# ITU-T Y.1731 Ethernet Service OAM

Published: 2013-02-14

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*ITU-T Y.1731 Ethernet Service OAM*


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

YEAR 2000 NOTICE

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

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# About the Documentation



## Documentation and Release Notes

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

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## 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.xsl; }
```

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

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

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

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

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

## Documentation Conventions

Table 1 on page xiii 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 xiii 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:<br>user@host> **configure** |
| `Fixed-width text like this` | Represents output that appears on the terminal screen. | `user@host>` **show chassis alarms**<br>`No alarms currently active` |

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

| Convention | Description | Examples |
|---|---|---|
| *Italic text like this* | • Introduces or emphasizes important new terms.<br>• Identifies book names.<br>• Identifies RFC and Internet draft titles. | • A policy *term* is a named structure that defines match conditions and actions.<br>• *Junos OS System Basics Configuration Guide*<br>• RFC 1997, *BGP Communities Attribute* |
| *Italic text like this* | Represents variables (options for which you substitute a value) in commands or configuration statements. | Configure the machine's domain name:<br>[edit]<br>root@# **set system domain-name** *domain-name* |
| **Text like this** | Represents names of configuration statements, commands, files, and directories; configuration hierarchy levels; or labels on routing platform components. | • To configure a stub area, include the **stub** statement at the **[edit protocols ospf area area-id]** hierarchy level.<br>• 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**<br>**(*string1* \| *string2* \| *string3*)** |
| # (pound sign) | Indicates a comment specified on the same line as the configuration statement to which it applies. | **rsvp { # Required for dynamic MPLS only** |
| [ ] (square brackets) | Enclose a variable for which you can substitute one or more values. | **community name members [** ***community-ids*** **]** |
| Indention and braces ( { } ) | Identify a level in the configuration hierarchy. | [edit]<br>routing-options {<br>  static {<br>  route default {<br>  nexthop *address*;<br>  retain;<br>  }<br>  }<br>} |
| ; (semicolon) | Identifies a leaf statement at a configuration hierarchy level. | |
| J-Web GUI Conventions | | |
| **Bold text like this** | Represents J-Web graphical user interface (GUI) items you click or select. | • In the Logical Interfaces box, select **All Interfaces**.<br>• To cancel the configuration, click **Cancel**. |
| **>** (bold right angle bracket) | Separates levels in a hierarchy of J-Web selections. | In the configuration editor hierarchy, select **Protocols>Ospf**. |

## Documentation Feedback

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

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

## Requesting Technical Support

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

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

### Self-Help Online Tools and Resources

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

- Find CSC offerings: http://www.juniper.net/customers/support/
- Search for known bugs: http://www2.juniper.net/kb/
- Find product documentation: http://www.juniper.net/techpubs/
- Find solutions and answer questions using our Knowledge Base: http://kb.juniper.net/
- Download the latest versions of software and review release notes: http://www.juniper.net/customers/csc/software/
- Search technical bulletins for relevant hardware and software notifications: 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



CHAPTER 1

# ITU-T Y.1731 Ethernet Service OAM



## Service-Level Agreement Measurement

Service-level agreement (SLA) measurement is the process of monitoring the bandwidth, delay, delay variation (jitter), continuity, and availability of a service (E-Line or E-LAN). It enables you to identify network problems before customers are impacted by network defects.

NOTE:

The Ethernet VPN services can be classified into:

- Peer-to-peer-services (E-Line services)—The E-Line services are offered using MPLS-based Layer 2 VPN virtual private wire service (VPWS).
- Multipoint-to-multipoint services (E-LAN services)—The E-LAN services are offered using MPLS-based virtual private LAN service (VPLS).

For more information, see the *Junos VPNs Configuration Guide*.

In Junos OS, SLA measurements are classified into:

- On-demand mode—In on-demand mode, the measurements are triggered through the CLI. For more information, see "On-Demand Mode" on page 11.
- Proactive mode—In proactive mode, the measurements are triggered by an iterator application. For more information, see "Proactive Mode" on page 12.

For more information about frame delay measurement, see "Ethernet Frame Delay Measurements Overview" on page 4. For more information about frame loss measurement, see "Ethernet Frame Loss Measurement Overview" on page 10. Note that

Ethernet frame delay measurement and Ethernet frame loss measurement are not supported on the **ae** interface.

**Related Documentation**

- Proactive Mode on page 12.
- On-Demand Mode on page 11.
- Junos® OS Ethernet Interfaces

## Ethernet Frame Delay Measurements Overview



### ITU-T Y.1731 Frame Delay Measurement Feature

The IEEE 802.3-2005 standard for Ethernet Operations, Administration, and Maintenance (OAM) defines a set of link fault management mechanisms to detect and report link faults on a single point-to-point Ethernet LAN.

Junos OS supports key OAM standards that provide for automated end-to-end management and monitoring of Ethernet service by service providers:

- *IEEE Standard 802.1ag*, also known as "Connectivity Fault Management (CFM)."
- *ITU-T Recommendation Y.1731*, which uses different terminology than IEEE 802.1ag and defines Ethernet service OAM features for fault monitoring, diagnostics, and performance monitoring.

These capabilities allow operators to offer binding service-level agreements (SLAs) and generate new revenues from rate- and performance-guaranteed service packages that are tailored to the specific needs of their customers.

#### Ethernet CFM

The IEEE 802.1ag standard for connectivity fault management (CFM) defines mechanisms to provide for end-to-end Ethernet service assurance over any path, whether a single link or multiple links spanning networks composed of multiple LANs.

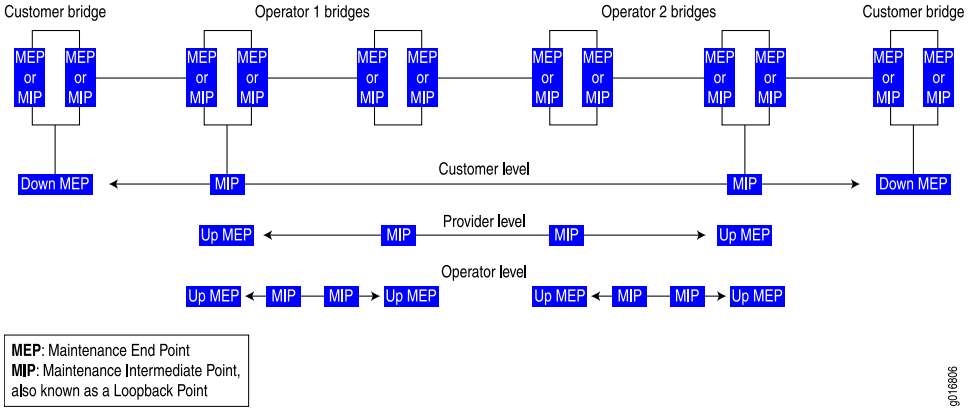
For Ethernet interfaces on M320, MX Series, and T Series routers, Junos OS supports the following key elements of the Ethernet CFM standard:

- Fault monitoring using the IEEE 802.1ag Ethernet OAM Continuity Check protocol
- Path discovery and fault verification using the IEEE 802.1ag Ethernet OAM Linktrace protocol
- Fault isolation using the IEEE 802.1ag Ethernet OAM Loopback protocol

In a CFM environment, network entities such as network operators, service providers, and customers may be part of different administrative domains. Each administrative domain is mapped into one maintenance domain. Maintenance domains are configured with different level values to keep them separate. Each domain provides enough information for the entities to perform their own management and end-to-end monitoring, and still avoid security breaches.

Figure 1 on page 5 shows the relationships among the customer, provider, and operator Ethernet bridges, maintenance domains, maintenance association end points (MEPs), and maintenance intermediate points (MIPs).

Figure 1: Relationship of MEPs, MIPs, and Maintenance Domain Levels




NOTE: Maintenance intermediate points (MIP) are not supported on the ACX Series routers.

## Ethernet Frame Delay Measurement

Two key objectives of OAM functionality are to measure quality-of-service attributes such as frame delay and frame delay variation (also known as “frame jitter”). Such measurements can enable you to identify network problems before customers are impacted by network defects.

Junos OS supports Ethernet frame delay measurement between MEPs configured on Ethernet physical or logical interfaces on MX Series routers. Ethernet frame delay measurement provides fine control to operators for triggering delay measurement on a given service and can be used to monitor SLAs. Ethernet frame delay measurement also collects other useful information, such as worst and best case delays, average delay, and average delay variation. The Junos OS implementation of Ethernet frame delay measurement (ETH-DM) is fully compliant with the ITU-T Recommendation Y.1731, *OAM Functions and Mechanisms for Ethernet-based Networks*. The recommendation defines OAM mechanisms for operating and maintaining the network at the Ethernet service layer, which is called the "ETH layer" in ITU-T terminology.

MX Series routers with modular port concentrators (MPCs) and 10-Gigabit Ethernet MPCs with SFP+ support ITU-T Y.1731 functionality on VPLS for frame-delay and delay-variation.

## One-Way Ethernet Frame Delay Measurement

In one-way ETH-DM mode, a series of frame delay and frame delay variation values are calculated based on the time elapsed between the time a measurement frame is sent from the initiator MEP at one router and the time when the frame is received at the receiver MEP at the other router.

### 1DM Transmission

When you start a one-way frame delay measurement, the router sends 1DM frames—frames that carry the protocol data unit (PDU) for a one-way delay measurement—from the initiator MEP to the receiver MEP at the rate and for the number of frames you specify. The router marks each 1DM frame as drop-ineligible and inserts a timestamp of the transmission time into the frame.

### 1DM Reception

When an MEP receives a 1DM frame, the router that contains the receiver MEP measures the one-way delay for that frame (the difference between the time the frame was received and the timestamp contained in the frame itself) and the delay variation (the difference between the current and previous delay values).

### One-Way ETH-DM Statistics

The router that contains the receiver MEP stores each set of one-way delay statistics in the ETH-DM database. The ETH-DM database collects up to 100 sets of statistics for any given CFM session (pair of peer MEPs). You can access these statistics at any time by displaying the ETH-DM database contents.

### One-Way ETH-DM Frame Counts

Each router counts the number of one-way ETH-DM frames sent and received:

- For an initiator MEP, the router counts the number of 1DM frames sent.
- For a receiver MEP, the router counts the number of valid 1DM frames received and the number of invalid 1DM frames received.

Each router stores ETH-DM frame counts in the CFM database. The CFM database stores CFM session statistics and, for interfaces that support ETH-DM, any ETH-DM frame counts. You can access the frame counts at any time by displaying CFM database information for Ethernet interfaces assigned to MEPs or for MEPs in CFM sessions.

### Synchronization of System Clocks

The accuracy of one-way delay calculations depends on close synchronization of the system clocks at the initiator MEP and receiver MEP.

The accuracy of one-way delay variation is not dependent on system clock synchronization. Because delay variation is simply the difference between consecutive one-way delay values, the out-of-phase period is eliminated from the frame jitter values.

NOTE: For a given one-way Ethernet frame delay measurement, frame delay and frame delay variation values are available only on the router that contains the receiver MEP.

## Two-Way Ethernet Frame Delay Measurement

In two-way ETH-DM mode, frame delay and frame delay variation values are based on the time difference between when the initiator MEP transmits a request frame and receives a reply frame from the responder MEP, subtracting the time elapsed at the responder MEP.

### DMM Transmission

When you start a two-way frame delay measurement, the router sends delay measurement message (DMM) frames— frames that carry the PDU for a two-way ETH-DM request—from the initiator MEP to the responder MEP at the rate and for the number of frames you specify. The router marks each DMM frame as drop-ineligible and inserts a timestamp of the transmission time into the frame.

### DMR Transmission

When an MEP receives a DMM frame, the responder MEP responds with a delay measurement reply (DMR) frame, which carries ETH-DM reply information and a copy of the timestamp contained in the DMM frame.

### DMR Reception

When an MEP receives a valid DMR, the router that contains the MEP measures the two-way delay for that frame based on the following sequence of timestamps:

1. $TI_{TxDMM}$
2. $TR_{RxDMM}$
3. $TR_{TxDMR}$
4. $TI_{RxDMR}$

A two-way frame delay is calculated as follows:

$$[TI_{RxDMR} - TI_{TxDMM}] - [TR_{TxDMR} - TR_{RxDMM}]$$

The calculation show that frame delay is the difference between the time at which the initiator MEP sends a DMM frame and the time at which the initiator MEP receives the associated DMR frame from the responder MEP, minus the time elapsed at the responder MEP.

The delay variation is the difference between the current and previous delay values.

### Two-Way ETH-DM Statistics

The router that contains the initiator MEP stores each set of two-way delay statistics in the ETH-DM database. The ETH-DM database collects up to 100 sets of statistics for any given CFM session (pair of peer MEPs). You can access these statistics at any time by displaying the ETH-DM database contents.

### Two-Way ETH-DM Frame Counts

Each router counts the number of two-way ETH-DM frames sent and received:

- For an initiator MEP, the router counts the number DMM frames transmitted, the number of valid DMR frames received, and the number of invalid DMR frames received.
- For a responder MEP, the router counts the number of DMR frames sent.

Each router stores ETH-DM frame counts in the CFM database. The CFM database stores CFM session statistics and, for interfaces that support ETH-DM, any ETH-DM frame counts. You can access the frame counts at any time by displaying CFM database information for Ethernet interfaces assigned to MEPs or for MEPs in CFM sessions.

NOTE: **For a given two-way Ethernet frame delay measurement, frame delay and frame delay variation values are available only at the router that contains the initiator MEP.**

## Choosing Between One-Way and Two-Way ETH-DM

One-way frame delay measurement requires that the system clocks at the initiator MEP and receiver MEP are closely synchronized. Two-way frame delay measurement does not require synchronization of the two systems. If it is not practical for the clocks to be synchronized, two-way frame delay measurements are more accurate.

When two systems are physically close to each other, their one-way delay values are very high compared to their two-way delay values. One-way delay measurement requires that the timing for the two systems be synchronized at a very granular level, and MX Series routers currently do not support this granular synchronization.

## Restrictions for Ethernet Frame Delay Measurement

The following restrictions apply to the Ethernet frame delay measurement feature:

- The ETH-DM feature is not supported on aggregated Ethernet interfaces or label-switched interface. (LSI) pseudowires.
- Hardware-assisted timestamping for ETH-DM frames in the reception path is only supported for MEP interfaces on Enhanced DPCs and Enhanced Queuing DPCs in MX Series routers. For information about hardware-assisted timestamping, see "Guidelines for Configuring Routers to Support an ETH-DM Session" on page 18 and "Enabling the Hardware-Assisted Timestamping Option" on page 28.

- Ethernet frame delay measurements can be triggered only when the distributed periodic packet management daemon (**ppm**) is enabled. For more information about this limitation, see "Guidelines for Configuring Routers to Support an ETH-DM Session" on page 18 and "Ensuring That Distributed ppm Is Not Disabled" on page 26.
- You can monitor only one session at a time to the same remote MEP or MAC address. For more information about starting an ETH-DM session, see "Starting an ETH-DM Session" on page 37.
- ETH-DM statistics are collected at only one of the two peer routers in the ETH-DM session. For a one-way ETH-DM session, you can display frame ETH-DM statistics at the receiver MEP only, using ETH-DM-specific **show** commands. For a two-way ETH-DM session, you can display frame delay statistics at the initiator MEP only, using the same ETH-DM-specific **show** commands. For more information, see "Managing ETH-DM Statistics and ETH-DM Frame Counts" on page 41.
- ETH-DM frame counts are collected at both MEPs and are stored in the respective CFM databases.
- If graceful Routing Engine switchover (GRES) occurs, any collected ETH-DM statistics are lost, and ETH-DM frame counts are reset to zeroes. Therefore, the collection of ETH-DM statistics and ETH-DM frame counters has to be restarted, after the switchover is complete. GRES enables a router with dual Routing Engines to switch from a master Routing Engine to a backup Routing Engine without interruption to packet forwarding. For more information, see the Junos OS High Availability Configuration Guide.
- Accuracy of frame delay statistics is compromised when the system is changing (such as from reconfiguration). We recommend performing Ethernet frame delay measurements on a stable system.

**Related Documentation**

- Ethernet Frame Loss Measurement Overview on page 10
- Example: One-Way Ethernet Frame Delay Measurement on page 53
- Guidelines for Configuring Routers to Support an ETH-DM Session on page 18
- Guidelines for Starting an ETH-DM Session on page 19
- Guidelines for Managing ETH-DM Statistics and ETH-DM Frame Counts on page 21
- On-Demand Mode on page 11
- Proactive Mode on page 12
- Junos® OS Ethernet Interfaces

## Ethernet Frame Loss Measurement Overview

The key objectives of the OAM functionality are to measure quality-of-service attributes such as frame delay, frame delay variation (also known as “frame jitter”), and frame loss. Such measurements enable you to identify network problems before customers are impacted by network defects. For more information about Ethernet frame delay measurement, see “Ethernet Frame Delay Measurements Overview” on page 4.

Junos OS supports Ethernet frame loss measurement (ETH-LM) between maintenance association end points (MEPs) configured on Ethernet physical or logical interfaces on MX Series routers and is presently supported only for VPWS service. ETH-LM is used by operators to collect counter values applicable for ingress and egress service frames. These counters maintain a count of transmitted and received data frames between a pair of MEPs. Ethernet frame loss measurement is performed by sending frames with ETH-LM information to a peer MEP and similarly receiving frames with ETH-LM information from the peer MEP. This type of frame loss measurement is also known as single-ended Ethernet loss measurement.

ETH-LM supports the following frame loss measurements:

- Near-end frame loss measurement—Measurement of frame loss associated with ingress data frames.
- Far-end frame loss measurement—Measurement of frame loss associated with egress data frames.

NOTE: **The proactive and dual-ended loss measurement functionality of ITU-T Y1731 is not supported on the ACX Series routers.**

The Junos OS implementation of Ethernet frame delay measurement (ETH-DM) is fully compliant with the ITU-T Recommendation Y.1731, as described in *OAM Functions and Mechanisms for Ethernet-Based Networks*. The recommendation defines OAM mechanisms for operating and maintaining the network at the Ethernet service layer, which is called the "ETH layer" in ITU-T terminology.

**Related Documentation**

- Managing Continuity Measurement Statistics on page 50
- On-Demand Mode on page 11
- Proactive Mode on page 12
- Junos® OS Ethernet Interfaces

## On-Demand Mode

In on-demand mode, the measurements are triggered by the user through the CLI.

When the user triggers the delay measurement through the CLI, the delay measurement request that is generated is as per the frame formats specified by the ITU-T Y.1731 standard. For two-way delay measurement, the server-side processing can be delegated to the Packet Forwarding Engine to prevent overloading on the Routing Engine. For more information, see "Configuring Routers to Support an ETH-DM Session" on page 25. When the server-side processing is delegated to the Packet Forwarding Engine, the delay measurement message (DMM) frame **receive** counters and delay measurement reply (DMR) frame **transmit** counters are not displayed by the **show** command.

When the user triggers the loss measurement through the CLI, the router sends the packets in standard format along with the loss measurement TLV. By default, the **session-id-tlv** argument is included in the packet to allow concurrent loss measurement sessions from same local MEP. You can also disable the session ID TLV by using the **no-session-id-tlv** argument.

Single-ended ETH-LM is used for on-demand operation, administration, and maintenance purposes. An MEP sends frames with ETH-LM request information to its peer MEP and receives frames with ETH-LM reply information from its peer MEP to carry out loss measurements. The protocol data unit (PDU) used for a single-ended ETH-LM request is referred to as a loss measurement message (LMM) and the PDU used for a single-ended ETH-LM reply is referred to as a loss measurement reply (LMR).

**Related Documentation**

- Ethernet Frame Delay Measurements Overview on page 4
- Ethernet Frame Loss Measurement Overview on page 10
- Proactive Mode on page 12
- Configuring Routers to Support an ETH-DM Session on page 25.
- Junos® OS Ethernet Interfaces

## Proactive Mode

In proactive mode, SLA measurements are triggered by an iterator application. An iterator is designed to periodically transmit SLA measurement packets in form of ITU-Y.1731-compliant frames for two-way delay measurement or loss measurement on MX Series routers. This mode differs from on-demand SLA measurement, which is user initiated. The iterator sends periodic delay or loss measurement request packets for each of the connections registered to it. Iterators make sure that measurement cycles do not occur at the same time for the same connection to avoid CPU overload. Junos OS supports proactive mode for VPWS. For an iterator to form a remote adjacency and to become functionally operational, the continuity check message (CCM) must be active between the local and remote MEP configurations of the connectivity fault management (CFM). Any change in the iterator adjacency parameters resets the existing iterator statistics and restarts the iterator. Here, the term adjacency refers to a pairing of two endpoints (either connected directly or virtually) with relevant information for mutual understanding, which is used for subsequent processing. For example, the iterator adjacency refers to the iterator association between the two endpoints of the MEPs.

For every DPC or MPC, only 30 iterator instances for a cycle time value of 10 milliseconds (ms) are supported. In Junos OS, 255 iterator profile configurations and 2000 remote MEP associations are supported.

Iterators with cycle time value less than 100 ms are supported only for infinite iterators, whereas the iterators with cycle time value greater than 100 ms are supported for both finite and infinite iterators. Infinite iterators are iterators that run infinitely until the iterator is disabled or deactivated manually.

A VPWS service configured on a router is monitored for SLA measurements by registering the connection (here, the connection is a pair of remote and local MEPs) on an iterator and then initiating periodic SLA measurement frame transmission on those connections. The end-to-end service is identified through a maintenance association end point (MEP) configured at both ends.

For two-way delay measurement and loss measurement, an iterator sends a request message for the connection in the list (if any) and then sends a request message for the connection that was polled in the former iteration cycle. The back-to-back request messages for the SLA measurement frames and their responses help in computing delay variation and loss measurement.

The Y.1731 frame transmission for a service attached to an iterator continues endlessly unless intervened and stopped by an operator or until the iteration-count condition is met. To stop the iterator from sending out any more proactive SLA measurement frames, the operator must perform one of the following tasks:

- Enable the **deactivate sla-iterator-profile** statement at the **[edit protocols oam ethernet connectivity-fault-management maintenance-domain *md-name* maintenance association *ma-name* mep *mep-id* remote-mep *mep-id*]** hierarchy level. For more information, see "Example: Configuring an Iterator" on page 60.

- Provision a **disable** statement under the corresponding iterator profile at the **[edit protocols oam ethernet connectivity-fault-management performance-monitoring sla-iterator-profiles *profile-name*]** hierarchy level. For more information, see "Configuring an Iterator Profile" on page 30.

## Ethernet Delay Measurements and Loss Measurement by Proactive Mode

In two-way delay measurement, the delay measurement message (DMM) frame is triggered through an iterator application. The DMM frame carries an iterator type, length, and value (TLV) in addition to the fields described in standard frame format and the server copies the iterator TLV from the DMM frame to the delay measurement reply (DMR) frame.

In one-way delay variation computation using the two-way delay measurement method, the delay variation computation is based on the timestamps that are present in the DMR frame (and not the 1DM frame). Therefore, there is no need for client-side and server-side clocks to be in sync. Assuming that the difference in their clocks remains constant, the one-way delay variation results are expected to be fairly accurate. This method also eliminates the need to send separate 1DM frames just for the one-way delay variation measurement purpose.

In proactive mode for loss measurement, the router sends packets in standard format along with loss measurement TLV and iterator TLV.

**Related Documentation**

- Clearing Iterator Statistics on page 49
- Configuring an Iterator Profile on page 30
- Configuring a Remote MEP with an Iterator Profile on page 32
- Displaying Iterator Statistics on page 45
- Ethernet Frame Delay Measurements Overview on page 4
- Ethernet Frame Loss Measurement Overview on page 10
- Example: Configuring an Iterator on page 60
- Managing Iterator Statistics on page 45
- On-Demand Mode on page 11
- Junos® OS Ethernet Interfaces

# Ethernet Failure Notification Protocol Overview

The Failure Notification Protocol (FNP) is a failure notification mechanism that detects failures in Point-to-Point Ethernet transport networks on MX Series routers. If a node link fails, FNP detects the failure and sends out FNP messages to the adjacent nodes that a circuit is down. Upon receiving the FNP message, nodes can redirect traffic to the protection circuit.

NOTE: FNP is supported on E-Line services only.

An E-Line service provides a secure Point-to-Point Ethernet connectivity between two user network interfaces (UNIs). E-Line services are a protected service and each service has a working circuit and protection circuit. CFM is used to monitor the working and protect paths. CCM intervals result in failover time in hundreds of milliseconds or a few seconds. FNP provides service circuit failure detection and propagation in less than 50ms and provide 50ms failover for E-Line services.

The MX router acts as a PE node and handles the FNP messages received on the management VLAN and the FNP messages received on both the Ethernet interfaces and PWs created for the management VPLS. MX-series routers do not initiate FNP messages and responds only to FNP messages generated by devices in the Ethernet Access network. FNP can be enabled only on logical interfaces that are part of a VPLS routing instance, and no physical interfaces in that VPLS routing instance should have CCM configured. FNP can be enabled only on one logical interface per physical interface.

All E-Line services are configured as layer 2 circuits with edge protection. A VLAN associated with the working circuit or protection circuit must map to a logical interface. No trunk port or access port is supported in the ring link for VLANs used by E-LINE services. FNP does not control the logical interface associated with protection circuit. Only E-Line service whose termination point is not in an MX node is controlled by FNP.

FNP supports graceful restart and the Graceful Routing Engine switchover (GRES) features.

**Related Documentation**

- Configuring the Failure Notification Protocol on page 62
- **show oam ethernet fnp interface on page 172**
- **show oam ethernet fnp status on page 175**
- **show oam ethernet fnp messages on page 173**
- **connectivity-fault-management on page 91**
- IEEE 802.1ag OAM Connectivity Fault Management Overview
- Junos® OS Ethernet Interfaces

PART 2

# Configuration

CHAPTER 2

# ITU-T Y.1731 Ethernet Service OAM

## Guidelines for Configuring Routers to Support an ETH-DM Session

Keep the following guidelines in mind when configuring routers to support an Ethernet frame delay measurement (ETH-DM) session:



### Configuration Requirements for ETH-DM

You can obtain ETH-DM information for a link that meets the following requirements:

- The measurements can be performed between peer maintenance association endpoints (MEPs) on two routers.
- The two MEPs must be configured on two Ethernet physical interfaces or on two Ethernet logical interfaces. For more information, see Configuring a Maintenance Endpoint.
- The two MEPs must be configured—on their respective routers—under the same maintenance association (MA) identifier. For more information, see Creating a Maintenance Association.
- On both routers, the MA must be associated with the same maintenance domain (MD) name. For more information, see Creating the Maintenance Domain.
- On both routers, periodic packet management (PPM) must be running on the Routing Engine and Packet Forwarding Engine, which is the default configuration. You can disable PPM on the Packet Forwarding Engine only. However, the Ethernet frame delay measurement feature requires that distributed PPM remain enabled on the Packet Forwarding Engine of both routers. For more information about **ppm**, see the Junos OS Routing Protocols Configuration Guide.
- If the PPM process (**ppm**) is disabled on the Packet Forwarding Engine, you must re-enable it. Re-enabling distributed **ppm** entails restarting the **ethernet-connectivity-fault-management** process, which causes all connectivity fault management (CFM) sessions to re-establish. For more information about CFM sessions, see Configuring Ethernet Local Management Interface.

NOTE: **The Ethernet frame delay measurement feature is supported only for MEPs configured on Ethernet physical or logical interfaces on DPCs in MX Series routers. The ETH-DM feature is not supported on aggregated Ethernet interfaces or LSI pseudowires.**

### Configuration Options for ETH-DM

By default, the ETH-DM feature calculates frame delays using software-based timestamping of the ETH-DM PDU frames sent and received by the MEPs in the session. As an option that can increase the accuracy of ETH-DM calculations when the DPC is

loaded with heavy traffic in the receive direction, you can enable hardware-assisted timestamping of session frames in the receive direction.

**Related Documentation**

- Ethernet Frame Delay Measurements Overview on page 4
- Configuring Routers to Support an ETH-DM Session on page 25
- Junos® OS Ethernet Interfaces

## Guidelines for Starting an ETH-DM Session

Keep the following guidelines in mind when preparing to start an Ethernet frame delay measurement (ETH-DM) session:

- ETH-DM Session Prerequisites on page 19
- ETH-DM Session Parameters on page 19
- Restrictions for an ETH-DM Session on page 20

### ETH-DM Session Prerequisites

Before you can start an ETH-DM session, you must configure two MX Series routers to support ETH-DM by defining the two CFM-enabled physical or logical Ethernet interfaces on each router. This entails creating and configuring CFM maintenance domains, maintenance associations, and maintenance association end points on each router. For more information about enabling CFM on an Ethernet interface, see Creating the Maintenance Domain.

NOTE: **The Ethernet frame delay measurement feature is supported only for maintenance association end points configured on Ethernet physical or logical interfaces on DPCs in MX Series routers. The ETH-DM feature is not supported on aggregated Ethernet interfaces or LSI pseudowires.**

For specific information about configuring routers to support ETH-DM, see "Guidelines for Configuring Routers to Support an ETH-DM Session" on page 18 and "Configuring Routers to Support an ETH-DM Session" on page 25.

### ETH-DM Session Parameters

You can initiate a one-way or two-way ETH-DM session by entering the **monitor ethernet delay-measurement** operational command at a router that contains one end of the service for which you want to measure frame delay. The command options specify the ETH-DM session in terms of the CFM elements:

- The type of ETH-DM measurement (one-way or two-way) to be performed.
- The Ethernet service for which the ETH-DM measurement is to be performed:
  - CFM maintenance domain—Name of the existing maintenance domain (MD) for which you want to measure Ethernet frame delays. For more information, see Creating the Maintenance Domain.

- CFM maintenance association—Name of an existing maintenance association (MA) within the maintenance domain. For more information, see Creating a Maintenance Association.
- Remote CFM maintenance association end point—The unicast MAC address or the numeric identifier of the remote maintenance association end point (MEP)—the physical or logical interface on the remote router that resides in the specified MD and is named in the specified MA—with which to perform the ETH-DM session. For more information, see Configuring a Maintenance Endpoint.

- Optional specifications:
  - Count—You can specify the number of ETH-DM requests to send for this frame delay measurement session. The range is from 1 through 65,535 frames. The default value is 10 frames.

    **NOTE:** Although you can trigger frame delay collection for up to 65,535 ETH-DM requests at a time, a router stores only the last 100 frame delay statistics per CFM session (pair of peer MEPs).
  - Frame interval—You can specify the number of seconds to elapse between ETH-DM frame transmittals. The default value is 1 second.

For more detailed information about the parameters you can specify to start an ETH-DM session, see the **monitor ethernet delay-measurement** operational command description in the Junos OS Operational Mode Commands.

## Restrictions for an ETH-DM Session

The following restrictions apply to an ETH-DM session:

- You cannot run multiple simultaneous ETH-DM sessions with the same remote MEP or MAC address.
- For a given ETH-DM session, you can collect frame delay information for a maximum of 65,535 frames.
- For a given CFM session (pair of peer MEPs), the ETH-DM database stores a maximum of 100 statistics, with the older statistics being “aged out” as newer statistics are collected for that pair of MEPs.
  - For one-way delay measurements collected within the same CFM session, the 100 most recent ETH-DM statistics can be retrieved at any point of time at the router on which the receiver MEP is defined.
  - For two-way delay measurements collected within the same CFM session, the 100 most recent ETH-DM statistics can be retrieved at any point of time at the router on which the initiator MEP is defined.

  Depending on the number of frames exchanged in the individual ETH-DM sessions, the ETH-DM database can contain statistics collected through multiple ETH-DM sessions.
- If graceful Routing Engine switchover (GRES) occurs, any collected ETH-DM statistics are lost, and ETH-DM frame counts are reset to zeroes. GRES enables a router with

dual Routing Engines to switch from a master Routing Engine to a backup Routing Engine without interruption to packet forwarding. For more information, see the Junos OS High Availability Configuration Guide.

- Accuracy of frame delay data is compromised when the system is changing (such as from reconfiguration). We recommend performing Ethernet frame delay measurements on a stable system.

**Related Documentation**

- Ethernet Frame Delay Measurements Overview on page 4
- Starting an ETH-DM Session on page 37
- Guidelines for Managing ETH-DM Statistics and ETH-DM Frame Counts on page 21
- **monitor ethernet delay-measurement** operational command
- Junos® OS Ethernet Interfaces

## Guidelines for Managing ETH-DM Statistics and ETH-DM Frame Counts



### ETH-DM Statistics

Ethernet frame delay statistics are the frame delay and frame delay variation values determined by the exchange of frames containing ETH-DM protocol data units (PDUs).

- For a one-way ETH-DM session, statistics are collected in an ETH-DM database at the router that contains the receiver MEP. For a detailed description of one-way Ethernet frame delay measurement, including the exchange of one-way delay PDU frames, see "Ethernet Frame Delay Measurements Overview" on page 4.
- For a two-way ETH-DM session, statistics are collected in an ETH-DM database at the router that contains the initiator MEP. For a detailed description of two-way Ethernet frame delay measurement, including the exchange of two-way delay PDU frames, see "Ethernet Frame Delay Measurements Overview" on page 4.

A CFM database stores CFM-related statistics and—for Ethernet interfaces that support ETH-DM—the 100 most recently collected ETH-DM statistics for that pair of MEPs. You can view ETH-DM statistics by using the **delay-statistics** or **mep-statistics** form of the **show oam ethernet connectivity-fault-management** command to display the CFM statistics for the MEP that collects the ETH-DM statistics you want to view.

Table 3 on page 22 describes the ETH-DM statistics calculated in an ETH-DM session.

### Table 3: ETH-DM Statistics

| Field Name | Field Description |
|---|---|
| **One-way delay (µsec)**† | For a one-way ETH-DM session, the frame delay, in microseconds, collected at the receiver MEP.<br><br>To display frame delay statistics for a given one-way ETH-DM session, use the **delay-statistics** or **mep-statistics** form of the **show oam ethernet connectivity-fault-management** command at the receiver MEP for that session. |
| **Two-way delay (µsec)** | For a two-way ETH-DM session, the frame delay, in microseconds, collected at the initiator MEP.<br><br>When you start a two-way frame delay measurement, the CLI output displays each DMR frame receipt timestamp and corresponding DMM frame delay and delay variation collected as the session progresses.<br><br>To display frame delay statistics for a given two-way ETH-DM session, use the **delay-statistics** or **mep-statistics** form of the **show oam ethernet connectivity-fault-management** command at the initiator MEP for that session. |
| **Average delay**† | When you start a two-way frame delay measurement, the CLI output includes a runtime display of the average two-way frame delay among the statistics collected for the ETH-DM session only.<br><br>When you display ETH-DM statistics using a **show** command, the **Average delay** field displays the average one-way and two- frame delays among all ETH-DM statistics collected at the CFM session level.<br><br>For example, suppose you start two one-way ETH-DM sessions for 50 counts each, one after the other. If, after both measurement sessions complete, you use a **show** command to display 100 ETH-DM statistics for that CFM session, the **Average delay** field displays the average frame delay among all 100 statistics. |
| **Average delay variation**† | When you start a two-way frame delay measurement, the CLI output includes a runtime display of the average two-way frame delay variation among the statistics collected for the ETH-DM session only.<br><br>When you display ETH-DM statistics using a **show** command, the **Average delay variation** field displays the average one-way and two- frame delay variations among all ETH-DM statistics collected at the CFM session level. |
| **Best-case delay**† | When you start a two-way frame delay measurement, the CLI output includes a runtime display of the lowest two-way frame delay value among the statistics collected for the ETH-DM session only.<br><br>When you display ETH-DM statistics using a **show** command, the **Best case delay** field displays the lowest one-way and two-way frame delays among all ETH-DM statistics collected at the CFM session level. |
| **Worst-case delay**† | When you start a two-way frame delay measurement, the CLI output includes a runtime display of the highest two-way frame delay value among the statistics collected for the ETH-DM session only.<br><br>When you display ETH-DM statistics using a **show** command, the **Worst case delay** field displays the highest one-way and two-way frame delays among all statistics collected at the CFM session level. |

Table 3: ETH-DM Statistics *(continued)*

| Field Name | Field Description |
|---|---|
| †When you start a one-way frame delay measurement, the CLI output displays **NA** ("not available") for this field. One-way ETH-DM statistics are collected at the remote (receiver) MEP. Statistics for a given one-way ETH-DM session are available only by displaying CFM statistics for the receiver MEP. | |

## ETH-DM Statistics Retrieval

At the receiver MEP for a one-way session, or at the initiator MEP for a two-way session, you can display all ETH-DM statistics collected at a CFM session level by using the following operational commands:

- **show oam ethernet connectivity-fault-management delay-statistics maintenance-domain** *md-name* **maintenance-association** *ma-name* **<local-mep** *mep-id***> <remote-mep** *mep-id***> <count** *count***>**
- **show oam ethernet connectivity-fault-management mep-statistics maintenance-domain** *md-name* **maintenance-association** *ma-name* **<local-mep** *mep-id***> <remote-mep** *mep-id***> <count** *count***>**

## ETH-DM Frame Counts

The number of ETH-DM PDU frames exchanged in a ETH-DM session are stored in the CFM database on each router.

Table 4 on page 23 describes the ETH-DM frame counts collected in an ETH-DM session.

Table 4: ETH-DM Frame Counts

| Field Name | Field Description |
|---|---|
| **1DMs sent** | Number of one-way delay measurement (1DM) PDU frames sent to the peer MEP in this session.<br>Stored in the CFM database of the MEP initiating a one-way frame delay measurement. |
| **Valid 1DMs received** | Number of valid 1DM frames received.<br>Stored in the CFM database of the MEP receiving a one-way frame delay measurement. |
| **Invalid 1DMs received** | Number of invalid 1DM frames received.<br>Stored in the CFM database of the MEP receiving a one-way frame delay measurement. |
| **DMMs sent** | Number of delay measurement message (DMM) PDU frames sent to the peer MEP in this session.<br>Stored in the CFM database of the MEP initiating a two-way frame delay measurement. |
| **DMRs sent** | Number of delay measurement reply (DMR) frames sent (in response to a received DMM).<br>Stored in the CFM database of the MEP responding to a two-way frame delay measurement. |

Table 4: ETH-DM Frame Counts *(continued)*

| Field Name | Field Description |
|---|---|
| **Valid DMRs received** | Number of valid DMR frames received.<br><br>Stored in the CFM database of the MEP initiating a two-way frame delay measurement. |
| **Invalid DMRs received** | Number of invalid DMR frames received.<br><br>Stored in the CFM database of the MEP initiating a two-way frame delay measurement. |

## ETH-DM Frame Count Retrieval

Each router counts the number of ETH-DM frames sent or received and stores the counts in a CFM database.

### Frame Counts Stored in CFM Databases

You can display ETH-DM frame counts for MEPs assigned to specified Ethernet interfaces or for specified MEPs in CFM sessions by using the following operational commands:

- **show oam ethernet connectivity-fault-management interfaces** (**detail** | **extensive**)
- **show oam ethernet connectivity-fault-management mep-database maintenance-domain** *md-name* **maintenance-association** *ma-name* **<local-mep** *mep-id***> <remote-mep** *mep-id***>**

### One-Way ETH-DM Frame Counts

For a one-way ETH-DM session, delay statistics are collected at the receiver MEP only, but frame counts are collected at both MEPs. As indicated in Table 4 on page 23, one-way ETH-DM frame counts are tallied from the perspective of each router in the session:

- At the initiator MEP, the router counts the number of 1DM frames sent.
- At the receiver MEP, the router counts the number of valid 1DM frames received and the number of invalid 1DM frames received.

You can also view one-way ETH-DM frame counts—for a receiver MEP—by using the **show oam ethernet connectivity-fault-management mep-statistics** command to display one-way statistics and frame counts together.

### Two-Way ETH-DM Frame Counts

For a two-way ETH-DM session, delay statistics are collected at the initiator MEP only, but frame counts are collected at both MEPs. As indicated in Table 4 on page 23, two-way ETH-DM frame counts are tallied from the perspective of each router in the session:

- At the initiator MEP, the router counts the number of DMM frames sent, valid DMR frames received, and invalid DMR frames received.
- At the responder MEP, the router counts the number of DMR frames sent.

You can also view two-way ETH-DM frame counts—for an initiator MEP—by using the **show oam ethernet connectivity-fault-management mep-statistics** command to display two-way statistics and frame counts together.

**Related Documentation**

- Ethernet Frame Delay Measurements Overview on page 4
- Managing ETH-DM Statistics and ETH-DM Frame Counts on page 41
- Example: One-Way Ethernet Frame Delay Measurement on page 53
- **clear oam ethernet connectivity-fault-management statistics** command
- **show oam ethernet connectivity-fault-management mep-statistics** on page 152 command
- **show oam ethernet connectivity-fault-management delay-statistics** on page 122 command
- **show oam ethernet connectivity-fault-management interfaces** on page 130 (**detail** | **extensive**) command
- **show oam ethernet connectivity-fault-management mep-database** on page 142 command
- Junos® OS Ethernet Interfaces

## Configuring Routers to Support an ETH-DM Session



### Configuring MEP Interfaces

Before you can start an Ethernet frame delay measurement session across an Ethernet service, you must configure two MX Series routers to support ETH-DM.

To configure an Ethernet interface on a MX Series router to support ETH-DM:

1. On each router, configure two physical or logical Ethernet interfaces connected by a VLAN. The following configuration is typical for single-tagged logical interfaces:

```
[edit interfaces]
interface {
  ethernet-interface-name {
    vlan-tagging;
    unit logical-unit-number {
      vlan-id vlan-id; # Both interfaces on this VLAN
    }
  }
}
```

   Both interfaces will use the same VLAN ID.

2. On each router, attach peer MEPs to the two interfaces. The following configuration is typical:

```
[edit protocols]
```

```
oam {
  ethernet {
    connectivity-fault-management {
      maintenance-domain md-name { # On both routers
        level number;
        maintenance-association ma-name { # On both routers
          continuity-check {
            interval 100ms;
            hold-interval 1;
          }
          mep mep-id { # Attach to VLAN interface
            auto-discovery;
            direction (up | down);
            interface interface-name;
            priority number;
          }
        }
      }
    }
  }
}
```

## Ensuring That Distributed ppm Is Not Disabled

By default, the router's period packet management process (**ppm**) runs sessions distributed to the Packet Forwarding Engine in addition to the Routing Engine. This process is responsible for periodic transmission of packets on behalf of its various client processes, such as Bidirectional Forwarding Detection (BFD), and it also receives packets on behalf of client processes.

In addition, **ppm** handles time-sensitive periodic processing and performs such processes as sending process-specific packets and gathering statistics. With **ppm** processes running distributed on both the Routing Engine and the Packet Forwarding Engine, you can run such processes as BFD on the Packet Forwarding Engine.

**Distributed ppm Required for ETH-DM**

Ethernet frame delay measurement requires that **ppm** remains distributed to the Packet Forwarding Engine. If **ppm** is not distributed to the Packet Forwarding Engines of both routers, ETH-DM PDU frame timestamps and ETH-DM statistics are not valid.

Before you start ETH-DM, you must verify that the following configuration statement is *NOT* present:

```
[edit]
routing-options {
  ppm {
    no-delegate-processing;
  }
}
```

If distributed **ppm** processing is disabled (as shown in the stanza above) on either router, you must re-enable it in order to use the ETH-DM feature.

**Procedure to Ensure that Distributed ppm is Not Disabled**

To ensure that distributed **ppm** is not disabled on a router:

1. Display the packet processing management (PPM) configuration to determine whether distributed **ppm** is disabled.

   - In the following example, distributed **ppm** is enabled on the router. In this case, you do not need to modify the router configuration:

     ```
     [edit]
     user@host# show routing-options
     ppm;
     ```

   - In the following example, distributed **ppm** is disabled on the router. In this case, you must proceed to Step 2 to modify the router configuration:

     ```
     [edit]
     user@host show routing-options
     ppm {
       no-delegate-processing;
     }
     ```

2. Modify the router configuration to re-enable distributed **ppm** and restart the Ethernet OAM Connectivity Fault Management process *ONLY IF* distributed **ppm** is disabled (as determined in the previous step).

   a. Before continuing, make any necessary preparations for the possible loss of connectivity on the router.

      Restarting the **ethernet-connectivity-fault-management** process has the following effect on your network:

      - All connectivity fault management (CFM) sessions re-establish.
      - All ETH-DM requests on the router terminate.
      - All ETH-DM statistics and frame counts reset to 0.

   b. Modify the router configuration to re-enable distributed **ppm**. For example:

      ```
      [edit]
      user@host# delete routing-options ppm no-delegate-processing
      ```

   c. Commit the updated router configuration. For example:

      ```
      [edit]
      user@host# commit and-quit
      commit complete
      exiting configuration mode
      ```

   d. To restart the Ethernet OAM Connectivity-Fault-Management process, enter the **restart ethernet-connectivity-fault-management <gracefully | immediately | soft>** operational mode command. For example:

      ```
      user@host> restart ethernet-connectivity-fault-management
      Connectivity fault management process started, pid 9893
      ```

## Enabling the Hardware-Assisted Timestamping Option

By default, Ethernet frame delay measurement uses software for timestamping transmitted and received ETH-DM frames. For Ethernet interfaces, you can optionally use hardware timing to assist in the timestamping of received ETH-DM frames to increase the accuracy of delay measurements.

Enabling hardware-assisted timestamping of received frames can increase the accuracy of ETH-DM calculations when the DPC is loaded with heavy traffic in the receive direction.

To enable Ethernet frame delay measurement hardware assistance on the reception path, include the **hardware-assisted-timestamping** statement at the **[edit protocols oam ethernet connectivity-fault-management performance-monitoring]** hierarchy level:

```
[edit protocols]
oam {
  ethernet {
    connectivity-fault-management {
      performance-monitoring {
        hardware-assisted-timestamping;
      }
```

```
    }
  }
}
```

### Configuring the Server-Side Processing Option

You can delegate the server-side processing (for both two-way delay measurement and loss measurement) to the Packet Forwarding Engine to prevent overloading on the Routing Engine. By default, the server-side processing is done by the Routing Engine.

To configure the server-side processing option:

1. In configuration mode, go to the following hierarchy level:

   ```
   user@host# edit protocols oam ethernet connectivity-fault-management
     performance-monitoring
   ```

2. Configure the server-side processing option.

   ```
   [edit protocols oam ethernet connectivity-fault-management performance-monitoring]
   user@host# set delegate-server-processing
   ```

3. Verify the configuration.

   ```
   [edit protocols oam ethernet connectivity-fault-management]
   user@host# show
   performance-monitoring {
     delegate-server-processing;
   }
   ```

## Configuring MEP Interfaces

Before you can start an Ethernet frame delay measurement session across an Ethernet service, you must configure two MX Series routers to support ETH-DM.

To configure an Ethernet interface on a MX Series router to support ETH-DM:

1. On each router, configure two physical or logical Ethernet interfaces connected by a VLAN. The following configuration is typical for single-tagged logical interfaces:

   ```
   [edit interfaces]
   interface {
     ethernet-interface-name {
       vlan-tagging;
       unit logical-unit-number {
         vlan-id vlan-id; # Both interfaces on this VLAN
       }
     }
   }
   ```

   Both interfaces will use the same VLAN ID.

2. On each router, attach peer MEPs to the two interfaces. The following configuration is typical:

   ```
   [edit protocols]
   oam {
     ethernet {
   ```

```
connectivity-fault-management {
  maintenance-domain md-name { # On both routers
    level number;
    maintenance-association ma-name { # On both routers
      continuity-check {
        interval 100ms;
        hold-interval 1;
      }
      mep mep-id { # Attach to VLAN interface
        auto-discovery;
        direction (up | down);
        interface interface-name;
        priority number;
      }
    }
  }
 }
}
```

**Related Documentation**

- Ethernet Frame Delay Measurements Overview on page 4
- Guidelines for Configuring Routers to Support an ETH-DM Session on page 18
- Junos® OS Ethernet Interfaces

## Configuring an Iterator Profile

You can create an iterator profile with its parameters to periodically transmit SLA measurement packets in the form of ITU-Y.1731-compliant frames for delay measurement or loss measurement.

To create an iterator profile:

1. In configuration mode, go to the following hierarchy level:

   ```
   [edit]
   user@host# edit protocols oam ethernet connectivity-fault-management
     performance-monitoring
   ```

2. Configure the SLA measurement monitoring iterator:

   ```
   [edit protocols oam ethernet connectivity-fault-management performance-monitoring]
   user@host# edit sla-iterator-profiles
   ```

3. Configure an iterator profile—for example, i1:

   ```
   [edit protocols oam ethernet connectivity-fault-management performance-monitoring
     sla-iterator-profiles]
   user@host# set i1
   ```

4. (Optional) Configure the cycle time, which is the amount of time (in milliseconds) between back-to-back transmission of SLA frames for one connection, with values from 10 through 3,600,000. The default value is 1000 ms.

   ```
   [edit protocols oam ethernet connectivity-fault-management performance-monitoring
     sla-iterator-profiles i1]
   ```

```
user@host# set cycle-time cycle-time-value
```

5. (Optional) Configure the iteration period, which indicates the maximum number of cycles per iteration (the number of connections registered to an iterator cannot exceed this value), with values from 1 through 2000. The default value is 2000.

```
[edit protocols oam ethernet connectivity-fault-management performance-monitoring
  sla-iterator-profiles i1]
user@host# set iteration-period iteration-period-value
```

6. Configure the measurement type as loss measurement, statistical frame-loss measurment, or two-way delay measurement.

```
[edit protocols oam ethernet connectivity-fault-management performance-monitoring
  sla-iterator-profiles i1]
user@host# set measurement-type (loss | statistical-frame-loss | two-way-delay)
```

7. (Optional) Configure the calculation weight for delay with values from 1 through 65,535. The default value is 1 (applicable only for two-way delay measurement).

```
[edit protocols oam ethernet connectivity-fault-management performance-monitoring
  sla-iterator-profiles i1]
user@host# set calculation-weight delay delay-value
```

8. (Optional) Configure the calculation weight for delay variation with values from 1 through 65,535. The default value is 1 (applicable only for two-way delay measurement).

```
[edit protocols oam ethernet connectivity-fault-management performance-monitoring
  sla-iterator-profiles i1]
user@host# set calculation-weight delay-variation delay-variation-value
```

9. Configure the **disable** statement to stop the iterator (that is, disable the iterator profile).

```
[edit protocols oam ethernet connectivity-fault-management performance-monitoring
  sla-iterator-profiles i1]
user@host# set disable
```

10. Verify the configuration.

```
[edit protocols oam ethernet connectivity-fault-management performance-monitoring
  sla-iterator-profiles]
user@host# show i1
  cycle-time cycle-time-value;
  iteration-period iteration-period-value;
  measurement-type (loss | two-way-delay);
  calculation-weight {
    delay delay-weight;
    delay-variation delay-variation-weight;
  }
```

**Related Documentation**

- Proactive Mode on page 12
- Clearing Iterator Statistics on page 49
- Configuring a Remote MEP with an Iterator Profile on page 32
- Example: Configuring an Iterator on page 60
- Displaying Iterator Statistics on page 45

- Managing Iterator Statistics on page 45
- Junos® OS Ethernet Interfaces

## Configuring a Remote MEP with an Iterator Profile

You can associate a remote maintenance association end point (MEP) with more than one iterator profile.

To configure a remote MEP with an iterator profile:

1. In configuration mode, go to the following hierarchy level:

   user@host# **edit protocols oam ethernet connectivity-fault-management maintenance-domain** ***md-name*** **maintenance-association** ***ma-name*** mep ***mep-id***

2. Configure the remote MEP with values from 1 through 8191.

   [edit protocols oam ethernet connectivity-fault-management maintenance-domain *md-name* maintenance-association *ma-name* mep *mep-id*]
   user@host# **set remote-mep** ***remote-mep-id***

3. Set the iterator profile.

   [edit protocols oam ethernet connectivity-fault-management maintenance-domain *md-name* maintenance-association *ma-name* mep *mep-id* remote-mep *remote-mep-id*]
   user@host# **set** sla-iterator-profile ***profile-name***

4. (Optional) Set the size of the data TLV portion of the Y.1731 data frame with values from 1 through 1400 bytes. The default value is 1.

   [edit protocols oam ethernet connectivity-fault-management maintenance-domain *md-name* maintenance-association *ma-name* mep *mep-id* remote-mep *remote-mep-id* sla-iterator-profile *profile-name*]
   user@host# **set** data-tlv-size ***size***

5. (Optional) Set the iteration count, which indicates the number of iterations for which this connection should partake in the iterator for acquiring SLA measurements, with values from 1 through 65,535. The default value is 0 (that is, infinite iterations).

   [edit protocols oam ethernet connectivity-fault-management maintenance-domain *md-name* maintenance-association *ma-name* mep *mep-id* remote-mep *remote-mep-id* sla-iterator-profile *profile-name*]
   user@host# **set** iteration-count ***count-value***

6. (Optional) Set the priority, which is the **vlan-pcp** value that is sent in the Y.1731 data frames, with values from 0 through 7. The default value is 0.

   [edit protocols oam ethernet connectivity-fault-management maintenance-domain *md-name* maintenance-association *ma-name* mep *mep-id* remote-mep *remote-mep-id* sla-iterator-profile *profile-name*]
   user@host# **set** priority ***priority-value***

7. Verify the configuration.

   [edit protocols oam ethernet connectivity-fault-management maintenance-domain *md-name* maintenance-association *ma-name* mep *mep-id* remote-mep *remote-mep-id*]

```
user@host# show
sla-iterator-profile profile-name  {
   data-tlv-size size;
   iteration-count count-value;
   priority priority-value;
}
```

**Related Documentation**

- Proactive Mode on page 12
- Clearing Iterator Statistics on page 49
- Configuring an Iterator Profile on page 30
- Example: Configuring an Iterator on page 60
- Displaying Iterator Statistics on page 45
- Managing Iterator Statistics on page 45
- Junos® OS Ethernet Interfaces

## Configuring Statistical Frame Loss Measurement for VPLS Connections

Using proactive statistical frame loss measurement, you can monitor VPLS connections on MX Series routers . Statistical frame loss measurement allows you to monitor the quality of Ethernet connections for service level agreements (SLAs). Point-to-point and multipoint-to-multipoint connections configured on MX Series routers can be monitored by registering the connection on an iterator and initiating periodic SLA measurement of frame transmissions on the connections.

Iterators periodically transmit SLA measurement packets using ITU-Y.1731 compliant frames. The iterator sends periodic measurement packets for each of the connections registered to it. These measurement cycles are transmitted in such a way as to not overlap, reducing the processing demands placed on the CPU. The measurement packets are exchanged between the source user network interface (UNI) port and the destination UNI port, providing a sequence of timed performance measurements for each UNI pair. The Frame Loss Ratio (FLR) and connection availability can be computed from these measurements using statistics.

The following steps outline how to configure statistical frame loss measurement for VPLS connections:

1. To configure proactive ETH-DM measurement for a VPLS connection, see "Guidelines for Configuring Routers to Support an ETH-DM Session" on page 18.
2. To enable statistical loss measurement for a VPLS connection, configure an iterator for the VPLS connection using the **sla-iterator-profiles** statement at the **[edit protocols oam ethernet connectivity-fault-management performance-monitoring]** hierarchy level. For detailed instructions, see "Configuring an Iterator Profile" on page 30.
3. As part of the iterator configuration, include the **statistical-frame-loss** option for the **measurement-type** statement at the **[edit protocols oam ethernet**

**connectivity-fault-management performance-monitoring sla-iterator-profiles *profile-name*]** hierarchy level.

4. Once you have enabled the iterator, you can display the statistical frame loss for a VPLS connection by issuing the **show oam ethernet connectivity-fault-management sla-iterator-statistics sla-iterator *identifier* maintenance-domain *name* maintenance-association *name* local-mep *identifier* remote-mep *identifier*** command.

**Related Documentation**

- Guidelines for Configuring Routers to Support an ETH-DM Session on page 18
- Configuring an Iterator Profile on page 30
- Example: Configuring an Iterator on page 60
- Junos® OS Ethernet Interfaces

## Ensuring That Distributed ppm Is Not Disabled

By default, the router's period packet management process (**ppm**) runs sessions distributed to the Packet Forwarding Engine in addition to the Routing Engine. This process is responsible for periodic transmission of packets on behalf of its various client processes, such as Bidirectional Forwarding Detection (BFD), and it also receives packets on behalf of client processes.

In addition, **ppm** handles time-sensitive periodic processing and performs such processes as sending process-specific packets and gathering statistics. With **ppm** processes running distributed on both the Routing Engine and the Packet Forwarding Engine, you can run such processes as BFD on the Packet Forwarding Engine.

**Distributed ppm Required for ETH-DM**

Ethernet frame delay measurement requires that **ppm** remains distributed to the Packet Forwarding Engine. If **ppm** is not distributed to the Packet Forwarding Engines of both routers, ETH-DM PDU frame timestamps and ETH-DM statistics are not valid.

Before you start ETH-DM, you must verify that the following configuration statement is *NOT* present:

```
[edit]
routing-options {
   ppm {
      no-delegate-processing;
   }
}
```

If distributed **ppm** processing is disabled (as shown in the stanza above) on either router, you must re-enable it in order to use the ETH-DM feature.

**Procedure to Ensure that Distributed ppm is Not Disabled**

To ensure that distributed **ppm** is not disabled on a router:

1. Display the packet processing management (PPM) configuration to determine whether distributed **ppm** is disabled.

   - In the following example, distributed **ppm** is enabled on the router. In this case, you do not need to modify the router configuration:

     ```
     [edit]
     user@host# show routing-options
     ppm;
     ```

   - In the following example, distributed **ppm** is disabled on the router. In this case, you must proceed to Step 2 to modify the router configuration:

     ```
     [edit]
     user@host show routing-options
     ppm {
       no-delegate-processing;
     }
     ```

2. Modify the router configuration to re-enable distributed **ppm** and restart the Ethernet OAM Connectivity Fault Management process *ONLY IF* distributed **ppm** is disabled (as determined in the previous step).

   a. Before continuing, make any necessary preparations for the possible loss of connectivity on the router.

      Restarting the **ethernet-connectivity-fault-management** process has the following effect on your network:

      - All connectivity fault management (CFM) sessions re-establish.
      - All ETH-DM requests on the router terminate.
      - All ETH-DM statistics and frame counts reset to 0.

   b. Modify the router configuration to re-enable distributed **ppm**. For example:

      ```
      [edit]
      user@host# delete routing-options ppm no-delegate-processing
      ```

   c. Commit the updated router configuration. For example:

      ```
      [edit]
      user@host# commit and-quit
      commit complete
      exiting configuration mode
      ```

   d. To restart the Ethernet OAM Connectivity-Fault-Management process, enter the **restart ethernet-connectivity-fault-management <gracefully | immediately | soft>** operational mode command. For example:

      ```
      user@host> restart ethernet-connectivity-fault-management
      Connectivity fault management process started, pid 9893
      ```

**Related Documentation**

- Ethernet Frame Delay Measurements Overview on page 4
- Guidelines for Configuring Routers to Support an ETH-DM Session on page 18
- Junos® OS Ethernet Interfaces

## Enabling the Hardware-Assisted Timestamping Option

By default, Ethernet frame delay measurement uses software for timestamping transmitted and received ETH-DM frames. For Ethernet interfaces, you can optionally use hardware timing to assist in the timestamping of received ETH-DM frames to increase the accuracy of delay measurements.

Enabling hardware-assisted timestamping of received frames can increase the accuracy of ETH-DM calculations when the DPC is loaded with heavy traffic in the receive direction.

To enable Ethernet frame delay measurement hardware assistance on the reception path, include the **hardware-assisted-timestamping** statement at the **[edit protocols oam ethernet connectivity-fault-management performance-monitoring]** hierarchy level:

```
[edit protocols]
oam {
  ethernet {
    connectivity-fault-management {
      performance-monitoring {
        hardware-assisted-timestamping;
      }
    }
  }
}
```

**Related Documentation**

- Ethernet Frame Delay Measurements Overview on page 4
- Guidelines for Configuring Routers to Support an ETH-DM Session on page 18
- Junos® OS Ethernet Interfaces

## Starting an ETH-DM Session

- Using the monitor ethernet delay-measurement Command on page 37
- Starting a One-Way ETH-DM Session on page 38
- Starting a Two-Way ETH-DM Session on page 38

### Using the monitor ethernet delay-measurement Command

After you have configured two MX Series routers to support ITU-T Y.1731 Ethernet frame delay measurement (ETH-DM), you can initiate a one-way or two-way Ethernet frame delay measurement session from the CFM maintenance association end point (MEP) on one of the routers to the peer MEP on the other router.

To start an ETH-DM session between the specified local MEP and the specified remote MEP, enter the **monitor ethernet delay-measurement** command at operational mode. The syntax of the command is as follows:

```
monitor ethernet delay-measurement
(one-way | two-way)
maintenance-domain md-name
maintenance-association ma-name
(remote-mac-address | mep remote-mep-id)
<count frame-count>
<wait interval-seconds>
<priority 802.1p value>
<size>
<no-session-id-tlv>
<xml>
```

For a one-way frame delay measurement, the command displays a runtime display of the number of 1DM frames sent from the initiator MEP during that ETH-DM session. One-way frame delay and frame delay variation measurements from an ETH-DM session

are collected in a CFM database at the router that contains the receiver MEP. You can retrieve ETH-DM statistics from a CFM database at a later time.

For a two-way frame delay measurement, the command displays two-way frame delay and frame delay variation values for each round-trip frame exchange during that ETH-DM session, as well as a runtime display of useful summary information about the session: average delay, average delay variation, best-case delay, and worst-case delay. Two-way frame delay and frame delay variation values measurements from an ETH-DM session are collected in a CFM database at the router that contains the initiator MEP. You can retrieve ETH-DM statistics from a CFM database at a later time.

NOTE: Although you can trigger frame delay collection for up to 65,535 ETH-DM requests at a time, a router stores only the last 100 frame delay statistics per CFM session (pair of peer MEPs).

For a complete description of the **monitor ethernet delay-measurement** operational command, see the Junos OS Operational Mode Commands.

## Starting a One-Way ETH-DM Session

To start a one-way Ethernet frame delay measurement session, enter the **monitor ethernet delay-measurement one-way** command from operational mode, and specify the peer MEP by its MAC address or by its MEP identifier.

For example:

```
user@host> monitor ethernet delay-measurement one-way 00:05:85:73:39:4a
maintenance-domain md6 maintenance-association ma6 count 10
One-way ETH-DM request to 00:05:85:73:39:4a, Interface xe-5/0/0.0
1DM Frames sent : 10
--- Delay measurement statistics ---
Packets transmitted: 10
Average delay: NA, Average delay variation: NA
Best case delay: NA, Worst case delay: NA
```

NOTE: If you attempt to monitor delays to a nonexistent MAC address, you must type Ctrl + C to explicitly quit the **monitor ethernet delay-measurement** command and return to the CLI command prompt.

## Starting a Two-Way ETH-DM Session

To start a two-way Ethernet frame delay measurement session, enter the **monitor ethernet delay-measurement two-way** command from operational mode, and specify the peer MEP by its MAC address or by its MEP identifier.

For example:

```
user@host> monitor ethernet delay-measurement two-way 00:05:85:73:39:4a
maintenance-domain md6 maintenance-association ma6 count 10
Two-way ETH-DM request to 00:05:85:73:39:4a, Interface xe-5/0/0.0
DMR received from 00:05:85:73:39:4a Delay: 100 usec Delay variation: 0 usec
```

```
DMR received from 00:05:85:73:39:4a Delay: 92 usec  Delay variation: 8 usec
DMR received from 00:05:85:73:39:4a Delay: 92 usec  Delay variation: 0 usec
DMR received from 00:05:85:73:39:4a Delay: 111 usec Delay variation: 19 usec
DMR received from 00:05:85:73:39:4a Delay: 110 usec Delay variation: 1 usec
DMR received from 00:05:85:73:39:4a Delay: 119 usec Delay variation: 9 usec
DMR received from 00:05:85:73:39:4a Delay: 122 usec Delay variation: 3 usec
DMR received from 00:05:85:73:39:4a Delay: 92 usec  Delay variation: 30 usec
DMR received from 00:05:85:73:39:4a Delay: 92 usec  Delay variation: 0 usec
DMR received from 00:05:85:73:39:4a Delay: 108 usec Delay variation: 16 usec

--- Delay measurement statistics ---
Packets transmitted: 10, Valid packets received: 10
Average delay: 103 usec, Average delay variation: 8 usec
Best case delay: 92 usec, Worst case delay: 122 usec
```

NOTE: If you attempt to monitor delays to a nonexistent MAC address, you must type Ctrl + C to explicitly quit the **monitor ethernet delay-measurement** command and return to the CLI command prompt.

**Related Documentation**

- Ethernet Frame Delay Measurements Overview on page 4
- Guidelines for Starting an ETH-DM Session on page 19
- **monitor ethernet delay-measurement** command
- Guidelines for Managing ETH-DM Statistics and ETH-DM Frame Counts on page 21
- Managing ETH-DM Statistics and ETH-DM Frame Counts on page 41
- Junos® OS Ethernet Interfaces

## Using the monitor ethernet delay-measurement Command

After you have configured two MX Series routers to support ITU-T Y.1731 Ethernet frame delay measurement (ETH-DM), you can initiate a one-way or two-way Ethernet frame delay measurement session from the CFM maintenance association end point (MEP) on one of the routers to the peer MEP on the other router.

To start an ETH-DM session between the specified local MEP and the specified remote MEP, enter the **monitor ethernet delay-measurement** command at operational mode. The syntax of the command is as follows:

```
monitor ethernet delay-measurement
(one-way | two-way)
maintenance-domain md-name
maintenance-association ma-name
(remote-mac-address | mep remote-mep-id)
<count frame-count>
<wait interval-seconds>
<priority 802.1p value>
<size>
<no-session-id-tlv>
<xml>
```

For a one-way frame delay measurement, the command displays a runtime display of the number of 1DM frames sent from the initiator MEP during that ETH-DM session. One-way frame delay and frame delay variation measurements from an ETH-DM session are collected in a CFM database at the router that contains the receiver MEP. You can retrieve ETH-DM statistics from a CFM database at a later time.

For a two-way frame delay measurement, the command displays two-way frame delay and frame delay variation values for each round-trip frame exchange during that ETH-DM session, as well as a runtime display of useful summary information about the session: average delay, average delay variation, best-case delay, and worst-case delay. Two-way frame delay and frame delay variation values measurements from an ETH-DM session are collected in a CFM database at the router that contains the initiator MEP. You can retrieve ETH-DM statistics from a CFM database at a later time.

NOTE: Although you can trigger frame delay collection for up to 65,535 ETH-DM requests at a time, a router stores only the last 100 frame delay statistics per CFM session (pair of peer MEPs).

For a complete description of the **monitor ethernet delay-measurement** operational command, see the Junos OS Operational Mode Commands.

## Starting a One-Way ETH-DM Session

To start a one-way Ethernet frame delay measurement session, enter the **monitor ethernet delay-measurement one-way** command from operational mode, and specify the peer MEP by its MAC address or by its MEP identifier.

For example:

```
user@host> monitor ethernet delay-measurement one-way 00:05:85:73:39:4a
maintenance-domain md6 maintenance-association ma6 count 10
One-way ETH-DM request to 00:05:85:73:39:4a, Interface xe-5/0/0.0
1DM Frames sent : 10
--- Delay measurement statistics ---
Packets transmitted: 10
Average delay: NA, Average delay variation: NA
Best case delay: NA, Worst case delay: NA
```

NOTE: If you attempt to monitor delays to a nonexistent MAC address, you must type Ctrl + C to explicitly quit the **monitor ethernet delay-measurement** command and return to the CLI command prompt.

## Starting a Two-Way ETH-DM Session

To start a two-way Ethernet frame delay measurement session, enter the **monitor ethernet delay-measurement two-way** command from operational mode, and specify the peer MEP by its MAC address or by its MEP identifier.

For example:

```
user@host> monitor ethernet delay-measurement two-way 00:05:85:73:39:4a
maintenance-domain md6 maintenance-association ma6 count 10
Two-way ETH-DM request to 00:05:85:73:39:4a, Interface xe-5/0/0.0
DMR received from 00:05:85:73:39:4a Delay: 100 usec Delay variation: 0 usec
DMR received from 00:05:85:73:39:4a Delay: 92 usec  Delay variation: 8 usec
DMR received from 00:05:85:73:39:4a Delay: 92 usec  Delay variation: 0 usec
DMR received from 00:05:85:73:39:4a Delay: 111 usec Delay variation: 19 usec
DMR received from 00:05:85:73:39:4a Delay: 110 usec Delay variation: 1 usec
DMR received from 00:05:85:73:39:4a Delay: 119 usec Delay variation: 9 usec
DMR received from 00:05:85:73:39:4a Delay: 122 usec Delay variation: 3 usec
DMR received from 00:05:85:73:39:4a Delay: 92 usec  Delay variation: 30 usec
DMR received from 00:05:85:73:39:4a Delay: 92 usec  Delay variation: 0 usec
DMR received from 00:05:85:73:39:4a Delay: 108 usec Delay variation: 16 usec

