/0/0
- Donor interface — ge-0/0/0
- Donor interface address — 4.4.4.1/24

The unnumbered interface “borrows” an IP address from the donor interface.

**Action**
- Run the `show` command at the `[edit]` hierarchy level.
Meaning
The sample configuration that is described works correctly on M and T Series routers. For unnumbered interfaces on MX Series routers, you must additionally configure static routes on an unnumbered Ethernet interface by including the qualified-next-hop statement at the [edit routing-options static route destination-prefix] hierarchy level to specify the unnumbered Ethernet interface as the next-hop interface for a configured static route.

Displaying the Configured Preferred Source Address for an Unnumbered Ethernet Interface

Purpose
To display the configuration of preferred source address for an unnumbered interface at the [edit interfaces interface-name unit logical-unit-number family inet] hierarchy level:

- Unnumbered interface — ge-0/0/0
- Donor interface — lo0
- Donor interface primary address—2.2.1/32
- Donor interface secondary address—3.3.1/32

Action
- Run the show command at the [edit] hierarchy level.
Meaning

The loopback interface lo0 is the donor interface from which unnumbered Ethernet interface ge-4/0/0 "borrows" an IP address.

The example shows one of the loopback interface's secondary addresses, 3.3.3.1, as the preferred source address for the unnumbered Ethernet interface.

Displaying the Configuration for Unnumbered Ethernet Interface as the Next Hop for a Static Route

Purpose

To display the unnumbered interface configured as the next hop for the static route at the [edit interfaces interface-name unit logical-unit-number family inet] hierarchy level:

- Unnumbered interface — ge-0/0/0
- Donor interface — lo0
- Donor interface primary address—5.5.5.1/32
- Donor interface secondary address—6.6.6.1/32
- Static route—7.7.7.1/32

Action

- Run the show command at the [edit] hierarchy level.
The following configuration enables the kernel to install a static route to address 7.7.7.1/32 with a next hop through unnumbered interface ge-0/0/0.0.

```
static {
  route 7.7.7.1/32 {
    qualified-next-hop ge-0/0/0.0;
  }
}
```

**Meaning**

In this example, **ge-0/0/0** is the unnumbered interface and a loopback interface, **lo0**, is the donor interface from which **ge-0/0/0** "borrows" an IP address. The example also configures a static route to **7.7.7.1/32** with a next hop through unnumbered interface **ge-0/0/0.0**.

### Setting the Protocol MTU

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

For a list of default protocol MTU values, see "Media MTU Sizes by Interface Type" on page 100.

To modify the MTU for a particular protocol family, include the **mtu** statement:
You can include this statement at the following hierarchy levels:

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

If you increase the size of the protocol MTU, you must ensure that the size of the media MTU is equal to or greater than the sum of the protocol MTU and the encapsulation overhead. For a list of encapsulation overhead values, see “Encapsulation Overhead by Interface Encapsulation Type” on page 114. If you reduce the media MTU size, but there are already one or more address families configured and active on the interface, you must also reduce the protocol MTU size. (You configure the media MTU by including the mtu statement at the [edit interfaces interface-name] hierarchy level.)

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

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

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

**RELATED DOCUMENTATION**

| Media MTU Overview | 99 |

**Disabling the Removal of Address and Control Bytes**

For Point-to-Point Protocol (PPP) CCC-encapsulated interfaces, the address and control bytes are removed by default before the packet is encapsulated into a tunnel.

You can disable the removal of address and control bytes. To do this, include the keep-address-and-control statement:

```text
keep-address-and-control;
```
You can include this statement at the following hierarchy levels:

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

**RELATED DOCUMENTATION**

- keep-address-and-control | 389

---

**Disabling the Transmission of Redirect Messages on an Interface**

By default, the interface sends protocol redirect messages. To disable the sending of these messages on an interface, include the `no-redirects` statement:

```
no-redirects;
```

You can include this statement at the following hierarchy levels:

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

To disable the sending of protocol redirect messages for the entire router or switch, include the `no-redirects` statement at the [edit system] hierarchy level.

**RELATED DOCUMENTATION**

- `no-redirects`

---

**Applying a Filter to an Interface**

**IN THIS SECTION**

- Defining Interface Groups in Firewall Filters | 224
- Applying a Filter to an Interface | 224
Defining Interface Groups in Firewall Filters

When applying a firewall filter, you can define an interface to be part of an interface group. Packets received on that interface are tagged as being part of the group. You can then match these packets using the interface-group match statement, as described in the Routing Policies, Firewall Filters, and Traffic Policers User Guide.

To define the interface to be part of an interface group, include the group statement:

```
group filter-group-number;
```

You can include this statement at the following hierarchy levels:

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

NOTE: The number 0 is not a valid interface group number.

Filter-Based Forwarding on the Output Interface

If port-mirrored packets are to be distributed to multiple monitoring or collection interfaces, based on patterns in packet headers, it is helpful to configure a filter-based forwarding (FBF) filter on the port-mirroring egress interface.

When an FBF filter is installed as an output filter, a packet that is forwarded to the filter has already undergone at least one route lookup. After the packet is classified at the egress interface by the FBF filter, it is redirected to another routing table for additional route lookup. To avoid packet looping inside the Packet Forwarding Engine, the route lookup in the latter routing table (designated by an FBF routing instance) must result in a different next hop from any next hop specified in a table that has already been applied to the packet.

If an input interface is configured for FBF, the source lookup is disabled for those packets headings to a different routing instance, since the routing table is not set up to handle the source lookup.

For more information about FBF configuration, see the Junos OS Routing Protocols Library. For more information about port mirroring, see the Junos OS Services Interfaces Library for Routing Devices.

Applying a Filter to an Interface

To apply firewall filters to an interface, include the filter statement:
To apply a single filter, include the **input** statement:

```plaintext
filter {
    input filter-name;
}
```

To apply a list of filters to evaluate packets received on an interface, include the **input-list** statement.

```plaintext
filter {
    input-list [ filter-names ];
}
```

Up to 16 filter names can be included in an input list.

To apply a list of filters to evaluate packets transmitted on an interface, include the **output-list** statement.

```plaintext
filter {
    output-list [ filter-names ];
}
```

When you apply filters using the **input-list** statement or the **output-list** statement, a new filter is created with the name `<interface-name>.<unit-direction>`. This filter is exclusively interface-specific.

You can include these statements at the following hierarchy levels:

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

In the **family** statement, the protocol family can be ccc, inet, inet6, mpls, or vpls.

In the **group** statement, specify the interface group number to associate with the filter.

In the **input** statement, list the name of one firewall filter to be evaluated when packets are received on the interface.

In the **input-list** statement, list the names of filters to evaluate when packets are received on the interface. You can include up to 16 filter names.
In the output statement, list the name of one firewall filter to be evaluated when packets are transmitted on the interface.

NOTE: Output filters do not work for broadcast and multicast traffic, including VPLS traffic (except in MX Series routers with MPC/MIC interfaces), as shown in "Applying a Filter to an Interface" on page 224.

NOTE: MPLS family firewall filters applied on the output interface are not supported on the PTX10003 router due to product limitation.

NOTE: On an MX Series router, you cannot apply as an output filter, a firewall filter configured at the [edit firewall filter family ccc] hierarchy level. Firewall filters configured for the family ccc statement can be applied only as input filters.

In the output-list statement, list the names of filters to evaluate when packets are transmitted on the interface. You can include up to 16 filter names.

You can use the same filter one or more times. On M Series routers (except the M320 and M120 routers), if you apply a firewall filter or policer to multiple interfaces, the filter or policer acts on the sum of traffic entering or exiting those interfaces.

On T Series, M120, and M320 routers, interfaces are distributed among multiple packet forwarding components. Therefore, on these routers, if you apply a firewall filter or policer to multiple interfaces, the filter or policer acts on the traffic stream entering or exiting each interface, regardless of the sum of traffic on the multiple interfaces.

For more information on Understanding Ethernet Frame Statistics, see the MX Series Layer 2 Configuration Guide.

If you apply the filter to the interface lo0, it is applied to packets received or transmitted by the Routing Engine. You cannot apply MPLS filters to the management interface (fxp0 or em0) or the loopback interface (lo0).

Filters applied at the [set interfaces lo0 unit 0 family any filter input] hierarchy level are not installed on T4000 Type 5 FPCs.

For more information about firewall filters, see the Routing Policies, Firewall Filters, and Traffic Policers User Guide. For more information about MPLS filters, see the MPLS Applications User Guide.

Example: Input Filter for VPLS Traffic
For M Series and T Series routers only, apply an input filter to VPLS traffic. Output filters do not work for broadcast and multicast traffic, including VPLS traffic. Note that on MX Series routers with MPC/MIC interfaces, the VPLS filters on the egress is applicable to broadcast, multicast, and unknown unicast traffic.

```
[edit interfaces]
fe-2/2/3 {
    vlan-tagging;
    encapsulation vlan-vpls;
    unit 601 {
        encapsulation vlan-vpls;
        vlan-id 601;
        family vpls {
            filter {
                input filter1; # Works for multicast destination MAC address
                output filter1; # Does not work for multicast destination MAC address
            }
        }
    }
}

[edit firewall]
family vpls {
    filter filter1 {
        term 1 {
            from {
                destination-mac-address {
                    01:00:0c:cc:cc:cd/48;
                }
            }
            then {
                discard;
            }
        }
        term 2 {
            then {
                accept;
            }
        }
    }
}
```

Example: Filter-Based Forwarding at the Output Interface
The following example illustrates the configuration of filter-based forwarding at the output interface. In this example, the packet flow follows this path:

1. A packet arrives at interface **fe-1/2/0.0** with source and destination addresses **10.50.200.1** and **10.50.100.1** respectively.
2. The route lookup in routing table **inet.0** points to the egress interface **so-0/0/3.0**.
3. The output filter installed at **so-0/0/3.0** redirects the packet to routing table **fbf.inet.0**.
4. The packet matches the entry **10.50.100.0/25** in the **fbf.inet.0** table, and finally leaves the router from interface **so-2/0/0.0**.

```
[edit interfaces]
so-0/0/3 {
    unit 0 {
        family inet {
            filter {
                output fbf;
            }
            address 10.50.10.2/25;
        }
    }
}
fe-1/2/0 {
    unit 0 {
        family inet {
            address 10.50.50.2/25;
        }
    }
}
so-2/0/0 {
    unit 0 {
        family inet {
            address 10.50.20.2/25;
        }
    }
}
[edit firewall]
filter fbf {
    term 0 {
        from {
            source-address {
```
10.50.200.0/25;
}
} then routing-instance fbf;
}
term d {
    then count d;
}
}
[edit routing-instances]
fbf {
    instance-type forwarding;
    routing-options {
        static {
            route 10.50.100.0/25 next-hop so-2/0/0.0;
        }
    }
}
[edit routing-options]
interface-routes {
    rib-group inet fbf-group;
}
static {
    route 10.50.100.0/25 next-hop 10.50.10.1;
}
rib-groups {
    fbf-group {
        import-rib [inet.0 fbf.inet.0];
    }
}
}

Enabling Source Class and Destination Class Usage

IN THIS SECTION

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- Enabling Source Class and Destination Class Usage | 234
Source Class and Destination Class Usage

For interfaces that carry IPv4, IPv6, MPLS, or peer AS billing traffic, you can maintain packet counts based on the entry and exit points for traffic passing through your network. Entry and exit points are identified by source and destination prefixes grouped into disjoint sets defined as source classes and destination classes. You can define classes based on a variety of parameters, such as routing neighbors, autonomous systems, and route filters.

Source class usage (SCU) counts packets sent to customers by performing lookup on the IP source address. SCU makes it possible to track traffic originating from specific prefixes on the provider core and destined for specific prefixes on the customer edge. You must enable SCU accounting on both the inbound and outbound physical interfaces, and the route for the source of the packet must be in located in the forwarding table.

**NOTE:** SCU and DCU accounting do not work with directly connected interface routes. Source class usage does not count packets coming from sources with direct routes in the forwarding table because of software architecture limitations.

Destination class usage (DCU) counts packets from customers by performing lookup of the IP destination address. DCU makes it possible to track traffic originating from the customer edge and destined for specific prefixes on the provider core router.

**NOTE:** We recommend that you stop the network traffic on an interface before you modify the DCU or SCU configuration for that interface. Modifying the DCU or SCU configuration without stopping the traffic might corrupt the DCU or SCU statistics. Before you restart the traffic after modifying the configuration, enter the `clear interfaces statistics` command.

Figure 11 on page 231 illustrates an Internet service provider (ISP) network. In this topology, you can use DCU to count packets customers send to specific prefixes. For example, you can have three counters, one per customer, that count the packets destined for prefix 210.210/16 and 220.220/16.

You can use SCU to count packets the provider sends from specific prefixes. For example, you can count the packets sent from prefix 210.210/16 and 215.215/16 and transmitted on a specific output interface.
You can configure up to 126 source classes and 126 destination classes. For each interface on which you enable destination class usage and source class usage, the Junos OS maintains an interface-specific counter for each corresponding class up to the 126 class limit.

**NOTE:** For transit packets exiting the router through the tunnel, forwarding path features, such as RPF, forwarding table filtering, source class usage, and destination class usage are not supported on the interfaces you configure as the output interface for tunnel traffic. For firewall filtering, you must allow the output tunnel packets through the firewall filter applied to input traffic on the interface that is the next-hop interface towards the tunnel destination.

**NOTE:**
Performing DCU accounting when an output service is enabled produces inconsistent behavior in the following configuration:

- Both SCU input and DCU are configured on the packet input interface.
- SCU output is configured on the packet output interface.
- Interface services is enabled on the output interface.

For an incoming packet with source and destination prefixes matching the SCU and DCU classes respectively configured in the router, both SCU and DCU counters will be incremented. This behavior is not harmful or negative. However, it is inconsistent with non-serviced packets, in that only the SCU count will be incremented (because the SCU class ID will override the DCU class ID in this case).

To enable packet counting on an interface, include the `accounting` statement:

```
accounting {}
```
**destination-class-usage;**

**source-class-usage {**

  
  **direction;**

  **}**

**}**

direction can be one of the following:

- **input**—Configure at least one expected ingress point.
- **output**—Configure at least one expected egress point.
- **input output**—On a single interface, configure at least one expected ingress point and one expected egress point.

You can include these statements at the following hierarchy levels:

- **[edit interfaces interface-name unit logical-unit-number family (inet | inet6 | mpls)]**
- **[edit logical-systems logical-system-name interfaces interface-name unit logical-unit-number family (inet | inet6 | mpls)]**

For SCU to work, you must configure at least one input interface and at least one output interface.

The ability to count a single packet for both SCU and DCU accounting depends on the underlying physical interface.

- For traffic over MPC/MIC interfaces, a single incoming packet is counted for both SCU and DCU accounting if both SCU and DCU are configured. To ensure the outgoing packet is counted, include the **source-class-usage output** statements in the configuration of the outgoing interface.

- For traffic over DPC interfaces, an incoming packet is counted only once, and SCU takes priority over DCU. This means that when a packet arrives on an interface on which you include the **source-class-usage input** and **destination-class-usage** statements in the configuration, and when the source and destination both match accounting prefixes, the Junos OS associates the packet with the source class only.

For traffic over MPC interfaces, SCU and DCU accounting is performed after output filters are evaluated. If a packet matches a firewall filter match condition, the packet is included in SCU or DCU accounting except in the case where the action of the matched term is **discard**.

On T Series, M120, and M320 routers, the source class and destination classes are not carried across the router fabric. The implications of this are as follows:

- On T Series, M120, and M320 routers, SCU and DCU accounting is performed before the packet enters the fabric.

- On M7i, M10i, M120, and M320 routers, on MX Series routers with non-MPC, and on T Series routers, SCU and DCU accounting is performed before output filters are evaluated. Consequently, if a packet
matches a firewall filter match condition, the packet is included in SCU or DCU accounting; the packet
is counted for any term action (including the discard action).

- On M120, M320, and T Series routers, the destination-class and source-class statements are supported
  at the [edit firewall family family-name filter filter-name term term-name from] hierarchy level only for
  the filter applied to the forwarding table. On M7i, M10i, and MX Series routers, these statements are
  supported.

Once you enable accounting on an interface, the Junos OS maintains packet counters for that interface,
with separate counters for inet, inet6, and mpls protocol families. You must then configure the source
class and destination class attributes in policy action statements, which must be included in forwarding-table
export policies.

NOTE: When configuring policy action statements, you can configure only one source class for
each matching route. In other words, more than one source class cannot be applied to the same
route.

In Junos OS Release 9.3 and later, you can configure SCU accounting for Layer 3 VPNs configured with
the vrf-table-label statement. Include the source-class-usage statement at the [edit routing-instances
routing-instance-name vrf-table-label] hierarchy level. The source-class-usage statement at this hierarchy
level is supported only for the virtual routing and forwarding (VRF) instance type.

NOTE: DCU counters cannot be enabled on the label-switched interface (LSI) that is created
dynamically when the vrf-table-label statement is configured within a VRF. For more information,
see the Junos OS VPNs Library for Routing Devices.

For a complete discussion about source and destination class accounting profiles, see the Network
Management and Monitoring Guide. For more information about MPLS, see the MPLS Applications User
Guide.
Enabling Source Class and Destination Class Usage

Figure 12: Prefix Accounting with Source and Destination Classes

Configure DCU and SCU output on one interface:

```
[edit]
interfaces {
  so-6/1/0 {
    unit 0 {
      family inet {
        accounting {
          destination-class-usage;
          source-class-usage {
            output;
          }
        }
      }
    }
  }
}
```

1. **Complete SCU Configuration**

Source routers A and B use loopback addresses as the prefixes to be monitored. Most of the configuration tasks and actual monitoring occur on transit Router SCU.

The loopback address on Router A contains the origin of the prefix that is to be assigned to source class A on Router SCU. However, no SCU processing happens on this router. Therefore, configure Router A for basic OSPF routing and include your loopback interface and interface so-0/0/2 in the OSPF process.
2. **Router A**

    [edit]
    interfaces {
        so-0/0/2 {
            unit 0 {
                family inet {
                    address 10.255.50.2/24;
                }
            }
        }
        lo0 {
            unit 0 {
                family inet {
                    address 10.255.192.10/32;
                }
            }
        }
    }
    protocols {
        ospf {
            area 0.0.0.0 {
                interface so-0/0/2.0;
                interface lo0.0;
            }
        }
    }

3. **Router SCU**

    Last, apply the policy to the forwarding table.

    Router SCU handles the bulk of the activity in this example. On Router SCU, enable source class usage on the inbound and outbound interfaces at the [edit interfaces interface-name unit unit-number family inet accounting] hierarchy level. Make sure you specify the expected traffic: input, output, or, in this case, both.

    Next, configure a route filter policy statement that matches the prefixes of the loopback addresses from routers A and B. Include statements in the policy that classify packets from Router A in one group named scu-class-a and packets from Router B in a second class named scu-class-b. Notice the efficient use of a single policy containing multiple terms.

    [edit]
    interfaces {
so-0/0/1 {
  unit 0 {
    family inet {
      accounting {
        source-class-usage {
          input;
          output;
        }
      }
      address 10.255.50.1/24;
    }
  }
}
so-0/0/3 {
  unit 0 {
    family inet {
      accounting {
        source-class-usage {
          input;
          output;
        }
      }
      address 10.255.10.3/24;
    }
  }
}
lo0 {
  unit 0 {
    family inet {
      address 10.255.6.111/32;
    }
  }
}
}
protocols {
  ospf {
    area 0.0.0.0 {
      interface so-0/0/1.0;
      interface so-0/0/3.0;
    }
  }
  forwarding-table {

```
export scu-policy;
}
}
policy-options {
policy-statement scu-policy {
term 0 {
    from {
        route-filter 10.255.192.0/24 or longer;
    }
    then source-class scu-class-a;
}
term 1 {
    from {
        route-filter 10.255.165.0/24 or longer;
    }
    then source-class scu-class-b;
}
}
}

4. Router B

Just as Router A provides a source prefix, Router B’s loopback address matches the prefix assigned to scu-class-b on Router SCU. Again, no SCU processing happens on this router, so configure Router B for basic OSPF routing and include your loopback interface and interface so-0/0/4 in the OSPF process.

interfaces {
    so-0/0/4 {
        unit 0 {
            family inet {
                address 10.255.10.4/24;
            }
        }
    }
    lo0 {
        unit 0 {
            family inet {
                address 10.255.165.226/32;
            }
        }
    }
}
}
protocols {
5. Enabling Packet Counting for Layer 3 VPNs

You can use SCU and DCU to count packets on Layer 3 VPNs. To enable packet counting for Layer 3 VPN implementations at the egress point of the MPLS tunnel, you must configure a virtual loopback tunnel interface (vt) on the PE router, map the virtual routing and forwarding (VRF) instance type to the virtual loopback tunnel interface, and send the traffic received from the VPN out the source class output interface, as shown in the following example:

Configure a virtual loopback tunnel interface on a provider edge router equipped with a tunnel PIC:

```
[edit interfaces]
vt-0/3/0 {
    unit 0 {
        family inet {
            accounting {
                source-class-usage { input; }
            }
        }
    }
}
```

6. Map the VRF instance type to the virtual loopback tunnel interface.

In Junos OS Release 9.3 and later, you can configure SCU accounting for Layer 3 VPNs configured with the `vrf-table-label` statement. Include the `source-class-usage` statement at the `[edit routing-instances routing-instance-name vrf-table-label]` hierarchy level. The `source-class-usage` statement at this hierarchy level is supported only for the virtual routing and forwarding (VRF) instance type. DCU is not supported when the `vrf-table-label` statement is configured. For more information, see the Junos OS VPNs Library for Routing Devices.

```
[edit routing-instances]
VPN-A {
```
7. Send traffic received from the VPN out the source class output interface:

[edit interfaces]
at-2/1/0 {
    unit 0 {
        family inet {
            accounting {
                source-class-usage {output;}
            }
        }
    }
}

For more information about VPNs, see the Junos OS VPNs Library for Routing Devices. For more information about virtual loopback tunnel interfaces, see the Junos OS Services Interfaces Library for Routing Devices.

SEE ALSO

  accounting | 332
  destination-classes
  family
Understanding Targeted Broadcast

Targeted broadcast is a process of flooding a target subnet with Layer 3 broadcast IP packets originating from a different subnet. The intent of targeted broadcast is to flood the target subnet with the broadcast packets on a LAN interface without broadcasting to the entire network. Targeted broadcast is configured with various options on the egress interface of the router or switch and the IP packets are broadcast only on the LAN (egress) interface. Targeted broadcast helps you implement remote administration tasks such as backups and wake-on LAN (WOL) on a LAN interface, and supports virtual routing and forwarding (VRF) instances.

Regular Layer 3 broadcast IP packets originating from a subnet are broadcast within the same subnet. When these IP packets reach a different subnet, they are forwarded to the Routing Engine (to be forwarded to other applications). Because of this, remote administration tasks such as backups cannot be performed on a particular subnet through another subnet. As a workaround you can enable targeted broadcast, to forward broadcast packets that originate from a different subnet.

Layer 3 broadcast IP packets have a destination IP address that is a valid broadcast address for the target subnet. These IP packets traverse the network in the same way as unicast IP packets until they reach the destination subnet. In the destination subnet, if the receiving router has targeted broadcast enabled on the egress interface, the IP packets are forwarded to an egress interface and the Routing Engine or to an egress interface only. The IP packets are then translated into broadcast IP packets which flood the target subnet only through the LAN interface (if there is no LAN interface, the packets are discarded), and all hosts on the target subnet receive the IP packets. If targeted broadcast is not enabled on the receiving router, the IP packets are treated as regular Layer 3 broadcast IP packets and are forwarded to the Routing Engine. If targeted broadcast is enabled without any options, the IP packets are forwarded to the Routing Engine.

Targeted broadcast can be configured to forward the IP packets only to an egress interface, which is helpful when the router is flooded with packets to process, or to both an egress interface and the Routing Engine.
NOTE: Targeted broadcast does not work when the targeted broadcast option `forward-and-send-to-re` and the traffic sampling option `sampling` are configured on the same egress interface of an M320 router, a T640 router, or an MX960 router. To overcome this scenario, you must either disable one of these options or enable the `sampling` option with the targeted broadcast option `forward-only` on the egress interface. For information about traffic sampling, see Configuring Traffic Sampling.

NOTE: Any firewall filter that is configured on the Routing Engine loopback interface (lo0) cannot be applied to IP packets that are forwarded to the Routing Engine as a result of a targeted broadcast. This is because broadcast packets are forwarded as flood next hop and not as local next hop traffic, and you can only apply a firewall filter to local next hop routes for traffic directed towards the Routing Engine.

RELATED DOCUMENTATION

- targeted-broadcast

**Configuring Targeted Broadcast**

**IN THIS SECTION**
- Configuring Targeted Broadcast and Its Options | 242
- Display Targeted Broadcast Configuration Options | 243

The following sections explain how to configure targeted broadcast on an egress interface and its options:
Configuring Targeted Broadcast and Its Options

You can configure targeted broadcast on an egress interface with different options. You can either allow the IP packets destined for a Layer 3 broadcast address to be forwarded on the egress interface and to send a copy of the IP packets to the Routing Engine or you can allow the IP packets to be forwarded on the egress interface only. Note that the packets are broadcast only if the egress interface is a LAN interface.

To configure targeted broadcast and its options:

1. Configure the physical interface.

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

2. Configure the logical unit number at the [edit interfaces interface-name] hierarchy level.

   ```
   [edit interfaces interface-name]
   user@host# set unit logical-unit-number
   ```

3. Configure the protocol family as inet at the [edit interfaces interface-name unit interface-unit-number] hierarchy level.

   ```
   [edit interfaces interface-name unit interface-unit-number]
   user@host# set family inet
   ```

4. Configure targeted broadcast at the [edit interfaces interface-name unit interface-unit-number family inet] hierarchy level

   ```
   [edit interfaces interface-name unit interface-unit-number family inet]
   user@host# set targeted-broadcast
   ```

5. Specify one of the following options as per requirement:

   - To allow IP packets destined for a Layer 3 broadcast address to be forwarded on the egress interface and to send a copy of the IP packets to the Routing Engine.

     ```
     [edit interfaces interface-name unit interface-unit-number family inet targeted-broadcast]
     user@host# set forward-and-send-to-re
     ```

   - To allow IP packets to be forwarded on the egress interface only.
NOTE: Targeted broadcast does not work when the targeted broadcast option forward-and-send-to-re and the traffic sampling option sampling are configured on the same egress interface of an M320 router, a T640 router, or an MX960 router. To overcome this scenario, you must either disable one of the these options or enable the sampling option with the targeted broadcast option forward-only on the egress interface. For information about traffic sampling, see Configuring Traffic Sampling.

Display Targeted Broadcast Configuration Options

The following topics display targeted broadcast configuration with its various options:

Forward IP Packets On the Egress Interface and To the Routing Engine

Purpose
Display the configuration when targeted broadcast is configured on the egress interface to forward the IP packets on the egress interface and to send a copy of the IP packets to the Routing Engine.

Action
To display the configuration run the show command at the [edit interfaces interface-name unit interface-unit-number family inet] where the interface name is ge-2/0/0, the unit value is set to 0, the protocol family is set to inet.

[edit interfaces interface-name unit interface-unit-number family inet]
user@host# show
targeted-broadcast {
   forward-and-send-to-re;
}
**Forward IP Packets On the Egress Interface Only**

**Purpose**
Display the configuration when targeted broadcast is configured on the egress interface to forward the IP packets on the egress interface only.

**Action**
To display the configuration run the `show` command at the `[edit interfaces interface-name unit interface-unit-number family inet]` where the interface name is ge-2/0/0, the unit value is set to 0, the protocol family is set to inet.

```plaintext
[edit interfaces interface-name unit interface-unit-number family inet]
user@host#show
targeted-broadcast {
    forward-only;
}
```

**RELATED DOCUMENTATION**

- targeted-broadcast
Special Router Interfaces

Configuring Discard Interfaces | 247
Configuring IP Demultiplexing Interfaces | 251
Configuring the Loopback Interface | 269
Configuring Discard Interfaces

IN THIS CHAPTER

- Discard Interfaces Overview | 247
- Configuring Discard Interfaces | 248

Discard Interfaces Overview

IN THIS SECTION

- Understanding Discard Interfaces | 247
- Guidelines to Follow When Configuring a Discard Interface | 248

The discard interface *dsc* is not a physical interface, but a virtual interface that discards packets.

The following sections explain discard interfaces in detail:

**Understanding Discard Interfaces**

The discard interface allows you to identify the ingress 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. When traffic is routed out of the discard interface, the traffic is silently discarded.

The discard interface allows you to protect a network from DoS attacks by identifying the target IP address that is being attacked and configuring a policy to forward all packets to a discard interface. All packets forwarded to the discard interface are dropped. See *Example: Forwarding Packets to the Discard Interface*.

You can configure the *inet* family protocol on the discard interface, which allows you to apply an output filter to the interface. If you apply an output filter to the interface, the action specified by the filter is executed before the traffic is discarded.
Once you configure a discard interface, you must then configure a local policy to forward attacking traffic to the discard interface.

Guidelines to Follow When Configuring a Discard Interface

Keep the following guidelines in mind when configuring the discard interface:

- Only the logical interface unit 0 is supported.
- The `filter` and `address` statements are optional.
- Although you can configure an input filter and a filter group, these configuration statements have no effect because traffic is not transmitted from the discard interface.
- The discard interface does not support class of service (CoS).

RELATED DOCUMENTATION

| Configuring Discard Interfaces | 248 |

Example: Forwarding Packets to the Discard Interface

Configuring Discard Interfaces

IN THIS SECTION

- Configuring and Usage of Discard Interface | 249
- Configure an Output Filter with Output policy | 249

The discard (dsc) interface is not a physical interface, but a virtual interface that discards packets. You can configure one discard interface. 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 of the discard interface is silently discarded.

The following sections explain how to configure a discard interface:
Configuring and Usage of Discard Interface

To configure a discard interface:

1. In configuration mode, go to the [edit interfaces] hierarchy level.

   [edit]
   user@host# edit interfaces

2. Configure the discard interface. Note that you must use 'dsc' to configure discard interface and ensure that there is no discard interface already configured.

   [edit interfaces]
   user@host# edit dsc

3. Configure the logical interface and the protocol family.

   [edit interfaces dsc]
   user@host# edit unit 0 family family

4. If appropriate, apply an output filter to the discard interface.
   
   Input filters have no impact in this context.

   [edit interfaces dsc unit 0 family family]
   user@host# set filter output filter-name

5. Commit the configuration and go to the top of the hierarchy level.

   [edit interfaces dsc unit 0 family family]
   user@host# commit
   user@host# top

Configure an Output Filter with Output policy

You must configure an output policy to set up the community on the routes injected into the network.

To configure an output policy.

1. In configuration mode, go to the [edit policy-options] hierarchy level.
2. Configure a routing policy.

