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Junos<sup>®</sup> OS

# IEEE 802.3ah OAM Link-Fault Management Feature Guide for Routing Devices

Release

14.1



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*Junos<sup>®</sup> OS IEEE 802.3ah OAM Link-Fault Management Feature Guide for Routing Devices*

14.1

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## Documentation and Release Notes

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

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

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## Supported Platforms

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

- M Series
- MX Series
- T Series
- J Series
- ACX Series

## Using the Examples in This Manual

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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.xml; }
```

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

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

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

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

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

## Documentation Conventions

Table 1 on page xi defines notice icons used in this guide.

Table 1: Notice Icons







Icon	Meaning	Description
	Informational note	Indicates important features or instructions.
	Caution	Indicates a situation that might result in loss of data or hardware damage.
	Warning	Alerts you to the risk of personal injury or death.
	Laser warning	Alerts you to the risk of personal injury from a laser.
	Tip	Indicates helpful information.
	Best practice	Alerts you to a recommended use or implementation.

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

Table 2: Text and Syntax Conventions

Convention	Description	Examples
<b>Bold text like this</b>	Represents text that you type.	To enter configuration mode, type the <b>configure</b> command:  user@host> <b>configure</b>
Fixed-width text like this	Represents output that appears on the terminal screen.	user@host> <b>show chassis alarms</b>  No alarms currently active
<i>Italic text like this</i>	<ul style="list-style-type: none"> <li>Introduces or emphasizes important new terms.</li> <li>Identifies guide names.</li> <li>Identifies RFC and Internet draft titles.</li> </ul>	<ul style="list-style-type: none"> <li>A policy <i>term</i> is a named structure that defines match conditions and actions.</li> <li><i>Junos OS CLI User Guide</i></li> <li>RFC 1997, <i>BGP Communities Attribute</i></li> </ul>
<i>Italic text like this</i>	Represents variables (options for which you substitute a value) in commands or configuration statements.	Configure the machine's domain name:  [edit] root@# <b>set system domain-name</b> <i>domain-name</i>
Text like this	Represents names of configuration statements, commands, files, and directories; configuration hierarchy levels; or labels on routing platform components.	<ul style="list-style-type: none"> <li>To configure a stub area, include the <b>stub</b> statement at the [edit protocols ospf area area-id] hierarchy level.</li> <li>The console port is labeled <b>CONSOLE</b>.</li> </ul>
< > (angle brackets)	Encloses optional keywords or variables.	<b>stub &lt;default-metric metric&gt;;</b>
(pipe symbol)	Indicates a choice between the mutually exclusive keywords or variables on either side of the symbol. The set of choices is often enclosed in parentheses for clarity.	<b>broadcast   multicast</b>  <b>(string1   string2   string3)</b>
# (pound sign)	Indicates a comment specified on the same line as the configuration statement to which it applies.	<b>rsvp { # Required for dynamic MPLS only</b>
[ ] (square brackets)	Encloses a variable for which you can substitute one or more values.	<b>community name members [ community-ids ]</b>
Indentation and braces ( { } )	Identifies a level in the configuration hierarchy.	[edit] routing-options { static { route default { nexthop <i>address</i> ; retain; } } }
;(semicolon)	Identifies a leaf statement at a configuration hierarchy level.	}

---

#### GUI Conventions

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

Convention	Description	Examples
<b>Bold text like this</b>	Represents graphical user interface (GUI) items you click or select.	<ul style="list-style-type: none"> <li>In the Logical Interfaces box, select <b>All Interfaces</b>.</li> <li>To cancel the configuration, click <b>Cancel</b>.</li> </ul>
> (bold right angle bracket)	Separates levels in a hierarchy of menu selections.	In the configuration editor hierarchy, select <b>Protocols&gt;Ospf</b> .

## Documentation Feedback

We encourage you to provide feedback, comments, and suggestions so that we can improve the documentation. You can send your comments to [techpubs-comments@juniper.net](mailto:techpubs-comments@juniper.net), or fill out the documentation feedback form at <https://www.juniper.net/cgi-bin/docbugreport/>. If you are using e-mail, be sure to include the following information with your comments:

- Document or topic name
- URL or page number
- Software release version (if applicable)

## Requesting Technical Support

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

- JTAC policies—For a complete understanding of our JTAC procedures and policies, review the *JTAC User Guide* located at <http://www.juniper.net/us/en/local/pdf/resource-guides/7100059-en.pdf>.
- Product warranties—For product warranty information, visit <http://www.juniper.net/support/warranty/>.
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- Search for known bugs: <http://www2.juniper.net/kb/>

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

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

## Opening a Case with JTAC

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

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

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

## PART 1

# Overview

- [IEEE 802.3ah OAM Link-Fault Management on page 3](#)





## CHAPTER 1

# IEEE 802.3ah OAM Link-Fault Management

- [IEEE 802.3ah OAM Link-Fault Management Overview on page 3](#)

## IEEE 802.3ah OAM Link-Fault Management Overview

---

Ethernet interfaces capable of running at 100 Mbps or faster on EX Series switches, MX Series, M Series (except M5 and M10 routers), and T Series routers support the IEEE 802.3ah standard for Operation, Administration, and Management (OAM). You can configure IEEE 802.3ah OAM on Ethernet point-to-point direct links or links across Ethernet repeaters. The IEEE 802.3ah standard meets the requirement for OAM capabilities as Ethernet moves from being solely an enterprise technology to being a WAN and access technology, as well as being backward-compatible with existing Ethernet technology. Junos OS supports IEEE 802.3ah link-fault management.

The features of link-fault management are:

- Discovery
- Link monitoring
- Remote fault detection
- Remote loopback

The following features are not supported:

- Ethernet running on top of a Layer 2 protocol, such as Ethernet over ATM, is not supported in OAM configurations.
- Remote loopback is not supported on the 10-Gigabit Ethernet LAN/WAN PIC with SFP+.
- The remote loopback feature mentioned in section 57.2.11 of IEEE 802.3ah is not supported on T4000 routers.



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

**Related  
Documentation**

- [Configuring IEEE 802.3ah OAM Link-Fault Management on page 7](#)
- [Enabling IEEE 802.3ah OAM Support on page 8](#)
- [Configuring Link Discovery on page 9](#)
- [Configuring the OAM PDU Interval on page 10](#)
- [Configuring the OAM PDU Threshold on page 11](#)
- [Configuring Threshold Values for Local Fault Events on an Interface on page 12](#)
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## PART 2

# Configuration

- [IEEE 802.3ah OAM Link-Fault Management on page 7](#)
- [Network Interfaces Configuration Statements and Hierarchy on page 27](#)
- [Statement Summary on page 31](#)



## CHAPTER 2

# IEEE 802.3ah OAM Link-Fault Management

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- [Enabling IEEE 802.3ah OAM Support on page 8](#)
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- [Configuring Ethernet 802.3ah OAM on PTX Series Packet Transport Routers on page 24](#)

## Configuring IEEE 802.3ah OAM Link-Fault Management

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You can configure threshold values for fault events that trigger the sending of link event TLVs when the values exceed the threshold. To set threshold values for fault events on an interface, include the **event-thresholds** statement at the **[edit protocols oam ethernet link-fault-management interface]** hierarchy level.

You can also configure OAM threshold values within an action profile and apply the action profile to multiple interfaces. To create an action profile, include the **action-profile** statement at the **[edit protocols oam ethernet link-fault-management]** hierarchy level.

You can configure Ethernet OAM either on an aggregate interface or on each of its member links. However, we recommend that you configure Ethernet OAM on the aggregate interface, and this will internally enable Ethernet OAM on the member links.

To view OAM statistics, use the **show oam ethernet link-fault-management** operational mode command. To clear OAM statistics, use the **clear oam ethernet link-fault-management statistics** operational mode command. To clear link-fault management state information and restart the link discovery process on Ethernet interfaces, use the **clear oam ethernet link-fault-management state** operational mode command. For more information about these commands, see the [CLI Explorer](#).

#### Related Documentation

- [event-thresholds on page 38](#)
- *action-profile*
- [IEEE 802.3ah OAM Link-Fault Management Overview on page 3](#)
- [Enabling IEEE 802.3ah OAM Support on page 8](#)
- [Configuring Link Discovery on page 9](#)
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- *Ethernet Interfaces*

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## Enabling IEEE 802.3ah OAM Support

To enable IEEE 802.3ah OAM support, include the **interface** statement at the **[edit protocols oam ethernet link-fault-management]** hierarchy level:

```
[edit protocols oam ethernet link-fault-management interface interface-name]
```

When you enable IEEE 802.3ah OAM on a physical interface, the discovery process is automatically triggered.

**Related  
Documentation**

- [link-fault-management on page 46](#)
- [IEEE 802.3ah OAM Link-Fault Management Overview on page 3](#)
- [Configuring IEEE 802.3ah OAM Link-Fault Management on page 7](#)
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## Configuring Link Discovery

When the IEEE 802.3ah OAM protocol is enabled on a physical interface, the discovery process is automatically triggered. The discovery process permits Ethernet interfaces to discover and monitor the peer on the link if it also supports the IEEE 802.3ah standard.

You can specify the discovery mode used for IEEE 802.3ah OAM support. The discovery process is triggered automatically when OAM IEEE 802.3ah functionality is enabled on a port. Link monitoring is done when the interface sends periodic OAM PDUs.

To configure the discovery mode, include the **link-discovery** statement at the **[edit protocol oam ethernet link-fault-management interface *interface-name*]** hierarchy level:

```
[edit protocol oam ethernet link-fault-management interface interface-name]  
  link-discovery (active | passive);
```

In active mode, the interface discovers and monitors the peer on the link if the peer also supports IEEE 802.3ah OAM functionality. In passive mode, the peer initiates the discovery process. After the discovery process has been initiated, both sides participate in discovery.

**Related  
Documentation**

- [link-discovery on page 45](#)
- [IEEE 802.3ah OAM Link-Fault Management Overview on page 3](#)
- [Configuring IEEE 802.3ah OAM Link-Fault Management on page 7](#)
- [Enabling IEEE 802.3ah OAM Support on page 8](#)
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## Configuring the OAM PDU Interval

Periodic OAM PDUs are sent to perform link monitoring.

You can specify the periodic OAM PDU sending interval for fault detection.

To configure the sending interval, include the **pdu-interval** statement at the **[edit protocol oam ethernet link-fault-management interface *interface-name*]** hierarchy level:

```
[edit protocol oam ethernet link-fault-management interface interface-name]  
  pdu-interval interval;
```

The periodic OAM PDU interval range is from 100 through 1000 milliseconds. The default sending interval is 1000 milliseconds.

**Related  
Documentation**

- [pdu-interval on page 50](#)
- [IEEE 802.3ah OAM Link-Fault Management Overview on page 3](#)



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---

## Configuring the OAM PDU Threshold

You can specify the number of OAM PDUs that an interface can miss before the link between peers is considered down.

To configure the number of PDUs that can be missed from the peer, include the **pdu-threshold** statement at the **[edit protocol oam ethernet link-fault-management interface *interface-name*]** hierarchy level:

```
[edit protocol oam ethernet link-fault-management interface interface-name]  
  pdu-threshold threshold-value;
```

The threshold value range is from 3 through 10. The default is three PDUs.

### Related Documentation

- [pdu-threshold on page 51](#)
- [IEEE 802.3ah OAM Link-Fault Management Overview on page 3](#)
- [Configuring IEEE 802.3ah OAM Link-Fault Management on page 7](#)
- [Enabling IEEE 802.3ah OAM Support on page 8](#)
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---

## Configuring Threshold Values for Local Fault Events on an Interface

---

You can configure threshold values on an interface for the local errors that trigger the sending of link event TLVs.

To set the error threshold values for sending event TLVs, include the **frame-error**, **frame-period**, **frame-period-summary**, and **symbol-period** statements at the **[edit protocols oam ethernet link-fault-management interface *interface-name* event-thresholds]** hierarchy level:

```
[edit protocol oam ethernet link-fault-management interface interface-name]  
event-thresholds {  
    frame-error count;  
    frame-period count;  
    frame-period-summary count;  
    symbol-period count;  
}
```

### Related Documentation

- [event-thresholds on page 38](#)
- [frame-error on page 40](#)
- [frame-period on page 41](#)
- [frame-period-summary on page 42](#)
- [symbol-period on page 53](#)
- [IEEE 802.3ah OAM Link-Fault Management Overview on page 3](#)
- [Configuring IEEE 802.3ah OAM Link-Fault Management on page 7](#)
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## Disabling the Sending of Link Event TLVs

You can disable the sending of link event TLVs.

To disable the monitoring and sending of PDUs containing link event TLVs in periodic PDUs, include the **no-allow-link-events** statement at the **[edit protocols oam ethernet link-fault-management interface *interface-name* negotiation-options]** hierarchy level:

```
[edit protocol oam ethernet link-fault-management interface interface-name
 negotiation-options]
no-allow-link-events;
```

### Related Documentation

- [no-allow-link-events on page 47](#)
- [IEEE 802.3ah OAM Link-Fault Management Overview on page 3](#)
- [Configuring IEEE 802.3ah OAM Link-Fault Management on page 7](#)
- [Enabling IEEE 802.3ah OAM Support on page 8](#)
- [Configuring Link Discovery on page 9](#)
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## Detecting Remote Faults

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Fault detection is either based on flags or fault event type, length, and values (TLVs) received in OAM protocol data units (PDUs). Flags that trigger a link fault are:

- Critical Event
- Dying Gasp
- Link Fault

The link event TLVs are sent by the remote DTE by means of event notification PDUs. Link event TLVs are:

- Errored Symbol Period Event
- Errored Frame Event
- Errored Frame Period Event
- Errored Frame Seconds Summary Event

### Related Documentation

- [IEEE 802.3ah OAM Link-Fault Management Overview on page 3](#)
- [Configuring IEEE 802.3ah OAM Link-Fault Management on page 7](#)
- [Enabling IEEE 802.3ah OAM Support on page 8](#)
- [Configuring Link Discovery on page 9](#)
- [Configuring the OAM PDU Interval on page 10](#)
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- [Monitoring Protocol Status on page 18](#)
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## Configuring an OAM Action Profile

You can create an action profile to define event fault flags and thresholds and the action to be taken. You can then apply the action profile to one or more interfaces.

To configure an action profile, include the **action-profile** statement at the **[edit protocols oam ethernet link-fault-management]** hierarchy level:

```
action-profile profile-name {
  action {
    syslog;
    link-down;
    send-critical-event;
  }
  event {
    link-adjacency-loss;
    link-event-rate {
      frame-error count;
      frame-period count;
      frame-period-summary count;
      symbol-period count;
    }
    protocol-down;
  }
}
```

### Related Documentation

- [action-profile on page 33](#)
- [IEEE 802.3ah OAM Link-Fault Management Overview on page 3](#)
- [Configuring IEEE 802.3ah OAM Link-Fault Management on page 7](#)
- [Enabling IEEE 802.3ah OAM Support on page 8](#)
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## Specifying the Actions to Be Taken for Link-Fault Management Events

You can specify the action to be taken by the system when the configured link-fault event occurs. Multiple action profiles can be applied to a single interface. For each action-profile, at least one event and one action must be specified. The actions are taken only when all of the events in the action profile are true. If more than one action is specified, all the actions are executed.

You might want to set a lower threshold for a specific action such as logging the error and set a higher threshold for another action such as sending a critical event TLV.

To specify the action, include the **action** statement at the **[edit protocols oam ethernet link-fault-management action-profile *profile-name*]** hierarchy level:

```
[edit protocol oam ethernet link-fault-management action-profile profile-name]  
event {  
    link-adjacency-loss;  
    protocol-down;  
}  
action {  
    syslog;  
    link-down;  
    send-critical-event;  
}
```

To create a system log entry when the link-fault event occurs, include the **syslog** statement.

To administratively disable the link when the link-fault event occurs, include the **link-down** statement.

To send IEEE 802.3ah link event TLVs in the OAM PDU when a link-fault event occurs, include the **send-critical-event** statement.



**NOTE:** If multiple actions are specified in the action profile, all of the actions are executed in no particular order.

#### Related Documentation

- [action on page 32](#)
- [syslog on page 53](#)
- [link-down on page 44](#)
- [send-critical-event on page 52](#)
- [IEEE 802.3ah OAM Link-Fault Management Overview on page 3](#)
- [Configuring IEEE 802.3ah OAM Link-Fault Management on page 7](#)
- [Enabling IEEE 802.3ah OAM Support on page 8](#)
- [Configuring Link Discovery on page 9](#)
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## Monitoring the Loss of Link Adjacency

You can specify actions be taken when link adjacency is lost. When link adjacency is lost, the system takes the action defined in the **action** statement of the action profile.

To configure the system to take action when link adjacency is lost, include the **link-adjacency-loss** statement at the **[edit protocols oam ethernet link-fault-management action-profile *profile-name* event]** hierarchy level:

```
[edit protocol oam ethernet link-fault-management action-profile profile-name]
link-adjacency-loss;
```

- Related Documentation**
- [link-adjacency-loss on page 44](#)
  - [IEEE 802.3ah OAM Link-Fault Management Overview on page 3](#)
  - [Configuring IEEE 802.3ah OAM Link-Fault Management on page 7](#)
  - [Enabling IEEE 802.3ah OAM Support on page 8](#)
  - [Configuring Link Discovery on page 9](#)
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## Monitoring Protocol Status

The CCC-DOWN flag is associated with a circuit cross-connect (CCC) connection, Layer 2 circuit, and Layer 2 VPN, which send the CCC-DOWN status to the kernel. The CCC-DOWN flag indicates that the CCC is down. The CCC-DOWN status is sent to the kernel when the CCC connection, Layer 2 circuit, or Layer 2 VPN is down. This in turn, brings down the CE-facing PE interface associated with the CCC connection, Layer 2 circuit, or Layer 2 VPN.

When the CCC-DOWN flag is signaled to the IEEE 802.3ah protocol, the system takes the action defined in the **action** statement of the action profile. For additional information about Layer 2 circuits, see the Junos OS Layer 2 Circuits Feature Guide, Junos OS VPNs Configuration Guide.

To monitor the IEEE 802.3ah protocol, on the CE-facing PE interface, include the **protocol-down** statement at the **[edit protocols oam ethernet link-fault-management action-profile *profile-name* event]** hierarchy level:

```
[edit protocol oam ethernet link-fault-management action-profile profile-name]  
  protocol-down;
```





**NOTE:** If multiple events are specified in the action profile, all the events must occur before the specified action is taken.

#### Related Documentation

- [protocol-down on page 51](#)
- [IEEE 802.3ah OAM Link-Fault Management Overview on page 3](#)
- [Configuring IEEE 802.3ah OAM Link-Fault Management on page 7](#)
- [Enabling IEEE 802.3ah OAM Support on page 8](#)
- [Configuring Link Discovery on page 9](#)
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## Configuring Threshold Values for Fault Events in an Action Profile

You can configure link event thresholds for received error events that trigger the action specified in the **action** statement. You can then apply the action profile to one or more interfaces.

To configure link event thresholds, include the **link-event-rate** statement at the **[edit protocols oam ethernet link-fault-management action-profile *profile-name* event]** hierarchy level:

```
link-event-rate {
  frame-error count;
  frame-period count;
  frame-period-summary count;
  symbol-period count;
}
```

- Related Documentation**
- [link-event-rate on page 45](#)
  - [IEEE 802.3ah OAM Link-Fault Management Overview on page 3](#)
  - [Configuring IEEE 802.3ah OAM Link-Fault Management on page 7](#)
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## Applying an Action Profile

You can apply an action profile to one or more interfaces.

To apply an action profile to an interface, include the **apply-action-profile** statement at the **[edit protocols oam ethernet link-fault-management action-profile interface *interface-name*]** hierarchy level:

```
[edit protocol oam ethernet link-fault-management interface interface-name]  
  apply-action-profile profile-name;
```

- Related Documentation**
- [apply-action-profile on page 34](#)
  - [IEEE 802.3ah OAM Link-Fault Management Overview on page 3](#)
  - [Configuring IEEE 802.3ah OAM Link-Fault Management on page 7](#)
  - [Enabling IEEE 802.3ah OAM Support on page 8](#)
  - [Configuring Link Discovery on page 9](#)
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## Setting a Remote Interface into Loopback Mode

You can configure the software to set the remote DTE into loopback mode on the following interfaces:

- IQ2 and IQ2-E Gigabit Ethernet interfaces
- Ethernet interfaces on the MX Series routers or EX Series switches

Junos OS can place a remote DTE into loopback mode (if remote-loopback mode is supported by the remote DTE). When you place a remote DTE into loopback mode, the interface receives the remote-loopback request and puts the interface into remote-loopback mode. When the interface is in remote-loopback mode, all frames except OAM PDUs are looped back without any changes made to the frames. OAM PDUs continue to be sent to the management plane and processed.

To configure remote loopback, include the **remote-loopback** statement at the **[edit protocol oam ethernet link-fault-management interface *interface-name*]** hierarchy level:

```
[edit protocol oam ethernet link-fault-management interface interface-name]  
remote-loopback;
```

To take the remote DTE out of loopback mode, remove the **remote-loopback** statement from the configuration.

### Related Documentation

- [remote-loopback on page 52](#)
- [IEEE 802.3ah OAM Link-Fault Management Overview on page 3](#)
- [Configuring IEEE 802.3ah OAM Link-Fault Management on page 7](#)
- [Enabling IEEE 802.3ah OAM Support on page 8](#)

- [Configuring Link Discovery on page 9](#)
- [Configuring the OAM PDU Interval on page 10](#)
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## Enabling Remote Loopback Support on the Local Interface

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You can allow a remote DTE to set a local interface into remote loopback mode on IQ2 and IQ2-E Gigabit Ethernet interfaces and all Ethernet interfaces on the MX Series routers and EX Series switches. When a remote-loopback request is sent by a remote DTE, the Junos OS places the local interface into loopback mode. When an interface is in loopback mode, all frames except OAM PDUs are looped back without any changes to the frames. OAM PDUs continue to be sent to the management plane and processed. By default, the remote loopback feature is not enabled.

To enable remote loopback, include the **allow-remote-loopback** statement at the **[edit protocol oam ethernet link-fault-management interface *interface-name* negotiation-options]** hierarchy level:

```
[edit protocol oam ethernet link-fault-management interface interface-name
 negotiation-options]
allow-remote-loopback;
```



**NOTE:** Activation of OAM remote loopback may result in data frame loss.

---

### Related Documentation

- [allow-remote-loopback on page 34](#)
- [IEEE 802.3ah OAM Link-Fault Management Overview on page 3](#)
- [Configuring IEEE 802.3ah OAM Link-Fault Management on page 7](#)

- [Enabling IEEE 802.3ah OAM Support on page 8](#)
- [Configuring Link Discovery on page 9](#)
- [Configuring the OAM PDU Interval on page 10](#)
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## Example: Configuring IEEE 802.3ah OAM Support on an Interface

---

Configure 802.3ah OAM support on a 10-Gigabit Ethernet interface:

