Ethernet Operations, Administration, and Maintenance

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Ethernet Operations, Administration, and Maintenance (OAM) is a protocol for installing, monitoring, and troubleshooting Ethernet metropolitan-area networks (MANs) and Ethernet WANs. It relies on a new, optional sublayer in the data link layer of the Open Systems Interconnection (OSI) model. The OAM features covered by this protocol are Discovery, Link Monitoring, Remote Fault Detection, Remote Loopback, and Cisco Proprietary Extensions.

The advent of Ethernet as a MAN and WAN technology has emphasized the necessity for integrated management for larger deployments. For Ethernet to extend into public MANs and WANs, it must be equipped with a new set of requirements on Ethernet's traditional operations, which had been centered on enterprise networks only. The expansion of Ethernet technology into the domain of service providers, where networks are substantially larger and more complex than enterprise networks and the user-base is wider, makes operational management of link uptime crucial.

Finding Feature Information in This Module

Your Cisco IOS software release may not support all of the features documented in this module. To reach links to specific feature documentation in this module and to see a list of the releases in which each feature is supported, use the "Feature Information for Ethernet Operations, Administration, and Maintenance" section on page 61.

Finding Support Information for Platforms and Cisco IOS and Catalyst OS Software Images

Use Cisco Feature Navigator to find information about platform support and Cisco IOS and Catalyst OS software image support. To access Cisco Feature Navigator, go to http://www.cisco.com/go/cfn. An account on Cisco.com is not required.

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Contents

Information About Ethernet Operations, Administration, and Maintenance

Before you set up Ethernet OAM, you should understand the following concepts:

Ethernet OAM

Ethernet OAM is a protocol for installing, monitoring, and troubleshooting metro Ethernet networks and Ethernet WANs. It relies on a new, optional sublayer in the data link layer of the OSI model. Ethernet OAM can be implemented on any full-duplex point-to-point or emulated point-to-point Ethernet link. A system-wide implementation is not required; OAM can be deployed for part of a system; that is, on particular interfaces.

Normal link operation does not require Ethernet OAM. OAM frames, called OAM protocol data units (PDUs), use the slow protocol destination MAC address 0180.c200.0002. They are intercepted by the MAC sublayer and cannot propagate beyond a single hop within an Ethernet network.

Ethernet OAM is a relatively slow protocol with modest bandwidth requirements. The frame transmission rate is limited to a maximum of 10 frames per second; therefore, the impact of OAM on normal operations is negligible. However, when link monitoring is enabled, the CPU must poll error counters frequently. In this case, the required CPU cycles will be proportional to the number of interfaces that have to be polled.

Two major components, the OAM client and the OAM sublayer, make up Ethernet OAM. The following two sections describe these components.

OAM Client

The OAM client is responsible for establishing and managing Ethernet OAM on a link. The OAM client also enables and configures the OAM sublayer. During the OAM discovery phase, the OAM client monitors OAM PDUs received from the remote peer and enables OAM functionality on the link based

on local and remote state as well as configuration settings. Beyond the discovery phase (at steady state), the OAM client is responsible for managing the rules of response to OAM PDUs and managing the OAM remote loopback mode.

OAM Sublayer

The OAM sublayer presents two standard IEEE 802.3 MAC service interfaces: one facing toward the superior sublayers, which include the MAC client (or link aggregation), and the other interface facing toward the subordinate MAC control sublayer. The OAM sublayer provides a dedicated interface for passing OAM control information and OAM PDUs to and from a client.

The OAM sublayer is made up of three components: control block, multiplexer, and packet parser (p-parser). Each component is described in the following sections.

Control Block

The control block provides the interface between the OAM client and other blocks internal to the OAM sublayer. The control block incorporates the discovery process, which detects the existence and capabilities of remote OAM peers. It also includes the transmit process that governs the transmission of OAM PDUs to the multiplexer and a set of rules that govern the receipt of OAM PDUs from the p-parser.