```
[edit]
user@host# edit policy-options

[edit policy-options]
user@host# edit policy-statement statement-name
```

3. Configure a policy term with a name.

```
[edit policy-options policy-statement statement-name]
user@host# edit term term-variable
```

4. Configure the list of prefix-lists of routes to match with a name.

```
[edit policy-options policy-statement statement-name term term-variable]
user@host# set from prefix-list name
```

5. Configure the action that is to be taken when the if and to conditions match with the `then` statement. In this case, configure the BGP community properties (set, add, and delete) associated with a route.

```
[edit policy-options policy-statement statement-name term term-variable]
user@host# set then community (set | add | delete) community-name
```

6. Commit the configuration and go to the top of the hierarchy level.

```
[edit interfaces dsc unit 0 family family]
user@host# commit
user@host# top
```

**RELATED DOCUMENTATION**

| Discard Interfaces Overview | 247 |
Demultiplexing (demux) interfaces are logical interfaces that share a common, underlying interface. You can create logical subscriber interfaces using static or dynamic demultiplexing interfaces. In addition, you can use IP demultiplexing interfaces or VLAN demultiplexing interfaces when creating logical subscriber interfaces.

Demux interfaces are supported on M120 or MX Series routers only.

Demux interfaces support only Gigabit Ethernet, Fast Ethernet, 10-Gigabit Ethernet, or aggregated Ethernet underlying interfaces.
NOTE: You can also configure demux interfaces dynamically. For information about how to configure dynamic IP demux or dynamic VLAN demux interfaces, see Configuring Dynamic Subscriber Interfaces Using IP Demux Interfaces in Dynamic Profiles or Configuring Dynamic Subscriber Interfaces Using VLAN Demux Interfaces in Dynamic Profiles.

To configure static demux interfaces, see "Configuring a VLAN Demultiplexing Interface" on page 260 and "Configuring an IP Demultiplexing Interface" on page 255.

IP Demux Interface Overview

IP demux interfaces use the IP source address or IP destination address to demultiplex received packets when the subscriber is not uniquely identified by a Layer 2 circuit.

To determine which IP demux interface to use, the destination or source prefix is matched against the destination or source address of packets that the underlying interface receives. The underlying interface family type must match the demux interface prefix type.

VLAN Demux Interface Overview

VLAN demux interfaces use the VLAN ID to demultiplex received packets when the subscriber is not uniquely identified. A VLAN demux interface uses an underlying logical interface to receive packets.

To determine which VLAN demux interface to use, the VLAN ID is matched against that which the underlying interface receives.

NOTE: VLAN demux subscriber interfaces over aggregated Ethernet physical interfaces are supported only for MX Series routers that have only Trio MPCs installed. If the router has other MPCs in addition to Trio MPCs, the CLI accepts the configuration but errors are reported when the subscriber interfaces are brought up.

Guidelines to Remember When Configuring A Demux Interface

IN THIS SECTION

- Points to Remember When Configuring an IP Demux Interface | 253
- Points to Remember When Configuring a VLAN Demux Interface | 253
Keep the following guidelines in mind when configuring the demux interface:

- Demux interfaces are supported on M120 or MX Series routers only.
- Only demux0 is supported. If you configure another demux interface, such as demux1, the configuration commit fails.
- You can configure only one demux0 interface per chassis, but you can define logical demux interfaces on top of it (for example, demux0.1, demux0.2, and so on).
- If the address in a received packet does not match any demux prefix, the packet is logically received on the underlying interface. For this reason, the underlying interface is often referred to as the primary interface.

**Points to Remember When Configuring an IP Demux Interface**

In addition to the guidelines in “Guidelines to Remember When Configuring A Demux Interface” on page 252, the following guidelines are to be noted when configuring an IP demux interface:

- You must associate demux interfaces with an underlying logical interface.

  **NOTE:** IP demux interfaces currently support only Gigabit Ethernet, Fast Ethernet, 10-Gigabit Ethernet, and aggregated Ethernet underlying interfaces.

- The demux underlying interface must reside on the same logical system as the demux interfaces that you configure over it.
- IP demux interfaces currently supports the Internet Protocol version 4 (IPv4) suite inet and Internet Protocol version 6 (IPv6) suite inet6 family types.
- You can configure more than one demux prefix for a given demux unit. However, you cannot configure the exact same demux prefix on two different demux units with the same underlying interface.
- You can configure overlapping demux prefixes on two different demux units with the same underlying prefix. However, under this configuration, best match rules apply (in other words, the most specific prefix wins).

**Points to Remember When Configuring a VLAN Demux Interface**

In addition to the guidelines in “Guidelines to Remember When Configuring A Demux Interface” on page 252, the following guidelines are to be noted when configuring a VLAN demux interface:

- You must associate VLAN demux interfaces with an underlying logical interface.

  **NOTE:** VLAN demux interfaces currently support only Gigabit Ethernet, Fast Ethernet, 10-Gigabit Ethernet, and aggregated Ethernet underlying interfaces.
• The demux underlying interface must reside on the same logical system as the demux interfaces that you configure over it.

• VLAN demux interfaces currently support the Internet Protocol version 4 (IPv4) suite inet and Internet Protocol version 6 (IPv6) suite inet6 family types.

### MAC Address Validation on Static Demux Interfaces

MAC address validation enables the router to validate that received packets contain a trusted IP source and an Ethernet MAC source address.

MAC address validation is supported on static demux interfaces on MX Series routers only.

There are two types of MAC address validation that you can configure:

**Loose**

Forwards packets when both the IP source address and the MAC source address match one of the trusted address tuples.

Drops packets when the IP source address matches one of the trusted tuples, but the MAC address does not support the MAC address of the tuple

Continues to forward packets when the source address of the incoming packet does not match any of the trusted IP addresses.

**Strict**

Forwards packets when both the IP source address and the MAC source address match one of the trusted address tuples.

Drops packets when the MAC address does not match the tuple’s MAC source address, or when IP source address of the incoming packet does not match any of the trusted IP addresses.

### RELATED DOCUMENTATION

- Associating VLAN IDs to VLAN Demux Interfaces
Configuring an IP Demultiplexing Interface

Demultiplexing (demux) interfaces are logical interfaces that share a common, underlying interface. You can configure IP demultiplexing interfaces or VLAN demultiplexing interfaces.

To configure an IP demux interface, you must configure the demux prefixes that are used by the underlying interface and then configure the IP demultiplexing interface as explained in the following tasks:

1. Configuring an IP Demux Underlying Interface
2. Configuring the IP Demux Interface
3. Configuring MAC Address Validation on Static IP Demux Interfaces

Configuring an IP Demux Underlying Interface

An IP demux interface uses an underlying logical interface to receive packets. To determine which IP demux interface to use, the destination or source prefix is matched against the destination or source address of packets that the underlying interface receives. The underlying interface family type must match the demux interface prefix type.

NOTE: IP demux interfaces currently support only Gigabit Ethernet, Fast Ethernet, 10-Gigabit Ethernet, and aggregated Ethernet underlying interfaces.

To configure a logical interface as an IP demux underlying interface with demux source:

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

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

2. Configure the interface as fe-<x>/>y/z and the logical interface with the unit statement. Note that IP demux interfaces currently support only Gigabit Ethernet, Fast Ethernet, 10-Gigabit Ethernet, and aggregated Ethernet underlying interfaces. In this procedure, we show a Fast Ethernet interface as an example.
3. Configure the logical demux source family type on the IP demux underlying interface as inet or inet6, or both.

```
[edit interfaces fe-x/y/z unit logical-unit-number]
user@host# set demux-source (inet | inet6)
```

or

```
[edit interfaces fe-x/y/z unit logical-unit-number]
user@host# set demux-source [inet inet6]
```

4. (Optional) To improve datapath performance for DHCPv4 subscribers, specify that only subscribers with 32-bit prefixes are allowed to come up on the interface.

```
[edit interfaces fe-x/y/z unit logical-unit-number]
user@host# set host-prefix-only
```

**NOTE:** This step requires that you specify the `demux-source` as only `inet`. A commit error occurs if you specify only `inet6` or both `inet` and `inet6`.

5. Save the configuration and move to top of the hierarchy level.

```
[edit interfaces fe-x/y/z unit logical-unit-number]
user@host# commit
user@host# top
```

To configure a logical interface as an IP demux underlying interface with demux destination:

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

```
[edit]
user@host# edit interfaces
```
2. Configure the interface as fe-x/y/z and the logical interface with the `unit` statement. Note that IP demux interfaces currently support only Gigabit Ethernet, Fast Ethernet, 10-Gigabit Ethernet, and aggregated Ethernet underlying interfaces.

```
[edit interfaces]
user@host# edit fe-x/y/z unit logical-unit-number unit logical-unit-number
```

3. Configure the logical demux destination family type on the IP demux underlying interface as inet or inet6.

```
[edit interfaces fe-x/y/z unit logical-unit-number]
user@host# set demux-destination (inet | inet6)
```

4. Save the configuration and move to top of the hierarchy level.

```
[edit interfaces fe-x/y/z unit logical-unit-number]
user@host# commit
user@host# top
```

**Configuring the IP Demux Interface**

You can configure one or more logical demux source prefixes or destination prefixes after specifying an underlying interface for the static demux interface to use. This underlying interface must reside on the same logical system as the demux interface.

You configure demux prefixes for use by the underlying interface. The demux prefixes can represent individual hosts or networks. For a given demux interface unit, you can configure either demux source or demux destination prefixes but not both.

You can choose not to configure a demux source or demux destination prefix. This type of configuration results in a transmit-only interface.

To configure the IP demux interface with source prefix:

1. In configuration mode, go to the `[edit interfaces]` hierarchy level:

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

2. Configure the interface as a logical demux interface (for example, demux0 interface) and configure the logical interface with the `unit` statement.
NOTE: You can configure only one demux0 interface per chassis, but you can define logical demux interfaces on top of it (for example, demux0.1, demux0.2, and so on).

[edit interfaces]
user@host# edit demux0 unit logical-unit-number

3. Configure the underlying interface on which the demux interface is running under the demux-options statement.

[edit interfaces demux0 unit logical-unit-number]
user@host# set demux-options underlying-interface interface-name

4. Configure the protocol family.

[edit interfaces demux0 unit logical-unit-number]
user@host# edit family family

5. Configure one or more logical demux source prefixes (IP address). The prefixes are matched against the source address of packets that the underlying interface receives. When a match occurs, the packet is processed as if it was received on the demux interface.

[edit interfaces demux0 unit logical-unit-number family family]
user@host# set demux-source source-prefix

6. Save the configuration and move to top of the hierarchy level.

[edit interfaces demux0 unit logical-unit-number family family]
user@host# commit
user@host# top

To configure the IP demux interface with destination prefix:

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

[edit]
user@host# edit interfaces
2. Configure the interface as a logical demux interface (for example, demux0 interface) and configure the logical interface with the `unit` statement.

   **NOTE:** You can configure only one demux0 interface per chassis, but you can define logical demux interfaces on top of it (for example, demux0.1, demux0.2, and so on).

   ```
   [edit interfaces]
   user@host# edit demux0 unit logical-unit-number
   ```

3. Configure the underlying interface on which the demux interface is running under the `demux-options` statement.

   ```
   [edit interfaces demux0 unit logical-unit-number]
   user@host# set demux-options underlying-interface interface-name
   ```

4. Configure the protocol family.

   ```
   [edit interfaces demux0 unit logical-unit-number]
   user@host# edit family family
   ```

5. Configure one or more logical demux destination prefixes. The prefixes are matched against the destination address of packets that the underlying interface receives. When a match occurs, the packet is processed as if it was received on the demux interface.

   ```
   [edit interfaces demux0 unit logical-unit-number family family]
   user@host# set demux-destination destination-prefix
   ```

6. Save the configuration and move to top of the hierarchy level.

   ```
   [edit interfaces demux0 unit logical-unit-number family family]
   user@host# commit
   user@host# top
   ```
Configuring MAC Address Validation on Static IP Demux Interfaces

MAC address validation enables the router to validate that received packets contain a trusted IP source and an Ethernet MAC source address.

To configure MAC address validation for an IP demux interface:

1. In configuration mode, go to the [edit interfaces demux0 unit logical-unit-number] hierarchy level:

   ```
   [edit]
   user@host# edit interfaces demux0 unit logical-unit-number
   ```

2. Configure the protocol family for the interface.

   ```
   [edit interfaces demux0 unit logical-unit-number]
   user@host# edit family family
   ```

3. Configure the `mac-validate` statement to validate source MAC address with loose or strict options.

   ```
   [edit interfaces demux0 unit logical-unit-number family family]
   user@host# set mac-validate (loose | strict)
   ```

4. Save the configuration and move to top of the hierarchy level.

   ```
   [edit interfaces demux0 unit logical-unit-number family family]
   user@host# commit
   user@host# top
   ```

RELATED DOCUMENTATION

- Configuring a VLAN Demultiplexing Interface | 260
- Demultiplexing Interface Overview | 251

Configuring a VLAN Demultiplexing Interface

Demultiplexing (demux) interfaces are logical interfaces that share a common, underlying interface. You can configure IP demultiplexing interfaces or VLAN demultiplexing interfaces.
To configure a VLAN demux interface, you must configure the demux prefixes that are used by the underlying interface and then configure the VLAN demultiplexing interface as explained by the following tasks:

1. **Configuring a VLAN Demux Underlying Interface | 261**
2. **Configuring the VLAN Demux Interface | 263**
3. **Configuring MAC Address Validation on Static VLAN Demux Interfaces | 265**
4. **Verifying a Demux Interface Configuration | 266**

### Configuring a VLAN Demux Underlying Interface

A VLAN demux interface uses an underlying logical interface to receive packets. To determine which VLAN demux interface to use, the VLAN ID is matched against that which the underlying interface receives.

#### NOTE:
VLAN demux interfaces currently support only Gigabit Ethernet, Fast Ethernet, 10-Gigabit Ethernet, and aggregated Ethernet underlying interfaces.

VLAN demux subscriber interfaces over aggregated Ethernet physical interfaces are supported only for MX Series routers that have only Trio MPCs installed. If the router has other MPCs in addition to Trio MPCs, the CLI accepts the configuration but errors are reported when the subscriber interfaces are brought up.

To configure a logical interface as a VLAN demux underlying interface with demux source:

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

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

2. Configure the interface as fe-x/y/z and the logical interface with the `unit` option.

   ```
   [edit interfaces]
   user@host# edit fe-x/y/z unit logical-unit-number unit logical-unit-number
   ```

3. Configure the VLAN ID. The VLAN ID is used to determine which VLAN demux interface to use, that is the VLAN ID is matched against that which the underlying interface receives.

   ```
   [edit interfaces fe-x/y/z unit logical-unit-number]
   user@host# set vlan-id number
   ```
4. Configure the logical demux source family type on the VLAN demux underlying interface as inet or inet6.

```
[edit interfaces fe-x/y/z unit logical-unit-number]
user@host# set demux-source (inet | inet6)
```

5. Save the configuration and move to top of the hierarchy level.

```
[edit interfaces fe-x/y/z unit logical-unit-number]
user@host# commit
user@host# top
```

To configure a logical interface as a VLAN demux underlying interface with demux destination:

1. In configuration mode, go to the `[edit interfaces]` hierarchy level:

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

2. Configure the interface as fe-x/y/z and the logical interface with the unit option.

```
[edit interfaces]
user@host# edit fe-x/y/z unit logical-unit-number unit logical-unit-number
```

3. Configure the VLAN ID. The VLAN ID is used to determine which VLAN demux interface to use, that is the VLAN ID is matched against that which the underlying interface receives.

```
[edit interfaces fe-x/y/z unit logical-unit-number]
user@host# set vlan-id number
```

4. Configure the logical demux destination family type on the VLAN demux underlying interface as inet or inet6.

```
[edit interfaces fe-x/y/z unit logical-unit-number]
user@host# set demux-destination (inet | inet6)
```

5. Save the configuration and move to top of the hierarchy level.
Configuring the VLAN Demux Interface

You can configure one or more logical demux source prefixes or destination prefixes after specifying an underlying interface for the static demux interface to use. This underlying interface must reside on the same logical system as the demux interface.

You configure demux prefixes for use by the underlying interface. The demux prefixes can represent individual hosts or networks. For a given demux interface unit, you can configure either demux source prefix or demux destination prefixes but not both.

You can choose not to configure a demux source prefix or a demux destination prefix. This type of configuration results in a transmit-only interface.

To configure VLAN demux interface with demux source prefix:

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

   [edit]
   user@host# edit interfaces

2. Configure the interface as a logical demux interface (for example, demux0 interface) and configure the logical interface with the unit statement.

   NOTE: You can configure only one demux0 interface per chassis, but you can define logical demux interfaces on top of it (for example, demux0.1, demux0.2, and so on).

   [edit interfaces]
   user@host# edit demux0 unit logical-unit-number

3. Configure the underlying interface on which the demux interface is running under the demux-options statement.

   [edit interfaces demux0 unit logical-unit-number]
   user@host# set demux-options underlying-interface interface-name
4. Configure the protocol family for the interface.

   ```
   [edit interfaces demux0 unit logical-unit-number]
   user@host# edit family family
   ```

5. Configure one or more logical demux source prefixes. The prefixes are matched against the source address of packets that the underlying interface receives. When a match occurs, the packet is processed as if it was received on the demux interface.

   ```
   [edit interfaces demux0 unit logical-unit-number family family]
   user@host# set demux-source source-prefix
   ```

6. Save the configuration and move to top of the hierarchy level.

   ```
   [edit interfaces demux0 unit logical-unit-number]
   user@host# commit
   user@host# top
   ```

To configure VLAN demux interface with demux destination prefix:

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

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

2. Configure the interface as a logical demux interface (for example, demux0 interface) and configure the logical interface with the `unit` statement.

   ```
   [edit interfaces]
   user@host# edit demux0 unit logical-unit-number
   ```

   **NOTE:** You can configure only one demux0 interface per chassis, but you can define logical demux interfaces on top of it (for example, demux0.1, demux0.2, and so on).

3. Configure the underlying interface on which the demux interface is running under the `demux-options` statement.
4. Configure the protocol family for the interface.

```plaintext
[edit interfaces demux0 unit logical-unit-number]
user@host# edit family family
```

5. Configure one or more logical demux destination prefixes. The prefixes are matched against the destination address of packets that the underlying interface receives. When a match occurs, the packet is processed as if it was received on the demux interface.

```plaintext
[edit interfaces demux0 unit logical-unit-number family family]
user@host# set demux-destination destination-prefix
```

6. Save the configuration and move to top of the hierarchy level.

```plaintext
[edit interfaces demux0 unit logical-unit-number]
user@host# commit
user@host# top
```

**Configuring MAC Address Validation on Static VLAN Demux Interfaces**

MAC address validation enables the router to validate that received packets contain a trusted IP source and an Ethernet MAC source address.

To configure MAC address validation for a VLAN demux interface:

1. In configuration mode, go to the [edit interfaces demux0 unit logical-unit-number] hierarchy level:

```plaintext
[edit]
user@host# edit interfaces demux0 unit logical-unit-number
```

2. Configure the protocol family for the interface.

```plaintext
[edit interfaces demux0 unit logical-unit-number]
user@host# edit family family
```
3. Configure the `mac-validate` statement to validate source MAC address with loose or strict options.

   ```
   [edit interfaces demux0 unit logical-unit-number family family]
   user@host# set mac-validate (loose | strict)
   ```

4. Save the configuration and move to top of the hierarchy level.

   ```
   [edit interfaces demux0 unit logical-unit-number family family]
   user@host# commit
   user@host# top
   ```

**Verifying a Demux Interface Configuration**

**Purpose**
Check the configuration of a demux interface and its underlying interface when the following are configured:

- Two VLANs are configured, where each VLAN consists of two IP demux interfaces.
- One VLAN demultiplexes based on the source address
- The other VLAN demultiplexes based on the destination address.

**Action**
From configuration mode on the MX Series router, run the `show interfaces fe-0/0/0` and `show interfaces demux0` configuration mode commands.

```
user@host> show interfaces fe-0/0/0
```
user@host> show interfaces demux0

unit 101 {
    description vlan1-sub1;
    demux-options {
        underlying-interface fe-0/0/0.100;
    }
    family inet {
        demux-source 10.1.1.0/24;
        filter {
            input vlan1-sub1-in-filter;
            output vlan1-sub1-out-filter;
        }
        mac-validate loose;
    }
}
unit 102 {
    description vlan1-sub2;
    demux-options {
        underlying-interface fe-0/0/0.100;
    }
    family inet {
        demux-source {
            10.1.0.0/16;
            10.2.1.0/24;
        }
        filter {
            input vlan1-sub2-in-filter;
        }
    }
}
output vlan1-sub2-out-filter;
}
mac-validate loose;
}
}

unit 202 {

description vlan2-sub2;
demux-options {
underlying-interface fe-0/0/0.200;
}
family inet {

demux-destination 100.1.2.0/24;
}
}

unit 302 {

description vlan2-sub2;
demux-options {
underlying-interface fe-0/0/0.300;
}
family inet {

demux-source 100.1.2.0/24;
}
}
Configuring the Loopback Interface

Understanding the Loopback Interface

The loopback address (lo0) has several uses, depending on the particular Junos feature being configured. It can perform the following functions:

- Device identification—The loopback interface is used to identify the device. While any interface address can be used to determine if the device is online, the loopback address is the preferred method. Whereas interfaces might be removed or addresses changed based on network topology changes, the loopback address never changes.

  When you ping an individual interface address, the results do not always indicate the health of the device. For example, a subnet mismatch in the configuration of two endpoints on a point-to-point link makes the link appear to be inoperable. Pinging the interface to determine whether the device is online provides a misleading result. An interface might be unavailable because of a problem unrelated to the device’s configuration or operation.

- Routing information—The loopback address is used by protocols such as OSPF to determine protocol-specific properties for the device or network. Further, some commands such as ping mpls require a loopback address to function correctly.

- Packet filtering—Stateless firewall filters can be applied to the loopback address to filter packets originating from, or destined for, the Routing Engine.

The Internet Protocol (IP) specifies a loopback network with the (IPv4) address 127.0.0.0/8. Most IP implementations support a loopback interface (lo0) to represent the loopback facility. Any traffic that a computer program sends on the loopback network is addressed to the same computer. The most commonly used IP address on the loopback network is 127.0.0.1 for IPv4 and ::1 for IPv6. The standard domain name for the address is localhost.

The device also includes an internal loopback address (lo0.16384). The internal loopback address is a particular instance of the loopback address with the logical unit number 16384. Junos OS creates the
Loopback interface for the internal routing instance. This interface prevents any filter on lo0.0 from disrupting internal traffic.

**RELATED DOCUMENTATION**

| Understanding Interfaces |

**Loopback Interface Configuration**

**IN THIS SECTION**

- Configuring the Loopback Interface | 270
- Example: Configuring Two Addresses on the Loopback Interface with Host Routes | 271
- Example: Configuring Two Addresses on the Loopback Interface with Subnetwork Routes | 272
- Example: Configuring an IPv4 and an IPv6 Address on the Loopback Interface with Subnetwork Routes | 272

**Configuring the Loopback Interface**

When specifying the loopback address, do not include a destination prefix. Also, in most cases, do not specify a loopback address on any unit other than unit 0.

**NOTE:** For Layer 3 virtual private networks (VPNs), you can configure multiple logical units for the loopback interface. This allows you to configure a logical loopback interface for each virtual routing and forwarding (VRF) routing instance. For more information, see the Junos OS VPNs Library for Routing Devices.

For some applications, such as SSL for Junos XML protocol, the address for the interface lo0.0 must be 127.0.0.1.

You can configure loopback interfaces using a subnetwork address for both inet and inet6 address families. Many protocols require a subnetwork address as their source address. Configuring a subnetwork loopback address as a donor interface enables these protocols to run on unnumbered interfaces.

If you configure the loopback interface, it is automatically used for unnumbered interfaces. If you do not configure the loopback interface, the router chooses the first interface to come online as the default. If
you configure more than one address on the loopback interface, we recommend that you configure one to be the primary address to ensure that it is selected for use with unnumbered interfaces. By default, the primary address is used as the source address when packets originate from the interface.

On the router, you can configure the physical loopback interface, lo0, and one or more addresses on the interface. You can configure more than just unit 0 for lo0, but each additional unit needs to be applied somewhere other than the main instance.

1. To configure the physical loopback interface, include the following statements at the [edit interfaces] hierarchy level:

```
[edit interfaces]
lo0 {
  unit 0 {
    family inet {
      address loopback-address;
      address <loopback-address2>;
      ...
    }
    family inet6 {
      address loopback-address;
    }
  }
}
```

Example: Configuring Two Addresses on the Loopback Interface with Host Routes

To configure two addresses on the loopback interface with host routes:

```
[edit]
user@host# edit interfaces lo0 unit 0 family inet
[edit interfaces lo0 unit 0 family inet]
user@host# set address 172.16.0.1
[edit interfaces lo0 unit 0 family inet]
user@host# set address 10.0.0.1
[edit interfaces lo0 unit 0 family inet]
user@host# top
[edit]
user@host# show interfaces {
  lo0 {
    unit 0 {
      family inet {
```

Example: Configuring Two Addresses on the Loopback Interface with Subnetwork Routes

To configure two addresses on the loopback interface with subnetwork routes:

```
[edit]
user@host# edit interfaces lo0 unit 0 family inet
[edit interfaces lo0 unit 0 family inet]
user@host# set address 192.16.0.1/24
[edit interfaces lo0 unit 0 family inet]
user@host# set address 10.2.0.1/16
[edit interfaces lo0 unit 0 family inet]
user@host# top
[edit]
user@host# show
interfaces {
lo0 {
    unit 0 {
        family inet {
            10.2.0.1/16;
            127.0.0.1/32;
            192.16.0.1/24;
        }
    }
}
```

Example: Configuring an IPv4 and an IPv6 Address on the Loopback Interface with Subnetwork Routes

To configure an IPv4 and an IPv6 address on the loopback interface with subnetwork routes:

```
[edit]
```
user@host# edit interfaces lo0 unit 0 family inet
[edit interfaces lo0 unit 0 family inet]
user@host# set address 192.16.0.1/24
[edit interfaces lo0 unit 0 family inet]
user@host# up
[edit interfaces lo0 unit 0 family]
user@host# edit interfaces lo0 unit 0 family inet6
[edit interfaces lo0 unit 0 family inet6]
user@host# set address 3ffe::1:200:f8ff:fe75:50df/64
[edit interfaces lo0 unit 0 family inet6]
user@host# top
[edit]
user@host# show
interfaces {
  lo0 {
    unit 0 {
      family inet {
        127.0.0.1/32;
        192.16.0.1/24;
      }
      family inet6 {
        3ffe::1:200:f8ff:fe75:50df/64;
      }
    }
  }
}

RELATED DOCUMENTATION

*Junos OS VPNs Library for Routing Devices*

Configuring an Unnumbered Interface  |  213
Configuring the Interface Address  |  202
Serial Interfaces

Serial Interfaces Overview | 277
Configuring Serial Interfaces | 279
Serial Interfaces Overview

Devices that communicate over a serial interface are divided into two classes: data terminal equipment (DTE) and data circuit-terminating equipment (DCE). Juniper Networks Serial Physical Interface Cards (PICs) have two ports per PIC and support full-duplex data transmission. These PICs support DTE mode only. On the Serial PIC, you can configure three types of serial interfaces:

- **EIA-530**—An Electronics Industries Alliance (EIA) standard for the interconnection of DTE and DCE using serial binary data interchange with control information exchanged on separate control circuits.
- **V.35**—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 in Europe.
- **X.21**—An ITU-T standard for serial communications over synchronous digital lines. The X.21 protocol is used primarily in Europe and Japan.

The following standards apply to serial interfaces:

- **TIA/EIA Standard 530, High-Speed 25-Position Interface for Data Terminal Equipment and Data Circuit-Terminating Equipment**, defines the signals on the cable and specifies the connector at the end of the cable.
- **TIA/EIA Standard 232, Interface between Data Terminal Equipment and Data Circuit-Terminating Equipment Employing Serial Binary Data Interchange**, describes the physical interface and protocol for serial data communication.
- **ITU-T Recommendation V.35, Data Transmission at 48 kbit/s Using 60-108 kHz Group Band Circuits**. Note that the Juniper Networks Serial PIC supports V.35 interfaces with speeds higher than 48 kilobits per second.
- **ITU-T Recommendation X.21, Interface Between Data Terminal Equipment and Data Circuit-Terminating Equipment for Synchronous Operation on Public Data Networks.**
There are no serial interface-specific logical properties. For information about general logical properties that you can configure, see Configuring Logical Interface Properties. This support on serial interfaces is the same as the existing LFI and MLPPP support on T1 and E1 interfaces.

RELATED DOCUMENTATION

| Example: Physical Interface Configuration Statements for Serial Interfaces | 279 |
| Configuring the Serial Line Protocol | 280 |
| Configuring the Serial Clocking Mode | 285 |
| Configuring the Serial Signal Handling | 288 |
| Configuring the Serial DTR Circuit | 292 |
| Configuring Serial Signal Polarities | 292 |
| Configuring Serial Loopback Capability | 293 |
| Configuring Serial Line Encoding | 295 |
Configuring Serial Interfaces

Example: Physical Interface Configuration Statements for Serial Interfaces

To configure serial physical interface properties, include the `serial-options` statement at the `[edit interfaces se-fpc/pic/port]` hierarchy level.