```
[edit]
protocols {
  oam {
    ethernet {
      link-fault-management {
        interface xe-0/0/0 {
          link-discovery active;
          pdu-interval 800;
          pdu-threshold 4;
          remote-loopback;
          negotiation-options {
            allow-remote-loopback;
          }
          event-thresholds {
            frame-error 30;
            frame-period 50;
            frame-period summary 40;
            symbol-period 20;
          }
        }
      }
    }
  }
}
```

}

**Related  
Documentation**

- [link-fault-management on page 46](#)
- [IEEE 802.3ah OAM Link-Fault Management Overview on page 3](#)
- [Configuring IEEE 802.3ah OAM Link-Fault Management on page 7](#)
- [Enabling IEEE 802.3ah OAM Support on page 8](#)
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## Configuring Ethernet 802.3ah OAM on PTX Series Packet Transport Routers

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The IEEE 802.3ah standard for Operation, Administration, and Management (OAM) provides a specification for *Ethernet in the first mile (EFM)* connectivity. EFM defines how Ethernet can be transmitted over new media types using new Ethernet physical layer (PHY) interfaces. You can configure IEEE 802.3ah OAM on Ethernet point-to-point direct links or links across Ethernet repeaters. The IEEE 802.3ah OAM standard meets the requirement for OAM capabilities as Ethernet moves from being solely an enterprise technology to being a WAN and access technology, as well as being backward-compatible with existing Ethernet technology.

For Ethernet interfaces capable of running at 100 Mbps or faster, the IEEE 802.3ah OAM standard is supported on numerous Juniper Networks routers and switches. This topic describes configuration support for IEEE 802.3ah OAM features on PTX Series Packet Transport Routers.

On PTX Series Packet Transport Routers, Junos OS Release 12.1 supports the following IEEE 802.3ah OAM features at the physical interface level:

- Discovery and link monitoring
- Fault signaling and detection
- Periodic packet management (PPM) processing
- Action profile support
- Graceful Routing Engine switchover (GRES)

To configure 802.3ah OAM support for Ethernet interfaces, include the **oam** statement at the **[edit protocols]** hierarchy level:

```
oam {
  ethernet {
    link-fault-management {
      interfaces {
        interface-name {
          pdu-interval interval;
          link-discovery (active | passive);
          pdu-threshold count;
        }
      }
    }
  }
}
```

**Related  
Documentation**

- [Configuring IEEE 802.3ah OAM Link-Fault Management on page 7](#)
- [Configuring Link Discovery on page 9](#)
- [Detecting Remote Faults on page 14](#)
- [Configuring an OAM Action Profile on page 15](#)





## CHAPTER 3

# Network Interfaces Configuration Statements and Hierarchy

- [\[edit protocols oam\] Hierarchy Level on page 27](#)

### [\[edit protocols oam\] Hierarchy Level](#)

---

```
ethernet {
  connectivity-fault-management {
    action-profile profile-name {
      default-actions {
        interface-down;
      }
      event {
        adjacency-loss;
        interface-status-tlv (down | lower-layer-down);
        port-status-tlv blocked;
        rdi;
      }
    }
  }
  linktrace {
    age (30m | 10m | 1m | 30s | 10s);
    path-database-size path-database-size;
  }
  maintenance-domain domain-name {
    bridge-domain name;
    routing-instance rl {
      bridge-domain name;
      instance vpls-instance;
      interface (ge | xe) fpc/pic/port.domain;
      level number;
      maintenance-association name{
        mep identifier {
          direction (up | down)
          interface (ge | xe) fpc/pic/port.domain (working | protect );
          auto-discovery;
          lowest-priority-defect (all-defects | err-xcon | mac-rem-err-xcon | no-defect |
            rem-err-xcon | xcon);
          priority number;
        }
      }
    }
    mip-half-function (none | default | explicit);
```

```

name-format (character-string | none | dns | mac+2oct);
short-name-format (character-string | vlan | 2octet | rfc-2685-vpn-id);
protect-maintenance-association protect-ma-name;
remote-maintenance-association remote-ma-name;
continuity-check {
    hold-interval minutes;
    interval (10m | 10s | 1m | 1s | 100ms);
    loss-threshold number;
}
maintenance-association ma-name {
    mip-half-function (none | default | explicit);
    mep mep-id {
        auto-discovery;
        direction (up | down);
        interface interface-name (working | protect);
        priority number;
        remote-mep mep-id {
            action-profile profile-name;
            sla-iterator-profile profile-name {
                data-tlv-size bytes;
                iteration-count frames;
                priority priority-value;
            }
        }
    }
}
}
performance-monitoring {
    hardware-assisted-timestamping;
    sla-iterator-profiles {
        profile-name {
            disable;
            calculation-weight {
                delay delay-weight;
                delay-variation delay-variation-weight;
            }
            cycle-time milliseconds;
            iteration-period connections;
            measurement-type (loss | statistical-frame-loss | two-way-delay);
        }
    }
}
no-aggregate-delegate-processing;
}
link-fault-management {
    action-profile profile-name {
        action {
            syslog;
            link-down;
            send-critical-event;
        }
        event {
            link-adjacency-loss;
            link-event-rate {
                frame-error count;
                frame-period count;
            }
        }
    }
}

```

```

        frame-period-summary count;
        symbol-period count;
    }
    protocol-down;
}
}
interface interface-name {
    apply-action-profile profile-name;
    event-thresholds {
        frame-error count;
        frame-period count;
        frame-period-summary count;
        symbol-period count;
    }
    link-discovery (active | passive);
    negotiation-options {
        allow-remote-loopback;
        no-allow-link-events;
    }
    pdu-interval interval;
    pdu-threshold threshold-value;
    remote-loopback;
}
}
fnp {
    interval <100ms | 1s | 10s | 1m | 10m>;
    loss-threshold number
    interface interface name {
        domain-id domain-id
    }
}
}

```

#### Related Documentation

- [Junos OS Hierarchy and RFC Reference](#)
- [Ethernet Interfaces](#)
- [Junos OS Network Interfaces Library for Routing Devices](#)



## CHAPTER 4

# Statement Summary

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- [protocol-down on page 51](#)
- [remote-loopback on page 52](#)
- [send-critical-event on page 52](#)
- [symbol-period on page 53](#)
- [syslog \(OAM Action\) on page 53](#)

## action (OAM)

---

<b>Syntax</b>	<pre>action {     link-down;     send-critical-event;     syslog; }</pre>
<b>Hierarchy Level</b>	[edit protocols <a href="#">oam ethernet link-fault-management action-profile</a> ]
<b>Release Information</b>	Statement introduced in Junos OS Release 8.5.
<b>Description</b>	Define the action or actions to be taken when the OAM fault event occurs.
<b>Required Privilege Level</b>	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
<b>Related Documentation</b>	<ul style="list-style-type: none"><li>• <a href="#">Specifying the Actions to Be Taken for Link-Fault Management Events on page 16</a></li></ul>

## action-profile (Defining for LFM)

<b>Syntax</b>	<pre> action-profile <i>profile-name</i> {   action {     link-down;     send-critical-event;     syslog;   }   event {     link-adjacency-loss;     link-event-rate {       frame-error <i>count</i>;       frame-period <i>count</i>;       frame-period-summary <i>count</i>;       symbol-period <i>count</i>;     }     protocol-down;   } } </pre>
<b>Hierarchy Level</b>	[edit protocols <a href="#">oam ethernet link-fault-management</a> ]
<b>Release Information</b>	Statement introduced in Junos OS Release 8.5.
<b>Description</b>	Configure a name, one or more actions, and the events that trigger the action for an action profile.
<b>Options</b>	<p><i>profile-name</i>—Name of the action profile.</p> <p>The remaining statements are explained separately.</p>
<b>Required Privilege Level</b>	<p>interface—To view this statement in the configuration.</p> <p>interface-control—To add this statement to the configuration.</p>
<b>Related Documentation</b>	<ul style="list-style-type: none"> <li><a href="#">Configuring an OAM Action Profile on page 15</a></li> </ul>

## allow-remote-loopback

---

<b>Syntax</b>	allow-remote-loopback;
<b>Hierarchy Level</b>	[edit protocols <a href="#">oam link-fault-management interface</a> <i>interface-name</i> <a href="#">negotiation-options</a> ]
<b>Release Information</b>	Statement introduced in Junos OS Release 8.4.
<b>Description</b>	Enable the remote loopback on IQ2 and IQ2-E Gigabit Ethernet interfaces, and Ethernet interfaces on the MX Series routers and EX Series switches.
<b>Required Privilege Level</b>	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
<b>Related Documentation</b>	<ul style="list-style-type: none"><li>• <a href="#">Enabling Remote Loopback Support on the Local Interface on page 22</a></li></ul>

## apply-action-profile

---

<b>Syntax</b>	apply-action-profile <i>profile-name</i> ;
<b>Hierarchy Level</b>	[edit protocols <a href="#">oam ethernet link-fault-management interface</a> ]
<b>Release Information</b>	Statement introduced in Junos OS Release 8.5.
<b>Description</b>	Apply the specified action profile to the interface for link-fault management.
<b>Required Privilege Level</b>	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
<b>Related Documentation</b>	<ul style="list-style-type: none"><li>• <a href="#">Applying an Action Profile on page 20</a></li></ul>



## ethernet (Protocols OAM)

```

Syntax  ethernet {
        connectivity-fault-management {
            action-profile profile-name {
                default-actions {
                    interface-down;
                }
            }
        }
        performance-monitoring {
            delegate-server-processing;
            hardware-assisted-timestamping;
            sla-iterator-profiles {
                profile-name {
                    disable;
                    calculation-weight {
                        delay delay-weight;
                        delay-variation delay-variation-weight;
                    }
                    cycle-time milliseconds;
                    iteration-period connections;
                    measurement-type (loss | statistical-frame-loss | two-way-delay);
                }
            }
        }
        linktrace {
            age (30m | 10m | 1m | 30s | 10s);
            path-database-size path-database-size;
        }
        maintenance-domain domain-name {
            level number;
            name-format (character-string | none | dns | mac+2octet);
            maintenance-association ma-name {
                short-name-format (character-string | vlan | 2octet | rfc-2685-vpn-id);
                protect-maintenance-association protect-ma-name;
                remote-maintenance-association remote-ma-name;
                continuity-check {
                    convey-loss-threshold;
                    hold-interval minutes;
                    interface-status-tlv;
                    interval (10m | 10s | 1m | 1s | 100ms);
                    loss-threshold number;
                    port-status-tlv;
                }
            }
            mep mep-id {
                auto-discovery;
                direction (up | down);
                interface interface-name (protect | working);
                lowest-priority-defect (all-defects | err-xcon | mac-rem-err-xcon | no-defect |
                    rem-err-xcon | xcon );
                priority number;
                remote-mep mep-id {
                    action-profile profile-name;
                    sla-iterator-profile profile-name {

```

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```

        status-counter number;
        polling-verification-timer value;
        evc-map-type (all-to-one-bundling | bundling | service-multiplexing);
        evc evc-name {
            default-evc;
            vlan-list vlan-id-list;
        }
    }
}

```

**Hierarchy Level** [edit protocols [oam](#)]

**Release Information** Statement introduced in Junos OS Release 8.2.

**Description** For Ethernet interfaces on EX Series switches, and M320, MX Series, and T Series routers, provide fault signaling and detection for 802.3ah Operation, Administration, and Management (OAM) support.

The remaining statements are explained separately.

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

**Related Documentation**

- [Enabling IEEE 802.3ah OAM Support on page 8](#)

## event (LFM)

```

Syntax  event {
        link-adjacency-loss;
        link-event-rate {
            frame-error count;
            frame-period count;
            frame-period-summary count;
            symbol-period count;
        }
        protocol-down;
    }

```

**Hierarchy Level** [edit protocols [oam](#) [ethernet](#) [link-fault-management](#) [action-profile](#)]

**Release Information** Statement introduced in Junos OS Release 8.5.

**Description** Configure threshold values for link events in an action profile.

The remaining statements are explained separately.

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

**Related Documentation**

- [Monitoring Protocol Status on page 18](#)

## event-thresholds

---

<b>Syntax</b>	<pre>event-thresholds {     frame-error <i>count</i>;     frame-period <i>count</i>;     frame-period-summary <i>count</i>;     symbol-period <i>count</i>; }</pre>
<b>Hierarchy Level</b>	[edit protocols <a href="#">oam link-fault-management interface</a> <i>interface-name</i> ]
<b>Release Information</b>	Statement introduced in Junos OS Release 8.4.
<b>Description</b>	<p>Configure threshold limit values for link events in periodic OAM PDUs.</p> <p>The remaining statements are explained separately.</p>
<b>Required Privilege Level</b>	<p>interface—To view this statement in the configuration.</p> <p>interface-control—To add this statement to the configuration.</p>
<b>Related Documentation</b>	<ul style="list-style-type: none"><li>• <a href="#">Configuring Threshold Values for Local Fault Events on an Interface on page 12</a></li></ul>

## fast-aps-switch

<b>Syntax</b>	fast-aps-switch;
<b>Hierarchy Level</b>	[edit interfaces <i>interface-name</i> sonet-options aps]
<b>Release Information</b>	Statement introduced in Junos OS Release 12.1.
<b>Description</b>	(M320 routers with Channelized OC3/STM1 Circuit Emulation PIC with SFP only and EX Series switches) Reduce the Automatic Protection Switching (APS) switchover time in Layer 2 circuits.



### NOTE:

- Configuring this statement reduces the APS switchover time only when the Layer 2 circuit encapsulation type for the interface receiving traffic from a Layer 2 circuit neighbor is SAToP.
- When the fast-aps-switch statement is configured in revertive APS mode, you must configure an appropriate value for revert time to achieve reduction in APS switchover time.
- To prevent the logical interfaces in the data path from being shut down, configure appropriate hold-time values on all the interfaces in the data path that support TDM.
- The fast-aps-switch statement cannot be configured when the APS annex-b option is configured.
- The interfaces that have the fast-aps-switch statement configured cannot be used in virtual private LAN service (VPLS) environments.

<b>Required Privilege Level</b>	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
<b>Related Documentation</b>	<ul style="list-style-type: none"> <li>• <i>Reducing APS Switchover Time in Layer 2 Circuits</i></li> </ul>

## frame-error

---

<b>Syntax</b>	<code>frame-error count;</code>
<b>Hierarchy Level</b>	[edit protocols <a href="#">oam ethernet link-fault-management action-profile event link-event-rate</a> ], [edit protocols <a href="#">oam link-fault-management interface interface-name event-thresholds</a> ]
<b>Release Information</b>	Statement introduced in Junos OS Release 8.4.
<b>Description</b>	<p>Threshold for sending frame error events or taking the action specified in the action profile.</p> <p>A frame error is any frame error on the underlying physical layer. The threshold is reached when the number of frame errors reaches the configured value within the window.</p> <p>The window or period during which frame errors are counted is 5 seconds or multiples of it (with a maximum value of 1 minute). This window denotes the duration as intervals of 100 milliseconds, encoded as a 16-bit unsigned integer. This window is not configurable in Junos OS. According to the IEEE 802.3ah standard, the default value of the frame-errors window is 1 second. This window has a lower bound of 1 second and an upper bound of 1 minute.</p>
<b>Options</b>	<p><b>count</b>—Threshold count for frame error events.</p> <p><b>Range:</b> 1 through 100</p>
<b>Required Privilege Level</b>	<p>interface—To view this statement in the configuration.</p> <p>interface-control—To add this statement to the configuration.</p>
<b>Related Documentation</b>	<ul style="list-style-type: none"><li>• <a href="#">Configuring Threshold Values for Local Fault Events on an Interface on page 12</a></li><li>• <a href="#">Configuring Threshold Values for Fault Events in an Action Profile on page 19</a></li></ul>

## frame-period

---

<b>Syntax</b>	<code>frame-period <i>count</i>;</code>
<b>Hierarchy Level</b>	[edit protocols <a href="#">oam ethernet link-fault-management action-profile event link-event-rate</a> ], [edit protocols <a href="#">oam link-fault-management interface <i>interface-name</i> event-thresholds</a> ]
<b>Release Information</b>	Statement introduced in Junos OS Release 8.4.
<b>Description</b>	<p>Threshold for sending frame period error events or taking the action specified in the action profile.</p> <p>A frame error is any frame error on the underlying physical layer. The frame period threshold is reached when the number of frame errors reaches the configured value within the period window. The default period window is the number of minimum-size frames that can be transmitted on the underlying physical layer in 1 second. The window is not configurable.</p>
<b>Options</b>	<p><b>count</b>—Threshold count for frame period error events.</p> <p><b>Range:</b> 1 through 100</p>
<b>Required Privilege Level</b>	<p>interface—To view this statement in the configuration.</p> <p>interface-control—To add this statement to the configuration.</p>
<b>Related Documentation</b>	<ul style="list-style-type: none"> <li>• <a href="#">Configuring Threshold Values for Local Fault Events on an Interface on page 12</a></li> <li>• <a href="#">Configuring Threshold Values for Fault Events in an Action Profile on page 19</a></li> </ul>

## frame-period-summary

---

<b>Syntax</b>	<code>frame-period-summary count;</code>
<b>Hierarchy Level</b>	[edit protocols <a href="#">oam ethernet link-fault-management action-profile event link-event-rate</a> ], [edit protocols <a href="#">oam link-fault-management interface interface-name event-thresholds</a> ]
<b>Release Information</b>	Statement introduced in Junos OS Release 8.4.
<b>Description</b>	<p>Threshold for sending frame period summary error events or taking the action specified in the action profile.</p> <p>An errored frame second is any 1-second period that has at least one errored frame. This event is generated if the number of errored frame seconds is equal to or greater than the specified threshold for that period window. The default window is 60 seconds. The window is not configurable.</p>
<b>Options</b>	<p><b>count</b>—Threshold count for frame period summary error events.</p> <p><b>Range:</b> 1 through 100</p>
<b>Required Privilege Level</b>	<p>interface—To view this statement in the configuration.</p> <p>interface-control—To add this statement to the configuration.</p>
<b>Related Documentation</b>	<ul style="list-style-type: none"><li>• <a href="#">Configuring Threshold Values for Local Fault Events on an Interface on page 12</a></li><li>• <a href="#">Configuring Threshold Values for Fault Events in an Action Profile on page 19</a></li></ul>



## interface (OAM Link-Fault Management)

<b>Syntax</b>	<pre> interface <i>interface-name</i> {   apply-action-profile <i>profile-name</i>;   link-discovery (active   passive);   pdu-interval <i>interval</i>;   pdu-threshold <i>threshold-value</i>;   remote-loopback;   event-thresholds {     frame-error <i>count</i>;     frame-period <i>count</i>;     frame-period-summary <i>count</i>;     symbol-period <i>count</i>;   }   negotiation-options {     allow-remote-loopback;     no-allow-link-events;   } } </pre>
<b>Hierarchy Level</b>	[edit protocols <a href="#">oam ethernet link-fault-management</a> ]
<b>Release Information</b>	Statement introduced in Junos OS Release 8.2.
<b>Description</b>	For Ethernet interfaces on M320, MX Series, and T Series routers, configure IEEE 802.3ah Operation, Administration, and Management (OAM) support.
<b>Options</b>	<p><b>interface</b> <i>interface-name</i>—Interface to be enabled for IEEE 802.3ah link fault management OAM support.</p> <p><b>Range:</b> 1 through 10 interfaces can be tracked.</p> <p>The remaining statements are described separately.</p>
<b>Required Privilege Level</b>	<p>interface—To view this statement in the configuration.</p> <p>interface-control—To add this statement to the configuration.</p>
<b>Related Documentation</b>	<ul style="list-style-type: none"> <li>• <a href="#">Enabling IEEE 802.3ah OAM Support on page 8</a></li> </ul>

## link-adjacency-loss

---

<b>Syntax</b>	link-adjacency-loss;
<b>Hierarchy Level</b>	[edit protocols <a href="#">oam ethernet link-fault-management action-profile event</a> ]
<b>Release Information</b>	Statement introduced in Junos OS Release 8.5.
<b>Description</b>	Loss of adjacency with IEEE 802.3ah link-fault management peer event. When included, the loss-of-adjacency event triggers the action specified under the <b>action</b> statement.
<b>Required Privilege Level</b>	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
<b>Related Documentation</b>	<ul style="list-style-type: none"><li>• <a href="#">Monitoring the Loss of Link Adjacency on page 17</a></li></ul>

## link-down

---

<b>Syntax</b>	link-down;
<b>Hierarchy Level</b>	[edit protocols <a href="#">oam ethernet link-fault-management</a> ]
<b>Release Information</b>	Statement introduced in Junos OS Release 8.5.
<b>Description</b>	Mark the interface down for transit traffic.
<b>Required Privilege Level</b>	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
<b>Related Documentation</b>	<ul style="list-style-type: none"><li>• <a href="#">Specifying the Actions to Be Taken for Link-Fault Management Events on page 16</a></li></ul>

## link-discovery

<b>Syntax</b>	link-discovery (active   passive);
<b>Hierarchy Level</b>	[edit protocols <a href="#">oam ethernet link-fault-management interface</a> <i>interface-name</i> ]
<b>Release Information</b>	Statement introduced in Junos OS Release 8.2.
<b>Description</b>	For Ethernet interfaces on EX Series switches, and M320, M120, MX Series, and T Series routers, specify the discovery mode used for IEEE 802.3ah Operation, Administration, and Management (OAM) support. The discovery process is triggered automatically when OAM 802.3ah functionality is enabled on a port. Link monitoring is done when the interface sends periodic OAM PDUs.
<b>Options</b>	(active   passive)—Passive or active mode. In active mode, the interface discovers and monitors the peer on the link if the peer also supports IEEE 802.3ah OAM functionality. In passive mode, the peer initiates the discovery process. Once the discovery process is initiated, both sides participate in discovery.
<b>Required Privilege Level</b>	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
<b>Related Documentation</b>	<ul style="list-style-type: none"> <li>• <a href="#">Configuring Link Discovery on page 9</a></li> </ul>

## link-event-rate

<b>Syntax</b>	<pre>link-event-rate {   frame-error count;   frame-period count;   frame-period-summary count;   symbol-period count; }</pre>
<b>Hierarchy Level</b>	[edit protocols <a href="#">oam ethernet link-fault-management action-profile event</a> ]
<b>Release Information</b>	Statement introduced in Junos OS Release 8.5.
<b>Description</b>	Configure the number of link-fault management events per second.
<b>Required Privilege Level</b>	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
<b>Related Documentation</b>	<ul style="list-style-type: none"> <li>• <a href="#">Configuring Threshold Values for Fault Events in an Action Profile on page 19</a></li> </ul>

## link-fault-management

```
Syntax  link-fault-management {
        action-profile profile-name {
            action {
                link-down;
                send-critical-event;
                syslog;
            }
            event {
                link-adjacency-loss;
                link-event-rate {
                    frame-error count;
                    frame-period count;
                    frame-period-summary count;
                    symbol-period count;
                }
                protocol-down;
            }
        }
    }
    interface interface-name {
        apply-action-profile profile-name;
        link-discovery (active | passive);
        pdu-interval interval;
        pdu-threshold threshold-value;
        remote-loopback;
        event-thresholds {
            frame-error count;
            frame-period count;
            frame-period-summary count;
            symbol-period count;
        }
        negotiation-options {
            allow-remote-loopback;
            no-allow-link-events;
        }
    }
}
```

**Hierarchy Level** [edit protocols [oam](#) [ethernet](#)]

**Release Information** Statement introduced in Junos OS Release 8.2.

**Description** For Ethernet interfaces on M320, M120, MX Series, and T Series routers and EX Series switches, specify fault signaling and detection for IEEE 802.3ah Operation, Administration, and Management (OAM) support.