Multiplexer

The multiplexer manages frames generated (or relayed) from the MAC client, control block, and p-parser. The multiplexer passes through frames generated by the MAC client untouched. It passes OAM PDUs generated by the control block to the subordinate sublayer; for example, the MAC sublayer. Similarly, the multiplexer passes loopback frames from the p-parser to the same subordinate sublayer when the interface is in OAM remote loopback mode.

P-Parser

The p-parser classifies frames as OAM PDUs, MAC client frames, or loopback frames and then dispatches each class to the appropriate entity. OAM PDUs are sent to the control block. MAC client frames are passed to the superior sublayer. Loopback frames are dispatched to the multiplexer.

Benefits of Ethernet OAM

Ethernet OAM provides the following benefits:

- Competitive advantage for service providers
- Standardized mechanism to monitor the health of a link and perform diagnostics

Cisco IOS Implementation of Ethernet OAM

The Cisco IOS implementation of Ethernet OAM consists of the Ethernet OAM shim and the Ethernet OAM module.

The Ethernet OAM shim is a thin layer that connects the Ethernet OAM module and the platform code. It is implemented in the platform code (driver). The shim also communicates port state and error conditions to the Ethernet OAM module via control signals.

The Ethernet OAM module, implemented within the control plane, handles the OAM client as well as control block functionality of the OAM sublayer. This module interacts with the command-line interface (CLI) and Simple Network Management Protocol (SNMP)/programmatic interface via control signals. In addition, this module interacts with the Ethernet OAM shim through OAM PDU flows.

OAM Features

The OAM features as defined by IEEE 802.3ah, *Ethernet in the First Mile*, are discovery, Link Monitoring, Remote Fault Detection, Remote Loopback, and Cisco Proprietary Extensions.

Discovery

Discovery is the first phase of Ethernet OAM and it identifies the devices in the network and their OAM capabilities. Discovery uses information OAM PDUs. During the discovery phase, the following information is advertised within periodic information OAM PDUs:

- OAM mode—Conveyed to the remote OAM entity. The mode can be either active or passive and can be used to determine device functionality.
- OAM configuration (capabilities)—Advertises the capabilities of the local OAM entity. With this information a peer can determine what functions are supported and accessible; for example, loopback capability.
- OAM PDU configuration—Includes the maximum OAM PDU size for receipt and delivery. This information along with the rate limiting of 10 frames per second can be used to limit the bandwidth allocated to OAM traffic.
- Platform identity—A combination of an organization unique identifier (OUI) and 32-bits of vendor-specific information. OUI allocation, controlled by the IEEE, is typically the first three bytes of a MAC address.

Discovery includes an optional phase in which the local station can accept or reject the configuration of the peer OAM entity. For example, a node may require that its partner support loopback capability to be accepted into the management network. These policy decisions may be implemented as vendor-specific extensions.

Link Monitoring

Link monitoring in Ethernet OAM detects and indicates link faults under a variety of conditions. Link monitoring uses the event notification OAM PDU and sends events to the remote OAM entity when there are problems detected on the link. The error events include the following:

- Error Symbol Period (error symbols per second)—The number of symbol errors that occurred during a specified period exceeded a threshold. These errors are coding symbol errors.
- Error Frame (error frames per second)—The number of frame errors detected during a specified period exceeded a threshold.
- Error Frame Period (error frames per *n* frames)—The number of frame errors within the last n frames has exceeded a threshold.
- Error Frame Seconds Summary (error seconds per *m* seconds)—The number of error seconds (1-second intervals with at least one frame error) within the last m seconds has exceeded a threshold.

Since IEEE 802.3ah OAM does not provide a guaranteed delivery of any OAM PDU, the event notification OAM PDU may be sent multiple times to reduce the probability of a lost notification. A sequence number is used to recognize duplicate events.

