



Junos[®] OS

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



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Junos® OS IEEE 802.3ah OAM Link-Fault Management Feature Guide for Routing Devices

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Table of Contents

	About the Documentation	ix
	Documentation and Release Notes	ix
	Supported Platforms	ix
	Using the Examples in This Manual	ix
	Merging a Full Example	x
	Merging a Snippet	x
	Documentation Conventions	xi
	Documentation Feedback	xiii
	Requesting Technical Support	xiii
	Self-Help Online Tools and Resources	xiii
	Opening a Case with JTAC	xiv
Part 1	Overview	
Chapter 1	IEEE 802.3ah OAM Link-Fault Management	3
	IEEE 802.3ah OAM Link-Fault Management Overview	3
Part 2	Configuration	
Chapter 2	IEEE 802.3ah OAM Link-Fault Management	7
	Configuring IEEE 802.3ah OAM Link-Fault Management	7
	Enabling IEEE 802.3ah OAM Support	8
	Configuring Link Discovery	9
	Configuring the OAM PDU Interval	10
	Configuring the OAM PDU Threshold	11
	Configuring Threshold Values for Local Fault Events on an Interface	12
	Disabling the Sending of Link Event TLVs	13
	Detecting Remote Faults	14
	Configuring an OAM Action Profile	15
	Specifying the Actions to Be Taken for Link-Fault Management Events	16
	Monitoring the Loss of Link Adjacency	17
	Monitoring Protocol Status	18
	Configuring Threshold Values for Fault Events in an Action Profile	19
	Applying an Action Profile	20
	Setting a Remote Interface into Loopback Mode	21
	Enabling Remote Loopback Support on the Local Interface	22
	Example: Configuring IEEE 802.3ah OAM Support on an Interface	23
Chapter 3	Network Interfaces Configuration Statements and Hierarchy	25
	[edit protocols oam] Hierarchy Level	25

Chapter 4	Statement Summary	29
	action (OAM)	29
	action-profile (Defining for LFM)	30
	allow-remote-loopback	31
	apply-action-profile	31
	ethernet (Protocols OAM)	32
	event (LFM)	35
	event-thresholds	35
	fast-aps-switch	36
	frame-error	37
	frame-period	38
	frame-period-summary	39
	interface (OAM Link-Fault Management)	40
	link-adjacency-loss	41
	link-down	41
	link-discovery	42
	link-event-rate	42
	link-fault-management	43
	negotiation-options	44
	no-allow-link-events	44
	oam	45
	pdu-interval	47
	pdu-threshold	48
	protocol-down	48
	remote-loopback	49
	send-critical-event	49
	symbol-period	50
	syslog (OAM Action)	50
Part 3	Administration	
Chapter 5	Monitoring Commands	53
	show oam ethernet link-fault-management	54
	show interfaces (Fast Ethernet)	60
	show interfaces (10-Gigabit Ethernet)	76
Chapter 6	Command Summary	101
	Ethernet Interface Operational Mode Commands	101
Part 4	Troubleshooting	
Chapter 7	Ethernet	109
	traceroute ethernet	110
Chapter 8	Interface Diagnostics	113
	Interface Diagnostics	113
	Configuring Loopback Testing	113
	Interface Diagnostics	115
	Starting and Stopping a BERT Test	119
	Example: Configuring Bit Error Rate Testing	119

Part 5

Index

Index	123
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List of Tables

	About the Documentation	ix
	Table 1: Notice Icons	xi
	Table 2: Text and Syntax Conventions	xi
Part 3	Administration	
Chapter 5	Monitoring Commands	53
	Table 3: show oam ethernet link-fault-management Output Fields	54
	Table 4: show interfaces Fast Ethernet Output Fields	60
	Table 5: show interfaces Gigabit Ethernet Output Fields	77
	Table 6: Gigabit Ethernet IQ PIC Traffic and MAC Statistics by Interface Type	91
Chapter 6	Command Summary	101
	Table 7: Ethernet Interface Operational Mode Commands	101
Part 4	Troubleshooting	
Chapter 7	Ethernet	109
	Table 8: traceroute ethernet Output Fields	110
Chapter 8	Interface Diagnostics	113
	Table 9: Loopback Modes by Interface Type	114
	Table 10: BERT Capabilities by Interface Type	118

About the Documentation

- Documentation and Release Notes on page ix
- Supported Platforms on page ix
- Using the Examples in This Manual on page ix
- Documentation Conventions on page xi
- Documentation Feedback on page xiii
- Requesting Technical Support on page xiii

Documentation and Release Notes

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Supported Platforms

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

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.

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

Table 2: Text and Syntax Conventions

Convention	Description	Examples
Bold text like this	Represents text that you type.	To enter configuration mode, type the configure command: user@host> configure
Fixed-width text like this	Represents output that appears on the terminal screen.	user@host> show chassis alarms No alarms currently active

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

Convention	Description	Examples
<i>Italic text like this</i>	<ul style="list-style-type: none"> Introduces or emphasizes important new terms. Identifies book names. Identifies RFC and Internet draft titles. 	<ul style="list-style-type: none"> A policy <i>term</i> is a named structure that defines match conditions and actions. <i>Junos OS System Basics Configuration Guide</i> RFC 1997, <i>BGP Communities Attribute</i>
<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@# set system domain-name <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"> To configure a stub area, include the stub statement at the [edit protocols ospf area area-id] hierarchy level. The console port is labeled CONSOLE.
< > (angle brackets)	Enclose optional keywords or variables.	stub <default-metric metric>;
(pipe symbol)	Indicates a choice between the mutually exclusive keywords or variables on either side of the symbol. The set of choices is often enclosed in parentheses for clarity.	broadcast multicast <i>(string1 string2 string3)</i>
# (pound sign)	Indicates a comment specified on the same line as the configuration statement to which it applies.	rsvp { # Required for dynamic MPLS only
[] (square brackets)	Enclose a variable for which you can substitute one or more values.	community name members [community-ids]
Indentation and braces ({ })	Identify 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		
Bold text like this	Represents graphical user interface (GUI) items you click or select.	<ul style="list-style-type: none"> In the Logical Interfaces box, select All Interfaces. To cancel the configuration, click Cancel.
> (bold right angle bracket)	Separates levels in a hierarchy of menu selections.	In the configuration editor hierarchy, select Protocols>Ospf .

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

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

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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: <https://www.juniper.net/alerts/>

- 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](#)
- [Disabling the Sending of Link Event TLVs on page 13](#)
- [Detecting Remote Faults on page 14](#)
- [Configuring an OAM Action Profile on page 15](#)
- [Specifying the Actions to Be Taken for Link-Fault Management Events on page 16](#)
- [Monitoring the Loss of Link Adjacency on page 17](#)
- [Monitoring Protocol Status on page 18](#)
- [Configuring Threshold Values for Fault Events in an Action Profile on page 19](#)
- [Applying an Action Profile on page 20](#)
- [Setting a Remote Interface into Loopback Mode on page 21](#)
- [Enabling Remote Loopback Support on the Local Interface on page 22](#)
- [Example: Configuring IEEE 802.3ah OAM Support on an Interface on page 23](#)
- [Ethernet Interfaces](#)

PART 2

Configuration

- [IEEE 802.3ah OAM Link-Fault Management on page 7](#)
- [Network Interfaces Configuration Statements and Hierarchy on page 25](#)
- [Statement Summary on page 29](#)

CHAPTER 2

IEEE 802.3ah OAM Link-Fault Management

- [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](#)
- [Disabling the Sending of Link Event TLVs on page 13](#)
- [Detecting Remote Faults on page 14](#)
- [Configuring an OAM Action Profile on page 15](#)
- [Specifying the Actions to Be Taken for Link-Fault Management Events on page 16](#)
- [Monitoring the Loss of Link Adjacency on page 17](#)
- [Monitoring Protocol Status on page 18](#)
- [Configuring Threshold Values for Fault Events in an Action Profile on page 19](#)
- [Applying an Action Profile on page 20](#)
- [Setting a Remote Interface into Loopback Mode on page 21](#)
- [Enabling Remote Loopback Support on the Local Interface on page 22](#)
- [Example: Configuring IEEE 802.3ah OAM Support on an Interface on page 23](#)

Configuring IEEE 802.3ah OAM Link-Fault Management

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 *Junos OS Operational Mode Commands*.

**Related
Documentation**

- [event-thresholds on page 35](#)
- [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](#)
- [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](#)
- [Disabling the Sending of Link Event TLVs on page 13](#)
- [Detecting Remote Faults on page 14](#)
- [Configuring an OAM Action Profile on page 15](#)
- [Specifying the Actions to Be Taken for Link-Fault Management Events on page 16](#)
- [Monitoring the Loss of Link Adjacency on page 17](#)
- [Monitoring Protocol Status on page 18](#)
- [Configuring Threshold Values for Fault Events in an Action Profile on page 19](#)
- [Applying an Action Profile on page 20](#)
- [Setting a Remote Interface into Loopback Mode on page 21](#)
- [Enabling Remote Loopback Support on the Local Interface on page 22](#)
- [Example: Configuring IEEE 802.3ah OAM Support on an Interface on page 23](#)
- [Ethernet Interfaces](#)

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 43](#)
- [IEEE 802.3ah OAM Link-Fault Management Overview on page 3](#)
- [Configuring IEEE 802.3ah OAM Link-Fault Management on page 7](#)
- [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](#)
- [Disabling the Sending of Link Event TLVs on page 13](#)
- [Detecting Remote Faults on page 14](#)
- [Configuring an OAM Action Profile on page 15](#)
- [Specifying the Actions to Be Taken for Link-Fault Management Events on page 16](#)
- [Monitoring the Loss of Link Adjacency on page 17](#)
- [Monitoring Protocol Status on page 18](#)
- [Configuring Threshold Values for Fault Events in an Action Profile on page 19](#)
- [Applying an Action Profile on page 20](#)
- [Setting a Remote Interface into Loopback Mode on page 21](#)
- [Enabling Remote Loopback Support on the Local Interface on page 22](#)
- [Example: Configuring IEEE 802.3ah OAM Support on an Interface on page 23](#)
- *Ethernet Interfaces*

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 42](#)
- [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 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](#)
- [Disabling the Sending of Link Event TLVs on page 13](#)
- [Detecting Remote Faults on page 14](#)
- [Configuring an OAM Action Profile on page 15](#)
- [Specifying the Actions to Be Taken for Link-Fault Management Events on page 16](#)
- [Monitoring the Loss of Link Adjacency on page 17](#)
- [Monitoring Protocol Status on page 18](#)
- [Configuring Threshold Values for Fault Events in an Action Profile on page 19](#)
- [Applying an Action Profile on page 20](#)
- [Setting a Remote Interface into Loopback Mode on page 21](#)
- [Enabling Remote Loopback Support on the Local Interface on page 22](#)
- [Example: Configuring IEEE 802.3ah OAM Support on an Interface on page 23](#)
- *Ethernet Interfaces*