```
[edit interfaces se-fpc/pic/port]
serial-options {
    clock-rate rate;
    clocking-mode (dce | internal | loop);
    control-polarity (negative | positive);
    cts-polarity (negative | positive);
    dcd-polarity (negative | positive);
    dce-options {
        control-signal (assert | de-assert | normal);
        cts (ignore | normal | require);
        dcd (ignore | normal | require);
        dsr (ignore | normal | require);
        dtr signal-handling-option;
        ignore-all;
        indication (ignore | normal | require);
        rts (assert | de-assert | normal);
    }
    ignore-all;
    indication (ignore | normal | require);
    rts (assert | de-assert | normal);
```
Configuring the Serial Line Protocol

IN THIS SECTION

- Configuring the Serial Line Protocol | 280
- Serial Interface Default Settings | 281

Configuring the Serial Line Protocol

By default, serial interfaces use the EIA-530 line protocol. You can configure each port on the PIC independently to use one of the following line protocols:
To configure the serial line protocol:

1. Include the `line-protocol` statement, specifying the `eia530`, `v.35`, or `x.21` option:

   ```
   line-protocol protocol;
   ```

   You can include these statements at the following hierarchy levels:
   
   - [edit interfaces se-pim/0/port serial-options]
   - [edit interfaces se-fpc/pic/port serial-options]

   For more information about serial interfaces, see the following sections:

   **Serial Interface Default Settings**

   **EIA-530 Interface Default Settings**

   If you do not include the `line-protocol` statement or if you explicitly configure the default EIA-530 line protocol, the default settings are as follows:
NOTE: On M Series routers, you can set the DCE clocking mode for EIA-530 interfaces and commit. An error message is not displayed and the CLI is not blocked.

You can include the line-protocol statement at the following hierarchy levels:

- [edit interfaces se-pim/0/port serial-options]
- [edit interfaces se-fpc/pic/port serial-options]

**V.35 Interface Default Settings**

If you include the line-protocol v.35 statement, the default settings are as follows:
dsr-polarity positive;
dtr-circuit balanced;
dtr-polarity positive;
encoding nrz;
rts-polarity positive;

You can include the `line-protocol` statement at the following hierarchy levels:

- [edit interfaces se-pim/0/port serial-options]
- [edit interfaces se-fpc/pic/port serial-options]

**X.21 Interface Default Settings**

If you include the `line-protocol x.21` statement, the default settings are as follows:

```plaintext
dce-options | dte-options {
  control-signal normal;
  indication normal;
}
clock-rate 16.384mhz;
clocking-mode loop;
control-polarity positive;
encoding nrz;
indication-polarity positive;
```

You can include the `line-protocol` statement at the following hierarchy levels:

- [edit interfaces se-pim/0/port serial-options]
- [edit interfaces se-fpc/pic/port serial-options]

**Invalid Serial Interface Statements**

IN THIS SECTION

- Invalid EIA-530 Interface Statements | 284
- Invalid V.35 Interface Statements | 284
- Invalid X.21 Interface Statements | 284

The following sections show the invalid configuration statements for each type of serial interface. If you include the following statements in the configuration, an error message indicates the location of the error and the configuration is not activated.
Invalid EIA-530 Interface Statements

If you do not include the `line-protocol` statement or if you explicitly configure the default EIA-530 line protocol, the following statements are invalid:

```plaintext
dce-options | dte-options {
  control-signal (assert | de-assert | normal);
  indication (ignore | normal | require);
}
control-polarity (negative | positive);
indication-polarity (negative | positive);
```

You can include the `line-protocol` statement at the following hierarchy levels:

- `[edit interfaces se-pim/0/port serial-options]`
- `[edit interfaces se-fpc/pic/port serial-options]`

Invalid V.35 interface Statements

If you include the `line-protocol v.35` statement, the following statements are invalid:

```plaintext
dce-options | dte-options {
  control-signal (assert | de-assert | normal);
  indication (ignore | normal | require);
  tm (ignore | normal | require);
}
control-polarity (negative | positive);
indication-polarity (negative | positive);
loopback (dce-local | dce-remote);
tm-polarity (negative | positive);
```

You can include the `line-protocol` statement at the following hierarchy levels:

- `[edit interfaces se-pim/0/port serial-options]`
- `[edit interfaces se-fpc/pic/port serial-options]`

Invalid X.21 Interface Statements

If you include the `line-protocol x.21` statement, the following statements are invalid:

```plaintext
dce-options | dte-options {
  cts (ignore | normal | require);
  dcd (ignore | normal | require);
  dsr (ignore | normal | require);
  dtr (assert | de-assert | normal);
```
rts (assert | de-assert | normal);
    tm (ignore | normal | require);
}
clocking-mode (dce | internal);
    cts-polarity (negative | positive);
    dce-polarity (negative | positive);
    dsr-polarity (negative | positive);
    dtr-circuit (balanced | unbalanced);
    dtr-polarity (negative | positive);
    loopback (dce-local | dce-remote);
    rts-polarity (negative | positive);
    tm-polarity (negative | positive);

You can include the line-protocol statement at the following hierarchy levels:

- [edit interfaces se-pim/0/port serial-options]
- [edit interfaces se-fpc/pic/port serial-options]

SEE ALSO

- [Serial Interfaces Overview | 277]

### Configuring the Serial Clocking Mode

**IN THIS SECTION**

- Configuring the Serial Clocking Mode | 285
- Inverting the Serial Interface Transmit Clock | 286
- Configuring the DTE Clock Rate | 287

#### Configuring the Serial Clocking Mode

By default, serial interfaces use loop clocking mode. For EIA-530 and V.35 interfaces, you can configure each port on the PIC independently to use loop, DCE, or internal clocking mode. For X.21 interfaces, only loop clocking mode is supported.
The three clocking modes work as follows:

- **Loop clocking mode**—Uses the DCE's RX clock to clock data from the DCE to the DTE.
- **DCE clocking mode**—Uses the TXC clock, which is generated by the DCE specifically to be used by the DTE as the DTE's transmit clock.
- **Internal clocking mode**—Also known as line timing, uses an internally generated clock. You can configure the speed of this clock by including the `clock-rate` statement at the `[edit interfaces se-pim/0/port serial-options]` or `[edit interfaces se-fpc/pic/port dte-options]` hierarchy levels. For more information about the DTE clock rate, see "Configuring the DTE Clock Rate" on page 287.

Note that DCE clocking mode and loop clocking mode use external clocks generated by the DCE.

Figure 13 on page 286 shows the clock sources of loop, DCE, and internal clocking modes.

**Figure 13: Serial Interface Clocking Mode**

To configure the clocking mode of a serial interface, include the `clocking-mode` statement:

```
clocking-mode (dce | internal | loop);
```

You can include this statement at the following hierarchy levels:

- `[edit interfaces se-pim/0/port serial-options]`
- `[edit interfaces se-fpc/pic/port serial-options]`

**Inverting the Serial Interface Transmit Clock**

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.
By default, the transmit clock is not inverted. To invert the transmit clock, include the `transmit-clock invert` statement:

```plaintext
transmit-clock invert;
```

You can include this statement at the following hierarchy levels:

- `[edit interfaces se-pim/0/port serial-options]`
- `[edit interfaces se-fpc/pic/port serial-options]`

### Configuring the DTE Clock Rate

By default, the serial interface has a clock rate of 16.384 MHz. For EIA-530 and V.35 interfaces with internal clocking mode configured, you can configure the clock rate.

To configure the clock rate, include the `clock-rate` statement:

```plaintext
clock-rate rate;
```

You can include this statement at the following hierarchy levels:

- `[edit interfaces se-pim/0/port serial-options]`
- `[edit interfaces se-fpc/pic/port serial-options]`

You can configure the following interface speeds:

- 2.048 MHz
- 2.341 MHz
- 2.731 MHz
- 3.277 MHz
- 4.096 MHz
- 5.461 MHz
- 8.192 MHz
- 16.384 MHz

Although the serial interface is intended for use at the default rate of 16.384 MHz, you might need to use a slower rate if any of the following conditions prevail:
• 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 measured differentially between the signal conductor and circuit common at the load end of the cable, with a 50-ohm resistor substituted for the generator.

• You need to minimize interference with other signals.

• You need to invert signals.

For detailed information about the relationship between signaling rate and interface cable distance, see the following standards:

• EIA-422-A, *Electrical Characteristics of Balanced Voltage Digital Interface Circuits*

• EIA-423-A, *Electrical Characteristics of Unbalanced Voltage Digital Interface Circuits*

### RELATED DOCUMENTATION

| Serial Interfaces Overview | 277 |

### Configuring the Serial Signal Handling

By default, normal signal handling is enabled for all signals. For each signal, the **normal** option applies to the normal signal handling for that signal, as defined by the following standards:

• TIA/EIA Standard 530

• ITU-T Recommendation V.35

• ITU-T Recommendation X.21

Table 24 on page 288 shows the serial interface modes that support each signal type.

**Table 24: Signal Handling by Serial Interface Type**

<table>
<thead>
<tr>
<th>Signal</th>
<th>Serial Interfaces</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>From-DCE signals</strong></td>
<td></td>
</tr>
<tr>
<td>Clear to send (CTS)</td>
<td>EIA-530 and V.35</td>
</tr>
<tr>
<td>Data carrier detect (DCD)</td>
<td>EIA-530 and V.35</td>
</tr>
<tr>
<td>Data set ready (DSR)</td>
<td>EIA-530 and V.35</td>
</tr>
</tbody>
</table>
Table 24: Signal Handling by Serial Interface Type (continued)

<table>
<thead>
<tr>
<th>Signal</th>
<th>Serial Interfaces</th>
</tr>
</thead>
<tbody>
<tr>
<td>Indication</td>
<td>X.21 only</td>
</tr>
<tr>
<td>Test mode (TM)</td>
<td>EIA-530 only</td>
</tr>
</tbody>
</table>

To-DCE signals

| Control signal      | X.21 only         |
| Data transfer ready (DTR) | EIA-530 and V.35 |
| Request to send (RTS)  | EIA-530 and V.35 |

You configure serial interface signal characteristics by including the `dce-options` or `dte-options` statement:

```
  dce-options | dte-options {
    control-signal (assert | de-assert | normal);
    cts (ignore | normal | require);
    dcd (ignore | normal | require);
    dsr (ignore | normal | require);
    dtr signal-handling-option;
    ignore-all;
    indication (ignore | normal | require);
    rts (assert | de-assert | normal);
    tm (ignore | normal | require);
  }
```

You can include these statements at the following hierarchy levels:

- `[edit interfaces se-pim/0/port serial-options]`
- `[edit interfaces se-fpc/pic/port serial-options]`

For EIA-530 and V.35 interfaces, configure to-DCE signals by including the `dtr` and `rts` statements, specifying the `assert`, `de-assert`, or `normal` option:

```
dtr (assert | de-assert | normal);
rts (assert | de-assert | normal);
```

For X.21 interfaces, configure to-DCE signals by including the `control-signal` statement, specifying the `assert`, `de-assert`, or `normal` option:
**control-signal** (assert | de-assert | normal);

Assertion is when the positive side of a given signal is at potential high-level output voltage (Voh), while the negative side of the same signal is at potential low-level output voltage (Vol). Deassertion is when the positive side of a given signal is at potential Vol, while the negative side of the same signal is at potential Voh.

For the DTR signal, you can configure normal signal handling using the signal for automatic resynchronization by including the **dtr** statement, and specifying the **auto-synchronize** option:

```plaintext
dtr {  
  auto-synchronize {  
    duration milliseconds;  
    interval seconds;  
  }  
}
```

The pulse duration of resynchronization can be from 1 through 1000 milliseconds. The offset interval for resynchronization can be from 1 through 31 seconds.

For EIA-530 and V.35 interfaces, configure from-DCE signals by including the **cts**, **dcd**, and **dsr** statements, specifying the **ignore**, **normal**, or **require** option:

```plaintext
cts (ignore | normal | require);  
dcd (ignore | normal | require);  
dsr (ignore | normal | require);```

For X.21 interfaces, configure from-DCE signals by including the **indication** statement, specifying the **ignore**, **normal**, or **require** option:

```plaintext
indication (ignore | normal | require);```

For EIA-530 interfaces only, you can configure from-DCE test-mode (TM) signaling by including the **tm** statement, specifying the **ignore**, **normal**, or **require** option:

```plaintext
tm (ignore | normal | require);```

To specify that the from-DCE signal must be asserted, include the **require** option in the configuration. To specify that the from-DCE signal must be ignored, include the **ignore** option in the configuration.
NOTE: For V.35 and X.21 interfaces, you cannot include the `tm` statement in the configuration.

For X.21 interfaces, you cannot include the `cts`, `dcd`, `dsr`, `dtr`, and `rts` statements in the configuration.

For EIA-530 and V.35 interfaces, you cannot include the `control-signal` and `indication` statements in the configuration.

For a complete list of serial options statements that are not supported by each serial interface mode, see "Invalid Serial Interface Statements" on page 283.

To return to the default normal signal handling, delete the `require`, `ignore`, `assert`, `de-assert`, or `auto-synchronize` statement from the configuration, as shown in the following example:

```
[edit]
user@host# delete interfaces se-fpc/pic/port dte-options control-leads cts require
```

To explicitly configure normal signal handling, include the `control-signal` statement with the `normal` option:

```
control-signal normal;
```

You can configure the serial interface to ignore all control leads by including the `ignore-all` statement:

```
ignore-all;
```

You can include the `ignore-all` statement in the configuration only if you do not explicitly enable other signal handling options at the `[edit interfaces se-pim/0/port serial-options dce-options]` or `[edit interfaces se-fpc/pic/port serial-options dte-options]` hierarchy levels.

You can include the `control-signal`, `cts`, `dcd`, `dsr`, `dtr`, `indication`, `rts`, and `tm` statements at the following hierarchy levels:

- `[edit interfaces se-pim/0/port serial-options dte-options]`
- `[edit interfaces se-fpc/pic/port serial-options dte-options]`
Configuring the Serial DTR Circuit

A balanced circuit has two currents that are equal in magnitude and opposite in phase. An unbalanced circuit has one current and a ground; if a pair of terminals is unbalanced, one side is connected to electrical ground and the other carries the signal. By default, the DTR circuit is balanced.

For EIA-530 and V.35 interfaces, configure the DTR circuit by including the `dtr-circuit` statement:

```
dtr-circuit (balanced | unbalanced);
```

You can include this statement at the following hierarchy levels:

- [edit interfaces se-pim/0/port serial-options]
- [edit interfaces se-fpc/pic/port serial-options]

Configuring Serial Signal Polarities

Serial interfaces use a differential protocol signaling technique. Of the two serial signals associated with a circuit, the one referred to as the A signal is denoted with a plus sign, and the one referred to as the B signal is denoted with a minus sign; for example, DTR+ and 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. You can reverse this polarity on a Juniper Networks serial interface. You might need to do this if signals are miswired as a result of reversed polarities.

For EIA-530 and V.35 interfaces, configure signal polarities by including the `cts-polarity`, `dcd-polarity`, `dsr-polarity`, `dtr-polarity`, `rts-polarity`, and `tm-polarity` statements:

```
ccts-polarity (negative | positive);
dcd-polarity (negative | positive);
dsdr-polarity (negative | positive);
dtr-polarity (negative | positive);
rts-polarity (negative | positive);
tm-polarity (negative | positive);
```

You can include these statements at the following hierarchy levels:

- [edit interfaces se-pim/0/port serial-options]
- [edit interfaces se-fpc/pic/port serial-options]
For X.21 interfaces, configure signal polarities by including the **control-polarity** and **indication-polarity** statements:

- **control-polarity** (negative | positive);
- **indication-polarity** (negative | positive);

You can include these statements at the following hierarchy levels:

- `[edit interfaces se-pim/0/port serial-options]`
- `[edit interfaces se-fpc/pic/port serial-options]`

### Configuring Serial Loopback Capability

From the router, remote line interface unit (LIU) loopback loops the TX (transmit) data and TX clock back to the router as RX (receive) data and RX clock. From the line, LIU loopback loops the RX data and RX clock back out the line as TX data and TX clock, as shown in Figure 14 on page 293.

**Figure 14: Serial Interface LIU Loopback**

![Diagram of Serial Interface LIU Loopback](image)

DCE local and DCE remote control the EIA-530 interface-specific signals for enabling local and remote loopback on the link partner DCE. Local loopback is shown in Figure 15 on page 294.
For EIA-530 interfaces, you can configure DCE local, DCE remote, local, and remote (LIU) loopback capability.

For V.35, you can configure remote LIU and local loopback capability. DCE local and DCE remote loopbacks are not supported on V.35 and X.21 interfaces. Local and remote loopbacks are not supported on X.21 interfaces.

To configure the loopback capability on a serial interface, include the `loopback` statement, specifying the `dce-local`, `dce-remote`, `local`, or `remote` option:

```
   loopback mode;
```

You can include this statement at the following hierarchy levels:

- `[edit interfaces se-pim/0/port serial-options]`
- `[edit interfaces se-fpc/pic/port serial-options]`

To disable the loopback capability, remove the `loopback` statement from the configuration:

```
[edit]
user@host# delete interfaces se-fpc/pic/port serial-options loopback
```

You can determine whether there is an internal or external problem by checking the error counters in the output of the `show interfaces se-fpc/pic/port extensive` command:

```
user@host> show interfaces se-fpc/pic/port extensive
```

To Configure Serial Loopback Capability:

1. To determine the source of a problem, loop the packets on the local router, the local DCE, the remote DCE, and the remote line interface unit (LIU).
2. To do this, include the `no-keepalives` and `encapsulation cisco-hdlc` statements at the `[edit interfaces se-fpc/pic/port]` hierarchy level, and the `loopback local` option at the `[edit interfaces se-pim/0/port serial-options]` or `[edit interfaces se-fpc/pic/port serial-options]` hierarchy level. With this configuration, the link stays up, so you can loop ping packets to a remote router. The `loopback local` statement causes the interface to loop within the PIC just before the data reaches the transceiver.

```plaintext
[edit interfaces]
se-1/0/0 {
    no-keepalives;
    encapsulation cisco-hdlc;
    serial-options {
        loopback local;
    }
    unit 0 {
        family inet {
            address 10.100.100.1/24;
        }
    }
}
```

### RELATED DOCUMENTATION

- Serial Interfaces Overview | 277

### Configuring Serial Line Encoding

By default, serial interfaces use non-return to zero (NRZ) line encoding. You can configure non-return to zero inverted (NRZI) line encoding if necessary.

To have the interface use NRZI line encoding, include the `encoding` statement, specifying the `nrzi` option:

```plaintext
encoding nrzi;
```

To explicitly configure the default NRZ line encoding, include the `encoding` statement, specifying the `nrz` option:

```plaintext
encoding nrz;
```

You can include this statement at the following hierarchy levels:
When setting the line encoding parameter, you must set the same value for paired ports. Ports 0 and 1 must share the same value.
Monitoring and Troubleshooting Interfaces

Monitoring Interfaces | 299
Troubleshooting Interfaces | 305
Monitoring Interfaces

IN THIS CHAPTER

- Tracing Interface Operations Overview | 299
- Tracing Operations of an Individual Router Interface | 299
- Tracing Operations of the Interface Process | 300
- Tracing Operations of the pppd Process | 302

Tracing Interface Operations Overview

You can trace the operations of individual router interfaces and those of the interface process (dcd). For a general discussion of tracing and of the precedence of multiple tracing operations, see the Junos OS Administration Library.

For information about the operations of Virtual Router Resolution Protocol (VRRP)-enabled interfaces, see the High Availability User Guide.

RELATED DOCUMENTATION

- Tracing Operations of an Individual Router Interface | 299
- Tracing Operations of the Interface Process | 300

Tracing Operations of an Individual Router Interface

To trace the operations of individual router interfaces, perform the following steps:

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

   [edit]
   user@host# edit interfaces interface-name
2. Configure the `traceoptions` option.

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

3. Configure the tracing flag.

```
[edit interfaces interface-name traceoptions]
user@host# set flag flag-option
```

You can specify the following interface tracing flags:

- **all**—Trace all interface operations.
- **event**—Trace all interface events.
- **ipc**—Trace all interface interprocess communication (IPC) messages.
- **media**—Trace all interface media changes.

The `traceoptions` statement does not support a trace file. The logging is done by the kernel, so the tracing information is placed in the system `syslog` files.

For more information about trace operations, see “Tracing Operations of the Interface Process” on page 300.

**RELATED DOCUMENTATION**

- `traceoptions`

**Tracing Operations of the Interface Process**

To trace the operations of the router or switch interface process, dcd, perform the following steps:

1. In configuration mode, go to the `[edit interfaces]` hierarchy level:

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

2. Configure the `traceoptions` statement.
3. Configure the **no-remote-trace** option to disable remote tracing.

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

```
[edit interfaces traceoptions]
user@host# set no-remote-trace
```

4. Configure the **file filename** option.

```
[edit interfaces traceoptions]
user@host# edit file
```

5. Configure the **files number** option, **match regular-expression** option, **size size** option, and **world-readable | no-world-readable** option.

```
[edit interfaces traceoptions file]
user@host# set files number
user@host# set match regular-expression
user@host# set size size
user@host# set word-readable | no-world-readable
```

6. Configure the tracing flag.

```
[edit interfaces traceoptions]
user@host# set flag flag-option
```

7. Configure the **disable** option in **flag flag-option** statement to disable the tracing operation. You can use this option to disable a single operation when you have defined a broad group of tracing operations, such as **all**.

```
[edit interfaces traceoptions]
user@host# set flag flag-option disable
```

You can specify the following flags in the **interfaces traceoptions** statement:

- **all**—Enable all configuration logging.
- **change-events**—Log changes that produce configuration events.
• **gres-events**—Log the events related to GRES.
• **resource-usage**—Log the resource usage for different states.
• **config-states**—Log the configuration state machine changes.
• **kernel**—Log configuration IPC messages to kernel.
• **kernel-detail**—Log details of configuration messages to kernel.
• **select-events**—Log the events on select state machine.

By default, interface process operations are placed in the file named dcd and three 1-MB files of tracing information are maintained.

For general information about tracing, see the tracing and logging information in the *Junos OS Administration Library*.

**RELATED DOCUMENTATION**

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<tbody>
<tr>
<td>Tracing Operations of an Individual Router Interface</td>
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</tr>
</tbody>
</table>

**traceoptions**

### Tracing Operations of the pppd Process

You can trace the operations of the router’s pppd process.

To trace the router’s pppd process:

1. In configuration mode, go to the `[edit protocols ppp]` hierarchy level.

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

2. Include the **traceoptions** statement.

   ```
   [edit protocols ppp]
   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:

- **access**—Trace access code
- **address-pool**—Trace address pool code
- **all**—Trace all areas of code
- **auth**—Trace authentication code
- **chap**—Trace challenge handshake authentication protocol code
- **ci**—Trace CI code
- **config**—Trace configuration code
- **ifdb**—Trace interface database code
- **lcp**—Trace LCP state machine code
- **memory**—Trace memory management code
- **message**—Trace message processing code
- **mlppp**—Trace multilink point-to-point protocol code
- **ncp**—Trace NCP state machine code
- **pap**—Trace password authentication protocol code
- **ppp**—Trace PPP protocol processing code
- **radius**—Trace RADIUS processing code
- **redundancy**—Trace redundancy code
- **rtsock**—Trace routing socket code
- **session**—Trace session management code
- **signal**—Trace signal handling code
- **timer**—Trace timer code
- **ui**—Trace user interface code

**RELATED DOCUMENTATION**

| traceoptions | 419 |
Troubleshooting Interfaces

Troubleshooting: em0 Management Interface Link is Down

Problem
Description: Ethernet Link Down alarm is raised when you run the show chassis alarm operational mode command on a T640 router, a T1600 router, T4000 router, or a TX Matrix Plus router.

Diagnosis

Perform the following tests to check if the em0 management interface is down on the master Routing Engine or the backup Routing Engine:

1. Run the show chassis alarms command.

```
show chassis alarms
```

```
user@host0> show chassis alarms
1 alarms currently active
Alarm time Class Description
2011-10-19 11:13:02 MYT Major Host 1 em0 : Ethernet Link Down
```

Is the alarm Ethernet Link Down displayed against the em0 interface of the master Routing Engine (Host 0)?

- Yes: Contact JTAC for further assistance.
• No: Continue to the next diagnostic test.

2. Run the `show interfaces em0` and the `show interfaces em0 terse` operational mode commands.

```plaintext
show interfaces em0

user@host> show interfaces em0
Physical interface: em0, Enabled, Physical link is Up
Interface index: 1, SNMP ifIndex: 1
Type: Ethernet, Link-level type: Ethernet, MTU: 1514, Speed: 100mbps
Device flags : Present Running
Interface flags: SNMP-Traps
...
```

```plaintext
show interfaces em0 terse

user@host> show interfaces em0 terse
Interface Admin Link Proto Local Remote
em0 up up
em0.0 up up inet 10.100.100.1/30
```

Is the em0 interface on the master Routing Engine **up**?

• Yes: Continue to resolution.

• No: Contact JTAC for further assistance

---

**Resolution**

**To Resolve This Issue**

From the aforementioned diagnosis, we ascertain that the chassis alarm has been raised for the em0 management interface in the backup Routing Engine (Host 1) and not for the master Routing Engine (Host 0).

Implement one of the following solutions on the backup Routing Engine to resolve this issue:

• Disable the em0 interface in the backup Routing Engine:
  1. In configuration mode, go to the `[edit groups re1]` hierarchy level.
2. Disable the em0 interface.

   user@host1# edit groups re1
   [edit groups re1]
   user@host1# set interfaces em0 disable

• Ignore the alarm:
  1. In configuration mode, go to the [edit chassis] hierarchy level.

   user@host1# edit chassis

  2. Ignore the Ethernet link down alarm on the management interface by setting the management-ethernet link-down alarm option to ignore.

   [edit chassis]
   user@host1# set alarm management-ethernet link-down ignore

RELATED DOCUMENTATION

Supported Routing Engines by Router
show chassis alarms

Troubleshooting: fxp0 Management Interface Link is Down

Problem
Description: Ethernet Link Down alarm is raised when you run the show chassis alarm operational mode command on an M Series router, an MX Series router, a T320 router, a T640 router, a T1600 router, or on a TX Matrix router.

Diagnosis
Perform the following tests to check if the fxp0 interface is down on the master Routing Engine or the backup Routing Engine:

1. Run the `show chassis alarms` command.

   **show chassis alarms**

   ```
   user@host0> show chassis alarms
   1 alarms currently active
   Alarm time Class Description
   2011-10-19 11:13:02 MYT Major Host 1 fxp0 : Ethernet Link Down
   ```

   Is the alarm **Ethernet Link Down** displayed against the fxp0 interface of the master Routing Engine (Host 0)?
   - Yes: Contact JTAC for further assistance.
   - No: Continue to the next diagnostic test.

2. Run the `show interfaces fxp0` and the `show interfaces fxp0 terse` operational mode commands.

   **show interfaces fxp0**

   ```
   user@host> show interfaces fxp0
   Physical interface: fxp0, Enabled, Physical link is Up
   Interface index: 1, SNMP ifIndex: 1
   Type: Ethernet, Link-level type: Ethernet, MTU: 1514, Speed: 100mbps
   Device flags : Present Running
   Interface flags: SNMP-Traps
   ...
   ```

   **show interfaces fxp0 terse**

   ```
   user@host> show interfaces fxp0 terse
   Interface Admin Link Proto Local Remote
   fxp0 up up
   fxp0.0 up up inet 10.100.100.1/30
   ```

   Is the fxp0 interface on the master Routing Engine **up**?
   - Yes: Continue to resolution.
Resolution

To Resolve This Issue

From the diagnosis, we ascertain that the chassis alarm has been raised for the fxp0 management interface in the backup Routing Engine (Host 1) and not for the master Routing Engine (Host 0).

Implement one of the following solutions on the backup Routing Engine to avoid this issue:

• Disable the fxp0 interface in the backup Routing Engine:
  1. In configuration mode, go to the [edit groups re1] hierarchy level.

        user@host1# edit groups re1

  2. Disable the fxp0 interface.

        [edit groups re1]
        user@host1# set interfaces fxp0 disable

• Ignore the alarm:
  1. In configuration mode, go to the [edit chassis] hierarchy level.

        user@host1# edit chassis

  2. Ignore the Ethernet link down alarm on the management interface by setting the management-ethernet link-down alarm option to ignore.

        [edit chassis]
        user@host1# set alarm management-ethernet link-down ignore

RELATED DOCUMENTATION

Supported Routing Engines by Router
Troubleshooting: Faulty Ethernet Physical Interface on an M Series, an MX Series, or a T Series Router

You can follow the basic troubleshooting checklist as explained in the following topics from one through five to troubleshoot an Ethernet physical interface on an M Series, MX Series, or a T Series router.

1. Checking the Cable Connection | 310
2. Checking the Physical Link Status of the Interface | 311
3. Checking the Interface Statistics in Detail | 313
4. Performing the Loopback Diagnostic Test | 315
5. Checking Other Possibilities | 318
6. To Enable a Physical Interface | 319

Checking the Cable Connection

Problem
Description: Packets are not received or transmitted over the Ethernet physical interface.

Diagnosis

1. Is the correct cable connected to the correct port?
   - Yes: Continue to “Checking the Physical Link Status of the Interface” on page 311.
   - No: See "Resolving Cabling Issue" on page 310.

Resolution

Resolving Cabling Issue

Perform one or more of the following steps to resolve the cabling issue:

1. Connect the cable properly on the local and remote ends without any loose connections.

2. Swap the Ethernet cable for a known good cable if the existing cable is damaged.
3. Connect a single-mode fiber cable to a single-mode interface only and a multimode fiber cable to a multimode interface only. To check fiber optic cable integrity, see “Checking Fiber Optic Cable Integrity” on page 311.

4. Connect the correct small form-factor pluggable transceiver (SFP) on both sides of the cable.

Checking Fiber Optic Cable Integrity

To check the integrity of fiber optic cable with an external cable diagnostic testing tool:

**NOTE:** A single-mode fiber cable must be connected to a single-mode interface and a multi-mode fiber cable must be connected to a multi-mode interface.

1. Measure the received light level at the receiver (R) port to see whether the received light level is within the receiver specification of the Ethernet interface.

2. Measure transmitted light level at the transmitter (T) port to see whether the transmitted light level is within the transmitter specification of the Ethernet interface.

Checking the Physical Link Status of the Interface

**Problem**

**Description:** Unable to transmit and receive packets on the Ethernet interface even though the cable connection is correct.

**Solution**

To display the physical link status of the interface, run the `show interface interface-name media` operational mode command. For example, on the ge-5/0/1 interface.