--- Delay measurement statistics ---
Packets transmitted: 10, Valid packets received: 10
Average delay: 103 usec, Average delay variation: 8 usec
Best case delay: 92 usec, Worst case delay: 122 usec
```

NOTE: If you attempt to monitor delays to a nonexistent MAC address, you must type Ctrl + C to explicitly quit the **monitor ethernet delay-measurement** command and return to the CLI command prompt.

## Managing ETH-DM Statistics and ETH-DM Frame Counts



### Displaying ETH-DM Statistics Only

**Purpose** Display ETH-DM statistics.

By default, the **show oam ethernet connectivity-fault-management delay-statistics** command displays ETH-DM statistics for MEPs in the specified CFM maintenance association (MA) within the specified CFM maintenance domain (MD).

**Action**

- To display the ETH-DM statistics collected for MEPs belonging to MA **ma1** and within MD **md1**:

  ```
  user@host> show oam ethernet connectivity-fault-management delay-statistics
  maintenance-domain ma1 maintenance-association ma1
  ```

- To display the ETH-DM statistics collected for ETH-DM sessions for the local MEP **201** belonging to MA **ma2** and within MD **md2**:

  ```
  user@host> show oam ethernet connectivity-fault-management delay-statistics
  maintenance-domain md2 maintenance-association ma2 local-mep 201
  ```

- To display the ETH-DM statistics collected for ETH-DM sessions from local MEPs belonging to MA **ma3** and within MD **md3** to remote MEP **302**:

```
user@host> show oam ethernet connectivity-fault-management delay-statistics
maintenance-domain md3 maintenance-association ma3 remote-mep 302
```

## Displaying ETH-DM Statistics and Frame Counts

**Purpose** Display ETH-DM statistics and ETH-DM frame counts.

By default, the **show oam ethernet connectivity-fault-management mep-statistics** command displays ETH-DM statistics and frame counts for MEPs in the specified CFM maintenance association (MA) within the specified CFM maintenance domain (MD).

**Action**

- To display the ETH-DM statistics and ETH-DM frame counts for MEPs in MA **ma1** and within MD **md1**:

  ```
  user@host> show oam ethernet connectivity-fault-management mep-statistics
  maintenance-domain md1 maintenance-association ma1
  ```

- To display the ETH-DM statistics and ETH-DM frame counts for the local MEP **201** in MA **ma2** and within MD **md2**:

  ```
  user@host> show oam ethernet connectivity-fault-management mep-statistics
  maintenance-domain md2 maintenance-association ma2 local-mep 201
  ```

- To display the ETH-DM statistics and ETH-DM frame counts for the local MEP in MD **md3** and within MA **ma3** that participates in an ETH-DM session with the remote MEP **302**:

  ```
  user@host> show oam ethernet connectivity-fault-management mep-statistics
  maintenance-domain ma3 maintenance-association ma3 remote-mep 302
  ```

## Displaying ETH-DM Frame Counts for MEPs by Enclosing CFM Entity

**Purpose** Display ETH-DM frame counts for CFM maintenance association end points (MEPs).

By default, the **show oam ethernet connectivity-fault-management mep-database** command displays CFM database information for MEPs in the specified CFM maintenance association (MA) within the specified CFM maintenance domain (MD).

NOTE: At the router attached to the initiator MEP for a one-way session, or at the router attached to the receiver MEP for a two-way session, you can only display ETH-DM frame counts.

**Action**

- To display CFM database information (including ETH-DM frame counts) for all MEPs in MA **ma1** within MD **md1**:

  ```
  user@host> show oam ethernet connectivity-fault-management mep-database
  maintenance-domain ma1 maintenance-association ma1
  ```

- To display CFM database information (including ETH-DM frame counts) only for local MEP **201** in MA **ma1** within MD **md1**:

  ```
  user@host> show oam ethernet connectivity-fault-management mep-database
  maintenance-domain md2 maintenance-association ma2 local-mep 201
  ```

- To display CFM database information (including ETH-DM frame counts) only for remote MEP **302** in MD **md3** within MA **ma3**:

  ```
  user@host> show oam ethernet connectivity-fault-management mep-database
  maintenance-domain ma3 maintenance-association ma3 remote-mep 302
  ```

## Displaying ETH-DM Frame Counts for MEPs by Interface or Domain Level

**Purpose** Display ETH-DM frame counts for CFM maintenance association end points (MEPs).

By default, the **show oam ethernet connectivity-fault-management interfaces** command displays CFM database information for MEPs attached to CFM-enabled Ethernet interfaces on the router or at a maintenance domain level. For Ethernet interfaces that support ETH-DM, any frame counts are also displayed when you specify the **detail** or **extensive** command option.

NOTE: At the router attached to the initiator MEP for a one-way session, or at the router attached to the receiver MEP for a two-way session, you can only display ETH-DM frame counts.

**Action**

- To display CFM database information (including ETH-DM frame counts) for all MEPs attached to CFM-enabled Ethernet interfaces on the router:

  ```
  user@host> show oam ethernet connectivity-fault-management interfaces detail
  ```

- To display CFM database information (including ETH-DM frame counts) only for the MEPs attached to CFM-enabled router interface **ge-5/2/9.0**:

  ```
  user@host> show oam ethernet connectivity-fault-management interfaces ge-5/2/9.0 detail
  ```

- To display CFM database information (including ETH-DM frame counts) only for MEPs enclosed within CFM maintenance domains (MDs) at level **6**:

  ```
  user@host> show oam ethernet connectivity-fault-management interfaces level 6 detail
  ```

## Clearing ETH-DM Statistics and Frame Counts

**Purpose** Clear the ETH-DM statistics and ETH-DM frame counts.

By default, statistics and frame counts are deleted for all MEPs attached to CFM-enabled interfaces on the router. However, you can filter the scope of the command by specifying an interface name.

**Action**

- To clear the ETH-DM statistics and ETH-DM frame counts for all MEPs attached to CFM-enabled interfaces on the router:

  ```
  user@host> clear oam ethernet connectivity-fault-management statistics
  ```

- To clear the ETH-DM statistics and ETH-DM frame counts only for MEPs attached to the logical interface **ge-0/5.9.0**:

  ```
  user@host> clear oam ethernet connectivity-fault-management statistics ge-0/5/9.0
  ```

**Related Documentation**

- **clear oam ethernet connectivity-fault-management statistic** command
- **show oam ethernet connectivity-fault-management delay-statistics** command
- **show oam ethernet connectivity-fault-management interfaces** (**detail** | **extensive**) command
- **show oam ethernet connectivity-fault-management mep-statistics** command
- **show oam ethernet connectivity-fault-management mep-database** command
- Junos® OS Ethernet Interfaces

## Managing ETH-LM Statistics



### Displaying ETH-LM Statistics

**Purpose** Display the ETH-LM statistics.

By default, the **show oam ethernet connectivity-fault-management loss-statistics maintenance-domain *md-name* maintenance-association *ma-name*** command displays ETH-LM statistics for MEPs in the specified CFM maintenance association (MA) within the specified CFM maintenance domain (MD).

The following list consists of the CFM-related operational mode commands that have been enhanced to display ETH-LM statistics:

- The **show oam ethernet connectivity-fault-management interfaces detail** command is enhanced to display ETH-DM and ETH-LM statistics for MEPs in the specified CFM maintenance association (MA) within the specified CFM maintenance domain (MD).
- The **show oam ethernet connectivity-fault-management mep-statistics** command is enhanced to display ETH-DM and ETH-LM statistics and frame counts for MEPs in the specified CFM maintenance association (MA) within the specified CFM maintenance domain (MD).
- The **show oam ethernet connectivity-fault-management mep-database** command is enhanced to display ETH-DM and ETH-LM frame counters for MEPs in the specified CFM maintenance association (MA) within the specified CFM maintenance domain (MD).

**Action**

- To display the ETH-LM statistics for all MEPs attached to CFM-enabled interfaces on the router:

  ```
  user@host> show oam ethernet connectivity-fault-management loss-statistics
  ```

- To display the ETH-DM statistics collected for MEPs belonging to MA **ma1** and within MD **md1**:

  ```
  user@host> show oam ethernet connectivity-fault-management delay-statistics
  maintenance-domain md1 maintenance-association ma1
  ```

- To display the ETH-DM statistics and ETH-DM frame counts for MEPs in MA **ma1** and within MD **md1**:

  ```
  user@host> show oam ethernet connectivity-fault-management mep-statistics
  maintenance-domain md1 maintenance-association ma1
  ```

- To display CFM database information (including ETH-DM frame counts) for all MEPs in MA **ma1** within MD **md1**:

  ```
  user@host> show oam ethernet connectivity-fault-management mep-database
  maintenance-domain md1 maintenance-association ma1
  ```

### Clearing ETH-LM Statistics

**Purpose** Clear the ETH-LM statistics.

By default, statistics are deleted for all MEPs attached to CFM-enabled interfaces on the router. However, you can filter the scope of the command by specifying an interface name.

**Action**

- To clear the ETH-LM statistics for all MEPs attached to CFM-enabled interfaces on the router:

  ```
  user@host> clear oam ethernet connectivity-fault-management loss-statistics
  ```

**Related Documentation**

- Managing ETH-DM Statistics and ETH-DM Frame Counts on page 41

## Managing Iterator Statistics



### Displaying Iterator Statistics

**Purpose** Retrieve and display iterator statistics.

Muliple iterators can be associated with a remote MEP. However, by default, only one result pertaining to one iterator profile is displayed.

**Action**

- To display the iterator statistics for remote MEP **1** and iterator profile **i1** with MEPs belonging to the maintenance association **ma1** and within the maintenance domain **default-1** (here, the iterator profile **i1** is configured for two-way delay measurement):

  ```
  user@host> show oam ethernet connectivity-fault-management sla-iterator-statistics
  sla-iterator i1 maintenance-domain default-1 maintenance-association ma1 local-mep 1
  remote-mep 1
  Iterator statistics:
  Maintenance domain: md6, Level: 6
  Maintenance association: ma6, Local MEP id: 1000
  Remote MEP id: 103, Remote MAC address: 00:90:69:0a:43:92
  Iterator name: i1, Iterator Id: 1
  Iterator cycle time: 10ms, Iteration period: 1 cycles
  Iterator status: running, Infinite iterations: true
  Counter reset time: 2010-03-19 20:42:39 PDT (2d 18:24 ago)
  ```

```
Reset reason: Adjacency flap

Iterator delay measurement statistics:
Delay weight: 1, Delay variation weight: 1
DMM sent                                          : 23898520
DMM skipped for threshold hit                     : 11000
DMM skipped for threshold hit window              : 0
DMR received                                      : 23851165
DMR out of sequence                               : 1142
DMR received with invalid time stamps             : 36540
Average two-way delay                             : 129 usec
Average two-way delay variation                   : 15 usec
Average one-way forward delay variation           : 22 usec
Average one-way backward delay variation          : 22 usec
Weighted average two-way delay                    : 134 usec
Weighted average two-way delay variation          : 8 usec
Weighted average one-way forward delay variation  : 6 usec
Weighted average one-way backward delay variation : 2 usec
```

Output fields are listed in the approximate order in which they appear.

Table 5: Displaying Iterator Statistics for Ethernet Delay Measurement Output Fields

| Output Field Name | Output Field Description |
|---|---|
| **Maintenance domain** | Maintenance domain name. |
| **Level** | Maintenance domain level configured. |
| **Maintenance association** | Maintenance association name. |
| **Local MEP id** | Numeric identifier of the local MEP. |
| **Remote MEP id** | Numeric identifier of the remote MEP. |
| **Remote MAC address** | Unicast MAC address of the remote MEP. |
| **Iterator name** | Name of iterator. |
| **Iterator Id** | Numeric identifier of the iterator. |
| **Iterator cycle time** | Number of cycles (in milliseconds) taken between back-to-back transmission of SLA frames for this connection |
| **Iteration period** | Maximum number of cycles per iteration |
| **Iterator status** | Current status of iterator whether running or stopped. |
| **Infinite iterations** | Status of iteration as infinite or finite. |
| **Counter reset time** | Date and time when the counter was reset. |
| **Reset reason** | Reason to reset counter. |
| **Delay weight** | Calculation weight of delay. |

Table 5: Displaying Iterator Statistics for Ethernet Delay Measurement Output Fields *(continued)*

| Output Field Name | Output Field Description |
|---|---|
| **Delay variation weight** | Calculation weight of delay variation. |
| **DMM sent** | Delay measurement message (DMM) PDU frames sent to the peer MEP in this session. |
| **DMM skipped for threshold hit** | Number of DMM frames sent to the peer MEP in this session skipped during threshold hit. |
| **DMM skipped for threshold hit window** | Number of DMM frames sent to the peer MEP in this session skipped during the last threshold hit window. |
| **DMR received** | Number of delay measurement reply (DMR) frames received. |
| **DMR out of sequence** | Total number of DMR out of sequence packets received. |
| **DMR received with invalid time stamps** | Total number of DMR frames received with invalid timestamps. |
| **Average two-way delay** | Average two-way frame delay for the statistics displayed. |
| **Average two-way delay variation** | Average two-way “frame jitter” for the statistics displayed. |
| **Average one-way forward delay variation** | Average one-way forward delay variation for the statistics displayed in microseconds. |
| **Average one-way backward delay variation** | Average one-way backward delay variation for the statistics displayed in microseconds. |
| **Weighted average two-way delay** | Weighted average two-way delay for the statistics displayed in microseconds. |
| **Weighted average two-way delay variation** | Weighted average two-way delay variation for the statistics displayed in microseconds. |
| **Weighted average one-way forward delay variation** | Weighted average one-way forward delay variation for the statistics displayed in microseconds. |
| **Weighted average one-way backward delay variation** | Weighted average one-way backward delay variation for the statistics displayed in microseconds. |

- To display the iterator statistics for remote MEP **1** and iterator profile **i2** with MEPs belonging to the maintenance association **ma1** and within the maintenance domain **default-1** (here, the iterator profile **i1** is configured for loss measurement):

```
user@host> show oam ethernet connectivity-fault-management sla-iterator-statistics
sla-iterator i2 maintenance-domain default-1 maintenance-association ma1 local-mep 1
remote-mep 1
Iterator statistics:
Maintenance domain: md6, Level: 6
```

```
Maintenance association: ma6, Local MEP id: 1000
Remote MEP id: 103, Remote MAC address: 00:90:69:0a:43:92
Iterator name: i2, Iterator Id: 2
Iterator cycle time: 1000ms, Iteration period: 2000 cycles
Iterator status: running, Infinite iterations: true
Counter reset time: 2010-03-19 20:42:39 PDT (2d 18:25 ago)
Reset reason: Adjacency flap

Iterator loss measurement statistics:
LMM sent                              : 238970
LMM skipped for threshold hit         : 60
LMM skipped for threshold hit window  : 0
LMR received                          : 238766
LMR out of sequence                   : 43

Accumulated transmit statistics:
Near-end (CIR)                        : 0
Far-end (CIR)                         : 0
Near-end (EIR)                        : 0
Far-end (EIR)                         : 0

Accumulated loss statistics:
Near-end (CIR)                        : 0 (0.00%)
Far-end (CIR)                         : 0 (0.00%)
Near-end (EIR)                        : 0 (0.00%)
Far-end (EIR)                         : 0 (0.00%)

Last loss measurement statistics:
Near-end (CIR)                        : 0
Far-end (CIR)                         : 0
Near-end (EIR)                        : 0
Far-end (EIR)                         : 0
```

Output fields are listed in the approximate order in which they appear.

Table 6: Displaying Iterator Statistics for Ethernet Loss Measurement Output Fields

| Output Field Name | Output Field Description |
|---|---|
| **Maintenance domain** | Maintenance domain name. |
| **Level** | Maintenance domain level configured. |
| **Maintenance association** | Maintenance association name. |
| **Local MEP id** | Numeric identifier of the local MEP. |
| **RemoteMEP identifier** | Numeric identifier of the remote MEP. |
| **Remote MAC address** | Unicast MAC address of the remote MEP. |
| **Iterator name** | Name of iterator. |
| **Iterator Id** | Numeric identifier of the iterator. |
| **Iterator cycle time** | Number of cycles (in milliseconds) taken between back-to-back transmission of SLA frames for this connection |

Table 6: Displaying Iterator Statistics for Ethernet Loss Measurement Output Fields *(continued)*

| Output Field Name | Output Field Description |
|---|---|
| **Iteration period** | Maximum number of cycles per iteration |
| **Iterator status** | Current status of iterator whether running or stopped. |
| **Infinite iterations** | Status of iteration as infinite or finite. |
| **Counter reset time** | Date and time when the counter was reset. |
| **Reset reason** | Reason to reset counter. |
| **LMM sent** | Number of loss measurement message (LMM) PDU frames sent to the peer MEP in this session. |
| **LMM skipped for threshold hit** | Number of LMM frames sent to the peer MEP in this session skipped during threshold hit. |
| **LMM skipped for threshold hit window** | Number of LMM frames sent to the peer MEP in this session skipped during the last threshold hit window. |
| **LMR received** | Number of LMRs frames received. |
| **LMR out of sequence** | Total number of LMR out of sequence packets received. |
| **Near-end (CIR)** | Frame loss associated with ingress data frames for the statistics displayed. |
| **Far-end (CIR)** | Frame loss associated with egress data frames for the statistics displayed. |
| **Near-end (EIR)** | Frame loss associated with ingress data frames for the statistics displayed. |
| **Far-end (EIR)** | Frame loss associated with egress data frames for the statistics displayed. |

## Clearing Iterator Statistics

**Purpose** Clear iterator statistics.

Multiple iterators can be associated with remote MEP. However, by default, only one result pertaining to one iterator profile can be cleared.

**Action**

- To clear the iterator statistics for remote MEP **1** and iterator profile **i1** with MEPs belonging to the maintenance association **ma1** and within the maintenance domain **default-1**:

  ```
  user@host> clear oam ethernet connectivity-fault-management sla-iterator-statistics
  sla-iterator i1 maintenance-domain default-1 maintenance-association ma1 local-mep 1
  remote-mep 1
  ```

- To clear the iterator statistics for remote MEP **1** and iterator profile **i2** with MEPs belonging to the maintenance association **ma1** and within the maintenance domain **default-1**:

  ```
  user@host> clear oam ethernet connectivity-fault-management sla-iterator-statistics
  sla-iterator i2 maintenance-domain default-1 maintenance-association ma1 local-mep 1
  remote-mep 1
  ```

**Related Documentation**

- Configuring an Iterator Profile on page 30
- Configuring a Remote MEP with an Iterator Profile on page 32
- Example: Configuring an Iterator on page 60
- Proactive Mode on page 12

## Managing Continuity Measurement Statistics

- Displaying Continuity Measurement Statistics on page 50
- Clearing Continuity Measurement Statistics on page 50

### Displaying Continuity Measurement Statistics

**Purpose** Display continuity measurement.

The **show oam ethernet connectivity-fault-management delay-statistics maintenance-domain md1 maintenance-association ma1** command is enhanced to display continuity measurement statistics for MEPs in the specified CFM maintenance association (MA) within the specified CFM maintenance domain (MD).

**Action**

- To display the ETH-DM statistics collected for MEPs belonging to MA **ma1** and within MD **md1**:

  ```
  user@host> show oam ethernet connectivity-fault-management delay-statistics
  maintenance-domain md1 maintenance-association ma1
  ```

### Clearing Continuity Measurement Statistics

**Purpose** Clear the continuity measurement statistics

By default, statistics are deleted for all MEPs attached to CFM-enabled interfaces on the router. However, you can filter the scope of the command by specifying an interface name.

**Action**

- To clear the continuity measurement statistics for all MEPs attached to CFM-enabled interfaces on the router:

  ```
  user@host> clear oam ethernet connectivity-fault-management continuity-measurement
  maintenance-domain md-name maintenance-association ma-name local-mep local-mep-id
  remote-mep remote-mep-id
  ```

## Displaying ETH-DM Statistics Only

**Purpose** Display ETH-DM statistics.

By default, the **show oam ethernet connectivity-fault-management delay-statistics** command displays ETH-DM statistics for MEPs in the specified CFM maintenance association (MA) within the specified CFM maintenance domain (MD).

**Action**

- To display the ETH-DM statistics collected for MEPs belonging to MA **ma1** and within MD **md1**:

  ```
  user@host> show oam ethernet connectivity-fault-management delay-statistics
  maintenance-domain ma1 maintenance-association ma1
  ```

- To display the ETH-DM statistics collected for ETH-DM sessions for the local MEP **201** belonging to MA **ma2** and within MD **md2**:

  ```
  user@host> show oam ethernet connectivity-fault-management delay-statistics
  maintenance-domain md2 maintenance-association ma2 local-mep 201
  ```

- To display the ETH-DM statistics collected for ETH-DM sessions from local MEPs belonging to MA **ma3** and within MD **md3** to remote MEP **302**:

  ```
  user@host> show oam ethernet connectivity-fault-management delay-statistics
  maintenance-domain md3 maintenance-association ma3 remote-mep 302
  ```

**Related Documentation**

- **show oam ethernet connectivity-fault-management delay-statistics**

## Displaying ETH-DM Statistics and Frame Counts

**Purpose** Display ETH-DM statistics and ETH-DM frame counts.

By default, the **show oam ethernet connectivity-fault-management mep-statistics** command displays ETH-DM statistics and frame counts for MEPs in the specified CFM maintenance association (MA) within the specified CFM maintenance domain (MD).

**Action**

- To display the ETH-DM statistics and ETH-DM frame counts for MEPs in MA **ma1** and within MD **md1**:

  ```
  user@host> show oam ethernet connectivity-fault-management mep-statistics
  maintenance-domain md1 maintenance-association ma1
  ```

- To display the ETH-DM statistics and ETH-DM frame counts for the local MEP **201** in MA **ma2** and within MD **md2**:

  ```
  user@host> show oam ethernet connectivity-fault-management mep-statistics
  maintenance-domain md2 maintenance-association ma2 local-mep 201
  ```

- To display the ETH-DM statistics and ETH-DM frame counts for the local MEP in MD **md3** and within MA **ma3** that participates in an ETH-DM session with the remote MEP **302**:

  ```
  user@host> show oam ethernet connectivity-fault-management mep-statistics
  maintenance-domain ma3 maintenance-association ma3 remote-mep 302
  ```

Related Documentation
- **show oam ethernet connectivity-fault-management mep-statistics**

## Displaying ETH-DM Frame Counts for MEPs by Enclosing CFM Entity

**Purpose** Display ETH-DM frame counts for CFM maintenance association end points (MEPs).

By default, the **show oam ethernet connectivity-fault-management mep-database** command displays CFM database information for MEPs in the specified CFM maintenance association (MA) within the specified CFM maintenance domain (MD).

NOTE: At the router attached to the initiator MEP for a one-way session, or at the router attached to the receiver MEP for a two-way session, you can only display ETH-DM frame counts.

**Action**
- To display CFM database information (including ETH-DM frame counts) for all MEPs in MA **ma1** within MD **md1**:

  ```
  user@host> show oam ethernet connectivity-fault-management mep-database
  maintenance-domain ma1 maintenance-association ma1
  ```
- To display CFM database information (including ETH-DM frame counts) only for local MEP **201** in MA **ma1** within MD **md1**:

  ```
  user@host> show oam ethernet connectivity-fault-management mep-database
  maintenance-domain md2 maintenance-association ma2 local-mep 201
  ```
- To display CFM database information (including ETH-DM frame counts) only for remote MEP **302** in MD **md3** within MA **ma3**:

  ```
  user@host> show oam ethernet connectivity-fault-management mep-database
  maintenance-domain ma3 maintenance-association ma3 remote-mep 302
  ```

Related Documentation
- **show oam ethernet connectivity-fault-management mep-database**

## Displaying ETH-DM Frame Counts for MEPs by Interface or Domain Level

**Purpose** Display ETH-DM frame counts for CFM maintenance association end points (MEPs).

By default, the **show oam ethernet connectivity-fault-management interfaces** command displays CFM database information for MEPs attached to CFM-enabled Ethernet interfaces on the router or at a maintenance domain level. For Ethernet interfaces that support ETH-DM, any frame counts are also displayed when you specify the **detail** or **extensive** command option.

NOTE: At the router attached to the initiator MEP for a one-way session, or at the router attached to the receiver MEP for a two-way session, you can only display ETH-DM frame counts.

**Action**

- To display CFM database information (including ETH-DM frame counts) for all MEPs attached to CFM-enabled Ethernet interfaces on the router:

  ```
  user@host> show oam ethernet connectivity-fault-management interfaces detail
  ```

- To display CFM database information (including ETH-DM frame counts) only for the MEPs attached to CFM-enabled router interface **ge-5/2/9.0**:

  ```
  user@host> show oam ethernet connectivity-fault-management interfaces ge-5/2/9.0 detail
  ```

- To display CFM database information (including ETH-DM frame counts) only for MEPs enclosed within CFM maintenance domains (MDs) at level **6**:

  ```
  user@host> show oam ethernet connectivity-fault-management interfaces level 6 detail
  ```

**Related Documentation**

- **show oam ethernet connectivity-fault-management interfaces**

## Clearing ETH-DM Statistics and Frame Counts

**Purpose** Clear the ETH-DM statistics and ETH-DM frame counts.

By default, statistics and frame counts are deleted for all MEPs attached to CFM-enabled interfaces on the router. However, you can filter the scope of the command by specifying an interface name.

**Action**

- To clear the ETH-DM statistics and ETH-DM frame counts for all MEPs attached to CFM-enabled interfaces on the router:

  ```
  user@host> clear oam ethernet connectivity-fault-management statistics
  ```

- To clear the ETH-DM statistics and ETH-DM frame counts only for MEPs attached to the logical interface **ge-0/5.9.0**:

  ```
  user@host> clear oam ethernet connectivity-fault-management statistics ge-0/5/9.0
  ```

## Example: One-Way Ethernet Frame Delay Measurement



### Description of the One-Way Frame Delay Measurement Example

This example shows how you can configure two MX Series routers (**MX-PE1** and **MX-PE2**) to support an ETH-DM session between two peer MEPs (MEP **201** and MEP **101**), initiate a one-way ETH-DM session (from MEP **101** to MEP **201**), and then display the ETH-DM statistics and frame counts collected. To increase the accuracy of the ETH-DM statistics, enable optional hardware-assisted timestamping of received ETH-DM frames on the router that contains the receiver MEP.

### Routers Used in This Example

To support one-way ETH-DM with optional hardware timestamping of frames on the reception path, the routers used in this example are configured as follows:

- Routers **MX-PE1** and **MX-PE2** are MX Series routers.
- The system clocks of routers **MX-PE1** and **MX-PE2** are closely synchronized.
- On router **MX-PE1**, interface **ge-5/2/9** is an Ethernet port. The traffic load received is heavy.
- On router **MX-PE2**, interface **ge-0/2/5** is an Ethernet port.

### ETH-DM Frame Counts for this Example

Both routers count the number of ETH-DM frames sent and received by the peer MEPs in the session and store the frame counts in the CFM databases as follows:

- At router **MX-PE2**, which contains the initiator MEP **101**, the CFM database stores the ETH-DM frame counts for a one-way ETH-DM initiator (the count of 1DM frames sent).
- At router **MX-PE1**, which contains the receiver MEP **201**, the CFM database stores the ETH-DM frame counts for a one-way ETH-DM receiver (the count of valid 1DM frames received and the count of invalid 1DM frames received).

### ETH-DM Statistics for this Example

For a one-way frame delay measurement, only the router that contains the receiver MEP measures and stores frame delay statistics. In this example, ETH-DM statistics collected for the session are available only at router **MX-PE1**.

## Steps for the One-Way Frame Delay Measurement Example

The following steps describe an example one-way Ethernet frame delay measurement:

1. At router **MX-PE1**, configure MEP **201** as a CFM maintenance association endpoint in CFM maintenance domain **md6** as follows:

   a. Define the maintenance domain **md6** by associating it with maintenance domain level **6** and maintenance association identifier **ma6**.

   b. Configure the maintenance association by specifying continuity protocol options and specifying MEP identifier **201**.

   c. Configure MEP **201** by attaching it to logical interface **ge-5/2/9.0**, which is a single-tag interface on VLAN **512**.

   The following configuration is only a partial example of a complete and functional router configuration:

```
[edit]
interfaces { # Configure a single-tag logical interface on VLAN 512
  ge-5/2/9 {
    vlan-tagging;
    unit 0 {
      vlan-id 512;
    }
  }
}
protocols {
  oam {
    ethernet {
      connectivity-fault-management {
        traceoptions {
          file eoam_cfm.log size 1g files 2 world-readable;
          flag all;
        }
        maintenance-domain md6 { # Define MD 'md6' on router MX-PE1
          level 6;
          maintenance-association ma6 { # Configure MA 'ma6' on router MX-PE1
            continuity-check {
              interval 100ms;
              hold-interval 1;
            }
            mep 201 { # Configure MEP 201 on router MX-PE1
              interface ge-5/2/9.0; # Attach to logical interface on VLAN 512
              direction down;
              auto-discovery;
            }
          }
        }
      }
    }
  }
}
```

2. At router **MX-PE2**, configure MEP **101** as a CFM maintenance association endpoint in CFM maintenance domain **md6** as follows:

   a. Define the maintenance domain **md6** by associating it with maintenance domain level **6** and maintenance association identifier **ma6**.

   b. Configure the maintenance association by specifying continuity protocol options and specifying MEP identifier **101**.

   c. Configure MEP **101** by attaching it to logical interface **ge-0/2/5.0**, which is a single-tag interface on VLAN **512**.

   The following configuration is only a partial example of a complete and functional configuration for router **MX-PE2**:

```
[edit]
interfaces { # Configure a single-tag logical interface on VLAN 512
  ge-0/2/5 {
    vlan-tagging;
    unit 0 {
      vlan-id 512;
    }
  }
}
protocols {
  oam {
    ethernet {
      connectivity-fault-management {
        traceoptions {
          file eoam_cfm.log size 1g files 2 world-readable;
          flag all;
        }
        maintenance-domain md6 { # Define MD 'md6' on router MX-PE2
          level 6;
          maintenance-association ma6 { # Configure MA 'ma6' on router MX-PE2
            continuity-check {
              interval 100ms;
              hold-interval 1;
            }
            mep 101 { # Configure MEP 101 on router MX-PE2
              interface ge–0/2/5.0; # Attach to logical interface on VLAN 512
              direction down;
              auto-discovery;
            }
          }
        }
      }
    }
  }
```

3. (Optional) To increase the accuracy of the ETH-DM statistics, modify the configuration of router **MX-PE1**, which contains the receiver MEP, by enabling hardware-assisted timestamping of **1DM** frames received on the router.

```
[edit protocols]
oam {
```

```
    ethernet {
      connectivity-fault-management {
        performance-monitoring {
          hardware-assisted-timestamping;
        }
      }
    }
  }
```

4. At router **MX-PE2**, start a one-way frame delay measurement session from local MEP **101** to remote MEP **201** on router **MX-PE1**:

   ```
   user@MX-PE2> monitor ethernet delay-measurement one-way mep 201 maintenance-domain
   md6 maintenance-association ma6 count 10
   One-way ETH-DM request to 00:90:69:0a:43:94, Interface ge-0/2/5.0
   1DM Frames sent : 10
   --- Delay measurement statistics ---
   Packets transmitted: 10
   Average delay: NA, Average delay variation: NA
   Best case delay: NA, Worst case delay: NA
   ```

5. At router **MX-PE2**, which contains the initiator MEP, only the ETH-DM frame counts are available. Furthermore, the only frame count tallied for the initiator of a one-way frame delay measurement is the count of 1DM frames transmitted.

   ETH-DM frame counts (the number of 1DM, DMM, and DMR frames exchanged during an ETH-DM session) are stored in the CFM database of both the initiator and receiver MEPs. When you display CFM database information, you can also display the ETH-DM frame counts. You can display CFM database information for all interfaces on the router, or you can limit the output to MEPs associated with certain CFM MDs and MAs.

   - To display CFM database information for MEPs specified by enclosing CFM entities, use the **mep-database** form of the **show oam ethernet connectivity-fault-management** command. A CFM database also stores any ETH-DM frame counts.

     In the example configuration for router **MX-PE2**, MEP **101** is the only MEP defined in MA **ma6** within MD **md6**. Therefore, the **show oam ethernet connectivity-fault management mep-database** command output displays CFM database information for MEP **101** only, even though you do not filter the command output by including the **local-mep** or **remote-mep** command options.

     ```
     user@MX-PE2> show oam ethernet connectivity-fault-management mep-database
     maintenance-domain md6 maintenance-association ma6
     Maintenance domain name: md6, Format: string, Level: 6
       Maintenance association name: ma6, Format: string
       Continuity-check status: enabled, Interval: 100ms, Loss-threshold: 3 frames

       MEP identifier: 101, Direction: down, MAC address: 00:90:69:0a:48:57
       Auto-discovery: enabled, Priority: 0
       Interface name: ge-0/2/5.0, Interface status: Active, Link status: Up
       Defects:
         Remote MEP not receiving CCM                 : no
         Erroneous CCM received                       : no
         Cross-connect CCM received                   : no
         RDI sent by some MEP                         : no
       Statistics:
         CCMs sent                                    : 1590
         CCMs received out of sequence                : 0
     ```

```
    LBMs sent                                      : 0
    Valid in-order LBRs received                   : 0
    Valid out-of-order LBRs received               : 0
    LBRs received with corrupted data              : 0
    LBRs sent                                      : 0
    LTMs sent                                      : 0
    LTMs received                                  : 0
    LTRs sent                                      : 0
    LTRs received                                  : 0
    Sequence number of next LTM request            : 0
    1DMs sent                                      : 10
    Valid 1DMs received                            : 0
    Invalid 1DMs received                          : 0
    DMMs sent                                      : 0
    DMRs sent                                      : 0
    Valid DMRs received                            : 0
    Invalid DMRs received                          : 0
  Remote MEP count: 1
    Identifier    MAC address        State    Interface
      201     00:90:69:0a:43:94       ok    ge-0/2/5.0
```

- To display CFM database information for MEPs specified by interface name, use the **interfaces detail** form of the **show oam ethernet connectivity-fault-management** command. A CFM database also stores any ETH-DM frame counts.

  In the example configuration for router **MX-PE2**, MEP **101** is the only MEP assigned to an interface on the router. Therefore, the **show oam ethernet connectivity-fault-management interfaces** (**detail** | **extensive**) command output displays CFM database information for MEP **101** only, even though you do not filter the command output by including the ***ethernet-interface-name*** or **level** ***md-level*** command options.