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 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](#)
- [Configuring the OAM PDU Threshold on page 11](#)
- [Configuring Threshold Values for Local Fault Events on an Interface on page 12](#)
- [Disabling the Sending of Link Event TLVs on page 13](#)
- [Detecting Remote Faults on page 14](#)
- [Configuring an OAM Action Profile on page 15](#)
- [Specifying the Actions to Be Taken for Link-Fault Management Events on page 16](#)
- [Monitoring the Loss of Link Adjacency on page 17](#)
- [Monitoring Protocol Status on page 18](#)
- [Configuring Threshold Values for Fault Events in an Action Profile on page 19](#)
- [Applying an Action Profile on page 20](#)
- [Setting a Remote Interface into Loopback Mode on page 21](#)
- [Enabling Remote Loopback Support on the Local Interface on page 22](#)
- [Example: Configuring IEEE 802.3ah OAM Support on an Interface on page 23](#)
- [Ethernet Interfaces](#)

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 48](#)
- [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](#)
- [Configuring Threshold Values for Local Fault Events on an Interface on page 12](#)

- [Disabling the Sending of Link Event TLVs on page 13](#)
- [Detecting Remote Faults on page 14](#)
- [Configuring an OAM Action Profile on page 15](#)
- [Specifying the Actions to Be Taken for Link-Fault Management Events on page 16](#)
- [Monitoring the Loss of Link Adjacency on page 17](#)
- [Monitoring Protocol Status on page 18](#)
- [Configuring Threshold Values for Fault Events in an Action Profile on page 19](#)
- [Applying an Action Profile on page 20](#)
- [Setting a Remote Interface into Loopback Mode on page 21](#)
- [Enabling Remote Loopback Support on the Local Interface on page 22](#)
- [Example: Configuring IEEE 802.3ah OAM Support on an Interface on page 23](#)
- [Ethernet Interfaces](#)

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 35](#)
- [frame-error on page 37](#)
- [frame-period on page 38](#)
- [frame-period-summary on page 39](#)
- [symbol-period on page 50](#)
- [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](#)
- [Configuring the OAM PDU Threshold on page 11](#)
- [Disabling the Sending of Link Event TLVs on page 13](#)
- [Detecting Remote Faults on page 14](#)
- [Configuring an OAM Action Profile on page 15](#)
- [Specifying the Actions to Be Taken for Link-Fault Management Events on page 16](#)
- [Monitoring the Loss of Link Adjacency on page 17](#)
- [Monitoring Protocol Status on page 18](#)
- [Configuring Threshold Values for Fault Events in an Action Profile on page 19](#)
- [Applying an Action Profile on page 20](#)
- [Setting a Remote Interface into Loopback Mode on page 21](#)
- [Enabling Remote Loopback Support on the Local Interface on page 22](#)
- [Example: Configuring IEEE 802.3ah OAM Support on an Interface on page 23](#)
- [Ethernet Interfaces](#)

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 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](#)
- [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](#)
- [Detecting Remote Faults on page 14](#)
- [Configuring an OAM Action Profile on page 15](#)
- [Specifying the Actions to Be Taken for Link-Fault Management Events on page 16](#)

- [Monitoring the Loss of Link Adjacency on page 17](#)
- [Monitoring Protocol Status on page 18](#)
- [Configuring Threshold Values for Fault Events in an Action Profile on page 19](#)
- [Applying an Action Profile on page 20](#)
- [Setting a Remote Interface into Loopback Mode on page 21](#)
- [Enabling Remote Loopback Support on the Local Interface on page 22](#)
- [Example: Configuring IEEE 802.3ah OAM Support on an Interface on page 23](#)
- [Ethernet Interfaces](#)

Detecting Remote Faults

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](#)
- [Configuring the OAM PDU Threshold on page 11](#)
- [Configuring Threshold Values for Local Fault Events on an Interface on page 12](#)
- [Disabling the Sending of Link Event TLVs on page 13](#)
- [Configuring an OAM Action Profile on page 15](#)
- [Specifying the Actions to Be Taken for Link-Fault Management Events on page 16](#)
- [Monitoring the Loss of Link Adjacency on page 17](#)

- [Monitoring Protocol Status on page 18](#)
- [Configuring Threshold Values for Fault Events in an Action Profile on page 19](#)
- [Applying an Action Profile on page 20](#)
- [Setting a Remote Interface into Loopback Mode on page 21](#)
- [Enabling Remote Loopback Support on the Local Interface on page 22](#)
- [Example: Configuring IEEE 802.3ah OAM Support on an Interface on page 23](#)
- [Ethernet Interfaces](#)

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 30](#)
- [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](#)
- [Configuring the OAM PDU Threshold on page 11](#)
- [Configuring Threshold Values for Local Fault Events on an Interface on page 12](#)
- [Disabling the Sending of Link Event TLVs on page 13](#)

- [Detecting Remote Faults on page 14](#)
- [Specifying the Actions to Be Taken for Link-Fault Management Events on page 16](#)
- [Monitoring the Loss of Link Adjacency on page 17](#)
- [Monitoring Protocol Status on page 18](#)
- [Configuring Threshold Values for Fault Events in an Action Profile on page 19](#)
- [Applying an Action Profile on page 20](#)
- [Setting a Remote Interface into Loopback Mode on page 21](#)
- [Enabling Remote Loopback Support on the Local Interface on page 22](#)
- [Example: Configuring IEEE 802.3ah OAM Support on an Interface on page 23](#)
- *Ethernet Interfaces*

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 29](#)
- [syslog on page 50](#)
- [link-down on page 41](#)
- [send-critical-event on page 49](#)
- [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](#)
- [Configuring the OAM PDU Threshold on page 11](#)
- [Configuring Threshold Values for Local Fault Events on an Interface on page 12](#)
- [Disabling the Sending of Link Event TLVs on page 13](#)
- [Detecting Remote Faults on page 14](#)
- [Configuring an OAM Action Profile on page 15](#)
- [Monitoring the Loss of Link Adjacency on page 17](#)
- [Monitoring Protocol Status on page 18](#)
- [Configuring Threshold Values for Fault Events in an Action Profile on page 19](#)
- [Applying an Action Profile on page 20](#)
- [Setting a Remote Interface into Loopback Mode on page 21](#)
- [Enabling Remote Loopback Support on the Local Interface on page 22](#)
- [Example: Configuring IEEE 802.3ah OAM Support on an Interface on page 23](#)
- [Ethernet Interfaces](#)

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 41](#)
 - [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](#)
 - [Configuring the OAM PDU Threshold on page 11](#)
 - [Configuring Threshold Values for Local Fault Events on an Interface on page 12](#)
 - [Disabling the Sending of Link Event TLVs on page 13](#)
 - [Detecting Remote Faults on page 14](#)
 - [Configuring an OAM Action Profile on page 15](#)
 - [Specifying the Actions to Be Taken for Link-Fault Management Events on page 16](#)
 - [Monitoring Protocol Status on page 18](#)
 - [Configuring Threshold Values for Fault Events in an Action Profile on page 19](#)
 - [Applying an Action Profile on page 20](#)
 - [Setting a Remote Interface into Loopback Mode on page 21](#)
 - [Enabling Remote Loopback Support on the Local Interface on page 22](#)
 - [Example: Configuring IEEE 802.3ah OAM Support on an Interface on page 23](#)
 - *Ethernet Interfaces*

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 48](#)
- [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](#)
- [Configuring the OAM PDU Threshold on page 11](#)
- [Configuring Threshold Values for Local Fault Events on an Interface on page 12](#)
- [Disabling the Sending of Link Event TLVs on page 13](#)
- [Detecting Remote Faults on page 14](#)
- [Configuring an OAM Action Profile on page 15](#)
- [Specifying the Actions to Be Taken for Link-Fault Management Events on page 16](#)
- [Monitoring the Loss of Link Adjacency on page 17](#)
- [Configuring Threshold Values for Fault Events in an Action Profile on page 19](#)
- [Applying an Action Profile on page 20](#)
- [Setting a Remote Interface into Loopback Mode on page 21](#)
- [Enabling Remote Loopback Support on the Local Interface on page 22](#)
- [Example: Configuring IEEE 802.3ah OAM Support on an Interface on page 23](#)
- [Ethernet Interfaces](#)

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 42](#)
 - [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](#)
 - [Configuring the OAM PDU Threshold on page 11](#)
 - [Configuring Threshold Values for Local Fault Events on an Interface on page 12](#)
 - [Disabling the Sending of Link Event TLVs on page 13](#)
 - [Detecting Remote Faults on page 14](#)
 - [Configuring an OAM Action Profile on page 15](#)
 - [Specifying the Actions to Be Taken for Link-Fault Management Events on page 16](#)
 - [Monitoring the Loss of Link Adjacency on page 17](#)
 - [Monitoring Protocol Status on page 18](#)
 - [Applying an Action Profile on page 20](#)
 - [Setting a Remote Interface into Loopback Mode on page 21](#)
 - [Enabling Remote Loopback Support on the Local Interface on page 22](#)
 - [Example: Configuring IEEE 802.3ah OAM Support on an Interface on page 23](#)
 - [Ethernet Interfaces](#)

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 31](#)
 - [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](#)

- [Configuring the OAM PDU Threshold on page 11](#)
- [Configuring Threshold Values for Local Fault Events on an Interface on page 12](#)
- [Disabling the Sending of Link Event TLVs on page 13](#)
- [Detecting Remote Faults on page 14](#)
- [Configuring an OAM Action Profile on page 15](#)
- [Specifying the Actions to Be Taken for Link-Fault Management Events on page 16](#)
- [Monitoring the Loss of Link Adjacency on page 17](#)
- [Monitoring Protocol Status on page 18](#)
- [Configuring Threshold Values for Fault Events in an Action Profile on page 19](#)
- [Setting a Remote Interface into Loopback Mode on page 21](#)
- [Enabling Remote Loopback Support on the Local Interface on page 22](#)
- [Example: Configuring IEEE 802.3ah OAM Support on an Interface on page 23](#)
- *Ethernet Interfaces*

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 49](#)
- [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](#)
- [Configuring the OAM PDU Threshold on page 11](#)
- [Configuring Threshold Values for Local Fault Events on an Interface on page 12](#)
- [Disabling the Sending of Link Event TLVs on page 13](#)
- [Detecting Remote Faults on page 14](#)
- [Configuring an OAM Action Profile on page 15](#)
- [Specifying the Actions to Be Taken for Link-Fault Management Events on page 16](#)
- [Monitoring the Loss of Link Adjacency on page 17](#)
- [Monitoring Protocol Status on page 18](#)
- [Configuring Threshold Values for Fault Events in an Action Profile on page 19](#)
- [Applying an Action Profile on page 20](#)
- [Enabling Remote Loopback Support on the Local Interface on page 22](#)
- [Example: Configuring IEEE 802.3ah OAM Support on an Interface on page 23](#)
- [Ethernet Interfaces](#)

Enabling Remote Loopback Support on the Local Interface

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 31](#)
- [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](#)
- [Configuring the OAM PDU Threshold on page 11](#)
- [Configuring Threshold Values for Local Fault Events on an Interface on page 12](#)
- [Disabling the Sending of Link Event TLVs on page 13](#)
- [Detecting Remote Faults on page 14](#)
- [Configuring an OAM Action Profile on page 15](#)
- [Specifying the Actions to Be Taken for Link-Fault Management Events on page 16](#)
- [Monitoring the Loss of Link Adjacency on page 17](#)
- [Monitoring Protocol Status on page 18](#)
- [Configuring Threshold Values for Fault Events in an Action Profile on page 19](#)
- [Applying an Action Profile on page 20](#)
- [Setting a Remote Interface into Loopback Mode on page 21](#)
- [Example: Configuring IEEE 802.3ah OAM Support on an Interface on page 23](#)
- *Ethernet Interfaces*