```bash
user@host> show interfaces ge-5/0/1 media
Physical interface: ge-5/0/1, Enabled, Physical link is Up
   Interface index: 317, SNMP ifIndex: 1602
   Link-level type: Ethernet, MTU: 1514, Speed: 1000mbps, BPDU Error: None,
   MAC-REWRITE Error: None, Loopback: Disabled,
   Source filtering: Disabled, Flow control: Enabled, Auto-negotiation: Enabled,
   Remote fault: Online, Speed-negotiation: Disabled,
   Auto-MDIX: Enabled
Device flags   : Present Running
Interface flags: SNMP-Traps Internal: 0x4000
Link flags     : None
```
CoS queues : 8 supported, 8 maximum usable queues
Current address: 2c:6b:f5:4c:26:73, Hardware address: 2c:6b:f5:4c:26:73
Last flapped : 2012-11-30 01:25:37 UTC (03:46:55 ago)
Input rate : 880 bps (1 pps)
Output rate : 312 bps (0 pps)
Active alarms : None
Active defects : None
MAC statistics:
  Input bytes: 901296, Input packets: 9799, Output bytes: 976587, Output packets: 10451
Filter statistics:
  Filtered packets: 68, Padded packets: 0, Output packet errors: 0
Autonegotiation information:
  Negotiation status: Complete
  Link partner:
    Link mode: Full-duplex, Flow control: Symmetric/Asymmetric, Remote fault: OK
Local resolution:
  Flow control: Symmetric, Remote fault: Link OK
Interface transmit statistics: Disabled

For information about show interfaces interface-name media, see show interfaces.

Diagnosis

1. Are there any connectivity problems such as input errors and packet loss even though the Enabled field displays Physical link is Up status and the Active alarms and Active defect field displays None?
   - Yes: Go to “Checking the Interface Statistics in Detail” on page 313.
   - No: Continue to the next diagnostic test.

2. Does the Enabled field display Physical link is Down status and the Active alarms and Active defect field display Link?
   - Yes: The interface is either not connected correctly or is not receiving a valid signal. Go to “Resolving Cabling Issue” on page 310.
   - No: Continue.
Checking the Interface Statistics in Detail

Problem

Description: The physical interface is not working even though the Enabled field displays Physical link is Up status and the Active alarms and Active defect field displays None.

Solution

To display the interface statistics in detail, run the show interface interface-name extensive operational command. For example, on ge-5/0/1 interface.

```
user@host> show interfaces ge-5/0/1 extensive
Physical interface: ge-5/0/1, Enabled, Physical link is Up
   Interface index: 317, SNMP ifIndex: 1602, Generation: 322
   Link-level type: Ethernet, MTU: 1514, Speed: 1000mbps, BPDU Error: None,
   MAC-REWRITE Error: None, Loopback: Disabled,
   Source filtering: Disabled, Flow control: Enabled, Auto-negotiation: Enabled,
   Remote fault: Online, Speed-negotiation: Disabled,
   Auto-MDIX: Enabled
   Device flags   : Present Running
   Interface flags: SNMP-Traps Internal: 0x4000
   Link flags     : None
   CoS queues     : 8 supported, 8 maximum usable queues
   Hold-times     : Up 0 ms, Down 0 ms
   Current address: 2c:6b:f5:4c:26:73, Hardware address: 2c:6b:f5:4c:26:73
   Last flapped   : 2012-11-30 01:25:37 UTC (04:38:32 ago)
   Statistics last cleared: Never
   Traffic statistics:
      Input  bytes  :               806283                    0 bps
      Output bytes  :              1153215                  424 bps
      Input  packets:                10818                    0 pps
      Output packets:                11536                    0 pps
   IPv6 transit statistics:
      Input  bytes  :                    0                        0 bps
      Output bytes  :                    0                        0 bps
      Input  packets:                    0                        0 pps
      Output packets:                    0                        0 pps
   Label-switched interface (LSI) traffic statistics:
      Input  bytes  :                    0                        0 bps
      Input  packets:                    0                        0 pps
   Dropped traffic statistics due to STP State:
      Input  bytes  :                    0                        0 bps
      Output bytes  :                    0                        0 bps
      Input  packets:                    0                        0 pps
      Output packets:                    0                        0 bps
```
Input errors:
   Errors: 0, Drops: 0, Framing errors: 0, Runts: 0, Policed discards: 233060,
   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

<table>
<thead>
<tr>
<th>Queue counters:</th>
<th>Queued packets</th>
<th>Transmitted packets</th>
<th>Dropped packets</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 best-effort</td>
<td>3216</td>
<td>3216</td>
<td>0</td>
</tr>
<tr>
<td>1 expedited-fo</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>2 assured-forw</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>3 network-cont</td>
<td>8320</td>
<td>8320</td>
<td>0</td>
</tr>
</tbody>
</table>

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:

<table>
<thead>
<tr>
<th></th>
<th>Receive</th>
<th>Transmit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total octets</td>
<td>1007655</td>
<td>1082219</td>
</tr>
<tr>
<td>Total packets</td>
<td>10886</td>
<td>11536</td>
</tr>
<tr>
<td>Unicast packets</td>
<td>4350</td>
<td>4184</td>
</tr>
<tr>
<td>Broadcast packets</td>
<td>32</td>
<td>77</td>
</tr>
<tr>
<td>Multicast packets</td>
<td>6504</td>
<td>7275</td>
</tr>
<tr>
<td>CRC/Align errors</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>FIFO errors</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>MAC control frames</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>MAC pause frames</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Oversized frames</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Jabber frames</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Fragment frames</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>VLAN tagged frames</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Code violations</td>
<td>0</td>
<td></td>
</tr>
</tbody>
</table>

Filter statistics:

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Input packet count</td>
<td>10886</td>
</tr>
<tr>
<td>Input packet rejects</td>
<td>68</td>
</tr>
<tr>
<td>Input DA rejects</td>
<td>68</td>
</tr>
<tr>
<td>Input SA rejects</td>
<td>0</td>
</tr>
<tr>
<td>Output packet count</td>
<td>11536</td>
</tr>
<tr>
<td>Output packet pad count</td>
<td>0</td>
</tr>
<tr>
<td>Output packet error count</td>
<td>0</td>
</tr>
</tbody>
</table>
CAM destination filters: 0, CAM source filters: 0

Autonegotiation information:
Negotiation status: Complete
Link partner:
  Link mode: Full-duplex, Flow control: Symmetric/Asymmetric, Remote fault: OK
Local resolution:
  Flow control: Symmetric, Remote fault: Link OK

Packet Forwarding Engine configuration:
Destination slot: 5
Cos information:
Direction: Output

<table>
<thead>
<tr>
<th>CoS transmit queue</th>
<th>Bandwidth</th>
<th>Buffer Priority</th>
</tr>
</thead>
<tbody>
<tr>
<td>Limit</td>
<td>%</td>
<td>bps</td>
</tr>
<tr>
<td>0 best-effort</td>
<td>95</td>
<td>950000000</td>
</tr>
<tr>
<td>none</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 network-control</td>
<td>5</td>
<td>50000000</td>
</tr>
<tr>
<td>none</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Interface transmit statistics: Disabled

For information about `show interfaces interface-name detail`, see `show interfaces`.

Diagnosis

1. Does the Policed discards, L2 channel errors, Input DA rejects, or the Input SA rejects field display any errors?

   For information about the errors, see `show interfaces`.

   - Yes: Resolve the errors as needed. Resolving these errors is beyond the scope of this topic.
   - No: Continue with “Performing the Loopback Diagnostic Test” on page 315.

Performing the Loopback Diagnostic Test

Problem
Description: The interface cable is connected correctly and there are no alarms or errors associated with the Ethernet physical interface yet the interface is not working.

Solution
To check whether the Ethernet port or PIC is faulty, you must perform the internal loopback test and hardware loopback test.
To perform an internal loopback diagnostic test on an Ethernet interface, for example on ge-5/0/1 interface:

1. In configuration mode, go to the `[edit interfaces ge-5/0/1]` hierarchy level.
   ```bash
   [edit]
   user@host# edit interface ge-5/0/1
   ```

2. Set the `gigether-options` option as loopback, commit the configuration and quit configuration mode.
   ```bash
   [edit interfaces ge-5/0/1]
   user@host# set gigether-options loopback
   user@host# commit
   user@host# quit
   ```

3. In operational mode, execute the `show interfaces ge-5/0/1 media` command.
   ```bash
   user@host> show interfaces ge-5/0/1 media
   Physical interface: ge-5/0/1, Enabled, Physical link is Up
   Interface index: 317, SNMP ifIndex: 1602
   Link-level type: Ethernet, MTU: 1514, Speed: 1000mbps, BPDU Error: None,
   MAC-REWRITE Error: None, Loopback: Enabled,
   Source filtering: Disabled, Flow control: Enabled, Auto-negotiation: Enabled,
   Remote fault: Online, Speed-negotiation: Disabled,
   Auto-MDIX: Enabled
   Device flags   : Present Running
   Interface flags: SNMP-Traps Internal: 0x4000
   Link flags     : None
   CoS queues     : 8 supported, 8 maximum usable queues
   Current address: 2c:6b:f5:4c:26:73, Hardware address: 2c:6b:f5:4c:26:73
   Last flapped   : 2012-11-30 01:25:37 UTC (03:46:55 ago)
   Input rate     : 880 bps (1 pps)
   Output rate    : 312 bps (0 pps)
   Active alarms  : None
   Active defects : None
   MAC statistics:
   Input bytes: 901296, Input packets: 9799, Output bytes: 976587, Output packets: 10451
   Filter statistics:
   Filtered packets: 68, Padded packets: 0, Output packet errors: 0
   Autonegotiation information:
   Negotiation status: Complete
   Link partner:
   Link mode: Full-duplex, Flow control: Symmetric/Asymmetric, Remote fault:
OK

Local resolution:
Flow control: Symmetric, Remote fault: Link OK
Interface transmit statistics: Disabled

NOTE: Delete the loopback statement after completing your diagnosis.

Execute one of the following steps for a hardware loopback diagnostic test as needed:

- For an Ethernet PIC with a fiber optic interface—Physically loop the \( T_x \) and \( R_x \) port and check the status of the physical link with the `show interfaces interface-name media` operational mode command.

- For an Ethernet PIC with an RJ-45 Ethernet interface—Build a loopback plug by crossing pin 1 (\( T_x^+ \)) to pin 3 (\( R_x^+ \)) together and pin 2 (\( T_x^- \)) and pin 6 (\( R_x^- \)) together and check the status of the physical link with the `show interfaces interface-name media` operational mode command.

NOTE: For information about loopback testing, see *Performing Loopback Testing for Fast Ethernet and Gigabit Ethernet Interfaces*.

Diagnosis

1. Does the Enabled field display Physical link is Up status and the Active alarms and Active defect field display None when you perform the loopback test?
   - Yes: Go to the "Checking Other Possibilities" on page 318 section.
   - No: Continue to the next diagnostic test.

2. When the Ethernet interface is connected to a remote Ethernet device over multiple patch panels, check to see whether the connection can be looped back at the different patch panels so you can conduct a loopback diagnostic test. Is the loopback diagnostic test successful?
   - Yes: Go to the "Checking Other Possibilities" on page 318 section.
   - No: Contact JTAC for further assistance.
Checking Other Possibilities

Problem
Description: Loopback diagnostic test is successful but unable to transmit and receive packets on the Ethernet interface.

Solution
Use the following commands as needed to troubleshoot an Ethernet interface, for example, an ge-5/0/1 interface:

• Run the **show interfaces interface-name terse** operational command to check if the physical interface and logical interfaces are administratively disabled. For example, on ge-5/0/1 interface.

```
user@host> show interfaces ge-5/0/1 terse
Interface         Admin Link Proto   Local                  Remote
ge-5/0/1          up    up          ge-5/0/1.0              up    up   inet     20.1.1.2/24
```

Diagnosis

1. Does the physical interface and its corresponding logical interfaces display **down** in the output of the **show interfaces interface-name terse** operational mode command?
   - Yes: Enable the interfaces as shown in “To Enable a Physical Interface” on page 319.
   - No: Continue to the next diagnostic test.

2. Are the **speed**, **duplex**, and **auto-negotiation** fields in the output of **show interfaces interface-name extensive** operational mode command correctly set for the interface?

   **NOTE:** Check if the associated Flexible PIC Concentrator (FPC), Modular Port Concentrator (MPC), or Dense Port Concentrator (DPC) and its Modular Interface Card (MIC) or PIC with its 10-gigabit small form-factor pluggable transceiver (XFP) or SFP supports speed and auto-negotiation settings.

   - Yes: Check **Monitoring Fast Ethernet and Gigabit Ethernet Interfaces** for more troubleshooting tips.
   - No: Contact JTAC for further assistance.
To Enable a Physical Interface

To enable a physical interface:

1. In configuration mode, go to the [edit interfaces] hierarchy level.

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

2. Check if the interface is administratively disabled by executing the `show` command on the interface. For example on ge-5/0/1 interface.

   ```
   user@host# show ge-5/0/1
   disable;
   ```

3. Enable the interface and commit.

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

SEE ALSO

`show interfaces`

Time Domain Reflectometry on ACX Series Routers Overview

Time Domain Reflectometry (TDR) is a technology used for diagnosing copper cable states. This technique can be used to determine if cabling is at fault when you cannot establish a link. TDR detects the defects by sending a signal through a cable, and reflecting it from the end of the cable. Open circuits, short circuits, sharp bends and other defects in the cable, reflects the signal back, at different amplitudes, depending on the severity of the defect.

Several factors that result in degraded or low-quality cable plants can cause packet loss, suboptimal connection speed, reduced network efficiency, and complete connection failures. These types of problems can occur because of poor cable construction, identification of pair twists, loose connectors, poor contacts
between the points, and stretched or broken pairs of cables. Broadcom transceivers enable you to analyze the condition of the cable plant or topology and identify any problems that have occurred. This functionality is effectively used in the following scenarios:

- Troubleshooting during initial network equipment installation.
- Discovery of failures when network problems occur.
- Maintenance of optimally functioning cable plants.
- Fault determination during the testing of network equipment in production cable networks.

TDR supports the following capabilities for examination of cable faults on ACX Series routers:

- **Cable status pair (open or short)—** When the router operates in Gigabit Ethernet mode, all the four pairs (8 wires) are used. Only Pair-A and Pair-B are required to operate in 10/100BASE-T Ethernet mode. If either of these required pairs is open or short-circuited, the transceiver reports the following faults:
  - Any open wire
  - Wires of a particular pair that are shorted

- **Distance to fault per pair—** Distance at which an open or a short-circuit is detected in meters. This measurement is also termed as cable length. The transceiver reports the following faults:
  - Cable length when the cable status is normal
  - Distance to fault when the cable status is not normal

- **Pair Swap—** Swapping of twisted-pairs in straight-through and cross-over cable plants are detected.

- **Polarity Swap—** Each cable pair carries a differential signal from one end to the other end of the cable. Each wire within the pair is assigned a polarity. The wires in a pair are normally connected in a one-to-one form. This connection enables the transmitter at one end to be connected to the receiver at the other end with same polarity. Sometimes, the wiring within the pair is also swapped. This type of connection is called polarity swap. Broadcom transceivers can detect such swapping and automatically adjust the connection to enable the links to operate normally. However, the transceiver reports polarity swaps that it detects in the cable plant.

On 4-port Gigabit Ethernet and 8-port Gigabit Ethernet MICs with copper SFP transceivers (using BCM54880) and 4-port Gigabit Ethernet, 6-port Gigabit Ethernet, and 8-port Gigabit Ethernet MICs with copper and optical SFP transceivers (using BCM54640E PHY), only 10BASE-T pair polarity is supported. 100BASE-T and 1000BASE-T polarities are not supported.

When the Gigabit Ethernet link cannot be established (for example, if only two pairs are present that are fully functional), TDR in the physical layer (PHY) brings down the link to a 100 MB link, which is called a downshift in the link. The physical layer might require 10-20 seconds for the link to come up if a downgrade in wire speed occurs because it attempts to connect at 1000 MB five times before it falls back to 100BASE-TX.

TDR diagnostics is supported only on copper interfaces and not on fiber interfaces.
Keep the following points in mind when you configure TDR:

- If you connect a port undergoing a TDR test to a Gigabit Ethernet interface that is enabled to automatically detect MDI (Media Dependent Interface) and MDIX (Media Dependent Interface with Crossover) port connections, the TDR result might be invalid.

- If you connect a port undergoing a TDR test to a 100BASE-T copper interface, the unused pairs are reported as faulty because the remote end does not terminate these pairs.

- You must not modify the port configuration while the TDR test is running.

- Because of cable characteristics, you need to run the TDR test multiple times to get accurate results.

- Do not change the port status (such as removing the cable at the near or far end) because such a change can result in inaccurate statistics in the results.

- While measuring the cable length or distance to fault (per pair), sometimes, a few cable length inconsistencies might be observed during a TDR test. Broadcom transceivers have the following cable length limitations:
  - For a properly-terminated good cable, the accuracy of the cable length reported is plus or minus 10 meters.
  - If a pair is open or short-circuited, the far-end termination does not affect the computed result for that pair.
  - The accuracy of the measured cable length, when open and short-circuit conditions are detected, is plus or minus 5 meters.
  - The accuracy of a good pair, when one or more pairs are open or short-circuited, is plus or minus 10 meters.

- Polarity swap detection is supported only in 10BASE-T mode.

- The TDR test does not impact the traffic if the interface operates at 10-Gigabit Ethernet per second of bandwidth, which is the default configuration. However, if the speed of the interface is configured to be other than 10-Gigabit Ethernet, running the TDR test affects the traffic.

  TDR diagnostics might bring the link down and initialize the physical layer (PHY) with default configuration to perform its operation.

  When the TDR validation test is completed, the PHY layer resumes operation in the same manner as before the cable diagnostics test was performed. However, link flaps might be momentarily observed. We recommend that you run the TDR test at a speed of 1 gigabit per second, which is the default configuration, to obtain more accurate results.

TDR is supported on the following interfaces on ACX Series routers:
On ACX1000 routers, 4 RJ45 (Cu) ports or 8-port Gigabit Ethernet MICs with small form-factor pluggable (SFP) transceivers and RJ45 connectors.

On ACX1100 routers, 4-port or 8-port Gigabit Ethernet MICs with SFP transceivers and RJ45 connectors.

On ACX2000 routers, 8-port Gigabit Ethernet MICs with SFP transceivers and RJ45 connectors.

On ACX2100 and ACX2200 routers, 4-port Gigabit Ethernet MICs with SFP transceivers and RJ45 connectors.

On ACX4000 routers, 4-port, 6-port, or 8-port Gigabit Ethernet MICs with SFP transceivers and RJ45 connectors.

You must select the media type as copper for the 1-Gigabit Ethernet interfaces. To specify the media type, include the media-type statement with the copper option at the [edit interfaces interface-name] hierarchy level. Media type selection is applicable to ports only in slot 2. When media-type is not set, the port accepts either type of connection. The media type is fiber if a transceiver is installed in the SFP connection. If no transceiver is installed, the media type is copper. The COMBO ports (combination ports) on ACX routers support both the copper and fiber-optic media types. On such ports or interfaces, you must configure the media type as copper to run the TDR test.

You can run the TDR test from operational mode and view the success or failure results of the test. To start a test on a specific interface, issue the request diagnostics tdr start interface interface-name command. To stop the TDR test currently in progress on the specified interface, issue the request diagnostics tdr abort interface interface-name command. To display the test results for all copper interfaces, enter the show diagnostics tdr command. To display the test results for a particular interface, enter the show diagnostics tdr interface interface-name command.

RELATED DOCUMENTATION

Diagnosing a Faulty Twisted-Pair Cable on ACX Series Routers

Problem

Description: A 10/100BASE-T Ethernet interface has connectivity problems that you suspect might be caused by a faulty cable.

Solution

Use the time domain reflectometry (TDR) test to determine whether a twisted-pair Ethernet cable is faulty.

The TDR test:
• Detects and reports faults for each twisted pair in an Ethernet cable. Faults detected include open circuits, short circuits, and impedance mismatches.

• Reports the distance to fault to within 1 meter.

• Detects and reports pair swaps, pair polarity reversals, and excessive pair skew.

The TDR test is supported on the following ACX routers and interfaces:

• On ACX1000 routers, 4 RJ45 (Cu) ports or 8-port Gigabit Ethernet MICs with small form-factor pluggable (SFP) transceivers and RJ45 connectors.

• On ACX1100 routers, 4-port or 8-port Gigabit Ethernet MICs with SFP transceivers and RJ45 connectors.

• On ACX2000 routers, 8-port Gigabit Ethernet MICs with SFP transceivers and RJ45 connectors.

• On ACX2100 and ACX2200 routers, 4-port Gigabit Ethernet MICs with SFP transceivers and RJ45 connectors.

• On ACX4000 routers, 4-port, 6-port, or 8-port Gigabit Ethernet MICs with SFP transceivers and RJ45 connectors.

NOTE: We recommend running the TDR test on an interface when there is not traffic on the interface.

TDR diagnostics are applicable for copper ports only and not for optical fiber ports.

To diagnose a cable problem by running the TDR test:

1. Run the request diagnostics tdr command.

   ```
   user@host> request diagnostics tdr start interface ge-0/0/10
   
   Interface TDR detail:
   Test status : Test successfully executed  ge-0/0/10
   ```

2. View the results of the TDR test with the show diagnostics tdr command.

   ```
   user@host> show diagnostics tdr interface ge-0/0/10
   
   Interface TDR detail:
   Interface name : ge-0/0/10
   Test status : Passed
   Link status : Down
   MDI pair : 1-2
   ```
<table>
<thead>
<tr>
<th>Field</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cable status</td>
<td>Normal</td>
</tr>
<tr>
<td>Distance fault</td>
<td>0 Meters</td>
</tr>
<tr>
<td>Polarity swap</td>
<td>N/A</td>
</tr>
<tr>
<td>Skew time</td>
<td>N/A</td>
</tr>
<tr>
<td>MDI pair</td>
<td>3-6</td>
</tr>
<tr>
<td>Cable status</td>
<td>Normal</td>
</tr>
<tr>
<td>Distance fault</td>
<td>0 Meters</td>
</tr>
<tr>
<td>Polarity swap</td>
<td>N/A</td>
</tr>
<tr>
<td>Skew time</td>
<td>N/A</td>
</tr>
<tr>
<td>MDI pair</td>
<td>4-5</td>
</tr>
<tr>
<td>Cable status</td>
<td>Open</td>
</tr>
<tr>
<td>Distance fault</td>
<td>1 Meters</td>
</tr>
<tr>
<td>Polarity swap</td>
<td>N/A</td>
</tr>
<tr>
<td>Skew time</td>
<td>N/A</td>
</tr>
<tr>
<td>MDI pair</td>
<td>7-8</td>
</tr>
<tr>
<td>Cable status</td>
<td>Normal</td>
</tr>
<tr>
<td>Distance fault</td>
<td>0 Meters</td>
</tr>
<tr>
<td>Polarity swap</td>
<td>N/A</td>
</tr>
<tr>
<td>Skew time</td>
<td>N/A</td>
</tr>
<tr>
<td>Channel pair</td>
<td>1</td>
</tr>
<tr>
<td>Pair swap</td>
<td>N/A</td>
</tr>
<tr>
<td>Channel pair</td>
<td>2</td>
</tr>
<tr>
<td>Pair swap</td>
<td>N/A</td>
</tr>
<tr>
<td>Downshift</td>
<td>N/A</td>
</tr>
</tbody>
</table>

3. **Examine the Cable status field** for the four MDI pairs to determine if the cable has a fault. In the preceding example, the twisted pair on pins 4 and 5 is broken or cut at approximately one meter from the ge-0/0/10 port connection.

**NOTE:** The Test Status field indicates the status of the TDR test, not the cable. The value **Passed** means the test completed—it does not mean that the cable has no faults.

The following is additional information about the TDR test:

- The TDR test can take some seconds to complete. If the test is still running when you execute the `show diagnostics tdr` command, the Test status field displays **Started**. For example:

```
user@host> show diagnostics tdr interface ge-0/0/22
```

Interface TDR detail:
You can terminate a running TDR test before it completes by using the `request diagnostics tdr abort interface interface-name` command. The test terminates with no results, and the results from any previous test are cleared.

You can display summary information about the last TDR test results for all interfaces on the router that support the TDR test by not specifying an interface name with the `show diagnostics tdr` command. For example:

```
user@host> show diagnostics tdr
```

<table>
<thead>
<tr>
<th>Interface</th>
<th>Test status</th>
<th>Link status</th>
<th>Cable status</th>
<th>Max distance fault</th>
</tr>
</thead>
<tbody>
<tr>
<td>ge-0/0/0</td>
<td>Passed</td>
<td>UP</td>
<td>OK</td>
<td>0</td>
</tr>
<tr>
<td>ge-0/0/1</td>
<td>Not Started</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>ge-0/0/2</td>
<td>Passed</td>
<td>UP</td>
<td>OK</td>
<td>0</td>
</tr>
<tr>
<td>ge-0/0/3</td>
<td>Not Started</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>ge-0/0/4</td>
<td>Passed</td>
<td>UP</td>
<td>OK</td>
<td>0</td>
</tr>
<tr>
<td>ge-0/0/5</td>
<td>Passed</td>
<td>UP</td>
<td>OK</td>
<td>0</td>
</tr>
<tr>
<td>ge-0/0/6</td>
<td>Passed</td>
<td>UP</td>
<td>OK</td>
<td>0</td>
</tr>
<tr>
<td>ge-0/0/7</td>
<td>Not Started</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>ge-0/0/8</td>
<td>Passed</td>
<td>Down</td>
<td>OK</td>
<td>0</td>
</tr>
<tr>
<td>ge-0/0/9</td>
<td>Not Started</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>ge-0/0/10</td>
<td>Passed</td>
<td>Down</td>
<td>Fault</td>
<td>1</td>
</tr>
<tr>
<td>ge-0/0/11</td>
<td>Passed</td>
<td>UP</td>
<td>OK</td>
<td>0</td>
</tr>
<tr>
<td>ge-0/0/12</td>
<td>Not Started</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>ge-0/0/13</td>
<td>Not Started</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>ge-0/0/14</td>
<td>Not Started</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>ge-0/0/15</td>
<td>Not Started</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>ge-0/0/16</td>
<td>Not Started</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>ge-0/0/17</td>
<td>Not Started</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>ge-0/0/18</td>
<td>Not Started</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>ge-0/0/19</td>
<td>Passed</td>
<td>Down</td>
<td>OK</td>
<td>0</td>
</tr>
<tr>
<td>ge-0/0/20</td>
<td>Not Started</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>ge-0/0/21</td>
<td>Not Started</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>ge-0/0/22</td>
<td>Passed</td>
<td>UP</td>
<td>OK</td>
<td>0</td>
</tr>
<tr>
<td>ge-0/0/23</td>
<td>Not Started</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
</tbody>
</table>

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accounting

Syntax

```
accounting {
    destination-class-usage;
    source-class-usage {
        direction;
    }
}
```

Hierarchy Level

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

Release Information

Statement introduced before Junos OS Release 7.4.

Description

Enable IP packet counters on an 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

| Enabling Source Class and Destination Class Usage | 229 |
accounting-profile

Syntax

```
accounting-profile name;
```

Hierarchy Level

```
[edit interfaces interface-name],
[edit interfaces interface-name unit logical-unit-number],
[edit interfaces interface-range name]
```

Release Information

Statement introduced before Junos OS Release 7.4.
Statement introduced in Junos OS Release 9.0 for EX Series switches.
Statement introduced in Junos OS Release 15.1F6 for PTX Series routers with third-generation FPCs installed.

Description

Enable collection of accounting data for the specified physical or logical interface or interface range.

Options

- `name`—Name of the accounting profile.

Required Privilege Level

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

RELATED DOCUMENTATION

- Applying an Accounting Profile to the Physical Interface
- Applying an Accounting Profile to the Logical Interface
acfc

Syntax

acfc;

Hierarchy Level

[edit interfaces interface-name ppp-options compression],
[edit interfaces interface-name unit logical-unit-number ppp-options compression],
[edit logical-systems logical-system-name interfaces interface-name unit logical-unit-number ppp-options compression]

Release Information
Statement introduced before Junos OS Release 7.4.

Description
For interfaces with PPP encapsulation, configure compression of the Data Link Layer address and control fields. The acfc option is not supported with frame-relay-ppp encapsulation.

On M320, M120, and T Series routers, address and control field compression (ACFC) is not supported for any ISO family protocols. Do not include the acfc statement at the [edit interfaces interface-name ppp-options compression] hierarchy level when you include the family iso statement at the [edit interfaces interface-name unit logical-unit-number] hierarchy level.

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

RELATED DOCUMENTATION

Configuring PPP Address and Control Field Compression
action (Policer)

Syntax

```plaintext
action {
    loss-priority high then discard;
}
```

Hierarchy Level

```plaintext
[edit firewall three-color-policer policer-name]
```

Release Information
Statement introduced in Junos OS Release 8.2.

Description
This statement discards high loss priority traffic as part of a configuration using tricolor marking on a logical interface.

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

RELATED DOCUMENTATION

- *Class of Service User Guide (Routers and EX9200 Switches)*
- *logical-interface-policer*
activation-priority

Syntax

activation-priority priority;

Hierarchy Level

[edit interfaces interface-name unit logical-unit-number dynamic-call-admission-control],
[edit logical-systems logical-system-name interfaces interface-name unit logical-unit-number
dynamic-call-admission-control]

Release Information

Statement introduced in Junos OS Release 8.2.

Description

(J4350 and J6350 Services Routers supporting voice over IP with the TGM550 media gateway module)
For Fast Ethernet and Gigabit Ethernet interfaces, ISDN BRI interfaces, and serial interfaces with PPP or
Frame Relay encapsulation, configure the dynamic call admission control (dynamic CAC) activation priority
value.