```
user@MX-PE2> show oam ethernet connectivity-fault-management interfaces detail
Interface name: ge-0/2/5.0, Interface status: Active, Link status: Up
  Maintenance domain name: md6, Format: string, Level: 6
    Maintenance association name: ma6, Format: string
    Continuity-check status: enabled, Interval: 100ms, Loss-threshold: 3
frames
    MEP identifier: 101, Direction: down, MAC address: 00:90:69:0a:48:57
    MEP status: running
    Defects:
      Remote MEP not receiving CCM                 : no
      Erroneous CCM received                       : no
      Cross-connect CCM received                   : no
      RDI sent by some MEP                         : no
    Statistics:
      CCMs sent                                    : 1590
      CCMs received out of sequence                : 0
      LBMs sent                                    : 0
      Valid in-order LBRs received                 : 0
      Valid out-of-order LBRs received             : 0
      LBRs received with corrupted data            : 0
      LBRs sent                                    : 0
      LTMs sent                                    : 0
      LTMs received                                : 0
      LTRs sent                                    : 0
      LTRs received                                : 0
      Sequence number of next LTM request          : 0
      1DMs sent                                    : 10
      Valid 1DMs received                          : 0
```

```
  Invalid 1DMs received                          : 0
  DMMs sent                                      : 0
  DMRs sent                                      : 0
  Valid DMRs received                            : 0
  Invalid DMRs received                          : 0
Remote MEP count: 1
  Identifier    MAC address        State    Interface
    201     00:90:69:0a:43:94       ok    ge-0/2/5.0
```

NOTE: You can use these same commands—**show oam ethernet connectivity-fault-management mep-database** and **show oam ethernet connectivity-fault-management interfaces (detail | extensive)**—at router **MX-PE1** to display the CFM database information (which includes any ETH-DM frame counts) for receiver MEP **201**.

6. At router **MX-PE1**, which contains the receiver MEP, you can use two different **show oam ethernet connectivity-fault-management** commands to display ETH-DM statistics and ETH-DM frame counts.

   - To display only the delay statistics, use the **delay-statistics** form of the **show oam ethernet connectivity-fault-management** command:

     ```
     user@MX-PE1> show oam ethernet connectivity-fault-management delay-statistics
     maintenance-domain md6
     MEP identifier: 201, MAC address: 00:90:69:0a:43:94
     Remote MEP count: 1

       Remote MAC address: 00:90:69:0a:48:57
         Delay measurement statistics:
         Index  One-way delay  Two-way delay
                    (usec)         (usec)
           1        370
           2        357
           3        344
           4        332
           5        319
           6        306
           7        294
           8        281
           9        269
           10       255
         Average one-way delay          : 312 usec
         Average one-way delay variation: 11 usec
         Best case one-way delay        : 255 usec
         Worst case one-way delay       : 370 usec
     ```

   - To display both the ETH-DM statistics and the CFM database information (which includes any ETH-DM frame counts), use the **mep-statistics** form of the **show oam ethernet connectivity-fault-management** command:

     ```
     user@MX-PE1> show oam ethernet connectivity-fault-management mep-statistics
     maintenance-domain md6
     MEP identifier: 201, MAC address: 00:90:69:0a:43:94
     Remote MEP count: 1
       CCMs sent                                    : 3240
       CCMs received out of sequence                : 0
       LBMs sent                                    : 0
     ```

```
Valid in-order LBRs received                  : 0
Valid out-of-order LBRs received              : 0
LBRs received with corrupted data             : 0
LBRs sent                                     : 0
LTMs sent                                     : 0
LTMs received                                 : 0
LTRs sent                                     : 0
LTRs received                                 : 0
Sequence number of next LTM request           : 0
1DMs sent                                     : 0
Valid 1DMs received                           : 10
Invalid 1DMs received                         : 0
DMMs sent                                     : 0
DMRs sent                                     : 0
Valid DMRs received                           : 0
Invalid DMRs received                         : 0

Remote MEP identifier: 101
Remote MAC address: 00:90:69:0a:48:57
  Delay measurement statistics:
  Index  One-way delay  Two-way delay
            (usec)         (usec)
    1        370
    2        357
    3        344
    4        332
    5        319
    6        306
    7        294
    8        281
    9        269
    10       255
  Average one-way delay          : 312 usec
  Average one-way delay variation: 11 usec
  Best case one-way delay        : 255 usec
  Worst case one-way delay       : 370 usec
```

**Related Documentation**

- Guidelines for Configuring Routers to Support an ETH-DM Session on page 18
- Guidelines for Starting an ETH-DM Session on page 19
- Guidelines for Managing ETH-DM Statistics and ETH-DM Frame Counts on page 21
- On-Demand Mode on page 11
- Junos® OS Ethernet Interfaces

## Example: Configuring an Iterator

The following examples illustrate the configuration of an iterator for two-way delay measurement and loss measurement and the configuration of a remote MEP with an iterator profile. The examples also illustrate disabling an iterator profile with the **disable** statement and deactivating an iterator profile with the **deactivate** command.

- Example: Configuring an Iterator Profile for Two-way Delay Measurement on page 61
- Example: Configuring an Iterator Profile for Loss Measurement on page 61
- Example: Configuring a Remote MEP with an Iterator Profile on page 61

## Example: Configuring an Iterator Profile for Two-way Delay Measurement

Configuring an iterator profile **i1** for two-way delay measurement, where the cycle time value is **1000 ms**, iteration period is **2000** cycles per second, delay value is **1**, and delay variation value is **1**:

```
[edit protocols oam ethernet connectivity-fault-management performance-monitoring
   sla-iterator-profiles]
i1 {
   cycle-time 1000;
   iteration-period 2000;
   measurement-type two-way-delay;
   calculation-weight {
      delay 1;
      delay-variation 1;
   }
}
```

## Example: Configuring an Iterator Profile for Loss Measurement

Configuring an iterator profile **i2** for loss measurement, where the cycle time value is **1000 ms** and iteration period is **2000** cycles per second:

```
[edit protocols oam ethernet connectivity-fault-management performance-monitoring
   sla-iterator-profiles]
12 {
   cycle-time 1000;
   iteration-period 2000;
   measurement-type loss;
}
```

## Example: Configuring a Remote MEP with an Iterator Profile

Configuring a remote MEP with an iterator profile **i3** for two-way delay measurement, where the data TLV size is **1**, iteration count is **1**, and the priority value is **1** for the remote MEP whose value is **1**:

```
[edit protocols oam ethernet connectivity-fault-management maintenance-domain
   default-1 maintenance association ma1 mep 1 remote-mep 1]
user@host# show
sla-iterator-profile i3 {
   data-tlv-size 1;
   iteration-count 1;
   priority 1;
}
```

## Example: Disabling an Iterator Profile with the disable Statement

Disabling an iterator profile **i1** for two-way delay measurement with the **disable** statement, where the cycle time value is **1000 ms**, iteration period is **2000** cycles per second, delay value is **1**, delay variation value is **1**:

```
[edit protocols oam ethernet connectivity-fault-management performance-monitoring
  sla-iterator-profiles i1]
  disable;
  cycle-time 1000;
  iteration-period 2000;
  measurement-type two-way-delay;
  calculation-weight {
    delay 1;
    delay-variation 1;
  }
```

### Example: Disabling an Iterator Profile by Deactivating the Profile

Disabling an iterator profile **i2** with the **deactivate** command for a remote MEP whose value is **1**:

```
[edit protocols oam ethernet connectivity-fault-management maintenance-domain
  default-1 maintenance association ma1 mep 1]
remote-mep 1 {
  deactivate sla-iterator-profile i2;
}
```

**Related Documentation**

- Proactive Mode on page 12
- Clearing Iterator Statistics on page 49
- Configuring an Iterator Profile on page 30
- Configuring a Remote MEP with an Iterator Profile on page 32
- Displaying Iterator Statistics on page 45
- Managing Iterator Statistics on page 45
- Junos® OS Ethernet Interfaces

## Configuring the Failure Notification Protocol

This topic describes how to configure the Ethernet Operations, Administration, and Maintenance (OAM) Failure Notification Protocol (FNP) on MX Series routers. The FNP detects link failures in a Carrier Ethernet network and broadcasts FNP messages when a failure occurs to all nodes affected by the link failure. To configure FNP functionality, include the **fnp** statement at the **[edit protocols oam ethernet]** hierarchy level:

```
[edit protocols oam]
ethernet {
  fnp {
    interval <100ms | 1s | 10s | 1m | 10m>;
    loss-threshold number
    interface interface name {
      domain-id domain-id
    }
  }
}
```

The **interval** statement specifies the time between the transmission of FNP messages. You can specify 10 minutes (10m), 1 minute (1m), 10 seconds (10s), 1 second (1s), and 100 milliseconds (100ms). The **loss-threshold** statement specifies how many FNP messages can be lost before the FNP message is considered aged out and flushed. You must include the **interface** ***interface-name*** statement with the **domain-id** ***domain-id*** statement. The **domain-id** statement specifies a domain ID for the route. FNP messages can be received and processed on MX Series routers, but generating FNP messages is not supported.

The **show oam ethernet fnp interface**, **show oam ethernet fnp status**, and **show oam ethernet fnp messages** operational commands display the configured information.

FNP can be enabled only on logical interfaces that are part of a VPLS routing instance, and none of the logical interfaces in the VPLS routing instance should have CCM configured. FNP can be enabled on only one logical interface per physical interface.

**Related Documentation**

- connectivity-fault-management on page 91
- IEEE 802.1ag OAM Connectivity Fault Management Overview

CHAPTER 3

# Network Interfaces Configuration Statements and Hierarchy



## [edit interfaces] Hierarchy Level

The statements at the **[edit interfaces *interface-name* unit *logical-unit-number*]** hierarchy level can also be configured at the **[edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number*]** hierarchy level.

NOTE: The accounting-profile statement is an exception to this rule. The **accounting-profile** statement can be configured at the **[edit interfaces *interface-name* unit *logical-unit-number*]** hierarchy level, but it cannot be configured at the **[edit logical-systems *logical-system-name* interfaces *interface-name* unit *logical-unit-number*]** hierarchy level.

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

```
    link-speed speed;
    (loopback | no-loopback);
    mc-ae{
      chassis-id chassis-id;
      mc-ae-id mc-ae-id;
      mode (active-active | active-standby);
      redundancy-group group-id;
      status-control (active | standby);
    }
    minimum-links number;
    source-address-filter {
      mac-address;
    }
    (source-filtering | no-source-filtering);
  }
  aggregated-sonet-options {
    link-speed speed | mixed;
    minimum-links number;
  }
  atm-options {
    cell-bundle-size cells;
    ilmi;
    linear-red-profiles profile-name {
      high-plp-max-threshold percent;
      low-plp-max-threshold percent;
      queue-depth cells high-plp-threshold percent low-plp-threshold percent;
    }
    mpls {
      pop-all-labels {
        required-depth number;
      }
    }
    pic-type (atm1 | atm2);
    plp-to-clp;
    promiscuous-mode {
      vpi vpi-identifier;
    }
    scheduler-maps map-name {
      forwarding-class class-name {
        epd-threshold cells plp1 cells;
        linear-red-profile profile-name;
        priority (high | low);
        transmit-weight (cells number | percent number);
      }
      vc-cos-mode (alternate | strict);
    }
    use-null-cw;
      vpi vpi-identifier {
      maximum-vcs maximum-vcs;
      oam-liveness {
        down-count cells;
        up-count cells;
      }
      oam-period (seconds | disable);
      shaping {
```

```
        (cbr rate | rtvbr peak rate sustained rate burst length | vbr peak rate sustained rate
          burst length);
        queue-length number;
      }
    }
}
clocking clock-source;
data-input (system | interface interface-name);
dce;
serial-options {
  clock-rate rate;
  clocking-mode (dce | internal | loop);
  control-polarity (negative | positive);
  cts-polarity (negative | positive);
  dcd-polarity (negative | positive);
  dce-options {
    control-signal (assert | de-assert | normal);
    cts (ignore | normal | require);
    dcd (ignore | normal | require);
    dsr (ignore | normal | require);
    dtr signal-handling-option;
    ignore-all;
    indication (ignore | normal | require);
    rts (assert | de-assert | normal);
    tm (ignore | normal | require);
  }
  dsr-polarity (negative | positive);
  dte-options {
    control-signal (assert | de-assert | normal);
    cts (ignore | normal | require);
    dcd (ignore | normal | require);
    dsr (ignore | normal | require);
    dtr signal-handling-option;
    ignore-all;
    indication (ignore | normal | require);
    rts (assert | de-assert | normal);
    tm (ignore | normal | require);
  }
  dtr-circuit (balanced | unbalanced);
  dtr-polarity (negative | positive);
  encoding (nrz | nrzi);
  indication-polarity (negative | positive);
  line-protocol protocol;
  loopback mode;
  rts-polarity (negative | positive);
  tm-polarity (negative | positive);
  transmit-clock invert;
}
description text;
dialer-options {
  pool pool-name <priority priority>;
}
disable;
ds0-options {
  bert-algorithm algorithm;
  bert-error-rate rate;
```

```
    bert-period seconds;
    byte-encoding (nx56 | nx64);
    fcs (16 | 32);
    idle-cycle-flag (flags | ones);
    invert-data;
    loopback payload;
    start-end-flag (filler | shared);
  }
  e1-options {
    bert-error-rate rate;
    bert-period seconds;
    fcs (16 | 32);
    framing (g704 | g704-no-crc4 | unframed);
    idle-cycle-flag (flags | ones);
    invert-data;
    loopback (local | remote);
    start-end-flag (filler | shared);
    timeslots time-slot-range;
  }
  e3-options {
    atm-encapsulation (direct | plcp);
    bert-algorithm algorithm;
    bert-error-rate rate;
    bert-period seconds;
    framing feet;
    compatibility-mode (digital-link | kentrox | larscom) <subrate value>;
    fcs (16 | 32);
    framing (g.751 | g.832);
    idle-cycle-flag (filler | shared);
    invert-data;
    loopback (local | remote);
    (payload-scrambler | no-payload-scrambler);
    start-end-flag (filler | shared);
    (unframed | no-unframed);
  }
  encapsulation type;
  es-options {
    backup-interface es-fpc/pic/port;
  }
  fastether-options {
    802.3ad aex;
    (flow-control | no-flow-control);
    ignore-l3-incompletes;
    ingress-rate-limit rate;
    (loopback | no-loopback);
    mpls {
      pop-all-labels {
        required-depth number;
      }
    }
    source-address-filter {
      mac-address;
    }
    (source-filtering | no-source-filtering);
  }
  flexible-vlan-tagging;
```

```
gigether-options {
  802.3ad ae x;
  (asynchronous-notification | no-asynchronous-notification);
  (auto-negotiation | no-auto-negotiation) remote-fault <local-interface-online |
    local-interface-offline>;
  auto-reconnect seconds;
  (flow-control | no-flow-control);
  ignore-l3-incompletes;
  (loopback | no-loopback);
  mpls {
    pop-all-labels {
      required-depth number;
    }
  }
  no-auto-mdix;
  source-address-filter {
    mac-address;
  }
  (source-filtering | no-source-filtering);
  ethernet-switch-profile {
    (mac-learn-enable | no-mac-learn-enable);
    tag-protocol-id [ tpids ];
    ethernet-policer-profile {
      input-priority-map {
        ieee802.1p premium [ values ];
      }
      output-priority-map {
        classifier {
          premium {
            forwarding-class class-name {
              loss-priority (high | low);
            }
          }
        }
      }
      policer cos-policer-name {
        aggregate {
          bandwidth-limit bps;
          burst-size-limit bytes;
        }
        premium {
          bandwidth-limit bps;
          burst-size-limit bytes;
        }
      }
    }
  }
}
(gratuitous-arp-reply | no-gratuitous-arp-reply);
hold-time up milliseconds down milliseconds;
ima-group-options {
  differential-delay number;
  frame-length (32 | 64 | 128 | 256);
  frame-synchronization {
    alpha number;
    beta number;
```

```
      gamma number;
    }
    minimum-links number;
    symmetry (symmetrical-config-and-operation |
      symmetrical-config-asymmetrical-operation);
    test-procedure {
      ima-test-start;
      ima-test-stop;
      interface name;
      pattern number;
      period number;
    }
    transmit-clock (common | independent);
    version (1.0 |1.1);
  }
  ima-link-options group-id group-id;
  interface-set interface-set-name {
    interface ethernet-interface-name {
      (unit unit-number | vlan-tags-outer vlan-tag);
    }
    interface interface-name {
      (unit unit-number);
    }
  }
  isdn-options {
    bchannel-allocation (ascending | descending);
    calling-number number;
    pool pool-name <priority priority>;
    spid1 spid-string;
    spid2 spid-string;
    static-tei-val value;
    switch-type (att5e | etsi | ni1 | ntdms100 | ntt);
    t310 seconds;
    tei-option (first-call | power-up);
  }
  keepalives <down-count number> <interval seconds> <up-count number>;
  link-mode mode;
  lmi {
    lmi-type (ansi | itu | c-lmi);
    n391dte number;
    n392dce number;
    n392dte number;
    n393dce number;
    n393dte number;
    t391dte seconds;
    t392dce seconds;
  }
  lsq-failure-options {
    no-termination-request;
    [ trigger-link-failure interface-name ];
  }
  mac mac-address;
  mlfr-uni-nni-bundle-options {
    acknowledge-retries number;
    acknowledge-timer milliseconds;
    action-red-differential-delay (disable-tx | remove-link);
```

```
    drop-timeout milliseconds;
    fragment-threshold bytes;
    cisco-interoperability send-lip-remove-link-for-link-reject;
    hello-timer milliseconds;
    link-layer-overhead percent;
    lmi-type (ansi | itu | c-lmi);
    minimum-links number;
    mrru bytes;
    n391 number;
    n392 number;
    n393 number;
    red-differential-delay milliseconds;
    t391 seconds;
    t392 seconds;
    yellow-differential-delay milliseconds;
}
modem-options {
    dialin (console | routable);
    init-command-string initialization-command-string;
}
mtu bytes;
multi-chassis-protection {
    peer a.b.c.d {
        interfaceinterface-name;
        }
    }
multiservice-options {
    (core-dump | no-core-dump);
    (syslog | no-syslog);
}
native-vlan-id number;
no-gratuitous-arp-request;
no-keepalives;
no-partition {
    interface-type type;
}
no-vpivci-swapping;
otn-options {
    fec (efec | gfec | none);
    (laser-enable | no-laser-enable);
    (line-loopback | no-line-loopback);
    pass-thru;
    rate (fixed-stuff-bytes | no-fixed-stuff-bytes | pass-thru);
    transmit-payload-type number;
    trigger (oc-lof | oc-lom | oc-los | oc-wavelength-lock | odu-ais | odu-bbe-th | odu-bdi
        | odu-es-th | odu-lck | odu-oci | odu-sd | odu-ses-th | odu-ttim | odu-uas-th |
        opu-ptm | otu-ais | otu-bbe-th | otu-bdi | otu-es-th | otu-fec-deg | otu-fec-exe |
        otu-iae | otu-sd | otu-ses-th | otu-ttim | otu-uas-th);
    tti;
}
optics-options {
    wavelength nm;
    alarm alarm-name {
        (syslog | link-down);
    }
    warning warning-name {
```

```
      (syslog | link-down);
    }
  }
  partition partition-number oc-slice oc-slice-range interface-type type;
  timeslots time-slot-range;
  passive-monitor-mode;
  per-unit-scheduler;
  ppp-options {
    chap {
      access-profile name;
      default-chap-secret name;
      local-name name;
      passive;
    }
    compression {
      acfc;
      pfc;
    }
    dynamic-profile profile-name;
    no-termination-request;
    pap {
      access-profile name;
      local-name name;
      local-password password;
      compression;
    }
  }
  psn-vcipsn-vci-identifier;
  psn-vpipsn-vpi-identifier;
  receive-bucket {
    overflow (discard | tag);
    rate percentage;
    threshold bytes;
  }
  redundancy-options {
    priority sp-fpc/pic/port;
    secondary sp-fpc/pic/port;
    hot-standby;
  }
  satop-options {
    payload-size n;
  }
  schedulers number;
  serial-options {
    clock-rate rate;
    clocking-mode (dce | internal | loop);
    control-polarity (negative | positive);
    cts-polarity (negative | positive);
    dcd-polarity (negative | positive);
    dce-options {
      control-signal (assert | de-assert | normal);
      cts (ignore | normal | require);
      dcd (ignore | normal | require);
      dsr (ignore | normal | require);
      dtr signal-handling-option;
      ignore-all;
```

```
      indication (ignore | normal | require);
      rts (assert | de-assert | normal);
      tm (ignore | normal | require);
    }
    dsr-polarity (negative | positive);
    dte-options {
      control-signal (assert | de-assert | normal);
      cts (ignore | normal | require);
      dcd (ignore | normal | require);
      dsr (ignore | normal | require);
      dtr signal-handling-option;
      ignore-all;
      indication (ignore | normal | require);
      rts (assert | de-assert | normal);
      tm (ignore | normal | require);
    }
    dtr-circuit (balanced | unbalanced);
    dtr-polarity (negative | positive);
    encoding (nrz | nrzi);
    indication-polarity (negative | positive);
    line-protocol protocol;
    loopback mode;
    rts-polarity (negative | positive);
    tm-polarity (negative | positive);
    transmit-clock invert;
  }
  services-options {
    inactivity-timeout seconds;
    open-timeout seconds;
    session-limit {
      maximum number;
      rate new-sessions-per-second;
      }
      syslog {
      host hostname {
        facility-override facility-name;
        log-prefix prefix-number;
        services priority-level;
      }
    }
  }
  shdsl-options {
    annex (annex-a | annex-b);
    line-rate line-rate;
    loopback (local | remote);
    snr-margin {
      current margin;
      snext margin;
    }
  }
  sonet-options {
    aggregate asx;
    aps {
      advertise-interval milliseconds;
      annex-b;
      authentication-key key;
```

```
        fast-aps-switch;
        force;
        hold-time milliseconds;
        lockout;
        neighbor address;
        paired-group group-name;
        preserve-interface;
        protect-circuit group-name;
        request;
        revert-time seconds;
        switching-mode (bidirectional | unidirectional);
        working-circuit group-name;
      }
      bytes {
        c2 value;
        e1-quiet value;
        f1 value;
        f2 value;
        s1 value;
        z3 value;
        z4 value;
      }
      fcs (16 | 32);
      loopback (local | remote);
      mpls {
        pop-all-labels {
          required-depth number;
        }
      }
      path-trace trace-string;
      (payload-scrambler | no-payload-scrambler);
      rfc-2615;
      trigger {
        defect ignore;
        hold-time up milliseconds down milliseconds;
      }
      vtmapping (itu-t | klm);
      (z0-increment | no-z0-increment);
    }
    speed (10m | 100m | 1g | oc3 | oc12 | oc48);
    stacked-vlan-tagging;
    switch-options {
      switch-port port-number {
        (auto-negotiation | no-auto-negotiation);
        speed (10m | 100m | 1g);
        link-mode (full-duplex | half-duplex);
      }
    }
    t1-options {
      bert-algorithm algorithm;
      bert-error-rate rate;
      bert-period seconds;
      buildout value;
      byte-encoding (nx56 | nx64);
      crc-major-alarm-threshold (1e-3 | 5e-4 | 1e-4 | 5e-5 | 1e-5);
      crc-minor-alarm-threshold (1e-3 | 5e-4 | 1e-4 | 5e-5 | 1e-5 | 5e-6 | 1e-6);
```

```
    fcs (16 | 32);
    framing (esf | sf);
    idle-cycle-flag (flags | ones);
    invert-data;
    line-encoding (ami | b8zs);
    loopback (local | payload | remote);
    remote-loopback-respond;
    start-end-flag (filler | shared);
    timeslots time-slot-range;
  }
  t3-options {
    atm-encapsulation (direct | plcp);
    bert-algorithm algorithm;
    bert-error-rate rate;
    bert-period seconds;
    buildout feet;
    (cbit-parity | no-cbit-parity);
    compatibility-mode (adtran | digital-link | kentrox | larscom | verilink) <subrate
      value>;
    fcs (16 | 32);
    (feac-loop-respond | no-feac-loop-respond);
    idle-cycle-flag value;
    (long-buildout | no-long-buildout);
    (loop-timing | no-loop-timing);
    loopback (local | payload | remote);
    (mac | no-mac);
    (payload-scrambler | no-payload-scrambler);
    start-end-flag (filler | shared);
  }
  traceoptions {
    flag flag <flag-modifier> <disable>;
  }
  transmit-bucket {
    overflow discard;
    rate percentage;
    threshold bytes;
  }
  (traps | no-traps);
  unidirectional;
  vlan-tagging;
  vlan-vci-tagging;
  unit logical-unit-number {
    accept-source-mac {
      mac-address mac-address {
        policer {
          input cos-policer-name;
          output cos-policer-name;
        }
      }
    }
    accounting-profile name;
    advisory-options {
      downstream-rate rate;
      upstream-rate rate;
    }
    allow-any-vci;
```

```
atm-scheduler-map (map-name | default);
backup-options {
  interface interface-name;
}
bandwidth rate;
cell-bundle-size cells;
clear-dont-fragment-bit;
compression {
  rtp {
    f-max-period number;
    maximum-contexts number <force>;
    queues [ queue-numbers ];
    port {
      minimum port-number;
      maximum port-number;
    }
  }
}
compression-device interface-name;
copy-tos-to-outer-ip-header;
demux-destination family;
demux-source family;
demux-options {
  underlying-interface interface-name;
}
description text;
interface {
  l2tp-interface-id name;
  (dedicated | shared);
}
dialer-options {
  activation-delay seconds;
  callback;
  callback-wait-period time;
  deactivation-delay seconds;
  dial-string [ dial-string-numbers ];
  idle-timeout seconds;
  incoming-map {
    caller (caller-id | accept-all);
    initial-route-check seconds;
    load-interval seconds;
    load-threshold percent;
    pool pool-name;
    redial-delay time;
    watch-list {
      [ routes ];
    }
  }
}
disable;
disable-mlppp-inner-ppp-pfc;
dlci dlci-identifier;
drop-timeout milliseconds;
dynamic-call-admission-control {
  activation-priority priority;
  bearer-bandwidth-limit kilobits-per-second;
```

```
}
encapsulation type;
epd-threshold cells plp1 cells;
fragment-threshold bytes;
inner-vlan-id-range start start-id end end-id;
input-vlan-map {
   (pop | pop-pop | pop-swap | push | push-push | swap | swap-push | swap-swap);
   inner-tag-protocol-id tpid;
   inner-vlan-id number;
   tag-protocol-id tpid;
   vlan-id number;
}
interleave-fragments;
inverse-arp;
layer2-policer {
   input-policer policer-name;
   input-three-color policer-name;
   output-policer policer-name;
   output-three-color policer-name;
}
link-layer-overhead percent;
minimum-links number;
mrru bytes;
multicast-dlci dlci-identifier;
multicast-vci vpi-identifier.vci-identifier;
multilink-max-classes number;
multipoint;
oam-liveness {
   down-count cells;
   up-count cells;
}
oam-period (seconds | disable);
output-vlan-map {
   (pop | pop-pop | pop-swap | push | push-push | swap | swap-push | swap-swap);
   inner-tag-protocol-id tpid;
   inner-vlan-id number;
   tag-protocol-id tpid;
   vlan-id number;
}
passive-monitor-mode;
peer-unit unit-number;
plp-to-clp;
point-to-point;
ppp-options {
   chap {
      access-profile name;
      default-chap-secret name;
      local-name name;
      passive;
   }
   compression {
      acfc;
      pfc;
      pap;
      default-pap-password password;
      local-name name;
```

```
        local-password password;
        passive;
    }
    dynamic-profile profile-name;
    lcp-max-conf-req number;
    lcp-restart-timer milliseconds;
    loopback-clear-timer seconds;
    ncp-max-conf-req number;
    ncp-restart-timer milliseconds;
}
pppoe-options {
    access-concentrator name;
    auto-reconnect seconds;
    (client | server);
    service-name name;
    underlying-interface interface-name;
}
proxy-arp;
service-domain (inside | outside);
shaping {
    (cbr rate | rtvbr peak rate sustained rate burst length | vbr peak rate sustained rate
        burst length);
    queue-length number;
}
short-sequence;
transmit-weight number;
(traps | no-traps);
trunk-bandwidth rate;
trunk-id number;
tunnel {
    backup-destination address;
    destination address;
    key number;
    routing-instance {
        destination routing-instance-name;
    }
    source source-address;
    ttl number;
}
vci vpi-identifier.vci-identifier;
vci-range start start-vci end end-vci;
vpi vpi-identifier;
vlan-id number;
vlan-id-list [vlan-id vlan-id–vlan-id];
vlan-id-range number-number;
vlan-tags inner tpid.vlan-id outer tpid.vlan-id;
vlan-tags-outer tpid.vlan-id inner-list [vlan-id vlan-id–vlan-id];
family family {
    accounting {
        destination-class-usage;
        source-class-usage {
            direction;
        }
    }
    access-concentrator name;
    address address {
```

```
    destination address;
}
bundle ml-fpc/pic/port | ls-fpc/pic/port);
duplicate-protection;
dynamic-profile profile-name;
filter {
    group filter-group-number;
    input filter-name;
    input-list {
        [ filter-names ];
        output filter-name;
    }
    output-list {
        [ filter-names ];
    }
}
ipsec-sa sa-name;
keep-address-and-control;
max-sessions number;
max-sessions-vsa-ignore;
mtu bytes;
multicast-only;
negotiate-address;
no-redirects;
policer {
    arp policer-template-name;
    input policer-template-name;
    output policer-template-name;
}
primary;
proxy inet-address address;
receive-options-packets;
receive-ttl-exceeded;
remote (inet-address address | mac-address address);
rpf-check {
    fail-filter filter-name;
    mode loose;
}
sampling {
    direction;
}
service {
    input {
        service-set service-set-name <service-filter filter-name>;
        post-service-filter filter-name;
    }
    output {
        service-set service-set-names <service-filter filter-name>;
    }
}
service-name-table table-name;
short-cycle-protection <lockout-time-min minimum-seconds lockout-time-max
    maximum-seconds>;
targeted-broadcast {
    forward-and-send-to-re;
    forward-only;
```

```
        }
        (translate-discard-eligible | no-translate-discard-eligible);
        (translate-fecn-and-becn | no-translate-fecn-and-becn);
        translate-plp-control-word-de;
        unnumbered-address interface-name <destination address destination-profile
          profile-name | preferred-source-address address>;
        address address {
          arp ip-address (mac | multicast-mac) mac-address <publish>;
          broadcast address;
          destination address;
          destination-profile name;
          eui-64;
          multipoint-destination address (dlci dlci-identifier | vci vci-identifier);
          multipoint-destination address {
            epd-threshold cells plp1 cells;
            inverse-arp;
            oam-liveness {
              up-count cells;
              down-count cells;
            }
            oam-period (seconds | disable);
            shaping {
              (cbr rate | rtvbr peak rate sustained rate burst length | vbr peak rate sustained
                rate burst length);
              queue-length number;
            }
            vci vpi-identifier.vci-identifier;
          }
          preferred;
          primary;
          (vrrp-group | vrrp-inet6-group) group-number {
            (accept-data | no-accept-data);
            advertise–interval seconds;
            authentication-type authentication;
            authentication-key key;
            fast-interval milliseconds;
            (preempt | no-preempt) {
              hold-time seconds;
            }
            priority-number number;
            track {
              priority-cost seconds;
              priority-hold-time interface-name {
                bandwidth-threshold bits-per-second {
                  priority;
                }
                interface priority;
              }
              route ip-address/mask routing-instance instance-name priority-cost cost;
            }
            virtual-address [ addresses ];
          }
        }
      }
    }
  }
```

```
}
```

**Related Documentation**

- *Junos OS Hierarchy and RFC Reference*
- Junos® OS Ethernet Interfaces
- Junos® OS Network Interfaces

## [edit logical-systems] Hierarchy Level

The following lists the statements that can be configured at the **[edit logical-systems]** hierarchy level that are also documented in this manual. For more information about logical systems, see the Logical Systems Configuration Guide.