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 43](#)
- [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](#)
- [Configuring the OAM PDU Threshold on page 11](#)
- [Configuring Threshold Values for Local Fault Events on an Interface on page 12](#)
- [Disabling the Sending of Link Event TLVs on page 13](#)
- [Detecting Remote Faults on page 14](#)
- [Configuring an OAM Action Profile on page 15](#)
- [Specifying the Actions to Be Taken for Link-Fault Management Events on page 16](#)
- [Monitoring the Loss of Link Adjacency on page 17](#)
- [Monitoring Protocol Status on page 18](#)
- [Configuring Threshold Values for Fault Events in an Action Profile on page 19](#)
- [Applying an Action Profile on page 20](#)
- [Setting a Remote Interface into Loopback Mode on page 21](#)
- [Enabling Remote Loopback Support on the Local Interface on page 22](#)
- [Ethernet Interfaces](#)

CHAPTER 3

Network Interfaces Configuration Statements and Hierarchy

- [\[edit protocols oam\] Hierarchy Level on page 25](#)

[\[edit protocols oam\] 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);
        }
    }
}
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

action (OAM)

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

action-profile (Defining for LFM)

Syntax	<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>
Hierarchy Level	[edit protocols oam ethernet link-fault-management]
Release Information	Statement introduced in Junos OS Release 8.5.
Description	Configure a name, one or more actions, and the events that trigger the action for an action profile.
Options	<p><i>profile-name</i>—Name of the action profile.</p> <p>The remaining statements are explained separately.</p>
Required Privilege Level	<p>interface—To view this statement in the configuration.</p> <p>interface-control—To add this statement to the configuration.</p>
Related Documentation	<ul style="list-style-type: none">• Configuring an OAM Action Profile on page 15

allow-remote-loopback

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

apply-action-profile

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

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 {

```

```

        data-tlv-size size;
        iteration-count count-value;
        priority priority-value;
    }
}
}
}
}
}
}
evcs evc-id {
    evc-protocol cfm management-domain domain-id (management-association
        association-id | vpls (routing-instance instance-id);
    remote-uni-count count;
    multipoint-to-multipoint;
}
link-fault-management {
    action-profile profile-name {
        action {
            link-down;
            send-critical-event;
            syslog;
        }
        event {
            link-adjacency-loss;
            link-event-rate {
                frame-error count;
                frame-period count;
                frame-period-summary count;
                symbol-period count;
            }
            protocol-down;
        }
    }
}
interface interface-name {
    apply-action-profile;
    link-discovery (active | passive);
    pdu-interval interval;
    pdu-threshold threshold-value;
    remote-loopback;
    event-thresholds {
        frame-error count;
        frame-period count;
        frame-period-summary count;
        symbol-period count;
    }
    negotiation-options {
        allow-remote-loopback;
        no-allow-link-events;
    }
}
}
lmi {
    status-counter count;
    polling-verification-timer value;
    interface name {
        uni-id uni-name;

```

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

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](#)
- *Example: Configuring Connectivity Fault Management for a PBB Network on MX Series Routers*


event (LFM)

Syntax	<pre>event { link-adjacency-loss; link-event-rate { frame-error count; frame-period count; frame-period-summary count; symbol-period count; } protocol-down; }</pre>
Hierarchy Level	[edit protocols oam ethernet link-fault-management action-profile]
Release Information	Statement introduced in Junos OS Release 8.5.
Description	<p>Configure threshold values for link events in an action profile.</p> <p>The remaining statements are explained separately.</p>
Required Privilege Level	<p>interface—To view this statement in the configuration.</p> <p>interface-control—To add this statement to the configuration.</p>
Related Documentation	<ul style="list-style-type: none"> • Monitoring Protocol Status on page 18

event-thresholds

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

fast-aps-switch

Syntax	fast-aps-switch;
Hierarchy Level	[edit interfaces <i>interface-name</i> sonet-options aps]
Release Information	Statement introduced in Junos OS Release 12.1.
Description	(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.
	<div> NOTE:<ul style="list-style-type: none">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.</div>
Required Privilege Level	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none"><i>Reducing APS Switchover Time in Layer 2 Circuits</i>

frame-error

Syntax	<code>frame-error count;</code>
Hierarchy Level	[edit protocols oam ethernet link-fault-management action-profile event link-event-rate], [edit protocols oam link-fault-management interface interface-name event-thresholds]
Release Information	Statement introduced in Junos OS Release 8.4.
Description	<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>
Options	<p>count—Threshold count for frame error events.</p> <p>Range: 1 through 100</p>
Required Privilege Level	<p>interface—To view this statement in the configuration.</p> <p>interface-control—To add this statement to the configuration.</p>
Related Documentation	<ul style="list-style-type: none"> • Configuring Threshold Values for Local Fault Events on an Interface on page 12 • Configuring Threshold Values for Fault Events in an Action Profile on page 19

frame-period

Syntax	<code>frame-period count;</code>
Hierarchy Level	[edit protocols oam ethernet link-fault-management action-profile event link-event-rate], [edit protocols oam link-fault-management interface interface-name event-thresholds]
Release Information	Statement introduced in Junos OS Release 8.4.
Description	<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>
Options	<p>count—Threshold count for frame period error events.</p> <p>Range: 1 through 100</p>
Required Privilege Level	<p>interface—To view this statement in the configuration.</p> <p>interface-control—To add this statement to the configuration.</p>
Related Documentation	<ul style="list-style-type: none">• Configuring Threshold Values for Local Fault Events on an Interface on page 12• Configuring Threshold Values for Fault Events in an Action Profile on page 19

frame-period-summary

Syntax	<code>frame-period-summary count;</code>
Hierarchy Level	[edit protocols oam ethernet link-fault-management action-profile event link-event-rate], [edit protocols oam link-fault-management interface interface-name event-thresholds]
Release Information	Statement introduced in Junos OS Release 8.4.
Description	<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>
Options	<p>count—Threshold count for frame period summary error events.</p> <p>Range: 1 through 100</p>
Required Privilege Level	<p>interface—To view this statement in the configuration.</p> <p>interface-control—To add this statement to the configuration.</p>
Related Documentation	<ul style="list-style-type: none"> • Configuring Threshold Values for Local Fault Events on an Interface on page 12 • Configuring Threshold Values for Fault Events in an Action Profile on page 19

interface (OAM Link-Fault Management)

Syntax	<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>
Hierarchy Level	[edit protocols oam ethernet link-fault-management]
Release Information	Statement introduced in Junos OS Release 8.2.
Description	For Ethernet interfaces on M320, MX Series, and T Series routers, configure IEEE 802.3ah Operation, Administration, and Management (OAM) support.
Options	<p>interface <i>interface-name</i>—Interface to be enabled for IEEE 802.3ah link fault management OAM support.</p> <p>Range: 1 through 10 interfaces can be tracked.</p> <p>The remaining statements are described separately.</p>
Required Privilege Level	<p>interface—To view this statement in the configuration.</p> <p>interface-control—To add this statement to the configuration.</p>
Related Documentation	<ul style="list-style-type: none">• Enabling IEEE 802.3ah OAM Support on page 8

link-adjacency-loss

Syntax	link-adjacency-loss;
Hierarchy Level	[edit protocols oam ethernet link-fault-management action-profile event]
Release Information	Statement introduced in Junos OS Release 8.5.
Description	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 action statement.
Required Privilege Level	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none">• Monitoring the Loss of Link Adjacency on page 17

link-down

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

link-discovery

Syntax	link-discovery (active passive);
Hierarchy Level	[edit protocols oam ethernet link-fault-management interface <i>interface-name</i>]
Release Information	Statement introduced in Junos OS Release 8.2.
Description	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.
Options	(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.
Required Privilege Level	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none">• Configuring Link Discovery on page 9

link-event-rate

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

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

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

no-allow-link-events

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

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.

Description	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.
Required Privilege Level	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none"> • IEEE 802.3ah OAM Link-Fault Management Overview on page 3 • Configuring Ethernet 802.1ag OAM on PTX Series Packet Transport Routers

pdu-interval

Syntax	<code>pdu-interval <i>interval</i>;</code>
Hierarchy Level	[edit protocols oam ethernet link-fault-management interface <i>interface-name</i>]
Release Information	Statement introduced in Junos OS Release 8.2.
Description	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.
Options	<p>interval—Periodic OAM PDU sending interval.</p> <p>Range: 100 through 1000 milliseconds</p> <p>Default: 1000 milliseconds</p>
Required Privilege Level	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none"> • Configuring the OAM PDU Interval on page 10

pdu-threshold

Syntax	<code>pdu-threshold <i>threshold-value</i>;</code>
Hierarchy Level	[edit protocols oam ethernet link-fault-management interface <i>interface-name</i>]
Release Information	Statement introduced in Junos OS Release 8.2.
Description	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.
Options	<i>threshold-value</i> —The number of PDUs missed before declaring the peer lost. Range: 3 through 10 PDUs Default: 3 PDUs
Required Privilege Level	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none">• Configuring the OAM PDU Threshold on page 11

protocol-down

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

remote-loopback

Syntax	remote-loopback;
Hierarchy Level	[edit protocols oam link-fault-management interface interface-name]
Release Information	Statement introduced in Junos OS Release 8.2.
Description	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.
Required Privilege Level	interface—To view this statement in the configuration. interface-control—To add this statement to the configuration.
Related Documentation	<ul style="list-style-type: none"> • Setting a Remote Interface into Loopback Mode on page 21

send-critical-event

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

symbol-period

Syntax	<code>symbol-period count;</code>
Hierarchy Level	[edit protocols oam ethernet link-fault-management action-profile event , link-event-rate], [edit protocols oam link-fault-management interface <i>interface-name</i> event-thresholds]
Release Information	Statement introduced in Junos OS Release 8.4.
Description	<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>
Options	<p>count—Threshold count for symbol period events.</p> <p>Range: 1 through 100</p>
Required Privilege Level	<p>interface—To view this statement in the configuration.</p> <p>interface-control—To add this statement to the configuration.</p>
Related Documentation	<ul style="list-style-type: none">• Configuring Threshold Values for Local Fault Events on an Interface on page 12• Configuring Threshold Values for Fault Events in an Action Profile on page 19

syslog (OAM Action)

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

PART 3

Administration

- [Monitoring Commands on page 53](#)
- [Command Summary on page 101](#)

CHAPTER 5

Monitoring Commands

show oam ethernet link-fault-management

Syntax	show oam ethernet link-fault-management <brief detail> <interface-name>
Release Information	Command introduced in Junos OS Release 8.2.
Description	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.
Options	brief detail —(Optional) Display the specified level of output. interface-name —(Optional) Display link fault management information for the specified Ethernet interface only.
Required Privilege Level	view
List of Sample Output	show oam ethernet link-fault-management brief on page 58 show oam ethernet link-fault-management detail on page 58
Output Fields	Table 3 on page 54 lists the output fields for the show oam ethernet link-fault-management command. Output fields are listed in the approximate order in which they appear.

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

Field Name	Field Description	Level of Output
Status	Indicates the status of the established link. <ul style="list-style-type: none"> Fail—A link fault condition exists. Running—A link fault condition does not exist. 	All levels
Discovery state	State of the discovery mechanism: <ul style="list-style-type: none"> Passive Wait Send Any Send Local Remote Send Local Remote Ok Fault 	All levels
Peer address	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
Flags	<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"> • Remote-Stable—Indicates remote OAM client acknowledgment of and satisfaction with local OAM state information. False indicates that remote DTE either has not seen or is unsatisfied with local state information. True indicates that remote DTE has seen and is satisfied with local state information. • Local-Stable—Indicates local OAM client acknowledgment of and satisfaction with remote OAM state information. False indicates that local DTE either has not seen or is unsatisfied with remote state information. True indicates that local DTE has seen and is satisfied with remote state information. • Remote-State-Valid—Indicates the OAM client has received remote state information found within Local Information TLVs of received Information OAM PDUs. False indicates that OAM client has not seen remote state information. True indicates that the OAM client has seen remote state information. 	All levels
Remote loopback status	Indicates the remote loopback status. An OAM entity can put its remote peer into loopback mode using the Loopback control OAM PDU. In loopback mode, every frame received is transmitted back on the same port (except for OAM PDUs, which are needed to maintain the OAM session).	All levels
Remote entity information	<p>Remote entity information.</p> <ul style="list-style-type: none"> • Remote MUX action—Indicates the state of the multiplexer functions of the OAM sublayer. Device is forwarding non-OAM PDUs to the lower sublayer or discarding non-OAM PDUs. • Remote parser action—Indicates the state of the parser function of the OAM sublayer. Device is forwarding non-OAM PDUs to higher sublayer, looping back non-OAM PDUs to the lower sublayer, or discarding non-OAM PDUs. • Discovery mode—Indicates whether discovery mode is active or inactive. • Unidirectional mode—Indicates the ability to operate a link in a unidirectional mode for diagnostic purposes. • Remote loopback mode—Indicates whether remote loopback is supported or unsupported. • Link events—Indicates whether interpreting link events is supported or unsupported on the remote peer. • Variable requests—Indicates whether variable requests are supported. The Variable Request OAM PDU, is used to request one or more MIB variables from the remote peer. 	All levels
OAM Receive Statistics		
Information	The total number of information PDUs received.	detail
Event	The total number of loopback control PDUs received.	detail
Variable request	The total number of variable request PDUs received.	detail
Variable response	The total number of variable response PDUs received.	detail

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

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

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

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

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

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

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
Peer address: 00:90:69:72:2c:83
Flags:Remote-Stable Remote-State-Valid Local-Stable 0x50
Remote loopback status: Disabled on local port, Enabled on peer port
Remote entity information:
  Remote MUX action: discarding, Remote parser action: loopback
  Discovery mode: active, Unidirectional mode: unsupported
  Remote loopback mode: supported, Link events: supported
  Variable requests: unsupported