The remaining statements are explained separately.

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

**Related Documentation** • [Enabling IEEE 802.3ah OAM Support on page 8](#)

## negotiation-options

---

<b>Syntax</b>	negotiation-options { <a href="#">allow-remote-loopback</a> ; <a href="#">no-allow-link-events</a> ; }
<b>Hierarchy Level</b>	[edit protocols <a href="#">oam link-fault-management interface</a> <i>interface-name</i> ]
<b>Release Information</b>	Statement introduced in Junos OS Release 8.4.
<b>Description</b>	Enable and disable IEEE 802.3ah Operation, Administration, and Management (OAM) features for Ethernet interfaces.  The statements are explained separately.
<b>Required Privilege Level</b>	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
<b>Related Documentation</b>	• <a href="#">IEEE 802.3ah OAM Link-Fault Management Overview on page 3</a>

## no-allow-link-events

---

<b>Syntax</b>	no-allow-link-events;
<b>Hierarchy Level</b>	[edit protocols <a href="#">oam ethernet link-fault-management interface</a> <i>interface-name</i> <a href="#">negotiation-options</a> ]
<b>Release Information</b>	Statement introduced in Junos OS Release 8.4.
<b>Description</b>	Disable the sending of link event TLVs.
<b>Required Privilege Level</b>	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
<b>Related Documentation</b>	• <a href="#">Disabling the Sending of Link Event TLVs on page 13</a>

## oam

```

Syntax  oam {
        ethernet {
            connectivity-fault-management {
                action-profile profile-name {
                    default-actions {
                        interface-down;
                    }
                }
            }
            performance-monitoring {
                delegate-server-processing;
                hardware-assisted-timestamping;
                sla-iterator-profiles {
                    profile-name {
                        disable;
                        calculation-weight {
                            delay delay-weight;
                            delay-variation delay-variation-weight;
                        }
                        cycle-time milliseconds;
                        iteration-period connections;
                        measurement-type (loss | statistical-frame-loss | two-way-delay);
                    }
                }
            }
            linktrace {
                age (30m | 10m | 1m | 30s | 10s);
                path-database-size path-database-size;
            }
            maintenance-domain domain-name {
                level number;
                name-format (character-string | none | dns | mac+2octet);
                maintenance-association ma-name {
                    short-name-format (character-string | vlan | 2octet | rfc-2685-vpn-id);
                    protect-maintenance-association protect-ma-name;
                    remote-maintenance-association remote-ma-name;
                    continuity-check {
                        convey-loss-threshold;
                        hold-interval minutes;
                        interface-status-tlv;
                        interval (10m | 10s | 1m | 1s | 100ms);
                        loss-threshold number;
                        port-status-tlv;
                    }
                }
                mep mep-id {
                    auto-discovery;
                    direction (up | down);
                    interface interface-name (protect | working);
                    lowest-priority-defect (all-defects | err-xcon | mac-rem-err-xcon | no-defect |
                        rem-err-xcon | xcon );
                    priority number;
                    remote-mep mep-id {
                        action-profile profile-name;
                    }
                }
            }
        }
    }

```

```

        sla-iterator-profile profile-name {
            data-tlv-size size;
            iteration-count count-value;
            priority priority-value;
        }
    }
}
}
}
link-fault-management {
    action-profile profile-name {
        action {
            link-down;
            send-critical-event;
            syslog;
        }
        event {
            link-adjacency-loss;
            link-event-rate {
                frame-error count;
                frame-period count;
                frame-period-summary count;
                symbol-period count;
            }
            protocol-down;
        }
    }
}
interface interface-name {
    apply-action-profile
    link-discovery (active | passive);
    pdu-interval interval;
    pdu-threshold threshold-value;
    remote-loopback;
    event-thresholds {
        frame-error count;
        frame-period count;
        frame-period-summary count;
        symbol-period count;
    }
    negotiation-options {
        allow-remote-loopback;
        no-allow-link-events;
    }
}
}
}
}
}

```

**Hierarchy Level** [edit protocols]

**Release Information** Statement introduced in Junos OS Release 8.2.  
Statement introduced in Junos OS Release 12.1X48 for PTX Series Packet Transport Routers.

<b>Description</b>	For Ethernet interfaces on M320, M120, MX Series, and T Series routers and PTX Series Packet Transport Routers, provide IEEE 802.3ah Operation, Administration, and Maintenance (OAM) support.  The remaining statements are explained separately.
<b>Required Privilege Level</b>	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
<b>Related Documentation</b>	<ul style="list-style-type: none"><li>• <a href="#">IEEE 802.3ah OAM Link-Fault Management Overview on page 3</a></li><li>• <i>Configuring Ethernet 802.1ag OAM on PTX Series Packet Transport Routers</i></li></ul>

---

## pdu-interval

---

<b>Syntax</b>	<code>pdu-interval <i>interval</i>;</code>
<b>Hierarchy Level</b>	[edit protocols <a href="#">oam ethernet link-fault-management interface</a> <i>interface-name</i> ]
<b>Release Information</b>	Statement introduced in Junos OS Release 8.2.
<b>Description</b>	For Ethernet interfaces on EX Series switches and M320, M120, MX Series, and T Series routers, specify the periodic OAM PDU sending interval for fault detection. Used for IEEE 802.3ah Operation, Administration, and Management (OAM) support.
<b>Options</b>	<b>interval</b> —Periodic OAM PDU sending interval. <b>Range:</b> 100 through 1000 milliseconds <b>Default:</b> 1000 milliseconds
<b>Required Privilege Level</b>	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
<b>Related Documentation</b>	<ul style="list-style-type: none"><li>• <a href="#">Configuring the OAM PDU Interval on page 10</a></li></ul>



## pdu-threshold

---

<b>Syntax</b>	<code>pdu-threshold <i>threshold-value</i>;</code>
<b>Hierarchy Level</b>	[edit protocols <a href="#">oam ethernet link-fault-management interface <i>interface-name</i></a> ]
<b>Release Information</b>	Statement introduced in Junos OS Release 8.2.
<b>Description</b>	For Ethernet interfaces on EX Series switches and M320, M120, MX Series, and T Series routers, specify the number of OAM PDUs to miss before an error is logged. Used for IEEE 802.3ah Operation, Administration, and Management (OAM) support.
<b>Options</b>	<p><b><i>threshold-value</i></b>—The number of PDUs missed before declaring the peer lost.</p> <p><b>Range:</b> 3 through 10 PDUs</p> <p><b>Default:</b> 3 PDUs</p>
<b>Required Privilege Level</b>	<p>interface—To view this statement in the configuration.</p> <p>interface-control—To add this statement to the configuration.</p>
<b>Related Documentation</b>	<ul style="list-style-type: none"> <li>• <a href="#">Configuring the OAM PDU Threshold on page 11</a></li> </ul>

## protocol-down

---

<b>Syntax</b>	<code>protocol-down;</code>
<b>Hierarchy Level</b>	[edit protocols <a href="#">oam ethernet link-fault-management action-profile event</a> ]
<b>Release Information</b>	Statement introduced in Junos OS Release 8.5.
<b>Description</b>	Upper layer indication of protocol down event. When the <b>protocol-down</b> statement is included, the protocol down event triggers the action specified under the <b>action</b> statement.
<b>Required Privilege Level</b>	<p>interface—To view this statement in the configuration.</p> <p>interface-control—To add this statement to the configuration.</p>
<b>Related Documentation</b>	<ul style="list-style-type: none"> <li>• <a href="#">Configuring an OAM Action Profile on page 15</a></li> </ul>

## remote-loopback

---

<b>Syntax</b>	remote-loopback;
<b>Hierarchy Level</b>	[edit protocols <a href="#">oam link-fault-management interface interface-name</a> ]
<b>Release Information</b>	Statement introduced in Junos OS Release 8.2.
<b>Description</b>	For Ethernet interfaces on EX Series switches and M320, M120, MX Series, and T Series routers, set the remote DTE into loopback mode. Remove the statement from the configuration to take the remote DTE out of loopback mode. Used for IEEE 802.3ah Operation, Administration, and Management (OAM) support.
<b>Required Privilege Level</b>	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
<b>Related Documentation</b>	<ul style="list-style-type: none"><li>• <a href="#">Setting a Remote Interface into Loopback Mode on page 21</a></li></ul>

## send-critical-event

---

<b>Syntax</b>	send-critical-event;
<b>Hierarchy Level</b>	[edit protocols <a href="#">oam ethernet link-fault-management action-profile action</a> ]
<b>Release Information</b>	Statement introduced in Junos OS Release 8.5.
<b>Description</b>	Send OAM PDUs with the critical event bit set.
<b>Required Privilege Level</b>	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
<b>Related Documentation</b>	<ul style="list-style-type: none"><li>• <a href="#">Specifying the Actions to Be Taken for Link-Fault Management Events on page 16</a></li></ul>

## symbol-period

<b>Syntax</b>	<code>symbol-period count;</code>
<b>Hierarchy Level</b>	[edit protocols <a href="#">oam ethernet link-fault-management action-profile event</a> , <a href="#">link-event-rate</a> ], [edit protocols <a href="#">oam link-fault-management interface</a> <i>interface-name</i> <a href="#">event-thresholds</a> ]
<b>Release Information</b>	Statement introduced in Junos OS Release 8.4.
<b>Description</b>	<p>Configure the threshold for sending symbol period events or taking the action specified in the action profile.</p> <p>A symbol error is any symbol code error on the underlying physical layer. The symbol period threshold is reached when the number of symbol errors reaches the configured value within the period window. The default period window is the number of symbols that can be transmitted on the underlying physical layer in 1 second. The window is not configurable.</p>
<b>Options</b>	<p><b>count</b>—Threshold count for symbol period events.</p> <p><b>Range:</b> 1 through 100</p>
<b>Required Privilege Level</b>	<p>interface—To view this statement in the configuration.</p> <p>interface-control—To add this statement to the configuration.</p>
<b>Related Documentation</b>	<ul style="list-style-type: none"> <li>• <a href="#">Configuring Threshold Values for Local Fault Events on an Interface on page 12</a></li> <li>• <a href="#">Configuring Threshold Values for Fault Events in an Action Profile on page 19</a></li> </ul>

## syslog (OAM Action)

<b>Syntax</b>	<code>syslog;</code>
<b>Hierarchy Level</b>	[edit protocols <a href="#">oam ethernet link-fault-management action-profile action</a> ]
<b>Release Information</b>	Statement introduced in Junos OS Release 8.5.
<b>Description</b>	Generate a syslog message for the Ethernet Operation, Administration, and Management (OAM) event.
<b>Required Privilege Level</b>	<p>interface—To view this statement in the configuration.</p> <p>interface-control—To add this statement to the configuration.</p>
<b>Related Documentation</b>	<ul style="list-style-type: none"> <li>• <a href="#">Specifying the Actions to Be Taken for Link-Fault Management Events on page 16</a></li> </ul>



## PART 3

# Administration

- [Monitoring Commands on page 57](#)



## CHAPTER 5

# Monitoring Commands

- `show oam ethernet link-fault-management`
- `show interfaces (Fast Ethernet)`
- `show interfaces (10-Gigabit Ethernet)`

## show oam ethernet link-fault-management

<b>Syntax</b>	show oam ethernet link-fault-management <brief   detail> <interface-name>
<b>Release Information</b>	Command introduced in Junos OS Release 8.2.
<b>Description</b>	On EX Series switches and M320, M120, MX Series, T320, and T640 routers, display Operation, Administration, and Management (OAM) link fault management information for Ethernet interfaces.
<b>Options</b>	<b>brief   detail</b> —(Optional) Display the specified level of output.  <b>interface-name</b> —(Optional) Display link fault management information for the specified Ethernet interface only.
<b>Required Privilege Level</b>	view
<b>List of Sample Output</b>	<a href="#">show oam ethernet link-fault-management brief on page 62</a> <a href="#">show oam ethernet link-fault-management detail on page 62</a>
<b>Output Fields</b>	<a href="#">Table 3 on page 58</a> lists the output fields for the <b>show oam ethernet link-fault-management</b> command. Output fields are listed in the approximate order in which they appear.

**Table 3: show oam ethernet link-fault-management Output Fields**

Field Name	Field Description	Level of Output
<b>Status</b>	Indicates the status of the established link.  <ul style="list-style-type: none"> <li>• <b>Fail</b>—A link fault condition exists.</li> <li>• <b>Running</b>—A link fault condition does not exist.</li> <li>• <b>ISSU</b>—The local end is in ISSU.</li> </ul>	All levels
<b>Discovery state</b>	State of the discovery mechanism:  <ul style="list-style-type: none"> <li>• <b>Passive Wait</b></li> <li>• <b>Send Any</b></li> <li>• <b>Send Local Remote</b></li> <li>• <b>Send Local Remote Ok</b></li> <li>• <b>Fault</b></li> </ul>	All levels
<b>Peer address</b>	Address of the OAM peer.	All levels



Table 3: show oam ethernet link-fault-management Output Fields (*continued*)

Field Name	Field Description	Level of Output
<b>Flags</b>	<p>Information about the interface. Possible values are described in the “Link Flags” section under <i>Common Output Fields Description</i>.</p> <ul style="list-style-type: none"> <li>• <b>Remote-Stable</b>—Indicates remote OAM client acknowledgment of and satisfaction with local OAM state information. <b>False</b> indicates that remote DTE either has not seen or is unsatisfied with local state information. <b>True</b> indicates that remote DTE has seen and is satisfied with local state information.</li> <li>• <b>Local-Stable</b>—Indicates local OAM client acknowledgment of and satisfaction with remote OAM state information. <b>False</b> indicates that local DTE either has not seen or is unsatisfied with remote state information. <b>True</b> indicates that local DTE has seen and is satisfied with remote state information.</li> <li>• <b>Remote-State-Valid</b>—Indicates the OAM client has received remote state information found within Local Information TLVs of received Information OAM PDUs. <b>False</b> indicates that OAM client has not seen remote state information. <b>True</b> indicates that the OAM client has seen remote state information.</li> </ul>	All levels
<b>Remote loopback status</b>	Indicates the remote loopback status. An OAM entity can put its remote peer into loopback mode using the Loopback control OAM PDU. In loopback mode, every frame received is transmitted back on the same port (except for OAM PDUs, which are needed to maintain the OAM session).	All levels
<b>Remote entity information</b>	<p>Remote entity information.</p> <ul style="list-style-type: none"> <li>• <b>Remote MUX action</b>—Indicates the state of the multiplexer functions of the OAM sublayer. Device is forwarding non-OAM PDUs to the lower sublayer or discarding non-OAM PDUs.</li> <li>• <b>Remote parser action</b>—Indicates the state of the parser function of the OAM sublayer. Device is forwarding non-OAM PDUs to higher sublayer, looping back non-OAM PDUs to the lower sublayer, or discarding non-OAM PDUs.</li> <li>• <b>Discovery mode</b>—Indicates whether discovery mode is active or inactive.</li> <li>• <b>Unidirectional mode</b>—Indicates the ability to operate a link in a unidirectional mode for diagnostic purposes.</li> <li>• <b>Remote loopback mode</b>—Indicates whether remote loopback is supported or unsupported.</li> <li>• <b>Link events</b>—Indicates whether interpreting link events is supported or unsupported on the remote peer.</li> <li>• <b>Variable requests</b>—Indicates whether variable requests are supported. The Variable Request OAM PDU, is used to request one or more MIB variables from the remote peer. Also indicates if the remote end is in ISSU.</li> </ul>	All levels
<b>OAM Receive Statistics</b>		
<b>Information</b>	The total number of information PDUs received.	<b>detail</b>
<b>Event</b>	The total number of loopback control PDUs received.	<b>detail</b>
<b>Variable request</b>	The total number of variable request PDUs received.	<b>detail</b>
<b>Variable response</b>	The total number of variable response PDUs received.	<b>detail</b>

Table 3: show oam ethernet link-fault-management Output Fields (*continued*)

Field Name	Field Description	Level of Output
<b>Loopback control</b>	The total number of loopback control PDUs received.	<b>detail</b>
<b>Organization specific</b>	The total number of vendor organization specific PDUs received.	<b>detail</b>
<b>OAM Transmit Statistics</b>		
<b>Information</b>	The total number of information PDUs transmitted.	<b>detail</b>
<b>Event</b>	The total number of event notification PDUs transmitted.	<b>detail</b>
<b>Variable request</b>	The total number of variable request PDUs transmitted.	<b>detail</b>
<b>Variable response</b>	The total number of variable response PDUs transmitted.	<b>detail</b>
<b>Loopback control</b>	The total number of loopback control PDUs transmitted.	<b>detail</b>
<b>Organization specific</b>	The total number of vendor organization specific PDUs transmitted.	<b>detail</b>
<b>OAM Received Symbol Error Event information</b>		
<b>Events</b>	The number of symbol error event TLVs that have been received since the OAM sublayer was reset.	<b>detail</b>
<b>Window</b>	The symbol error event window in the received PDU.  The protocol default value is the number of symbols that can be received in one second on the underlying physical layer.	<b>detail</b>
<b>Threshold</b>	The number of errored symbols in the period required for the event to be generated.	<b>detail</b>
<b>Errors in period</b>	The number of symbol errors in the period reported in the received event PDU.	<b>detail</b>
<b>Total errors</b>	The number of errored symbols that have been reported in received event TLVs since the OAM sublayer was reset.  Symbol errors are coding symbol errors.	<b>detail</b>
<b>OAM Received Frame Error Event Information</b>		
<b>Events</b>	The number of errored frame event TLVs that have been received since the OAM sublayer was reset.	<b>detail</b>
<b>Window</b>	The duration of the window in terms of the number of 100 ms period intervals.	<b>detail</b>
<b>Threshold</b>	The number of detected errored frames required for the event to be generated.	<b>detail</b>
<b>Errors in period</b>	The number of detected errored frames in the period.	<b>detail</b>

Table 3: show oam ethernet link-fault-management Output Fields (*continued*)

Field Name	Field Description	Level of Output
<b>Total errors</b>	The number of errored frames that have been reported in received event TLVs since the OAM sublayer was reset.  A frame error is any frame error on the underlying physical layer.	<b>detail</b>
<b>OAM Received Frame Period Error Event Information</b>		
<b>Events</b>	The number of frame seconds errors event TLVs that have been received since the OAM sublayer was reset.	<b>detail</b>
<b>Window</b>	The duration of the frame seconds window.	<b>detail</b>
<b>Threshold</b>	The number of frame seconds errors in the period.	<b>detail</b>
<b>Errors in period</b>	The number of frame seconds errors in the period.	<b>detail</b>
<b>Total errors</b>	The number of frame seconds errors that have been reported in received event TLVs since the OAM sublayer was reset.	<b>detail</b>
<b>OAM Transmitted Symbol Error Event Information</b>		
<b>Events</b>	The number of symbol error event TLVs that have been transmitted since the OAM sublayer was reset.	<b>detail</b>
<b>Window</b>	The symbol error event window in the transmitted PDU.	<b>detail</b>
<b>Threshold</b>	The number of errored symbols in the period required for the event to be generated.	<b>detail</b>
<b>Errors in period</b>	The number of symbol errors in the period reported in the transmitted event PDU.	<b>detail</b>
<b>Total errors</b>	The number of errored symbols reported in event TLVs that have been transmitted since the OAM sublayer was reset.	<b>detail</b>
<b>OAM Current Symbol Error Event Information</b>		
<b>Events</b>	The number of symbol error TLVs that have been generated regardless of whether the threshold for sending event TLVs has been crossed.	<b>detail</b>
<b>Window</b>	The symbol error event window in the transmitted PDU.	<b>detail</b>
<b>Threshold</b>	The number of errored symbols in the period required for the event to be generated.	<b>detail</b>
<b>Errors in period</b>	The total number of symbol errors in the period reported.	<b>detail</b>
<b>Total errors</b>	The number of errored symbols reported in event TLVs that have been generated regardless of whether the threshold for sending event TLVs has been crossed.	<b>detail</b>
<b>OAM Transmitted Frame Error Event Information</b>		

Table 3: show oam ethernet link-fault-management Output Fields (*continued*)

Field Name	Field Description	Level of Output
<b>Events</b>	The number of errored frame event TLVs that have been transmitted since the OAM sublayer was reset.	<b>detail</b>
<b>Window</b>	The duration of the window in terms of the number of 100 ms period intervals.	<b>detail</b>
<b>Threshold</b>	The number of detected errored frames required for the event to be generated.	<b>detail</b>
<b>Errors in period</b>	The number of detected errored frames in the period.	<b>detail</b>
<b>Total errors</b>	The number of errored frames that have been detected since the OAM sublayer was reset.	<b>detail</b>
<b>OAM Current Frame Error Event Information</b>		
<b>Events</b>	The number of errored frame event TLVs that have been generated regardless of whether the threshold for sending event TLVs has been crossed.	<b>detail</b>
<b>Window</b>	The duration of the window in terms of the number of 100 ms period intervals.	<b>detail</b>
<b>Threshold</b>	The number of detected errored frames required for the event to be generated.	<b>detail</b>
<b>Errors in period</b>	The number of errored frames in the period.	<b>detail</b>
<b>Total errors</b>	The number of errored frames detected regardless of whether the threshold for transmitting event TLVs has been crossed.	<b>detail</b>

## Sample Output

### show oam ethernet link-fault-management brief

```

user@host> show oam ethernet link-fault-management brief
Interface: ge-3/1/3
Status: Running, Discovery state: Send Any, ISSU
Peer address: 00:90:69:72:2c:83
Flags:Remote-Stable Remote-State-Valid Local-Stable 0x50
Remote loopback status: Disabled on local port, Enabled on peer port
Remote entity information:
  Remote MUX action: discarding, Remote parser action: loopback
  Discovery mode: active, Unidirectional mode: unsupported
  Remote loopback mode: supported, Link events: supported
  Variable requests: unsupported, Remote in ISSU

```

### show oam ethernet link-fault-management detail

```

user@host> show oam ethernet link-fault-management detail
Interface: ge-6/1/0
Status: Running, Discovery state: Send Any, ISSU
Peer address: 00:90:69:0a:07:14
Flags:Remote-Stable Remote-State-Valid Local-Stable 0x50
OAM receive statistics:
  Information: 186365, Event: 0, Variable request: 0, Variable response: 0
  Loopback control: 0, Organization specific: 0