Options

priority—The activation priority in which the interface is used for providing call bandwidth. The interface
with the highest activation priority value is used as the primary link for providing call bandwidth. If the
primary link becomes unavailable, the TGM550 switches over to the next active interface with the highest
activation priority value, and so on.

Range: 0 through 255
Default: 50

Required Privilege Level

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

RELATED DOCUMENTATION

Junos OS Services Interfaces Library for Routing Devices
Junos OS Interfaces and Routing Configuration Guide
alias (Interfaces)

Syntax

```
alias alias-name;
```

Hierarchy Level

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

Release Information

Statement introduced in Junos OS Release 13.3.

Description

Configure a textual description of a physical interface or the logical unit of an interface to be the alias of an interface name. The alias name can be a single line of text. If the text contains spaces, enclose it in quotation marks. If you configure an alias name, the alias name is displayed instead of the interface name in the output of all `show`, `show interfaces`, and other operational mode commands. In Junos OS Release 12.3R8 and later, display of the alias can be suppressed in favor of the actual interface name by using the `display no-interface-alias` parameter along with the `show` command.

Options

- **alias-name**—Text to denote an easily identifiable, meaningful alias name for the interface. If the text includes spaces, enclose the entire text in quotation marks.

Required Privilege Level

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

RELATED DOCUMENTATION

- Example: Adding an Interface Alias Name | 128
- Junos OS Network Interfaces Library for Routing Devices
backup-options

Syntax

```plaintext
backup-options {
    interface interface-name;
}
```

Hierarchy Level

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

Release Information

Statement introduced before Junos OS Release 7.4.

Description

Configure an interface to be used as a backup interface if the primary interface goes down. This is used to support ISDN dial backup operation.

The remaining statement is explained separately. See CLI Explorer.

Required Privilege Level

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

RELATED DOCUMENTATION

- Junos OS Interfaces and Routing Configuration Guide
calling-number

Syntax

calling-number number;

Hierarchy Level

[edit interfaces br-pim/0/port isdn-options]

Release Information
Statement introduced before Junos OS Release 7.4.

Description
On J Series Services Routers with ISDN interfaces, configure the calling number to include in outgoing calls.

Options

number—Calling number.

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

RELATED DOCUMENTATION

Configuring ISDN Physical Interface Properties
Junos OS Interfaces and Routing Configuration Guide
clock-rate

Syntax

clock-rate rate;

Hierarchy Level

[edit interfaces interface-name serial-options]

Release Information
Statement introduced before Junos OS Release 7.4.

Description
For EIA-530 and V.35 interfaces, configure the interface speed, in megahertz (MHz).

Options
rate—You can specify one of the following rates:

- 2.048 MHz
- 2.341 MHz
- 2.731 MHz
- 3.277 MHz
- 4.096 MHz
- 5.461 MHz
- 8.192 MHz
- 16.384 MHz

Default: 16.384 MHz

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

RELATED DOCUMENTATION

Configuring the Serial Clocking Mode | 285
clocking-mode

Syntax

    clocking-mode (dce | internal | loop);

Hierarchy Level

    [edit interfaces interface-name serial-options]

Release Information
Statement introduced before Junos OS Release 7.4.

Description
For EIA-530 and V.35 interfaces, configure the clock mode. You cannot configure `clocking-mode dce` on a DTE router using an X.21 serial line protocol (detected automatically when an X.21 cable is plugged into the serial interface).

Options

dce—DCE timing (DTE mode only, not valid for X.21).

internal—Internal baud timing.

loop—Loop timing.

Default: loop

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

RELATED DOCUMENTATION

    Configuring the Serial Clocking Mode | 285
control-polarity

Syntax

control-polarity (negative | positive);

Hierarchy Level

[edit interfaces interface-name serial-options]

Release Information
Statement introduced before Junos OS Release 7.4.

Description
For X.21 interfaces only, configure the control signal polarity.

Options
positive—Positive signal polarity.

negative—Negative signal polarity.

Default: positive

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

RELATED DOCUMENTATION

Configuring Serial Signal Polarities | 292
control-signal

Syntax

control-signal (assert | de-assert | normal);

Hierarchy Level

[edit interfaces interface-name serial-options dce-options],
[edit interfaces interface-name serial-options dte-options]

Release Information
Statement introduced before Junos OS Release 7.4.

Description
For X.21 interfaces only, configure the to-DCE signal.

Options
assert—The to-DCE signal must be asserted.

de-assert—The to-DCE signal must be deasserted.

normal—Normal request-to-send (RTS) signal handling, as defined by ITU-T Recommendation X.21.

Default: normal

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

RELATED DOCUMENTATION

| Configuring the Serial Signal Handling | 288 |
cts

Syntax

ccts (ignore | normal | require);

Hierarchy Level

[edit interfaces interface-name serial-options dce-options],
[edit interfaces interface-name serial-options dte-options]

Release Information
Statement introduced before Junos OS Release 7.4.

Description
For EIA-530 and V.35 interfaces only, configure the from-DCE signal, clear-to-send (CTS).

Options
ignore—The from-DCE signal is ignored.

normal—Normal CTS signal handling as defined by the TIA/EIA Standard 530.

require—The from-DCE signal must be asserted.

Default: normal

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

RELATED DOCUMENTATION

Configuring the Serial Signal Handling | 288
cts-polarity

Syntax

cts-polarity (negative | positive);

Hierarchy Level

[edit interfaces interface-name serial-options]

Release Information
Statement introduced before Junos OS Release 7.4.

Description
Configure CTS signal polarity.

Options
positive—Positive signal polarity.

negative—Negative signal polarity.

Default: positive

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

RELATED DOCUMENTATION

Configuring Serial Signal Polarities | 292
damping (Interfaces)

Syntax

damping {
  enable;
  half-life seconds;
  max-suppress seconds;
  reuse number;
  suppress number;
}

Hierarchy Level

[edit interfaces interface--name],
[edit interfaces interface--range]

Release Information

Statement introduced in Junos OS Release 14.1 for PTX Series Packet Transport Routers and T Series Core Routers.

Description

Limit the number of advertisements of the up and down transitions (flapping) on an interface. Each time a transition occurs, the interface state is changed, which generates an advertisement to the upper-level routing protocols. Damping helps reduce the number of these advertisements. Every time an interface goes down, a penalty is added to the interface penalty counter. Penalty added on every interface flap is 1000.

If at some point the accumulated penalty exceeds the suppress level max-suppress, the interface is placed in the suppress state, and further interface state up and down transitions are not reported to the upper-level protocols.

Options

enable—Enable damping on a per-interface basis. If damping is enabled on an interface, it is suppressed during interface flaps that match the configuration settings.

Default: Disabled

half-life seconds—Decay half-life. seconds is the interval after which the accumulated interface penalty counter is reduced by half if the interface remains stable.
NOTE: For the half-life, configure a value that is less than the max-suppress value. If you do not, the configuration is rejected.

**Range:** 1 through 30  
**Default:** 5

**max-suppress seconds**—Maximum hold-down time. **seconds** is the maximum time that an interface can be suppressed no matter how unstable the interface has been.

NOTE: For max-suppress, configure a value that is greater than the half-life. If you do not, the configuration is rejected.

**Range:** 1 through 20,000  
**Default:** 20

**reuse number**—Reuse threshold. When the accumulated interface penalty counter falls below **number**, the interface is no longer suppressed.

**Range:** 1 through 20,000  
**Default:** 1000

**suppress number**—Cutoff (suppression) threshold. When the accumulated interface penalty counter exceeds **number**, the interface is suppressed.

**Range:** 1 through 20,000  
**Default:** 2000

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

**RELATED DOCUMENTATION**

- Physical Interface Damping Overview | 147
- Damping Shorter Physical Interface Transitions | 153
- Damping Longer Physical Interface Transitions | 155
- `show interfaces extensive`
- `hold-time`
dcd

Syntax

dcd (ignore | normal | require);

Hierarchy Level

[edit interfaces interface-name serial-options dce-options],
[edit interfaces interface-name serial-options dte-options]

Release Information
Statement introduced before Junos OS Release 7.4.

Description
For EIA-530 and V.35 interfaces only, configure the from-DCE signal, data-carrier-detect (DCD).

Options
ignore—The from-DCE signal is ignored.
	normal—Normal DCD signal handling as defined by the TIA/EIA Standard 530.

require—The from-DCE signal must be asserted.

Default: normal

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

RELATED DOCUMENTATION

 Configuring the Serial Signal Handling | 288
dcd-polarity

Syntax

dcd-polarity (negative | positive);

Hierarchy Level

[edit interfaces interface-name serial-options]

Release Information
Statement introduced before Junos OS Release 7.4.

Description
Configure DCD signal polarity.

Options
positive—Positive signal polarity.

negative—Negative signal polarity.

Default: positive

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

RELATED DOCUMENTATION

Configuring Serial Signal Polarities | 292
dce-options

Syntax

dce-options {
    control-signal (assert | de-assert | normal);
    cts (ignore | normal | require);
    dcd (ignore | normal | require);
    dsr (ignore | normal | require);
    dtr signal-handling-option;
    ignore-all;
    indication (ignore | normal | require);
    rts (assert | de-assert | normal);
    tm (ignore | normal | require);
}

Hierarchy Level

[edit interfaces interface-name serial-options]

Release Information
Statement introduced in Junos OS Release 8.3.
Statement previously known as control-leads.

Description
For J Series Services Routers, configure the serial interface signal characteristics.

The remaining statements are explained separately. See CLI Explorer.

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

RELATED DOCUMENTATION

| Configuring the Serial Signal Handling | 288 |
**demux-destination (Underlying Interface)**

**Syntax**

```
demux-destination family;
```

**Hierarchy Level**

- [edit interfaces interface-name unit logical-unit-number],
- [edit logical-systems logical-system-name interfaces interface-name unit logical-unit-number],
- [edit logical-systems logical-system-name routing-instances routing-instance-name interfaces interface-name unit logical-unit-number]

**Release Information**

Statement introduced in Junos OS Release 9.0.
Support for aggregated Ethernet added in Junos OS Release 9.4.

**Description**

Configure the logical demultiplexing (demux) destination family type on the IP demux underlying interface.

**NOTE:** The IP demux interface feature currently supports only Fast Ethernet, Gigabit Ethernet, 10-Gigabit Ethernet, or aggregated Ethernet underlying interfaces.

**Required Privilege Level**

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

**RELATED DOCUMENTATION**

<table>
<thead>
<tr>
<th>Configuring an IP Demultiplexing Interface</th>
<th>255</th>
</tr>
</thead>
<tbody>
<tr>
<td>Configuring a VLAN Demultiplexing Interface</td>
<td>260</td>
</tr>
</tbody>
</table>
**demux-destination (Demux Interface)**

**Syntax**

```yaml
demux-destination {
  destination-prefix;
}
```

**Hierarchy Level**

```bash
[edit interfaces interface-name unit logical-unit-number family family],
[edit logical-systems logical-system-name interfaces interface-name unit logical-unit-number family family],
[edit logical-systems logical-system-name routing-instances routing-instance-name interfaces interface-name unit logical-unit-number family family]
```

**Release Information**

Statement introduced in Junos OS Release 9.0.
Support for aggregated Ethernet added in Junos OS Release 9.4.

**Description**

Configure one or more logical demultiplexing (demux) destination prefixes. The prefixes are matched against the destination address of packets that the underlying interface receives. When a match occurs, the packet is processed as if it was received on the demux interface.

**Required Privilege Level**

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

**RELATED DOCUMENTATION**

- Configuring an IP Demultiplexing Interface | 255
- Configuring a VLAN Demultiplexing Interface | 260
demux-options (Static Interface)

Syntax

demux-options {
    underlying-interface interface-name
}

Hierarchy Level

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

Release Information
Statement introduced in Junos OS Release 9.0.

Description
Configure logical demultiplexing (demux) interface options.

The remaining statement is explained separately. See CLI Explorer.

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

RELATED DOCUMENTATION

| Configuring an IP Demultiplexing Interface | 255 |
| Configuring a VLAN Demultiplexing Interface | 260 |
demux-source (Demux Interface)

Syntax

demux-source {
  source-prefix;
}

Hierarchy Level

[edit interfaces interface-name unit logical-unit-number family family],
[edit logical-systems logical-system-name interfaces interface-name unit logical-unit-number family family],
[edit logical-systems logical-system-name routing-instances routing-instance-name interfaces interface-name unit logical-unit-number family family]

Release Information

Statement introduced in Junos OS Release 9.0.
Support for aggregated Ethernet added in Junos OS Release 9.4.

Description

Configure one or more logical demultiplexing (demux) source prefixes. The prefixes are matched against the source address of packets that the underlying interface receives. When a match occurs, the packet is processed as if it was received on the demux interface.

Required Privilege Level

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

RELATED DOCUMENTATION

- Configuring an IP Demultiplexing Interface | 255
- Configuring a VLAN Demultiplexing Interface | 260
demux-source (Underlying Interface)

Syntax

demux-source family;

Hierarchy Level

[edit interfaces interface-name unit logical-unit-number],  
[edit logical-systems logical-system-name interfaces interface-name unit logical-unit-number],  
[edit logical-systems logical-system-name routing-instances routing-instance-name interfaces interface-name unit logical-unit-number]

Release Information

Statement introduced in Junos OS Release 9.0.  
Support for aggregated Ethernet added in Junos OS Release 9.4.

Description

Configure the logical demultiplexing (demux) source family type on the IP demux underlying interface.

NOTE: The IP demux interface feature currently supports only Fast Ethernet, Gigabit Ethernet, 10-Gigabit Ethernet, or aggregated Ethernet underlying interfaces.

Options

family—Protocol family:

- inet—Internet Protocol version 4 suite
- inet6—Internet Protocol version 6 suite

Required Privilege Level

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

RELATED DOCUMENTATION

| Configuring an IP Demultiplexing Interface | 255 |
| Configuring a VLAN Demultiplexing Interface | 260 |
demux0 (Static Interface)

Syntax

demux0 {
    unit logical-unit-number {
        demux-options {
            underlying-interface interface-name
        }
        family family {
            access-concentrator name;
            destination-prefix;
            direct-connect;
            duplicate-protection;
            dynamic-profile profile-name;
            source-prefix;
            max-sessions number;
            service-name-table table-name
            targeted-distribution;
            unnumbered-address interface-name <preferred-source-address address>;
        }
        vlan-id number;
        vlan-tags outer [tpid].vlan-id [inner [tpid].vlan-id];
    }
}

Hierarchy Level

[edit interfaces],
[edit logical-systems logical-system-name interfaces]

Release Information
Statement introduced in Junos OS Release 9.0.

Description
Configure the logical demultiplexing (demux) interface.

Logical IP demux interfaces do not support IPv4 and IPv6 dual stack.

The remaining statements are explained separately. See CLI Explorer.
**Required Privilege Level**

*interface*—To view this statement in the configuration.

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

**RELATED DOCUMENTATION**

- Configuring an IP Demultiplexing Interface | 255
- Configuring a VLAN Demultiplexing Interface | 260
demux0 (Dynamic Interface)

Syntax

demux0 {
  unit logical-unit-number {
    demux-options {
      underlying-interface interface-name
    }
    family family {
      access-concentrator name;
      address address;
      demux-source {
        source-prefix;
      }
      direct-connect;
      duplicate-protection;
      dynamic-profile profile-name;
      filter {
        input filter-name;
        output filter-name;
      }
      mac-validate (loose | strict);
      max-sessions number;
      max-sessions-vsa-ignore;
      rpf-check {
        fail-filter filter-name;
        mode loose;
      }
      service-name-table table-name
      short-cycle-protection <lockout-time-min minimum-seconds lockout-time-max maximum-seconds>;
      unnumbered-address interface-name <preferred-source-address address>;
    }
    filter {
      input filter-name;
      output filter-name;
    }
    vlan-id number;
  }
}

Hierarchy Level

[edit dynamic-profiles profile-name interfaces]
Release Information
Statement introduced in Junos OS Release 9.3.

Description
Configure the logical demultiplexing (demux) interface in a dynamic profile.

Logical IP demux interfaces do not support IPv4 and IPv6 dual stack.

The remaining statements are explained separately. Search for a statement in CLI Explorer or click a linked statement in the Syntax section for details.

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

RELATED DOCUMENTATION

- Configuring Dynamic Subscriber Interfaces Using IP Demux Interfaces in Dynamic Profiles
- Demultiplexing Interface Overview | 251
destination-class-usage

Syntax

```
destination-class-usage;
```

Hierarchy Level

```
[edit interfaces interface-name unit logical-unit-number family inet accounting],
[edit logical-systems logical-system-name interfaces interface-name unit logical-unit-number family inet accounting]
```

Release Information

Statement introduced before Junos OS Release 7.4.

Description

Enable packet counters on an interface that count packets that arrive from specific customers and are destined for specific prefixes on the provider core router.

Required Privilege Level

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

RELATED DOCUMENTATION

- Enabling Source Class and Destination Class Usage | 229
- accounting | 332
- source-class-usage
destination-profile

Syntax

destination-profile name;

Hierarchy Level

[edit interfaces interface-name unit logical-unit-number family inet address address],
[edit interfaces interface-name unit logical-unit-number family inet unnumbered-address interface-name destination address],
[edit logical-systems logical-system-name interfaces interface-name unit logical-unit-number family inet address address],
[edit logical-systems logical-system-name interfaces interface-name unit logical-unit-number family inet unnumbered-address interface-name destination address]

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

Description
For interfaces with PPP encapsulation, assign PPP properties to the remote destination end. You define the profile at the [edit access group-profile name ppp] hierarchy level.

Options
name—Profile name defined at the [edit access group-profile name ppp] hierarchy level.

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

RELATED DOCUMENTATION

Configuring IPCP Options for Interfaces with PPP Encapsulation | 211

destination (IPCP)

Junos OS Administration Library
dial-string

Syntax

dial-string [ dial-string-numbers ];

Hierarchy Level

[edit interfaces br-pim/0/port unit logical-unit-number dialer-options],
[edit logical-systems logical-system-name interfaces br-pim/0/port unit logical-unit-number dialer-options]

Release Information
Statement introduced before Junos OS Release 7.4.

Description
On J Series Services Routers with ISDN interfaces, specify one or more ISDN dial strings used to reach a destination subnetwork.

Options
dial-string-numbers—One or more strings of numbers to call.

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

RELATED DOCUMENTATION

None
**Syntax**

```plaintext
dialer filter-name;
```

**Hierarchy Level**

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

**Release Information**

Statement introduced before Junos OS Release 7.4.

**Description**

Apply a dialer filter to an interface. To create the dialer filter, include the `dialer-filter` statement at the `[edit firewall filter family family]` hierarchy level.

**Options**

- `filter-name`—Dialer filter name.

**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 and Routing Configuration Guide
dot1x

Syntax

```
dot1x {
    authenticator {
        authentication-profile-name access-profile-name;
        interface interface-id {
            maximum-requests integer;
            quiet-period seconds;
            reauthentication (disable | interval seconds);
            retries integer;
            server-timeout seconds;
            supplicant (single);
            supplicant-timeout seconds;
            transmit-period seconds;
        }
    }
}
```

Hierarchy Level

[edit protocols]

Release Information
Statement introduced in Junos OS Release 9.3.

Description
For the MX Series only, specifies settings for using 802.1x Port-Based Network Access Control.

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

| IEEE 802.1x Port-Based Network Access Control Overview |
| authenticator |
| authentication-profile-name |
| interface (IEEE 802.1x) |
**dsr**

**Syntax**

```text
dsr (ignore | normal | require);
```

**Hierarchy Level**

```text
[edit interfaces interface-name serial-options dce-options],
[edit interfaces interface-name serial-options dte-options]
```

**Release Information**

Statement introduced before Junos OS Release 7.4.

**Description**

For EIA-530 and V.35 interfaces only, configure the from-DCE signal, data-set-ready (DSR).

**Options**

- **ignore**—The from-DCE signal is ignored.
- **normal**—Normal DSR signal handling as defined by the TIA/EIA Standard 530.
- **require**—The from-DCE signal must be asserted.

**Default:** normal

**Required Privilege Level**

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

**RELATED DOCUMENTATION**

- Configuring the Serial Signal Handling | 288
dsr-polarity

Syntax

dsr-polarity (negative | positive);

Hierarchy Level

[edit interfaces interface-name serial-options]

Release Information
Statement introduced before Junos OS Release 7.4.

Description
Configure DSR signal polarity.

Options
- **positive**—Positive signal polarity.
- **negative**—Negative signal polarity.

Default: **positive**

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

RELATED DOCUMENTATION

- Configuring Serial Signal Polarities | 292
dte-options

Syntax

dte-options {
    control-signal (assert | de-assert | normal);
    cts (ignore | normal | require);
    dcd (ignore | normal | require);
    dsr (ignore | normal | require);
    dtr signal-handling-option;
    ignore-all;
    indication (ignore | normal | require);
    rts (assert | de-assert | normal);
    tm (ignore | normal | require);
}

Hierarchy Level

[edit interfaces interface-name serial-options]

Release Information
Statement introduced in Junos OS Release 8.3.
Statement previously known as control-leads.

Description
For M Series and T Series routers, configure the serial interface signal characteristics.
The remaining statements are explained separately. See CLI Explorer.

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

RELATED DOCUMENTATION

Configuring the Serial Signal Handling | 288
dtr

Syntax

dtr signal-handling-option;

Hierarchy Level

[edit interfaces interface-name serial-options dce-options],
[edit interfaces interface-name serial-options dte-options]

Release Information
Statement introduced before Junos OS Release 7.4.

Description
For EIA-530 and V.35 interfaces only, configure the to-DCE signal, data-transmit-ready (DTR).

Options

signal-handling-option—Signal handling for the DTR signal. The signal handling can be one of the following:

assert—The to-DCE signal must be asserted.

auto-synchronize—Normal DTR signal with automatic synchronization. This statement has two substatements:

duration milliseconds—Pulse duration of resynchronization.

Range: 1 through 1000 milliseconds
Default: 1000 milliseconds

interval seconds—Offset interval for resynchronization.

Range: 1 through 31 seconds
Default: 15 seconds

de-assert—The to-DCE signal must be deasserted.

normal—Normal DTR signal handling as defined by the TIA/EIA Standard 530.
Default: normal

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

RELATED DOCUMENTATION
dtr-circuit

Syntax

dtr-circuit (balanced | unbalanced);

Hierarchy Level

[edit interfaces interface-name serial-options]

Release Information
Statement introduced before Junos OS Release 7.4.

Description
For EIA-530 and V.35 interfaces only, configure a DTR circuit.

Options
balanced—Balanced DTR signal.
unbalanced—Unbalanced DTR signal.

Default: balanced

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

RELATED DOCUMENTATION

- Configuring the Serial DTR Circuit | 292
**dtr-polarity**

**Syntax**

```plaintext
dtr-polarity (negative | positive);
```

**Hierarchy Level**

```
[edit interfaces interface-name serial-options]
```

**Release Information**

Statement introduced before Junos OS Release 7.4.

**Description**

Configure DTR signal polarity.

**Options**

- `positive`—Positive signal polarity.
- `negative`—Negative signal polarity.

**Default:** positive

**Required Privilege Level**

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

**RELATED DOCUMENTATION**

- Configuring Serial Signal Polarities | 292
encoding

Syntax

encoding (nrz | nrzi);

Hierarchy Level

[edit interfaces interface-name serial-options]

Release Information
Statement introduced before Junos OS Release 7.4.

Description
For serial interfaces, set the line encoding format.

Default
The default line encoding is non-return to zero (NRZ).

Options

nrz—Use NRZ line encoding.

nrzi—Use non-return to zero inverted (NRZI) line encoding.

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

RELATED DOCUMENTATION

Configuring Serial Line Encoding | 295
**f-max-period**

**Syntax**

```
f-max-period number;
```

**Hierarchy Level**

```
[edit interfaces interface-name unit logical-unit-number],
[edit interfaces interface-name unit logical-unit-number rtp]
```

**Release Information**

Statement introduced before Junos OS Release 7.4.

**Description**

For all adaptive services interfaces and for ISDN interfaces on J Series Services Routers. Specify the maximum number of compressed packets allowed between the transmission of full headers in a compressed Real-Time Transport Protocol (RTP) traffic stream.

**Options**

`number`—Maximum number of packets. The value can be from 1 through 65535.

**Required Privilege Level**

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

**RELATED DOCUMENTATION**

- *Configuring Bandwidth on Demand*
- *Junos OS Services Interfaces Library for Routing Devices*
forward-and-send-to-re

Syntax

```
forward-and-send-to-re;
```

Hierarchy Level

```
[edit interfaces interface-name unit logical-unit-number family inet targeted-broadcast],
[edit logical-systems logical-system-name interfaces interface-name unit logical-unit-number family inet targeted-broadcast]
```

Release Information

Statement introduced in Junos OS Release 10.2.

Description

Specify that IP packets destined for a Layer 3 broadcast address be forwarded to an egress interface and the Routing Engine. The packets are broadcast only if the egress interface is a LAN interface.

Required Privilege Level

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

RELATED DOCUMENTATION

- Configuring Targeted Broadcast | 241
- targeted-broadcast
- Understanding Targeted Broadcast | 240
forward-only

Syntax

```
forward-only;
```

Hierarchy Level

```
[edit interfaces interface-name unit logical-unit-number family inet targeted-broadcast],
[edit logical-systems logical-system-name interfaces interface-name unit logical-unit-number family inet targeted-broadcast]
```

Release Information
Statement introduced in Junos OS Release 10.2.

Description
Specify that IP packets destined for a Layer 3 broadcast address be forwarded to an egress interface only. The packets are broadcast only if the egress interface is a LAN interface.

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

RELATED DOCUMENTATION

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<td>Understanding Targeted Broadcast</td>
<td>240</td>
</tr>
</tbody>
</table>
hierarchical-policer

Syntax

```
hierarchical-policer name {
    aggregate {
        if-exceeding {
            bandwidth-limit bandwidth;
            burst-size-limit burst;
        }
        then {
            discard;
        }
    }
    premium {
        if-exceeding {
            bandwidth-limit bandwidth;
            burst-size-limit burst;
        }
        then {
            discard;
        }
    }
}
```

Hierarchy Level

[edit firewall]

Release Information

Statement introduced in Junos OS Release 9.5.

Description

For M40e, M120, and M320 (with FFPC and SFPC) edge routers and T320, T640, and T1600 core routers with Enhanced Intelligent Queuing (IQE) PICs, specify a hierarchical policer.

Options

Options are described separately.

Required Privilege Level

firewall—To view this statement in the configuration.
firewall-control—To add this statement to the configuration.
RELATED DOCUMENTATION

- Applying Policers
- Class of Service User Guide (Routers and EX9200 Switches)
if-exceeding-pps (Hierarchical Policer)

Syntax

```yaml
if-exceeding-pps {
    pps-limit pps;
    packet-burst packets;
}
```

Hierarchy Level

```yaml
[edit dynamic-profiles profile-name firewall hierarchical-policer hierarchical-policer-name aggregate],
[edit dynamic-profiles profile-name firewall hierarchical-policer hierarchical-policer-name premium],
[edit firewall hierarchical-policer hierarchical-policer-name aggregate],
[edit firewall hierarchical-policer hierarchical-policer-name premium]
```

Release Information

Statement introduced in Junos OS Release 15.2 for MX Series routers with MPCs.

Description

For MX Series routers, **if-exceeding-pps** allows you to configure a packets-per-second (pps)-based trigger for a premium or aggregate component of a hierarchical policer. When applied to the loopback interface (lo0), this kind of trigger can help protect the Routing Engine from DDoS attacks. When applied in other areas, to either transit or control traffic, it is a more fine-grained monitor.

The remaining statements are explained separately. See CLI Explorer.

Required Privilege Level

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

RELATED DOCUMENTATION

- **Hierarchical Policer Configuration Overview**
- Hierarchical Policers
  - aggregate (Hierarchical Policer)
  - bandwidth-limit (Hierarchical Policer)
  - burst-size-limit (Hierarchical Policer)
  - hierarchical-policer
  - premium (Hierarchical Policer)
ignore-all

Syntax

ignore-all;

Hierarchy Level

[edit interfaces interface-name serial-options dce-options], [edit interfaces interface-name serial-options dte-options]

Release Information
Statement introduced before Junos OS Release 7.4.

Description
Ignore all control leads. You can include the ignore-all statement in the configuration only if you do not explicitly enable other signal handling options at the dte-options hierarchy level.

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

RELATED DOCUMENTATION

Configuring the Serial Signal Handling  |  288
### indication

**Syntax**

indication (ignore | normal | require);

**Hierarchy Level**

- [edit interfaces interface-name serial-options dce-options],
- [edit interfaces interface-name serial-options dte-options]

**Release Information**

Statement introduced before Junos OS Release 7.4.

**Description**

For X.21 interfaces only, configure the from-DCE signal indication.

**Options**

- **ignore**—The from-DCE signal is ignored.
- **normal**—Normal indication signal handling as defined by ITU-T Recommendation X.21.
- **require**—The from-DCE signal must be asserted.

**Default:** normal

**Required Privilege Level**

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

**RELATED DOCUMENTATION**

- Configuring the Serial Signal Handling | 288
indication-polarity

Syntax

indication-polarity (negative | positive);

Hierarchy Level

[edit interfaces interface-name serial-options]

Release Information
Statement introduced before Junos OS Release 7.4.

Description
For X.21 interfaces only, configure the indication signal polarity.

Options
- positive—Positive signal polarity.
- negative—Negative signal polarity.

Default: positive

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

RELATED DOCUMENTATION

- Configuring Serial Signal Polarities | 292
**init-command-string**

**Syntax**

```
init-command-string initialization-command-string;
```

**Hierarchy Level**

```
[edit interfaces umd0 modem-options]
```

**Release Information**

Statement introduced in Junos OS Release 8.2.

**Description**

For J Series Services Routers, configure the command string used to initialize the USB modem.

When you connect the USB modem to the USB port on a Services Router, the router applies the modem AT commands configured in the `init-command-string` command to the initialization commands on the modem.

For example, the initialization command string `ATS0 = 2\n` configures the USB modem to pick up a call after 2 rings.

If you do not include the `init-command-string` statement, the router applies the default initialization string to the modem.