```

show oam ethernet link-fault-management detail

```

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

```



```
OAM transmit statistics:
  Information: 186347, Event: 0, Variable request: 0, Variable response: 0
  Loopback control: 0, Organization specific: 0
OAM received symbol error event information:
  Events: 0, Window: 0, Threshold: 0
  Errors in period: 0, Total errors: 0
OAM received frame error event information:
  Events: 0, Window: 0, Threshold: 0
  Errors in period: 0, Total errors: 0
OAM received frame period error event information:
  Events: 0, Window: 0, Threshold: 0
  Errors in period: 0, Total errors: 0
OAM transmitted symbol error event information:
  Events: 0, Window: 0, Threshold: 1
  Errors in period: 0, Total errors: 0
OAM 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
```

show interfaces (Fast Ethernet)

Syntax	<pre>show interfaces <i>interface-type</i> <brief detail extensive terse> <descriptions> <media> <snmp-index <i>snmp-index</i>> <statistics></pre>
Release Information	Command introduced before Junos OS Release 7.4.
Description	Display status information about the specified Fast Ethernet interface.
Options	<p><i>interface-type</i>—On M Series and T Series routers, the interface type is <i>fe-fpc/pic/port</i>. On the J Series routers, the interface type is <i>fe-pim/O/port</i>.</p> <p><i>brief detail extensive terse</i>—(Optional) Display the specified level of output.</p> <p><i>descriptions</i>—(Optional) Display interface description strings.</p> <p><i>media</i>—(Optional) Display media-specific information about network interfaces.</p> <p><i>snmp-index snmp-index</i>—(Optional) Display information for the specified SNMP index of the interface.</p> <p><i>statistics</i>—(Optional) Display static interface statistics.</p>
Required Privilege Level	view
List of Sample Output	<p>show interfaces (Fast Ethernet) on page 73</p> <p>show interfaces brief (Fast Ethernet) on page 74</p> <p>show interfaces detail (Fast Ethernet) on page 74</p> <p>show interfaces extensive (Fast Ethernet) on page 74</p>
Output Fields	<p>Table 4 on page 60 lists the output fields for the show interfaces Fast Ethernet 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		
Physical interface	Name of the physical interface.	All levels
Enabled	State of the interface. Possible values are described in the “Enabled Field” section under <i>Common Output Fields Description</i> .	All levels
Interface index	Index number of the physical interface, which reflects its initialization sequence.	detail extensive none
SNMP ifIndex	SNMP index number for the physical interface.	detail extensive none

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

Field Name	Field Description	Level of Output
Generation	Unique number for use by Juniper Networks technical support only.	detail extensive
Link-level type	Encapsulation being used on the physical interface.	All levels
MTU	Maximum transmission unit size on the physical interface.	All levels
Link-mode	Type of link connection configured for the physical interface: Full-duplex or Half-duplex	extensive
Speed	Speed at which the interface is running.	All levels
Loopback	Loopback status: Enabled or Disabled . If loopback is enabled, type of loopback: Local or Remote .	All levels
Source filtering	Source filtering status: Enabled or Disabled .	All levels
LAN-PHY mode	10-Gigabit Ethernet interface operating in Local Area Network Physical Layer Device (LAN PHY) mode. LAN PHY allows 10-Gigabit Ethernet wide area links to use existing Ethernet applications.	All levels
WAN-PHY mode	10-Gigabit Ethernet interface operating in Wide Area Network Physical Layer Device (WAN PHY) mode. WAN PHY allows 10-Gigabit Ethernet wide area links to use fiber-optic cables and other devices intended for SONET/SDH.	All levels
Unidirectional	Unidirectional link mode status for 10-Gigabit Ethernet interface: Enabled or Disabled for parent interface; Rx-only or Tx-only for child interfaces.	All levels
Flow control	Flow control status: Enabled or Disabled .	All levels
Auto-negotiation	(Gigabit Ethernet interfaces) Autonegotiation status: Enabled or Disabled .	All levels
Remote-fault	(Gigabit Ethernet interfaces) Remote fault status: <ul style="list-style-type: none"> • Online—Autonegotiation is manually configured as online. • Offline—Autonegotiation is manually configured as offline. 	All levels
Device flags	Information about the physical device. Possible values are described in the "Device Flags" section under <i>Common Output Fields Description</i> .	All levels
Interface flags	Information about the interface. Possible values are described in the "Interface Flags" section under <i>Common Output Fields Description</i> .	All levels
Link flags	Information about the link. Possible values are described in the "Links Flags" section under <i>Common Output Fields Description</i> .	All levels
Wavelength	(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
Frequency	(10-Gigabit Ethernet DWDM interfaces only) Displays the frequency associated with the configured wavelength, in terahertz (THz).	All levels
CoS queues	Number of CoS queues configured.	detail extensive none
Schedulers	(GigabitEthernet intelligent queuing 2 (IQ2) interfaces only) Number of CoS schedulers configured.	extensive
Hold-times	Current interface hold-time up and hold-time down, in milliseconds.	detail extensive
Current address	Configured MAC address.	detail extensive none
Hardware address	Hardware MAC address.	detail extensive none
Last flapped	Date, time, and how long ago the interface went from down to up. The format is Last flapped: year-month-day hour:minute:second:timezone (hour:minute:second ago) . For example, Last flapped: 2002-04-26 10:52:40 PDT (04:33:20 ago) .	detail extensive none
Input Rate	Input rate in bits per second (bps) and packets per second (pps).	None specified
Output Rate	Output rate in bps and pps.	None specified
Statistics last cleared	Time when the statistics for the interface were last set to zero.	detail extensive
Traffic statistics	<p>Number and rate of bytes and packets received and transmitted on the physical interface.</p> <ul style="list-style-type: none"> • Input bytes—Number of bytes received on the interface • Output bytes—Number of bytes transmitted on the interface. • Input packets—Number of packets received on the interface. • Output packets—Number of packets transmitted on the interface. <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 show interfaces (10-Gigabit Ethernet) command.</p>	detail extensive

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

Field Name	Field Description	Level of Output
Input errors	<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"> • Errors—Sum of the incoming frame aborts and FCS errors. • Drops—Number of packets dropped by the input queue of the I/O Manager ASIC. If the interface is saturated, this number increments once for every packet that is dropped by the ASIC's RED mechanism. • Framing errors—Number of packets received with an invalid frame checksum (FCS). • Runts—Number of frames received that are smaller than the runt threshold. • Policed discards—Number of frames that the incoming packet match code discarded because they were not recognized or not of interest. Usually, this field reports protocols that the Junos OS does not handle. • L3 incompletes—Number of incoming packets discarded because they failed Layer 3 (usually IPv4) sanity checks of the header. For example, a frame with less than 20 bytes of available IP header is discarded. L3 incomplete errors can be ignored by configuring the ignore-l3-incompletes statement. • L2 channel errors—Number of times the software did not find a valid logical interface for an incoming frame. • L2 mismatch timeouts—Number of malformed or short packets that caused the incoming packet handler to discard the frame as unreadable. • FIFO errors—Number of FIFO errors in the receive direction that are reported by the ASIC on the PIC. If this value is ever nonzero, the PIC is probably malfunctioning. • Resource errors—Sum of transmit drops. 	extensive

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

Field Name	Field Description	Level of Output
Output errors	<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"> • Carrier transitions—Number of times the interface has gone from down to up. This number does not normally increment quickly, increasing only when the cable is unplugged, the far-end system is powered down and then up, or another problem occurs. If the number of carrier transitions increments quickly (perhaps once every 10 seconds), the cable, the far-end system, or the PIC or PIM is malfunctioning. • Errors—Sum of the outgoing frame aborts and FCS errors. • Drops—Number of packets dropped by the output queue of the I/O Manager ASIC. If the interface is saturated, this number increments once for every packet that is dropped by the ASIC's RED mechanism. • Collisions—Number of Ethernet collisions. The Gigabit Ethernet PIC supports only full-duplex operation, so for Gigabit Ethernet PICs, this number should always remain 0. If it is nonzero, there is a software bug. • Aged packets—Number of packets that remained in shared packet SDRAM so long that the system automatically purged them. The value in this field should never increment. If it does, it is most likely a software bug or possibly malfunctioning hardware. • FIFO errors—Number of FIFO errors in the send direction as reported by the ASIC on the PIC. If this value is ever nonzero, the PIC is probably malfunctioning. • HS link CRC errors—Number of errors on the high-speed links between the ASICs responsible for handling the router interfaces. • MTU errors—Number of packets whose size exceeded the MTU of the interface. • Resource errors—Sum of transmit drops. 	extensive
Egress queues	Total number of egress queues supported on the specified interface.	detail extensive
Queue counters (Egress)	<p>CoS queue number and its associated user-configured forwarding class name.</p> <ul style="list-style-type: none"> • Queued packets—Number of queued packets. • Transmitted packets—Number of transmitted packets. • Dropped packets—Number of packets dropped by the ASIC's RED mechanism. 	detail extensive
Ingress queues	Total number of ingress queues supported on the specified interface. Displayed on IQ2 interfaces.	extensive
Queue counters (Ingress)	<p>CoS queue number and its associated user-configured forwarding class name. Displayed on IQ2 interfaces.</p> <ul style="list-style-type: none"> • Queued packets—Number of queued packets. • Transmitted packets—Number of transmitted packets. • Dropped packets—Number of packets dropped by the ASIC's RED mechanism. 	extensive