Remote Failure Indication

Faults in Ethernet connectivity that are caused by slowly deteriorating quality are difficult to detect. Ethernet OAM provides a mechanism for an OAM entity to convey these failure conditions to its peer via specific flags in the OAM PDU. The following failure conditions can be communicated:

- Link Fault—Loss of signal is detected by the receiver; for instance, the peer's laser is malfunctioning. A link fault is sent once per second in the information OAM PDU. Link fault applies only when the physical sublayer is capable of independent transmit and receive operations.
- Dying Gasp—An unrecoverable condition has occurred; for example, a power failure. This type of condition is vendor specific. A notification about the condition may be sent immediately and continuously.
- Critical Event—An unspecified critical event has occurred. This type of event is vendor specific. A critical event may be sent immediately and continuously.

Remote Loopback

An OAM entity can put its remote peer into loopback mode using the loopback control OAM PDU. Loopback mode helps an administrator ensure the quality of links during installation or when troubleshooting. In loopback mode, every frame received is transmitted back on the same port except for OAM PDUs and pause frames. The periodic exchange of OAM PDUs must continue during the loopback state to maintain the OAM session.

The loopback command is acknowledged by responding with an information OAM PDU with the loopback state indicated in the state field. This acknowledgement allows an administrator, for example, to estimate if a network segment can satisfy a service-level agreement. Acknowledgement makes it possible to test delay, jitter, and throughput.

When an interface is set to the remote loopback mode the interface no longer participates in any other Layer 2 or Layer 3 protocols; for example Spanning Tree Protocol (STP) or Open Shortest Path First (OSPF). The reason is that when two connected ports are in a loopback session, no frames other than the OAM PDUs are sent to the CPU for software processing. The non-OAM PDU frames are either looped back at the MAC level or discarded at the MAC level.

From a user's perspective, an interface in loopback mode is in a link-up state.

Cisco Vendor-Specific Extensions

Ethernet OAM allows vendors to extend the protocol by allowing them to create their own type-length-value (TLV) fields.

OAM Messages

Ethernet OAM messages or OAM PDUs are standard length, untagged Ethernet frames within the normal frame length bounds of 64 to 1518 bytes. The maximum OAM PDU frame size exchanged between two peers is negotiated during the discovery phase.

OAM PDUs always have the destination address of slow protocols (0180.c200.0002) and an Ethertype of 8809. OAM PDUs do not go beyond a single hop and have a hard-set maximum transmission rate of 10 OAM PDUs per second. Some OAM PDU types may be transmitted multiple times to increase the likelihood that they will be successfully received on a deteriorating link.

Four types of OAM messages are supported:

- Information OAM PDU—A variable-length OAM PDU that is used for discovery. This OAM PDU includes local, remote, and organization-specific information.
- Event notification OAM PDU—A variable-length OAM PDU that is used for link monitoring. This type of OAM PDU may be transmitted multiple times to increase the chance of a successful receipt; for example, in the case of high-bit errors. Event notification OAM PDUs also may include a time stamp when generated.

- Loopback control OAM PDU—An OAM PDU fixed at 64 bytes in length that is used to enable or disable the remote loopback command.
- Vendor-specific OAM PDU—A variable-length OAM PDU that allows the addition of vendor-specific extensions to OAM.

Ethernet Connectivity Fault Management

Ethernet connectivity fault management (CFM) is an end-to-end per-service-instance Ethernet layer OAM protocol that includes proactive connectivity monitoring, fault verification, and fault isolation. End to end can be provider edge (PE) to PE or customer edge (CE) to CE. Per service instance means per VLAN.

For more information about Ethernet CFM, see *Ethernet Connectivity Fault Management*.