**Options**

**initialization-command-string**—Specify an initialization command string using the following AT command values:

- `%C0`—Disables data compression.
- `&C1`—Disables reset of the modem when it loses the carrier signal.
- `&Q8`—Enables Microcom Networking Protocol (MNP) error control mode.
- `AT`—Attention. Informs the modem that a command follows.
- `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.
- `S0=0`—Disables the auto-answer feature, whereby the modem automatically answers calls.
- `S7=45`—Instructs the modem to wait 45 seconds for a telecommunications service provider (carrier) signal before terminating the call.
- `V1`—Displays result codes as words.
Default: AT S7=45 S0=0 V1 X4 &C1 E0 Q0 &Q8 %C0

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

input-list

Syntax

input-list [ filter-names ];

Hierarchy Level

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

Release Information
Statement introduced in Junos OS Release 7.6.

Description
Apply a group of filters to evaluate when packets are received on an interface.

Options

[ filter-names ]—Name of a filter to evaluate when packets are received on the interface. Up to 16 filters can be included in a filter input list.

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

RELATED DOCUMENTATION

- Applying a Filter to an Interface  |  223
- Routing Policies, Firewall Filters, and Traffic Policers User Guide
- Junos OS Administration Library
- output-list
interface (Hierarchical CoS Schedulers)

Syntax

interface interface-name;

Hierarchy Level

[edit interfaces interface-set interface-set-name]

Release Information
Statement introduced in Junos OS Release 8.5.

Description
Specify an interface that is a member of the interface set. Supported on Ethernet interfaces on an MX Series router, Ethernet interfaces on IQ2E PIC on M Series and T Series routers, and IP demux interfaces on an MX Series router.

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 User Guide (Routers and EX9200 Switches)
interface-range

Syntax

interface-range name {
member-range interface-name-fpc/pic/port to interface-name-fpc/pic/port;
member interface-name-fpc/pic/port;
member interface-name-fpc/[low-high]/*
member interface-name-fpc/[pic1,pic2,pic3...picN]/port
/*Common config is added as part of interface-range definition, as follows*/
mtu 256;
hold-time up 10;
ether-options {
   flow-control;
speed {
      100m;
   }
   802.3ad primary;
}
}

Hierarchy Level

[edit interfaces]

Release Information

Statement introduced in Junos OS Release 10.0.

Description

Specify a set of identical interfaces as an interface group, to which you can apply a common configuration to the entire set of interfaces. This group can consist of both lexical member ranges of interfaces specified using the member-range interface-type-fpc/pic/port to xx-fpc/pic/port option (regex not supported), and of individual or non-sequential members using the member interface-type-fpc/pic/port option (with regex support to specify the fpc/pic/port values).

Options

member-range—Adds interfaces in lexical order. Regex is not supported.

   Format:—member-range <start-range> to <end-range>

   Example:—member-range ge-0/0/0 to ge-4/0/40;

member—To add individual interfaces or multiple interfaces using regex.
Format:—member <list of interface names>

Example:—member ge-0/0/0;

    member ge-0/1/1;
    member ge-0/*/*
    member ge-0/[1-10]/0;
    member ge-1/[1,3,6,10]/12

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

RELATED DOCUMENTATION

| Configuring Interface Ranges | 86 |
interface-transmit-statistics

Syntax

interface-transmit-statistics;

Hierarchy Level

[edit interface interface-name]

Release Information

Statement introduced in Junos OS Release 11.4R3 for MX Series devices.

Description

Configure the interface to report the transmitted load statistics. If this statement is not included in the configuration, the interface statistics show the offered load on the interface, and not the actual transmitted load.

Required Privilege Level

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

RELATED DOCUMENTATION

- Improvements to Interface Transmit Statistics Reporting | 435
- show interfaces
interface-set (Ethernet Interfaces)

Syntax

```snippet
interface-set interface-set-name {
  interface ethernet-interface-name {
    (unit unit-number | vlan-tags-outer vlan-tag);
  }
}
```

Hierarchy Level

[edit interfaces]

Release Information

Statement introduced in Junos OS Release 8.5.

Description

The set of interfaces used to configure hierarchical CoS schedulers on Ethernet interfaces on the MX Series router and IQ2E PIC on M Series and T Series routers.

The remaining statements are described separately.

Required Privilege Level

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

RELATED DOCUMENTATION

- interface-set (Hierarchical Schedulers)
interface-shared-with

Syntax

interface-shared-with psdn;

Hierarchy Level

[edit interfaces ge-fpc/pic/slot unit logical-unit-number],
[edit interfaces so-fpc/pic/slot unit logical-unit-number],
[edit interfaces xe-fpc/pic/slot unit logical-unit-number]

Release Information

Statement introduced in Junos OS Release 9.3.
Statement introduced in Junos OS Release 12.3R2 for EX Series switches.

Description

Assign a logical interface under a shared physical interface to a Protected System Domain (PSD).

Options

n—PSD identification as a numeric value.

Range: 1 through 31

Required Privilege Level

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

RELATED DOCUMENTATION
**keep-address-and-control**

**Syntax**

```plaintext
keep-address-and-control;
```

**Hierarchy Level**

```plaintext
[edit interfaces interface-name unit logical-unit-number family ccc],
[edit logical-systems logical-system-name interfaces interface-name unit logical-unit-number family ccc]
```

**Release Information**

Statement introduced before Junos OS Release 7.4.

**Description**

For interfaces with encapsulation type PPP CCC, do not remove the address and control bytes before encapsulating the packet into a tunnel.

**Default**

If you do not include this statement, address and control bytes are removed before encapsulating the packet into a tunnel.

**Required Privilege Level**

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

**RELATED DOCUMENTATION**

- Disabling the Removal of Address and Control Bytes | 222
key

Syntax

```
key number;
```

Hierarchy Level

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

Release Information

Statement introduced before Junos OS Release 7.4.

Description

For Adaptive Services PICs on M Series routers (except the M320 and M120 routers), identify an individual traffic flow within a tunnel, as defined in RFC 2890, *Key and Sequence Number Extensions to GRE*.

Options

- `number`—Value of the key.

Range: 0 through 4,294,967,295

Required Privilege Level

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

RELATED DOCUMENTATION

- *Junos OS Services Interfaces Library for Routing Devices*
lcp-max-conf-req

Syntax

lcp-max-conf-req number

Hierarchy Level

[edit interfaces so-fpc/pic/port unit number ppp-options]

Release Information

Description
Set the maximum number of LCP Configure-Requests to be sent, after which the router goes to LCP down state.

Options
number—From 0 to 65,535, where 0 means send infinite LCP Configure-Requests, and any other value specifies the maximum number LCP Configure-Requests to send and then stop sending.

Default—254

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

RELATED DOCUMENTATION

Configuring the Maximum Number of LCP Configure-Requests to be Sent

ppp-options
lcp-restart-timer

Syntax

```
lcp-restart-timer milliseconds;
```

Hierarchy Level

```
[edit interfaces interface-name unit logical-unit-number ppp-options],
[edit logical-systems logical-system-name interfaces interface-name unit logical-unit-number ppp-options]
```

Release Information

Statement introduced in Junos OS Release 8.1.

Description

For interfaces with PPP, PPP TCC, PPP over Ethernet, PPP over ATM, and PPP over Frame Relay
encapsulations, configure a restart timer for the Link Control Protocol (LCP) component of a PPP session.

Options

`milliseconds`—The time, in milliseconds, between successive LCP configuration requests.

Range: 20 through 10000 milliseconds

Default: 3 seconds

Required Privilege Level

interface—To view this statement in the configuration.

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

RELATED DOCUMENTATION

`Configuring the PPP Restart Timers`
line-protocol

Syntax

line-protocol protocol;

Hierarchy Level

[edit interfaces interface-name serial-options]

Release Information
Statement introduced before Junos OS Release 7.4.

Description
For serial interfaces only, configure the line protocol.

Options
protocol—You can specify the one of the following line protocols:

- eia530—Line protocol EIA-530
- v.35—Line protocol V.35
- x.21—Line protocol X.21

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

RELATED DOCUMENTATION

Configuring the Serial Line Protocol | 280
**line-rate**

**Syntax**

```
line-rate line-rate;
```

**Hierarchy Level**

```
[edit interfaces interface-name shdsl-options],
[edit logical-systems logical-system-name interfaces interface-name shdsl-options]
```

**Release Information**

Statement introduced in Junos OS Release 7.4.

**Description**

For J Series Services Routers only, configure the SHDSL line rate.

**Options**

- **line-rate**—SHDSL line rate, in Kbps. Possible values are:

  - 4-wire (Kbps): 384, 512, 640, 768, 896, 1024, 1152, 1280, 1408, 1536, 1664, 1792, 1920, 2048, 2176, 2304, 2432, 2560, 2688, 2816, 2944, 3072, 3200, 3328, 3456, 3584, 3712, 3840, 3968, 4096, 4224, 4352, 4480, 4608

**Default:** For 2-wire mode, **auto**; for 4-wire mode, **4608** Kbps

**Required Privilege Level**

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

Syntax

local-password password;

Hierarchy Level

[edit interfaces interface-name ppp-options pap],
[edit interfaces interface-name unit logical-unit-number ppp-options pap],
[edit logical-systems logical-system-name interfaces interface-name unit logical-unit-number ppp-options pap]

Release Information

Statement introduced in Junos OS Release 8.3.

Description

Configure the host password for sending PAP requests.

Required Privilege Level

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

RELATED DOCUMENTATION

- Configuring the Local Password
- Configuring the PPP Password Authentication Protocol On a Physical Interface
loopback (Serial)

Syntax

loopback mode;

Hierarchy Level

[edit interfaces interface-name serial-options]

Release Information
Statement introduced before Junos OS Release 7.4.

Description
Configure a loopback connection.

Default
If you do not include this statement, there is no loopback connection.

Options
mode—You can specify the one of the following loopback modes:

- dce-local—For EIA-530 interfaces only, loop packets back on the local DCE.
- dce-remote—For EIA-530 interfaces only, loop packets back on the remote DCE.
- local—Loop packets back on the local router’s PIC.
- remote—Loop packets back on the line interface unit (LIU).

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

RELATED DOCUMENTATION

| Configuring Serial Loopback Capability | 293 |
**loopback-clear-timer**

**Syntax**

```
loopback-clear-timer seconds;
```

**Hierarchy Level**

```
[edit interfaces interface-name unit logical-unit-number ppp-options],
[edit logical-systems logical-system-name interfaces interface-name unit logical-unit-number ppp-options]
```

**Release Information**

Statement introduced in Junos OS Release 8.5.

**Description**

For interfaces with PPP, PPP TCC, PPP over Ethernet, PPP over ATM, and PPP over Frame Relay encapsulations, configure a loop detection clear timer for the Link Control Protocol (LCP) component of a PPP session.

**Options**

- `seconds`—The time in seconds to wait before the loop detection flag is cleared if it is not cleared by the protocol.

**Range:** 1 through 60 seconds

**Default:** 9 seconds

**Required Privilege Level**

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

**RELATED DOCUMENTATION**

- *Configuring the PPP Clear Loop Detected Timer*
monitor-session

Syntax

monitor-session (interface-name | all);

Hierarchy Level

[edit protocols ppp]

Release Information
Statement introduced in Junos OS Release 7.5.

Description
Monitor PPP packet exchanges. When monitoring is enabled, packets exchanged during a session are logged to the default log of /var/log/pppd.

Default
If you do not include this statement, no PPPD-specific monitoring operations are performed.

Options
all—Monitor PPP packet exchanges on all sessions.

interface-name—Logical interface name on which to enable session monitoring.

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

RELATED DOCUMENTATION

Monitoring a PPP Session
**multipoint**

**Syntax**

```
multipoint;
```

**Hierarchy Level**

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

**Release Information**

Statement introduced before Junos OS Release 7.4.

**Description**

Configure the interface unit as a multipoint connection.

**Default**

If you omit this statement, the interface unit is configured as a point-to-point connection.

**Required Privilege Level**

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

**RELATED DOCUMENTATION**

- Configuring a Multipoint Connection | 189
- point-to-point | 405
ncp-max-conf-req

Syntax

ncp-max-conf-req number

Hierarchy Level

[edit interfaces so-fpc/pic/port unit number ppp-options]

Release Information

Description
Set the maximum number of NCP Configure-Requests to be sent, after which the router goes to NCP down state.

Options

number—Ranges from 0 to 65535, where 0 means send infinite NCP Configure-Requests and any other value specifies the maximum number NCP Configure-Requests to send and then stop sending.

Default—254

Range: 0 through 65,535

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

RELATED DOCUMENTATION

Configuring the Maximum Number of NCP Configure-Requests to be Sent

ppp-options
**ncp-restart-timer**

**Syntax**

```plaintext
ncp-restart-timer milliseconds;
```

**Hierarchy Level**

```
[edit interfaces interface-name unit logical-unit-number ppp-options],
[edit logical-systems logical-system-name interfaces interface-name unit logical-unit-number ppp-options]
```

**Release Information**

Statement introduced in Junos OS Release 8.1.

**Description**

For interfaces with PPP and PPP TCC encapsulations and on multilink PPP bundle interfaces, configure a restart timer for the Network Control Protocol (NCP) component of a PPP session.

**Options**

- `milliseconds`—The time in milliseconds between successive NCP configuration requests.

**Range:** 500 through 10,000 milliseconds

**Default:** 3 seconds

**Required Privilege Level**

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

**RELATED DOCUMENTATION**

- *Configuring the PPP Restart Timers*
operating-mode

Syntax

operating-mode mode;

Hierarchy Level

[edit interfaces at-fpc/pic/port dsl-options]

Release Information

Statement introduced before Junos OS Release 7.4.

Description

For J Series Services Routers only, modify the operating mode of the digital subscriber line for an ATM interface.

Options

mode—Operating mode for ATM-over-ADSL interfaces. The mode can be one of the following:

- adsl2plus—Set the ADSL line to train in the ITU G.992.5 mode.
- ansi-dmt—Set the ADSL line to train in the ANSI T1.413 Issue 2 mode.
- auto—Set the ADSL line to autonegotiate the setting to match the setting of the DSL access multiplexer (DSLAM) located at the central office. The ADSL line trains in the ANSI T1.413 Issue 2 (ansi-dmt) or ITU G.992.1 (itu-dmt) mode.
- etsi—Set the ADSL line to train in the ETSI TS 101 388 V1.3.1 mode.
- itu-annexb-ur2—Set the ADSL line to train in the ITU G.992.1 UR-2 mode.
- itu-annexb-non-ur2—Set the ADSL line to train in the ITU G.992.1 non-UR-2 mode.
- itu-dmt—Set the ADSL line to train in the ITU G.992.1 mode.
- itu-dmt-bis—Set the ADSL line to train in the ITU G.992.3 mode.

Default: auto

Required Privilege Level

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

RELATED DOCUMENTATION
passive (PAP)

Syntax

passive;

Hierarchy Level

[edit interfaces interface-name ppp-options pap],
[edit interfaces interface-name unit logical-unit-number ppp-options pap],
[edit logical-systems logical-system-name interfaces interface-name unit logical-unit-number ppp-options pap]

Release Information

Statement introduced in Junos OS Release 8.3.

Description

Initiate an authentication request when the PAP option is received from a peer. If you omit this statement from the configuration, the interface requires the peer to initiate an authentication request.

Required Privilege Level

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

RELATED DOCUMENTATION

Configuring Passive Mode
Junos OS Administration Library
### pfc

**Syntax**

```
pfc;
```

**Hierarchy Level**

- `[edit interfaces interface-name ppp-options compression]`
- `[edit interfaces interface-name unit logical-unit-number ppp-options compression]`
- `[edit logical-systems logical-system-name interfaces interface-name unit logical-unit-number ppp-options compression]`

**Release Information**

Statement introduced before Junos OS Release 7.4.

**Description**

For interfaces with PPP encapsulation, configure the router to compress the protocol field to one byte.

**Required Privilege Level**

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

**RELATED DOCUMENTATION**

- *Configuring the PPP Protocol Field Compression*
point-to-point

Syntax

```
point-to-point;
```

Hierarchy Level

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

Release Information
Statement introduced before Junos OS Release 7.4.

Description
For all interfaces except aggregated Ethernet, Fast Ethernet, and Gigabit Ethernet, configure the interface unit as a point-to-point connection. This is the default connection type.

Default
If you omit this statement, the interface unit is configured as a point-to-point connection.

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

RELATED DOCUMENTATION

| Configuring a Point-to-Point Connection | 188 |
| multipoint | 399 |
**policer (Interface)**

**Syntax**

```plaintext
policer {
  arp policer-template-name;
  input policer-template-name;
  output policer-template-name;
}
```

**Hierarchy Level**

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

**Release Information**

Statement introduced before Junos OS Release 7.4.

**Description**

Apply a policer to an interface.

**Options**

*arp policer-template-name*—For inet family only, name of one policer to evaluate when ARP packets are received on the interface.

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

*output policer-template-name*—Name of one policer to evaluate when packets are transmitted 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**

*Applying Policers*

*Configuring Firewall Filters and Policers for VPLS*

*Routing Policies, Firewall Filters, and Traffic Policers User Guide*

*Junos OS Services Interfaces Library for Routing Devices*
preferred-source-address

Syntax

preferred-source-address address;

Hierarchy Level

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

Release Information
Statement introduced in Junos OS Release 9.0.

Description
For unnumbered Ethernet interfaces configured with a loopback interface as the donor interface, specify one of the loopback interface’s secondary addresses as the preferred source address for the unnumbered Ethernet interface. Configuring the preferred source address enables you to use an IP address other than the primary IP address on some of the unnumbered Ethernet interfaces in your network.

Configuration of a preferred source address for unnumbered Ethernet interfaces is supported for the IPv4 and IPv6 address families.

Options
address—Secondary IP address of the donor loopback interface.

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

RELATED DOCUMENTATION

| Configuring a Preferred Source Address for Unnumbered Ethernet or Demux Interfaces | 213 | address
| Junos OS Administration Library |
primary (Interface for Router)

Syntax

primary;

Hierarchy Level

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

Release Information
Statement introduced before Junos OS Release 7.4.

Description
Configure the primary interface for a device. By default, the multicast-capable interface with the lowest-index address is chosen as the primary interface. If there is no such interface, the point-to-point interface with the lowest-index address is chosen. Otherwise, any interface with an address can be picked. In practice, this means that, on the device, the fxp0 or em0 interface is picked by default. To configure a different interface to be the primary interface, you include this statement.

The primary interface for the router has the following characteristics:

- It is the interface through which the packets go out when you type a command such as ping 255.255.255.255—that is, a command that does not include an interface name (there is no interface type-0/0/0.0 qualifier) and where the destination address does not imply any particular outgoing interface.

- It is the interface on which multicast applications running locally on the router, such as Session Announcement Protocol (SAP), perform group joins by default.

- It is the interface from which the default local address is derived for packets sourced out of an unnumbered interface if there are no non-127 addresses configured on the loopback interface, lo0.

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

RELATED DOCUMENTATION

Configuring Default, Primary, and Preferred Addresses and Interfaces | 205
rts

Syntax

rts (assert | de-assert | normal);

Hierarchy Level

[edit interfaces interface-name serial-options dce-options],
[edit interfaces interface-name serial-options dte-options]

Release Information
Statement introduced before Junos OS Release 7.4.

Description
For EIA-530 and V.35 interfaces only, configure the to-DCE signal, request to send (RTS).

Options
assert—The to-DCE signal must be asserted.

de-assert—The to-DCE signal must be deasserted.

normal—Normal RTS signal handling, as defined by the TIA/EIA Standard 530.

Default: normal

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

RELATED DOCUMENTATION

| Configuring the Serial Signal Handling | 288 |
rts-polarity

Syntax

rts-polarity (negative | positive);

Hierarchy Level

[edit interfaces interface-name serial-options]

Release Information
Statement introduced before Junos OS Release 7.4.

Description
Configure RTS signal polarity.

Options

negative—Negative signal polarity.

positive—Positive signal polarity.

Default: positive

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

RELATED DOCUMENTATION

Configuring Serial Signal Polarities  |  292
serial-options

Syntax

```plaintext
serial-options {
  clock-rate rate;
  clocking-mode (dce | loop);
  control-polarity (negative | positive);
  cts-polarity (negative | positive);
  dcd-polarity (negative | positive);
  dce-options {
    control-signal (assert | de-assert | normal);
    cts (ignore | normal | require);
    dcd (ignore | normal | require);
    dsr (ignore | normal | require);
    dtr signal-handling-option;
    ignore-all;
    indication (ignore | normal | require);
    rts (assert | de-assert | normal);
    tm (ignore | normal | require);
  }
  dsr-polarity (negative | positive);
  dte-options {
    control-signal (assert | de-assert | normal);
    cts (ignore | normal | require);
    dcd (ignore | normal | require);
    dtr signal-handling-option;
    ignore-all;
    indication (ignore | normal | require);
    rts (assert | de-assert | normal);
    tm (ignore | normal | require);
  }
  dtr-circuit (balanced | unbalanced);
  dtr-polarity (negative | positive);
  encoding (nrz | nrzi);
  indication-polarity (negative | positive);
  line-protocol protocol;
  loopback (dce-local | dce-remote | local | remote);
  rts-polarity (negative | positive);
  tm-polarity (negative | positive);
  transmit-clock invert;
}
```
[edit interfaces se-pim/0/port]

Release Information
Statement introduced prior to Junos OS Release 7.4.

Description
Configure serial-specific interface properties.

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

Serial Interfaces Overview | 277
no-concatenate
shdsl-options

Syntax

shdsl-options {
    annex (annex-a | annex-b);
    line-rate line-rate;
    loopback (local | remote | payload);
    snr-margin {
        snext margin;
    }
}

Hierarchy Level

[edit interfaces interface-name],
[edit logical-systems logical-system-name interfaces interface-name]

Release Information
Statement introduced in Junos OS Release 7.4.

Description
For J Series Services Routers only, configure symmetric DSL (SHDSL) 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.
**snr-margin**

**Syntax**

```plaintext
snr-margin {
    snext margin;
}
```

**Hierarchy Level**

```plaintext
[edit interfaces interface-name shdsl-options],
[edit logical-systems logical-system-name interfaces interface-name shdsl-options]
```

**Release Information**

Statement introduced in Junos OS Release 7.4.

**Description**

For J Series Services Routers only, configure the SHDSL signal-to-noise ratio (SNR) margin. The SNR margin is the difference between the desired SNR and the actual SNR. Configuring 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.

The remaining statements are explained separately. See CLI Explorer.

**Required Privilege Level**

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

**RELATED DOCUMENTATION**

- *Junos OS Interfaces and Routing Configuration Guide*
### snext

**Syntax**

```
snext margin;
```

**Hierarchy Level**

```
[edit interfaces interface-name shdsl-options snr-margin],
[edit logical-systems logical-system-name interfaces interface-name shdsl-options snr-margin]
```

**Release Information**

Statement introduced in Junos OS Release 7.4.

**Description**

For J Series Services Routers only, configure self-near-end crosstalk (SNEXT) signal-to-noise ratio (SNR) margin for a SHDSL line. When configured, the line trains at higher than SNEXT threshold. The SNR margin is the difference between the desired SNR and the actual SNR.

**Options**

- `margin`—Desired SNEXT margin. Possible values are disabled or a margin between –10dB and 10 dB.

**Default:** disabled

**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 and Routing Configuration Guide*
then

Syntax

```plaintext
then {
   discard;
}
```

Hierarchy Level

```plaintext
[edit firewall hierarchical-policer aggregate],
[edit firewall hierarchical-policer premium]
```

Release Information

Statement introduced in Junos OS Release 9.5.

Description

On M40e, M120, and M320 (with FFPC and SFPC) edge routers and T320, T640, and T1600 core routers with Enhanced Intelligent Queuing (IQE) PICs, discard packets when a specified bandwidth or burst limits for an aggregate level of a hierarchical policer is reached.

Options

discard—Discard packets if condition is met.

Required Privilege Level

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

RELATED DOCUMENTATION

- Applying Policers
- Class of Service User Guide (Routers and EX9200 Switches)
tm

Syntax

tm (ignore | normal | require);

Hierarchy Level

[edit interfaces interface-name serial-options dce-options],
[edit interfaces interface-name serial-options dte-options]

Release Information
Statement introduced before Junos OS Release 7.4.

Description
For EIA-530 interfaces only, configure the from-DCE signal, test-mode (TM).

Options
ignore—The from-DCE signal is ignored.

normal—Normal TM signal handling as defined by the TIA/EIA Standard 530.

require—The from-DCE signal must be asserted.

Default: normal

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

RELATED DOCUMENTATION

 Configuring the Serial Signal Handling | 288
tm-polarity

Syntax

```
tm-polarity (negative | positive);
```

Hierarchy Level

```
[edit interfaces interface-name serial-options]
```

Release Information

Statement introduced before Junos OS Release 7.4.

Description

Configure TM signal polarity.

Options

- **negative**—Negative signal polarity.
- **positive**—Positive signal polarity.

Default: **positive**

Required Privilege Level

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

RELATED DOCUMENTATION

- Configuring Serial Signal Polarities | 292
traceoptions (PPP Process)

Syntax

traceoptions {
    file filename <files number> <match regular-expression> <size size> <world-readable | no-world-readable>;
    flag flag;
    level severity-level;
    no-remote-trace;
}

Hierarchy Level

[edit protocols ppp]

Release Information
Statement introduced in Junos OS Release 7.5.

Description
Define tracing operations for the PPP process.

To specify more than one tracing operation, include multiple flag statements.

You cannot specify a separate trace tile. Tracing information is placed in the system syslog file in the directory /var/log/pppd.

Default
If you do not include this statement, no PPPD-specific tracing operations are performed.

Options
filename—Name of the file to receive the output of the tracing operation. Enclose the name within quotation marks. All files are placed in the directory /var/log. By default, commit script process tracing output is placed in the file ppd. If you include the file statement, you must specify a filename. To retain the default, you can specify eventd as the filename.

files number—(Optional) Maximum number of trace files. When a trace file named trace-file reaches its maximum size, it is renamed trace-file.0, then trace-file.1, and so on, until the maximum number of trace files is reached. Then the oldest trace file is overwritten.

If you specify a maximum number of files, you also must specify a maximum file size with the size option and a filename.

Range: 2 through 1000
Default: 3 files
disable—(Optional) Disable the tracing operation. You can use this option to disable a single operation when you have defined a broad group of tracing operations, such as all.

flag—Tracing operation to perform. To specify more than one tracing operation, include multiple flag statements. The following are the PPPD-specific tracing options.

- access—Access code
- address-pool—Address pool code
- all—All areas of code
- auth—Authentication code
- chap—Challenge Handshake Authentication Protocol (CHAP) code
- config—Configuration code
- ifdb—Interface database code
- lcp—LCP state machine code
- memory—Memory management code
- message—Message processing code
- mlppp—Trace MLPPP code
- ncp—NCP state machine code
- pap—Password Authentication Protocol (PAP) code
- ppp—PPP protocol processing code
- radius—RADIUS processing code
- rtsock—Routing socket code
- session—Session management code
- signal—Signal handling code
- timer—Timer code
- ui—User interface code

match regex—(Optional) Refine the output to include only those lines that match the given regular expression.

size size—(Optional) Maximum size of each trace file, in kilobytes (KB), megabytes (MB), or gigabytes (GB). When a trace file named trace-file reaches this size, it is renamed trace-file.0. When the trace-file again reaches its maximum size, trace-file.0 is renamed trace-file.1 and trace-file is renamed trace-file.0. This renaming scheme continues until the maximum number of trace files is reached. Then the oldest trace file is overwritten.
If you specify a maximum file size, you also must specify a maximum number of trace files with the `files` option and filename.

**Syntax:** `xk` to specify KB, `xm` to specify MB, or `xg` to specify GB

**Range:** 10 KB through 1 GB

**Default:** 128 KB

- **world-readable**—(Optional) Enable unrestricted file access.
- **non-world-readable**—(Optional) By default, log files can be accessed only by the user who configures the tracing operation. Specify **non-world-readable** to reset the default.

**Required Privilege Level**

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

**RELATED DOCUMENTATION**

| Tracing Operations of the pppd Process | 302 |
transmit-clock

Syntax

transmit-clock invert;

Hierarchy Level

[edit interfaces interface-name serial-options]

Release Information

Statement introduced before Junos OS Release 7.4.

Description

Configure the transmit clock signal.

Options

invert—Shift the clock phase 180 degrees.

Required Privilege Level

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

RELATED DOCUMENTATION

 Configuring the Serial Clocking Mode  |  285
unnumbered-address (Demux)

Syntax

unnumbered-address interface-name <preferred-source-address address>;

Hierarchy Level

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

Release Information

Statement introduced in Junos OS Release 8.2.
preferred-source-address option introduced in Junos OS Release 9.0.
IP demultiplexing interfaces supported in Junos OS Release 9.2.

Description

For IP demultiplexing interfaces, enable the local address to be derived from the specified interface. Configuring an unnumbered interface enables IP processing on the interface without assigning an explicit IP address to the interface.

Options

interface-name—Name of the interface from which the local address is derived. The specified interface must have a logical unit number and a configured IP address, and must not be an unnumbered interface.

The preferred-source-address statement is explained separately.

Required Privilege Level

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

RELATED DOCUMENTATION

<table>
<thead>
<tr>
<th>Configuring an Unnumbered Interface</th>
<th>213</th>
</tr>
</thead>
<tbody>
<tr>
<td>address</td>
<td></td>
</tr>
<tr>
<td>Junos System Basics Configuration Guide</td>
<td></td>
</tr>
</tbody>
</table>
vlan-id-list (Ethernet VLAN Circuit)

Syntax

vlan-id-list [vlan-id vlan-id–vlan-id];

Hierarchy Level

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

Release Information

Statement introduced in Junos OS Release 9.5.

Description

Binds a single-tag logical interface to a list of VLAN IDs. Configures a logical interface to receive and forward any tag frame whose VLAN ID tag matches the list of VLAN IDs you specify.

NOTE:

When you create a circuit cross-connect (CCC) using VLAN-bundled single-tag logical interfaces on Layer 2 VPN routing instances, the circuit automatically uses ethernet encapsulation. For Layer 2 VPN, you need to include the encapsulation-type statement and specify the value ethernet at either of the following hierarchy levels:

- [edit routing-instances routing-instance-name protocols l2vpn]
- [edit logical-systems logical-system-name routing-instances routing-instance-name protocols l2vpn]

For more information about the encapsulation-type configuration statement and the Layer 2 encapsulation types ethernet and ethernet-vlan, see the Junos OS VPNs Library for Routing Devices.