```

```
OAM transmit statistics:
  Information: 186347, Event: 0, Variable request: 0, Variable response: 0
  Loopback control: 0, Organization specific: 0
OAM received symbol error event information:
  Events: 0, Window: 0, Threshold: 0
  Errors in period: 0, Total errors: 0
OAM received frame error event information:
  Events: 0, Window: 0, Threshold: 0
  Errors in period: 0, Total errors: 0
OAM received frame period error event information:
  Events: 0, Window: 0, Threshold: 0
  Errors in period: 0, Total errors: 0
OAM transmitted symbol error event information:
  Events: 0, Window: 0, Threshold: 1
  Errors in period: 0, Total errors: 0
OAM current symbol error event information:
  Events: 0, Window: 0, Threshold: 1
  Errors in period: 0, Total errors: 0
OAM transmitted frame error event information:
  Events: 0, Window: 0, Threshold: 1
  Errors in period: 0, Total errors: 0
OAM current frame error event information:
  Events: 0, Window: 0, Threshold: 1
  Errors in period: 0, Total errors: 0
Remote entity information:
  Remote MUX action: forwarding, Remote parser action: forwarding
  Discovery mode: active, Unidirectional mode: unsupported
  Remote loopback mode: supported, Link events: supported
  Variable requests: unsupported, Remote in ISSU
```

## show interfaces (Fast Ethernet)

<b>Syntax</b>	<pre>show interfaces <i>interface-type</i> &lt;brief   detail   extensive   terse&gt; &lt;descriptions&gt; &lt;media&gt; &lt;snmp-index <i>snmp-index</i>&gt; &lt;statistics&gt;</pre>
<b>Release Information</b>	Command introduced before Junos OS Release 7.4.
<b>Description</b>	Display status information about the specified Fast Ethernet interface.
<b>Options</b>	<p><b><i>interface-type</i></b>—On M Series and T Series routers, the interface type is <b><i>fe-fpc/pic/port</i></b>. On the J Series routers, the interface type is <b><i>fe-pim/O/port</i></b>.</p> <p><b><i>brief   detail   extensive   terse</i></b>—(Optional) Display the specified level of output.</p> <p><b><i>descriptions</i></b>—(Optional) Display interface description strings.</p> <p><b><i>media</i></b>—(Optional) Display media-specific information about network interfaces.</p> <p><b><i>snmp-index snmp-index</i></b>—(Optional) Display information for the specified SNMP index of the interface.</p> <p><b><i>statistics</i></b>—(Optional) Display static interface statistics.</p>
<b>Required Privilege Level</b>	view
<b>List of Sample Output</b>	<p><a href="#">show interfaces (Fast Ethernet) on page 77</a></p> <p><a href="#">show interfaces brief (Fast Ethernet) on page 78</a></p> <p><a href="#">show interfaces detail (Fast Ethernet) on page 78</a></p> <p><a href="#">show interfaces extensive (Fast Ethernet) on page 78</a></p>
<b>Output Fields</b>	<p><a href="#">Table 4 on page 64</a> lists the output fields for the <b>show interfaces Fast Ethernet</b> command. Output fields are listed in the approximate order in which they appear.</p>

Table 4: show interfaces Fast Ethernet Output Fields

Field Name	Field Description	Level of Output
Physical Interface		
<b>Physical interface</b>	Name of the physical interface.	All levels
<b>Enabled</b>	State of the interface. Possible values are described in the “Enabled Field” section under <i>Common Output Fields Description</i> .	All levels
<b>Interface index</b>	Index number of the physical interface, which reflects its initialization sequence.	<b>detail extensive none</b>
<b>SNMP ifIndex</b>	SNMP index number for the physical interface.	<b>detail extensive none</b>

Table 4: show interfaces Fast Ethernet Output Fields (*continued*)

Field Name	Field Description	Level of Output
<b>Generation</b>	Unique number for use by Juniper Networks technical support only.	<b>detail extensive</b>
<b>Link-level type</b>	Encapsulation being used on the physical interface.	All levels
<b>MTU</b>	Maximum transmission unit size on the physical interface.	All levels
<b>Link-mode</b>	Type of link connection configured for the physical interface: <b>Full-duplex</b> or <b>Half-duplex</b>	<b>extensive</b>
<b>Speed</b>	Speed at which the interface is running.	All levels
<b>Loopback</b>	Loopback status: <b>Enabled</b> or <b>Disabled</b> . If loopback is enabled, type of loopback: <b>Local</b> or <b>Remote</b> .	All levels
<b>Source filtering</b>	Source filtering status: <b>Enabled</b> or <b>Disabled</b> .	All levels
<b>LAN-PHY mode</b>	10-Gigabit Ethernet interface operating in Local Area Network Physical Layer Device (LAN PHY) mode. LAN PHY allows 10-Gigabit Ethernet wide area links to use existing Ethernet applications.	All levels
<b>WAN-PHY mode</b>	10-Gigabit Ethernet interface operating in Wide Area Network Physical Layer Device (WAN PHY) mode. WAN PHY allows 10-Gigabit Ethernet wide area links to use fiber-optic cables and other devices intended for SONET/SDH.	All levels
<b>Unidirectional</b>	Unidirectional link mode status for 10-Gigabit Ethernet interface: <b>Enabled</b> or <b>Disabled</b> for parent interface; <b>Rx-only</b> or <b>Tx-only</b> for child interfaces.	All levels
<b>Flow control</b>	Flow control status: <b>Enabled</b> or <b>Disabled</b> .	All levels
<b>Auto-negotiation</b>	(Gigabit Ethernet interfaces) Autonegotiation status: <b>Enabled</b> or <b>Disabled</b> .	All levels
<b>Remote-fault</b>	(Gigabit Ethernet interfaces) Remote fault status: <ul style="list-style-type: none"> <li>• <b>Online</b>—Autonegotiation is manually configured as online.</li> <li>• <b>Offline</b>—Autonegotiation is manually configured as offline.</li> </ul>	All levels
<b>Device flags</b>	Information about the physical device. Possible values are described in the "Device Flags" section under <i>Common Output Fields Description</i> .	All levels
<b>Interface flags</b>	Information about the interface. Possible values are described in the "Interface Flags" section under <i>Common Output Fields Description</i> .	All levels
<b>Link flags</b>	Information about the link. Possible values are described in the "Links Flags" section under <i>Common Output Fields Description</i> .	All levels
<b>Wavelength</b>	(10-Gigabit Ethernet dense wavelength-division multiplexing [DWDM] interfaces) Displays the configured wavelength, in nanometers (nm).	All levels

Table 4: show interfaces Fast Ethernet Output Fields (*continued*)

Field Name	Field Description	Level of Output
<b>Frequency</b>	(10-Gigabit Ethernet DWDM interfaces only) Displays the frequency associated with the configured wavelength, in terahertz (THz).	All levels
<b>CoS queues</b>	Number of CoS queues configured.	detail extensive none
<b>Schedulers</b>	(GigabitEthernet intelligent queuing 2 (IQ2) interfaces only) Number of CoS schedulers configured.	extensive
<b>Hold-times</b>	Current interface hold-time up and hold-time down, in milliseconds.	detail extensive
<b>Current address</b>	Configured MAC address.	detail extensive none
<b>Hardware address</b>	Hardware MAC address.	detail extensive none
<b>Last flapped</b>	Date, time, and how long ago the interface went from down to up. The format is <b>Last flapped: year-month-day hour:minute:second:timezone (hour:minute:second ago)</b> . For example, <b>Last flapped: 2002-04-26 10:52:40 PDT (04:33:20 ago)</b> .	detail extensive none
<b>Input Rate</b>	Input rate in bits per second (bps) and packets per second (pps).	None specified
<b>Output Rate</b>	Output rate in bps and pps.	None specified
<b>Statistics last cleared</b>	Time when the statistics for the interface were last set to zero.	detail extensive
<b>Traffic statistics</b>	<p>Number and rate of bytes and packets received and transmitted on the physical interface.</p> <ul style="list-style-type: none"> <li>• <b>Input bytes</b>—Number of bytes received on the interface</li> <li>• <b>Output bytes</b>—Number of bytes transmitted on the interface.</li> <li>• <b>Input packets</b>—Number of packets received on the interface.</li> <li>• <b>Output packets</b>—Number of packets transmitted on the interface.</li> </ul> <p>Gigabit Ethernet and 10-Gigabit Ethernet IQ PICs count the overhead and CRC bytes.</p> <p>For Gigabit Ethernet IQ PICs, the input byte counts vary by interface type. For more information, see Table 31 under the <a href="#">show interfaces (10-Gigabit Ethernet)</a> command.</p>	detail extensive



Table 4: show interfaces Fast Ethernet Output Fields (*continued*)

Field Name	Field Description	Level of Output
<b>Input errors</b>	<p>Input errors on the interface. The following paragraphs explain the counters whose meaning might not be obvious:</p> <ul style="list-style-type: none"> <li>• <b>Errors</b>—Sum of the incoming frame aborts and FCS errors.</li> <li>• <b>Drops</b>—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.</li> <li>• <b>Framing errors</b>—Number of packets received with an invalid frame checksum (FCS).</li> <li>• <b>Runts</b>—Number of frames received that are smaller than the runt threshold.</li> <li>• <b>Policed discards</b>—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.</li> <li>• <b>L3 incompletes</b>—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 <b>ignore-l3-incompletes</b> statement.</li> <li>• <b>L2 channel errors</b>—Number of times the software did not find a valid logical interface for an incoming frame.</li> <li>• <b>L2 mismatch timeouts</b>—Number of malformed or short packets that caused the incoming packet handler to discard the frame as unreadable.</li> <li>• <b>FIFO errors</b>—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.</li> <li>• <b>Resource errors</b>—Sum of transmit drops.</li> </ul>	<b>extensive</b>

Table 4: show interfaces Fast Ethernet Output Fields (*continued*)

Field Name	Field Description	Level of Output
<b>Output errors</b>	<p>Output errors on the interface. The following paragraphs explain the counters whose meaning might not be obvious:</p> <ul style="list-style-type: none"> <li>• <b>Carrier transitions</b>—Number of times the interface has gone from <b>down</b> to <b>up</b>. 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.</li> <li>• <b>Errors</b>—Sum of the outgoing frame aborts and FCS errors.</li> <li>• <b>Drops</b>—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.</li> <li>• <b>Collisions</b>—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.</li> <li>• <b>Aged packets</b>—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.</li> <li>• <b>FIFO errors</b>—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.</li> <li>• <b>HS link CRC errors</b>—Number of errors on the high-speed links between the ASICs responsible for handling the router interfaces.</li> <li>• <b>MTU errors</b>—Number of packets whose size exceeded the MTU of the interface.</li> <li>• <b>Resource errors</b>—Sum of transmit drops.</li> </ul>	<b>extensive</b>
<b>Egress queues</b>	Total number of egress queues supported on the specified interface.	<b>detail extensive</b>
<b>Queue counters (Egress)</b>	<p>CoS queue number and its associated user-configured forwarding class name.</p> <ul style="list-style-type: none"> <li>• <b>Queued packets</b>—Number of queued packets.</li> <li>• <b>Transmitted packets</b>—Number of transmitted packets.</li> <li>• <b>Dropped packets</b>—Number of packets dropped by the ASIC's RED mechanism.</li> </ul>	<b>detail extensive</b>
<b>Ingress queues</b>	Total number of ingress queues supported on the specified interface. Displayed on IQ2 interfaces.	<b>extensive</b>
<b>Queue counters (Ingress)</b>	<p>CoS queue number and its associated user-configured forwarding class name. Displayed on IQ2 interfaces.</p> <ul style="list-style-type: none"> <li>• <b>Queued packets</b>—Number of queued packets.</li> <li>• <b>Transmitted packets</b>—Number of transmitted packets.</li> <li>• <b>Dropped packets</b>—Number of packets dropped by the ASIC's RED mechanism.</li> </ul>	<b>extensive</b>

Table 4: show interfaces Fast Ethernet Output Fields (*continued*)

Field Name	Field Description	Level of Output
<b>Active alarms and Active defects</b>	<p>Ethernet-specific defects that can prevent the interface from passing packets. When a defect persists for a certain amount of time, it is promoted to an alarm. Based on the routing device configuration, an alarm can ring the red or yellow alarm bell on the routing device, or turn on the red or yellow alarm LED on the craft interface. These fields can contain the value <b>None</b> or <b>Link</b>.</p> <ul style="list-style-type: none"> <li>• <b>None</b>—There are no active defects or alarms.</li> <li>• <b>Link</b>—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.</li> </ul>	<b>detail extensive none</b>
<b>OTN FEC statistics</b>	<p>The forward error correction (FEC) counters provide the following statistics:</p> <ul style="list-style-type: none"> <li>• <b>Corrected Errors</b>—The count of corrected errors in the last second.</li> <li>• <b>Corrected Error Ratio</b>—The corrected error ratio in the last 25 seconds. For example, 1e-7 is 1 error per 10 million bits.</li> </ul>	
<b>PCS statistics</b>	<p>(10-Gigabit Ethernet interfaces) Displays Physical Coding Sublayer (PCS) fault conditions from the WAN PHY or the LAN PHY device.</p> <ul style="list-style-type: none"> <li>• <b>Bit errors</b>—High bit error rate. Indicates the number of bit errors when the PCS receiver is operating in normal mode.</li> <li>• <b>Errored blocks</b>—Loss of block lock. The number of errored blocks when PCS receiver is operating in normal mode.</li> </ul>	<b>detail extensive</b>

Table 4: show interfaces Fast Ethernet Output Fields (*continued*)

Field Name	Field Description	Level of Output
MAC statistics	<p>Receive and Transmit statistics reported by the PIC's MAC subsystem, including the following:</p> <ul style="list-style-type: none"> <li>• <b>Total octets and total packets</b>—Total number of octets and packets. For Gigabit Ethernet IQ PICs, the received octets count varies by interface type. For more information, see Table 31 under the <a href="#">show interfaces (10-Gigabit Ethernet)</a> command.</li> <li>• <b>Unicast packets, Broadcast packets, and Multicast packets</b>—Number of unicast, broadcast, and multicast packets.</li> <li>• <b>CRC/Align errors</b>—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).</li> <li>• <b>FIFO error</b>—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.</li> <li>• <b>MAC control frames</b>—Number of MAC control frames.</li> <li>• <b>MAC pause frames</b>—Number of MAC control frames with <b>pause</b> operational code.</li> <li>• <b>Oversized frames</b>—Number of frames that exceed 1518 octets.</li> <li>• <b>Jabber frames</b>—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.</li> <li>• <b>Fragment frames</b>—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.</li> <li>• <b>VLAN tagged frames</b>—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.</li> <li>• <b>Code violations</b>—Number of times an event caused the PHY to indicate "Data reception error" or "invalid data symbol error."</li> </ul>	extensive
OTN Received Overhead Bytes	APS/PCC0: 0x02, APS/PCC1: 0x11, APS/PCC2: 0x47, APS/PCC3: 0x58 Payload Type: 0x08	extensive
OTN Transmitted Overhead Bytes	APS/PCC0: 0x00, APS/PCC1: 0x00, APS/PCC2: 0x00, APS/PCC3: 0x00 Payload Type: 0x08	extensive

Table 4: show interfaces Fast Ethernet Output Fields (*continued*)

Field Name	Field Description	Level of Output
<b>Filter statistics</b>	<p><b>Receive</b> and <b>Transmit</b> 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.</p> <ul style="list-style-type: none"> <li>• <b>Input packet count</b>—Number of packets received from the MAC hardware that the filter processed.</li> <li>• <b>Input packet rejects</b>—Number of packets that the filter rejected because of either the source MAC address or the destination MAC address.</li> <li>• <b>Input DA rejects</b>—Number of packets that the filter rejected because the destination MAC address of the packet is not on the accept list. It is normal for this value to increment. When it increments very quickly and no traffic is entering the routing device from the far-end system, either there is a bad ARP entry on the far-end system, or multicast routing is not on and the far-end system is sending many multicast packets to the local routing device (which the routing device is rejecting).</li> <li>• <b>Input SA rejects</b>—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.</li> <li>• <b>Output packet count</b>—Number of packets that the filter has given to the MAC hardware.</li> <li>• <b>Output packet pad count</b>—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.</li> <li>• <b>Output packet error count</b>—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.</li> <li>• <b>CAM destination filters, CAM source filters</b>—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.</li> </ul>	<b>extensive</b>
<b>PMA PHY</b>	<p>(10-Gigabit Ethernet interfaces, WAN PHY mode) SONET error information:</p> <ul style="list-style-type: none"> <li>• <b>Seconds</b>—Number of seconds the defect has been active.</li> <li>• <b>Count</b>—Number of times that the defect has gone from inactive to active.</li> <li>• <b>State</b>—State of the error. Any state other than <b>OK</b> indicates a problem.</li> </ul> <p>Subfields are:</p> <ul style="list-style-type: none"> <li>• <b>PHY Lock</b>—Phase-locked loop</li> <li>• <b>PHY Light</b>—Loss of optical signal</li> </ul>	<b>extensive</b>

Table 4: show interfaces Fast Ethernet Output Fields (*continued*)

Field Name	Field Description	Level of Output
<b>WIS section</b>	<p>(10-Gigabit Ethernet interfaces, WAN PHY mode) SONET error information:</p> <ul style="list-style-type: none"> <li>• <b>Seconds</b>—Number of seconds the defect has been active.</li> <li>• <b>Count</b>—Number of times that the defect has gone from inactive to active.</li> <li>• <b>State</b>—State of the error. Any state other than <b>OK</b> indicates a problem.</li> </ul> <p>Subfields are:</p> <ul style="list-style-type: none"> <li>• <b>BIP-B1</b>—Bit interleaved parity for SONET section overhead</li> <li>• <b>SEF</b>—Severely errored framing</li> <li>• <b>LOL</b>—Loss of light</li> <li>• <b>LOF</b>—Loss of frame</li> <li>• <b>ES-S</b>—Errored seconds (section)</li> <li>• <b>SES-S</b>—Severely errored seconds (section)</li> <li>• <b>SEFS-S</b>—Severely errored framing seconds (section)</li> </ul>	<b>extensive</b>
<b>WIS line</b>	<p>(10-Gigabit Ethernet interfaces, WAN PHY mode) Active alarms and defects, plus counts of specific SONET errors with detailed information.</p> <ul style="list-style-type: none"> <li>• <b>Seconds</b>—Number of seconds the defect has been active.</li> <li>• <b>Count</b>—Number of times that the defect has gone from inactive to active.</li> <li>• <b>State</b>—State of the error. State other than <b>OK</b> indicates a problem.</li> </ul> <p>Subfields are:</p> <ul style="list-style-type: none"> <li>• <b>BIP-B2</b>—Bit interleaved parity for SONET line overhead</li> <li>• <b>REI-L</b>—Remote error indication (near-end line)</li> <li>• <b>RDI-L</b>—Remote defect indication (near-end line)</li> <li>• <b>AIS-L</b>—Alarm indication signal (near-end line)</li> <li>• <b>BERR-SF</b>—Bit error rate fault (signal failure)</li> <li>• <b>BERR-SD</b>—Bit error rate defect (signal degradation)</li> <li>• <b>ES-L</b>—Errored seconds (near-end line)</li> <li>• <b>SES-L</b>—Severely errored seconds (near-end line)</li> <li>• <b>UAS-L</b>—Unavailable seconds (near-end line)</li> <li>• <b>ES-LFE</b>—Errored seconds (far-end line)</li> <li>• <b>SES-LFE</b>—Severely errored seconds (far-end line)</li> <li>• <b>UAS-LFE</b>—Unavailable seconds (far-end line)</li> </ul>	<b>extensive</b>

Table 4: show interfaces Fast Ethernet Output Fields (*continued*)

Field Name	Field Description	Level of Output
<b>WIS path</b>	<p>(10-Gigabit Ethernet interfaces, WAN PHY mode) Active alarms and defects, plus counts of specific SONET errors with detailed information.</p> <ul style="list-style-type: none"> <li>• <b>Seconds</b>—Number of seconds the defect has been active.</li> <li>• <b>Count</b>—Number of times that the defect has gone from inactive to active.</li> <li>• <b>State</b>—State of the error. Any state other than <b>OK</b> indicates a problem.</li> </ul> <p>Subfields are:</p> <ul style="list-style-type: none"> <li>• <b>BIP-B3</b>—Bit interleaved parity for SONET section overhead</li> <li>• <b>REI-P</b>—Remote error indication</li> <li>• <b>LOP-P</b>—Loss of pointer (path)</li> <li>• <b>AIS-P</b>—Path alarm indication signal</li> <li>• <b>RDI-P</b>—Path remote defect indication</li> <li>• <b>UNEQ-P</b>—Path unequipped</li> <li>• <b>PLM-P</b>—Path payload (signal) label mismatch</li> <li>• <b>ES-P</b>—Errored seconds (near-end STS path)</li> <li>• <b>SES-P</b>—Severely errored seconds (near-end STS path)</li> <li>• <b>UAS-P</b>—Unavailable seconds (near-end STS path)</li> <li>• <b>SES-PFE</b>—Severely errored seconds (far-end STS path)</li> <li>• <b>UAS-PFE</b>—Unavailable seconds (far-end STS path)</li> </ul>	<b>extensive</b>

Table 4: show interfaces Fast Ethernet Output Fields (*continued*)

Field Name	Field Description	Level of Output
Autonegotiation information	<p>Information about link autonegotiation.</p> <ul style="list-style-type: none"> <li>• <b>Negotiation status:</b> <ul style="list-style-type: none"> <li>• <b>Incomplete</b>—Ethernet interface has the speed or link mode configured.</li> <li>• <b>No autonegotiation</b>—Remote Ethernet interface has the speed or link mode configured, or does not perform autonegotiation.</li> <li>• <b>Complete</b>—Ethernet interface is connected to a device that performs autonegotiation and the autonegotiation process is successful.</li> </ul> </li> <li>• <b>Link partner status</b>—OK when Ethernet interface is connected to a device that performs autonegotiation and the autonegotiation process is successful.</li> <li>• <b>Link partner:</b> <ul style="list-style-type: none"> <li>• <b>Link mode</b>—Depending on the capability of the attached Ethernet device, either <b>Full-duplex</b> or <b>Half-duplex</b>.</li> <li>• <b>Flow control</b>—Types of flow control supported by the remote Ethernet device. For Fast Ethernet interfaces, the type is <b>None</b>. For Gigabit Ethernet interfaces, types are <b>Symmetric</b> (link partner supports <b>PAUSE</b> on receive and transmit), <b>Asymmetric</b> (link partner supports <b>PAUSE</b> on transmit), and <b>Symmetric/Asymmetric</b> (link partner supports both <b>PAUSE</b> on receive and transmit or only <b>PAUSE</b> receive).</li> <li>• <b>Remote fault</b>—Remote fault information from the link partner—<b>Failure</b> indicates a receive link error. <b>OK</b> indicates that the link partner is receiving. <b>Negotiation error</b> indicates a negotiation error. <b>Offline</b> indicates that the link partner is going offline.</li> </ul> </li> <li>• <b>Local resolution</b>—Information from the link partner: <ul style="list-style-type: none"> <li>• <b>Flow control</b>—Types of flow control supported by the remote Ethernet device. For Gigabit Ethernet interfaces, types are <b>Symmetric</b> (link partner supports <b>PAUSE</b> on receive and transmit), <b>Asymmetric</b> (link partner supports <b>PAUSE</b> on transmit), and <b>Symmetric/Asymmetric</b> (link partner supports both <b>PAUSE</b> on receive and transmit or only <b>PAUSE</b> receive).</li> <li>• <b>Remote fault</b>—Remote fault information. <b>Link OK</b> (no error detected on receive), <b>Offline</b> (local interface is offline), and <b>Link Failure</b> (link error detected on receive).</li> </ul> </li> </ul>	extensive
Received path trace, Transmitted path trace	<p>(10-Gigabit Ethernet interfaces, WAN PHY mode) SONET/SDH interfaces allow path trace bytes to be sent inband across the SONET/SDH link. Juniper Networks and other routing device manufacturers use these bytes to help diagnose misconfigurations and network errors by setting the transmitted path trace message so that it contains the system hostname and name of the physical interface. The received path trace value is the message received from the routing device at the other end of the fiber. The transmitted path trace value is the message that this routing device transmits.</p>	extensive
Packet Forwarding Engine configuration	<p>Information about the configuration of the Packet Forwarding Engine:</p> <ul style="list-style-type: none"> <li>• <b>Destination slot</b>—FPC slot number.</li> </ul>	extensive