How to Set Up and Configure Ethernet Operations, Administration, and Maintenance

Perform the following tasks to configure Ethernet OAM:

- Enabling Ethernet OAM on an Interface, page 6
- Disabling and Enabling a Link Monitoring Session, page 7
- Stopping and Starting Link Monitoring Operations, page 9
- Configuring Link Monitoring Options, page 11
- Configuring Global Ethernet OAM Options Using a Template, page 14

Enabling Ethernet OAM on an Interface

Ethernet OAM is by default disabled on an interface.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **interface** *type number*
4. **ethernet oam** [**max-rate** *oampdus* | **min-rate** *num-seconds* | **mode** {**active** | **passive**} | **timeout** *seconds*]
5. **exit**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**enable** **Example:** `Router> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Router# configure terminal`	Enters global configuration mode.
Step 3	**interface** *type number* **Example:** `Router(config)# interface gigabitethernet 3/8`	Specifies an interface and places the CLI in interface configuration mode.
Step 4	**ethernet oam** [**max-rate** *oampdus* | **min-rate** *num-seconds* | **mode** {**active** | **passive**} | **timeout** *seconds*] **Example:** `Router(config-if)# ethernet oam`	Enables Ethernet OAM.
Step 5	**exit** **Example:** `Router(config-if)# exit`	Returns the CLI to global configuration mode.

Disabling and Enabling a Link Monitoring Session

Link monitoring is enabled by default when you enable Ethernet OAM. Perform these tasks to disable and enable link monitoring sessions:

- Disabling a Link Monitoring Session, page 7
- Enabling a Link Monitoring Session, page 8

Disabling a Link Monitoring Session

Perform this task to disable a link monitoring session.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **interface** *type number*
4. **ethernet oam** [**max-rate** *oampdus* | **min-rate** *num-seconds* | **mode** {**active** | **passive**} | **timeout** *seconds*]

5. **no ethernet oam link-monitor supported**
6. **exit**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**enable** **Example:** `Router> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Router# configure terminal`	Enters global configuration mode.
Step 3	**interface** *type number* **Example:** `Router(config)# interface gigabitEthernet 3/8`	Specifies an interface and places the CLI in interface configuration mode.
Step 4	**ethernet oam** [**max-rate** *oampdus* | **min-rate** *num-seconds* | **mode** {**active** | **passive**} | **timeout** *seconds*] **Example:** `Router(config-if)# ethernet oam`	Enables Ethernet OAM.
Step 5	**no ethernet oam link-monitor supported** **Example:** `Router(config-if)# no ethernet oam link-monitor supported`	Disables link monitoring on the interface.
Step 6	**exit** **Example:** `Router(config-if)# exit`	Returns the CLI to global configuration mode.

Enabling a Link Monitoring Session

Perform this task to reenable a link monitoring session after it was previously disabled.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **interface** *type number*
4. **ethernet oam link-monitor supported**
5. **exit**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**enable** **Example:** `Router> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Router# configure terminal`	Enters global configuration mode.
Step 3	**interface** *type number* **Example:** `Router(config)# interface gigabitEthernet 3/8`	Specifies an interface and places the CLI in interface configuration mode.

Step 4	`ethernet oam link-monitor supported`
	
	Example:
	`Router(config-if)# ethernet oam link-monitor supported`
		Enables link monitoring on the interface.

Step 5	**exit** **Example:** `Router(config-if)# exit`	Returns the CLI to global configuration mode.

Stopping and Starting Link Monitoring Operations

Link monitoring operations start automatically when Ethernet OAM is enabled on an interface. When link monitoring operations are stopped, the interface does not actively send or receive event notification OAM PDUs. The tasks in this section describe how to stop and start link monitoring operations.

- Stopping Link Monitoring Operations, page 9
- Starting Link Monitoring Operations, page 10

Stopping Link Monitoring Operations

Perform this task to stop link monitoring operations.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **interface** *type number*
4. **ethernet oam** [**max-rate** *oampdus* | **min-rate** *num-seconds* | **mode** {**active** | **passive**} | **timeout** *seconds*]

5. **no ethernet oam link-monitor on**
6. **exit**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**enable** **Example:** `Router> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Router# configure terminal`	Enters global configuration mode.
Step 3	**interface** *type number* **Example:** `Router(config)# interface gigabitethernet 3/8`	Specifies an interface and places the CLI in interface configuration mode.
Step 4	**ethernet oam** [**max-rate** *oampdus* | **min-rate** *num-seconds* | **mode** {**active** | **passive**} | **timeout** *seconds*] **Example:** `Router(config-if)# ethernet oam`	Enables Ethernet OAM.
Step 5	**no ethernet oam link-monitor on** **Example:** `Router(config-if)# no ethernet oam link-monitor on`	Stops link monitoring operations.
Step 6	**exit** **Example:** `Router(config-if)# exit`	Returns the CLI to global configuration mode.