```
logical-systems logical-system-name {
  interfaces interface-name {
    unit logical-unit-number {
      accept-source-mac {
        mac-address mac-address {
          policer {
            input cos-policer-name;
            output cos-policer-name;
          }
        }
      }
      allow-any-vci;
      atm-scheduler-map (map-name | default);
      bandwidth rate;
      backup-options {
        interface interface-name;
      }
      cell-bundle-size cells;
      clear-dont-fragment-bit;
      compression {
        rtp {
          f-max-period number;
          port {
            minimum port-number;
            maximum port-number;
          }
          queues [ queue-numbers ];
        }
      }
      compression-device interface-name;
      description text;
      interface {
        l2tp-interface-id name;
        (dedicated | shared);
      }
      dialer-options {
        activation-delay seconds;
        deactivation-delay seconds;
        dial-string [ dial-string-numbers ];
        idle-timeout seconds;
        initial-route-check seconds;
```

```
    load-threshold number;
    pool pool;
    remote-name remote-callers;
    watch-list {
      [ routes ];
    }
  }
  disable;
  dlci dlci-identifier;
  drop-timeout milliseconds;
  dynamic-call-admission-control {
    activation-priority priority;
    bearer-bandwidth-limit kilobits-per-second;
  }
  encapsulation type;
  epd-threshold cells plp1 cells;
  fragment-threshold bytes;
  input-vlan-map {
    inner-tag-protocol-id;
    inner-vlan-id;
    (pop | pop-pop | pop-swap | push | push-push | swap | swap-push | swap-swap);
    tag-protocol-id tpid;
    vlan-id number;
  }
  interleave-fragments;
  inverse-arp;
  layer2-policer {
    input-policer policer-name;
    input-three-color policer-name;
    output-policer policer-name;
    output-three-color policer-name;
  }
  link-layer-overhead percent;
  minimum-links number;
  mrru bytes;
  multicast-dlci dlci-identifier;
  multicast-vci vpi-identifier.vci-identifier;
  multilink-max-classes number;
  multipoint;
  oam-liveness {
    up-count cells;
    down-count cells;
  }
  oam-period (seconds | disable);
  output-vlan-map {
    inner-tag-protocol-id;
    inner-vlan-id;
    (pop | pop-pop | pop-swap | push | push-push | swap | swap-swap);
    tag-protocol-id tpid;
    vlan-id number;
  }
  passive-monitor-mode;
  peer-unit unit-number;
  plp-to-clp;
  point-to-point;
  ppp-options {
```

```
    chap {
      access-profile name;
      default-chap-secret name;
      local-name name;
      passive;
    }
    compression {
      acfc;
      pfc;
      }
    }
    dynamic-profile profile-name;
    pap {
      default-pap-password password;
      local-name name;
      local-password password;
      passive;
    }
  }
  proxy-arp;
  service-domain (inside | outside);
  shaping {
    (cbr rate | rtvbr peak rate sustained rate burst length | vbr peak rate sustained rate
      burst length);
    queue-length number;
  }
  short-sequence;
  transmit-weight number;
  (traps | no-traps);
  trunk-bandwidth rate;
  trunk-id number;
  tunnel {
    backup-destination address;
    destination address;
    key number;
    routing-instance {
      destination routing-instance-name;
    }
    source source-address;
    ttl number;
  }
  vci vpi-identifier.vci-identifier;
  vlan-id number;
  vlan-id-list [vlan-id vlan-id–vlan-id]
  vlan-tags inner tpid.vlan-id outer tpid.vlan-id;
  vlan-tags outer tpid.vlan-id inner-list [vlan-id vlan-id–vlan-id]
  vpi vpi-identifier;
  family family {
    accounting {
      destination-class-usage;
      source-class-usage {
        direction;
      }
    }
    bundle interface-name;
    filter {
```

```
    group filter-group-number;
    input filter-name;
    input-list {
      [ filter-names ];
    }
    output filter-name;
    output-list {
      [ filter-names ];
    }
  }
  ipsec-sa sa-name;
  keep-address-and-control;
  mtu bytes;
  multicast-only;
  no-redirects;
  policer {
    arp policer-template-name;
    input policer-template-name;
    output policer-template-name;
  }
  primary;
  proxy inet-address address;
  receive-options-packets;
  receive-ttl-exceeded;
  remote (inet-address address | mac-address address);
  rpf-check <fail-filter filter-name> {
    <mode loose>;
  }
  sampling {
    direction;
  }
  service {
    input {
      service-set service-set-name <service-filter filter-name>;
      post-service-filter filter-name;
    }
    output {
      service-set service-set-name <service-filter filter-name>;
    }
  }
  (translate-discard-eligible | no-translate-discard-eligible);
  (translate-fecn-and-becn | no-translate-fecn-and-becn);
  unnumbered-address interface-name destination address destination-profile
    profile-name;
  address address {
    arp ip-address (mac | multicast-mac) mac-address <publish>;
    broadcast address;
    destination address;
    destination-profile name;
    eui-64;
    multipoint-destination address (dlci dlci-identifier | vci vci-identifier);
    multipoint-destination address {
      epd-threshold cells plp1 cells;
      inverse-arp;
      oam-liveness {
        up-count cells;
```

```
            down-count cells;
          }
          oam-period (seconds | disable);
          shaping {
            (cbr rate | rtvbr peak rate sustained rate burst length | vbr peak rate sustained
              rate burst length);
            queue-length number;
          }
          vci vpi-identifier.vci-identifier;
        }
        preferred;
        primary;
        (vrrp-group | vrrp-inet6-group) group-number {
          (accept-data | no-accept-data);
          advertise–interval seconds;
          authentication-type authentication;
          authentication-key key;
          fast-interval milliseconds;
          (preempt | no-preempt) {
            hold-time seconds;
          }
          priority-number number;
          track {
            priority-cost seconds;
            priority-hold-time interface-name {
              interface priority;
              bandwidth-threshold bits-per-second {
                priority;
              }
            }
            route ip-address/mask routing-instance instance-name priority-cost cost;
          }
        }
        virtual-address [ addresses ];
      }
    }
  }
}
```

**Related Documentation**

- *Junos OS Hierarchy and RFC Reference*
- Junos® OS Ethernet Interfaces
- Junos® OS Network Interfaces

## [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 r1 {
    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*
- Junos® OS Ethernet Interfaces
- Junos® OS Network Interfaces

CHAPTER 4

# Statement Summary

## auto-discovery

**Syntax** auto-discovery;

**Hierarchy Level** [edit protocols oam ethernet connectivity-fault-management maintenance-domain *domain-name* maintenance-association *ma-name* mep *mep-id*]

**Release Information** Statement introduced in Junos OS Release 8.4.

**Description** Enable the MEP to accept continuity check messages from all remote MEPs.

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

**Related Documentation**

- Configuring a Maintenance Endpoint
- Example: Configuring Connectivity Fault Management for a PBB Network on MX Series Routers

## calculation-weight

**Syntax**

```
calculation-weight {
  delay delay-value;
  delay-variation delay-variation-value;
}
```

**Hierarchy Level**

[edit protocols oam ethernet connectivity-fault-management performance-monitoring sla-iterator-profiles *profile-name*]

**Release Information**

Statement introduced in Junos OS Release 11.1.
Statement introduced in Junos OS Release 11.4 for EX Series switches.

**Description**

Configure the calculation weight for delay and delay variation.

NOTE: This option is applicable only for two-way delay measurement.

The remaining statements are explained separately.

**Required Privilege Level**

Configure—To enter configuration mode.
Control—To modify any configuration.

**Related Documentation**

- Configuring an Iterator Profile on page 30
- Configuring an Iterator Profile on a Switch (CLI Procedure)
- delay on page 96
- delay-variation on page 97

## connectivity-fault-management

**Syntax**

```
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;
    }
  }
  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 {
    bridge-domain <vlan-id [ vlan-ids ]>;
    instance routing-instance-name;
    interface interface-name;
    level number;
    name-format (character-string | none | dns | mac+2oct);
    maintenance-association ma-name {
      protect-maintenance-association protect-ma-name;
      remote-maintenance-association remote-ma-name;
      short-name-format (character-string | vlan | 2octet | rfc-2685-vpn-id);
      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;
              }
            }
          }
        }
        virtual-switch routing-instance-name {
          bridge-domain name <vlan-ids [ vlan-ids ]>;
        }
      }
    }
```

**Hierarchy Level** [edit protocols oam ethernet]

**Release Information** Statement introduced in Junos OS Release 8.4.

**Description** For Ethernet interfaces on M7i and M10i routers with Enhanced CFEB (CFEB-E), and on M120, M320, MX Series, and T Series routers, specify connectivity fault management for IEEE 802.1ag Operation, Administration, and Management (OAM) support.
In Junos OS Release 9.3 and later, this statement is also supported on aggregated Ethernet interfaces.

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**

- IEEE 802.1ag OAM Connectivity Fault Management Overview
- Example: Configuring Connectivity Fault Management for a PBB Network on MX Series Routers

## continuity-check

**Syntax**

```
continuity-check {
  convey-loss-threshold;
  hold-interval minutes;
  interface-status-tlv;
  interval (10m | 10s | 1m | 1s| 100ms | 10ms);
  loss-threshold number;
  port-status-tlv;
}
```

**Hierarchy Level** [edit protocols oam ethernet connectivity-fault-management maintenance-domain *domain-name* maintenance-association *ma-name*]

**Release Information** Statement introduced in Junos OS Release 8.4.

**Description** Specify continuity check protocol options.

**Options**

**convey-loss-threshold**—Enable loss-threshold-tlv transmission.

**hold-interval *minutes***—Specify the continuity check hold-interval, in minutes.

**interface-status-tlv**—Enable interface-status-tlv transmission.

**interval *(10m | 10s | 1m | 1s| 100ms | 10ms)***—Specify the continuity check interval.

**loss-threshold *minutes***—Specify the loss-threshold, in minutes.

**port-status-tlv**—Enable port-status-tlv transmission.

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

**Related Documentation**

- Continuity Check Protocol
- Example: Configuring Connectivity Fault Management for a PBB Network on MX Series Routers

## cycle-time

**Syntax** cycle-time *cycle-time-value*;

**Hierarchy Level** [edit protocols oam ethernet connectivity-fault-management performance-monitoring sla-iterator-profiles *profile-name*]

**Release Information** Statement introduced in Junos OS Release 11.1.
Statement introduced in Junos OS Release 11.4 for EX Series switches.

**Description** Configure the time (in milliseconds) taken between back-to-back transmissions of SLA frames for a single connection.

**Options** ***cycle-time-value***—Cycle time value in milliseconds.

**Range:** 10 through 3,600,000

**Default:** 1000

**Required Privilege Level** Configure—To enter configuration mode.
Control—To modify any configuration.

**Related Documentation**

- Configuring an Iterator Profile on page 30
- Configuring an Iterator Profile on a Switch (CLI Procedure)

## data-tlv-size

**Syntax** data-tlv-size *size*;

**Hierarchy Level** [edit protocols oam ethernet connectivity-fault-management maintenance-domain *md-name* maintenance-association *ma-name* mep *mep-id* remote-mep *remote-mep-id* sla-iterator-profile *profile-name*]

**Release Information** Statement introduced in Junos OS Release 11.1.

**Description** Configure the size of the data TLV portion of the Y.1731 data frame.

**Options** ***size***—Size of the data TLV portion of the Y.1731 data frame.

NOTE: This option is applicable only for two-way delay measurement.

**Range:** 1 through 1400 bytes

**Default:** 1

**Required Privilege Level** Configure—To enter configuration mode.
Control—To modify any configuration.

**Related Documentation**

- sla-iterator-profile on page 116
- Configuring a Remote MEP with an Iterator Profile on page 32

## delay

**Syntax** delay *delay-value*;

**Hierarchy Level** [edit protocols oam ethernet connectivity-fault-management performance-monitoring sla-iterator-profiles *profile-name* calculation-weight]

**Release Information** Statement introduced in Junos OS Release 11.1.
Statement introduced in Junos OS Release 11.4 for EX Series switches.

**Description** Configure the calculation weight for delay.

**Options** ***delay-value***—Calculation weight for delay.

NOTE: This option is applicable only for two-way delay measurement.

**Range:** 1 through 65,535

**Default:** 1

**Required Privilege Level** Configure—To enter configuration mode.
Control—To modify any configuration.

**Related Documentation**

- Configuring an Iterator Profile on page 30
- Configuring an Iterator Profile on a Switch (CLI Procedure)
- calculation-weight on page 90

## delay-variation

**Syntax** delay-variation *delay-variation-value*;

**Hierarchy Level** [edit protocols oam ethernet connectivity-fault-management performance-monitoring sla-iterator-profiles *profile-name* calculation-weight]

**Release Information** Statement introduced in Junos OS Release 11.1.
Statement introduced in Junos OS Release 11.4 for EX Series switches.

**Description** Configure the calculation weight for delay variation.

**Options** ***delay-variation-value***—Calculation weight for delay variation.

NOTE: This option is applicable only for two-way delay measurement.

**Range:** 1 through 65,535

**Default:** 1

**Required Privilege Level** Configure—To enter configuration mode.
Control—To modify any configuration.

**Related Documentation**

- Configuring an Iterator Profile on page 30
- Configuring an Iterator Profile on a Switch (CLI Procedure)
- calculation-weight on page 90

## delegate-server-processing

**Syntax** delegate-server-processing;

**Hierarchy Level** [edit protocols oam ethernet connectivity-fault-management performance-monitoring]

**Release Information** Statement introduced in Junos OS Release 11.1.

**Description** For Ethernet interfaces on MX Series routers , enable server-side processing for two-way delay measurement and loss measurement.

By default, the processing is done by the Routing Engine.

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

**Related Documentation**

- Ethernet Frame Delay Measurements Overview on page 4

## direction

**Syntax** direction (up | down);

**Hierarchy Level** [edit protocols oam ethernet connectivity-fault-management maintenance-domain *domain-name* maintenance-association *ma-name* mep *mep-id*]

**Release Information** Statement introduced in Junos OS Release 8.4.

**Description** Configure the direction of the MEP.

**Options** **up**—An UP MEP CCM is transmitted out of every logical interface which is part of the same bridging or vpls instance except for the interface configured on this MEP.

NOTE: The up direction for MEP is not supported on T Series routers.

**down**—Down MEP CCMs are transmitted only out the interface configured on this MEP.

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

**Related Documentation**

- Configuring a Maintenance Endpoint
- Example: Configuring Connectivity Fault Management for a PBB Network on MX Series Routers
- IEEE 802.1ag OAM Connectivity Fault Management Overview

## domain-id

**Syntax** domain-id *domain-id*;

**Hierarchy Level** [edit logical-systems *logical-system-name* routing-instances *routing-instance-name* protocols (ospf | ospf3)],
[edit routing-instances *routing-instance-name* protocols (ospf | ospf3)]

**Release Information** Statement introduced before Junos OS Release 7.4.
Statement introduced in Junos OS Release 9.0 for EX Series switches.

**Description** Specify a domain ID for a route. The domain ID identifies the OSPF domain from which the route originated.

**Options** ***domain-id***—You can specify either an IP address or an IP address and a local identifier using the following format: ***ip-address:local-identifier***. If you do not specify a local identifier with the IP address, the identifier is assumed to have a value of 0.

**Default:** If the router ID is not configured in the routing instance, the router ID is derived from an interface address belonging to the routing instance.

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

**Related Documentation**

- Configuring Routing Between PE and CE Routers in Layer 3 VPNs

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

## fast-aps-switch

**Syntax** fast-aps-switch;

**Hierarchy Level** [edit interfaces *interface-name* 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) Reduce the Automatic Protection Switching (APS) switchover time in Layer 2 circuits.

NOTE:

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

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

**Related Documentation**
- Reducing APS Switchover Time in Layer 2 Circuits

## fnp

**Syntax**

```
fnp {
  interval <100ms | 1s | 10s | 1m | 10m>;;
  loss-threshold number
  interface interface name {
    domain-id domain-id
  }
}
```

**Hierarchy Level** [edit protocols oam ethernet]

**Release Information** Command introduced in Junos OS Release 11.4.

**Description** On routers with **ge**, **xe**, or **ae** interfaces, configure an OAM Ethernet failure notification protocol.

**Options**

**interval** ***number***—Specifies the time between the transmission of FNP messages.

**loss-threshold** ***number***—FNP messages that can be lost before the FNP message is considered aged out and flushed.

**interface** ***interface-name***—Name of the Ethernet interface.

**domain-id** ***number***—Domain ID of the access network.

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

**Related Documentation**

- Ethernet Failure Notification Protocol Overview on page 13
- Configuring the Failure Notification Protocol on page 62

## hardware-assisted-timestamping

**Syntax** hardware-assisted-timestamping;

**Hierarchy Level** [edit protocols oam ethernet connectivity-fault-management performance-monitoring]

**Release Information** Statement introduced in Junos OS Release 9.5.

**Description** For Ethernet interfaces on Enhanced and Enhanced Queuing Dense Port Concentrators (DPCs) in MX Series routers only, enable hardware-assisted timestamping support for Ethernet frame delay measurement.

By default, the ETH-DM feature calculates frame delays using software-based timestamping of the ETH-DM PDU frames sent and received by the MEPs in the session. As an option that can increase the accuracy of ETH-DM calculations when the DPC is loaded with heavy traffic in the receive direction, you can enable hardware-assisted timestamping of session frames in the receive direction.

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

**Related Documentation**

- Ethernet Frame Delay Measurements Overview on page 4
- Guidelines for Configuring Routers to Support an ETH-DM Session on page 18
- Enabling the Hardware-Assisted Timestamping Option on page 28

## iteration-count

**Syntax** iteration-count *count-value*;

**Hierarchy Level** [edit protocols oam ethernet connectivity-fault-management maintenance-domain *md-name* maintenance-association *ma-name* mep *mep-id* remote-mep *remote-mep-id* sla-iterator-profile *profile-name*]

**Release Information** Statement introduced in Junos OS Release 11.1.

**Description** Configure the number of iterations for which the connection partakes in the iterator for acquiring SLA measurements.

**Options** ***count-value***—Number of iterations for which the connection should partake in the iterator for acquiring SLA measurements.

**Range:** 1 through 65,535

**Default:** 0 (or infinite iterations)

**Required Privilege Level** Configure—To enter configuration mode.
Control—To modify any configuration.

**Related Documentation**

- sla-iterator-profile on page 116
- Configuring a Remote MEP with an Iterator Profile on page 32

## iteration-period

**Syntax** iteration-period *iteration-period-value*;

**Hierarchy Level** [edit protocols oam ethernet connectivity-fault-management performance-monitoring sla-iterator-profiles *profile-name*]

**Release Information** Statement introduced in Junos OS Release 11.1.
Statement introduced in Junos OS Release 11.4 for EX Series switches.

**Description** Configure the iteration period, which is the maximum number of cycles per iteration (that is, the number of connections registered to an iterator cannot exceed this value).

**Options** ***iteration-period-value***—Maximum number of cycles per iteration.

**Range:** 1 through 2000

**Default:** 2000

**Required Privilege Level** Configure—To enter configuration mode.
Control—To modify any configuration.

**Related Documentation**

- Configuring an Iterator Profile on page 30
- Configuring an Iterator Profile on a Switch (CLI Procedure)

## level

**Syntax** level *number*;

**Hierarchy Level** [edit protocols oam ethernet connectivity-fault-management maintenance-domain *domain-name*]

**Release Information** Statement introduced in Junos OS Release 8.4.
Statement introduced in junos os release 12.1X48 for PTX Series Packet Transport Switches.

**Description** A number used in CFM messages to identify the maintenance association.

**Options** *number*—A number used to identify the maintenance domain to which the CFM message belongs.

**Range:** 0 through 7

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

**Related Documentation**

- Configuring the Maintenance Domain Level
- Example: Configuring Connectivity Fault Management for a PBB Network on MX Series Routers
- Configuring Ethernet 802.1ag OAM on PTX Series Packet Transport Switches

## maintenance-association

**Syntax**

```
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 {
    hold-interval minutes;
    interval (10m | 10s | 1m | 1s| 100ms);
    loss-threshold number;
  }
  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;
      }
    }
  }
}
```

**Hierarchy Level** [edit protocols oam ethernet connectivity-fault-management maintenance-domain *domain-name*]

**Release Information** Statement introduced in Junos OS Release 8.4.
Statement introduced in Junos OS Release 12.1X48 for PTX Series Packet Transport Switches.

**Description** Configure the name of the maintenance association in IEEE-compliant format.

**Options** **ma-name**—The name of the maintenance association within the maintenance domain.

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**

- Creating a Maintenance Association
- Configuring a Maintenance Endpoint
- Example: Configuring Connectivity Fault Management for a PBB Network on MX Series Routers
- Configuring Ethernet 802.1ag OAM on PTX Series Packet Transport Switches

## maintenance-domain

**Syntax**

```
maintenance-domain domain-name {
  bridge-domain name <vlan-id [ vlan-ids ]>;
  instance vpls-instance-name;
  level number;
  maintenance-association ma-name {
    protect-maintenance-association protect-ma-name;
    remote-maintenance-association remote-ma-name;
    short-name-format (character-string | vlan | 2octet | rfc-2685-vpn-id);
    continuity-check {
      hold-interval minutes;
      interval (10m | 10s | 1m | 1s| 100ms);
      loss-threshold number
    }
    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;
        }
      }
    }
    mip-half-function(none | default | explicit);
    name-format (character-string | none | dns | mac+2oct);
  }
  virtual-switch name {
    bridge-domain name <vlan-id [ vlan-ids ]>;
  }
}
```

**Hierarchy Level** [edit protocols oam ethernet connectivity-fault-management]

**Release Information** Statement introduced in Junos OS Release 8.4.
Statement introduced in Junos OS Release 12.1X48 for PTX Series Packet Transport Switches.

**Description** Configure the name of the maintenance domain in IEEE-compliant format.

**Options** *domain-name*—Name of the maintenance domain.

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**

- Creating the Maintenance Domain
- Configuring a Maintenance Endpoint
- Example: Configuring Connectivity Fault Management for a PBB Network on MX Series Routers
- Configuring Ethernet 802.1ag OAM on PTX Series Packet Transport Switches

## measurement-type

**Syntax** measurement-type (loss | statistical-loss-measurement | two-way-delay);

**Hierarchy Level** [edit protocols oam ethernet connectivity-fault-management performance-monitoring sla-iterator-profiles *profile-name*]

**Release Information** Statement introduced in Junos OS Release 11.1.
The **statistical-loss-measurement** option introduced in Junos OS Release 11.2.

**Description** Configure the measurement type for the service level agreement (SLA) frames. An SLA frame is a type of packet used to measure frame loss in Ethernet connections.

**Options**

**loss**—Use Y.1731-compliant line module (LM) frames to measure frame loss.

**statistical-loss-measurement**— Use Y.1731-compliant two-way data module (DM) frames to statistically measure frame loss.

**two-way-delay**—Use Y.1731-compliant two-way DM frames to measure frame loss.

**Required Privilege Level** Configure—To enter configuration mode.
Control—To modify any configuration.

**Related Documentation**

- Configuring an Iterator Profile on page 30

## mep

**Syntax**

```
mep mep-id {
  auto-discovery;
  direction (up | down);
  interface interface-name (protect | working);
  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;
    }
  }
}
```

**Hierarchy Level** [edit protocols oam ethernet connectivity-fault-management maintenance-domain *md-name* maintenance-association *ma-name*]

**Release Information** Statement introduced in Junos OS Release 8.4.

**Description** The numeric identifier of the maintenance association end point (MEP) within the maintenance association.

**Options** **mep-id**—Specify the numeric identifier of the MEP.

**Range:** 1 through 8191

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**

- Configuring a Maintenance Endpoint
- Example: Configuring Connectivity Fault Management for a PBB Network on MX Series Routers

## 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 Switches.

**Description** For Ethernet interfaces on M320, M120, MX Series, and T Series routers and PTX Series Packet Transport Switches, provide IEEE 802.3ah Operation, Administration, and Maitenance (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**
- IEEE 802.3ah OAM Link-Fault Management Overview
- Configuring Ethernet 802.1ag OAM on PTX Series Packet Transport Switches

## performance-monitoring

**Syntax**

```
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);
    }
  }
}
```

**Hierarchy Level** [edit protocols oam ethernet connectivity-fault-management]

**Release Information** Statement introduced in Junos OS Release 9.5.

**Description** Specify performance monitoring support for Ethernet frame delay measurement.

The remaining statements are explained separately.

**Required Privilege Level** Configure—To enter configuration mode.
Control—To modify any configuration.

**Related Documentation**
- Ethernet Frame Delay Measurements Overview on page 4
- Guidelines for Configuring Routers to Support an ETH-DM Session on page 18
- Enabling the Hardware-Assisted Timestamping Option on page 28

## priority (Protocols OAM)

**Syntax** priority *priority-value*;

**Hierarchy Level** [edit protocols oam ethernet connectivity-fault-management maintenance-domain *md-name* maintenance-association *ma-name* mep *mep-id* remote-mep *remote-mep-id* sla-iterator-profile *profile-namesla-iterator-profile*]

**Release Information** Statement introduced in Junos OS Release 11.1.

**Description** Configure the priority of the iterator profile, which is the **vlan-pcp** value that is sent in the Y.1731 data frames.

**Options** ***priority-value***—Priority value, which is the **vlan-pcp** value that is sent in the Y.1731 data frames.

**Range:** 0 through 7

**Default:** 0

**Required Privilege Level** Configure—To enter configuration mode.
Control—To modify any configuration.

**Related Documentation**

- sla-iterator-profile on page 116
- Configuring a Remote MEP with an Iterator Profile on page 32

## protocols

**Syntax** protocols [inet iso mpls];

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

**Release Information** Statement introduced in Junos OS Release 8.3.

**Description** For Layer 2.5 VPNs on T Series, MX Series, M120, and M320 routers support, configure IS-IS (ISO traffic) or MPLS traffic to traverse a TCC interface. By default, IPv4 (inet) traffic runs on T Series, MX, Series, M120, and M320 routers and over TCC interfaces. You must configure the same traffic type on both ends of the Layer 2.5 VPN.

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

**Related Documentation**

- Configuring IS-IS or MPLS Traffic for TCC Interfaces

## sla-iterator-profile

**Syntax**

```
sla-iterator-profile profile-name {
  data-tlv-size size;
  iteration-count count-value;
  priority priority-value;
}
```

**Hierarchy Level**

[edit protocols oam ethernet connectivity-fault-management maintenance-domain *md-name* maintenance-association *ma-name* mep *mep-id* remote-mep *remote-mep-id*]

**Release Information**

Statement introduced in Junos OS Release 11.1.

**Description**

Configure a remote MEP with an iterator profile and specify the options.

**Options**

***profile-name***—Name of the iterator profile configured for a remote MEP. For more information about configuring a remote MEP with an iterator profile, see "Configuring a Remote MEP with an Iterator Profile" on page 32.

The remaining statements are explained separately.

**Required Privilege Level**

Configure—To enter configuration mode.
Control—To modify any configuration.

**Related Documentation**

- Clearing Iterator Statistics on page 49
- Configuring an Iterator Profile on page 30
- Configuring a Remote MEP with an Iterator Profile on page 32
- Example: Configuring an Iterator on page 60
- Displaying Iterator Statistics on page 45
- Managing Iterator Statistics on page 45
- sla-iterator-profiles on page 117

## sla-iterator-profiles

**Syntax**

```
sla-iterator-profiles {
  profile-name {
    calculation-weight {
      delay delay-weight;
      delay-variation delay-variation-weight;
    }
    cycle-time milliseconds;
    iteration-period iteration-period-value;
    measurement-type (loss | statistical-frame-loss | two-way-delay);
  }
}
```

**Hierarchy Level** [edit protocols oam ethernet connectivity-fault-management performance-monitoring]

**Release Information** Statement introduced in Junos OS Release 11.1.

**Description** Configure an iterator application and specify the iterator profile options.

**Options** *profile-name*—Name of the iterator profile. For more information about configuring the iterator profile, see "Configuring an Iterator Profile" on page 30.

The remaining statements are explained separately.

**Required Privilege Level** Configure—To enter configuration mode.
Control—To modify any configuration.

**Related Documentation**

- Clearing Iterator Statistics on page 49
- Configuring an Iterator Profile on page 30
- Configuring a Remote MEP with an Iterator Profile on page 32
- Example: Configuring an Iterator on page 60
- Displaying Iterator Statistics on page 45
- Managing Iterator Statistics on page 45

PART 3

# Administration

CHAPTER 5

# Monitoring Commands

## show oam ethernet connectivity-fault-management delay-statistics

**Syntax**

**show oam ethernet connectivity-fault-management delay-statistics**
<**count** *entry-count*>
<**local-mep** *local-mep-id*>
**maintenance-association** *ma-name*
**maintenance-domain** *md-name*
<**remote-mep** *remote-mep-id*>

**Release Information**

Command introduced in Junos OS Release 9.5.
Command introduced in Junos OS Release 11.4 for EX Series switches.

**Description**

On MX Series routers with Ethernet interfaces on Dense Port Concentrators (DPCs), display ETH-DM delay statistics.

On EX Series switches, display delay measurement results.

**Options**

**count** *entry-count*—(Optional) Number of entries to display from the statistics table. The range of values is **1** through **100**. The default value is **100** entries.

**local-mep** *local-mep-id*—(Optional) Numeric identifier of the local MEP. On MX Series routers, the range of values is **1** through **8192**. On EX Series switches, the range of values is **1** through **8191**.

**maintenance-association** *ma-name*—Name of an existing CFM maintenance association.

**maintenance-domain** *md-name*—Name of an existing connectivity fault management (CFM) maintenance domain.

**remote-mep** *remote-mep-id*—(Optional) Numeric identifier of the remote MEP. On MX Series routers, the range of values is **1** through **8192**. On EX Series switches, the range of values is **1** through **8191**.

**Required Privilege Level**

view

**Related Documentation**

- clear oam ethernet connectivity-fault-management statistics
- clear oam ethernet connectivity-fault-management delay-statistics
- show oam ethernet connectivity-fault-management interfaces on page 130
- show oam ethernet connectivity-fault-management mep-database on page 142
- show oam ethernet connectivity-fault-management mep-statistics on page 152

**List of Sample Output**

show oam ethernet connectivity-fault-management delay-statistics on page 124
show oam ethernet connectivity-fault-management delay-statistics remote-mep on page 124

**Output Fields**

Table 7 on page 123 lists the output fields for the **show oam ethernet connectivity-fault-management delay-statistics** command and the **show oam ethernet**

**connectivity-fault-management mep-statistics** command. Output fields are listed in the approximate order in which they appear.

### Table 7: show oam ethernet connectivity-fault-management delay-statistics and mep-statistics Output Fields

| Output Field Name | Field Description |
|---|---|
| **MEP identifier** | Maintenance association end point (MEP) numeric identifier. |
| **MAC address** | Unicast MAC address configured for the MEP. |
| **Remote MEP count** | Number of remote MEPs (unless you specify the **remote-mep** option). |
| **Remote MEP identifier** | Numeric identifier of the remote MEP. |
| **Remote MAC address** | Unicast MAC address of the remote MEP. |
| **Index** | Index number that corresponds to the ETH-DM entry in the CFM database. |
| **One-way delay (usec)** | For a one-way ETH-DM session, the frame delay time, in microseconds, measured at the receiver MEP.<br><br>For a detailed description of one-way Ethernet frame delay measurement, see the *ITU-T Y.1731 Ethernet Service OAM* topics in the Junos® OS Network Interfaces. |
| **Two-way delay (usec)** | For a two-way ETH-DM session, the frame delay time, in microseconds, measured at the initiator MEP.<br><br>For a detailed description of two-way Ethernet frame delay measurement, see the *ITU-T Y.1731 Ethernet Service OAM* topics in the Junos® OS Network Interfaces. |
| **Average one-way delay** | Average one-way frame delay for the statistics displayed. |
| **Average one-way delay variation** | Average one-way “frame jitter” for the statistics displayed. |
| **Best-case one-way delay** | Lowest one-way frame delay for the statistics displayed. |
| **Worst-case one-way delay** | Highest one-way frame delay for the statistics displayed. |
| **Average two-way delay** | Average two-way frame delay for the statistics displayed. |
| **Average two-way delay variation** | Average two-way “frame jitter” for the statistics displayed. |
| **Best-case two-way delay** | Lowest two-way frame delay for the statistics displayed. |
| **Worst-case two-way delay** | Highest two-way frame delay calculated in this session. |

## Sample Output

### show oam ethernet connectivity-fault-management delay-statistics

```
user@switch> show oam ethernet connectivity-fault-management delay-statistics
maintenance-domain md6 maintenance-association ma6
MEP identifier: 100, MAC address: 00:05:85:73:7b:39
Remote MEP count: 2
  Remote MEP identifier: 101
  Remote MAC address: 00:05:85:73:39:4a
    Delay measurement statistics:
    Index  One-way delay  Two-way delay
              (usec)         (usec)
      1        259            519
      2        273            550
      3        287            571
      4        299            610
      5        313            650
    Average one-way delay          : 286 usec
    Average one-way delay variation: 62 usec
    Best case one-way delay        : 259 usec
    Worst case one-way delay       : 313 usec
    Average two-way delay          : 580 usec
    Average two-way delay variation: 26 usec
    Best case two-way delay        : 519 usec
    Worst case two-way delay       : 650 usec

  Remote MEP identifier: 102
  Remote MAC address: 00:04:55:63:39:5a
    Delay measurement statistics:
    Index  One-way delay  Two-way delay
              (usec)         (usec)
      1        29             58
      2        23             59
      3        27             56
      4        29             62
      5        33             68
    Average one-way delay          : 28 usec
    Average one-way delay variation: 3 usec
    Best case one-way delay        : 23 usec
    Worst case one-way delay       : 33 usec
    Average two-way delay          : 60 usec
    Average two-way delay variation: 3 usec
    Best case two-way delay        : 56 usec
    Worst case two-way delay       : 68 usec
```

### show oam ethernet connectivity-fault-management delay-statistics remote-mep

```
user@switch> show oam ethernet connectivity-fault-management delay-statistics
maintenance-domain md6 maintenance-association ma6 remote-mep 101
MEP identifier: 100, MAC address: 00:05:85:73:7b:39

  Remote MEP identifier: 101
  Remote MAC address: 00:05:85:73:39:4a
    Delay measurement statistics:
    Index  One-way delay  Two-way delay
              (usec)         (usec)
      1        259            519
      2        273            550
      3        287            571
      4        299            610
      5        313            650
    Average one-way delay          : 286 usec
```

```
Average one-way delay variation: 62 usec
Best case one-way delay        : 259 usec
Worst case one-way delay       : 313 usec
Average two-way delay          : 580 usec
Average two-way delay variation: 26 usec
Best case two-way delay        : 519 usec
Worst case two-way delay       : 650 usec
```

## show oam ethernet connectivity-fault-management forwarding-state

**Syntax** **show oam ethernet connectivity-fault-management forwarding-state interface *interface-name* | instance *instance-name* <brief | detail | extensive>**

**Release Information** Command introduced in Junos OS Release 8.4.

**Description** On M7i and M10i with the Enhanced CFEB (CFEB-E), M320, MX Series, T320, and T640 routers, display IEEE 802.1ag Operation, Administration, and Management (OAM) connectivity fault management forwarding state information for Ethernet interfaces.

**Options**

**interface *interface-name***—Display forwarding state information for the specified Ethernet interface only.

**instance *instance-name***—Display forwarding state information for the specified forwarding instance only.

**brief | detail | extensive**—(Optional) Display the specified level of output.

**Required Privilege Level** view

**List of Sample Output**

show oam ethernet connectivity-fault-management forwarding-state instance on page 128
show oam ethernet connectivity-fault-management forwarding-state interface on page 128
show oam ethernet connectivity-fault-management forwarding-state interface detail on page 128
show oam ethernet connectivity-fault-management forwarding-state interfaceinterface-name on page 129

**Output Fields** Table 8 on page 126 lists the output fields for the **show oam ethernet connectivity-fault-management forwarding-state** command. Output fields are listed in the approximate order in which they appear.

Table 8: show oam ethernet connectivity-fault-management forwarding-state Output Fields

| Field Name | Field Description | Level of Output |
|---|---|---|
| **Interface name** | Interface identifier. | All levels |
| **Link (Status)** | Local link status. | All levels |
| **Filter action** | Filter action for messages at the level. | All levels |
| **Next hop type** | Next-hop type. | All levels |
| **Next index** | Next-hop index number. | **brief** |
| **Level** | Maintenance domain (MD) level. | **detail** |

Table 8: show oam ethernet connectivity-fault-management forwarding-state Output Fields *(continued)*

| Field Name | Field Description | Level of Output |
|---|---|---|
| **Direction** | MEP direction configured. | none |
| **Instance name** | Forwarding instance name. | All levels |
| **CEs** | Number of customer edge (CE) interfaces. | All levels |
| **VEs** | Number of VPN endpoint (VE) interfaces. | All levels |

## Sample Output

### show oam ethernet connectivity-fault-management forwarding-state instance