Table 4: show interfaces Fast Ethernet Output Fields (*continued*)

Field Name	Field Description	Level of Output
<b>CoS information</b>	Information about the CoS queue for the physical interface. <ul style="list-style-type: none"> <li>• <b>CoS transmit queue</b>—Queue number and its associated user-configured forwarding class name.</li> <li>• <b>Bandwidth %</b>—Percentage of bandwidth allocated to the queue.</li> <li>• <b>Bandwidth bps</b>—Bandwidth allocated to the queue (in bps).</li> <li>• <b>Buffer %</b>—Percentage of buffer space allocated to the queue.</li> <li>• <b>Buffer usec</b>—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.</li> <li>• <b>Priority</b>—Queue priority: <b>low</b> or <b>high</b>.</li> <li>• <b>Limit</b>—Displayed if rate limiting is configured for the queue. Possible values are <b>none</b> and <b>exact</b>. If <b>exact</b> is configured, the queue transmits only up to the configured bandwidth, even if excess bandwidth is available. If <b>none</b> is configured, the queue transmits beyond the configured bandwidth if bandwidth is available.</li> </ul>	<b>extensive</b>
<b>Logical Interface</b>		
<b>Logical interface</b>	Name of the logical interface.	All levels
<b>Index</b>	Index number of the logical interface, which reflects its initialization sequence.	<b>detail extensive</b> none
<b>SNMP ifIndex</b>	SNMP interface index number for the logical interface.	<b>detail extensive</b> none
<b>Generation</b>	Unique number for use by Juniper Networks technical support only.	<b>detail extensive</b>
<b>Flags</b>	Information about the logical interface. Possible values are described in the “Logical Interface Flags” section under <i>Common Output Fields Description</i> .	All levels
<b>VLAN-Tag</b>	Rewrite profile applied to incoming or outgoing frames on the outer ( <b>Out</b> ) VLAN tag or for both the outer and inner ( <b>In</b> ) VLAN tags. <ul style="list-style-type: none"> <li>• <b>push</b>—An outer VLAN tag is pushed in front of the existing VLAN tag.</li> <li>• <b>pop</b>—The outer VLAN tag of the incoming frame is removed.</li> <li>• <b>swap</b>—The outer VLAN tag of the incoming frame is overwritten with the user specified VLAN tag information.</li> <li>• <b>push-pop</b>—An outer VLAN tag is pushed in front of the existing VLAN tag, and the outer VLAN tag of the incoming frame is removed.</li> <li>• <b>push-push</b>—Two VLAN tags are pushed in from the incoming frame.</li> <li>• <b>swap-push</b>—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.</li> <li>• <b>swap-swap</b>—Both the inner and the outer VLAN tags of the incoming frame are replaced by the user specified VLAN tag value.</li> <li>• <b>pop-swap</b>—The outer VLAN tag of the incoming frame is removed, and the inner VLAN tag of the incoming frame is replaced by the user-specified VLAN tag value. The inner tag becomes the outer tag in the final frame.</li> <li>• <b>pop-pop</b>—Both the outer and inner VLAN tags of the incoming frame are removed.</li> </ul>	<b>brief detail extensive</b> none

Table 4: show interfaces Fast Ethernet Output Fields (*continued*)

Field Name	Field Description	Level of Output
<b>Demux:</b>	IP demultiplexing (demux) value that appears if this interface is used as the demux underlying interface. The output is one of the following: <ul style="list-style-type: none"> <li>Source Family Inet</li> <li>Destination Family Inet</li> </ul>	<b>detail extensive none</b>
<b>Encapsulation</b>	Encapsulation on the logical interface.	All levels
<b>Protocol</b>	Protocol family. Possible values are described in the "Protocol Field" section under <i>Common Output Fields Description</i> .	<b>detail extensive none</b>
<b>MTU</b>	Maximum transmission unit size on the logical interface.	<b>detail extensive none</b>
<b>Maximum labels</b>	Maximum number of MPLS labels configured for the MPLS protocol family on the logical interface.	<b>detail extensive none</b>
<b>Traffic statistics</b>	Number and rate of bytes and packets received and transmitted on the specified interface set. <ul style="list-style-type: none"> <li><b>Input bytes, Output bytes</b>—Number of bytes received and transmitted on the interface set</li> <li><b>Input packets, Output packets</b>—Number of packets received and transmitted on the interface set.</li> </ul>	<b>detail extensive</b>
<b>IPv6 transit statistics</b>	Number of IPv6 transit bytes and packets received and transmitted on the logical interface if IPv6 statistics tracking is enabled.	<b>extensive</b>
<b>Local statistics</b>	Number and rate of bytes and packets destined to the routing device.	<b>extensive</b>
<b>Transit statistics</b>	Number and rate of bytes and packets transiting the switch. <p><b>NOTE:</b> For Gigabit Ethernet intelligent queuing 2 (IQ2) interfaces, the logical interface egress statistics might not accurately reflect the traffic on the wire when output shaping is applied. Traffic management output shaping might drop packets after they are tallied by the <b>Output bytes</b> and <b>Output packets</b> interface counters. However, correct values display for both of these egress statistics when per-unit scheduling is enabled for the Gigabit Ethernet IQ2 physical interface, or when a single logical interface is actively using a shared scheduler.</p>	<b>extensive</b>
<b>Generation</b>	Unique number for use by Juniper Networks technical support only.	<b>detail extensive</b>
<b>Route Table</b>	Route table in which the logical interface address is located. For example, 0 refers to the routing table inet.0.	<b>detail extensive none</b>
<b>Flags</b>	Information about protocol family flags. Possible values are described in the "Family Flags" section under <i>Common Output Fields Description</i> .	<b>detail extensive</b>
<b>Donor interface</b>	(Unnumbered Ethernet) Interface from which an unnumbered Ethernet interface borrows an IPv4 address.	<b>detail extensive none</b>

Table 4: show interfaces Fast Ethernet Output Fields (*continued*)

Field Name	Field Description	Level of Output
<b>Preferred source address</b>	(Unnumbered Ethernet) Secondary IPv4 address of the donor loopback interface that acts as the preferred source address for the unnumbered Ethernet interface.	<b>detail extensive none</b>
<b>Input Filters</b>	Names of any input filters applied to this interface. If you specify a precedence value for any filter in a dynamic profile, filter precedence values appear in parenthesis next to all interfaces.	<b>detail extensive</b>
<b>Output Filters</b>	Names of any output filters applied to this interface. If you specify a precedence value for any filter in a dynamic profile, filter precedence values appear in parenthesis next to all interfaces.	<b>detail extensive</b>
<b>Mac-Validate Failures</b>	Number of MAC address validation failures for packets and bytes. This field is displayed when MAC address validation is enabled for the logical interface.	<b>detail extensive none</b>
<b>Addresses, Flags</b>	Information about the address flags. Possible values are described in the “Addresses Flags” section under <i>Common Output Fields Description</i> .	<b>detail extensive none</b>
<b><i>protocol-family</i></b>	Protocol family configured on the logical interface. If the protocol is <b>inet</b> , the IP address of the interface is also displayed.	<b>brief</b>
<b>Flags</b>	Information about address flag (possible values are described in the “Addresses Flags” section under <i>Common Output Fields Description</i> ).	<b>detail extensive none</b>
<b>Destination</b>	IP address of the remote side of the connection.	<b>detail extensive none</b>
<b>Local</b>	IP address of the logical interface.	<b>detail extensive none</b>
<b>Broadcast</b>	Broadcast address of the logical interface.	<b>detail extensive none</b>
<b>Generation</b>	Unique number for use by Juniper Networks technical support only.	<b>detail extensive</b>

## Sample Output

### show interfaces (Fast Ethernet)

```

user@host> show interfaces fe-0/0/0
Physical interface: fe-0/0/0, Enabled, Physical link is Up
  Interface index: 128, SNMP ifIndex: 22
  Link-level type: Ethernet, MTU: 1514, Speed: 100mbps, Loopback: Disabled,
  Source filtering: Disabled, Flow control: Enabled
  Device flags   : Present Running
  Interface flags: SNMP-Traps Internal: 0x4000
  CoS queues     : 4 supported, 4 maximum usable queues
  Current address: 00:05:85:02:38:00, Hardware address: 00:05:85:02:38:00
  Last flapped   : 2006-01-20 14:50:58 PST (2w4d 00:44 ago)
  Input rate     : 0 bps (0 pps)
  Output rate    : 0 bps (0 pps)
  Active alarms  : None
  Active defects : None
  Logical interface fe-0/0/0.0 (Index 66) (SNMP ifIndex 198)
    Flags: SNMP-Traps Encapsulation: ENET2

```

```

Protocol inet, MTU: 1500
Flags: None
Addresses, Flags: Is-Preferred Is-Primary
Destination: 10.10.10/24, Local: 10.10.10.1, Broadcast: 10.10.10.255

```

### show interfaces brief (Fast Ethernet)

```

user@host> show interfaces fe-0/0/0 brief
Physical interface: fe-0/0/0, Enabled, Physical link is Up
Link-level type: Ethernet, MTU: 1514, Speed: 100mbps, Loopback: Disabled,
Source filtering: Disabled, Flow control: Enabled
Device flags : Present Running
Interface flags: SNMP-Traps Internal: 0x4000
Logical interface fe-0/0/0.0
Flags: SNMP-Traps Encapsulation: ENET2
inet 10.10.10.1/24

```

### show interfaces detail (Fast Ethernet)

```

user@host> show interfaces fe-0/0/0 detail
Physical interface: fe-0/0/0, Enabled, Physical link is Up
Interface index: 128, SNMP ifIndex: 22, Generation: 5391
Link-level type: Ethernet, MTU: 1514, Speed: 100mbps, Loopback: Disabled,
Source filtering: Disabled, Flow control: Enabled
Device flags : Present Running
Interface flags: SNMP-Traps Internal: 0x4000
CoS queues : 4 supported, 4 maximum usable queues
Hold-times : Up 0 ms, Down 0 ms
Current address: 00:05:85:02:38:00, Hardware address: 00:05:85:02:38:00
Last flapped : 2006-01-20 14:50:58 PST (2w4d 00:45 ago)
Statistics last cleared: Never
Traffic statistics:
Input bytes : 0 0 bps
Output bytes : 42 0 bps
Input packets: 0 0 pps
Output packets: 1 0 pps
Active alarms : None
Active defects : None
Logical interface fe-0/0/0.0 (Index 66) (SNMP ifIndex 198) (Generation 67)
Flags: SNMP-Traps Encapsulation: ENET2
Protocol inet, MTU: 1500, Generation: 105, Route table: 0
Flags: Is-Primary, Mac-Validate-Strict
Mac-Validate Failures: Packets: 0, Bytes: 0
Addresses, Flags: Is-Preferred Is-Primary
Destination: 10.10.10/24, Local: 10.10.10.1, Broadcast: 10.10.10.255,
Generation: 136

```

### show interfaces extensive (Fast Ethernet)

```

user@host> show interfaces fe-0/0/0 extensive
Physical interface: fe-0/0/0, Enabled, Physical link is Up
Interface index: 128, SNMP ifIndex: 22, Generation: 5391
Link-level type: Ethernet, MTU: 1514, Link-mode: Full-duplex, Speed:
100mbps, Loopback: Disabled,
Source filtering: Disabled, Flow control: Enabled
Device flags : Present Running
Interface flags: SNMP-Traps Internal: 0x4000
CoS queues : 4 supported, 4 maximum usable queues
Hold-times : Up 0 ms, Down 0 ms
Current address: 00:05:85:02:38:00, Hardware address: 00:05:85:02:38:00
Last flapped : 2006-01-20 14:50:58 PST (2w4d 00:46 ago)
Statistics last cleared: Never

```

```

Traffic statistics:
Input bytes :          0          0 bps
Output bytes :         42          0 bps
Input packets:         0          0 pps
Output packets:        1          0 pps
Input errors:
  Errors: 0, Drops: 0, Framing errors: 0, Runts: 0, Policed discards: 0,
  L3 incompletes: 0, L2 channel errors: 0, L2 mismatch timeouts: 0,
  FIFO errors: 0, Resource errors: 0
Output errors:
  Carrier transitions: 3, Errors: 0, Drops: 0, Collisions: 0, Aged packets: 0,

  FIFO errors: 0, HS link CRC errors: 0, MTU errors: 0, Resource errors: 0
Active alarms : None
Active defects : None
MAC statistics:
Total octets          Receive          Transmit
Total packets         0                1
Unicast packets       0                0
Broadcast packets     0                1
Multicast packets     0                0
CRC/Align errors      0                0
FIFO errors           0                0
MAC control frames    0                0
MAC pause frames      0                0
Oversized frames      0
Jabber frames         0
Fragment frames       0
VLAN tagged frames    0
Code violations        0
Filter statistics:
Input packet count    0
Input packet rejects  0
Input DA rejects      0
Input SA rejects      0
Output packet count   1
Output packet pad count 0
Output packet error count 0
CAM destination filters: 1, CAM source filters: 0
Autonegotiation information:
Negotiation status: Complete
Link partner:
  Link partner: Full-duplex, Flow control: None, Remote fault: Ok
Local resolution:
Packet Forwarding Engine configuration:
Destination slot: 0
CoS information:
      Bandwidth          Buffer Priority  Limit
      %                bps  %          usec
0 best-effort          95    950000000  95          0    low  none
3 network-control      5     50000000   5          0    low  none
Logical interface fe-0/0/0.0 (Index 66) (SNMP ifIndex 198) (Generation 67)
Flags: SNMP-Traps Encapsulation: ENET2
Protocol inet, MTU: 1500, Generation: 105, Route table: 0
Flags: None
Addresses, Flags: Is-Preferred Is-Primary
  Destination: 10.10.10/24, Local: 10.10.10.1, Broadcast: 10.10.10.255,
  Generation: 136

```

## show interfaces (10-Gigabit Ethernet)

---

<b>Syntax</b>	<code>show interfaces <i>xe-fpc/pic/port</i></code> <code>&lt;brief   detail   extensive   terse&gt;</code> <code>&lt;descriptions&gt;</code> <code>&lt;media&gt;</code> <code>&lt;snmp-index <i>snmp-index</i>&gt;</code> <code>&lt;statistics&gt;</code>
<b>Release Information</b>	Command introduced in Junos OS Release 8.0.
<b>Description</b>	(M320, M120, MX Series, and T Series routers and EX Series switches only) Display status information about the specified 10-Gigabit Ethernet interface.
<b>Options</b>	<p><code><i>xe-fpc/pic/port</i></code>—Display standard information about the specified 10-Gigabit Ethernet interface.</p> <p><code>brief   detail   extensive   terse</code>—(Optional) Display the specified level of output.</p> <p><code>descriptions</code>—(Optional) Display interface description strings.</p> <p><code>media</code>—(Optional) Display media-specific information about network interfaces.</p> <p><code>snmp-index <i>snmp-index</i></code>—(Optional) Display information for the specified SNMP index of the interface.</p> <p><code>statistics</code>—(Optional) Display static interface statistics.</p>
<b>Required Privilege Level</b>	view
<b>List of Sample Output</b>	<p><a href="#">show interfaces extensive (10-Gigabit Ethernet, LAN PHY Mode, IQ2) on page 95</a></p> <p><a href="#">show interfaces extensive (10-Gigabit Ethernet, WAN PHY Mode) on page 98</a></p> <p><a href="#">show interfaces extensive (10-Gigabit Ethernet, DWDM OTN PIC) on page 100</a></p> <p><a href="#">show interfaces extensive (10-Gigabit Ethernet, LAN PHY Mode, Unidirectional Mode) on page 102</a></p> <p><a href="#">show interfaces extensive (10-Gigabit Ethernet, LAN PHY Mode, Unidirectional Mode, Transmit-Only) on page 102</a></p> <p><a href="#">show interfaces extensive (10-Gigabit Ethernet, LAN PHY Mode, Unidirectional Mode, Receive-Only) on page 103</a></p>
<b>Output Fields</b>	See <a href="#">Table 5 on page 81</a> for the output fields for the <b>show interfaces</b> (10-Gigabit Ethernet) command.

Table 5: show interfaces Gigabit Ethernet Output Fields

Field Name	Field Description	Level of Output
<b>Physical Interface</b>		
<b>Physical interface</b>	Name of the physical interface.	All levels
<b>Enabled</b>	State of the interface. Possible values are described in the “Enabled Field” section under <i>Common Output Fields Description</i> .	All levels
<b>Interface index</b>	Index number of the physical interface, which reflects its initialization sequence.	<b>detail extensive none</b>
<b>SNMP ifIndex</b>	SNMP index number for the physical interface.	<b>detail extensive none</b>
<b>Generation</b>	Unique number for use by Juniper Networks technical support only.	<b>detail extensive</b>
<b>Link-level type</b>	Encapsulation being used on the physical interface.	All levels
<b>MTU</b>	Maximum transmission unit size on the physical interface.	All levels
<b>Speed</b>	Speed at which the interface is running.	All levels
<b>Loopback</b>	Loopback status: <b>Enabled</b> or <b>Disabled</b> . If loopback is enabled, type of loopback: <b>Local</b> or <b>Remote</b> .	All levels
<b>Source filtering</b>	Source filtering status: <b>Enabled</b> or <b>Disabled</b> .	All levels
<b>LAN-PHY mode</b>	10-Gigabit Ethernet interface operating in Local Area Network Physical Layer Device (LAN PHY) mode. LAN PHY allows 10-Gigabit Ethernet wide area links to use existing Ethernet applications.	All levels
<b>WAN-PHY mode</b>	10-Gigabit Ethernet interface operating in Wide Area Network Physical Layer Device (WAN PHY) mode. WAN PHY allows 10-Gigabit Ethernet wide area links to use fiber-optic cables and other devices intended for SONET/SDH.	All levels
<b>Unidirectional</b>	Unidirectional link mode status for 10-Gigabit Ethernet interface: <b>Enabled</b> or <b>Disabled</b> for parent interface; <b>Rx-only</b> or <b>Tx-only</b> for child interfaces.	All levels
<b>Flow control</b>	Flow control status: <b>Enabled</b> or <b>Disabled</b> .	All levels
<b>Auto-negotiation</b>	(Gigabit Ethernet interfaces) Autonegotiation status: <b>Enabled</b> or <b>Disabled</b> .	All levels
<b>Remote-fault</b>	(Gigabit Ethernet interfaces) Remote fault status: <ul style="list-style-type: none"> <li><b>Online</b>—Autonegotiation is manually configured as online.</li> <li><b>Offline</b>—Autonegotiation is manually configured as offline.</li> </ul>	All levels
<b>Device flags</b>	Information about the physical device. Possible values are described in the “Device Flags” section under <i>Common Output Fields Description</i> .	All levels
<b>Interface flags</b>	Information about the interface. Possible values are described in the “Interface Flags” section under <i>Common Output Fields Description</i> .	All levels

Table 5: show interfaces Gigabit Ethernet Output Fields (*continued*)

Field Name	Field Description	Level of Output	
<b>Link flags</b>	Information about the link. Possible values are described in the “Links Flags” section under <i>Common Output Fields Description</i> .	All levels	
<b>Wavelength</b>	(10-Gigabit Ethernet dense wavelength-division multiplexing [DWDM] interfaces) Displays the configured wavelength, in nanometers (nm).	All levels	
<b>Frequency</b>	(10-Gigabit Ethernet DWDM interfaces only) Displays the frequency associated with the configured wavelength, in terahertz (THz).	All levels	
<b>CoS queues</b>	Number of CoS queues configured.	detail extensive none	
<b>Schedulers</b>	(Gigabit Ethernet intelligent queuing 2 (IQ2) interfaces only) Number of CoS schedulers configured.	extensive	
<b>Hold-times</b>	Current interface hold-time up and hold-time down, in milliseconds.	detail extensive	
<b>Current address</b>	Configured MAC address.	detail extensive none	
<b>Hardware address</b>	Hardware MAC address.	detail extensive none	
<b>Last flapped</b>	Date, time, and how long ago the interface went from down to up. The format is <b>Last flapped: year-month-day hour:minute:second:timezone (hour:minute:second ago)</b> . For example, <b>Last flapped: 2002-04-26 10:52:40 PDT (04:33:20 ago)</b> .	detail extensive none	
<b>Input Rate</b>	Input rate in bits per second (bps) and packets per second (pps). The value in this field also includes the Layer 2 overhead bytes for ingress traffic on Ethernet interfaces if you enable accounting of Layer 2 overhead at the PIC level or the logical interface level.	None specified	
<b>Output Rate</b>	Output rate in bps and pps. The value in this field also includes the Layer 2 overhead bytes for egress traffic on Ethernet interfaces if you enable accounting of Layer 2 overhead at the PIC level or the logical interface level.	None specified	
<b>Statistics last cleared</b>	Time when the statistics for the interface were last set to zero.	detail extensive	
<b>Egress account overhead</b>	Layer 2 overhead in bytes that is accounted in the interface statistics for egress traffic.	detail extensive	
<b>Ingress account overhead</b>	Layer 2 overhead in bytes that is accounted in the interface statistics for ingress traffic.	detail extensive	detail extensive



Table 5: show interfaces Gigabit Ethernet Output Fields (*continued*)