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

Field Name	Field Description	Level of Output
Active alarms and Active defects	<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 None or Link.</p> <ul style="list-style-type: none"> • None—There are no active defects or alarms. • Link—Interface has lost its link state, which usually means that the cable is unplugged, the far-end system has been turned off, or the PIC is malfunctioning. 	detail extensive none
OTN FEC statistics	<p>The forward error correction (FEC) counters provide the following statistics:</p> <ul style="list-style-type: none"> • Corrected Errors—The count of corrected errors in the last second. • Corrected Error Ratio—The corrected error ratio in the last 25 seconds. For example, 1e-7 is 1 error per 10 million bits. 	
PCS statistics	<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"> • Bit errors—High bit error rate. Indicates the number of bit errors when the PCS receiver is operating in normal mode. • Errored blocks—Loss of block lock. The number of errored blocks when PCS receiver is operating in normal mode. 	detail extensive

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"> • Total octets and total packets—Total number of octets and packets. For Gigabit Ethernet IQ PICs, the received octets count varies by interface type. For more information, see Table 31 under the show interfaces (10-Gigabit Ethernet) command. • Unicast packets, Broadcast packets, and Multicast packets—Number of unicast, broadcast, and multicast packets. • CRC/Align errors—Total number of packets received that had a length (excluding framing bits, but including FCS octets) of between 64 and 1518 octets, inclusive, and had either a bad FCS with an integral number of octets (FCS Error) or a bad FCS with a nonintegral number of octets (Alignment Error). • FIFO error—Number of FIFO errors that are reported by the ASIC on the PIC. If this value is ever nonzero, the PIC or a cable is probably malfunctioning. • MAC control frames—Number of MAC control frames. • MAC pause frames—Number of MAC control frames with pause operational code. • Oversized frames—Number of frames that exceed 1518 octets. • Jabber frames—Number of frames that were longer than 1518 octets (excluding framing bits, but including FCS octets), and had either an FCS error or an alignment error. This definition of jabber is different from the definition in IEEE-802.3 section 8.2.1.5 (10BASE5) and section 10.3.1.4 (10BASE2). These documents define jabber as the condition in which any packet exceeds 20 ms. The allowed range to detect jabber is from 20 ms to 150 ms. • Fragment frames—Total number of packets that were less than 64 octets in length (excluding framing bits, but including FCS octets), and had either an FCS error or an alignment error. Fragment frames normally increment because both runts (which are normal occurrences caused by collisions) and noise hits are counted. • VLAN tagged frames—Number of frames that are VLAN tagged. The system uses the TPID of 0x8100 in the frame to determine whether a frame is tagged or not. • Code violations—Number of times an event caused the PHY to indicate "Data reception error" or "invalid data symbol error." 	extensive
OTN Received Overhead Bytes	APS/PCC0: 0x02, APS/PCC1: 0x11, APS/PCC2: 0x47, APS/PCC3: 0x58 Payload Type: 0x08	extensive
OTN Transmitted Overhead Bytes	APS/PCC0: 0x00, APS/PCC1: 0x00, APS/PCC2: 0x00, APS/PCC3: 0x00 Payload Type: 0x08	extensive

Table 4: show interfaces Fast 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"> • Input packet count—Number of packets received from the MAC hardware that the filter processed. • Input packet rejects—Number of packets that the filter rejected because of either the source MAC address or the destination MAC address. • Input DA rejects—Number of packets that the filter rejected because the destination MAC address of the packet is not on the accept list. It is normal for this value to increment. When it increments very quickly and no traffic is entering the routing device from the far-end system, either there is a bad ARP entry on the far-end system, or multicast routing is not on and the far-end system is sending many multicast packets to the local routing device (which the routing device is rejecting). • Input SA rejects—Number of packets that the filter rejected because the source MAC address of the packet is not on the accept list. The value in this field should increment only if source MAC address filtering has been enabled. If filtering is enabled, if the value increments quickly, and if the system is not receiving traffic that it should from the far-end system, it means that the user-configured source MAC addresses for this interface are incorrect. • Output packet count—Number of packets that the filter has given to the MAC hardware. • Output packet pad count—Number of packets the filter padded to the minimum Ethernet size (60 bytes) before giving the packet to the MAC hardware. Usually, padding is done only on small ARP packets, but some very small IP packets can also require padding. If this value increments rapidly, either the system is trying to find an ARP entry for a far-end system that does not exist or it is misconfigured. • Output packet error count—Number of packets with an indicated error that the filter was given to transmit. These packets are usually aged packets or are the result of a bandwidth problem on the FPC hardware. On a normal system, the value of this field should not increment. • CAM destination filters, CAM source filters—Number of entries in the CAM dedicated to destination and source MAC address filters. There can only be up to 64 source entries. If source filtering is disabled, which is the default, the values for these fields should be 0. 	extensive
PMA PHY	<p>(10-Gigabit Ethernet interfaces, WAN PHY mode) SONET error information:</p> <ul style="list-style-type: none"> • Seconds—Number of seconds the defect has been active. • Count—Number of times that the defect has gone from inactive to active. • State—State of the error. Any state other than OK indicates a problem. <p>Subfields are:</p> <ul style="list-style-type: none"> • PHY Lock—Phase-locked loop • PHY Light—Loss of optical signal 	extensive

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

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

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

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

Table 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"> • Negotiation status: <ul style="list-style-type: none"> • Incomplete—Ethernet interface has the speed or link mode configured. • No autonegotiation—Remote Ethernet interface has the speed or link mode configured, or does not perform autonegotiation. • Complete—Ethernet interface is connected to a device that performs autonegotiation and the autonegotiation process is successful. • Link partner status—OK when Ethernet interface is connected to a device that performs autonegotiation and the autonegotiation process is successful. • Link partner: <ul style="list-style-type: none"> • Link mode—Depending on the capability of the attached Ethernet device, either Full-duplex or Half-duplex. • Flow control—Types of flow control supported by the remote Ethernet device. For Fast Ethernet interfaces, the type is None. For Gigabit Ethernet interfaces, types are Symmetric (link partner supports PAUSE on receive and transmit), Asymmetric (link partner supports PAUSE on transmit), and Symmetric/Asymmetric (link partner supports both PAUSE on receive and transmit or only PAUSE receive). • Remote fault—Remote fault information from the link partner—Failure indicates a receive link error. OK indicates that the link partner is receiving. Negotiation error indicates a negotiation error. Offline indicates that the link partner is going offline. • Local resolution—Information from the link partner: <ul style="list-style-type: none"> • Flow control—Types of flow control supported by the remote Ethernet device. For Gigabit Ethernet interfaces, types are Symmetric (link partner supports PAUSE on receive and transmit), Asymmetric (link partner supports PAUSE on transmit), and Symmetric/Asymmetric (link partner supports both PAUSE on receive and transmit or only PAUSE receive). • Remote fault—Remote fault information. Link OK (no error detected on receive), Offline (local interface is offline), and Link Failure (link error detected on receive). 	extensive
Received path trace, Transmitted path trace	<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"> • Destination slot—FPC slot number. 	extensive

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

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

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

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

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

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

Sample Output

show interfaces (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)

Syntax	<code>show interfaces <i>xe-fpc/pic/port</i></code> <code><brief detail extensive terse></code> <code><descriptions></code> <code><media></code> <code><snmp-index <i>snmp-index</i>></code> <code><statistics></code>
Release Information	Command introduced in Junos OS Release 8.0.
Description	(M320, M120, MX Series, and T Series routers and EX Series switches only) Display status information about the specified 10-Gigabit Ethernet interface.
Options	<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>
Required Privilege Level	view
List of Sample Output	<p>show interfaces extensive (10-Gigabit Ethernet, LAN PHY Mode, IQ2) on page 91</p> <p>show interfaces extensive (10-Gigabit Ethernet, WAN PHY Mode) on page 94</p> <p>show interfaces extensive (10-Gigabit Ethernet, DWDM OTN PIC) on page 96</p> <p>show interfaces extensive (10-Gigabit Ethernet, LAN PHY Mode, Unidirectional Mode) on page 98</p> <p>show interfaces extensive (10-Gigabit Ethernet, LAN PHY Mode, Unidirectional Mode, Transmit-Only) on page 98</p> <p>show interfaces extensive (10-Gigabit Ethernet, LAN PHY Mode, Unidirectional Mode, Receive-Only) on page 99</p>
Output Fields	See Table 5 on page 77 for the output fields for the show interfaces (10-Gigabit Ethernet) command.