```
user@host> show oam ethernet connectivity–fault-management forwarding-state instance
Instance name: __+bd1__
CEs: 3
VEs: 0
  Maintenance domain forwarding state:

  Level    Direction      Filter action     Nexthop      Nexthop
                                            type         index
  0                       Drop              none
  1                       Drop              none
  2                       Drop              none
  3                       Drop              none
  4                       Drop              none
  5                       Drop              none
  6                       Drop              none
  7                       Drop              none
```

### show oam ethernet connectivity-fault-management forwarding-state interface

```
user@host> show oam ethernet connectivity-fault-management forwarding-state interface
Interface name: ge-3/0/0.0
Instance name: __+bd1__
  Maintenance domain forwarding state:

  Level    Direction      Filter action     Nexthop      Nexthop
                                            type         index
  0                       Drop              none
  1                       Drop              none
  2                       Drop              none
  3                       Drop              none
  4                       Drop              none
  5                       Drop              none
  6                       Drop              none
  7        down           Receive           none

Interface name: xe-0/0/0.0
Instance name: __+bd1__
  Maintenance domain forwarding state:

  Level    Direction      Filter action     Nexthop      Nexthop
                                            type         index
  0                       Drop              none
  1                       Drop              none
  2                       Drop              none
  3                       Drop              none
  4                       Drop              none
  5                       Drop              none
  6                       Drop              none
  7        down           Receive           none
```

### show oam ethernet connectivity-fault-management forwarding-state interface detail

```
user@host> show oam ethernet connectivity-fault-management forwarding-state interface
detail
Interface name: ge-3/0/0.0
Instance name: __+bd1__

  Level: 0
  Filter action: Drop
  Nexthop type: none
```

```
  Level: 1
  Filter action: Drop
  Nexthop type: none

  Level: 2
  Filter action: Drop
  Nexthop type: none

  Level: 3
  Filter action: Drop
  Nexthop type: none

  Level: 4
  Filter action: Drop
  Nexthop type: none

  Level: 5
  Filter action: Drop
  Nexthop type: none

  Level: 6
  Filter action: Drop
  Nexthop type: none

  Level: 7
  Direction: down
  Filter action: Receive
  Nexthop type: none

Interface name: xe-0/0/0.0
Instance name: __+bd1__

  Level: 0
  Filter action: Drop
  Nexthop type: none

  Level: 1
  Filter action: Drop
  Nexthop type: none

  ...
```

### show oam ethernet connectivity-fault-management forwarding-state interface interface-name

```
user@host> show oam ethernet connectivity-fault-management forwarding-state interface
interface-name ge-3/0/0/0.0
Interface name: ge-3/0/0.0
Instance name: __+bd1__
  Maintenance domain forwarding state:

  Level    Direction      Filter action     Nexthop      Nexthop
                                            type         index
  0                       Drop              none
  1                       Drop              none
  2                       Drop              none
  3                       Drop              none
  4                       Drop              none
  5                       Drop              none
  6                       Drop              none
  7        down           Receive           none
```

## show oam ethernet connectivity-fault-management interfaces

**Syntax**

**show oam ethernet connectivity-fault-management interfaces**
<*ethernet-interface-name*>
<level *md-level*>
<**brief | detail | extensive**>

**Release Information**

Command introduced in Junos OS Release 8.4.
Support for ITU-T Y.1731 frame delay measurement added in Junos OS Release 9.5.

**Description**

On M7i and M10i routers with Enhanced CFEB (CFEB-E), and on M320, MX Series, ACX Series, T320, and T640 routers, display IEEE 802.1ag Operation, Administration, and Management (OAM) connectivity fault management (CFM) database information for Ethernet interfaces.

In addition, for Ethernet interfaces on MX Series routers , also display any ITU-T Y.1731 frame delay measurement (ETH-DM) frame counts when **detail** or **extensive** mode is specified.

**Options**

**brief | detail | extensive**—(Optional) Specified level of output.

***ethernet-interface-name***—(Optional) CFM information only for CFM entities attached to the specified Ethernet interface.

**level *md-level***—(Optional) CFM information for CFM identities enclosed within a maintenance domain of the specified level.

**Required Privilege Level**

view

**Related Documentation**

- clear oam ethernet connectivity-fault-management statistics
- show oam ethernet connectivity-fault-management delay-statistics on page 122
- show oam ethernet connectivity-fault-management mep-database on page 142
- show oam ethernet connectivity-fault-management mep-statistics on page 152

**List of Sample Output**



**Output Fields**

Table 9 on page 131 lists the output fields for the **show oam ethernet connectivity-fault-management interfaces** command. Output fields are listed in the approximate order in which they appear.

Table 9: show oam ethernet connectivity-fault-management interfaces Output Fields

| Field Name | Field Description | Level of Output |
|---|---|---|
| **Interface** | Interface identifier. | All levels |
| **Interface status** | Local interface status. | All levels |
| **Link status** | Local link status. **Up**, **down**, or **oam-down**. | All levels |
| **Maintenance domain name** | Maintenance domain name. | **detail extensive** |
| **Format (Maintenance domain)** | Maintenance domain name format configured. | **detail extensive** |
| **Level** | Maintenance domain level configured. | All levels |
| **Maintenance association name** | Maintenance association name. | **detail extensive** |
| **Format (Maintenance association)** | Maintenance association name format configured. | **detail extensive** |
| **Continuity-check status** | Continuity-check status. | **detail extensive** |
| **Interval** | Continuity-check message interval. | **detail extensive** |
| **Loss-threshold** | Lost continuity-check message threshold. | **detail extensive** |
| **Interface status TLV** | Status of the interface status TLV, if configured on the MEP interface: **none**, **up**, **down**, **testing**, **unknown**, **dormant**, **notPresent**, **lowerLayerDown** | **detail extensive** |
| **Port status TLV** | Status of the port status TLV, if configured on the MEP interface: **none**, **no**, **yes** | **detail extensive** |
| **Connection Protection TLV** | Status of the connection protection TLV if configured on the MEP interface: **no**, **yes**<br><br>If **yes**, then the transmitted connection protection TLV is decoded and the following three fields are displayed: **Prefer me**, **Protection in use**, **FRR Flag** | **detail extensive** |
| **Prefer me** | If set to **yes**, the path through which CCM was transmitted is preferred (unless the path fails). It is used for signaling a manual-switch command to the remote side.<br><br>Its value can be **yes** or **no**. | **detail extensive** |
| **Protection in use** | Used for protection decision coordination. Its value is set to **yes** if the endpoint transmitting the CCM is currently transmitting the user traffic to protection path.<br><br>Its value can be **yes** or **no**. | **detail extensive** |

Table 9: show oam ethernet connectivity-fault-management interfaces Output Fields *(continued)*

| Field Name | Field Description | Level of Output |
|---|---|---|
| **FRR Flag** | LSR/LER forwarding the CCM Frame into a bypass tunnel is set.<br><br>Its value can be **yes** or **no**. | **detail extensive** |
| **MEP identifier** | Maintenance association end point (MEP) identifier. | All levels |
| **Neighbors** | Number of MEP neighbors. | All levels |
| **Direction** | MEP direction configured. | **detail extensive** |
| **MAC address** | MAC address configured for the MEP. | **detail extensive** |
| **MEP status** | Indicates the status of the connectivity fault management (CFM) protocol running on the MEP: **Running**, **inactive**, **disabled**, or **unsupported**. | **detail extensive** |
| **Remote MEP not receiving CCM** | Whether the remote MEP is not receiving connectivity check messages (CCMs). | **detail extensive** |
| **Erroneous CCM received** | Whether erroneous CCMs have been received. | **detail extensive** |
| **Cross-connect CCM received** | Whether cross-connect CCMs have been received. | **detail extensive** |
| **RDI sent by some MEP** | Whether the remote defect indication (RDI) bit is set in messages that have been received. The absence of the RDI bit in a CCM indicates that the transmitting MEP is receiving CCMs from all configured MEPs. | **detail extensive** |
| **CCMs sent** | Number of CCMs transmitted. | **detail extensive** |
| **CCMs received out of sequence** | Number of CCMs received out of sequence. | **detail extensive** |
| **LBMs sent** | Number of loopback request messages (LBMs) sent. | **detail extensive** |
| **Valid in-order LBRs received** | Number of loopback response messages (LBRs) received that were valid messages and in sequence. | **detail extensive** |
| **Valid out-of-order LBRs received** | Number of LBRs received that were valid messages and not in sequence. | **detail extensive** |
| **LBRs received with corrupted data** | Number of LBRs received that were corrupted. | **detail extensive** |
| **LBRs sent** | Number of LBRs transmitted. | **detail extensive** |
| **LTMs sent** | Linktrace messages (LTMs) transmitted. | **detail extensive** |

Table 9: show oam ethernet connectivity-fault-management interfaces Output Fields *(continued)*

| Field Name | Field Description | Level of Output |
|---|---|---|
| **LTMs received** | Linktrace messages received. | **detail extensive** |
| **LTRs sent** | Linktrace responses (LTRs) transmitted. | **detail extensive** |
| **LTRs received** | Linktrace responses received. | **detail extensive** |
| **Sequence number of next LTM request** | Sequence number of next LTM request to be transmitted. | **detail extensive** |
| **1DMs sent** | If the interface is attached to an initiator MEP for a one-way ETH-DM session: Number of one-way delay measurement (1DM) PDU frames sent to the peer MEP in this session.<br><br>For all other cases, this field displays **0**. | **detail extensive** |
| **Valid 1DMs received** | If the interface is attached to a receiver MEP for a one-way ETH-DM session: Number of valid 1DM frames received.<br><br>For all other cases, this field displays **0**. | **detail extensive** |
| **Invalid 1DMs received** | If the interface is attached to a receiver MEP for a one-way ETH-DM session: Number of invalid 1DM frames received.<br><br>For all other cases, this field displays **0**. | **detail extensive** |
| **Out of sync 1DMs received** | If the interface is attached to a receiver MEP for a one-way ETH-DM session: Number of out-of-sync one-way delay measurement request packets received. | **detail extensive** |
| **DMMs sent** | If the interface is attached to an initiator MEP for a two-way ETH-DM session: Number of Delay Measurement Message (DMM) PDU frames sent to the peer MEP in this session.<br><br>For all other cases, this field displays **0**. | **detail extensive** |
| **Valid DMMs received** | If the interface is attached to an initiator MEP for a two-way ETH-DM session: Number of valid two-way delay measurement request packets received. | **detail extensive** |
| **Invalid DMMs received** | If the interface is attached to an initiator MEP for a two-way ETH-DM session: Number of invalid two-way delay measurement request packets received. | **detail extensive** |
| **DMRs sent** | If the interface is attached to a responder MEP for a two-way ETH-DM session: Number of delay measurement reply (DMR) frames sent.<br><br>For all other cases, this field displays **0**. | **detail extensive** |
| **Valid DMRs received** | If the interface is attached to an initiator MEP for a two-way ETH-DM session: Number of valid DMRs received.<br><br>For all other cases, this field displays **0**. | **detail extensive** |

Table 9: show oam ethernet connectivity-fault-management interfaces Output Fields *(continued)*

| Field Name | Field Description | Level of Output |
|---|---|---|
| **Invalid DMRs received** | If the interface is attached to an initiator MEP for a two-way ETH-DM session: Number of invalid DMRs received.<br><br>For all other cases, this field displays **0**. | **detail extensive** |
| **LMM sent** | If the interface is attached to an initiator MEP for a ETH-LM session: Number of loss measurement message (LMM) PDU frames sent to the peer MEP in this session. | **detail extensive** |
| **Valid LMM received** | If the interface is attached to an initiator MEP for a ETH-LM session: Number of valid loss measurement request packets received. | **detail extensive** |
| **Invalid LMM received** | If the interface is attached to an initiator MEP for a ETH-LM session: Number of invalid loss measurement request packets received. | **detail extensive** |
| **LMR sent** | If the interface is attached to a responder MEP for a ETH-LM session: Number of loss measurement reply (LMR) frames sent. | **detail extensive** |
| **Valid LMR received** | If the interface is attached to an initiator MEP for a ETH-LM session: Number of valid LMR frames received. | **detail extensive** |
| **Invalid LMR received** | If the interface is attached to an initiator MEP for a ETH-LM session: Number of invalid LMR frames received. | **detail extensive** |
| **Remote MEP count** | Number of remote MEPs. | **extensive** |
| **Identifier** (remote MEP) | MEP identifier of the remote MEP. | **extensive** |
| **MAC address** (remote MEP) | MAC address of the remote MEP. | **extensive** |
| **State** (remote MEP) | State of the remote MEP. | **extensive** |
| **Interface** (remote MEP) | Interface of the remote MEP. | **extensive** |

## Sample Output

### show oam ethernet connectivity-fault-management interfaces

```
user@host> show oam ethernet connectivity-fault-management interfaces
Interface       Link       Status           Level       MEP          Neighbors
                                                        Identifier
ge-1/1/0.0      Up         Active           0           2            1
ge-1/1/0.1      Up         Active           0           2            1
ge-1/1/0.10     Up         Active           0           2            1
ge-1/1/0.100    Up         Active           0           2            1
ge-1/1/0.101    Up         Active           0           2            1
ge-1/1/0.102    Up         Active           0           2            1
ge-1/1/0.103    Up         Active           0           2            1
ge-1/1/0.104    Up         Active           0           2            1
ge-1/1/0.105    Up         Active           0           2            1
ge-1/1/0.106    Up         Active           0           2            1

...
```

### show oam ethernet connectivity-fault-management interfaces detail

```
user@host> show oam ethernet connectivity-fault-management interfaces detail
Interface name: ge-5/2/9.0, Interface status: Active, Link status: Up
  Maintenance domain name: md0, Format: string, Level: 5
  Maintenance association name: ma1, Format: string
  Continuity-check status: enabled, Interval: 100ms, Loss-threshold: 3 frames
   MEP identifier: 1, Direction: down, MAC address: 00:90:69:0b:4b:94
    MEP status: running
    Defects:
      Remote MEP not receiving CCM                 : no
      Erroneous CCM received                       : yes
      Cross-connect CCM received                   : no
      RDI sent by some MEP                         : yes
    Statistics:
      CCMs sent                                    : 76
      CCMs received out of sequence                : 0
      LBMs sent                                    : 0
      Valid in-order LBRs received                 : 0
      Valid out-of-order LBRs received             : 0
      LBRs received with corrupted data            : 0
      LBRs sent                                    : 0
      LTMs sent                                    : 0
      LTMs received                                : 0
      LTRs sent                                    : 0
      LTRs received                                : 0
      Sequence number of next LTM request          : 0
      1DMs sent                                    : 0
      Valid 1DMs received                          : 0
      Invalid 1DMs received                        : 0
      DMMs sent                                    : 0
      DMRs sent                                    : 0
      Valid DMRs received                          : 0
      Invalid DMRs received                        : 0
      LMM sent                                     : 10
      Valid LMM received                           : 20
      Invalid LMM received                         : 0
      LMR sent                                     : 20
      Valid LMR received                           : 10
      Invalid LMR received                         : 0
    Remote MEP count: 2
      Identifier    MAC address        State    Interface
       2001     00:90:69:0b:7f:71       ok    ge-5/2/9.0
```

```
      4001     00:90:69:0b:09:c5       ok    ge-5/2/9.0
```

show oam ethernet connectivity-fault-management interfaces detail (One-Way ETH-DM)

```
user@host show oam ethernet connectivity-fault-management interfaces detail
Interface name: ge-0/2/5.0, Interface status: Active, Link status: Up
  Maintenance domain name: md6, Format: string, Level: 6
    Maintenance association name: ma6, Format: string
    Continuity-check status: enabled, Interval: 100ms, Loss-threshold: 3 frames
     MEP identifier: 101, Direction: down, MAC address: 00:90:69:0a:48:57
    MEP status: running
    Defects:
      Remote MEP not receiving CCM                 : no
      Erroneous CCM received                       : no
      Cross-connect CCM received                   : no
      RDI sent by some MEP                         : no
    Statistics:
      CCMs sent                                    : 1590
      CCMs received out of sequence                : 0
      LBMs sent                                    : 0
      Valid in-order LBRs received                 : 0
      Valid out-of-order LBRs received             : 0
      LBRs received with corrupted data            : 0
      LBRs sent                                    : 0
      LTMs sent                                    : 0
      LTMs received                                : 0
      LTRs sent                                    : 0
      LTRs received                                : 0
      Sequence number of next LTM request          : 0
      1DMs sent                                    : 10
      Valid 1DMs received                          : 0
      Invalid 1DMs received                        : 0
      DMMs sent                                    : 0
      DMRs sent                                    : 0
      Valid DMRs received                          : 0
      Invalid DMRs received                        : 0
    Remote MEP count: 1
      Identifier    MAC address        State    Interface
        201     00:90:69:0a:43:94       ok    ge-0/2/5.0
```

show oam ethernet connectivity-fault-management interfaces detail (Connection Protection TLV Configured)

```
user@hostshow oam ethernet connectivity-fault-management interfaces detail

Interface name: xe-6/2/0.0 , Interface status: Active, Link status: Up
  Maintenance domain name: md6, Format: string, Level: 6
 Maintenance association name: ma6, Format: string
    Continuity-check status: enabled, Interval: 1s, Loss-threshold: 3 frames
    Interface status TLV: none, Port status TLV: none
    Connection Protection TLV: yes
      Prefer me: no, Protection in use: no, FRR Flag: no
    MEP identifier: 1, Direction: down, MAC address: 00:19:e2:b1:14:30
    MEP status: running
    Defects:
      Remote MEP not receiving CCM                 : no
      Erroneous CCM received                       : no
      Cross-connect CCM received                   : no
      RDI sent by some MEP                         : no
      Some remote MEP's MAC in error state         : no
    Statistics:
      CCMs sent                                    : 225
      CCMs received out of sequence                : 0
      LBMs sent                                    : 0
      Valid in-order LBRs received                 : 0
```

```
  Valid out-of-order LBRs received              : 0
  LBRs received with corrupted data             : 0
  LBRs sent                                     : 0
  LTMs sent                                     : 0
  LTMs received                                 : 0
  LTRs sent                                     : 0
  LTRs received                                 : 0
  Sequence number of next LTM request           : 0
  1DMs sent                                     : 0
  Valid 1DMs received                           : 0
  Invalid 1DMs received                         : 0
  Out of sync 1DMs received                     : 0
  DMMs sent                                     : 0
  Valid DMMs received                           : 0
  Invalid DMMs received                         : 0
  DMRs sent                                     : 0
  Valid DMRs received                           : 0
  Invalid DMRs received                         : 0
  LMMs sent                                     : 0
  Valid LMMs received                           : 0
  Invalid LMMs received                         : 0
  LMRs sent                                     : 0
  Valid LMRs received                           : 0
  Invalid LMRs received                         : 0
Remote MEP count: 1
  Identifier    MAC address        State    Interface
      2     00:90:69:7f:e4:30
```

### show oam ethernet connectivity-fault-management interfaces extensive

```
user@host> show oam ethernet connectivity-fault-management interfaces extensive
Interface name: ge-5/2/9.0, Interface status: Active, Link status: Up
  Maintenance domain name: md0, Format: string, Level: 5
    Maintenance association name: ma1, Format: string
    Continuity-check status: enabled, Interval: 100ms, Loss-threshold: 3 frames
    Interface status TLV: none, Port status TLV: none
    Connection Protection TLV: no
 MEP identifier: 1, Direction: down, MAC address: 00:90:69:0b:4b:94
    MEP status: running
    Defects:
      Remote MEP not receiving CCM                 : no
      Erroneous CCM received                       : yes
      Cross-connect CCM received                   : no
      RDI sent by some MEP                         : yes
    Statistics:
      CCMs sent                                    : 76
      CCMs received out of sequence                : 0
      LBMs sent                                    : 0
      Valid in-order LBRs received                 : 0
      Valid out-of-order LBRs received             : 0
      LBRs received with corrupted data            : 0
      LBRs sent                                    : 0
      LTMs sent                                    : 0
      LTMs received                                : 0
      LTRs sent                                    : 0
      LTRs received                                : 0
      Sequence number of next LTM request          : 0
      1DMs sent                                    : 0
      Valid 1DMs received                          : 0
      Invalid 1DMs received                        : 0
      DMMs sent                                    : 0
      DMRs sent                                    : 0
      Valid DMRs received                          : 0
      Invalid DMRs received                        : 0
    Remote MEP count: 2
      Identifier    MAC address        State    Interface
       2001     00:90:69:0b:7f:71       ok    ge-5/2/9.0
       4001     00:90:69:0b:09:c5       ok    ge-5/2/9.0
```

### show oam ethernet connectivity-fault-management interfaces level

```
user@host> show oam ethernet connectivity-fault-management interfaces level 7
Interface       Link       Status           Level       MEP          Neighbors
                                                        Identifier
ge-3/0/0.0      Up         Active           7           201          0
xe-0/0/0.0      Up         Active           7           203          1
```

### show oam ethernet connectivity-fault-management interfaces (trunk ports)

```
user@host> show oam ethernet connectivity-fault-management interfaces

Interface                   Link      Status       Level  MEP          Neighbors
                                                          Identifier
ge-4/0/1.0, vlan 100        Up        Active       5      100          0
ge-10/3/10.4091, vlan 4091  Down      Inactive     4      400          0
ge-4/0/0.0                  Up        Active       6      200          0

user@host> show oam ethernet connectivity-fault-management interfaces ge-4/0/0.0

Interface                   Link      Status       Level  MEP          Neighbors
                                                          Identifier
```

```
ge-4/0/0.0                  Up        Active       6      200          0
```

```
user@host> show oam ethernet connectivity-fault-management interfaces ge-4/0/1.0 vlan 100

Interface                   Link      Status       Level  MEP          Neighbors
                                                          Identifier
ge-4/0/1.0, vlan 100        Up        Active       5      100          0
```

```
user@host> show oam ethernet connectivity-fault-management interfaces ge-10/3/10.4091
vlan 4091

Interface                   Link      Status       Level  MEP          Neighbors
                                                          Identifier
ge-10/3/10.4091, vlan 4091  Down      Inactive     4      400          0
```

## show oam ethernet connectivity-fault-management linktrace path-database

**Syntax** **show oam ethernet connectivity-fault-management linktrace path-database mac-address maintenance-association *ma-name* maintenance-domain *md-name***

**Release Information** Command introduced in Junos OS Release 9.0.

**Description** On M320, MX Series, T320, and T640 routers, display IEEE 802.1ag Operation, Administration, and Management (OAM) connectivity fault management maintenance linktrace database information.

**Options**

**mac-address**—Display connectivity fault management path database information for the specified MAC address of the remote host.

**maintenance-association *ma-name***—Display connectivity fault management path database information for the specified maintenance association.

**maintenance-domain *md-name***—Display connectivity fault management path database information for the specified maintenance domain.

**Required Privilege Level** view

**List of Sample Output**

show oam ethernet connectivity-fault-management linktrace path-database on page 141
show oam ethernet connectivity-fault-management linktrace path-database (Two traceroute Commands) on page 141

**Output Fields** Table 10 on page 140 lists the output fields for the **show oam ethernet connectivity-fault-management linktrace path-database** command. Output fields are listed in the approximate order in which they appear.

### Table 10: show oam ethernet connectivity-fault-management linktrace path-database Output Fields

| Field Name | Field Description |
|---|---|
| **Linktrace to** | MAC address of the 802.1ag node to which the linktrace message is targeted. |
| **Interface** | Interface used by the local MEP to send the linktrace message (LTM). |
| **Maintenance Domain** | Maintenance domain identifier specified in the traceroute command. |
| **Maintenance Association** | Maintenance association identifier specified in the traceroute command. |
| **Level** | Maintenance domain level configured for the maintenance domain. |
| **Local Mep** | MEP identifier of the local MEP originating the linktrace. |
| **Hop** | Sequential hop count of the linktrace path. |

Table 10: show oam ethernet connectivity-fault-management linktrace path-database Output Fields *(continued)*

| Field Name | Field Description |
|---|---|
| **TTL** | Number of hops remaining in the linktrace message (LTM). The time to live (TTL) is decremented at each hop. |
| **Source MAC address** | MAC address of the 802.1ag maintenance intermediate point (MIP) that is forwarding the LTM. |
| **Next hop MAC address** | MAC address of the 802.1ag node that is the next hop in the LTM path. |
| **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 responses (LTR), with a previously sent LTM. |

## Sample Output

### show oam ethernet connectivity-fault-management linktrace path-database

```
user@host> show oam ethernet connectivity-fault-management linktrace path-database
maintenance-domain MD1 maintenance-association MA1 00:01:02:03:04:05
Linktrace to 00:01:02:03:04:05, Interface : ge-5/0/0.0
       Maintenance Domain: MD1, Level: 7
       Maintenance Association: MA1, Local Mep: 1

       Hop     TTL      Source MAC address        Next hop MAC address
       Transaction Identifier:100001
       1       63       00:00:aa:aa:aa:aa         00:00: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
```

### show oam ethernet connectivity-fault-management linktrace path-database (Two traceroute Commands)

```
user@host> show oam ethernet connectivity-fault-management linktrace path-database
maintenance-domain MD2 maintenance-association MA2 00:06:07:08:09:0A
Linktrace to 00:06:07:08:09:0A, Interface : ge-5/0/1.0
       Maintenance Domain: MD2, Level: 6
       Maintenance Association: MA2, Local Mep: 10

       Hop     TTL      Source MAC address        Next hop MAC address
       Transaction Identifier:100002
       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         00:06:07:08:09:0A
       4       60       00:06:07:08:09:0A         00:00:00:00:00:00
       Transaction Identifier:100003
       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         00:06:07:08:09:0A
       4       60       00:06:07:08:09:0A         00:00:00:00:00:00
```

## show oam ethernet connectivity-fault-management mep-database

**Syntax**

**show oam ethernet connectivity-fault-management mep-database**
**maintenance-domain** *domain-name*
**maintenance-association** *ma-name*
<**local-mep** *local-mep-id*>
<**remote-mep** *remote-mep-id*>

**Release Information**

Command introduced in Junos OS Release 8.4.
Support for ITU-T Y.1731 frame delay measurement added in Junos OS Release 9.5.

**Description**

On M7i and M10i routers with Enhanced CFEB (CFEB-E), and on M320, M120, MX Series, ACX Series, T320, and T640 routers, display IEEE 802.1ag Operation, Administration, and Management (OAM) connectivity fault management (CFM) database information for CFM maintenance association end points (MEPs) in a CFM session.

In addition, on M120, M320, and MX series routers, also display port status TLV, interface status TLV, and action profile information.

In addition, for Ethernet interfaces on MX Series routers , also display any ITU-T Y.1731 frame delay measurement (ETH-DM) frame counts.

**Options**

**maintenance-association** ***ma-name***—Name of the maintenance association.

**maintenance-domain** ***domain-name***—Name of the maintenance domain.

***local-mep-id***—(Optional) Numeric identifier of local MEP.

***remote-mep-id***—(Optional) Numeric identifier of the remote MEP.

**Required Privilege Level**

view

**Related Documentation**

- clear oam ethernet connectivity-fault-management statistics
- show oam ethernet connectivity-fault-management delay-statistics on page 122
- show oam ethernet connectivity-fault-management interfaces on page 130
- show oam ethernet connectivity-fault-management mep-statistics on page 152

**List of Sample Output**

show oam ethernet connectivity-fault-management mep-database (enhanced continuity measurement) on page 151

**Output Fields** Table 11 on page 143 lists the output fields for the **show oam ethernet connectivity-fault-management mep-database** command. Output fields are listed in the approximate order in which they appear.

Table 11: show oam ethernet connectivity-fault-management mep-database Output Fields

| Field Name | Field Description |
|---|---|
| **Maintenance domain name** | Maintenance domain name. |
| **Format (Maintenance domain)** | Maintenance domain name format configured. |
| **Level** | Maintenance domain level configured. |
| **Maintenance association name** | Maintenance association name. |
| **Format (Maintenance association)** | Maintenance association name format configured. |
| **Continuity-check status** | Continuity-check status. |
| **Interval** | Continuity-check message interval. |
| **Loss-threshold** | Lost continuity-check message threshold. |
| **Connection Protection TLV** | Status of the connection protection TLV, if configured on the MEP interface: **no**, **yes**<br><br>If **yes**, then the transmitted connection protection TLV is decoded and the following three fields are displayed: **Prefer me**, **Protection in use**, **FRR Flag** |
| **Prefer me** | If set to **yes**, the path through which CCM was transmitted is preferred (unless the path fails). It is used for signaling a manual-switch command to remote side.<br><br>Its value can be **yes** or **no**. |
| **Protection in use** | Used for protection decision coordination. Its value is set to **yes** if the endpoint transmitting the CCM is currently transmitting the user traffic to protection path.<br><br>Its value can be **yes** or **no**. |
| **FRR Flag** | LSR/LER forwarding the CCM Frame into a bypass tunnel is set.<br><br>Its value can be **yes** or **no**. |
| **MEP identifier** | Maintenance association end point (MEP) identifier. |
| **Direction** | MEP direction configured. |

Table 11: show oam ethernet connectivity-fault-management mep-database Output Fields *(continued)*

| Field Name | Field Description |
|---|---|
| **MAC address** | MAC address configured for the MEP. |
| **Auto-discovery** | Whether automatic discovery is enabled or disabled. |
| **Priority** | Priority used for CCMs and linktrace messages transmitted by the MEP. |
| **Interface name** | Interface identifier. |
| **Interface status** | Local interface status. |
| **Link status** | Local link status. |
| **Remote MEP not receiving CCM** | Whether the remote MEP is not receiving CCMs. |
| **Erroneous CCM received** | Whether erroneous CCMs have been received. |
| **Cross-connect CCM received** | Whether cross-connect CCMs have been received. |
| **RDI sent by some MEP** | Whether the remote defect indication (RDI) bit is set in messages that have been received. The absence of the RDI bit in a CCM indicates that the transmitting MEP is receiving CCMs from all configured MEPs. |
| **CCMs sent** | Number of CCMs transmitted. |
| **CCMs received out of sequence** | Number of CCMs received out of sequence. |
| **LBMs sent** | Number of loopback messages (LBMs) sent. |
| **Valid in-order LBRs received** | Number of loopback response messages (LBRs) received that were valid messages and in sequence. |
| **1DMs sent** | If the MEP is an initiator for a one-way ETH-DM session: Number of one-way delay measurement (1DM) PDU frames sent to the peer MEP in this session.<br><br>For all other cases, this field displays **0**. |
| **Valid 1DMs received** | If the MEP is a receiver for a one-way ETH-DM session: Number of valid 1DM frames received.<br><br>For all other cases, this field displays **0**. |
| **Invalid 1DMs received** | If the MEP is a receiver for a one-way ETH-DM session: Number of invalid 1DM frames received.<br><br>For all other cases, this field displays **0**. |

Table 11: show oam ethernet connectivity-fault-management mep-database Output Fields *(continued)*

| Field Name | Field Description |
|---|---|
| **Out of sync 1DMs received** | If the MEP is a receiver for a one-way ETH-DM session: Number of out-of-sync one-way delay measurement request packets received. |
| **DMMs sent** | If the MEP is an initiator for a two-way ETH-DM session: Number of Delay Measurement Message (DMM) PDU frames sent to the peer MEP in this session.<br><br>For all other cases, this field displays **0**. |
| **Valid DMMs received** | If the MEP is an initiator for a two-way ETH-DM session: Number of valid two-way delay measurement packets received. |
| **Invalid DMMs received** | If the MEP is an initiator for a two-way ETH-DM session: Number of invalid two-way delay measurement packets received. |
| **DMRs sent** | If the MEP is a responder for a ETH-DM session: Number of Delay Measurement Reply (DMR) frames sent.<br><br>For all other cases, this field displays **0**. |
| **Valid DMRs received** | If the MEP is an initiator for a two-way ETH-DM session: Number of valid DMRs received.<br><br>For all other cases, this field displays **0**. |
| **Invalid DMRs received** | If the MEP is an initiator for a two-way ETH-DM session: Number of invalid DMRs received.<br><br>For all other cases, this field displays **0**. |
| **Valid out-of-order LBRs received** | Number of LBRs received that were valid messages and not in sequence. |
| **LBRs received with corrupted data** | Number of LBRs received that were corrupted. |
| **LBRs sent** | Number of LBRs transmitted. |
| **LTMs sent** | Linktrace messages (LTMs) transmitted. |
| **LTMs received** | Linktrace messages received. |
| **LTRs sent** | Linktrace responses (LTRs) transmitted. |
| **LTRs received** | Linktrace responses received. |
| **Sequence number of next LTM request** | Sequence number of the next linktrace message request to be transmitted. |
| **LMM sent** | If the interface is attached to an initiator MEP for a ETH-LM session: Number of loss measurement message (LMM) PDU frames sent to the peer MEP in this session. |

Table 11: show oam ethernet connectivity-fault-management mep-database Output Fields *(continued)*

| Field Name | Field Description |
|---|---|
| **Valid LMM received** | If the interface is attached to an initiator MEP for a ETH-LM session: Number of valid loss measurement request packets received. |
| **Invalid LMM received** | If the interface is attached to an initiator MEP for a ETH LM session: Number of invalid loss measurement request packets received. |
| **LMR sent** | If the interface is attached to a responder MEP for a ETH-LM session: Number of loss measurement reply (LMR) frames sent. |
| **Valid LMR received** | If the interface is attached to an initiator MEP for a ETH LM session: Number of valid LMR frames received. |
| **Invalid LMR received** | If the interface is attached to an initiator MEP for a ETH-LM session: Number of invalid LMR frames received. |
| **Remote MEP identifier** | MEP identifier of the remote MEP. |
| **State (remote MEP)** | State of the remote MEP: **idle**, **start**, **ok**, or **failed**. |
| **MAC address** | MAC address of the remote MEP. |
| **Type** | Whether the remote MEP MAC address was learned using automatic discovery or configured. |
| **Interface** | Interface of the remote MEP. A seven-digit number is appended if CFM is configured to run on a routing instance of type VPLS. |
| **Last flapped** | Date, time, and how long ago the remote MEP interface went from down to up. The format is **Last flapped:** ***year-month-day hours:minutes:seconds timezone*** **(*hours:minutes:seconds* ago)**. For example, **Last flapped: 2002-04-26 10:52:40 PDT (04:33:20 ago)**. |
| **Remote defect indication** | Whether the remote defect indication (RDI) bit is set in messages that have been received or transmitted. |
| **Port status TLV** | • In the Maintenance domain section, displays the last transmitted port status TLV value.<br>• In the Remote MEP section, displays the last value of port status TLV received from the remote MEP.<br>In the Action profile section, displays, the last occurred event **port-status-tlv blocked** event. This event occurred due to the reception of **blocked** value in the port status TLV from remote MEP. |
| **Interface status TLV** | • In the Maintenance domain section, displays the last transmitted interface status TLV value.<br>• In the Remote MEP section, displays the last value of interface status TLV received from the remote MEP.<br>In the Action profile section, if displays, the last occurred event interface-status-tlv event ( either **lower-layer-down** or **down**). This event occurred due to the reception of either lower or **down** value in the interface status TLV from remote MEP. |
| **Action profile** | Name of the action profile occurrence associated with a remote MEP. |

Table 11: show oam ethernet connectivity-fault-management mep-database Output Fields *(continued)*

| Field Name | Field Description |
|---|---|
| **Last event** | When an action profile occurs, displays the last event that triggered it. |
| **Last event cleared** | When all the configured and occurred events (under action profile) are cleared, then the action taken gets reverted (such as down interface is made up) and the corresponding time is noted and displayed. |
| **Action** | Action taken and the corresponding time of the action occurrence. |

## Sample Output

### show oam ethernet connectivity-fault-management mep-database