Field Name	Field Description	Level of Output
<b>Traffic statistics</b>	<p>Number and rate of bytes and packets received and transmitted on the physical interface.</p> <ul style="list-style-type: none"> <li>• <b>Input bytes</b>—Number of bytes received on the interface. The value in this field also includes the Layer 2 overhead bytes for ingress traffic on Ethernet interfaces if you enable accounting of Layer 2 overhead at the PIC level or the logical interface level.</li> <li>• <b>Output bytes</b>—Number of bytes transmitted on the interface. The value in this field also includes the Layer 2 overhead bytes for egress traffic on Ethernet interfaces if you enable accounting of Layer 2 overhead at the PIC level or the logical interface level.</li> <li>• <b>Input packets</b>—Number of packets received on the interface.</li> <li>• <b>Output packets</b>—Number of packets transmitted on the interface.</li> </ul> <p>Gigabit Ethernet and 10-Gigabit Ethernet IQ PICs count the overhead and CRC bytes.</p> <p>For Gigabit Ethernet IQ PICs, the input byte counts vary by interface type. For more information, see <a href="#">Table 5 on page 81</a>.</p>	<b>detail extensive</b>
<b>Input errors</b>	<p>Input errors on the interface. The following paragraphs explain the counters whose meaning might not be obvious:</p> <ul style="list-style-type: none"> <li>• <b>Errors</b>—Sum of the incoming frame aborts and FCS errors.</li> <li>• <b>Drops</b>—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.</li> <li>• <b>Framing errors</b>—Number of packets received with an invalid frame checksum (FCS).</li> <li>• <b>Runts</b>—Number of frames received that are smaller than the runt threshold.</li> <li>• <b>Policed discards</b>—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.</li> <li>• <b>L3 incompletes</b>—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 <b>ignore-l3-incompletes</b> statement.</li> <li>• <b>L2 channel errors</b>—Number of times the software did not find a valid logical interface for an incoming frame.</li> <li>• <b>L2 mismatch timeouts</b>—Number of malformed or short packets that caused the incoming packet handler to discard the frame as unreadable.</li> <li>• <b>FIFO errors</b>—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.</li> <li>• <b>Resource errors</b>—Sum of transmit drops.</li> </ul>	<b>extensive</b>

Table 5: show interfaces Gigabit Ethernet Output Fields (*continued*)

Field Name	Field Description	Level of Output
<b>Output errors</b>	<p>Output errors on the interface. The following paragraphs explain the counters whose meaning might not be obvious:</p> <ul style="list-style-type: none"> <li>• <b>Carrier transitions</b>—Number of times the interface has gone from <b>down</b> to <b>up</b>. 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.</li> <li>• <b>Errors</b>—Sum of the outgoing frame aborts and FCS errors.</li> <li>• <b>Drops</b>—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.</li> <li>• <b>Collisions</b>—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.</li> <li>• <b>Aged packets</b>—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.</li> <li>• <b>FIFO errors</b>—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.</li> <li>• <b>HS link CRC errors</b>—Number of errors on the high-speed links between the ASICs responsible for handling the router interfaces.</li> <li>• <b>MTU errors</b>—Number of packets whose size exceeded the MTU of the interface.</li> <li>• <b>Resource errors</b>—Sum of transmit drops.</li> </ul>	<b>extensive</b>
<b>Egress queues</b>	Total number of egress queues supported on the specified interface.	<b>detail extensive</b>
<b>Queue counters (Egress)</b>	<p>CoS queue number and its associated user-configured forwarding class name.</p> <ul style="list-style-type: none"> <li>• <b>Queued packets</b>—Number of queued packets.</li> <li>• <b>Transmitted packets</b>—Number of transmitted packets.</li> <li>• <b>Dropped packets</b>—Number of packets dropped by the ASIC's RED mechanism.</li> </ul>	<b>detail extensive</b>
<b>Ingress queues</b>	Total number of ingress queues supported on the specified interface. Displayed on IQ2 interfaces.	<b>extensive</b>
<b>Queue counters (Ingress)</b>	<p>CoS queue number and its associated user-configured forwarding class name. Displayed on IQ2 interfaces.</p> <ul style="list-style-type: none"> <li>• <b>Queued packets</b>—Number of queued packets.</li> <li>• <b>Transmitted packets</b>—Number of transmitted packets.</li> <li>• <b>Dropped packets</b>—Number of packets dropped by the ASIC's RED mechanism.</li> </ul>	<b>extensive</b>

Table 5: show interfaces Gigabit Ethernet Output Fields (*continued*)

Field Name	Field Description	Level of Output
<b>Active alarms and Active defects</b>	<p>Ethernet-specific defects that can prevent the interface from passing packets. When a defect persists for a certain amount of time, it is promoted to an alarm. Based on the routing device configuration, an alarm can ring the red or yellow alarm bell on the routing device, or turn on the red or yellow alarm LED on the craft interface. These fields can contain the value <b>None</b> or <b>Link</b>.</p> <ul style="list-style-type: none"> <li>• <b>None</b>—There are no active defects or alarms.</li> <li>• <b>Link</b>—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.</li> </ul>	<b>detail extensive none</b>
<b>OTN alarms</b>	Active OTN alarms identified on the interface.	<b>detail extensive</b>
<b>OTN defects</b>	OTN defects received on the interface.	<b>detail extensive</b>
<b>OTN FEC Mode</b>	<p>The FECmode configured on the interface.</p> <ul style="list-style-type: none"> <li>• <b>efec</b>—Enhanced forward error correction (EFEC) is configured to detect and correct bit errors.</li> <li>• <b>gfec</b>—G.709 Forward error correction (GFEC) mode is configured to detect and correct bit errors.</li> <li>• <b>none</b>—FEC mode is not configured.</li> </ul>	<b>detail extensive</b>
<b>OTN Rate</b>	<p>OTN mode.</p> <ul style="list-style-type: none"> <li>• <b>fixed-stuff-bytes</b>—Fixed stuff bytes 11.0957 Gbps.</li> <li>• <b>no-fixed-stuff-bytes</b>—No fixed stuff bytes 11.0491 Gbps.</li> <li>• <b>pass-through</b>—Enable OTN passthrough mode.</li> <li>• <b>no-pass-through</b>—Do not enable OTN passthrough mode.</li> </ul>	<b>detail extensive</b>
<b>OTN Line Loopback</b>	Status of the line loopback, if configured for the DWDM OTN PIC. Its value can be: <b>enabled</b> or <b>disabled</b> .	<b>detail extensive</b>
<b>OTN FEC statistics</b>	<p>The forward error correction (FEC) counters for the DWDM OTN PIC.</p> <ul style="list-style-type: none"> <li>• <b>Corrected Errors</b>—The count of corrected errors in the last second.</li> <li>• <b>Corrected Error Ratio</b>—The corrected error ratio in the last 25 seconds. For example, 1e-7 is 1 error per 10 million bits.</li> </ul>	<b>detail extensive</b>
<b>OTN FEC alarms</b>	<p>OTN FEC excessive or degraded error alarms triggered on the interface.</p> <ul style="list-style-type: none"> <li>• <b>FEC Degrade</b>—OTU FEC Degrade defect.</li> <li>• <b>FEC Excessive</b>—OTU FEC Excessive Error defect.</li> </ul>	<b>detail extensive</b>
<b>OTN OC</b>	<p>OTN OC defects triggered on the interface.</p> <ul style="list-style-type: none"> <li>• <b>LOS</b>—OC Loss of Signal defect.</li> <li>• <b>LOF</b>—OC Loss of Frame defect.</li> <li>• <b>LOM</b>—OC Loss of Multiframe defect.</li> <li>• <b>Wavelength Lock</b>—OC Wavelength Lock defect.</li> </ul>	<b>detail extensive</b>

Table 5: show interfaces Gigabit Ethernet Output Fields (*continued*)

Field Name	Field Description	Level of Output
<b>OTN OTU</b>	OTN OTU defects detected on the interface <ul style="list-style-type: none"> <li>• <b>AIS</b>—OTN AIS alarm.</li> <li>• <b>BDI</b>—OTN OTU BDI alarm.</li> <li>• <b>IAE</b>—OTN OTU IAE alarm.</li> <li>• <b>TTIM</b>—OTN OTU TTIM alarm.</li> <li>• <b>SF</b>—OTN ODU bit error rate fault alarm.</li> <li>• <b>SD</b>—OTN ODU bit error rate defect alarm.</li> <li>• <b>TCA-ES</b>—OTN ODU ES threshold alarm.</li> <li>• <b>TCA-SES</b>—OTN ODU SES threshold alarm.</li> <li>• <b>TCA-UAS</b>—OTN ODU UAS threshold alarm.</li> <li>• <b>TCA-BBE</b>—OTN ODU BBE threshold alarm.</li> <li>• <b>BIP</b>—OTN ODU BIP threshold alarm.</li> <li>• <b>BBE</b>—OTN OTU BBE threshold alarm.</li> <li>• <b>ES</b>—OTN OTU ES threshold alarm.</li> <li>• <b>SES</b>—OTN OTU SES threshold alarm.</li> <li>• <b>UAS</b>—OTN OTU UAS threshold alarm.</li> </ul>	<b>detail extensive</b>
<b>Received DAPI</b>	Destination Access Port Interface (DAPI) from which the packets were received.	<b>detail extensive</b>
<b>Received SAPI</b>	Source Access Port Interface (SAPI) from which the packets were received.	<b>detail extensive</b>
<b>Transmitted DAPI</b>	Destination Access Port Interface (DAPI) to which the packets were transmitted.	<b>detail extensive</b>
<b>Transmitted SAPI</b>	Source Access Port Interface (SAPI) to which the packets were transmitted.	<b>detail extensive</b>
<b>PCS statistics</b>	(10-Gigabit Ethernet interfaces) Displays Physical Coding Sublayer (PCS) fault conditions from the WAN PHY or the LAN PHY device. <ul style="list-style-type: none"> <li>• <b>Bit errors</b>—High bit error rate. Indicates the number of bit errors when the PCS receiver is operating in normal mode.</li> <li>• <b>Errored blocks</b>—Loss of block lock. The number of errored blocks when PCS receiver is operating in normal mode.</li> </ul>	<b>detail extensive</b>

Table 5: show interfaces Gigabit Ethernet Output Fields (*continued*)

Field Name	Field Description	Level of Output
<b>MAC statistics</b>	<p>Receive and Transmit statistics reported by the PIC's MAC subsystem, including the following:</p> <ul style="list-style-type: none"> <li>• <b>Total octets and total packets</b>—Total number of octets and packets. For Gigabit Ethernet IQ PICs, the received octets count varies by interface type. For more information, see <a href="#">Table 6 on page 95</a></li> <li>• <b>Unicast packets, Broadcast packets, and Multicast packets</b>—Number of unicast, broadcast, and multicast packets.</li> <li>• <b>CRC/Align errors</b>—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).</li> <li>• <b>FIFO error</b>—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.</li> <li>• <b>MAC control frames</b>—Number of MAC control frames.</li> <li>• <b>MAC pause frames</b>—Number of MAC control frames with <b>pause</b> operational code.</li> <li>• <b>Oversized frames</b>—Number of frames that exceed 1518 octets.</li> <li>• <b>Jabber frames</b>—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.</li> <li>• <b>Fragment frames</b>—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.</li> <li>• <b>VLAN tagged frames</b>—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.</li> <li>• <b>Code violations</b>—Number of times an event caused the PHY to indicate "Data reception error" or "invalid data symbol error."</li> </ul>	<b>extensive</b>
<b>OTN Received Overhead Bytes</b>	APS/PCC0: 0x02, APS/PCC1: 0x11, APS/PCC2: 0x47, APS/PCC3: 0x58 Payload Type: 0x08	<b>extensive</b>
<b>OTN Transmitted Overhead Bytes</b>	APS/PCC0: 0x00, APS/PCC1: 0x00, APS/PCC2: 0x00, APS/PCC3: 0x00 Payload Type: 0x08	<b>extensive</b>

Table 5: show interfaces Gigabit Ethernet Output Fields (*continued*)

Field Name	Field Description	Level of Output
Filter statistics	<p>Receive and Transmit statistics reported by the PIC's MAC address filter subsystem. The filtering is done by the content-addressable memory (CAM) on the PIC. The filter examines a packet's source and destination MAC addresses to determine whether the packet should enter the system or be rejected.</p> <ul style="list-style-type: none"> <li>• <b>Input packet count</b>—Number of packets received from the MAC hardware that the filter processed.</li> <li>• <b>Input packet rejects</b>—Number of packets that the filter rejected because of either the source MAC address or the destination MAC address.</li> <li>• <b>Input DA rejects</b>—Number of packets that the filter rejected because the destination MAC address of the packet is not on the accept list. It is normal for this value to increment. When it increments very quickly and no traffic is entering the routing device from the far-end system, either there is a bad ARP entry on the far-end system, or multicast routing is not on and the far-end system is sending many multicast packets to the local routing device (which the routing device is rejecting).</li> <li>• <b>Input SA rejects</b>—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.</li> <li>• <b>Output packet count</b>—Number of packets that the filter has given to the MAC hardware.</li> <li>• <b>Output packet pad count</b>—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.</li> <li>• <b>Output packet error count</b>—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.</li> <li>• <b>CAM destination filters, CAM source filters</b>—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.</li> </ul>	extensive
PMA PHY	<p>(10-Gigabit Ethernet interfaces, WAN PHY mode) SONET error information:</p> <ul style="list-style-type: none"> <li>• <b>Seconds</b>—Number of seconds the defect has been active.</li> <li>• <b>Count</b>—Number of times that the defect has gone from inactive to active.</li> <li>• <b>State</b>—State of the error. Any state other than <b>OK</b> indicates a problem.</li> </ul> <p>Subfields are:</p> <ul style="list-style-type: none"> <li>• <b>PHY Lock</b>—Phase-locked loop</li> <li>• <b>PHY Light</b>—Loss of optical signal</li> </ul>	extensive

Table 5: show interfaces Gigabit Ethernet Output Fields (*continued*)

Field Name	Field Description	Level of Output
<b>WIS section</b>	<p>(10-Gigabit Ethernet interfaces, WAN PHY mode) SONET error information:</p> <ul style="list-style-type: none"> <li>• <b>Seconds</b>—Number of seconds the defect has been active.</li> <li>• <b>Count</b>—Number of times that the defect has gone from inactive to active.</li> <li>• <b>State</b>—State of the error. Any state other than <b>OK</b> indicates a problem.</li> </ul> <p>Subfields are:</p> <ul style="list-style-type: none"> <li>• <b>BIP-B1</b>—Bit interleaved parity for SONET section overhead</li> <li>• <b>SEF</b>—Severely errored framing</li> <li>• <b>LOL</b>—Loss of light</li> <li>• <b>LOF</b>—Loss of frame</li> <li>• <b>ES-S</b>—Errored seconds (section)</li> <li>• <b>SES-S</b>—Severely errored seconds (section)</li> <li>• <b>SEFS-S</b>—Severely errored framing seconds (section)</li> </ul>	<b>extensive</b>
<b>WIS line</b>	<p>(10-Gigabit Ethernet interfaces, WAN PHY mode) Active alarms and defects, plus counts of specific SONET errors with detailed information.</p> <ul style="list-style-type: none"> <li>• <b>Seconds</b>—Number of seconds the defect has been active.</li> <li>• <b>Count</b>—Number of times that the defect has gone from inactive to active.</li> <li>• <b>State</b>—State of the error. State other than <b>OK</b> indicates a problem.</li> </ul> <p>Subfields are:</p> <ul style="list-style-type: none"> <li>• <b>BIP-B2</b>—Bit interleaved parity for SONET line overhead</li> <li>• <b>REI-L</b>—Remote error indication (near-end line)</li> <li>• <b>RDI-L</b>—Remote defect indication (near-end line)</li> <li>• <b>AIS-L</b>—Alarm indication signal (near-end line)</li> <li>• <b>BERR-SF</b>—Bit error rate fault (signal failure)</li> <li>• <b>BERR-SD</b>—Bit error rate defect (signal degradation)</li> <li>• <b>ES-L</b>—Errored seconds (near-end line)</li> <li>• <b>SES-L</b>—Severely errored seconds (near-end line)</li> <li>• <b>UAS-L</b>—Unavailable seconds (near-end line)</li> <li>• <b>ES-LFE</b>—Errored seconds (far-end line)</li> <li>• <b>SES-LFE</b>—Severely errored seconds (far-end line)</li> <li>• <b>UAS-LFE</b>—Unavailable seconds (far-end line)</li> </ul>	<b>extensive</b>

Table 5: show interfaces Gigabit Ethernet Output Fields (*continued*)

Field Name	Field Description	Level of Output
<b>WIS path</b>	<p>(10-Gigabit Ethernet interfaces, WAN PHY mode) Active alarms and defects, plus counts of specific SONET errors with detailed information.</p> <ul style="list-style-type: none"> <li>• <b>Seconds</b>—Number of seconds the defect has been active.</li> <li>• <b>Count</b>—Number of times that the defect has gone from inactive to active.</li> <li>• <b>State</b>—State of the error. Any state other than <b>OK</b> indicates a problem.</li> </ul> <p>Subfields are:</p> <ul style="list-style-type: none"> <li>• <b>BIP-B3</b>—Bit interleaved parity for SONET section overhead</li> <li>• <b>REI-P</b>—Remote error indication</li> <li>• <b>LOP-P</b>—Loss of pointer (path)</li> <li>• <b>AIS-P</b>—Path alarm indication signal</li> <li>• <b>RDI-P</b>—Path remote defect indication</li> <li>• <b>UNEQ-P</b>—Path unequipped</li> <li>• <b>PLM-P</b>—Path payload label mismatch</li> <li>• <b>ES-P</b>—Errored seconds (near-end STS path)</li> <li>• <b>SES-P</b>—Severely errored seconds (near-end STS path)</li> <li>• <b>UAS-P</b>—Unavailable seconds (near-end STS path)</li> <li>• <b>SES-PFE</b>—Severely errored seconds (far-end STS path)</li> <li>• <b>UAS-PFE</b>—Unavailable seconds (far-end STS path)</li> </ul>	<b>extensive</b>



Table 5: show interfaces Gigabit Ethernet Output Fields (*continued*)

Field Name	Field Description	Level of Output
Autonegotiation information	<p>Information about link autonegotiation.</p> <ul style="list-style-type: none"> <li>• <b>Negotiation status:</b> <ul style="list-style-type: none"> <li>• <b>Incomplete</b>—Ethernet interface has the speed or link mode configured.</li> <li>• <b>No autonegotiation</b>—Remote Ethernet interface has the speed or link mode configured, or does not perform autonegotiation.</li> <li>• <b>Complete</b>—Ethernet interface is connected to a device that performs autonegotiation and the autonegotiation process is successful.</li> </ul> </li> <li>• <b>Link partner status</b>—OK when Ethernet interface is connected to a device that performs autonegotiation and the autonegotiation process is successful.</li> <li>• <b>Link partner:</b> <ul style="list-style-type: none"> <li>• <b>Link mode</b>—Depending on the capability of the attached Ethernet device, either <b>Full-duplex</b> or <b>Half-duplex</b>.</li> <li>• <b>Flow control</b>—Types of flow control supported by the remote Ethernet device. For Fast Ethernet interfaces, the type is <b>None</b>. For Gigabit Ethernet interfaces, types are <b>Symmetric</b> (link partner supports PAUSE on receive and transmit), <b>Asymmetric</b> (link partner supports PAUSE on transmit), and <b>Symmetric/Asymmetric</b> (link partner supports both PAUSE on receive and transmit or only PAUSE receive).</li> <li>• <b>Remote fault</b>—Remote fault information from the link partner—<b>Failure</b> indicates a receive link error. <b>OK</b> indicates that the link partner is receiving. <b>Negotiation error</b> indicates a negotiation error. <b>Offline</b> indicates that the link partner is going offline.</li> </ul> </li> <li>• <b>Local resolution</b>—Information from the link partner: <ul style="list-style-type: none"> <li>• <b>Flow control</b>—Types of flow control supported by the remote Ethernet device. For Gigabit Ethernet interfaces, types are <b>Symmetric</b> (link partner supports PAUSE on receive and transmit), <b>Asymmetric</b> (link partner supports PAUSE on transmit), and <b>Symmetric/Asymmetric</b> (link partner supports both PAUSE on receive and transmit or only PAUSE receive).</li> <li>• <b>Remote fault</b>—Remote fault information. <b>Link OK</b> (no error detected on receive), <b>Offline</b> (local interface is offline), and <b>Link Failure</b> (link error detected on receive).</li> </ul> </li> </ul>	extensive
Received path trace, Transmitted path trace	<p>(10-Gigabit Ethernet interfaces, WAN PHY mode) SONET/SDH interfaces allow path trace bytes to be sent inband across the SONET/SDH link. Juniper Networks and other router manufacturers use these bytes to help diagnose misconfigurations and network errors by setting the transmitted path trace message so that it contains the system hostname and name of the physical interface. The received path trace value is the message received from the routing device at the other end of the fiber. The transmitted path trace value is the message that this routing device transmits.</p>	extensive
Packet Forwarding Engine configuration	<p>Information about the configuration of the Packet Forwarding Engine:</p> <ul style="list-style-type: none"> <li>• <b>Destination slot</b>—FPC slot number.</li> </ul>	extensive

Table 5: show interfaces Gigabit Ethernet Output Fields (*continued*)

Field Name	Field Description	Level of Output
<b>CoS information</b>	Information about the CoS queue for the physical interface. <ul style="list-style-type: none"> <li>• <b>CoS transmit queue</b>—Queue number and its associated user-configured forwarding class name.</li> <li>• <b>Bandwidth %</b>—Percentage of bandwidth allocated to the queue.</li> <li>• <b>Bandwidth bps</b>—Bandwidth allocated to the queue (in bps).</li> <li>• <b>Buffer %</b>—Percentage of buffer space allocated to the queue.</li> <li>• <b>Buffer usec</b>—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.</li> <li>• <b>Priority</b>—Queue priority: <b>low</b> or <b>high</b>.</li> <li>• <b>Limit</b>—Displayed if rate limiting is configured for the queue. Possible values are <b>none</b> and <b>exact</b>. If <b>exact</b> is configured, the queue transmits only up to the configured bandwidth, even if excess bandwidth is available. If <b>none</b> is configured, the queue transmits beyond the configured bandwidth if bandwidth is available.</li> </ul>	<b>extensive</b>
<b>Logical Interface</b>		
<b>Logical interface</b>	Name of the logical interface.	All levels
<b>Index</b>	Index number of the logical interface, which reflects its initialization sequence.	<b>detail extensive none</b>
<b>SNMP ifIndex</b>	SNMP interface index number for the logical interface.	<b>detail extensive none</b>
<b>Generation</b>	Unique number for use by Juniper Networks technical support only.	<b>detail extensive</b>
<b>Flags</b>	Information about the logical interface. Possible values are described in the "Logical Interface Flags" section under <i>Common Output Fields Description</i> .	All levels

Table 5: show interfaces Gigabit Ethernet Output Fields (*continued*)