Starting Link Monitoring Operations

Perform this task to start link monitoring operations.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **interface** *type number*
4. **ethernet oam link-monitor on**
5. **exit**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**enable** **Example:** `Router> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Router# configure terminal`	Enters global configuration mode.
Step 3	**interface** *type number* **Example:** `Router(config)# interface gigabitethernet 3/8`	Specifies an interface and places the CLI in interface configuration mode.
Step 4	**ethernet oam link-monitor on** **Example:** `Router(config-if)# ethernet oam link-monitor on`	Starts link monitoring operations.
Step 5	**exit** **Example:** `Router(config-if)# exit`	Returns the CLI to global configuration mode.

Configuring Link Monitoring Options

Perform this optional task to specify link monitoring options. Steps 4 through 10 can be performed in any sequence.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **interface** *type number*
4. **ethernet oam** [**max-rate** *oampdus* | **min-rate** *num-seconds* | **mode** {**active** | **passive**} | **timeout** *seconds*]
5. **ethernet oam link-monitor high-threshold action error-disable-interface**
6. **ethernet oam link-monitor frame** {**threshold** {**high** {**none** | *high-frames*} | **low** *low-frames*} | **window** *milliseconds*}
7. **ethernet oam link-monitor frame-period** {**threshold** {**high** {**none** | *high-frames*} | **low** *low-frames*} | **window** *frames*}
8. **ethernet oam link-monitor frame-seconds** {**threshold** {**high** {**none** | *high-frames*} | **low** *low-frames*} | **window** *milliseconds*}
9. **ethernet oam link-monitor receive-crc** {**threshold** {**high** {*high-frames* | **none**} | **low** *low-frames*} | **window** *milliseconds*}

10. **ethernet oam link-monitor transmit-crc** {**threshold** {**high** {*high-frames* | **none**} | **low** *low-frames*} | **window** *milliseconds*}
11. **ethernet oam link-monitor symbol-period** {**threshold** {**high** {**none** | *high-symbols*} | **low** *low-symbols*} | **window** *symbols*}
12. **exit**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**enable** **Example:** `Router> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Router# configure terminal`	Enters global configuration mode.
Step 3	**interface** *type number* **Example:** `Router(config)# interface gigabitEthernet 3/8`	Identifies the interface and places the CLI in interface configuration mode.
Step 4	**ethernet oam** [**max-rate** *oampdus* | **min-rate** *num-seconds* | **mode** {**active** | **passive**} | **timeout** *seconds*] **Example:** `Router(config-if)# ethernet oam`	Enables Ethernet OAM.
Step 5	**ethernet oam link-monitor high-threshold action error-disable-interface** **Example:** `Router(config-if)# ethernet oam link-monitor high-threshold action error-disable-interface`	Configures an error-disable function on an Ethernet OAM interface when a high threshold for an error is exceeded.
Step 6	**ethernet oam link-monitor frame** {**threshold** {**high** {**none** | *high-frames*} | **low** *low-frames*} | **window** *milliseconds*} **Example:** `Router(config-if)# ethernet oam link-monitor frame window 399`	Configures a number for error frames that when reached triggers an action.
Step 7	**ethernet oam link-monitor frame-period** {**threshold** {**high** {**none** | *high-frames*} | **low** *low-frames*} | **window** *frames*} **Example:** `Router(config-if)# ethernet oam link-monitor frame-period threshold high 599`	Configures a number of frames to be polled. Frame period is a user-defined parameter.