```
user@host> show oam ethernet connectivity-fault-management mep-database
maintenance-domain vpls-vlan2000 maintenance-association vpls-vlan200
Maintenance domain name: vpls-vlan2000, Format: string, Level: 5
  Maintenance association name: vpls-vlan200, Format: string
  Continuity-check status: enabled, Interval: 100ms, Loss-threshold: 3 frames
  MEP identifier: 200, Direction: up, MAC address: 00:19:e2:b0:74:01
  Auto-discovery: enabled, Priority: 0
 Interface status TLV: none, Port status TLV: none
  Connection Protection TLV: no  Interface name: ge-0/0/1.0, Interface status:
Active, Link status: Up
  Defects:
    Remote MEP not receiving CCM                 : no
    Erroneous CCM received                       : no
    Cross-connect CCM received                   : no
    RDI sent by some MEP                         : no
  Statistics:
    CCMs sent                                    : 1476
    CCMs received out of sequence                : 0
    LBMs sent                                    : 85
    Valid in-order LBRs received                 : 78
    Valid out-of-order LBRs received             : 0
    LBRs received with corrupted data            : 0
    LBRs sent                                    : 0
    LTMs sent                                    : 1
    LTMs received                                : 0
    LTRs sent                                    : 0
    LTRs received                                : 1
    Sequence number of next LTM request          : 1
    1DMs sent                                    : 0
    Valid 1DMs received                          : 0
    Invalid 1DMs received                        : 0
    DMMs sent                                    : 0
    DMRs sent                                    : 0
    Valid DMRs received                          : 0
    Invalid DMRs received                        : 0
  Remote MEP count: 1
    Identifier    MAC address        State    Interface
      100     00:19:e2:b2:81:4b       ok  vt-0/1/10.1049088
```

### show oam ethernet connectivity-fault-management mep-database (One-Way ETH-DM)

```
user@host> show oam ethernet connectivity-fault-management mep-database
maintenance-domain md6 maintenance-domain ma6
Maintenance domain name: md6, Format: string, Level: 6
  Maintenance association name: ma6, Format: string
  Continuity-check status: enabled, Interval: 100ms, Loss-threshold: 3 frames
  MEP identifier: 101, Direction: down, MAC address: 00:90:69:0a:48:57
  Auto-discovery: enabled, Priority: 0
  Interface name: ge-0/2/5.0, Interface status: Active, Link status: Up
  Defects:
    Remote MEP not receiving CCM                 : no
    Erroneous CCM received                       : no
    Cross-connect CCM received                   : no
    RDI sent by some MEP                         : no
  Statistics:
    CCMs sent                                    : 1590
    CCMs received out of sequence                : 0
    LBMs sent                                    : 0
    Valid in-order LBRs received                 : 0
```

```
    Valid out-of-order LBRs received              : 0
    LBRs received with corrupted data             : 0
    LBRs sent                                     : 0
    LTMs sent                                     : 0
    LTMs received                                 : 0
    LTRs sent                                     : 0
    LTRs received                                 : 0
    Sequence number of next LTM request           : 0
    1DMs sent                                     : 10
    Valid 1DMs received                           : 0
    Invalid 1DMs received                         : 0
    DMMs sent                                     : 0
    DMRs sent                                     : 0
    Valid DMRs received                           : 0
    Invalid DMRs received                         : 0
  Remote MEP count: 1
    Identifier    MAC address        State    Interface
      201     00:90:69:0a:43:94       ok    ge-0/2/5.0
```

### show oam ethernet connectivity-fault-management mep-database local-mep remote-mep

```
user@host> show oam ethernet connectivity-fault-management mep-database
maintenance-domain vpls-vlan2000 maintenance-association vpls-vlan200 local-mep 200
remote-mep 100
Maintenance domain name: vpls-vlan2000, Format: string, Level: 5
  Maintenance association name: vpls-vlan200, Format: string
  Continuity-check status: enabled, Interval: 100ms, Loss-threshold: 3 frames
  MEP identifier: 200, Direction: up, MAC address: 00:19:e2:b0:74:01
  Auto-discovery: enabled, Priority: 0
  Interface name: ge-0/0/1.0, Interface status: Active, Link status: Up

  Remote MEP identifier: 100, State: ok
    MAC address: 00:19:e2:b2:81:4b, Type: Learned
    Interface: vt-0/1/10.1049088
    Last flapped: Never
    Remote defect indication: false
    Port status TLV: none
    Interface status TLV: none
```

### show oam ethernet connectivity-fault-management mep-database remote-mep (Action Profile Event)

```
user@host> show oam ethernet connectivity-fault-management mep-database
maintenance-domain md5 maintenance-association ma5 remote-mep 200
Maintenance domain name: md5, Format: string, Level: 5
  Maintenance association name: ma5, Format: string
  Continuity-check status: enabled, Interval: 1s, Loss-threshold: 3 frames
  MEP identifier: 100, Direction: down, MAC address: 00:05:85:73:e8:ad
  Auto-discovery: enabled, Priority: 0
  Interface status TLV: none, Port status TLV: none
  Interface name: ge-1/0/8.0, Interface status: Active, Link status: Up

  Remote MEP identifier: 200, State: ok
    MAC address: 00:05:85:73:96:1f, Type: Configured
    Interface: ge-1/0/8.0
    Last flapped: Never
    Remote defect indication: false
    Port status TLV: none
    Interface status TLV: lower-layer-down
    Action profile: juniper
      Last event: Interface-status-tlv lower-layer-down
      Action: Interface-down, Time: 2009-03-27 14:25:10 PDT (00:00:02 ago)

user@host>show oam ethernet connectivity-fault-management mep-database
```

show oam ethernet connectivity-fault-management mep-database (Connection Protection TLV Configured)

**maintenance-domain md5 maintenance-association ma5**

If connection-protection is not enabled on down MEPs, but connection-protection TLV is used, MX always sets the protection-in-use flag in connection-protection tlv, while CCMs are sent out. During reversion, this is an indicator to the receiver that protect-path is in use, otherwise the peer (receiver) assumes working is active and reversion does not work as expected. Setting this bit does not affect protection-switching/traffic-loss.

```
Maintenance domain name: md5, Format: string, Level: 5
  Maintenance association name: ma5, Format: string
  Continuity-check status: enabled, Interval: 1s, Loss-threshold: 3 frames
  MEP identifier: 1, Direction: down, MAC address: 00:19:e2:b1:14:30
  Auto-discovery: enabled, Priority: 0
  Interface status TLV: none, Port status TLV: none
  Connection Protection TLV: yes
    Prefer me: no, Protection in use: no, FRR Flag: no
  Interface name: xe-6/2/0.0, Interface status: Active, Link status: Up
  Defects:
    Remote MEP not receiving CCM                 : no
    Erroneous CCM received                       : no
    Cross-connect CCM received                   : no
    RDI sent by some MEP                         : no
    Some remote MEP's MAC in error state         : no
  Statistics:
    CCMs sent                                    : 251
    CCMs received out of sequence                : 0
    LBMs sent                                    : 0
    Valid in-order LBRs received                 : 0
    Valid out-of-order LBRs received             : 0
    LBRs received with corrupted data            : 0
    LBRs sent                                    : 0
    LTMs sent                                    : 0
    LTMs received                                : 0
    LTRs sent                                    : 0
    LTRs received                                : 0
    Sequence number of next LTM request          : 0
    1DMs sent                                    : 0
    Valid 1DMs received                          : 0
    Invalid 1DMs received                        : 0
    Out of sync 1DMs received                    : 0
    DMMs sent                                    : 0
    Valid DMMs received                          : 0
    Invalid DMMs received                        : 0
    DMRs sent                                    : 0
    Valid DMRs received                          : 0
    Invalid DMRs received                        : 0
    LMMs sent                                    : 0
    Valid LMMs received                          : 0
    Invalid LMMs received                        : 0
    LMRs sent                                    : 0
    Valid LMRs received                          : 0
    Invalid LMRs received                        : 0
  Remote MEP count: 1
   Identifier    MAC address        State    Interface
        2     00:90:69:7f:e4:30
```

show oam ethernet connectivity-fault-management mep-database

```
user@host> show oam ethernet connectivity-fault-management mep-database
maintenance-domain md5 maintenance-association ma5
Maintenance association name: ma1, Format: string
Continuity-check status: enabled, Interval: 1s, Loss-threshold: 3 frames
MEP identifier: 1, Direction: down, MAC address: 00:14:f6:b6:01:fe
```

```
Auto-discovery: enabled, Priority: 0
Interface name: ge-1/0/0.0, Interface status: Active, Link status: Up

Defects:
Remote MEP not receiving CCM         : no
Erroneous CCM received               : no
Cross-connect CCM received           : no
RDI sent by some MEP                 : no

Statistics:
CCMs sent                            : 328703
CCMs received out of sequence        : 0
LBMs sent                            : 85
Valid in-order LBRs received         : 78
Valid out-of-order LBRs received     : 0
LBRs received with corrupted data    : 0
LBRs sent                            : 0
LTMs sent                            : 0
LTMs received                        : 0
LTRs sent                            : 0
LTRs received                        : 0
Sequence number of next LTM request  : 0
1DMs sent                            : 10
Valid 1DMs received                  : 10
Invalid 1DMs received                : 0
DMMs sent                            : 20
DMRs sent                            : 0
Valid DMRs received                  : 10
Invalid DMRs received                : 0
LMM sent                             : 10
Valid LMM received                   : 20
Invalid LMM received                 : 0
LMR sent                             : 20
Valid LMR received                   : 10
Invalid LMR received                 : 0
Remote MEP count                     : 1

Identifier     MAC address         State     Interface
    2       00:12:1e:fb:ea:7d       ok        ge-1/0/0.0
```

### show oam ethernet connectivity-fault-management mep-database (enhanced continuity measurement)

```
user@host> show oam ethernet connectivity-fault-management mep-database
maintenance-domain md5 maintenance-association ma5 local-mep 2001 remote-mep 1001
Maintenance domain name: md5, Format: string, Level: 5
Maintenance association name: ma5, Format: string
Continuity-check status: enabled, Interval: 100ms, Loss-threshold: 3 frames
MEP identifier: 2001, Direction: down, MAC address: 00:19:e2:b2:81:4a
Auto-discovery: enabled, Priority: 0
Interface status TLV: up, Port status TLV: up
Interface name: ge-2/0/0.0, Interface status: Active, Link status: Up

Remote MEP identifier: 1001, State: ok
MAC address  : 00:19:e2:b0:74:00, Type: Learned
Interface    : ge-2/0/0.0
Last flapped  : Never
+ Continuity  : 91%, Admin-enable duration: 2100sec, Oper-down duration: 100sec
Remote defect indication: false
Port status TLV: none
Interface status TLV: none
```

## show oam ethernet connectivity-fault-management mep-statistics

**Syntax**

**show oam ethernet connectivity-fault-management mep-statistics**
**maintenance-domain** *md-name*
**maintenance-association** *ma-name*
<**mep** *mep-id*>
<**remote-mep** *remote-mep-id*>
<**count** *entry-count*>

**Release Information**

Command introduced in Junos OS Release 9.5.
Command introduced in Junos OS Release 11.4 for EX Series switches.

**Description**

On MX Series and ACX Series routers and EX Series switches with Ethernet interfaces, display ETH-DM statistics and ETH-DM frame counts.

**Options**

**maintenance-domain** *md-name*—Name of an existing CFM maintenance domain.

**maintenance-association** *ma-name*—Name of an existing CFM maintenance association.

**mep** *mep-id*—(Optional) Numeric identifier of the local MEP. The range of values is 1 through 8192. On EX Series switches, the range of values is 1 through 8191.

**remote-mep** *remote-mep-id*—(Optional) Numeric identifier of the remote MEP. The range of values is 1 through 8192. On EX Series switches, the range of values is 1 through 8191.

**count** *entry-count*—(Optional) Number of entries to display from the statistics table. The range of values is 1 through 100. The default value is 100 entries.

**Required Privilege Level**

view

**Related Documentation**

- clear oam ethernet connectivity-fault-management statistics
- show oam ethernet connectivity-fault-management delay-statistics on page 122
- show oam ethernet connectivity-fault-management interfaces on page 130
- show oam ethernet connectivity-fault-management mep-database on page 142

**List of Sample Output**

show oam ethernet connectivity-fault-management mep-statistics (CIR counters only) on page 154
show oam ethernet connectivity-fault-management mep-statistics (CIR and EIR counters enabled) on page 155
show oam ethernet connectivity-fault-management mep-statistics remote-mep (CIR counters only) on page 157
show oam ethernet connectivity-fault-management mep-statistics remote-mep (CIR and EIR counters enabled) on page 159
show oam ethernet connectivity-fault-management mep-statistics on page 161
show oam ethernet connectivity-fault-management mep-statistics remote-mep on page 162

**Output Fields** Table 12 on page 153 lists the output fields for the **show oam ethernet connectivity-fault-management mep-statistics** command. Output fields are listed in the approximate order in which they appear.

Table 12: show oam ethernet connectivity-fault-management delay-statistics and mep-statistics Output Fields

| Output Field Name | Field Description |
|---|---|
| **MEP identifier** | Maintenance association end point (MEP) numeric identifier. |
| **MAC address** | Unicast MAC address configured for the MEP. |
| **Remote MEP count** | Number of remote MEPs (unless you specify the **remote-mep** option). |
| **Remote MEP identifier** | Numeric identifier of the remote MEP. |
| **Remote MAC address** | Unicast MAC address of the remote MEP. |
| **Index** | Index number that corresponds to the ETH-DM entry in the CFM database. |
| **One-way delay (usec)** | For a one-way ETH-DM session, the frame delay time, in microseconds, measured at the receiver MEP.<br><br>For a detailed description of one-way Ethernet frame delay measurement, see the *ITU-T Y.1731 Ethernet Service OAM* topics in the Junos® OS Network Interfaces. |
| **Two-way delay (usec)** | For a two-way ETH-DM session, the frame delay time, in microseconds, measured at the initiator MEP.<br><br>For a detailed description of two-way Ethernet frame delay measurement, see the *ITU-T Y.1731 Ethernet Service OAM* topics in the Junos® OS Network Interfaces. |
| **Average one-way delay** | Average one-way frame delay for the statistics displayed. |
| **Average one-way delay variation** | Average one-way “frame jitter” for the statistics displayed. |
| **Best-case one-way delay** | Lowest one-way frame delay for the statistics displayed. |
| **Worst-case one-way delay** | Highest one-way frame delay for the statistics displayed. |
| **Average two-way delay** | Average two-way frame delay for the statistics displayed. |
| **Average two-way delay variation** | Average two-way “frame jitter” for the statistics displayed. |
| **Best-case two-way delay** | Lowest two-way frame delay for the statistics displayed. |
| **Worst-case two-way delay** | Highest two-way frame delay calculated in this session. |

## Sample Output

### show oam ethernet connectivity-fault-management mep-statistics (CIR counters only)

```
user@host> show oam ethernet connectivity-fault-management mep-statistics
maintenance-domain md1 maintenance-association ma-1 local-mep 3 remote-mep 103 count 3
MEP identifier: 100, MAC address: 00:05:85:73:7b:39
Remote MEP count                     : 1
CCMs sent                            : 6550
CCMs received out of sequence        : 0
LBMs sent                            : 0
Valid in-order LBRs received         : 0
Valid out-of-order LBRs received     : 0
LBRs received with corrupted data    : 0
LBRs sent                            : 0
LTMs sent                            : 0
LTMs received                        : 0
LTRs sent                            : 0
LTRs received                        : 0
Sequence number of next LTM request : 0
1DMs sent                            : 5
Valid 1DMs received                  : 0
Invalid 1DMs received                : 0
DMMs sent                            : 5
DMRs sent                            : 0
Valid DMRs received                  : 5
Invalid DMRs received                : 0
LMM sent                             : 5
Valid LMM received                   : 5
Invalid LMM received                 : 0
LMR sent                             : 0
Valid LMR received                   : 5
Invalid LMR received                 : 0
Remote MEP identifier                : 101
Remote MAC address                   : 00:05:85:73:39:4a

Delay measurement statistics:
Index       One-way delay         Two-way delay
               (usec)                (usec)
  1             259                   519
  2             273                   550
  3             287                   571
  4             299                   610
  5             313                   650

Average one-way delay                 : 286 usec
Average one-way delay variation       : 62 usec
Best case one-way delay               : 259 usec
Average two-way delay                 : 580 usec
Average two-way delay variation       : 26 usec
Best case two-way delay               : 519 usec
Worst case two-way delay              : 650 usec

Loss measurement statistics:
Index     Near-end     Far-end       Near-end     Far-end
          Frame loss   Frame loss    Frame loss   Frame loss
            (CIR)       (CIR)         (EIR)        (EIR)
  1           9           9
  2           3           5
  3           7           5
  4           9           6
  5           3           6
```

```
Average near-end loss (CIR)            : 6.2
Average near-end loss ratio (CIR)      : 6.2%
Average far-end loss (CIR)             : 6.2
Average far-end loss ratio (CIR)       : 6.2%
Near-end best case loss (CIR)          : 3
Near-end best case loss ratio (CIR)    : 3%
Near-end worst case loss (CIR)         : 9
Near-end worst case loss ratio (CIR)   : 9%
Far-end best case loss (CIR)           : 5
Far-end best case loss ratio (CIR)     : 5%
Far-end worst case loss (CIR)          : 9
Far-end worst case loss ratio (CIR)    : 9%
```

### show oam ethernet connectivity-fault-management mep-statistics (CIR

```
user@host> show oam ethernet connectivity-fault-management mep-statistics
maintenance-domain md1 maintenance-association ma-1 local-mep 3 remote-mep 103 count 3
MEP identifier: 100, MAC address: 00:05:85:73:7b:39
Remote MEP count                       : 1
CCMs sent                              : 6550
```

and EIR counters enabled)

```
CCMs received out of sequence        : 0
LBMs sent                            : 0
Valid in-order LBRs received         : 0
Valid out-of-order LBRs received     : 0
LBRs received with corrupted data    : 0
LBRs sent                            : 0
LTMs sent                            : 0
LTMs received                        : 0
LTRs sent                            : 0
LTRs received                        : 0
Sequence number of next LTM request  : 0
1DMs sent                            : 5
Valid 1DMs received                  : 0
Invalid 1DMs received                : 0
DMMs sent                            : 5
DMRs sent                            : 0
Valid DMRs received                  : 5
Invalid DMRs received                : 0
LMM sent                             : 5
alid LMM received                    : 5
Invalid LMM received                 : 0
LMR sent                             : 0
Valid LMR received                   : 5
Invalid LMR received                 : 0
Remote MEP identifier                : 101
Remote MAC address                   : 00:05:85:73:39:4a

Delay measurement statistics:
Index       One-way delay         Two-way delay
              (usec)                (usec)
  1            259                   519
  2            273                  550
  3            287                  571
  4            299                  610
  5            313                  650

Average one-way delay                  : 286 usec
Average one-way delay variation        : 62 usec
Best case one-way delay                : 259 usec
Average two-way delay                  : 580 usec
Average two-way delay variation        : 26 usec
Best case two-way delay                : 519 usec
Worst case two-way delay               : 650 usec

Loss measurement statistics:
Index     Near-end     Far-end       Near-end     Far-end
          Frame loss   Frame loss    Frame loss   Frame loss
           (CIR)         (CIR)        (EIR)        (EIR)
  1          9             9            2            4
  2          3             5            4            6
  3          7             5            0            2
  4          9             6            8            2
  5          3             6            6            4

Average near-end loss (CIR)              : 6.2
Average near-end loss ratio (CIR)        : 6.2%
Average far-end loss (CIR)               : 6.2
Average far-end loss ratio (CIR)         : 6.2%
Near-end best case loss (CIR)            : 3
Near-end best case loss ratio (CIR)      : 3%
Near-end worst case loss (CIR)           : 9
```

```
Near-end worst case loss ratio (CIR)      : 9%
Far-end best case loss (CIR)              : 5
Far-end best case loss ratio (CIR)        : 5%
Far-end worst case loss (CIR)             : 9
Far-end worst case loss ratio (CIR)       : 9%
Average near-end loss (EIR)               : 4
Average near-end loss ratio (EIR)         : 4%
Average far-end loss (EIR)                : 3.4
Average far-end loss ratio (EIR)          : 3.4%
Near-end best case loss (EIR)             : 0
Near-end best case loss ratio (EIR)       : 0%
Near-end worst case loss (EIR)            : 8
Near-end worst case loss ratio (EIR)      : 8%
Far-end best case loss (EIR)              : 2
Far-end best case loss ratio (EIR)        : 2%
Far-end worst case loss (EIR)             : 6
Far-end worst case loss ratio (EIR)       : 6%
```

### show oam ethernet connectivity-fault-management mep-statistics

```
user@host> show oam ethernet connectivity-fault-management mep-statistics
maintenance-domain md1 maintenance-association ma-1 local-mep 3 remote-mep 103 count 3
remote-mep 101
MEP identifier: 100, MAC address: 00:05:85:73:7b:39
CCMs sent                               : 7762
```

remote-mep (CIR counters only)

```
CCMs received out of sequence         : 0
LBMs sent                             : 0
Valid in-order LBRs received          : 0
Valid out-of-order LBRs received      : 0
LBRs received with corrupted data     : 0
LBRs sent                             : 0
LTMs sent                             : 0
LTMs received                         : 0
LTRs sent                             : 0
LTRs received                         : 0
Sequence number of next LTM request   : 0
1DMs sent                             : 5
Valid 1DMs received                   : 0
Invalid 1DMs received                 : 0
DMMs sent                             : 5
DMRs sent                             : 0
Valid DMRs received                   : 5
Invalid DMRs received                 : 0
LMM sent                              : 5
Valid LMM received                    : 5
Invalid LMM received                  : 0
LMR sent                              : 0
Valid LMR received                    : 5
Invalid LMR received                  : 0
Remote MEP identifier                 : 101
Remote MAC address                    : 00:05:85:73:39:4a

Delay measurement statistics:
Index       One-way delay         Two-way delay
               (usec)                (usec)
  1             259                   519
  2             273                   550
  3             287                   571
  4             299                   610
  5             313                   650

Average one-way delay                  : 286 usec
Average one-way delay variation        : 62 usec
Best case one-way delay                : 259 usec
Average two-way delay                  : 580 usec
Average two-way delay variation        : 26 usec
Best case two-way delay                : 519 usec
Worst case two-way delay               : 650 usec

Loss measurement statistics:
Index     Near-end     Far-end       Near-end     Far-end
          Frame loss   Frame loss    Frame loss   Frame loss
            (CIR)        (CIR)         (EIR)        (EIR)
  1           9            9
  2           3            5
  3           7            5
  4           9            6
  5           3            6
Average near-end loss (CIR)               : 6.2
Average near-end loss ratio (CIR)         : 6.2%
Average far-end loss (CIR)                : 6.2
Average far-end loss ratio (CIR)          : 6.2%
Near-end best case loss (CIR)             : 3
Near-end best case loss ratio (CIR)       : 3%
Near-end worst case loss (CIR)            : 9
Near-end worst case loss ratio (CIR)      : 9%
```

```
Far-end best case loss (CIR)              : 5
Far-end best case loss ratio (CIR)        : 5%
Far-end worst case loss (CIR)             : 9
Far-end worst case loss ratio (CIR)       : 9%
Average near-end loss (EIR)               : 4
Average near-end loss ratio (EIR)         : 4%
Average far-end loss (EIR)                : 3.4
Average far-end loss ratio (EIR)          : 3.4%
Near-end best case loss (EIR)             : 0
Near-end best case loss ratio (EIR)       : 0%
Near-end worst case loss (EIR)            : 8
Near-end worst case loss ratio (EIR)      : 8%
Far-end best case loss (EIR)              : 2
Far-end best case loss ratio (EIR)        : 2%
Far-end worst case loss (EIR)             : 6
Far-end worst case loss ratio (EIR)       : 6%
```

### show oam ethernet connectivity-fault-management mep-statistics

```
user@host> show oam ethernet connectivity-fault-management mep-statistics
maintenance-domain md1 maintenance-association ma-1 local-mep 3 remote-mep 103 count 3
remote-mep 101
MEP identifier: 100, MAC address: 00:05:85:73:7b:39
CCMs sent                              :7762
```

### remote-mep (CIR and EIR counters enabled)

```
CCMs received out of sequence        : 0
LBMs sent                            : 0
Valid in-order LBRs received         : 0
Valid out-of-order LBRs received     : 0
LBRs received with corrupted data    : 0
LBRs sent                            : 0
LTMs sent                            : 0
LTMs received                        : 0
LTRs sent                            : 0
LTRs received                        : 0
Sequence number of next LTM request  : 0
1DMs sent                            : 5
Valid 1DMs received                  : 0
Invalid 1DMs received                : 0
DMMs sent                            : 5
DMRs sent                            : 0
Valid DMRs received                  : 5
Invalid DMRs received                : 0
LMM sent                             : 5
Valid LMM received                   : 5
Invalid LMM received                 : 0
LMR sent                             : 0
Valid LMR received                   : 5
Invalid LMR received                 : 0
Remote MEP identifier                : 101
Remote MAC address                   : 00:05:85:73:39:4a

Delay measurement statistics:
Index       One-way delay         Two-way delay
               (usec)                (usec)
  1             259                   519
  2             273                   550
  3             287                   571
  4             299                   610
  5             313                   650

Average one-way delay                 : 286 usec
Average one-way delay variation       : 62 usec
Best case one-way delay               : 259 usec
Average two-way delay                 : 580 usec
Average two-way delay variation       : 26 usec
Best case two-way delay               : 519 usec
Worst case two-way delay              : 650 usec

Loss measurement statistics:
Index     Near-end     Far-end       Near-end     Far-end
          Frame loss   Frame loss    Frame loss   Frame loss
            (CIR)       (CIR)         (EIR)        (EIR)
  1          10           8             5            12
  2          12           7             6            16
  3          7            5             0            2
  4          9            6             8            2
  5          3            6             6            4

Average near-end loss (CIR)             : 6.2
Average near-end loss ratio (CIR)       : 6.2%
Average far-end loss (CIR)              : 6.2
Average far-end loss ratio (CIR)        : 6.2%
Near-end best case loss (CIR)           : 3
Near-end best case loss ratio (CIR)     : 3%
Near-end worst case loss (CIR)          : 9
```

```
Near-end worst case loss ratio (CIR)    : 9%
Far-end best case loss (CIR)            : 5
Far-end best case loss ratio (CIR)      : 5%
Far-end worst case loss (CIR)           : 9
Far-end worst case loss ratio (CIR)     : 9%
Average near-end loss (EIR)             : 4
Average near-end loss ratio (EIR)       : 4%
Average far-end loss (EIR)              : 3.4
Average far-end loss ratio (EIR)        : 3.4%
Near-end best case loss (EIR)           : 0
Near-end best case loss ratio (EIR)     : 0%
Near-end worst case loss (EIR)          : 8
Near-end worst case loss ratio (EIR)    : 8%
Far-end best case loss (EIR)            : 2
Far-end best case loss ratio (EIR)      : 2%
Far-end worst case loss (EIR)           : 6
Far-end worst case loss ratio (EIR)     : 6%
```

### show oam ethernet connectivity-fault-management mep-statistics

```
user@host> show oam ethernet connectivity-fault-management mep-statistics
maintenance-domain md1 maintenance-association ma-1
MEP identifier: 100, MAC address: 00:05:85:73:7b:39
Remote MEP count: 1
  CCMs sent                                       : 6550
  CCMs received out of sequence                   : 0
  LBMs sent                                       : 0
  Valid in-order LBRs received                    : 0
  Valid out-of-order LBRs received                : 0
  LBRs received with corrupted data               : 0
  LBRs sent                                       : 0
  LTMs sent                                       : 0
  LTMs received                                   : 0
  LTRs sent                                       : 0
  LTRs received                                   : 0
  Sequence number of next LTM request             : 0
  1DMs sent                                       : 5
  Valid 1DMs received                             : 0
  Invalid 1DMs received                           : 0
  DMMs sent                                       : 5
  DMRs sent                                       : 0
  Valid DMRs received                             : 5
  Invalid DMRs received                           : 0

  Remote MEP identifier: 101
  Remote MAC address: 00:05:85:73:39:4a
    Delay measurement statistics:
    Index  One-way delay  Two-way delay
              (usec)         (usec)
      1        259            519
      2        273            550
      3        287            571
      4        299            610
      5        313            650
    Average one-way delay          : 286 usec
    Average one-way delay variation: 62 usec
    Best case one-way delay        : 259 usec
    Worst case one-way delay       : 313 usec
    Average two-way delay          : 580 usec
    Average two-way delay variation: 26 usec
    Best case two-way delay        : 519 usec
    Worst case two-way delay       : 650 usec
```

show oam ethernet connectivity-fault-management mep-statistics remote-mep

```
user@host> show oam ethernet connectivity-fault-management mep-statistics
maintenance-domain md1 maintenance-association ma1 remote-mep 101
MEP identifier: 100, MAC address: 00:05:85:73:7b:39
  CCMs sent                                       : 7762
  CCMs received out of sequence                   : 0
  LBMs sent                                       : 0
  Valid in-order LBRs received                    : 0
  Valid out-of-order LBRs received                : 0
  LBRs received with corrupted data               : 0
  LBRs sent                                       : 0
  LTMs sent                                       : 0
  LTMs received                                   : 0
  LTRs sent                                       : 0
  LTRs received                                   : 0
  Sequence number of next LTM request             : 0
  1DMs sent                                       : 5
  Valid 1DMs received                             : 0
  Invalid 1DMs received                           : 0
  DMMs sent                                       : 5
  DMRs sent                                       : 0
  Valid DMRs received                             : 5
  Invalid DMRs received                           : 0

  Remote MEP identifier: 101
  Remote MAC address: 00:05:85:73:39:4a
    Delay measurement statistics:
    Index  One-way delay  Two-way delay
              (usec)         (usec)
      1        259            519
      2        273            550
      3        287            571
      4        299            610
      5        313            650
    Average one-way delay          : 286 usec
    Average one-way delay variation: 62 usec
    Best case one-way delay        : 259 usec
    Worst case one-way delay       : 313 usec
    Average two-way delay          : 580 usec
    Average two-way delay variation: 26 usec
    Best case two-way delay        : 519 usec
    Worst case two-way delay       : 650 usec
```

## show oam ethernet connectivity-fault-management path-database

**Syntax**

show oam ethernet connectivity-fault-management path-database
<*host-mac-address*>
<maintenance-association *ma-name*>
<maintenance-domain *domain-name*>

**Release Information**

Command introduced in Junos OS Release 8.4.

**Description**

On M7i and M10i with Enhanced CFEB (CFEB-E), M320, MX Series, ACX Series, T320, and T640 routers, display IEEE 802.1ag Operation, Administration, and Management (OAM) connectivity fault management path database information for a host configured with an MEP.

**Options**

***host-mac-address***—(Optional) Display connectivity fault management path database information for a specified Ethernet host.

**maintenance-association *ma-name***—(Optional) Display connectivity fault management path database information for the specified maintenance association.

**maintenance-domain *domain-name***—(Optional) Display connectivity fault management path database information for the specified maintenance domain.

**Required Privilege Level**

view

**List of Sample Output**

show oam ethernet connectivity-fault-management path-database on page 164

**Output Fields**

Table 13 on page 163 lists the output fields for the **show oam ethernet connectivity-fault-management path-database** command. Output fields are listed in the approximate order in which they appear.

### Table 13: show oam ethernet connectivity-fault-management path-database Output Fields

| Field Name | Field Description |
|---|---|
| **Linktrace to** | MAC address of the remote MEPs in the path. |
| **Interface** | Interface identifier. |
| **Maintenance domain name** | Maintenance domain name. |
| **Format (Maintenance domain)** | Maintenance domain name format configured. |
| **Level** | Maintenance domain level configured. |
| **Maintenance association name** | Maintenance association name. |

Table 13: show oam ethernet connectivity-fault-management path-database Output Fields *(continued)*

| Field Name | Field Description |
|---|---|
| **Local Mep** | Local MEP identifier. |

## Sample Output

### show oam ethernet connectivity-fault -management path-database