Field Name	Field Description	Level of Output
<b>VLAN-Tag</b>	<p>Rewrite profile applied to incoming or outgoing frames on the outer (<b>Out</b>) VLAN tag or for both the outer and inner (<b>In</b>) VLAN tags.</p> <ul style="list-style-type: none"> <li>• <b>push</b>—An outer VLAN tag is pushed in front of the existing VLAN tag.</li> <li>• <b>pop</b>—The outer VLAN tag of the incoming frame is removed.</li> <li>• <b>swap</b>—The outer VLAN tag of the incoming frame is overwritten with the user specified VLAN tag information.</li> <li>• <b>push</b>—An outer VLAN tag is pushed in front of the existing VLAN tag.</li> <li>• <b>push-push</b>—Two VLAN tags are pushed in from the incoming frame.</li> <li>• <b>swap-push</b>—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.</li> <li>• <b>swap-swap</b>—Both the inner and the outer VLAN tags of the incoming frame are replaced by the user specified VLAN tag value.</li> <li>• <b>pop-swap</b>—The outer VLAN tag of the incoming frame is removed, and the inner VLAN tag of the incoming frame is replaced by the user-specified VLAN tag value. The inner tag becomes the outer tag in the final frame.</li> <li>• <b>pop-pop</b>—Both the outer and inner VLAN tags of the incoming frame are removed.</li> </ul>	<b>brief detail extensive none</b>
<b>Demux:</b>	<p>IP demultiplexing (demux) value that appears if this interface is used as the demux underlying interface. The output is one of the following:</p> <ul style="list-style-type: none"> <li>• Source Family Inet</li> <li>• Destination Family Inet</li> </ul>	<b>detail extensive none</b>
<b>Encapsulation</b>	Encapsulation on the logical interface.	All levels
<b>Protocol</b>	Protocol family. Possible values are described in the “Protocol Field” section under <i>Common Output Fields Description</i> .	<b>detail extensive none</b>
<b>MTU</b>	Maximum transmission unit size on the logical interface.	<b>detail extensive none</b>
<b>Maximum labels</b>	Maximum number of MPLS labels configured for the MPLS protocol family on the logical interface.	<b>detail extensive none</b>
<b>Traffic statistics</b>	<p>Number and rate of bytes and packets received and transmitted on the specified interface set.</p> <ul style="list-style-type: none"> <li>• <b>Input bytes, Output bytes</b>—Number of bytes received and transmitted on the interface set. The value in this field also includes the Layer 2 overhead bytes for ingress or egress traffic on Ethernet interfaces if you enable accounting of Layer 2 overhead at the PIC level or the logical interface level.</li> <li>• <b>Input packets, Output packets</b>—Number of packets received and transmitted on the interface set.</li> </ul>	<b>detail extensive</b>
<b>IPv6 transit statistics</b>	Number of IPv6 transit bytes and packets received and transmitted on the logical interface if IPv6 statistics tracking is enabled.	<b>extensive</b>
<b>Local statistics</b>	Number and rate of bytes and packets destined to the routing device.	<b>extensive</b>

Table 5: show interfaces Gigabit Ethernet Output Fields (*continued*)

Field Name	Field Description	Level of Output
<b>Transit statistics</b>	Number and rate of bytes and packets transiting the switch.  <b>NOTE:</b> For Gigabit Ethernet intelligent queuing 2 (IQ2) interfaces, the logical interface egress statistics might not accurately reflect the traffic on the wire when output shaping is applied. Traffic management output shaping might drop packets after they are tallied by the <b>Output bytes</b> and <b>Output packets</b> interface counters. However, correct values display for both of these egress statistics when per-unit scheduling is enabled for the Gigabit Ethernet IQ2 physical interface, or when a single logical interface is actively using a shared scheduler.	<b>extensive</b>
<b>Generation</b>	Unique number for use by Juniper Networks technical support only.	<b>detail extensive</b>
<b>Route Table</b>	Route table in which the logical interface address is located. For example, 0 refers to the routing table inet.0.	<b>detail extensive none</b>
<b>Flags</b>	Information about protocol family flags. Possible values are described in the “Family Flags” section under <i>Common Output Fields Description</i> .	<b>detail extensive</b>
<b>Donor interface</b>	(Unnumbered Ethernet) Interface from which an unnumbered Ethernet interface borrows an IPv4 address.	<b>detail extensive none</b>
<b>Preferred source address</b>	(Unnumbered Ethernet) Secondary IPv4 address of the donor loopback interface that acts as the preferred source address for the unnumbered Ethernet interface.	<b>detail extensive none</b>
<b>Input Filters</b>	Names of any input filters applied to this interface. If you specify a precedence value for any filter in a dynamic profile, filter precedence values appear in parenthesis next to all interfaces.	<b>detail extensive</b>
<b>Output Filters</b>	Names of any output filters applied to this interface. If you specify a precedence value for any filter in a dynamic profile, filter precedence values appear in parenthesis next to all interfaces.	<b>detail extensive</b>
<b>Mac-Validate Failures</b>	Number of MAC address validation failures for packets and bytes. This field is displayed when MAC address validation is enabled for the logical interface.	<b>detail extensive none</b>
<b>Addresses, Flags</b>	Information about the address flags. Possible values are described in the “Addresses Flags” section under <i>Common Output Fields Description</i> .	<b>detail extensive none</b>
<b><i>protocol-family</i></b>	Protocol family configured on the logical interface. If the protocol is <b>inet</b> , the IP address of the interface is also displayed.	<b>brief</b>
<b>Flags</b>	Information about address flag (possible values are described in the “Addresses Flags” section under <i>Common Output Fields Description</i> .	<b>detail extensive none</b>
<b>Destination</b>	IP address of the remote side of the connection.	<b>detail extensive none</b>
<b>Local</b>	IP address of the logical interface.	<b>detail extensive none</b>
<b>Broadcast</b>	Broadcast address of the logical interlace.	<b>detail extensive none</b>

Table 5: show interfaces Gigabit Ethernet Output Fields (*continued*)

Field Name	Field Description	Level of Output
Generation	Unique number for use by Juniper Networks technical support only.	detail extensive

For Gigabit Ethernet IQ PICs, traffic and MAC statistics output varies. [Table 6 on page 95](#) describes the traffic and MAC statistics for two sample interfaces, each of which is sending traffic in packets of 500 bytes (including 478 bytes for the Layer 3 packet, 18 bytes for the Layer 2 VLAN traffic header, and 4 bytes for cyclic redundancy check [CRC] information). In [Table 6 on page 95](#), the **ge-0/3/0** interface is the inbound physical interface, and the **ge-0/0/0** interface is the outbound physical interface. On both interfaces, traffic is carried on logical unit .50 (VLAN 50).

Table 6: Gigabit Ethernet IQ PIC Traffic and MAC Statistics by Interface Type

Interface Type	Sample Command	Byte and Octet Counts Include	Comments
Inbound physical interface	<b>show interfaces ge-0/3/0 extensive</b>	Traffic statistics:  Input bytes: 496 bytes per packet, representing the Layer 2 packet  MAC statistics:  Received octets: 500 bytes per packet, representing the Layer 2 packet + 4 bytes	The additional 4 bytes are for the CRC.
Inbound logical interface	<b>show interfaces ge-0/3/0.50 extensive</b>	Traffic statistics:  Input bytes: 478 bytes per packet, representing the Layer 3 packet	
Outbound physical interface	<b>show interfaces ge-0/0/0 extensive</b>	Traffic statistics:  Input bytes: 490 bytes per packet, representing the Layer 3 packet + 12 bytes  MAC statistics:  Received octets: 478 bytes per packet, representing the Layer 3 packet	For input bytes, the additional 12 bytes includes 6 bytes for the destination MAC address + 4 bytes for VLAN + 2 bytes for the Ethernet type.
Outbound logical interface	<b>show interfaces ge-0/0/0.50 extensive</b>	Traffic statistics:  Input bytes: 478 bytes per packet, representing the Layer 3 packet	

## Sample Output

### show interfaces extensive (10-Gigabit Ethernet, LAN PHY Mode, IQ2)

```

user@host> show interfaces xe-5/0/0 extensive
Physical interface: xe-5/0/0, Enabled, Physical link is Up
  Interface index: 177, SNMP ifIndex: 99, Generation: 178
  Link-level type: Ethernet, MTU: 1518, LAN-PHY mode, Speed: 10Gbps, Loopback:

```

```

None, Source filtering: Enabled,
Flow control: Enabled
Device flags : Present Running
Interface flags: SNMP-Traps Internal: 0x4000
Link flags : None
CoS queues : 8 supported, 4 maximum usable queues
Schedulers : 1024
Hold-times : Up 0 ms, Down 0 ms
Current address: 00:14:f6:b9:f1:f6, Hardware address: 00:14:f6:b9:f1:f6
Last flapped : Never
Statistics last cleared: Never
Traffic statistics:
Input bytes : 6970332384 0 bps
Output bytes : 0 0 bps
Input packets: 81050506 0 pps
Output packets: 0 0 pps
IPv6 transit statistics:
Input bytes : 0
Output bytes : 0
Input packets: 0
Output packets: 0
Ingress traffic statistics at Packet Forwarding Engine:
Input bytes : 6970299398 0 bps
Input packets: 81049992 0 pps
Drop bytes : 0 0 bps
Drop packets: 0 0 pps
Input errors:
Errors: 0, Drops: 0, Framing errors: 0, Runts: 0, Policed discards: 0, L3
incompletes: 0, L2 channel errors: 0,
L2 mismatch timeouts: 0, FIFO errors: 0, Resource errors: 0
Output errors:
Carrier transitions: 0, Errors: 0, Drops: 0, Collisions: 0, Aged packets: 0,
FIFO errors: 0, HS link CRC errors: 0,
MTU errors: 0, Resource errors: 0
Ingress queues: 4 supported, 4 in use
Queue counters: Queued packets Transmitted packets Dropped packets

0 best-effort 81049992 81049992 0

1 expedited-fo 0 0 0

2 assured-forw 0 0 0

3 network-cont 0 0 0

Egress queues: 4 supported, 4 in use
Queue counters: Queued packets Transmitted packets Dropped packets

0 best-effort 0 0 0

1 expedited-fo 0 0 0

2 assured-forw 0 0 0

3 network-cont 0 0 0

Active alarms : None
Active defects : None
PCS statistics Seconds
Bit errors 0
Errored blocks 0

```

```

MAC statistics:
Total octets          6970332384
Total packets        81050506
Unicast packets      81050000
Broadcast packets    506
Multicast packets    0
CRC/Align errors     0
FIFO errors          0
MAC control frames   0
MAC pause frames     0
Oversized frames     0
Jabber frames        0
Fragment frames      0
VLAN tagged frames   0
Code violations       0

Filter statistics:
Input packet count    81050506
Input packet rejects  506
Input DA rejects      0
Input SA rejects      0
Output packet count   0
Output packet pad count 0
Output packet error count 0
CAM destination filters: 0, CAM source filters: 0

Packet Forwarding Engine configuration:
Destination slot: 5

CoS information:
Direction : Output
CoS transmit queue   Bandwidth      Buffer Priority Limit
                        %      bps      %      usec
0 best-effort        95    950000000  95      0      low  none
3 network-control    5     50000000   5      0      low  none

Direction : Input
CoS transmit queue   Bandwidth      Buffer Priority Limit
                        %      bps      %      usec
0 best-effort        95    950000000  95      0      low  none
3 network-control    5     50000000   5      0      low  none

Logical interface xe-5/0/0.0 (Index 71) (SNMP ifIndex 95) (Generation 195)
Flags: SNMP-Traps 0x4000 VLAN-Tag [ 0x8100.100 ] Encapsulation: ENET2
Egress account overhead: 100
Ingress account overhead: 90

Traffic statistics:
Input bytes : 0
Output bytes : 46
Input packets: 0
Output packets: 1

IPv6 transit statistics:
Input bytes : 0
Output bytes : 0
Input packets: 0
Output packets: 0

Local statistics:
Input bytes : 0
Output bytes : 46
Input packets: 0
Output packets: 1

Transit statistics:
Input bytes : 0
Output bytes : 0

```

```

Input packets:                0                0 pps
Output packets:               0                0 pps
IPv6 transit statistics:
  Input bytes :                0
  Output bytes :               0
  Input packets:              0
  Output packets:             0
Protocol inet, MTU: 1500, Generation: 253, Route table: 0
  Addresses, Flags: Is-Preferred Is-Primary
    Destination: 192.1.1/24, Local: 192.1.1.1, Broadcast: 192.1.1.255,
Generation: 265
Protocol multiservice, MTU: Unlimited, Generation: 254, Route table: 0
  Flags: None
  Policer: Input: __default_arp_policer__

```

### show interfaces extensive (10-Gigabit Ethernet, WAN PHY Mode)

```

user@host> show interfaces xe-1/0/0 extensive
Physical interface: xe-1/0/0, Enabled, Physical link is Up
Interface index: 141, SNMP ifIndex: 34, Generation: 47
Link-level type: Ethernet, MTU: 1514, Speed: 10Gbps, Loopback: Disabled
WAN-PHY mode
Source filtering: Disabled, Flow control: Enabled
Device flags : Present Running
Interface flags: SNMP-Traps 16384
Link flags : None
CoS queues : 4 supported
Hold-times : Up 0 ms, Down 0 ms
Current address: 00:05:85:a2:10:9d, Hardware address: 00:05:85:a2:10:9d
Last flapped : 2005-07-07 11:22:34 PDT (3d 12:28 ago)
Statistics last cleared: Never
Traffic statistics:
  Input bytes :                0                0 bps
  Output bytes :               0                0 bps
  Input packets:              0                0 pps
  Output packets:             0                0 pps
Input errors:
  Errors: 0, Drops: 0, Framing errors: 0, Runts: 0, Policed discards: 0,
  L3 incompletes: 0, L2 channel errors: 0, L2 mismatch timeouts: 0,
  HS Link CRC errors: 0, HS Link FIFO overflows: 0,
  Resource errors: 0
Output errors:
  Carrier transitions: 1, Errors: 0, Drops: 0, Collisions: 0,
  Aged packets: 0, FIFO errors: 0, HS link CRC errors: 0, MTU errors: 0,
  Resource errors: 0
Queue counters:
  Queued packets  Transmitted packets  Dropped packets
0 best-effort    0                0                0
1 expedited-fo   0                0                0
2 assured-forw   0                0                0
3 network-cont   0                0                0
Active alarms : LOL, LOS, LBL
Active defects: LOL, LOS, LBL, SEF, AIS-L, AIS-P
PCS statistics
  Seconds  Count
Bit errors 0        0
Errored blocks 0      0
MAC statistics:
  Receive  Transmit
Total octets 0        0
Total packets 0        0
Unicast packets 0      0
Broadcast packets 0     0
Multicast packets 0     0

```



```

CRC/Align errors                0          0
FIFO errors                     0          0
MAC control frames              0          0
MAC pause frames                0          0
Oversized frames               0
Jabber frames                  0
Fragment frames                0
VLAN tagged frames             0
Code violations                 0
Filter statistics:
  Input packet count            0
  Input packet rejects          0
  Input DA rejects              0
  Input SA rejects              0
  Output packet count           0
  Output packet pad count       0
  Output packet error count     0
CAM destination filters: 0, CAM source filters: 0
PMA PHY:
  Seconds      Count  State
  PLL lock     0      0 OK
  PHY light    63159  1 Light Missing
WIS section:
  BIP-B1        0      0
  SEF           434430  434438 Defect Active
  LOS           434430  1 Defect Active
  LOF           434430  1 Defect Active
  ES-S          434430
  SES-S         434430
  SEFS-S        434430
WIS line:
  BIP-B2        0      0
  REI-L         0      0
  RDI-L         0      0 OK
  AIS-L         434430  1 Defect Active
  BERR-SF       0      0 OK
  BERR-SD       0      0 OK
  ES-L          434430
  SES-L         434430
  UAS-L         434420
  ES-LFE        0
  SES-LFE       0
  UAS-LFE       0
WIS path:
  BIP-B3        0      0
  REI-P         0      0
  LOP-P         0      0 OK
  AIS-P         434430  1 Defect Active
  RDI-P         0      0 OK
  UNEQ-P        0      0 OK
  PLM-P         0      0 OK
  ES-P          434430
  SES-P         434430
  UAS-P         434420
  ES-PFE        0
  SES-PFE       0
  UAS-PFE       0
Received path trace:
00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 .....
Transmitted path trace: orissa so-1/0/0
6f 72 69 73 73 61 20 73 6f 2d 31 2f 30 2f 30 00 orissa so-1/0/0.
Packet Forwarding Engine configuration:

```

```

Destination slot: 1
CoS information:
  CoS transmit queue      Bandwidth      Buffer      Priority  Limit
                           %      bps      %      bytes
  0 best-effort           95      950000000  95        0      low      none
  3 network-control       5       50000000   5         0      low      none

```

#### show interfaces extensive (10-Gigabit Ethernet, DWDM OTN PIC)

```

user@host> show interfaces ge-7/0/0 extensive
Physical interface: ge-7/0/0, Enabled, Physical link is Down
Interface index: 143, SNMP ifIndex: 508, Generation: 208
Link-level type: Ethernet, MTU: 1514, Speed: 10Gbps, BPDU Error: None,
MAC-REWRITE Error: None, Loopback: Disabled, Source filtering: Disabled,
Flow control: Enabled
Device flags   : Present Running Down
Interface flags: Hardware-Down SNMP-Traps Internal: 0x4000
Link flags     : None
Wavelength     : 1550.12 nm, Frequency: 193.40 THz
CoS queues     : 8 supported, 8 maximum usable queues
Hold-times     : Up 0 ms, Down 0 ms
Current address: 00:05:85:70:2b:72, Hardware address: 00:05:85:70:2b:72
Last flapped   : 2011-04-20 15:48:54 PDT (18:39:49 ago)
Statistics last cleared: Never
Traffic statistics:
Input bytes   : 0          0 bps
Output bytes  : 0          0 bps
Input packets: 0          0 pps
Output packets: 0         0 pps
IPv6 transit statistics:
Input bytes   : 0
Output bytes  : 0
Input packets: 0
Output packets: 0
Input errors:
Errors: 0, Drops: 0, Framing errors: 0, Runts: 0, Policed discards: 0,
L3 incompletes: 0, L2 channel errors: 0, L2 mismatch timeouts: 0,
FIFO errors: 0, Resource errors: 0
Output errors:
Carrier transitions: 2, Errors: 0, Drops: 0, Collisions: 0, Aged packets: 0,
FIFO errors: 0, HS link CRC errors: 0, MTU errors: 0, Resource errors: 0
Egress queues: 8 supported, 4 in use
Queue counters:      Queued packets  Transmitted packets      Dropped packets

  0 best-effort           0              0              0

  1 expedited-fo         0              0              0

  2 assured-forw         0              0              0

  3 network-cont
Queue number:      Mapped forwarding classes
  0                best-effort
  1                expedited-forwarding
  2                assured-forwarding
  3                network-control
Active alarms  : LINK
Active defects : LINK
MAC statistics:
Total octets      Receive      Transmit
Total packets     0              0

```

```

Unicast packets                0                0
Broadcast packets              0                0
Multicast packets              0                0
CRC/Align errors               0                0
FIFO errors                    0                0
MAC control frames             0                0
MAC pause frames               0                0
Oversized frames               0
Jabber frames                  0
Fragment frames                0
VLAN tagged frames             0
Code violations                 0
Total octets                   0                0
Total packets                  0                0
Unicast packets                0                0
Broadcast packets              0                0
Multicast packets              0                0
CRC/Align errors               0                0
FIFO errors                    0                0
MAC control frames             0                0
MAC pause frames               0                0
Oversized frames               0
Jabber frames                  0
Fragment frames                0
VLAN tagged frames             0
Code violations                 0
OTN alarms                     :   None
OTN defects                    :   None
OTN FEC Mode                   :  GFEC
OTN Rate                       :  Fixed Stuff Bytes 11.0957Gbps
OTN Line Loopback              :  Enabled
OTN FEC statistics :
  Corrected Errors              0
  Corrected Error Ratio (      0 sec average)  0e-0
OTN FEC alarms:                Seconds    Count  State
  FEC Degrade                   0          0  OK
  FEC Excessive                 0          0  OK
OTN OC:                        Seconds    Count  State
  LOS                           2          1  OK
  LOF                           67164      2  Defect Active
  LOM                           67164      71  Defect Active
  Wavelength Lock               0          0  OK
OTN OTU:
  AIS                           0          0  OK
  BDI                           65919     4814  Defect Active
  IAE                           67158      1  Defect Active
  TTIM                          7          1  OK
  SF                            67164      2  Defect Active
  SD                            67164      3  Defect Active
  TCA-ES                        0          0  OK
  TCA-SES                       0          0  OK
  TCA-UAS                       80         40  OK
  TCA-BBE                       0          0  OK
  BIP                           0          0  OK
  BBE                           0          0  OK
  ES                            0          0  OK
  SES                           0          0  OK
  UAS                           587         0  OK
Received DAPI:
00 00 00 00 00 00 00 00 00 00 00 00 00 00 .....
Received SAPI:

```

```

00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 .....
Transmitted DAPI:
00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 .....
Transmitted SAPI:
00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 .....
OTN Received Overhead Bytes:
  APS/PCC0: 0x02, APS/PCC1: 0x42, APS/PCC2: 0xa2, APS/PCC3: 0x48
  Payload Type: 0x03
OTN Transmitted Overhead Bytes:
  APS/PCC0: 0x00, APS/PCC1: 0x00, APS/PCC2: 0x00, APS/PCC3: 0x00
  Payload Type: 0x03
Filter statistics:
  Input packet count                0
  Input packet rejects              0
  Input DA rejects                  0
  Input SA rejects                  0
  Output packet count                0
  Output packet pad count            0
  Output packet error count          0
  CAM destination filters: 0, CAM source filters: 0
Packet Forwarding Engine configuration:
  Destination slot: 7
CoS information:
  Direction : Output
  CoS transmit queue      Bandwidth      Buffer Priority
Limit                    %      bps      %      usec
0 best-effort            95      9500000000    95      0      low
none
3 network-control        5       500000000     5      0      low
none
...

```

#### show interfaces extensive (10-Gigabit Ethernet, LAN PHY Mode, Unidirectional Mode)

```

user@host> show interfaces xe-7/0/0 extensive
Physical interface: xe-7/0/0, Enabled, Physical link is Up
  Interface index: 173, SNMP ifIndex: 212, Generation: 174
  Link-level type: Ethernet, MTU: 1514, LAN-PHY mode, Speed: 10Gbps,
  Unidirectional: Enabled,
  Loopback: None, Source filtering: Disabled, Flow control: Enabled
  Device flags   : Present Running
...