Table 5: show interfaces Gigabit Ethernet Output Fields

Field Name	Field Description	Level of Output
Physical Interface		
Physical interface	Name of the physical interface.	All levels
Enabled	State of the interface. Possible values are described in the “Enabled Field” section under <i>Common Output Fields Description</i> .	All levels
Interface index	Index number of the physical interface, which reflects its initialization sequence.	detail extensive none
SNMP ifIndex	SNMP index number for the physical interface.	detail extensive none
Generation	Unique number for use by Juniper Networks technical support only.	detail extensive
Link-level type	Encapsulation being used on the physical interface.	All levels
MTU	Maximum transmission unit size on the physical interface.	All levels
Speed	Speed at which the interface is running.	All levels
Loopback	Loopback status: Enabled or Disabled . If loopback is enabled, type of loopback: Local or Remote .	All levels
Source filtering	Source filtering status: Enabled or Disabled .	All levels
LAN-PHY mode	10-Gigabit Ethernet interface operating in Local Area Network Physical Layer Device (LAN PHY) mode. LAN PHY allows 10-Gigabit Ethernet wide area links to use existing Ethernet applications.	All levels
WAN-PHY mode	10-Gigabit Ethernet interface operating in Wide Area Network Physical Layer Device (WAN PHY) mode. WAN PHY allows 10-Gigabit Ethernet wide area links to use fiber-optic cables and other devices intended for SONET/SDH.	All levels
Unidirectional	Unidirectional link mode status for 10-Gigabit Ethernet interface: Enabled or Disabled for parent interface; Rx-only or Tx-only for child interfaces.	All levels
Flow control	Flow control status: Enabled or Disabled .	All levels
Auto-negotiation	(Gigabit Ethernet interfaces) Autonegotiation status: Enabled or Disabled .	All levels
Remote-fault	(Gigabit Ethernet interfaces) Remote fault status: <ul style="list-style-type: none"> • Online—Autonegotiation is manually configured as online. • Offline—Autonegotiation is manually configured as offline. 	All levels
Device flags	Information about the physical device. Possible values are described in the “Device Flags” section under <i>Common Output Fields Description</i> .	All levels
Interface flags	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
Link flags	Information about the link. Possible values are described in the “Links Flags” section under <i>Common Output Fields Description</i> .	All levels
Wavelength	(10-Gigabit Ethernet dense wavelength-division multiplexing [DWDM] interfaces) Displays the configured wavelength, in nanometers (nm).	All levels
Frequency	(10-Gigabit Ethernet DWDM interfaces only) Displays the frequency associated with the configured wavelength, in terahertz (THz).	All levels
CoS queues	Number of CoS queues configured.	detail extensive none
Schedulers	(Gigabit Ethernet intelligent queuing 2 (IQ2) interfaces only) Number of CoS schedulers configured.	extensive
Hold-times	Current interface hold-time up and hold-time down, in milliseconds.	detail extensive
Current address	Configured MAC address.	detail extensive none
Hardware address	Hardware MAC address.	detail extensive none
Last flapped	Date, time, and how long ago the interface went from down to up. The format is Last flapped: year-month-day hour:minute:second:timezone (hour:minute:second ago) . For example, Last flapped: 2002-04-26 10:52:40 PDT (04:33:20 ago) .	detail extensive none
Input Rate	Input rate in bits per second (bps) and packets per second (pps). The value in this field also includes the Layer 2 overhead bytes for ingress traffic on Ethernet interfaces if you enable accounting of Layer 2 overhead at the PIC level or the logical interface level.	None specified
Output Rate	Output rate in bps and pps. The value in this field also includes the Layer 2 overhead bytes for egress traffic on Ethernet interfaces if you enable accounting of Layer 2 overhead at the PIC level or the logical interface level.	None specified
Statistics last cleared	Time when the statistics for the interface were last set to zero.	detail extensive
Egress accounting overhead	Layer 2 overhead in bytes that is accounted in the interface statistics for egress traffic.	detail extensive
Ingress accounting overhead	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
Traffic statistics	<p>Number and rate of bytes and packets received and transmitted on the physical interface.</p> <ul style="list-style-type: none"> • Input bytes—Number of bytes received on the interface. The value in this field also includes the Layer 2 overhead bytes for ingress traffic on Ethernet interfaces if you enable accounting of Layer 2 overhead at the PIC level or the logical interface level. • Output bytes—Number of bytes transmitted on the interface. The value in this field also includes the Layer 2 overhead bytes for egress traffic on Ethernet interfaces if you enable accounting of Layer 2 overhead at the PIC level or the logical interface level. • Input packets—Number of packets received on the interface. • Output packets—Number of packets transmitted on the interface. <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 5 on page 77.</p>	detail extensive
Input errors	<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"> • Errors—Sum of the incoming frame aborts and FCS errors. • Drops—Number of packets dropped by the input queue of the I/O Manager ASIC. If the interface is saturated, this number increments once for every packet that is dropped by the ASIC's RED mechanism. • Framing errors—Number of packets received with an invalid frame checksum (FCS). • Runts—Number of frames received that are smaller than the runt threshold. • Policed discards—Number of frames that the incoming packet match code discarded because they were not recognized or not of interest. Usually, this field reports protocols that the Junos OS does not handle. • L3 incompletes—Number of incoming packets discarded because they failed Layer 3 (usually IPv4) sanity checks of the header. For example, a frame with less than 20 bytes of available IP header is discarded. L3 incomplete errors can be ignored by configuring the <code>ignore-l3-incompletes</code> statement. • L2 channel errors—Number of times the software did not find a valid logical interface for an incoming frame. • L2 mismatch timeouts—Number of malformed or short packets that caused the incoming packet handler to discard the frame as unreadable. • FIFO errors—Number of FIFO errors in the receive direction that are reported by the ASIC on the PIC. If this value is ever nonzero, the PIC is probably malfunctioning. • Resource errors—Sum of transmit drops. 	extensive

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

Field Name	Field Description	Level of Output
Output errors	<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"> • Carrier transitions—Number of times the interface has gone from down to up. This number does not normally increment quickly, increasing only when the cable is unplugged, the far-end system is powered down and then up, or another problem occurs. If the number of carrier transitions increments quickly (perhaps once every 10 seconds), the cable, the far-end system, or the PIC or PIM is malfunctioning. • Errors—Sum of the outgoing frame aborts and FCS errors. • Drops—Number of packets dropped by the output queue of the I/O Manager ASIC. If the interface is saturated, this number increments once for every packet that is dropped by the ASIC's RED mechanism. • Collisions—Number of Ethernet collisions. The Gigabit Ethernet PIC supports only full-duplex operation, so for Gigabit Ethernet PICs, this number should always remain 0. If it is nonzero, there is a software bug. • Aged packets—Number of packets that remained in shared packet SDRAM so long that the system automatically purged them. The value in this field should never increment. If it does, it is most likely a software bug or possibly malfunctioning hardware. • FIFO errors—Number of FIFO errors in the send direction as reported by the ASIC on the PIC. If this value is ever nonzero, the PIC is probably malfunctioning. • HS link CRC errors—Number of errors on the high-speed links between the ASICs responsible for handling the router interfaces. • MTU errors—Number of packets whose size exceeded the MTU of the interface. • Resource errors—Sum of transmit drops. 	extensive
Egress queues	Total number of egress queues supported on the specified interface.	detail extensive
Queue counters (Egress)	<p>CoS queue number and its associated user-configured forwarding class name.</p> <ul style="list-style-type: none"> • Queued packets—Number of queued packets. • Transmitted packets—Number of transmitted packets. • Dropped packets—Number of packets dropped by the ASIC's RED mechanism. 	detail extensive
Ingress queues	Total number of ingress queues supported on the specified interface. Displayed on IQ2 interfaces.	extensive
Queue counters (Ingress)	<p>CoS queue number and its associated user-configured forwarding class name. Displayed on IQ2 interfaces.</p> <ul style="list-style-type: none"> • Queued packets—Number of queued packets. • Transmitted packets—Number of transmitted packets. • Dropped packets—Number of packets dropped by the ASIC's RED mechanism. 	extensive

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

Field Name	Field Description	Level of Output
Active alarms and Active defects	<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 None or Link.</p> <ul style="list-style-type: none"> • None—There are no active defects or alarms. • Link—Interface has lost its link state, which usually means that the cable is unplugged, the far-end system has been turned off, or the PIC is malfunctioning. 	detail extensive none
OTN alarms	Active OTN alarms identified on the interface.	detail extensive
OTN defects	OTN defects received on the interface.	detail extensive
OTN FEC Mode	<p>The FECmode configured on the interface.</p> <ul style="list-style-type: none"> • efec—Enhanced forward error correction (EFEC) is configured to detect and correct bit errors. • gfec—G.709 Forward error correction (GFEC) mode is configured to detect and correct bit errors. • none—FEC mode is not configured. 	detail extensive
OTN Rate	<p>OTN mode.</p> <ul style="list-style-type: none"> • fixed-stuff-bytes—Fixed stuff bytes 11.0957 Gbps. • no-fixed-stuff-bytes—No fixed stuff bytes 11.0491 Gbps. • pass-through—Enable OTN passthrough mode. • no-pass-through—Do not enable OTN passthrough mode. 	detail extensive
OTN Line Loopback	Status of the line loopback, if configured for the DWDM OTN PIC. Its value can be: enabled or disabled .	detail extensive
OTN FEC statistics	<p>The forward error correction (FEC) counters for the DWDM OTN PIC.</p> <ul style="list-style-type: none"> • Corrected Errors—The count of corrected errors in the last second. • Corrected Error Ratio—The corrected error ratio in the last 25 seconds. For example, 1e-7 is 1 error per 10 million bits. 	detail extensive
OTN FEC alarms	<p>OTN FEC excessive or degraded error alarms triggered on the interface.</p> <ul style="list-style-type: none"> • FEC Degrade—OTU FEC Degrade defect. • FEC Excessive—OTU FEC Excessive Error defect. 	detail extensive
OTN OC	<p>OTN OC defects triggered on the interface.</p> <ul style="list-style-type: none"> • LOS—OC Loss of Signal defect. • LOF—OC Loss of Frame defect. • LOM—OC Loss of Multiframe defect. • Wavelength Lock—OC Wavelength Lock defect. 	detail extensive

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

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

Table 5: show interfaces Gigabit 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"> • Total octets and total packets—Total number of octets and packets. For Gigabit Ethernet IQ PICs, the received octets count varies by interface type. For more information, see Table 6 on page 91 • Unicast packets, Broadcast packets, and Multicast packets—Number of unicast, broadcast, and multicast packets. • CRC/Align errors—Total number of packets received that had a length (excluding framing bits, but including FCS octets) of between 64 and 1518 octets, inclusive, and had either a bad FCS with an integral number of octets (FCS Error) or a bad FCS with a nonintegral number of octets (Alignment Error). • FIFO error—Number of FIFO errors that are reported by the ASIC on the PIC. If this value is ever nonzero, the PIC or a cable is probably malfunctioning. • MAC control frames—Number of MAC control frames. • MAC pause frames—Number of MAC control frames with pause operational code. • Oversized frames—Number of frames that exceed 1518 octets. • Jabber frames—Number of frames that were longer than 1518 octets (excluding framing bits, but including FCS octets), and had either an FCS error or an alignment error. This definition of jabber is different from the definition in IEEE-802.3 section 8.2.1.5 (10BASE5) and section 10.3.1.4 (10BASE2). These documents define jabber as the condition in which any packet exceeds 20 ms. The allowed range to detect jabber is from 20 ms to 150 ms. • Fragment frames—Total number of packets that were less than 64 octets in length (excluding framing bits, but including FCS octets), and had either an FCS error or an alignment error. Fragment frames normally increment because both runts (which are normal occurrences caused by collisions) and noise hits are counted. • VLAN tagged frames—Number of frames that are VLAN tagged. The system uses the TPID of 0x8100 in the frame to determine whether a frame is tagged or not. • Code violations—Number of times an event caused the PHY to indicate "Data reception error" or "invalid data symbol error." 	extensive
OTN Received Overhead Bytes	APS/PCC0: 0x02, APS/PCC1: 0x11, APS/PCC2: 0x47, APS/PCC3: 0x58 Payload Type: 0x08	extensive
OTN Transmitted Overhead Bytes	APS/PCC0: 0x00, APS/PCC1: 0x00, APS/PCC2: 0x00, APS/PCC3: 0x00 Payload Type: 0x08	extensive