	Command or Action	Purpose
Step 8	**ethernet oam link-monitor frame-seconds** {**threshold** {**high** {**none** | *high-frames*} | **low** *low-frames*} | **window** *milliseconds*} **Example:** `Router(config-if)# ethernet oam link-monitor frame-seconds window 699`	Configures a period of time in which error frames are counted.
Step 9	**ethernet oam link-monitor receive-crc** {**threshold** {**high** {*high-frames* | **none**} | **low** *low-frames*} | **window** *milliseconds*} **Example:** `Router(config-if)# ethernet oam link-monitor receive-crc window 99`	Configures an Ethernet OAM interface to monitor ingress frames with cyclic redundancy check (CRC) errors for a period of time.
Step 10	**ethernet oam link-monitor transmit-crc** {**threshold** {**high** {*high-frames* | **none**} | **low** *low-frames*} | **window** *milliseconds*} **Example:** `Router(config-if)# ethernet oam link-monitor transmit-crc threshold low 199`	Configures an Ethernet OAM interface to monitor egress frames with CRC errors for a period of time.
Step 11	**ethernet oam link-monitor symbol-period** {**threshold** {**high** {**none** | *high-symbols*} | **low** *low-symbols*} | **window** *symbols*} **Example:** `Router(config-if)# ethernet oam link-monitor symbol-period threshold high 299`	Configures a threshold or window for error symbols, in number of symbols.
Step 12	**exit** **Example:** `Router(config-if)# exit`	Returns the CLI to global configuration mode.

Examples

```
Router# configure terminal

Enter configuration commands, one per line.  End with CNTL/Z.

Router(config)# interface gigabitEthernet 3/8
Router(config-if)#
Router(config-if)# ethernet oam
Router(config-if)# ethernet oam link-monitor high-threshold action error-disable-interface
Router(config-if)# ethernet oam link-monitor frame window 399
Router(config-if)# ethernet oam link-monitor frame-period threshold high 599
Router(config-if)# ethernet oam link-monitor frame-seconds window 699
Router(config-if)# ethernet oam link-monitor receive-crc window 99
Router(config-if)# ethernet oam link-monitor transmit-crc threshold low 199
Router(config-if)# ethernet oam link-monitor symbol-period threshold high 299
Router(config-if)# exit
```

```
Router# show running-config

Building configuration...

Current configuration : 5613 bytes
!
!
version 12.2
!
!
.
.
.
!
!
interface GigabitEthernet3/8
 no ip address
 ethernet oam link-monitor high-threshold action error-disable-interface
 ethernet oam link-monitor frame window 399
 ethernet oam link-monitor frame-period threshold high 599
 ethernet oam link-monitor frame-seconds window 699
 ethernet oam link-monitor receive-crc window 99
 ethernet oam link-monitor transmit-crc threshold low 199
 ethernet oam link-monitor symbol-period threshold high 299
 ethernet oam
```

Configuring Global Ethernet OAM Options Using a Template

Perform this task to create a template to use for configuring a common set of options on multiple Ethernet OAM interfaces. Steps 4 through 10 are optional and can be performed in any sequence. These steps may also be repeated to configure different options.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **template** *template-name*
4. **ethernet oam link-monitor receive-crc** {**threshold** {**high** {*high-frames* | **none**} | **low** *low-frames*} | **window** *milliseconds*}
5. **ethernet oam link-monitor transmit-crc** {**threshold** {**high** {*high-frames* | **none**} | **low** *low-frames*} | **window** *milliseconds*}
6. **ethernet oam link-monitor symbol-period** {**threshold** {**high** {**none** | *high-symbols*} | **low** *low-symbols*} | **window** *symbols*}
7. **ethernet oam link-monitor high-threshold action error-disable-interface**
8. **ethernet oam link-monitor frame** {**threshold** {**high** {**none** | *high-frames*} | **low** *low-frames*} | **window** *milliseconds*}
9. **ethernet oam link-monitor frame-period** {**threshold** {**high** {**none** | *high-frames*} | **low** *low-frames*} | **window** *frames*}
10. **ethernet oam link-monitor frame-seconds** {**threshold** {**high** {**none** | *high-frames*} | **low** *low-frames*} | **window** *milliseconds*}
11. **exit**