```

#### show interfaces extensive (10-Gigabit Ethernet, LAN PHY Mode, Unidirectional Mode, Transmit-Only)

```

user@host> show interfaces xe-7/0/0-tx extensive
Physical interface: xe-7/0/0-tx, Enabled, Physical link is Up
  Interface index: 176, SNMP ifIndex: 137, Generation: 177
  Link-level type: Ethernet, MTU: 1514, LAN-PHY mode, Speed: 10Gbps,
  Unidirectional: Tx-Only
  Device flags   : Present Running
  Interface flags: SNMP-Traps Internal: 0x4000
  Link flags     : None
  CoS queues     : 8 supported, 8 maximum usable queues
  Hold-times     : Up 0 ms, Down 0 ms
  Current address: 00:05:85:73:e4:83, Hardware address: 00:05:85:73:e4:83
  Last flapped   : 2007-06-01 09:08:19 PDT (3d 02:31 ago)
  Statistics last cleared: Never
Traffic statistics:
  Input bytes   :                0                0 bps

```

```

Output bytes :      322891152287160      9627472888 bps
Input packets:              0              0 pps
Output packets:    328809727380      1225492 pps

...

Filter statistics:
  Output packet count      328810554250
  Output packet pad count      0
  Output packet error count    0
...

Logical interface xe-7/0/0-tx.0 (Index 73) (SNMP ifIndex 138) (Generation 139)

Flags: SNMP-Traps Encapsulation: ENET2
Egress account overhead: 100
Ingress account overhead: 90
Traffic statistics:
  Input bytes :              0
  Output bytes :    322891152287160
  Input packets:              0
  Output packets:    328809727380
IPv6 transit statistics:
  Input bytes :              0
  Output bytes :              0
  Input packets:              0
  Output packets:            0
Local statistics:
  Input bytes :              0
  Output bytes :              0
  Input packets:              0
  Output packets:            0
Transit statistics:
  Input bytes :              0              0 bps
  Output bytes :    322891152287160      9627472888 bps
  Input packets:              0              0 pps
  Output packets:    328809727380      1225492 pps
IPv6 transit statistics:
  Input bytes :              0
  Output bytes :              0
  Input packets:              0
  Output packets:            0
Protocol inet, MTU: 1500, Generation: 147, Route table: 0
  Addresses, Flags: Is-Preferred Is-Primary
    Destination: 10.11.12/24, Local: 10.11.12.13, Broadcast: 10.11.12.255,
Generation: 141
  Protocol multiservice, MTU: Unlimited, Generation: 148, Route table: 0
  Flags: None
  Policer: Input: __default_arp_policer__

```

#### show interfaces extensive (10-Gigabit Ethernet, LAN PHY Mode, Unidirectional Mode, Receive-Only)

```

user@host> show interfaces xe-7/0/0-rx extensive
Physical interface: xe-7/0/0-rx, Enabled, Physical link is Up
  Interface index: 174, SNMP ifIndex: 118, Generation: 175
  Link-level type: Ethernet, MTU: 1514, LAN-PHY mode, Speed: 10Gbps,
Unidirectional: Rx-Only
  Device flags   : Present Running
  Interface flags: SNMP-Traps Internal: 0x4000
  Link flags     : None
  CoS queues     : 8 supported, 8 maximum usable queues

```

Hold-times : Up 0 ms, Down 0 ms  
 Current address: 00:05:85:73:e4:83, Hardware address: 00:05:85:73:e4:83  
 Last flapped : 2007-06-01 09:08:22 PDT (3d 02:31 ago)  
 Statistics last cleared: Never

Traffic statistics:

Input bytes :	322857456303482	9627496104 bps
Output bytes :	0	0 bps
Input packets:	328775413751	1225495 pps
Output packets:	0	0 pps

...

Filter statistics:

Input packet count	328775015056
Input packet rejects	1
Input DA rejects	0

...

Logical interface xe-7/0/0-rx.0 (Index 72) (SNMP ifIndex 120) (Generation 138)

Flags: SNMP-Traps Encapsulation: ENET2

Traffic statistics:

Input bytes :	322857456303482
Output bytes :	0
Input packets:	328775413751
Output packets:	0

IPv6 transit statistics:

Input bytes :	0
Output bytes :	0
Input packets:	0
Output packets:	0

Local statistics:

Input bytes :	0
Output bytes :	0
Input packets:	0
Output packets:	0

Transit statistics:

Input bytes :	322857456303482	9627496104 bps
Output bytes :	0	0 bps
Input packets:	328775413751	1225495 pps
Output packets:	0	0 pps

IPv6 transit statistics:

Input bytes :	0
Output bytes :	0
Input packets:	0
Output packets:	0

Protocol inet, MTU: 1500, Generation: 145, Route table: 0

Addresses, Flags: Is-Preferred Is-Primary

Destination: 192.1.1/24, Local: 192.1.1.1, Broadcast: 192.1.1.255,

Generation: 139

Protocol multiservice, MTU: Unlimited, Generation: 146, Route table: 0

Flags: None

Policer: Input: \_\_default\_arp\_policer\_\_

## PART 4

# Troubleshooting

- [Ethernet on page 107](#)
- [Interface Diagnostics on page 111](#)





## CHAPTER 6

# Ethernet

- `traceroute ethernet`

## traceroute ethernet

<b>Syntax</b>	<b>traceroute ethernet</b> ( <i>mac-address</i>   <i>mep-id</i> ) <b>maintenance-association</b> <i>ma-name</i> <b>maintenance-domain</b> <i>md-name</i> <b>ttl</b> <i>value</i> < <b>wait</b> <i>seconds</i> >
<b>Release Information</b>	Command introduced in Junos OS Release 9.0. <b>mep-id</b> option introduced in Junos OS Release 9.1.
<b>Description</b>	Triggers the linktrace protocol to trace the route between two maintenance points. The result of the traceroute protocol is stored in the path database. To display the path database, use the <b>show oam ethernet connectivity-fault-management path-database</b> command.  Before using the traceroute command, you can verify the remote MEP's MAC address using the <b>show oam ethernet connectivity-fault-management path-database</b> command.
<b>Options</b>	<b>mac-address</b> —Destination unicast MAC address of the remote maintenance point.  <b>mep-id</b> —MEP identifier of the remote maintenance point. The range of values is 1 through 8191.  <b>maintenance-association</b> <i>ma-name</i> —Specifies an existing maintenance association from the set of configured maintenance associations.  <b>maintenance-domain</b> <i>md-name</i> —Specifies an existing maintenance domain from the set of configured maintenance domains.  <b>ttl</b> <i>value</i> —Number of hops to use in the linktrace request. The range is 1 to 255 hops. The default is 4.  <b>wait</b> <i>seconds</i> —(Optional) Maximum time to wait for a response to the traceroute request. The range is 1 to 255 seconds. The default is 5.
<b>Required Privilege Level</b>	network
<b>List of Sample Output</b>	<a href="#">traceroute ethernet on page 109</a>
<b>Output Fields</b>	<a href="#">Table 7 on page 108</a> lists the output fields for the <b>traceroute ethernet</b> command. Output fields are listed in the approximate order in which they appear.

**Table 7: traceroute ethernet Output Fields**

Field Name	Field Description
Linktrace to	MAC address of the destination maintenance point.
Interface	Local interface used to send the linktrace message (LTM).

Table 7: traceroute ethernet Output Fields (*continued*)

Field Name	Field Description
<b>Maintenance Domain</b>	Maintenance domain specified in the traceroute command.
<b>Level</b>	Maintenance domain level configured.
<b>Maintenance Association</b>	Maintenance association specified in the traceroute command.
<b>Local Mep</b>	The local maintenance end point identifier.
<b>Transaction Identifier</b>	4-byte identifier maintained by the MEP. Each LTM uses a transaction identifier. The transaction identifier is maintained globally across all Maintenance Domains. Use the transaction identifier to match an incoming linktrace response (LTR), with a previously sent LTM.
<b>Hop</b>	Sequential hop count of the linktrace path.
<b>TTL</b>	Number of hops remaining in the linktrace message. The time to live (TTL) is decremented at each hop.
<b>Source MAC address</b>	MAC address of the 802.1ag node responding to the LTM or the source MAC address of the LTR.
<b>Next-hop MAC address</b>	MAC address of the egress interface of the node to which the LTM is forwarded or  the next-hop MAC address derived from the next egress identifier in the Egress-ID TLV of the LTR PDU.

## Sample Output

### traceroute ethernet

```
user@host> traceroute ethernet maintenance-domain md1 maintenance-association ma1
00:01:02:03:04:05
```

```
Linktrace to 00:01:02:03:04:05, Interface : ge-5/0/0.0
```

```
Maintenance Domain: MD1, Level: 7
```

```
Maintenance Association: MA1, Local Mep: 1
```

Hop	TTL	Source MAC address	Next hop MAC address
Transaction Identifier:100001			
1	63	00:00:aa:aa:aa:aa	00:00:ab:ab:ab:ab
2	62	00:00:bb:bb:bb:bb	00:00:bc:bc:bc:bc
3	61	00:00:cc:cc:cc:cc	00:00:cd:cd:cd:cd
4	60	00:01:02:03:04:05	00:00:00:00:00:00



## CHAPTER 7

# Interface Diagnostics

- [Interface Diagnostics on page 111](#)

## Interface Diagnostics

---

You can use two diagnostic tools to test the physical layer connections of interfaces: loopback testing and bit error rate test (BERT) testing. Loopback testing enables you to verify the connectivity of a circuit. BERT testing enables you to identify poor signal quality on a circuit. This section contains the following topics:

- [Configuring Loopback Testing on page 111](#)
- [Interface Diagnostics on page 113](#)

## Configuring Loopback Testing

Loopback testing allows you to verify the connectivity of a circuit. You can configure any of the following interfaces to execute a loopback test: Aggregated Ethernet, Fast Ethernet, Gigabit Ethernet, E1, E3, NxDSO, serial, SONET/SDH, T1, and T3.

The physical path of a network data circuit usually consists of segments interconnected by devices that repeat and regenerate the transmission signal. The transmit path on one device connects to the receive path on the next device. If a circuit fault occurs in the form of a line break or a signal corruption, you can isolate the problem by using a loopback test. Loopback tests allow you to isolate segments of the circuit and test them separately.

To do this, configure a *line loopback* on one of the routers. Instead of transmitting the signal toward the far-end device, the line loopback sends the signal back to the originating router. If the originating router receives back its own data link layer packets, you have verified that the problem is beyond the originating router. Next, configure a line loopback farther away from the local router. If this originating router does not receive its own data link layer packets, you can assume the problem is on one of the segments between the local router and the remote router's interface card. In this case, the next troubleshooting step is to configure a line loopback closer to the local router to find the source of the problem.

There are several types of loopback testing supported by the Junos OS, as follows:

- DCE local—Loops packets back on the local DCE.
- DCE remote—Loops packets back on the remote DCE.

- **Local**—Useful for troubleshooting physical PIC errors. Configuring local loopback on an interface allows transmission of packets to the channel service unit (CSU) and then to the circuit toward the far-end device. The interface receives its own transmission, which includes data and timing information, on the local router's PIC. The data received from the CSU is ignored. To test a local loopback, issue the **show interfaces *interface-name*** command. If PPP keepalives transmitted on the interface are received by the PIC, the **Device Flags** field contains the output **Loop-Detected**.
- **Payload**—Useful for troubleshooting the physical circuit problems between the local router and the remote router. A payload loopback loops data only (without clocking information) on the remote router's PIC. With payload loopback, overhead is recalculated.
- **Remote**—Useful for troubleshooting the physical circuit problems between the local router and the remote router. A remote loopback loops packets, including both data and timing information, back on the remote router's interface card. A router at one end of the circuit initiates a remote loopback toward its remote partner. When you configure a remote loopback, the packets received from the physical circuit and CSU are received by the interface. Those packets are then retransmitted by the PIC back toward the CSU and the circuit. This loopback tests all the intermediate transmission segments.

Table 8 on page 112 shows the loopback modes supported on the various interface types.

**Table 8: Loopback Modes by Interface Type**

Interface	Loopback Modes	Usage Guidelines
Aggregated Ethernet, Fast Ethernet, Gigabit Ethernet	Local	<i>Configuring Ethernet Loopback Capability</i>
Circuit Emulation E1	Local and remote	<i>Configuring E1 Loopback Capability</i>
Circuit Emulation T1	Local and remote	<i>Configuring T1 Loopback Capability</i>
E1 and E3	Local and remote	<i>Configuring E1 Loopback Capability and Configuring E3 Loopback Capability</i>
NxDSO	Payload	<i>Configuring Channelized E1 IQ and IQE Interfaces, Configuring T1 and NxDSO Interfaces, Configuring Channelized OC12/STM4 IQ and IQE Interfaces (SONET Mode), Configuring Channelized STM1 IQ and IQE Interfaces, and Configuring Channelized T3 IQ Interfaces</i>
Serial (V.35 and X.21)	Local and remote	<i>Configuring Serial Loopback Capability</i>
Serial (EIA-530)	DCE local, DCE remote, local, and remote	<i>Configuring Serial Loopback Capability</i>
SONET/SDH	Local and remote	<i>Configuring SONET/SDH Loopback Capability</i>

Table 8: Loopback Modes by Interface Type (*continued*)

Interface	Loopback Modes	Usage Guidelines
T1 and T3	Local, payload, and remote	<i>Configuring T1 Loopback Capability</i> and <i>Configuring T3 Loopback Capability</i>  <i>See also Configuring the T1 Remote Loopback Response</i>

To configure loopback testing, include the **loopback** statement:

**loopback mode;**

You can include this statement at the following hierarchy levels:

- [edit interfaces *interface-name* aggregated-ether-options]
- [edit interfaces *interface-name* ds0-options]
- [edit interfaces *interface-name* e1-options]
- [edit interfaces *interface-name* e3-options]
- [edit interfaces *interface-name* fastether-options]
- [edit interfaces *interface-name* gigether-options]
- [edit interfaces *interface-name* serial-options]
- [edit interfaces *interface-name* sonet-options]
- [edit interfaces *interface-name* t1-options]
- [edit interfaces *interface-name* t3-options]

## Interface Diagnostics

BERT allows you to troubleshoot problems by checking the quality of links. You can configure any of the following interfaces to execute a BERT when the interface receives a request to run this test: E1, E3, T1, T3; the channelized DS3, OC3, OC12, and STM1 interfaces; and the channelized DS3 IQ, E1 IQ, and OC12 IQ interfaces.

A BERT test requires a line loop to be in place on either the transmission devices or the far-end router. The local router generates a known bit pattern and sends it out the transmit path. The received pattern is then verified against the sent pattern. The higher the bit error rate of the received pattern, the worse the noise is on the physical circuit. As you move the position of the line loop increasingly downstream toward the far-end router, you can isolate the troubled portion of the link.

To configure BERT, you must configure the duration of the test, the bit pattern to send on the transmit path, and the error rate to monitor when the inbound pattern is received.

To configure the duration of the test, the pattern to send in the bit stream, and the error rate to include in the bit stream, include the **bert-period**, **bert-algorithm**, and **bert-error-rate** statements, respectively, at the [edit interfaces *interface-name* *interface-type*-options] hierarchy level:

```
[edit interfaces interface-name interface-type-options]
bert-algorithm algorithm;
bert-error-rate rate;
bert-period seconds;
```

By default, the BERT period is 10 seconds. You can configure the BERT period to last from 1 through 239 seconds on some PICs and from 1 through 240 seconds on other PICs.

**rate** is the bit error rate. This can be an integer from 0 through 7, which corresponds to a bit error rate from  $10^{-0}$  (1 error per bit) to  $10^{-7}$  (1 error per 10 million bits).

**algorithm** is the pattern to send in the bit stream. For a list of supported algorithms, enter a ? after the **bert-algorithm** statement; for example:

```
[edit interfaces t1-0/0/0 t1-options]
user@host# set bert-algorithm ?
Possible completions:
pseudo-2e11-o152    Pattern is 2^11 - 1 (per 0.152 standard)
pseudo-2e15-o151    Pattern is 2^15 - 1 (per 0.152 standard)
pseudo-2e20-o151    Pattern is 2^20 - 1 (per 0.151 standard)
pseudo-2e20-o153    Pattern is 2^20 - 1 (per 0.153 standard)
...
```

For specific hierarchy information, see the individual interface types.



**NOTE:** The 4-port E1 PIC supports only the following algorithms:

pseudo-2e11-o152	Pattern is $2^{11} - 1$ (per 0.152 standard)
pseudo-2e15-o151	Pattern is $2^{15} - 1$ (per 0.151 standard)
pseudo-2e20-o151	Pattern is $2^{20} - 1$ (per 0.151 standard)
pseudo-2e23-o151	Pattern is $2^{23}$ (per 0.151 standard)

When you issue the help command from the CLI, all BERT algorithm options are displayed, regardless of the PIC type, and no commit check is available. Unsupported patterns for a PIC type can be viewed in system log messages.





**NOTE:** The 12-port T1/E1 Circuit Emulation (CE) PIC supports only the following algorithms:

```
all-ones-repeating    Repeating one bits
all-zeros-repeating   Repeating zero bits
alternating-double-ones-zeros Alternating pairs of ones and zeros
alternating-ones-zeros Alternating ones and zeros
pseudo-2e11-o152      Pattern is 2^11 - 1 (per 0.152 standard)
pseudo-2e15-o151      Pattern is 2^15 - 1 (per 0.151 standard)
pseudo-2e20-o151      Pattern is 2^20 - 1 (per 0.151 standard)
pseudo-2e7            Pattern is 2^7 - 1
pseudo-2e9-o153       Pattern is 2^9 - 1 (per 0.153 standard)
repeating-1-in-4       1 bit in 4 is set
repeating-1-in-8       1 bit in 8 is set
repeating-3-in-24      3 bits in 24 are set
```

When you issue the help command from the CLI, all BERT algorithm options are displayed, regardless of the PIC type, and no commit check is available. Unsupported patterns for a PIC type can be viewed in system log messages.



**NOTE:** The IQE PICs support only the following algorithms:

```
all-ones-repeating    Repeating one bits
all-zeros-repeating   Repeating zero bits
alternating-double-ones-zeros Alternating pairs of ones and zeros
alternating-ones-zeros Alternating ones and zeros
pseudo-2e9-o153       Pattern is 2^9 - 1 (per 0.153 (511 type) standard)
pseudo-2e11-o152      Pattern is 2^11 - 1 (per 0.152 and 0.153 (2047 type)
standards)
pseudo-2e15-o151      Pattern is 2^15 - 1 (per 0.151 standard)
pseudo-2e20-o151      Pattern is 2^20 - 1 (per 0.151 standard)
pseudo-2e20-o153      Pattern is 2^20 - 1 (per 0.153 standard)
pseudo-2e23-o151      Pattern is 2^23 - 1 (per 0.151 standard)
repeating-1-in-4       1 bit in 4 is set
repeating-1-in-8       1 bit in 8 is set
repeating-3-in-24      3 bits in 24 are set
```

When you issue the help command from the CLI, all BERT algorithm options are displayed, regardless of the PIC type, and no commit check is available. Unsupported patterns for a PIC type can be viewed in system log messages.



**NOTE:** BERT is supported on the PDH interfaces of the Channelized SONET/SDH OC3/STM1 (Multi-Rate) MIC with SFP and the DS3/E3 MIC. The following BERT algorithms are supported:

all-ones-repeating	Repeating one bits
all-zeros-repeating	Repeating zero bits
alternating-double-ones-zeros	Alternating pairs of ones and zeros
alternating-ones-zeros	Alternating ones and zeros
repeating-1-in-4	1 bit in 4 is set
repeating-1-in-8	1 bit in 8 is set
repeating-3-in-24	3 bits in 24 are set
pseudo-2e9-o153	Pattern is $2^9 - 1$ (per 0.153 standard)
pseudo-2e11-o152	Pattern is $2^{11} - 1$ (per 0.152 standard)
pseudo-2e15-o151	Pattern is $2^{15} - 1$ (per 0.151 standard)
pseudo-2e20-o151	Pattern is $2^{20} - 1$ (per 0.151 standard)
pseudo-2e20-o153	Pattern is $2^{20} - 1$ (per 0.153 standard)
pseudo-2e23-o151	Pattern is $2^{23} - 1$ (per 0.151 standard)

Table 9 on page 116 shows the BERT capabilities for various interface types.

**Table 9: BERT Capabilities by Interface Type**

Interface	T1 BERT	T3 BERT	Comments
12-port T1/E1 Circuit Emulation	Yes (ports 0–11)		<ul style="list-style-type: none"> <li>Limited algorithms</li> </ul>
4-port Channelized OC3/STM1 Circuit Emulation	Yes (port 0–3)		<ul style="list-style-type: none"> <li>Limited algorithms</li> </ul>
E1 or T1	Yes (port 0–3)	Yes (port 0–3)	<ul style="list-style-type: none"> <li>Single port at a time</li> <li>Limited algorithms</li> </ul>
E3 or T3	Yes (port 0–3)	Yes (port 0–3)	<ul style="list-style-type: none"> <li>Single port at a time</li> </ul>
Channelized OC12	N/A	Yes (channel 0–11)	<ul style="list-style-type: none"> <li>Single channel at a time</li> <li>Limited algorithms</li> <li>No bit count</li> </ul>
Channelized STM1	Yes (channel 0–62)	N/A	<ul style="list-style-type: none"> <li>Multiple channels</li> <li>Only one algorithm</li> <li>No error insert</li> <li>No bit count</li> </ul>
Channelized T3 and Multichannel T3	Yes (channel 0–27)	Yes (port 0–3 on channel 0)	<ul style="list-style-type: none"> <li>Multiple ports and channels</li> <li>Limited algorithms for T1</li> <li>No error insert for T1</li> <li>No bit count for T1</li> </ul>

These limitations do not apply to channelized IQ interfaces. For information about BERT capabilities on channelized IQ interfaces, see *Channelized IQ and IQE Interfaces Properties*.

### Starting and Stopping a BERT Test

Before you can start the BERT test, you must disable the interface. To do this, include the **disable** statement at the **[edit interfaces *interface-name*]** hierarchy level:

```
[edit interfaces interface-name]
disable;
```

After you configure the BERT properties and commit the configuration, begin the test by issuing the **test interface *interface-name* *interface-type*-bert-start** operational mode command:

```
user@host> test interface interface-name interface-type-bert-start
```

The test runs for the duration you specify with the **bert-period** statement. If you wish to terminate the test sooner, issue the **test interface *interface-name* *interface-type*-bert-stop** command:

```
user@host> test interface interface-name interface-type-bert-stop
```

For example:

```
user@host> test interface t3-1/2/0 t3-bert-start
user@host> test interface t3-1/2/0 t3-bert-stop
```

To view the results of the BERT test, issue the **show interfaces extensive | find BERT** command:

```
user@host> show interfaces interface-name extensive | find BERT
```

For more information about running and evaluating the results of the BERT procedure, see the [CLI Explorer](#).



**NOTE:** To exchange BERT patterns between a local router and a remote router, include the **loopback remote** statement in the interface configuration at the remote end of the link. From the local router, issue the **test interface** command.

### Example: Configuring Bit Error Rate Testing

Configure a BERT test on a T3 interface. In this example, the run duration lasts for 120 seconds. The configured error rate is 0, which corresponds to a bit error rate of  $10^{-0}$  (1 error per bit). The configured bit pattern of **all-ones-repeating** means that every bit the interface sends is a set to a value of 1.

```
[edit interfaces]
t3-1/2/0 {
  t3-options {
    bert algorithm all-ones-repeating;
    bert-error-rate 0;
    bert-period 120;
```

```
}  
}
```

## PART 5

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