Options

[vlan-id vlan-id–vlan-id]—A list of valid VLAN ID numbers. Specify the VLAN IDs individually by using a space to separate each ID, as an inclusive list by separating the starting VLAN ID and ending VLAN ID with a hyphen, or as a combination of both.

Range: 1 through 4094. VLAN ID 0 is reserved for tagging the priority of frames.
NOTE: Configuring **vlan-id-list** with the entire vlan-id range is an unnecessary waste of system resources and is not best practice. It should be used only when a subset of VLAN IDs (not the entire range) needs to be associated with a logical interface. If you specify the entire range (1-4094), it has the same result as not specifying a range; however, it consumes PFE resources such as VLAN lookup tables entries, and so on.

The following examples illustrate this further:

```
[edit interfaces interface-name]
vlan-tagging;
unit number {
    vlan-id-range 1-4094;
}
```

```
[edit interfaces interface-name]
unit 0;
```

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

**RELATED DOCUMENTATION**

- Binding VLAN IDs to Logical Interfaces
- encapsulation (Logical Interface)
- encapsulation-type (Layer 2 VPN routing instance), see the Junos OS VPNs Library for Routing Devices
- flexible-vlan-tagging
- vlan-tagging
- vlan-tags (Dual-Tagged Logical Interface)
Common Output Fields Description

This chapter explains the content of the output fields, which appear in the output of most `show interfaces` commands.

**Damping Field**

For the physical interface, the Damping field shows the setting of the following damping parameters:

- **half-life**—Decay half-life. The number of seconds after which the accumulated interface penalty counter is reduced by half if the interface remains stable.

- **max-suppress**—Maximum hold-down time. The maximum number of seconds that an interface can be suppressed irrespective of how unstable the interface has been.

- **reuse**—Reuse threshold. When the accumulated interface penalty counter falls below this number, the interface is no longer suppressed.

- **suppress**—Cutoff (suppression) threshold. When the accumulated interface penalty counter exceeds this number, the interface is suppressed.

- **state**—Interface damping state. If damping is enabled on an interface, it is suppressed during interface flaps that match the configured damping parameters.
Destination Class Field

For the logical interface, the **Destination class** field provides the names of destination class usage (DCU) counters per family and per class for a particular interface. The counters display packets and bytes arriving from designated user-selected prefixes. For example:

<table>
<thead>
<tr>
<th>Destination class</th>
<th>Packets (packet-per-second)</th>
<th>Bytes (bits-per-second)</th>
</tr>
</thead>
<tbody>
<tr>
<td>gold</td>
<td>1928095</td>
<td>161959980</td>
</tr>
<tr>
<td></td>
<td>(889)</td>
<td>(597762)</td>
</tr>
<tr>
<td>bronze</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>(0)</td>
<td>(0)</td>
</tr>
<tr>
<td>silver</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>(0)</td>
<td>(0)</td>
</tr>
</tbody>
</table>

Enabled Field

For the physical interface, the **Enabled** field provides information about the state of the interface, displaying one or more of the following values:

- **Administratively down, Physical link is Down**—The interface is turned off, and the physical link is inoperable and cannot pass packets even when it is enabled. To change the interface state to **Enabled**, use the following command:

  ```
  user@host# set interfaces interface enable
  ```

  Manually verify the connections to bring the physical link up.

- **Administratively down, Physical link is Up**—The interface is turned off, but the physical link is operational and can pass packets when it is enabled. To change the interface state to **Enabled**, use the following command:

  ```
  user@host# set interfaces interface enable
  ```

- **Enabled, Physical link is Down**—The interface is turned on, but the physical link is inoperable and cannot pass packets. Manually verify the connections to bring the physical link up.

- **Enabled, Physical link is Up**—The interface is turned on, and the physical link is operational and can pass packets.
Filters Field

For the logical interface, the Filters field provides the name of the firewall filters to be evaluated when packets are received or transmitted on the interface. The format is Filters: Input: filter-name and Filters: Output: filter-name. For example:

```
Filters: Input: sample-all
Filters: Output: cp-ftp
```

Flags Fields

The following sections provide information about flags that are specific to interfaces:

**Addresses, Flags Field**

The Addresses, Flags field provides information about the addresses configured for the protocol family on the logical interface and displays one or more of the following values:

- **Dest-route-down**—The routing process detected that the link was not operational and changed the interface routes to nonforwarding status.
- **Is-Default**—The default address of the router used as the source address by SNMP, ping, traceroute, and other network utilities.
- **Is-Preferred**—The default local address for packets originating from the local router and sent to destinations on the subnet.
- **Is-Primary**—The default local address for broadcast and multicast packets originated locally and sent out the interface.
- **Preferred**—This address is a candidate to become the preferred address.
- **Primary**—This address is a candidate to become the primary address.
- **Trunk**—Interface is a trunk.
- **Trunk, Inter-Switch-Link**—Interface is a trunk, and InterSwitch Link protocol (ISL) is configured on the trunk port of the primary VLAN in order to connect the routers composing the PVLAN to each other.

**Device Flags Field**
The **Device flags** field provides information about the physical device and displays one or more of the following values:

- **ASIC Error**—Device is down because of ASIC wedging and due to which PFE is disabled.
- **Down**—Device has been administratively disabled.
- **Hear-Own-Xmit**—Device receives its own transmissions.
- **Link-Layer-Down**—The link-layer protocol has failed to connect with the remote endpoint.
- **Loopback**—Device is in physical loopback.
- **Loop-Detected**—The link layer has received frames that it sent, thereby detecting a physical loopback.
- **No-Carrier**—On media that support carrier recognition, no carrier is currently detected.
- **No-Multicast**—Device does not support multicast traffic.
- **Present**—Device is physically present and recognized.
- **Promiscuous**—Device is in promiscuous mode and recognizes frames addressed to all physical addresses on the media.
- **Quench**—Transmission on the device is quenched because the output buffer is overflowing.
- **Recv-All-Multicasts**—Device is in multicast promiscuous mode and therefore provides no multicast filtering.
- **Running**—Device is active and enabled.

**Family Flags Field**
The **Family flags** field provides information about the protocol family on the logical interface and displays one or more of the following values:

- **DCU**—Destination class usage is enabled.
- **Dest-route-down**—The software detected that the link is down and has stopped forwarding the link's interface routes.
- **Down**—Protocol is inactive.
- **Is-Primary**—Interface is the primary one for the protocol.
- **Mac-Validate-Loose**—Interface is enabled with loose MAC address validation.
- **Mac-Validate-Strict**—Interface is enabled with strict MAC address validation.
• **Maximum labels**—Maximum number of MPLS labels configured for the MPLS protocol family on the logical interface.

• **MTU-Protocol-Adjusted**—The effective MTU is not the configured value in the software.

• **No-Redirects**—Protocol redirects are disabled.

• **Primary**—Interface can be considered for selection as the primary family address.

• **Protocol-Down**—Protocol failed to negotiate correctly.

• **SCU-in**—Interface is configured for source class usage input.

• **SCU-out**—Interface is configured for source class usage output.

• **send-bcast-packet-to-re**—Interface is configured to forward IPv4 broadcast packets to the Routing Engine.

• **targeted-broadcast**—Interface is configured to forward IPv4 broadcast packets to the LAN interface and the Routing Engine.

• **Unnumbered**—Protocol family is configured for unnumbered Ethernet. An unnumbered Ethernet interface borrows an IPv4 address from another interface, which is referred to as the donor interface.

• **Up**—Protocol is configured and operational.

• **uRPF**—Unicast Reverse Path Forwarding is enabled.

**Interface Flags Field**

The **Interface flags** field provides information about the physical interface and displays one or more of the following values:

• **Admin-Test**—Interface is in test mode and some sanity checking, such as loop detection, is disabled.

• **Disabled**—Interface is administratively disabled.

• **Down**—A hardware failure has occurred.

• **Hardware-Down**—Interface is nonfunctional or incorrectly connected.

• **Link-Layer-Down**—Interface keepalives have indicated that the link is incomplete.

• **No-Multicast**—Interface does not support multicast traffic.

• **No-receive No-transmit**—Passive monitor mode is configured on the interface.

• **OAM-On-SVLAN**—(MX Series routers with MPC/MIC interfaces only) Interface is configured to propagate the Ethernet OAM state of a static, single-tagged service VLAN (S-VLAN) on a Gigabit Ethernet, 10-Gigabit Ethernet, or aggregated Ethernet interface to a dynamic or static double-tagged customer VLAN (C-VLAN) that has the same S-VLAN (outer) tag as the S-VLAN.

• **Point-To-Point**—Interface is point-to-point.

• **Pop all MPLS labels from packets of depth**—MPLS labels are removed as packets arrive on an interface that has the **pop-all-labels** statement configured. The depth value can be one of the following:
• **1**—Takes effect for incoming packets with one label only.

• **2**—Takes effect for incoming packets with two labels only.

• **[1 2]**—Takes effect for incoming packets with either one or two labels.

• **Promiscuous**—Interface is in promiscuous mode and recognizes frames addressed to all physical addresses.

• **Recv-All-Multicasts**—Interface is in multicast promiscuous mode and provides no multicast filtering.

• **SNMP-Traps**—SNMP trap notifications are enabled.

• **Up**—Interface is enabled and operational.

**Link Flags Field**
The **Link flags** field provides information about the physical link and displays one or more of the following values:

• **ACFC**—Address control field compression is configured. The Point-to-Point Protocol (PPP) session negotiates the ACFC option.

• **Give-Up**—Link protocol does not continue connection attempts after repeated failures.

• **Loose-LCP**—PPP does not use the Link Control Protocol (LCP) to indicate whether the link protocol is operational.

• **Loose-LMI**—Frame Relay does not use the Local Management Interface (LMI) to indicate whether the link protocol is operational.

• **Loose-NCP**—PPP does not use the Network Control Protocol (NCP) to indicate whether the device is operational.

• **No-Keepalives**—Link protocol keepalives are disabled.

• **PFC**—Protocol field compression is configured. The PPP session negotiates the PFC option.

**Logical Interface Flags Field**
The **Logical interface flags** field provides information about the logical interface and displays one or more of the following values:

• **ACFC Encapsulation**—Address control field Compression (ACFC) encapsulation is enabled (negotiated successfully with a peer).

• **Device-down**—Device has been administratively disabled.

• **Disabled**—Interface is administratively disabled.

• **Down**—A hardware failure has occurred.

• **Clear-DF-Bit**—GRE tunnel or IPsec tunnel is configured to clear the Don't Fragment (DF) bit.

• **Hardware-Down**—Interface protocol initialization failed to complete successfully.

• **PFC**—Protocol field compression is enabled for the PPP session.
- Point-To-Point—Interface is point-to-point.
- SNMP-Traps—SNMP trap notifications are enabled.
- Up—Interface is enabled and operational.

**Label-Switched Interface Traffic Statistics Field**

When you use the `vrf-table-label` statement to configure a VRF routing table, a label-switched interface (LSI) logical interface label is created and mapped to the VRF routing table.

Any routes present in a VRF routing table and configured with the `vrf-table-label` statement are advertised with the LSI logical interface label allocated for the VRF routing table. When packets for this VPN arrive on a core-facing interface, they are treated as if the enclosed IP packet arrived on the LSI interface and are then forwarded and filtered based on the correct table. For more information on the `vrf-table-label` statement, including a list of supported interfaces, see the *Junos VPNs Configuration Guide*.

If you configure the `family mpls` statement at the `[edit interfaces interface-name unit logical-unit-number]` hierarchy level and you also configure the `vrf-table-label` statement at the `[edit routing-instances routing-instance-name]` hierarchy level, the output for the `show interface interface-name extensive` command includes the following output fields about the LSI traffic statistics:

- **Input bytes**—Number of bytes entering the LSI and the current throughput rate in bits per second (bps).
- **Input packets**—Number of packets entering the LSI and the current throughput rate in packets per second (pps).

**NOTE:** If LSI interfaces are used with VPLS when `no-tunnel-services` is configured or L3VPN when `vrf-table-label` configuration is applied inside the routing-instance, the **Input packets** field associated with the core-facing interfaces may not display the correct value. Only the Input counter is affected because the LSI is used to receive traffic from the remote PEs. Traffic that arrives on an LSI interface might not be counted at both the Traffic Statistics and the Label-switched interface (LSI) traffic statistics levels.

This note applies to the following platforms:

- M Series routers with -E3 FPC model numbers or configured with an Enhanced CFEB (CFEB-E), and M120 routers
- MX Series routers with DPC or ADPC only

The following example shows the LSI traffic statistics that you might see as part of the output of the `show interface interface-name extensive` command:
Label-switched interface (LSI) traffic statistics:

| Input bytes: | 0 | 0 bps |
| Input packets: | 0 | 0 pps |

**Policer Field**

For the logical interface, the Policer field provides the policers that are to be evaluated when packets are received or transmitted on the interface. The format is **Policer: Input: type-fpc/picport-in-policer, Output: type-fpc/pic/port-out-policer**. For example:

```
```

**Protocol Field**

For the logical interface, the Protocol field indicates the protocol family or families that are configured on the interface, displaying one or more of the following values:

- **aenet**—Aggregated Ethernet. Displayed on Fast Ethernet interfaces that are part of an aggregated Ethernet bundle.
- **ccc**—Circuit cross-connect (CCC). Configured on the logical interface of CCC physical interfaces.
- **inet**—IP version 4 (IPv4). Configured on the logical interface for IPv4 protocol traffic, including Open Shortest Path First (OSPF), Border Gateway Protocol (BGP), Internet Control Message Protocol (ICMP), and Internet Protocol Control Protocol (IPCP).
- **inet6**—IP version 6 (IPv6). Configured on the logical interface for IPv6 protocol traffic, including Routing Information Protocol for IPv6 (RIPng), Intermediate System-to-Intermediate System (IS-IS), and BGP.
- **iso**—International Organization for Standardization (ISO). Configured on the logical interface for IS-IS traffic.
- **mlfr-uni-nni**—Multilink Frame Relay (MLFR) FRF.16 user-to-network network-to-network (UNI NNI). Configured on the logical interface for link services bundling.
- **mlfr-end-to-end**—Multilink Frame Relay end-to-end. Configured on the logical interface for multilink bundling.
- **mlppp**—Multilink Point-to-Point Protocol (MLPPP). Configured on the logical interface for multilink bundling.
- **mpls**—Multiprotocol Label Switching (MPLS). Configured on the logical interface for participation in an MPLS path.
- **pppoe**—Point-to-Point Protocol over Ethernet (PPPoE). Configured on Ethernet interfaces enabled to support multiple protocol families.
- **tcc**—Translational cross-connect (TCC). Configured on the logical interface of TCC physical interfaces.

- **tnp**—Trivial Network Protocol (TNP). Used to communicate between the Routing Engine and the router’s packet forwarding components. The Junos OS automatically configures this protocol family on the router’s internal interfaces only.

- **vpls**—Virtual private LAN service (VPLS). Configured on the logical interface on which you configure VPLS.

**RPF Failures Field**

For the logical interface, the **RPF Failures** field provides information about the amount of incoming traffic (in packets and bytes) that failed a unicast reverse path forwarding (RPF) check on a particular interface. The format is **RPF Failures: Packets: xx, Bytes: yy**. For example:

```
RPF Failures: Packets: 0, Bytes: 0
```

**Source Class Field**

For the logical interface, the **Source class** field provides the names of source class usage (SCU) counters per family and per class for a particular interface. The counters display packets and bytes arriving from designated user-selected prefixes. For example:

<table>
<thead>
<tr>
<th>Source class</th>
<th>Packets (packet-per-second)</th>
<th>Bytes (bits-per-second)</th>
</tr>
</thead>
<tbody>
<tr>
<td>gold</td>
<td>1928095</td>
<td>161959980</td>
</tr>
<tr>
<td></td>
<td>(889)</td>
<td>(597762)</td>
</tr>
<tr>
<td>bronze</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>(0)</td>
<td>(0)</td>
</tr>
<tr>
<td>silver</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>(0)</td>
<td>(0)</td>
</tr>
</tbody>
</table>

**Improvements to Interface Transmit Statistics Reporting**

The offered load on an interface can be defined as the amount of data the interface is capable of transmitting during a given time period. The actual traffic that goes out of the interface is the transmitted load. However, when outgoing interfaces are oversubscribed, there could be traffic drops in the schedulers attached to the outgoing interfaces. Hence, the offered load is not always the same as the actual transmitted load because the offered load calculation does not take into account possible packet drop or traffic loss.
On MX Series routers, the logical interface-level statistics show the offered load, which is often different from the actual transmitted load. To address this limitation, Junos OS introduces a new configuration option in Release 11.4 R3 and later. The new configuration option, `interface-transmit-statistics`, at the `[edit interface interface-name]` hierarchy level, enables you to configure Junos OS to accurately capture and report the transmitted load on interfaces.

When the `interface-transmit-statistics` statement is included at the `[edit interface interface-name]` hierarchy level, the following operational mode commands report the actual transmitted load:

- `show interface interface-name <detail | extensive>`
- `monitor interface interface-name`
- `show snmp mib get objectID.ifIndex`

The `show interface interface-name` command also shows whether the `interface-transmit-statistics` configuration is enabled or disabled on the interface.

RELATED DOCUMENTATION

- `interface-transmit-statistics` | 386
- `show interfaces`
show interfaces (PTX Series Packet Transport Routers)

Syntax

show interfaces et-fpc/pic/port
<brief | detail | extensive | terse>
<descriptions>
<media>
<snmp-index snmp-index>
<statistics>

Release Information
Command introduced in Junos OS Release 8.0.
Command introduced in Junos OS Release 12.1 for PTX Series Packet Transport Routers.

Description
(PTX Series Packet Transport Routers only) Display status information about the specified Ethernet interface.

Options
et-fpc/pic/port—Display standard information about the specified Ethernet interface.

brief | detail | extensive | terse—(Optional) Display the specified level of output.

descriptions—(Optional) Display interface description strings.

media—(Optional) Display media-specific information about network interfaces.

snmp-index snmp-index—(Optional) Display information for the specified SNMP index of the interface.

statistics—(Optional) Display static interface statistics.

Required Privilege Level
view

List of Sample Output
show interfaces brief (PTX5000 Packet Transport Router) on page 449
show interfaces extensive (PTX5000 Packet Transport Router) on page 449
show interfaces terse (PTX5000 Packet Transport Router) on page 451
show interfaces extensive (Junos OS Evolved) on page 455

Output Fields
See Table 25 on page 438 for the output fields for the show interfaces (PTX Series Packet Transport Routers) command.
Table 25: show interfaces PTX Series Output Fields

<table>
<thead>
<tr>
<th>Field Name</th>
<th>Field Description</th>
<th>Level of Output</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Physical Interface</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Physical interface</td>
<td>Name of the physical interface.</td>
<td>All levels</td>
</tr>
<tr>
<td>Enabled</td>
<td>State of the interface. Possible values are described in the “Enabled Field” section under “Common Output Fields Description” on page 427.</td>
<td>All levels</td>
</tr>
<tr>
<td>Interface index</td>
<td>Index number of the physical interface, which reflects its initialization sequence.</td>
<td>detail extensive none</td>
</tr>
<tr>
<td>SNMP ifIndex</td>
<td>SNMP index number for the physical interface.</td>
<td>detail extensive none</td>
</tr>
<tr>
<td>Generation</td>
<td>Unique number for use by Juniper Networks technical support only.</td>
<td>detail extensive</td>
</tr>
<tr>
<td>Link-level type</td>
<td>Encapsulation being used on the physical interface.</td>
<td>All levels</td>
</tr>
<tr>
<td>MTU</td>
<td>Maximum transmission unit size on the physical interface.</td>
<td>All levels</td>
</tr>
<tr>
<td>Speed</td>
<td>Speed at which the interface is running.</td>
<td>All levels</td>
</tr>
<tr>
<td>BPDU Error</td>
<td>Bridge protocol data unit (BPDU) errors (if any).</td>
<td>All levels</td>
</tr>
<tr>
<td>MAC-Rewrite</td>
<td>MAC Rewrite errors (if any).</td>
<td>All levels</td>
</tr>
<tr>
<td>Loopback</td>
<td>Loopback status: <strong>Enabled</strong> or <strong>Disabled</strong>. If loopback is enabled, type of loopback: <strong>Local</strong> or <strong>Remote</strong>.</td>
<td>All levels</td>
</tr>
<tr>
<td>Source filtering</td>
<td>Source filtering status: <strong>Enabled</strong> or <strong>Disabled</strong>.</td>
<td>All levels</td>
</tr>
<tr>
<td>Flow control</td>
<td>Flow control status: <strong>Enabled</strong> or <strong>Disabled</strong>.</td>
<td>All levels</td>
</tr>
<tr>
<td>Device flags</td>
<td>Information about the physical device. Possible values are described in the “Device Flags” section under “Common Output Fields Description” on page 427.</td>
<td>All levels</td>
</tr>
<tr>
<td>Interface flags</td>
<td>Information about the interface. Possible values are described in the “Interface Flags” section under “Common Output Fields Description” on page 427.</td>
<td>All levels</td>
</tr>
<tr>
<td>Link flags</td>
<td>Information about the link. Possible values are described in the “Links Flags” section under “Common Output Fields Description” on page 427.</td>
<td>All levels</td>
</tr>
<tr>
<td>Field Name</td>
<td>Field Description</td>
<td>Level of Output</td>
</tr>
<tr>
<td>----------------------</td>
<td>----------------------------------------------------------------------------------</td>
<td>----------------------</td>
</tr>
<tr>
<td>CoS queues</td>
<td>Number of CoS queues configured.</td>
<td>detail extensive</td>
</tr>
<tr>
<td>Hold-times</td>
<td>Current interface hold-time up and hold-time down, in milliseconds.</td>
<td>detail extensive</td>
</tr>
<tr>
<td>Current address</td>
<td>Configured MAC address.</td>
<td>detail extensive</td>
</tr>
<tr>
<td>Hardware address</td>
<td>Hardware MAC address.</td>
<td>detail extensive</td>
</tr>
<tr>
<td>Last flapped</td>
<td>Date, time, and how long ago the interface went from down to up. The format is</td>
<td>detail extensive</td>
</tr>
<tr>
<td>Statistics last</td>
<td>Time when the statistics for the interface were last set to zero.</td>
<td>detail extensive</td>
</tr>
<tr>
<td>cleared</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Traffic statistics</td>
<td>Number and rate of bytes and packets received and transmitted on the physical</td>
<td>detail extensive</td>
</tr>
<tr>
<td></td>
<td>interface.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Input bytes—Number of bytes received on the interface.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Output bytes—Number of bytes transmitted on the interface.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Input packets—Number of packets received on the interface.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Output packets—Number of packets transmitted on the interface.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>NOTE: Input bytes and output bytes are counted as Layer 3 packet length.</td>
<td></td>
</tr>
</tbody>
</table>
Table 25: show interfaces PTX Series Output Fields (continued)

<table>
<thead>
<tr>
<th>Field Name</th>
<th>Field Description</th>
<th>Level of Output</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Input errors</strong></td>
<td>Input errors on the interface. The following paragraphs explain the counters whose meaning might not be obvious:</td>
<td>extensive</td>
</tr>
<tr>
<td></td>
<td>• <strong>Errors</strong>—Sum of the incoming frame aborts and FCS errors.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• <strong>Drops</strong>—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.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• <strong>Framing errors</strong>—Number of packets received with an invalid frame checksum (FCS).</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• <strong>Runts</strong>—Number of frames received that are smaller than the runt threshold.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• <strong>Policed discards</strong>—Number of frames that the incoming packet match code discarded because they were not recognized or not of interest. Usually, this field reports protocols that the Junos OS does not handle.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• <strong>L3 incompletes</strong>—Number of incoming packets discarded because they failed Layer 3 (usually IPv4) sanity checks of the header. For example, a frame with less than 20 bytes of available IP header is discarded. L3 incomplete errors can be ignored by configuring the ignore-l3-incompletes statement. NOTE: The L3 incompletes field is not supported on PTX Series Packet Transport Routers.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• <strong>L2 channel errors</strong>—Number of times the software did not find a valid logical interface for an incoming frame.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• <strong>L2 mismatch timeouts</strong>—Number of malformed or short packets that caused the incoming packet handler to discard the frame as unreadable.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• <strong>FIFO errors</strong>—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.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• <strong>Resource errors</strong>—Sum of transmit drops.</td>
<td></td>
</tr>
</tbody>
</table>
### Table 25: show interfaces PTX Series Output Fields (continued)

<table>
<thead>
<tr>
<th>Field Name</th>
<th>Field Description</th>
<th>Level of Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output errors</td>
<td>Output errors on the interface. The following paragraphs explain the counters whose meaning might not be obvious:</td>
<td>extensive</td>
</tr>
<tr>
<td></td>
<td>• <strong>Carrier transitions</strong>—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.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• <strong>Errors</strong>—Sum of the outgoing frame aborts and FCS errors.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• <strong>Drops</strong>—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.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• <strong>Collisions</strong>—Number of Ethernet collisions. The Gigabit Ethernet PIC supports only full-duplex operation, so for Gigabit Ethernet PICs, this number should always remain 0. If it is nonzero, there is a software bug.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• <strong>Aged packets</strong>—Number of packets that remained in shared packet SDRAM so long that the system automatically purged them. The value in this field should never increment. If it does, it is most likely a software bug or possibly malfunctioning hardware.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• <strong>FIFO errors</strong>—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.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• <strong>HS link CRC errors</strong>—Number of errors on the high-speed links between the ASICs responsible for handling the router interfaces.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• <strong>MTU errors</strong>—Number of packets whose size exceeded the MTU of the interface.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• <strong>Resource errors</strong>—Sum of transmit drops.</td>
<td></td>
</tr>
</tbody>
</table>

<p>| Egress queues     | Total number of egress queues supported on the specified interface.                                                                                                                                               | detail extensive|
| Queue counters    | CoS queue number and its associated user-configured forwarding class name.                                                                                                                                       | detail extensive|
| (Egress)          |                                                                                                                                                                                                                 |                 |
|                   | • <strong>Queued packets</strong>—Number of queued packets.                                                                                                                                                                   |                 |
|                   | • <strong>Transmitted packets</strong>—Number of transmitted packets.                                                                                                                                                         |                 |
|                   | • <strong>Dropped packets</strong>—Number of packets dropped by the ASIC’s RED mechanism.                                                                                                                                     |                 |
| Ingress queues    | Total number of ingress queues supported on the specified interface.                                                                                                                                              | extensive       |</p>
<table>
<thead>
<tr>
<th>Field Name</th>
<th>Field Description</th>
<th>Level of Output</th>
</tr>
</thead>
</table>
| **Queue counters** *(Ingress)*   | **CoS queue number and its associated user-configured forwarding class name.**  
  *Queued packets*—Number of queued packets.  
  *Transmitted packets*—Number of transmitted packets.  
  *Dropped packets*—Number of packets dropped by the ASIC’s RED mechanism.                                                                                         | extensive       |
| **Active alarms** and **Active defects** | Ethernet-specific defects that can prevent the interface from passing packets. When a defect persists for a certain amount of time, it is promoted to an alarm. Based on the router configuration, an alarm can ring the red or yellow alarm bell on the router, or turn on the red or yellow alarm LED on the craft interface. These fields can contain the value None or Link.  
  *None*—There are no active defects or alarms.  
  *Link*—Interface has lost its link state, which usually means that the cable is unplugged, the far-end system has been turned off, or the PIC is malfunctioning.  
  *LOCAL-FAULT*—Link fault signaling operates between the remote PHY RS (Reconciliation sub-layer) and the local RS. A Local Fault is used to signal a detected fault between the remote RS and the local RS to the local Ethernet interface.  
  *REMOTE-FAULT*—When the Local Fault status reaches an RS, the RS stops sending MAC data and continuously generates the Remote Fault status on the transmit data path. | detail extensive none |
Table 25: show interfaces PTX Series Output Fields (continued)

<table>
<thead>
<tr>
<th>Field Name</th>
<th>Field Description</th>
<th>Level of Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>MAC statistics</td>
<td><strong>Receive</strong> and <strong>Transmit</strong> statistics reported by the PIC's MAC subsystem, including the following:</td>
<td>extensive</td>
</tr>
<tr>
<td></td>
<td>- <strong>Total octets</strong> and <strong>total packets</strong>—Total number of octets and packets.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- <strong>Unicast packets</strong>, <strong>Broadcast packets</strong>, and <strong>Multicast packets</strong>—Number of unicast, broadcast, and multicast packets.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- <strong>CRC/Align errors</strong>—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).</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- <strong>FIFO error</strong>—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.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- <strong>MAC control frames</strong>—Number of MAC control frames.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- <strong>MAC pause frames</strong>—Number of MAC control frames with pause operational code.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- <strong>Oversized frames</strong>—Number of frames that exceed 1518 octets.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- <strong>Jabber frames</strong>—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.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- <strong>Fragment frames</strong>—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.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- <strong>VLAN tagged frames</strong>—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.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- <strong>Code violations</strong>—Number of times an event caused the PHY to indicate “Data reception error” or “invalid data symbol error.”</td>
<td></td>
</tr>
</tbody>
</table>
Table 25: show interfaces PTX Series Output Fields (continued)

<table>
<thead>
<tr>
<th>Field Name</th>
<th>Field Description</th>
<th>Level of Output</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Filter statistics</strong></td>
<td><strong>Receive</strong> and <strong>Transmit</strong> 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.</td>
<td>extensive</td>
</tr>
<tr>
<td></td>
<td>- <strong>Input packet count</strong>—Number of packets received from the MAC hardware that the filter processed.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- <strong>Input packet rejects</strong>—Number of packets that the filter rejected because of either the source MAC address or the destination MAC address.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- <strong>Input DA rejects</strong>—Number of packets that the filter rejected because the destination MAC address of the packet is not on the accept list. It is normal for this value to increment. When it increments very quickly and no traffic is entering the router from the far-end system, either there is a bad ARP entry on the far-end system, or multicast routing is not on and the far-end system is sending many multicast packets to the local router (which the router is rejecting).</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- <strong>Input SA rejects</strong>—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.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- <strong>Output packet count</strong>—Number of packets that the filter has given to the MAC hardware.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- <strong>Output packet pad count</strong>—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.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- <strong>Output packet error count</strong>—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.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- <strong>CAM destination filters, CAM source filters</strong>—Number of entries in the CAM dedicated to destination and source MAC address filters. There can only be up to 64 source entries. If source filtering is disabled, which is the default, the values for these fields should be 0.</td>
<td></td>
</tr>
</tbody>
</table>
### Table 25: show interfaces PTX Series Output Fields (continued)