Table 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"> • Input packet count—Number of packets received from the MAC hardware that the filter processed. • Input packet rejects—Number of packets that the filter rejected because of either the source MAC address or the destination MAC address. • Input DA rejects—Number of packets that the filter rejected because the destination MAC address of the packet is not on the accept list. It is normal for this value to increment. When it increments very quickly and no traffic is entering the routing device from the far-end system, either there is a bad ARP entry on the far-end system, or multicast routing is not on and the far-end system is sending many multicast packets to the local routing device (which the routing device is rejecting). • Input SA rejects—Number of packets that the filter rejected because the source MAC address of the packet is not on the accept list. The value in this field should increment only if source MAC address filtering has been enabled. If filtering is enabled, if the value increments quickly, and if the system is not receiving traffic that it should from the far-end system, it means that the user-configured source MAC addresses for this interface are incorrect. • Output packet count—Number of packets that the filter has given to the MAC hardware. • Output packet pad count—Number of packets the filter padded to the minimum Ethernet size (60 bytes) before giving the packet to the MAC hardware. Usually, padding is done only on small ARP packets, but some very small IP packets can also require padding. If this value increments rapidly, either the system is trying to find an ARP entry for a far-end system that does not exist or it is misconfigured. • Output packet error count—Number of packets with an indicated error that the filter was given to transmit. These packets are usually aged packets or are the result of a bandwidth problem on the FPC hardware. On a normal system, the value of this field should not increment. • CAM destination filters, CAM source filters—Number of entries in the CAM dedicated to destination and source MAC address filters. There can only be up to 64 source entries. If source filtering is disabled, which is the default, the values for these fields should be 0. 	extensive
PMA PHY	<p>(10-Gigabit Ethernet interfaces, WAN PHY mode) SONET error information:</p> <ul style="list-style-type: none"> • Seconds—Number of seconds the defect has been active. • Count—Number of times that the defect has gone from inactive to active. • State—State of the error. Any state other than OK indicates a problem. <p>Subfields are:</p> <ul style="list-style-type: none"> • PHY Lock—Phase-locked loop • PHY Light—Loss of optical signal 	extensive

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

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

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

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

Table 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"> • Negotiation status: <ul style="list-style-type: none"> • Incomplete—Ethernet interface has the speed or link mode configured. • No autonegotiation—Remote Ethernet interface has the speed or link mode configured, or does not perform autonegotiation. • Complete—Ethernet interface is connected to a device that performs autonegotiation and the autonegotiation process is successful. • Link partner status—OK when Ethernet interface is connected to a device that performs autonegotiation and the autonegotiation process is successful. • Link partner: <ul style="list-style-type: none"> • Link mode—Depending on the capability of the attached Ethernet device, either Full-duplex or Half-duplex. • Flow control—Types of flow control supported by the remote Ethernet device. For Fast Ethernet interfaces, the type is None. For Gigabit Ethernet interfaces, types are Symmetric (link partner supports PAUSE on receive and transmit), Asymmetric (link partner supports PAUSE on transmit), and Symmetric/Asymmetric (link partner supports both PAUSE on receive and transmit or only PAUSE receive). • Remote fault—Remote fault information from the link partner—Failure indicates a receive link error. OK indicates that the link partner is receiving. Negotiation error indicates a negotiation error. Offline indicates that the link partner is going offline. • Local resolution—Information from the link partner: <ul style="list-style-type: none"> • Flow control—Types of flow control supported by the remote Ethernet device. For Gigabit Ethernet interfaces, types are Symmetric (link partner supports PAUSE on receive and transmit), Asymmetric (link partner supports PAUSE on transmit), and Symmetric/Asymmetric (link partner supports both PAUSE on receive and transmit or only PAUSE receive). • Remote fault—Remote fault information. Link OK (no error detected on receive), Offline (local interface is offline), and Link Failure (link error detected on receive). 	extensive
Received path trace, Transmitted path trace	<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"> • Destination slot—FPC slot number. 	extensive

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

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

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

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

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

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

Table 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 91](#) 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 91](#), 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	show interfaces ge-0/3/0 extensive	Traffic statistics: Input bytes: 496 bytes per packet, representing the Layer 2 packet MAC statistics: Received octets: 500 bytes per packet, representing the Layer 2 packet + 4 bytes	The additional 4 bytes are for the CRC.
Inbound logical interface	show interfaces ge-0/3/0.50 extensive	Traffic statistics: Input bytes: 478 bytes per packet, representing the Layer 3 packet	
Outbound physical interface	show interfaces ge-0/0/0 extensive	Traffic statistics: Input bytes: 490 bytes per packet, representing the Layer 3 packet + 12 bytes MAC statistics: Received octets: 478 bytes per packet, representing the Layer 3 packet	For input bytes, the additional 12 bytes includes 6 bytes for the destination MAC address + 4 bytes for VLAN + 2 bytes for the Ethernet type.
Outbound logical interface	show interfaces ge-0/0/0.50 extensive	Traffic statistics: Input bytes: 478 bytes per packet, representing the Layer 3 packet	

Sample Output

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

```

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

```

```

None, Source filtering: Enabled,
Flow control: Enabled
Device flags   : Present Running
Interface flags: SNMP-Traps Internal: 0x4000
Link flags     : None
CoS queues    : 8 supported, 4 maximum usable queues
Schedulers    : 1024
Hold-times    : Up 0 ms, Down 0 ms
Current address: 00:14: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
Bit errors          Seconds
Errorred blocks          0
Errorred 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 accounting overhead: 100
Ingress accounting 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, Runt: 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
      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 accounting overhead: 100
Ingress accounting 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__

CHAPTER 6

Command Summary

- [Ethernet Interface Operational Mode Commands on page 101](#)

Ethernet Interface Operational Mode Commands

[Table 7 on page 101](#) summarizes the command-line interface (CLI) commands that you can use to monitor and troubleshoot aggregated Ethernet, Fast Ethernet, Gigabit Ethernet, and 10-Gigabit Ethernet interfaces. Commands are listed in alphabetical order.

Table 7: Ethernet Interface Operational Mode Commands

Task	Command
Clear dynamic VLAN interfaces.	<i>clear auto-configuration interfaces</i>
Clear a specified dynamic agent circuit identifier (ACI) interface set configured on the router. You can clear only those ACI interface sets that have no subscriber interface members.	<i>clear auto-configuration interfaces interface-set</i>
Clear Link Aggregation Control Protocol (LACP) statistics.	<i>clear lacp statistics</i>
Clear Link Aggregation Control Protocol (LACP) timeout entries.	<i>clear lacp timeouts</i>
Clear learned MAC addresses from the hardware and MAC database. Static MAC addresses are not cleared.	<i>clear interfaces mac-database</i>
Clear statistics that are collected for every MAC address, including policer statistics, on a given physical or logical interface.	<i>clear interfaces mac-database statistics</i>
Clear statistics that are collected for interface sets.	<i>clear interfaces interface-set statistics</i>
Clear the existing continuity measurement and restart counting the operational uptime.	<i>clear oam ethernet connectivity-fault-management continuity-measurement</i>

Table 7: Ethernet Interface Operational Mode Commands (*continued*)

Task	Command
Clear ITU-T Y.1731 Ethernet frame delay measurement (ETH-DM) delay statistics and ETH-DM frame counts. (MX Series routers)	<i>clear oam ethernet connectivity-fault-management delay-statistics</i>
Clear Operation, Administration, and Management (OAM) and connectivity fault management (CFM) linktrace database information.	<i>clear oam ethernet connectivity-fault-management linktrace path-database</i>
Clear all loss statistics maintained by CFM for a given maintenance domain and maintenance association.	<i>clear oam ethernet connectivity-fault-management loss-statistics</i>
Clear connectivity-fault-management policer statistics.	<i>clear oam ethernet connectivity-fault-management policer</i>
Clear the Ethernet OAM service-level agreement (SLA) iterator statistics.	<i>clear oam ethernet connectivity-fault-management sla-iterator-statistics</i>
Clear all statistics maintained by CFM. (Routers that support IEEE 802.1ag OAM CFM) In addition, for interfaces that support ITU-T Y.1731 Ethernet frame delay measurement (ETH-DM), also clear any ETH-DM statistics and frame counts for CFM maintenance association end points (MEPs).	<i>clear oam ethernet connectivity-fault-management statistics</i>
Clear ITU-T Y.1731 Ethernet synthetic loss measurement (ETH-SLM) delay statistics and ETH-SLM frame counts. (MX Series routers, Modular Port Concentrators only)	<i>clear oam ethernet connectivity-fault-management synthetic-loss-measurement</i>
Clear Operation, Administration, and Management (OAM) link fault management state information and restart the link discovery process on Ethernet interfaces.	<i>clear oam ethernet link-fault-management state</i>
Clear Operation, Administration, and Management (OAM) statistics link fault management statistics for Ethernet interfaces.	<i>clear oam ethernet link-fault-management statistics</i>
Clear the statistics for all Ethernet ring protection groups or a specific Ethernet ring protection group.	<i>clear protection-group ethernet-ring statistics</i>
Check the reachability of a remote IEEE 802.1ag OAM maintenance association end point (MEP) or maintenance association intermediate point (MIP).	<i>ping ethernet</i>

Table 7: Ethernet Interface Operational Mode Commands (*continued*)

Task	Command
Manually rebalance the subscribers on an aggregated Ethernet bundle with targeted distribution enabled.	<i>request interface rebalance (Aggregated Ethernet for Subscriber Management)</i>
Manually revert egress traffic from the designated backup link to the designated primary link of an aggregated Ethernet interface for which link protection is enabled, or manually switch egress traffic from the primary link to the backup link.	<i>request interface (revert switchover) (Aggregated Ethernet Link Protection)</i>
Force LACP link switchover.	<i>request lacp link-switchover</i>
Clear the lockout, force switch, manual switch, exercise, and wait-to-restore states.	<i>request protection-group ethernet-aps clear</i>
Test if APS is operating correctly.	<i>request protection-group ethernet-aps exercise</i>
Force traffic to switch from the active path to the alternate path.	<i>request protection-group ethernet-aps force-switch</i>
Lock the protection path, forcing the use of the working path.	<i>request protection-group ethernet-aps lockout</i>
Force traffic to switch from the active path to the alternate path.	<i>request protection-group ethernet-aps manual-switch</i>
Display status information about aggregated Fast Ethernet or Gigabit Ethernet router interfaces.	<i>show interfaces (Aggregated Ethernet)</i> <i>show interfaces (far-end-interval)</i>
Display status information about Fast Ethernet interfaces.	<i>show interfaces (Fast Ethernet)</i>
Display status information about the specified Gigabit Ethernet interface.	<i>show interfaces (Gigabit Ethernet)</i>
Display status information about 10-Gigabit Ethernet router interfaces.	<i>show interfaces (10-Gigabit Ethernet)</i>

Table 7: Ethernet Interface Operational Mode Commands (*continued*)

Task	Command
Display IPv6 interface statistics for IPv6 traffic traversing through the IQ2 and IQ2E PICs on standalone T640 routers and on T640 routers in a TX Matrix or in a TXP Matrix.	<i>show interfaces extensive</i>
Display IPv6 interface statistics for IPv6 traffic traversing through the IQ2 PICs on M10i and M120 routers.	
Display IPv6 interface statistics for IPv6 traffic traversing through the IQ2E PICs on M10i, M120, and M320 routers.	
Display information about Gigabit Ethernet or 10-Gigabit Ethernet router interface sets.	<i>show interfaces interface-set (Ethernet Interface Set)</i>
Display information about Gigabit Ethernet or 10-Gigabit Ethernet router interface set queues.	<i>show interfaces interface-set queue</i>
Display the transceiver temperature, laser bias current, laser output power, receive optical power, and related alarms for 10-Gigabit Ethernet dense wavelength-division multiplexing (DWDM) interfaces.	<i>show interfaces diagnostics optics (Gigabit Ethernet, 10-Gigabit Ethernet, 40-Gigabit Ethernet, and 100-Gigabit Ethernet)</i>
Display information about integrated routing and bridging interfaces.	<i>show interfaces irb</i>
Display status information about the distribution of subscribers on different links in an aggregated Ethernet bundle.	<i>show interfaces targeting (Aggregated Ethernet for Subscriber Management)</i>
Display Link Aggregation Control Protocol (LACP) information for aggregated, Fast Ethernet, or Gigabit Ethernet router interfaces.	<i>show lacp interfaces</i>
Display Link Aggregation Control Protocol (LACP) statistics.	<i>show lacp statistics</i>
Display Link Aggregation Control Protocol timeout entries.	<i>show lacp timeouts</i>
Display MAC address information for Gigabit Ethernet router interfaces.	<i>show interfaces mac-database (Gigabit Ethernet)</i>
Display information on a specified interface that is part of a multichassis link aggregation configuration.	<i>show interfaces mc-ae</i>
Display ETH-DM statistics for CFM MEPs. (MX Series routers, Ethernet DPCs).	<i>show oam ethernet connectivity-fault-management delay-statistics</i>

Table 7: Ethernet Interface Operational Mode Commands (*continued*)

Task	Command
Display IEEE 802.1ag OAM connectivity fault management forwarding state information for Ethernet interfaces.	<i>show oam ethernet connectivity-fault-management forwarding-state</i>
Display OAM connectivity fault management information for Ethernet interfaces. For interfaces that support ETH-DM, also display any ETH-DM frame counts when the detail or extensive option is included. In all other cases, ETH-DM frame counts are zero.	<i>show oam ethernet connectivity-fault-management interfaces</i>
Display OAM connectivity fault management linktrace path database information.	<i>show oam ethernet connectivity-fault-management linktrace path-database</i>
Display OAM connectivity fault management maintenance association end point (MEP) database information. For interfaces that support ETH-DM, also display any ETH-DM frame counts. In all other cases, ETH-DM frame counts are zero.	<i>show oam ethernet connectivity-fault-management mep-database</i>
Display ETH-DM statistics and frame counts for CFM MEPs. (MX Series routers, Ethernet DPCs)	<i>show oam ethernet connectivity-fault-management mep-statistics</i>
Display ETH-LM statistics for on-demand mode only.	<i>show oam ethernet connectivity-fault-management loss-statistics</i>
Display information about maintenance intermediate points (MIPs) for the Ethernet OAM 802.1ag standard for connectivity fault management (CFM).	<i>show oam ethernet connectivity-fault-management mip</i>
Display OAM connectivity fault management path database information for hosts configured with MEP.	<i>show oam ethernet connectivity-fault-management path-database</i>
Displays connectivity-fault-management policer statistics.	<i>show oam ethernet connectivity-fault-management policer</i>
Display the Ethernet OAM service-level agreement (SLA) iterator statistics.	<i>show oam ethernet connectivity-fault-management sla-iterator-statistics</i>
Display ETH-SLM statistics for CFM MEPs (on-demand mode only). (MX Series routers, Ethernet MPCs)."	<i>show oam ethernet connectivity-fault-management synthetic-loss-statistics</i>

Table 7: Ethernet Interface Operational Mode Commands (*continued*)

Task	Command
Display OAM Ethernet Virtual Connection (EVC) information for hosts configured with Ethernet Local Management Interface (E-LMI). (MX series only)	<i>show oam ethernet evc</i>
Display OAM fault management statistics for Ethernet interfaces.	<i>show oam ethernet link-fault-management</i>
Display OAM Ethernet Local Management Interface status information for an LMI configured interface. (MX series only)	<i>show oam ethernet lmi</i>
Display OAM Ethernet Local Management Interface statistics for an LMI configured interface. (MX series only)	<i>show oam ethernet lmi statistics</i>
Display protection group Ethernet ring Automatic Protection Switching (APS).	<i>show protection-group ethernet-ring aps</i>
Display data channel information for all Ethernet ring protection groups or for a specific Ethernet ring protection group.	<i>show protection-group ethernet-ring data-channel</i>
Display protection group Ethernet ring interfaces.	<i>show protection-group ethernet-ring interface</i>
Display protection group Ethernet ring nodes.	<i>show protection-group ethernet-ring node-state</i>
Display protection group Ethernet ring statistics.	<i>show protection-group ethernet-ring statistics</i>
Display all data channel logical interfaces and the VLAN IDs controlled by a ring instance data channel.	<i>show protection-group ethernet-ring vlan</i>
Trace the path between two Ethernet OAM end points.	<i>traceroute ethernet</i>

PART 4

Troubleshooting

- [Ethernet on page 109](#)
- [Interface Diagnostics on page 113](#)

CHAPTER 7

Ethernet

traceroute ethernet

Syntax	traceroute ethernet (<i>mac-address</i> <i>mep-id</i>) maintenance-association <i>ma-name</i> maintenance-domain <i>md-name</i> ttl <i>value</i> < wait seconds >
Release Information	Command introduced in Junos OS Release 9.0. mep-id option introduced in Junos OS Release 9.1.
Description	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 show oam ethernet connectivity-fault-management path-database command. Before using the traceroute command, you can verify the remote MEP's MAC address using the show oam ethernet connectivity-fault-management path-database command.
Options	mac-address —Destination unicast MAC address of the remote maintenance point. mep-id —MEP identifier of the remote maintenance point. The range of values is 1 through 8191. maintenance-association <i>ma-name</i> —Specifies an existing maintenance association from the set of configured maintenance associations. maintenance-domain <i>md-name</i> —Specifies an existing maintenance domain from the set of configured maintenance domains. ttl value —Number of hops to use in the linktrace request. The range is 1 to 255 hops. The default is 4. wait seconds —(Optional) Maximum time to wait for a response to the traceroute request. The range is 1 to 255 seconds. The default is 5.
Required Privilege Level	network
List of Sample Output	traceroute ethernet on page 111
Output Fields	Table 8 on page 110 lists the output fields for the traceroute ethernet command. Output fields are listed in the approximate order in which they appear.

Table 8: 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 8: traceroute ethernet Output Fields (*continued*)

Field Name	Field Description
Maintenance Domain	Maintenance domain specified in the traceroute command.
Level	Maintenance domain level configured.
Maintenance Association	Maintenance association specified in the traceroute command.
Local Mep	The local maintenance end point identifier.
Transaction Identifier	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.
Hop	Sequential hop count of the linktrace path.
TTL	Number of hops remaining in the linktrace message. The time to live (TTL) is decremented at each hop.
Source MAC address	MAC address of the 802.1ag maintenance point that is sending the linktrace message.
Next-hop MAC address	MAC address of the 802.1ag node that is the next hop in the LTM path.

Sample Output

traceroute ethernet