```
user@host> show oam ethernet connectivity–fault-management path-database
maintenance-domain md1 maintenance-association ma1 00:05:85:79:39:ef
Linktrace to 00:05:85:79:39:ef, Interface : ge-3/0/0
      Maintenance Domain: md1, Level: 7
      Maintenance Association: ma1, Local Mep: 201
```

## show oam ethernet connectivity-fault-management loss-statistics

**Syntax**

**show oam ethernet connectivity-fault-management loss-statistics**
**maintenance-domain** *md-name*
**maintenance-association** *ma-name*
<**count** *entry-count*>
<**local-mep** *local-mep-id*>
<**remote-mep** *remote-mep-id*>

**Release Information**

Command introduced in Junos OS Release 11.1.

**Description**

On MX Series and ACX series routers with Ethernet interfaces, display ETH-LM statistics for on-demand mode only.

**Options**

**maintenance-domain** *md-name*—Name of an existing CFM maintenance domain.

**maintenance-association** *ma-name*—Name of an existing CFM maintenance association.

**count** *entry-count*—(Optional) Number of entries to display from the statistics table. The range of values is from 1 through 100. The default value is 100.

**local-mep** *local-mep-id*—(Optional) Numeric identifier of the local MEP. The range of values is from 1 through 8191.

**remote-mep** *remote-mep-id*—(Optional) Numeric identifier of the remote MEP. The range of values is from 1 through 8191.

**Required Privilege Level**

view

**Related Documentation**

- show oam ethernet connectivity-fault-management mep-statistics on page 152

**List of Sample Output**

show oam ethernet connectivity-fault-management loss-statistics (with only CIR frames) on page 168
show oam ethernet connectivity-fault-management loss-statistics (with CIR and EIR frames) on page 168
show oam ethernet connectivity-fault-management loss-statistics remote-mep (with CIR frames) on page 169
show oam ethernet connectivity-fault-management loss-statistics remote-mep (with CIR and EIR frames) on page 169

**Output Fields**

Table 14 on page 165 lists the output fields for the **show oam ethernet connectivity-fault-management loss-statistics** command. Output fields are listed in the approximate order in which they appear.

Table 14: show oam ethernet connectivity-fault-management loss-statistics Output Fields

| Output Field Name | Field Description |
|---|---|
| **MEP identifier** | Maintenance association end point (MEP) numeric identifier. |

Table 14: show oam ethernet connectivity-fault-management loss-statistics Output Fields *(continued)*

| Output Field Name | Field Description |
|---|---|
| **MAC address** | Unicast MAC address configured for the MEP. |
| **Remote MEP count** | Number of remote MEPs (unless you specify the **remote-mep** option). |
| **Remote MEP identifier** | Numeric identifier of the remote MEP. |
| **Remote MAC address** | Unicast MAC address of the remote MEP. |
| **Index** | Index number that corresponds to the ETH-LM entry in the CFM database. |
| **Near-end frame loss** | Count of frame loss associated with ingress data frames. |
| **Far-end frame loss** | Count of frame loss associated with egress data frames. |
| **Near-end loss ratio** | Ratio, expressed as a percentage, of the number of service frames not delivered divided by the total number of service frames during time interval T at the ingress interface. |
| **Far-end loss ratio** | Ratio, expressed as a percentage, of the number of service frames not delivered divided by the total number of service frames during time interval T at the egress interface. |
| **Average near-end frame loss** | Average frame loss measured in this session associated with ingress data frames. |
| **Average near-end loss ratio** | Average frame loss ratio measured in this session associated with ingress data frames. |
| **Average far-end frame loss** | Average frame loss measured in this session associated with egress data frames. |
| **Average far-end loss ratio** | Average frame loss ratio measured in this session associated with egress data frames. |
| **Near-end best case loss** | Lowest frame loss measured in this session associated with ingress data frames. |
| **Near-end best case loss ratio** | Lowest frame loss ratio measured in this session associated with ingress data frames. |
| **Near-end worst case loss** | Highest frame loss measured in this session associated with ingress data frames. |
| **Near-end worst case loss ratio** | Highest frame loss ratio measured in this session associated with ingress data frames. |
| **Far-end best case frame loss** | Lowest frame loss measured in this session associated with egress data frames. |
| **Far-end best case loss ratio** | Lowest frame loss ratio measured in this session associated with egress data frames. |

Table 14: show oam ethernet connectivity-fault-management loss-statistics Output Fields *(continued)*

| Output Field Name | Field Description |
|---|---|
| **Far-end worst case loss** | Highest frame loss measured in this session associated with egress data frames. |
| **Far-end worst case loss ratio** | Highest frame loss ratio measured in this session associated with egress data frames. |

## Sample Output

### show oam ethernet connectivity-fault-management loss-statistics (with only CIR frames)

```
user@host> show oam ethernet connectivity-fault-management loss-statistics
maintenance-domain md6 maintenance-association ma6
MEP identifier: 100, MAC address: 00:05:85:73:7b:39
Remote MEP count      : 1

Remote MEP identifier  : 101
Remote MAC address     : 00:05:85:73:39:4a

Loss measurement statistics:
Index   Near-end     Far-end       Near-end      Far-end
        Frame loss   Frame loss    Frame loss    Frame loss
         (CIR)        (CIR)          (EIR)         (EIR)
  1        9            9
  2        3            5
  3        7            7
  4        9            1
  5        3            6
Average near-end loss (CIR)          : 6.2
Average near-end loss ratio (CIR)    : 6.2%
Average far-end loss (CIR)           : 5.6
Average far-end loss ratio (CIR)     : 5.6%
Near-end best case loss (CIR)        : 3
Near-end best case loss ratio (CIR)  : 3%
Near-end worst case loss (CIR)       : 9
Near-end worst case loss ratio (CIR) : 9%
Far-end best case loss (CIR)         : 1
Far-end best case loss ratio (CIR)   : 1%
Far-end worst case loss (CIR)        : 9
Far-end worst case loss ratio (CIR)  : 9%
```

### show oam ethernet connectivity-fault-management loss-statistics (with CIR and EIR frames)

```
user@host> show oam ethernet connectivity-fault-management loss-statistics
maintenance-domain md6 maintenance-association ma6 remote-mep 101
MEP identifier: 100, MAC address: 00:05:85:73:7b:39
Remote MEP count       : 1
Remote MEP identifier  : 101
Remote MAC address     : 00:05:85:73:39:4a

Loss measurement statistics:
Index     Near-end     Far-end       Near-end     Far-end
          Frame loss   Frame loss    Frame loss   Frame loss
            (CIR)       (CIR)         (EIR)         (EIR)
 1            9           9             8            10
 2            3           5             4            16
 3            7           7             10           8
 4            9           1             12           20
 5            3           6             6            18
Average near-end loss (CIR)          : 6.2
Average near-end loss ratio (CIR)    : 6.2%
Average far-end loss (CIR)           : 5.6
Average far-end loss ratio (CIR)     : 5.6%
Near-end best case loss (CIR)        : 3
Near-end best case loss ratio (CIR)  : 3%
Near-end worst case loss (CIR)       : 9
Near-end worst case loss ratio (CIR) : 9%
Far-end best case loss (CIR)         : 1
Far-end best case loss ratio (CIR)   : 1%
Far-end worst case loss (CIR)        : 9
```

```
Far-end worst case loss ratio (CIR)   : 9%
Average near-end loss (EIR)           : 8
Average near-end loss ratio (EIR)     : 8%
Average far-end loss (EIR)            : 14.4
Average far-end loss ratio (EIR)      : 14.4%
Near-end best case loss (EIR)         : 4
Near-end best case loss ratio (EIR)   : 4%
Near-end worst case loss (EIR)        : 12
Near-end worst case loss ratio (EIR)  : 12%
Far-end best case loss (EIR)          : 8
Far-end best case loss ratio (EIR)    : 8%
Far-end worst case loss (EIR)         : 20
Far-end worst case loss ratio (EIR)   : 20%
```

### show oam ethernet connectivity-fault-management loss-statistics remote-mep (with CIR frames)

```
user@host> show oam ethernet connectivity-fault-management loss-statistics
maintenance-domain md6 maintenance-association ma6 remote-mep 102
Remote MEP identifier: 102
Remote MAC address: 00:05:85:73:39:4a

Loss measurement statistics:
Index     Near-end     Far-end       Near-end     Far-end
          Frame loss   Frame loss    Frame loss   Frame loss
           (CIR)        (CIR)         (EIR)        (EIR)
  1           5           9
  2           7           100
  3           8           1
  4           9           6
  5           1           5

Average near-end loss (CIR)           : 6
Average near-end loss ratio (CIR)     : 6%
Average far-end loss (CIR)            : 24.2
Average far-end loss ratio (CIR)      : 24.2%
Near-end best case loss (CIR)         : 1
Near-end best case loss ratio (CIR)   : 1%
Near-end worst case loss (CIR)        : 9
Near-end worst case loss ratio (CIR)  : 9%
Far-end best case loss (CIR)          : 1
Far-end best case loss ratio (CIR)    : 1%
Far-end worst case loss (CIR)         : 100
Far-end worst case loss ratio (CIR)   : 100%
```

### show oam ethernet connectivity-fault-management loss-statistics

```
user@host> show oam ethernet connectivity-fault-management loss-statistics
maintenance-domain md6 maintenance-association ma6 remote-mep 102

Remote MEP identifier    : 102
Remote MAC address       : 00:05:85:73:39:4a
```

### remote-mep (with CIR and EIR frames)

```
Loss measurement statistics:
  Index     Near-end      Far-end       Near-end     Far-end
            Frame loss    Frame loss    Frame loss    Frame loss
              (CIR)         (CIR)         (EIR)         (EIR)
    1           5             9             2             4
    2           7             100           4             6
    3           8             1             0             8
    4           9             6             6             4
    5           1             5             8             4

Average near-end loss (CIR)           : 6
Average near-end loss ratio (CIR)     : 6%
Average far-end loss (CIR)            : 24.2
Average far-end loss ratio (CIR)      : 24.2%
Near-end best case loss (CIR)         : 1
Near-end best case loss ratio (CIR)   : 1%
Near-end worst case loss (CIR)        : 9
Near-end worst case loss ratio (CIR)  : 9%
Far-end best case loss (CIR)          : 1
Far-end best case loss ratio (CIR)    : 1%
Far-end worst case loss (CIR)         : 100
Far-end worst case loss ratio (CIR)   : 100%
Average near-end loss (EIR)           : 4
Average near-end loss ratio (EIR)     : 4%
Average far-end loss (EIR)            : 5.2
Average far-end loss ratio (EIR)      : 5.2%
Near-end best case loss (EIR)         : 0
Near-end best case loss ratio (EIR)   : 0%
Near-end worst case loss (EIR)        : 8
Near-end worst case loss ratio (EIR)  : 8%
Far-end best case loss (EIR)          : 4
Far-end best case loss ratio (EIR)    : 4%
Far-end worst case loss (EIR)         : 8
Far-end worst case loss ratio (EIR)   : 8%
```

## show oam ethernet evc

**Syntax** **show oam ethernet evc <*evc-id*>**

**Release Information** Command introduced in Junos OS Release 9.5.

**Description** On MX Series routers with OAM Ethernet Virtual Connection (EVC) configurations, displays the EVC configuration and status information.

**Options** This command has no options.

**Required Privilege Level** View

**Output Fields** Table 15 on page 171 lists the output fields for the **show oam ethernet evc** command. Output fields are listed in the approximate order in which they appear.

### Table 15: show oam ethernet evc Output Fields

| Field Name | Field Description |
|---|---|
| **EVC identifier** | Header for the EVC information showing the EVC name, configuration, and active/inactive status. |
| **UNI count** | Number of configured and active UNIs. |
| **Protocol** | Protocol configured between the UNIs. |
| **Local UNIs** | Heading for the list of local UNIs |
| **UNI Identifier** | Name of the UNI. |
| **Interface** | Interface type-dpc/pic/port.unit-number. |
| **Status** | Status operational or not operational. |

## Sample Output

**show oam ethernet evc**

```
user@host> show oam ethernet evc
EVC identifier: evc1, Point-to-Point, Active
  UNI count: Configured(2), Active(2)
  Protocol: cfm, Management domain: md, Management association: ma
  Local UNIs:
    UNI Identifier      Interface     Status
    uni1                ge-1/1/1      Operational
    uni2                ge-1/1/1      Not Operational
```

## show oam ethernet fnp interface

**Syntax** **show oam ethernet fnp interface**
<*ethernet-interface-name*>
<routing-instance *routing-instance-name*>

**Release Information** Command introduced in Junos OS Release 11.4.

**Description** On MX Series routers with Gigabit Ethernet, Fast Ethernet, or aggregated Ethernet PICs, displays OAM Ethernet Failure Notification Protocol (FNP) information for Ethernet interfaces.

**Options** ***interface-name***—(Optional) Display Ethernet FNP information for the specified Ethernet interface only.

***routing-instance-name***—(Optional) Display FNP for the specified routing instance.

**Required Privilege Level** view

**List of Sample Output** show oam ethernet fnp interface on page 172

**Output Fields** Table 16 on page 172 lists the output fields for the **show oam ethernet fnp interface** command. Output fields are listed in the approximate order in which they appear.

**Table 16: show oam ethernet fnp interface Output Fields**

| Field Name | Field Description |
|---|---|
| **Interface** | Name of the interface for the displayed information. |
| **VLAN** | Name of the VLAN. |
| **State** | Displays state of the interface. |
| **FNP Message Interface** | Displays the message interface type. |
| **FNP Message Source MAC** | Displays the source MAC address. |

## Sample Output

### show oam ethernet fnp interface

```
user@host> show oam ethernet fnp interface
  The FNP controlled interfaces are:
  Interface    VLAN    State    FNP message    FNP message
                                Interface      Source MAC

  ge-0/0/0.30  30      down     lsi.1054976    a0:aa:aa:aa:aa:aa
  ge-0/0/0.20  20      down     lsi.1054976    a0:aa:aa:aa:aa:aa
```

## show oam ethernet fnp messages

**Syntax**

**show oam ethernet fnp messages**
**<interface *interface-name*>**
**<routing instance *routing-instance-name*>**

**Release Information**

Command introduced in Junos OS Release 11.4

**Description**

On MX Series routers with Gigabit Ethernet, Fast Ethernet, or aggregated Ethernet PICs, displays OAM Ethernet Failure Notification Protocol (FNP) messages.

**Options**

***interface-name***—(Optional) Display Ethernet FNP messages for the specified Ethernet interface only.

***routing-instance-name***—(Optional) Display FNP messages for the specified routing instance.

**Required Privilege Level**

view

**List of Sample Output**

show oam ethernet fnp messages on page 174

**Output Fields**

Table 17 on page 173 lists the output fields for the **show oam ethernet fnp messages** command. Output fields are listed in the approximate order in which they appear.

### Table 17: show oam ethernet fnp messages Output Fields

| Field Name | Field Description |
|---|---|
| **Message from source MAC address** | The source MAC address of the message. |
| **Originating port number** | Port number of the original message. |
| **Time since last message** | Elapsed time in hours, minutes, and seconds since the last message was received. |
| **Time since last message update** | Elapsed time in hours, minutes, and seconds since the last message was updated. |
| **Total messages received** | Number of messages received. |
| **Domain ID** | Domain ID of the message. |
| **STP Root ID** | The spanning tree Root ID of the message. |
| **Trigger Reason** | The reason why the message was triggered. |
| **Effected VLANs** | Number of VLANs that are affected. |
| **Disabled interfaces** | Name of the interfaces that are disabled. |

## Sample Output

### show oam ethernet fnp messages

```
user@host> show oam ethernet fnp messages
  Active FNP messages on interface lsi.1054465
  Message source MAC: a0:aa:aa:aa:aa:aa
    Originating port number: 141077
    Time since last message: 00:00:00
    Time since last message update: 00:00:00
    Total messages received: 1
    Domain ID: 0
    STP Root ID: 0.f0:ff:ff:ff:ff:ff
    Trigger reason: todo
    Effected VLANs: 10
    Disabled interfaces:
      Interface VLAN
      ge-0/0/0.10 10
```

## show oam ethernet fnp status

**Syntax** **show oam ethernet fnp status**
**<interface *interface-name*>**
**<routing instance *routing-instance-name*>**

**Release Information** Command introduced in Junos OS Release 11.4

**Description** On MX Series routers with Gigabit Ethernet, Fast Ethernet, or aggregated Ethernet PICs, displays OAM Ethernet Failure Notification Protocol (FNP) status.

**Options** ***interface-name***—(Optional) Display Ethernet FNP information for the specified Ethernet interface only.

***routing-instance-name***—(Optional) Display FNP for the specified routing instance.

**Required Privilege Level** view

**List of Sample Output** show oam ethernet fnp status on page 176

**Output Fields** Table 18 on page 175 lists the output fields for the **show oam ethernet fnp status** command. Output fields are listed in the approximate order in which they appear.

**Table 18: show oam ethernet fnp status Output Fields**

| Field Name | Field Description |
|---|---|
| **FNP interval** | The time interval between messages. |
| **Loss threshold** | The number of messages that can be lost before FNP is marked as down. |
| **FNP enabled interfaces** | Displays interfaces that are enabled. |
| **Interface** | The name of the interface. |
| **Domain ID** | Domain ID of the message. |
| **STP Root ID** | The spanning tree Root ID of the message. |
| **FNP Messages** | The total number of messages received. |

## Sample Output

### show oam ethernet fnp status

```
user@host> show oam ethernet status
  FNP interval:
  Loss threshold
  FNP enabled interfaces
  Interface      Domain ID      STP Root ID              FNP Messages
  ge-0/0/0.1278        100      0.f0:ff:ff:ff:ff:ff                 0
```

## 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 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 182
show oam ethernet link-fault-management detail on page 182

**Output Fields** Table 19 on page 177 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 19: show oam ethernet link-fault-management Output Fields

| Field Name | Field Description | Level of Output |
|---|---|---|
| **Status** | Indicates the status of the established link.<br>• **Fail**—A link fault condition exists.<br>• **Running**—A link fault condition does not exist. | All levels |
| **Discovery state** | State of the discovery mechanism:<br>• **Passive Wait**<br>• **Send Any**<br>• **Send Local Remote**<br>• **Send Local Remote Ok**<br>• **Fault** | All levels |
| **Peer address** | Address of the OAM peer. | All levels |

Table 19: show oam ethernet link-fault-management Output Fields *(continued)*

| Field Name | Field Description | Level of Output |
|---|---|---|
| **Flags** | Information about the interface. Possible values are described in the "Link Flags" section under Common Output Fields Description.<br>• **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.<br>• **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.<br>• **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** | Remote entity information.<br>• **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.<br>• **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.<br>• **Discovery mode**—Indicates whether discovery mode is active or inactive.<br>• **Unidirectional mode**—Indicates the ability to operate a link in a unidirectional mode for diagnostic purposes.<br>• **Remote loopback mode**—Indicates whether remote loopback is supported or unsupported.<br>• **Link events**—Indicates whether interpreting link events is supported or unsupported on the remote peer.<br>• **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 19: 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.<br><br>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.<br><br>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 19: 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.<br><br>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 19: 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 oam ethernet lmi

**Syntax** **show oam ethernet lmi (interface <*interface-name*>)**

**Release Information** Command introduced in Junos OS Release 9.5.

**Description** On MX Series routers with Gigabit Ethernet, Fast Ethernet, or aggregated Ethernet, and OAM Ethernet Local Management Interface (LMI) configuration, display the LMI information for the configured interfaces or optionally for a specified interface.

**Options** **interface**—(Optional) Display LMI information for a specified interface.

***interface-name***—(Optional) Display Ethernet LMI information for the specified interface only.

**Required Privilege Level** View

**Output Fields** Table 20 on page 183 lists the output fields for the **show oam ethernet lmi** command. Output fields are listed in the approximate order in which they appear.

### Table 20: show oam ethernet lmi Output Fields

| Field Name | Field Description |
|---|---|
| **Physical Interface** | Header for the EVC information showing the Ethernet virtual circuit (EVC) name, configuration, and active/inactive status. |
| **UNI Identifier** | Name of the UNI. |
| **EVC map type** | EVC configuration. |
| **Polling verification timer** | Polling verification timer status. |
| **E-LMI state** | Operational status of the E-LMI configuration in the interfaces or specified interface. |
| **Priority/Untagged VLAN ID** | To be provided. |
| **Default EVC** | The EVC set as the default EVC. |
| **Associated EVCs** | Heading for the list of configured EVCs. |
| **EVC Indentifier** | EVC name. |
| **Reference ID** | To be provided. |
| **Status** | Status active or not active. |
| **CE VLAN IDs** | Customer edge VLAN ID numbers. |

## Sample Output

### show oam ethernet lmi interface

```
user@host> show oam ethernet lmi interface ge-1/1/1
Physical interface: ge-1/1/1, Physical link is Up
  UNI identifier: uni-ce1, EVC map type: Bundling
  Polling verification timer: Enabled, E-LMI state: Operational
  Priority/Untagged VLAN ID: 20, Default EVC: evc1
  Associated EVCs:
    EVC         Reference     Status           CE VLAN IDs
    Identifier  ID
    evc1            1        Active (New)        1-2048
    evc2             2        Not Active          2049-4096
```

## show oam ethernet lmi statistics

**Syntax** **show oam ethernet lmi statistics <interface *interface-name*>**

**Release Information** Command introduced in Junos OS Release 9.5.

**Description** On MX Series routers with Gigabit Ethernet, Fast Ethernet, or aggregated Ethernet PICs, displays OAM Ethernet Local Management Interface (LMI) statistics.

**Options** **interface**—(Optional) Display LMI statistics for a specified interface.

***interface-name***—(Optional) Display Ethernet LMI information for the specified Ethernet interface only.

**Required Privilege Level** view

**List of Sample Output** show oam ethernet lmi statistics on page 186

**Output Fields** Table 21 on page 185 lists the output fields for the **show oam ethernet lmi statistics** command. Output fields are listed in the approximate order in which they appear.

Table 21: show oam ethernet lmi statistics Output Fields

| Field Name | Field Description |
|---|---|
| **Physical interface** | Name of the interface for the displayed statistics. |
| **Reliability errors** | Number of E-LMI reliability errors logged. |
| **Protocol errors** | Number of E-LMI protocol errorse. |
| **Status check received** | Number of E-LMI status check receive errors. |
| **Status check sent** | Number of E-LMI status check sent errors. |
| **Full status received** | Number of E-LMI full status receive errors. |
| **Full status sent** | Number of E-LMI full status sent errors. |
| **Full status continued received** | Number of E-LMI status continued received errors. |
| **Full status continued sent** | Number of E-LMI full status continued sent errors. |
| **Asynchronous status sent** | Number of E-LMI asynchronous status sent errors. |

## Sample Output

### show oam ethernet lmi statistics

```
user@host> show oam ethernet lmi statistics interface ge-1/1/1
Physical interface: ge-1/1/1
  Reliability errors                     4  Protocol errors
 0
  Status check received                  0  Status check sent
 0
  Full status received                 694  Full status sent
694
  Full status continued received         0  Full status continued sent
 0
  Asynchronous status sent               0
```

CHAPTER 6

# Command Summary



## Ethernet Interface Operational Mode Commands

Table 22 on page 187 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 22: Ethernet Interface Operational Mode Commands

| Task | Command |
|---|---|
| Clear dynamic VLAN interfaces. | clear auto-configuration interfaces |
| 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. | clear auto-configuration interfaces interface-set |
| Clear Link Aggregation Control Protocol (LACP) statistics. | clear lacp statistics |
| Clear Link Aggregation Control Protocol (LACP) timeout entries. | clear lacp timeouts |
| Clear learned MAC addresses from the hardware and MAC database. Static MAC addresses are not cleared. | clear interfaces mac-database |
| Clear statistics that are collected for every MAC address, including policer statistics, on a given physical or logical interface. | clear interfaces mac-database statistics |
| Clear statistics that are collected for interface sets. | clear interfaces interface-set statistics |
| Clear the existing continuity measurement and restart counting the operational uptime. | clear oam ethernet connectivity-fault-management continuity-measurement |

Table 22: 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) | clear oam ethernet connectivity-fault-management delay-statistics |
| Clear Operation, Administration, and Management (OAM) and connectivity fault management (CFM) linktrace database information. | clear oam ethernet connectivity-fault-management linktrace path-database |
| Clear all loss statistics maintained by CFM for a given maintenance domain and maintenance association. | clear oam ethernet connectivity-fault-management loss-statistics |
| Clear connectivity-fault-management policer statistics. | clear oam ethernet connectivity-fault-management policer |
| Clear all statistics maintained by CFM. (Routers that support IEEE 802.1ag OAM CFM)<br><br>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). | clear oam ethernet connectivity-fault-management statistics |
| Clear Operation, Administration, and Management (OAM) link fault management state information and restart the link discovery process on Ethernet interfaces. | clear oam ethernet link-fault-management state |
| Clear Operation, Administration, and Management (OAM) statistics link fault management statistics for Ethernet interfaces. | clear oam ethernet link-fault-management statistics |
| Clear the statistics for all Ethernet ring protection groups or a specific Ethernet ring protection group. | clear protection-group ethernet-ring statistics |
| Check the reachability of a remote IEEE 802.1ag OAM maintenance association end point (MEP) or maintenance association intermediate point (MIP). | ping ethernet |
| Manually rebalance the subscribers on an aggregated Ethernet bundle with targeted distribution enabled. | request interface rebalance (Aggregated Ethernet for Subscriber Management) |
| 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. | request interface (revert \| switchover) (Aggregated Ethernet Link Protection) |
| Force LACP link switchover. | request lacp link-switchover |

Table 22: Ethernet Interface Operational Mode Commands *(continued)*

| Task | Command |
|---|---|
| Clear the lockout, force switch, manual switch, exercise, and wait-to-restore states. | request protection-group ethernet-aps clear |
| Test if APS is operating correctly. | request protection-group ethernet-aps exercise |
| Force traffic to switch from the active path to the alternate path. | request protection-group ethernet-aps force-switch |
| Lock the protection path, forcing the use of the working path. | request protection-group ethernet-aps lockout |
| Force traffic to switch from the active path to the alternate path. | request protection-group ethernet-aps manual-switch |
| Display status information about aggregated Fast Ethernet or Gigabit Ethernet router interfaces. | show interfaces (Aggregated Ethernet) |
| | show interfaces (far-end-interval) |
| Display status information about Fast Ethernet interfaces. | show interfaces (Fast Ethernet) |
| Display status information about the specified Gigabit Ethernet interface. | show interfaces (Gigabit Ethernet) |
| Display status information about 10-Gigabit Ethernet router interfaces. | show interfaces (10-Gigabit Ethernet) |
| 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.<br><br>Display IPv6 interface statistics for IPv6 traffic traversing through the IQ2 PICs on M10i and M120 routers.<br><br>Display IPv6 interface statistics for IPv6 traffic traversing through the IQ2E PICs on M10i, M120, and M320 routers. | show interfaces extensive |
| Display information about Gigabit Ethernet or 10-Gigabit Ethernet router interface sets. | show interfaces interface-set (Ethernet Interface Set) |
| Display information about Gigabit Ethernet or 10-Gigabit Ethernet router interface set queues. | show interfaces interface-set queue |
| 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. | show interfaces diagnostics optics (Gigabit Ethernet, 10-Gigabit Ethernet, and 100 Gigabit Ethernet) |

Table 22: Ethernet Interface Operational Mode Commands *(continued)*

| Task | Command |
|---|---|
| Display information about integrated routing and bridging interfaces. | show interfaces irb |
| Display status information about the distribution of subscribers on different links in an aggregated Ethernet bundle. | show interfaces targeting (Aggregated Ethernet for Subscriber Management) |
| Display Link Aggregation Control Protocol (LACP) information for aggregated, Fast Ethernet, or Gigabit Ethernet router interfaces. | show lacp interfaces |
| Display Link Aggregation Control Protocol (LACP) statistics. | show lacp statistics |
| Display Link Aggregation Control Protocol timeout entries. | show lacp timeouts |
| Display MAC address information for Gigabit Ethernet router interfaces. | show interfaces mac-database (Gigabit Ethernet) |
| Display information on a specified interface that is part of a multichassis link aggregation configuration. | show interfaces mc-ae |
| Display ETH-DM statistics for CFM MEPs. (MX Series routers, Ethernet DPCs). | show oam ethernet connectivity-fault-management delay-statistics |
| Display IEEE 802.1ag OAM connectivity fault management forwarding state information for Ethernet interfaces. | show oam ethernet connectivity-fault-management forwarding-state |
| Display OAM connectivity fault management information for Ethernet interfaces.<br><br>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. | show oam ethernet connectivity-fault-management interfaces |
| Display OAM connectivity fault management linktrace path database information. | show oam ethernet connectivity-fault-management linktrace path-database |
| Display OAM connectivity fault management maintenance association end point (MEP) database information.<br><br>For interfaces that support ETH-DM, also display any ETH-DM frame counts. In all other cases, ETH-DM frame counts are zero. | show oam ethernet connectivity-fault-management mep-database |
| Display ETH-DM statistics and frame counts for CFM MEPs. (MX Series routers, Ethernet DPCs) | show oam ethernet connectivity-fault-management mep-statistics |

Table 22: Ethernet Interface Operational Mode Commands *(continued)*

| Task | Command |
|---|---|
| Display ETH-LM statistics for on-demand mode only. | show oam ethernet connectivity-fault-management loss-statistics |
| Display information about maintenance intermediate points (MIPs) for the Ethernet OAM 802.1ag standard for connectivity fault management (CFM). | show oam ethernet connectivity-fault-management mip |
| Display OAM connectivity fault management path database information for hosts configured with MEP. | show oam ethernet connectivity-fault-management path-database |
| Displays connectivity-fault-management policer statistics. | show oam ethernet connectivity-fault-management policer |
| Display OAM Ethernet Virtual Connection (EVC) information for hosts configured with Ethernet Local Management Interface (E-LMI). (MX series only) | show oam ethernet evc |
| Display OAM fault management statistics for Ethernet interfaces. | show oam ethernet link-fault-management |
| Display OAM Ethernet Local Management Interface status information for an LMI configured interface. (MX series only) | show oam ethernet lmi |
| Display OAM Ethernet Local Management Interface statistics for an LMI configured interface. (MX series only) | show oam ethernet lmi statistics |
| Display protection group Ethernet ring Automatic Protection Switching (APS). | show protection-group ethernet-ring aps |
| Display data channel information for all Ethernet ring protection groups or for a specific Ethernet ring protection group. | show protection-group ethernet-ring data-channel |
| Display protection group Ethernet ring interfaces. | show protection-group ethernet-ring interface |
| Display protection group Ethernet ring nodes. | show protection-group ethernet-ring node-state |
| Display protection group Ethernet ring statistics. | show protection-group ethernet-ring statistics |
| Display all data channel logical interfaces and the VLAN IDs controlled by a ring instance data channel. | show protection-group ethernet-ring vlan |
| Trace the path between two Ethernet OAM end points. | traceroute ethernet |

PART 4

# Troubleshooting

CHAPTER 7

# Ethernet

## traceroute ethernet

**Syntax**

**traceroute ethernet** (*mac-address* | *mep-id*)
**maintenance-association** *ma-name*
**maintenance-domain** *md-name*
**ttl** *value*
<**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** ***ma-name***—Specifies an existing maintenance association from the set of configured maintenance associations.

**maintenance-domain** ***md-name***—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 197

**Output Fields**

Table 23 on page 196 lists the output fields for the **traceroute ethernet** command. Output fields are listed in the approximate order in which they appear.

### Table 23: 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 23: 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

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

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, *N*xDS0, 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 24 on page 200 shows the loopback modes supported on the various interface types.

### Table 24: Loopback Modes by Interface Type

| Interface | Loopback Modes | Usage Guidelines |
|---|---|---|
| Aggregated Ethernet, Fast Ethernet, Gigabit Ethernet | Local | Configuring Ethernet Loopback Capability |
| Circuit Emulation E1 | Local and remote | Configuring E1 Loopback Capability |
| Circuit Emulation T1 | Local and remote | Configuring T1 Loopback Capability |
| E1 and E3 | Local and remote | Configuring E1 Loopback Capability and Configuring E3 Loopback Capability |
| *N*xDS0 | Payload | Configuring Channelized E1 IQ and IQE Interfaces, Configuring T1 and NxDS0 Interfaces, Configuring Channelized OC12/STM4 IQ and IQE Interfaces (SONET Mode), Configuring Channelized STM1 IQ and IQE Interfaces, and Configuring Channelized T3 IQ Interfaces |
| Serial (V.35 and X.21) | Local and remote | Configuring Serial Loopback Capability |
| Serial (EIA-530) | DCE local, DCE remote, local, and remote | Configuring Serial Loopback Capability |
| SONET/SDH | Local and remote | Configuring SONET/SDH Loopback Capability |

Table 24: Loopback Modes by Interface Type *(continued)*

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

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 O.152 standard)
  pseudo-2e15-o151     Pattern is 2^15 - 1 (per O.152 standard)
  pseudo-2e20-o151     Pattern is 2^20 - 1 (per O.151 standard)
  pseudo-2e20-o153     Pattern is 2^20 - 1 (per O.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 O.152 standard)
pseudo-2e15-o151     Pattern is 2^15 - 1 (per O.151 standard)
pseudo-2e20-o151     Pattern is 2^20 - 1 (per O.151 standard)
pseudo-2e23-o151     Pattern is 2^23 (per O.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 O.152 standard)
pseudo-2e15-o151     Pattern is 2^15 - 1 (per O.151 standard)
pseudo-2e20-o151     Pattern is 2^20 - 1 (per O.151 standard)
pseudo-2e7           Pattern is 2^7 - 1
pseudo-2e9-o153      Pattern is 2^9 - 1 (per O.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 O.153 (511 type) standard)
pseudo-2e11-o152     Pattern is 2^11 -1 (per O.152 and O.153 (2047 type)
 standards)
pseudo-2e15-o151     Pattern is 2^15 -1 (per O.151 standard)
pseudo-2e20-o151     Pattern is 2^20 -1 (per O.151 standard)
pseudo-2e20-o153     Pattern is 2^20 -1 (per O.153 standard)
pseudo-2e23-o151     Pattern is 2^23 -1 (per O.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 (per 0.151 standard)
```

Table 25 on page 204 shows the BERT capabilities for various interface types.

### Table 25: BERT Capabilities by Interface Type

| Interface | T1 BERT | T3 BERT | Comments |
|---|---|---|---|
| 12-port T1/E1 Circuit Emulation | Yes (ports 0–11) | | • Limited algorithms |
| 4-port Channelized OC3/STM1 Circuit Emulation | Yes (port 0–3) | | • Limited algorithms |
| E1 or T1 | Yes (port 0–3) | Yes (port 0–3) | • Single port at a time<br>• Limited algorithms |
| E3 or T3 | Yes (port 0–3) | Yes (port 0–3) | • Single port at a time |
| Channelized OC12 | N/A | Yes (channel 0–11) | • Single channel at a time<br>• Limited algorithms<br>• No bit count |
| Channelized STM1 | Yes (channel 0–62) | N/A | • Multiple channels<br>• Only one algorithm<br>• No error insert<br>• No bit count |
| Channelized T3 and Multichannel T3 | Yes (channel 0–27) | Yes (port 0–3 on channel 0) | • Multiple ports and channels<br>• Limited algorithms for T1<br>• No error insert for T1<br>• 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

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## Symbols



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