<table>
<thead>
<tr>
<th>Field Name</th>
<th>Field Description</th>
<th>Level of Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>Autonegotiation information</td>
<td>Information about link autonegotiation.</td>
<td>extensive</td>
</tr>
<tr>
<td></td>
<td>• <strong>Negotiation status:</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• <strong>Incomplete</strong>—Ethernet interface has the speed or link mode configured.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• <strong>No autonegotiation</strong>—Remote Ethernet interface has the speed or link mode configured, or does not perform autonegotiation.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• <strong>Complete</strong>—Ethernet interface is connected to a device that performs autonegotiation and the autonegotiation process is successful.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• <strong>Link partner status</strong>—<strong>OK</strong> when Ethernet interface is connected to a device that performs autonegotiation and the autonegotiation process is successful.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• <strong>Link partner:</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• <strong>Link mode</strong>—Depending on the capability of the attached Ethernet device, either <strong>Full-duplex</strong> or <strong>Half-duplex</strong>.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• <strong>Flow control</strong>—Types of flow control supported by the remote Ethernet device. For Fast Ethernet interfaces, the type is <strong>None</strong>. For Gigabit Ethernet interfaces, types are <strong>Symmetric</strong> (link partner supports <strong>PAUSE</strong> on receive and transmit), <strong>Asymmetric</strong> (link partner supports <strong>PAUSE</strong> on transmit), and <strong>Symmetric/Asymmetric</strong> (link partner supports both <strong>PAUSE</strong> on receive and transmit or only <strong>PAUSE</strong> receive).</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• <strong>Remote fault</strong>—Remote fault information from the link partner—<strong>Failure</strong> indicates a receive link error. <strong>OK</strong> indicates that the link partner is receiving. <strong>Negotiation error</strong> indicates a negotiation error. <strong>Offline</strong> indicates that the link partner is going offline.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• <strong>Local resolution</strong>—Information from the link partner:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• <strong>Flow control</strong>—Types of flow control supported by the remote Ethernet device. For Gigabit Ethernet interfaces, types are <strong>Symmetric</strong> (link partner supports <strong>PAUSE</strong> on receive and transmit), <strong>Asymmetric</strong> (link partner supports <strong>PAUSE</strong> on transmit), and <strong>Symmetric/Asymmetric</strong> (link partner supports both <strong>PAUSE</strong> on receive and transmit or only <strong>PAUSE</strong> receive).</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• <strong>Remote fault</strong>—Remote fault information. <strong>Link OK</strong> (no error detected on receive), <strong>Offline</strong> (local interface is offline), and <strong>Link Failure</strong> (link error detected on receive).</td>
<td></td>
</tr>
</tbody>
</table>
### Table 25: show interfaces PTX Series Output Fields (continued)

<table>
<thead>
<tr>
<th>Field Name</th>
<th>Field Description</th>
<th>Level of Output</th>
</tr>
</thead>
</table>
| **Packet Forwarding Engine configuration** | Information about the configuration of the Packet Forwarding Engine:  
  - **Destination slot**—FPC slot number. | extensive |
| **CoS information** | Information about the CoS queue for the physical interface.  
  - **CoS transmit queue**—Queue number and its associated user-configured forwarding class name.  
  - **Bandwidth %**—Percentage of bandwidth allocated to the queue.  
  - **Bandwidth bps**—Bandwidth allocated to the queue (in bps).  
  - **Buffer %**—Percentage of buffer space allocated to the queue.  
  - **Buffer usec**—Amount of buffer space allocated to the queue, in microseconds. This value is nonzero only if the buffer size is configured in terms of time.  
  - **Priority**—Queue priority: **low** or **high**.  
  - **Limit**—Displayed if rate limiting is configured for the queue. Possible values are **none** and **exact**. If **exact** is configured, the queue transmits only up to the configured bandwidth, even if excess bandwidth is available. If **none** is configured, the queue transmits beyond the configured bandwidth if bandwidth is available. | extensive |

### Logical Interface

<table>
<thead>
<tr>
<th>Field Name</th>
<th>Field Description</th>
<th>Level of Output</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Logical interface</strong></td>
<td>Name of the logical interface.</td>
<td>All levels</td>
</tr>
</tbody>
</table>
| **Index** | Index number of the logical interface, which reflects its initialization sequence. | **detail extensive**  
  - **none** |
| **SNMP ifIndex** | SNMP interface index number for the logical interface. | **detail extensive**  
  - **none** |
| **Generation** | Unique number for use by Juniper Networks technical support only. | **detail extensive** |
| **Flags** | Information about the logical interface. Possible values are described in the “Logical Interface Flags” section under “Common Output Fields Description” on page 427. | All levels |
### Table 25: show interfaces PTX Series Output Fields (continued)

<table>
<thead>
<tr>
<th>Field Name</th>
<th>Field Description</th>
<th>Level of Output</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>VLAN-Tag</strong></td>
<td>Rewrite profile applied to incoming or outgoing frames on the outer (Out) VLAN tag or for both the outer and inner (In) VLAN tags.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• <strong>push</strong>—An outer VLAN tag is pushed in front of the existing VLAN tag.</td>
<td>brief detail extensive none</td>
</tr>
<tr>
<td></td>
<td>• <strong>pop</strong>—The outer VLAN tag of the incoming frame is removed.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• <strong>swap</strong>—The outer VLAN tag of the incoming frame is overwritten with the user-specified VLAN tag information.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• <strong>push</strong>—An outer VLAN tag is pushed in front of the existing VLAN tag.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• <strong>push-push</strong>—Two VLAN tags are pushed in from the incoming frame.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• <strong>swap-push</strong>—The outer VLAN tag of the incoming frame is replaced by a user-specified VLAN tag value. A user-specified outer VLAN tag is pushed in front. The outer tag becomes an inner tag in the final frame.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• <strong>swap-swap</strong>—Both the inner and the outer VLAN tags of the incoming frame are replaced by the user-specified VLAN tag value.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• <strong>pop-swap</strong>—The outer VLAN tag of the incoming frame is removed, and</td>
<td></td>
</tr>
<tr>
<td></td>
<td>the inner VLAN tag of the incoming frame is replaced by the user-specified VLAN tag value. The inner tag becomes the outer tag in the final frame.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• <strong>pop-pop</strong>—Both the outer and inner VLAN tags of the incoming frame</td>
<td></td>
</tr>
<tr>
<td></td>
<td>are removed.</td>
<td></td>
</tr>
<tr>
<td><strong>Demux</strong></td>
<td>IP demultiplexing (demux) value that appears if this interface is used as the</td>
<td>detail extensive none</td>
</tr>
<tr>
<td></td>
<td>demux underlying interface. The output is one of the following:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Source Family Inet</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Destination Family Inet</td>
<td></td>
</tr>
<tr>
<td><strong>Encapsulation</strong></td>
<td>Encapsulation on the logical interface.</td>
<td>All levels</td>
</tr>
<tr>
<td><strong>Protocol</strong></td>
<td>Protocol family. Possible values are described in the &quot;Protocol Field&quot; section under &quot;Common Output Fields Description&quot; on page 427.</td>
<td>detail extensive none</td>
</tr>
<tr>
<td><strong>MTU</strong></td>
<td>Maximum transmission unit size on the logical interface.</td>
<td>detail extensive none</td>
</tr>
<tr>
<td><strong>Maximum labels</strong></td>
<td>Maximum number of MPLS labels configured for the MPLS protocol family on the logical interface.</td>
<td>detail extensive none</td>
</tr>
<tr>
<td>Field Name</td>
<td>Field Description</td>
<td>Level of Output</td>
</tr>
<tr>
<td>---------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td>-----------------</td>
</tr>
<tr>
<td>Traffic statistics</td>
<td>Number and rate of bytes and packets received and transmitted on the specified interface set.</td>
<td>detail extensive</td>
</tr>
<tr>
<td></td>
<td>• <strong>Input bytes, Output bytes</strong>—Number of bytes received and transmitted on the interface set.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• <strong>Input packets, Output packets</strong>—Number of packets received and transmitted on the interface set.</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>NOTE:</strong> <strong>Input bytes</strong> and <strong>output bytes</strong> are counted as Layer 3 packet length.</td>
<td></td>
</tr>
<tr>
<td>IPv6 transit statistics</td>
<td>Number of IPv6 transit bytes and packets received and transmitted on the logical interface if IPv6 statistics tracking is enabled.</td>
<td>extensive</td>
</tr>
<tr>
<td>Local statistics</td>
<td>Number and rate of bytes and packets destined to the router.</td>
<td>extensive</td>
</tr>
<tr>
<td>Transit statistics</td>
<td>Number and rate of bytes and packets transiting the switch.</td>
<td>extensive</td>
</tr>
<tr>
<td>Generation</td>
<td>Unique number for use by Juniper Networks technical support only.</td>
<td>detail extensive</td>
</tr>
<tr>
<td>Route Table</td>
<td>Route table in which the logical interface address is located. For example, 0 refers to the routing table inet.0.</td>
<td>detail extensive</td>
</tr>
<tr>
<td>Flags</td>
<td>Information about protocol family flags. Possible values are described in the &quot;Family Flags&quot; section under &quot;Common Output Fields Description&quot; on page 427.</td>
<td>detail extensive</td>
</tr>
<tr>
<td>Donor interface</td>
<td>(Unnumbered Ethernet) Interface from which an unnumbered Ethernet interface borrows an IPv4 address.</td>
<td>detail extensive</td>
</tr>
<tr>
<td>Preferred source address</td>
<td>(Unnumbered Ethernet) Secondary IPv4 address of the donor loopback interface that acts as the preferred source address for the unnumbered Ethernet interface.</td>
<td>detail extensive</td>
</tr>
<tr>
<td>Input Filters</td>
<td>Names of any input filters applied to this interface. If you specify a precedence value for any filter in a dynamic profile, filter precedence values appear in parentheses next to all interfaces.</td>
<td>detail extensive</td>
</tr>
<tr>
<td>Output Filters</td>
<td>Names of any output filters applied to this interface. If you specify a precedence value for any filter in a dynamic profile, filter precedence values appear in parentheses next to all interfaces.</td>
<td>detail extensive</td>
</tr>
</tbody>
</table>
Table 25: show interfaces PTX Series Output Fields (continued)

<table>
<thead>
<tr>
<th>Field Name</th>
<th>Field Description</th>
<th>Level of Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mac-Validate Failures</td>
<td>Number of MAC address validation failures for packets and bytes. This field is displayed when MAC address validation is enabled for the logical interface.</td>
<td>detail extensive</td>
</tr>
<tr>
<td>Addresses, Flags</td>
<td>Information about the address flags. Possible values are described in the &quot;Addresses Flags&quot; section under &quot;Common Output Fields Description&quot; on page 427.</td>
<td>detail extensive</td>
</tr>
<tr>
<td>protocol-family</td>
<td>Protocol family configured on the logical interface. If the protocol is inet, the IP address of the interface is also displayed.</td>
<td>brief</td>
</tr>
<tr>
<td>Flags</td>
<td>Information about flags (possible values are described in the &quot;Addresses Flags&quot; section under &quot;Common Output Fields Description&quot; on page 427.</td>
<td>detail extensive</td>
</tr>
<tr>
<td>Destination</td>
<td>IP address of the remote side of the connection.</td>
<td>detail extensive</td>
</tr>
<tr>
<td>Local</td>
<td>IP address of the logical interface.</td>
<td>detail extensive</td>
</tr>
<tr>
<td>Broadcast</td>
<td>Broadcast address of the logical interface.</td>
<td>detail extensive</td>
</tr>
<tr>
<td>Generation</td>
<td>Unique number for use by Juniper Networks technical support only.</td>
<td>detail extensive</td>
</tr>
</tbody>
</table>

Sample Output

show interfaces brief (PTX5000 Packet Transport Router)

user@host> show interfaces brief et-7/0/0

Physical interface: et-7/0/0, Enabled, Physical link is Up
  Device flags   : Present Running
  Interface flags: SNMP-Traps Internal: 0x4000
  Link flags     : None

show interfaces extensive (PTX5000 Packet Transport Router)

user@host> show interfaces et-7/0/0 extensive
Physical interface: et-7/0/0, Enabled, Physical link is Up

Interface index: 168, SNMP ifIndex: 501, Generation: 171

Link-level type: Ethernet, MTU: 1514, Speed: 10Gbps, BPDU Error: None, MAC-REWRITE Error: None, Loopback: Disabled, Source filtering: Disabled, Flow control: Enabled

Device flags   : Present Running
Interface flags: SNMP-Traps Internal: 0x4000
Link flags     : None
CoS queues     : 8 supported, 8 maximum usable queues
Hold-times     : Up 0 ms, Down 0 ms
Current address: 88:e0:f3:3b:de:43, Hardware address: 88:e0:f3:3b:de:43
Last flapped   : 2012-01-18 11:48:24 PST (01:51:00 ago)
Statistics last cleared: 2012-01-18 13:38:54 PST (00:00:30 ago)

Traffic statistics:

<table>
<thead>
<tr>
<th></th>
<th>Input bytes</th>
<th>0</th>
<th>0 bps</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Output bytes</td>
<td>0</td>
<td>0 bps</td>
</tr>
<tr>
<td>Input packets</td>
<td>0</td>
<td>0 pps</td>
<td></td>
</tr>
<tr>
<td>Output packets</td>
<td>0</td>
<td>0 pps</td>
<td></td>
</tr>
</tbody>
</table>

IPv6 transit statistics:

<table>
<thead>
<tr>
<th></th>
<th>Input bytes</th>
<th>0</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Output bytes</td>
<td>0</td>
</tr>
<tr>
<td>Input packets</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Output packets</td>
<td>0</td>
<td></td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Queue counters:</th>
<th>Queued packets</th>
<th>Transmitted packets</th>
<th>Dropped packets</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 best-effort</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>1 expedited-fo</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>2 assured-forw</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>3 network-cont</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Queue number: Mapped forwarding classes

<table>
<thead>
<tr>
<th></th>
<th>best-effort</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>expedited-forwarding</td>
</tr>
<tr>
<td>2</td>
<td>assured-forwarding</td>
</tr>
<tr>
<td>3</td>
<td>network-control</td>
</tr>
</tbody>
</table>

Active alarms : None

Active defects : None

MAC statistics:

<table>
<thead>
<tr>
<th></th>
<th>Receive</th>
<th>Transmit</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
show interfaces terse (PTX5000 Packet Transport Router)

user@host> show interfaces terse

<table>
<thead>
<tr>
<th>Interface</th>
<th>Admin Link</th>
<th>Proto</th>
<th>Local</th>
<th>Remote</th>
</tr>
</thead>
<tbody>
<tr>
<td>et-2/0/0</td>
<td>up</td>
<td>up</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
et-2/0/1  up  up
et-2/0/2  up  up
et-2/0/3  up  up
et-2/0/4  up  up
et-2/0/5  up  down
et-2/0/6  up  up
et-2/0/7  up  up
et-2/0/8  up  up
et-2/0/9  up  down
et-2/0/10 up  up
et-2/0/11 up  up
et-2/0/12 up  up
et-2/0/13 up  down
et-2/0/14 up  up
et-2/0/15 up  up
et-2/0/16 up  up
et-2/0/17 up  down
et-2/0/18 up  down
et-2/0/19 up  up
et-2/0/20 up  down
et-2/0/21 up  up
et-2/0/22 up  down
et-2/0/23 up  up
et-2/1/0  up  up
et-2/1/1  up  up
et-2/1/2  up  up
et-2/1/3  up  up
et-2/1/4  up  up
et-2/1/5  up  up
et-2/1/6  up  up
et-2/1/7  up  up
et-2/1/8  up  up
et-2/1/9  up  up
et-2/1/10 up  up
et-2/1/11 up  up
et-2/1/12 up  up
et-2/1/13 up  up
et-2/1/14 up  up
et-2/1/15 up  up
et-2/1/16 up  up
et-2/1/17 up  up
et-2/1/18 up  up
et-2/1/19 up  up
et-2/1/20 up  up
<table>
<thead>
<tr>
<th>Interface</th>
<th>Status 1</th>
<th>Status 2</th>
</tr>
</thead>
<tbody>
<tr>
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<td>up</td>
<td>up</td>
</tr>
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<td>up</td>
<td>up</td>
</tr>
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<tr>
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<td>up</td>
<td>up</td>
</tr>
<tr>
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<td>et-7/0/8</td>
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<td>et-7/0/9</td>
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<td>up</td>
</tr>
<tr>
<td>et-7/0/10</td>
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<td>down</td>
</tr>
</tbody>
</table>
et-7/0/11 up down
et-7/0/12 up down
et-7/0/13 up down
et-7/0/14 up down
et-7/0/15 up down
et-7/0/16 up down
et-7/0/17 up down
et-7/0/18 up down
et-7/0/19 up down
et-7/0/20 up down
et-7/0/21 up down
et-7/0/22 up down
et-7/0/23 up down
dsc up up
dm0 up up
dm0.0 up up inet 192.168.177.61/25
gre up up
ipip up up
ixgbe0 up up
ixgbe0.0 up up inet 10.0.0.4/8
128.0.0.1/2
128.0.0.4/2
inet6 fe80::200:ff:fe00:4/64
fec0::a:0:0:4/64
tnp 0x4
ixgbe1 up up
ixgbe1.0 up up inet 10.0.0.4/8
128.0.0.1/2
128.0.0.4/2
inet6 fe80::200:ff:fe00:4/64
fec0::a:0:0:4/64
tnp 0x4
lo0 up up
lo0.0 up up inet 10.255.177.61 --> 0/0
127.0.0.1 --> 0/0
iso 47.0005.80ff.f800.0000.0108.0001.0102.5517.7061
inet6 abcd::10:255:177:61
fe80::ee9e:cd0f:fc02:b01e
lo0.16384 up up inet 127.0.0.1 --> 0/0
lo0.16385 up up inet
lisi up up
mtun up up
pimd up up
show interfaces extensive (Junos OS Evolved)

user@host> show interfaces et-0/0/0 extensive

Physical interface: et-0/0/0, Enabled, Physical link is Up
   Interface index: 1002, SNMP ifIndex: 505, Generation: 113
   Link-level type: Ethernet, MTU: 1514, LAN-PHY mode, Speed: 100Gbps, BPDU Error: None, MAC-REWRITE Error: None, Loopback: Disabled, Source filtering: Disabled, Flow control: Enabled
   Device flags : Present Running
   Interface flags: SNMP-Traps
   Link flags : None
   CoS queues : 8 supported, 8 maximum usable queues
   Hold-times : Up 0 ms, Down 0 ms
   Damping : half-life: 0 sec, max-suppress: 0 sec, reuse: 0, suppress: 0, state: unsuppressed
   Current address: 88:e0:f3:3b:de:43, Hardware address: 88:e0:f3:3b:de:43
   Last flapped : Never
   Statistics last cleared: Never
   Traffic statistics:
   Input bytes : 0 0 bps
   Output bytes : 0 0 bps
   Input packets: 0 0 pps
   Output packets: 0 0 pps
   IPv6 transit statistics:
   Input bytes : 0
   Output bytes : 0
   Input packets: 0
   Output packets: 0
   Input errors:
      Errors: 0, Drops: 0, Framing errors: 0, Runts: 0, Policed discards: 0, L3 incompletes: 0, L2 channel errors: 0, L2 mismatch timeouts: 0, FIFO errors: 0, Resource errors: 0
   Output errors:
      Carrier transitions: 0, Errors: 0, Drops: 0, Collisions: 0, Aged packets: 0, FIFO errors: 0, HS link CRC errors: 0, MTU errors: 0, Resource errors: 0
   Egress queues: 8 supported, 4 in use
   Queue counters: Queued packets Transmitted packets Dropped packets
   0 16045690984503098046 0 0
   1 16045690984503098046 0 0
   2 16045690984503098046 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

<table>
<thead>
<tr>
<th>PCS statistics</th>
<th>Seconds</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bit errors</td>
<td>0</td>
</tr>
<tr>
<td>Errord blocks</td>
<td>0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>MAC statistics:</th>
<th>Receive</th>
<th>Transmit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total octets</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Total packets</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Unicast packets</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Broadcast packets</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Multicast packets</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>CRC/Align errors</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>FIFO errors</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>MAC control frames</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>MAC pause frames</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Oversized frames</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Jabber frames</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Fragment frames</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>VLAN tagged frames</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Code violations</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Total errors</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Filter statistics:
- Input packet count: 0
- Input packet rejects: 0
- Input DA rejects: 0
- Input SA rejects: 0
- Output packet count: 0
- Output packet pad count: 0
- Output packet error count: 0

CAM destination filters: 0, CAM source filters: 0
show interfaces media

Syntax

```
show interfaces media
```

Release Information

Command introduced before Junos OS Release 7.4.

Description

Display media-specific information about all configured network interfaces.

NOTE: `show interfaces media` lists details for all interfaces, whereas `show interfaces media interface-name` lists details only for the specified interface.

Options

This command has no options.

Additional Information

Output from both the `show interfaces interface-name detail` and the `show interfaces interface-name extensive` commands includes all the information displayed in the output from the `show interfaces media` command.

Required Privilege Level

`view`

List of Sample Output

- `show interfaces media (SONET/SDH) on page 458`
- `show interfaces media (MX Series Routers) on page 458`
- `show interfaces media (PTX Series Packet Transport Routers) on page 459`

Output Fields

The output from the `show interfaces media` command includes fields that display interface media-specific information. These fields are also included in the `show interfaces interface-name` command for each particular interface type, and the information provided in the fields is unique to each interface type.

One field unique to the `show interfaces media` command is interface-type errors (for example, SONET errors). This field appears for channelized E3, channelized T3, channelized OC, E1, E3, SONET, T1, and T3 interfaces. The information provided in this output field is also provided in the output from the `show interfaces interface-name` command. (For example, for SONET interfaces, these fields are SONET section,
SONET line, and SONET path). For a description of errors, see the chapter with the particular interface type in which you are interested.

Sample Output

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):

```plaintext
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
   CHAP state: Not-configured
   CoS queues : 8 supported
   Input rate : 0 bps (0 pps)
   Output rate : 0 bps (0 pps)
   SONET alarms : None
   SONET defects : None
   SONET errors:
   Received path trace: routerb so-1/1/2
   Transmitted path trace: routera so-4/1/2
```

show interfaces media (MX Series Routers)

```plaintext
user@host> show interfaces media xe-0/0/0

Physical interface: xe-0/0/0, Enabled, Physical link is Up
   Interface index: 145, SNMP ifIndex: 592
   Link-level type: Ethernet, MTU: 1514, LAN-PHY mode, Speed: 10Gbps, BPDU Error:
```
show interfaces media (PTX Series Packet Transport Routers)

user@host> show interfaces media em0

Physical interface: em0, Enabled, Physical link is Up
  Interface index: 8, SNMP ifIndex: 0
  Type: Ethernet, Link-level type: Ethernet, MTU: 1514, Speed: 1000mbps
  Device flags : Present Running
  Interface flags: SNMP-Traps
  Link type : Full-Duplex
  Current address: 00:80:f9:25:00:1b, Hardware address: 00:80:f9:25:00:1b
  Last flapped : Never
  Input packets : 215151
  Output packets: 72
show interfaces terse

Syntax

show interfaces terse

Release Information

Command introduced before Junos OS Release 7.4.

Description

Display summary information about interfaces.

Options

This command has no options.

Additional Information

Interfaces are always displayed in numerical order, from the lowest to the highest FPC slot number. Within that slot, the lowest PIC slot is shown first. On an individual PIC, the lowest port number is always first.

Required Privilege Level

view

RELATED DOCUMENTATION

Setting Up Logical Systems

List of Sample Output

show interfaces terse on page 461
show interfaces terse (TX Matrix Plus Router) on page 462
show interfaces terse (PTX Series Packet Transport Routers) on page 463

Output Fields

Table 26 on page 460 lists the output fields for the show interfaces terse command. Output fields are listed in the approximate order in which they appear.

Table 26: show interfaces terse Output Fields

<table>
<thead>
<tr>
<th>Field Name</th>
<th>Field Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interface</td>
<td>Interface name.</td>
</tr>
<tr>
<td>Admin</td>
<td>Whether the interface is turned on (up) or off (down).</td>
</tr>
</tbody>
</table>
Table 26: show interfaces terse Output Fields (continued)

<table>
<thead>
<tr>
<th>Field Name</th>
<th>Field Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Link</strong></td>
<td>Link state: <strong>up</strong> or <strong>down</strong>.</td>
</tr>
<tr>
<td><strong>Proto</strong></td>
<td>Protocol family configured on the logical interface. A logical interface on a router that supports Ethernet OAM always shows the multiservice protocol.</td>
</tr>
<tr>
<td><strong>Local</strong></td>
<td>Local IP address of the logical interface.</td>
</tr>
<tr>
<td><strong>Remote</strong></td>
<td>Remote IP address of the logical interface.</td>
</tr>
</tbody>
</table>

Sample Output

```
show interfaces terse

user@host> show interfaces terse

<table>
<thead>
<tr>
<th>Interface</th>
<th>Admin</th>
<th>Link</th>
<th>Proto</th>
<th>Local</th>
<th>Remote</th>
</tr>
</thead>
<tbody>
<tr>
<td>t1-0/1/0:0</td>
<td>up</td>
<td>up</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>t1-0/1/0:0.0</td>
<td>up</td>
<td>up</td>
<td>inet</td>
<td>192.168.220.18/30</td>
<td></td>
</tr>
<tr>
<td>t1-0/1/0:1</td>
<td>up</td>
<td>up</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>t1-0/1/0:2</td>
<td>up</td>
<td>up</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>t1-0/1/0:3</td>
<td>up</td>
<td>up</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>at-1/0/0</td>
<td>up</td>
<td>up</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>at-1/0/1</td>
<td>up</td>
<td>up</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>dsc</td>
<td>up</td>
<td>up</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>fxp0</td>
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<td>up</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>fxp0.0</td>
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<td>up</td>
<td>inet</td>
<td>192.168.71.249/21</td>
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</tr>
<tr>
<td>fxp1</td>
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<td>up</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>fxp1.0</td>
<td>up</td>
<td>up</td>
<td>inet</td>
<td>10.0.0.4/8</td>
<td>tnp</td>
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<td>gre</td>
<td>up</td>
<td>up</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ipip</td>
<td>up</td>
<td>up</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>lo0</td>
<td>up</td>
<td>up</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>lo0.0</td>
<td>up</td>
<td>up</td>
<td>inet</td>
<td>10.0.1.4</td>
<td>--&gt; 0/0</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>127.0.0.1</td>
<td>--&gt; 0/0</td>
</tr>
<tr>
<td>lo0.16385</td>
<td>up</td>
<td>up</td>
<td>inet</td>
<td></td>
<td></td>
</tr>
<tr>
<td>lsi</td>
<td>up</td>
<td>up</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
```
show interfaces terse (TX Matrix Plus Router)

user@host>  show interfaces terse

<table>
<thead>
<tr>
<th>Interface</th>
<th>Admin</th>
<th>Link</th>
<th>Proto</th>
<th>Local</th>
<th>Remote</th>
</tr>
</thead>
<tbody>
<tr>
<td>xe-0/0/0</td>
<td>up</td>
<td>up</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>xe-0/0/1</td>
<td>up</td>
<td>up</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>xe-0/0/2</td>
<td>up</td>
<td>up</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>xe-0/0/3</td>
<td>up</td>
<td>up</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>xe-0/0/0</td>
<td>up</td>
<td>up</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>xe-0/0/1</td>
<td>up</td>
<td>up</td>
<td></td>
<td></td>
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<tr>
<td>xe-0/0/2</td>
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<td>up</td>
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<td>so-0/0/0</td>
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<td></td>
<td></td>
</tr>
<tr>
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<td>up</td>
<td>up</td>
<td>inet</td>
<td>1.1.1.1/30</td>
<td></td>
</tr>
<tr>
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<td>up</td>
<td>inet</td>
<td>--&gt; 0/0</td>
<td></td>
</tr>
<tr>
<td>ge-7/0/0</td>
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<td>up</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ge-7/0/0.0</td>
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show interfaces terse (PTX Series Packet Transport Routers)

user@host> show interfaces em0 terse

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<th>Admin</th>
<th>Link</th>
<th>Proto</th>
<th>Local</th>
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</table>
Protocol-Independent Routing Operational Commands

IN THIS CHAPTER

- show route match-prefix | 466
show route match-prefix

Syntax

```bash
show route match-prefix match-prefix;
```

Release Information
Command introduced in Junos OS Release 11.4.

Description
Allows you to search for routes using regular expressions based on the extended (modern) regular expressions as defined in POSIX 1003.2.

Options

- `match-prefix`—Regular expression to match formatted prefix.

Additional Information

Required Privilege Level
view

RELATED DOCUMENTATION

- *Regular Expressions for Allowing and Denying Junos OS Operational Mode Commands, Configuration Statements, and Hierarchies*

List of Sample Output

- `show route match-prefix *.10.255.2.200:6:*` (Show all routes matching route distributor 10.255.2.200:6) on page 466
- `show route match-prefix 7*` (Show all mvpn type-7 routes) on page 467
- `show route match-prefix *224.*` (Show all routes matching group 224/4) on page 467

Output Fields
For information about output fields, see the output field tables for the `show route` command, the `show route detail` command, the `show route extensive` command, or the `show route terse` command.

Sample Output

```bash
user@host> show route match-prefix *.10.255.2.200:6:*
```

show route match-prefix 7* (Show all mvpn type-7 routes)
user@host>  show route table blue.mvpn.0 match-prefix 7*

Paste
router command output here

show route match-prefix *.224.* (Show all routes matching group 224/4)
user@host>  show route match-prefix *.224.*