```
user@host> traceroute ethernet maintenance-domain md1 maintenance-association ma1
00:90:69:7e:01:ff
```

```
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:bb:bb:bb:bb
2	62	00:00:bb:bb:bb:bb	00:00:cc:cc:cc:cc
3	61	00:00:cc:cc:cc:cc	00:01:02:03:04:05
4	60	00:01:02:03:04:05	00:00:00:00:00:00

CHAPTER 8

Interface Diagnostics

- [Interface Diagnostics on page 113](#)

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 113](#)
- [Interface Diagnostics on page 115](#)

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 9 on page 114 shows the loopback modes supported on the various interface types.

Table 9: 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 9: 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 10 on page 118 shows the BERT capabilities for various interface types.

Table 10: 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"> Limited algorithms
4-port Channelized OC3/STM1 Circuit Emulation	Yes (port 0–3)		<ul style="list-style-type: none"> Limited algorithms
E1 or T1	Yes (port 0–3)	Yes (port 0–3)	<ul style="list-style-type: none"> Single port at a time Limited algorithms
E3 or T3	Yes (port 0–3)	Yes (port 0–3)	<ul style="list-style-type: none"> Single port at a time
Channelized OC12	N/A	Yes (channel 0–11)	<ul style="list-style-type: none"> Single channel at a time Limited algorithms No bit count
Channelized STM1	Yes (channel 0–62)	N/A	<ul style="list-style-type: none"> Multiple channels Only one algorithm No error insert No bit count
Channelized T3 and Multichannel T3	Yes (channel 0–27)	Yes (port 0–3 on channel 0)	<ul style="list-style-type: none"> Multiple ports and channels Limited algorithms for T1 No error insert for T1 No bit count for T1

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 *Junos OS Operational Mode Commands*.



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

Index

- [Index on page 123](#)

Index

Symbols

#, comments in configuration statements.....	xii
(), in syntax descriptions.....	xii
10-Gigabit Ethernet interfaces	
802.3ah OAM.....	23
802.3ah OAM	
example configuration.....	23
< >, in syntax descriptions.....	xii
[], in configuration statements.....	xii
{ }, in configuration statements.....	xii
(pipe), in syntax descriptions.....	xii

A

action statement	
OAM.....	29
action-profile statement	
LFM.....	30
allow-remote-loopback statement.....	31
apply-action-profile statement.....	31

B

BERT	
configuring interface diagnostics.....	115
bert-algorithm statement	
usage guidelines.....	115
bert-error-rate statement	
usage guidelines.....	115
bert-period statement	
usage guidelines.....	115
bit error rate test See BERT	
braces, in configuration statements.....	xii
brackets	
angle, in syntax descriptions.....	xii
square, in configuration statements.....	xii

C

comments, in configuration statements.....	xii
conventions	
text and syntax.....	xi
curly braces, in configuration statements.....	xii

customer support.....	xiii
contacting JTAC.....	xiii

D

documentation	
comments on.....	xiii

E

Ethernet interfaces	
status information, displaying	
Fast Ethernet.....	60
Gigabit Ethernet.....	76
ethernet statement.....	32
event statement.....	35
event-thresholds	
frame-error statement.....	37
frame-period statement.....	38
frame-period-summary statement.....	39
symbol-period statement.....	50
event-thresholds statement.....	35

F

Fast Ethernet interfaces	
status information, displaying.....	60
fast-aps-switch statement.....	36
font conventions.....	xi
frame-error statement.....	37
frame-period statement.....	38
frame-period-summary statement.....	39

G

Gigabit Ethernet interfaces	
status information, displaying.....	76
Gigabit Ethernet IQ PIC	
traffic and MAC statistics.....	76

I

interface statement	
IEEE 802.3ah.....	40

L

link-adjacency-loss statement.....	41
link-discovery statement.....	42
link-down statement.....	41
link-event-rate statement.....	42
link-fault management.....	30
link-fault-management statement.....	43
linktrace	
tracing.....	110

loopback testing.....113

M

manuals

 comments on.....xiii

N

negotiation-options

 allow-remote-loopback statement.....31

 no-allow-link-events statement.....44

negotiation-options statement.....44

no-allow-link-events statement.....44

O

OAM

 configuration statements.....25

oam statement.....45

P

parentheses, in syntax descriptions.....xii

pdu-interval statement.....47

pdu-threshold statement.....48

protocol-down statement.....48

protocols OAM

 configuration statements.....25

R

remote-loopback statement.....49

S

send-critical-event statement.....49

show interfaces (10-Gigabit Ethernet)

 command.....76

show interfaces (Fast Ethernet) command.....60

show oam ethernet link-fault-management

 command.....54

support, technical See technical support

symbol-period statement.....50

syntax conventions.....xi

T

technical support

 contacting JTAC.....xiii

traceroute ethernet.....110

traceroute ethernet command.....110