12. **interface** *type number*
13. **source template** *template-name*
14. **exit**
15. **exit**
16. **show running-config**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**enable** **Example:** `Router> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Router# configure terminal`	Enters global configuration mode.
Step 3	**templat**e *template-name* **Example:** `Router(config)# template oam-temp`	Configures a template and places the CLI in template configuration mode.
Step 4	**ethernet oam link-monitor receive-crc** {**threshold** {**high** {*high-frames* | **none**} | **low** *low-frames*} | **window** *milliseconds*} **Example:** `Router(config-template)# ethernet oam link-monitor receive-crc window 99`	Configures an Ethernet OAM interface to monitor ingress frames with CRC errors for a period of time.
Step 5	**ethernet oam link-monitor transmit-crc** {**threshold** {**high** {*high-frames* | **none**} | **low** *low-frames*} | **window** *milliseconds*} **Example:** `Router(config-template)# ethernet oam link-monitor transmit-crc threshold low 199`	Configures an Ethernet OAM interface to monitor egress frames with CRC errors for a period of time.
Step 6	**ethernet oam link-monitor symbol-period** {**threshold** {**high** {**none** | *high-symbols*} | **low** *low-symbols*} | **window** *symbols*} **Example:** `Router(config-template)# ethernet oam link-monitor symbol-period threshold high 299`	Configures a threshold or window for error symbols, in number of symbols.

	Command or Action	Purpose
Step 7	**ethernet oam link-monitor high-threshold action error-disable-interface** **Example:** `Router(config-template)# ethernet oam link-monitor high-threshold action error-disable-interface`	Configures an error-disable function on an Ethernet OAM interface when a high threshold for an error is exceeded.
Step 8	**ethernet oam link-monitor frame** {**threshold** {**high** {**none** | *high-frames*} | **low** *low-frames*} | **window** *milliseconds*} **Example:** `Router(config-template)# ethernet oam link-monitor frame window 399`	Configures a number for error frames that when reached triggers an action.
Step 9	**ethernet oam link-monitor frame-period** {**threshold** {**high** {**none** | *high-frames*} | **low** *low-frames*} | **window** *frames*} **Example:** `Router(config-template)# ethernet oam link-monitor frame-period threshold high 599`	Configures a number of frames to be polled. Frame period is a user-defined parameter.
Step 10	**ethernet oam link-monitor frame-seconds** {**threshold** {**high** {**none** | *high-frames*} | **low** *low-frames*} | **window** *milliseconds*} **Example:** `Router(config-template)# ethernet oam link-monitor frame-seconds window 699`	Configures a period of time in which error frames are counted.
Step 11	**exit** **Example:** `Router(config-template)# exit`	Returns the CLI to global configuration mode.
Step 12	**interface** *type number* **Example:** `Router(config)# interface gigabitEthernet 3/8`	Identifies the interface on which to use the template and places the CLI in interface configuration mode.
Step 13	**source template** *template-name* **Example:** `Router(config-if)# source template oam-temp`	Applies to the interface the options configured in the template.
Step 14	**exit** **Example:** `Router(config-if)# exit`	Returns the CLI to global configuration mode.

	Command or Action	Purpose
Step 15	**exit** **Example:** `Router(config)# exit`	Returns the CLI to privileged EXEC mode.
Step 16	**show running-config** **Example:** `Router# show running-config`	Displays the updated running configuration.

Configuration Examples for Ethernet Operations, Administration, and Maintenance

The following example shows how to configure Ethernet OAM options using a template and overriding that configuration by configuring an interface. In this example, the network supports a Gigabit Ethernet interface between the customer edge device and provider edge device.

```
! Configure a global OAM template for both PE and CE configuration.
!

Router(config)# template oam
Router(config-template)# ethernet oam link-monitor symbol-period threshold low 10
Router(config-template)# ethernet oam link-monitor symbol-period threshold high 100
Router(config-template)# ethernet oam link-monitor frame window 100
Router(config-template)# ethernet oam link-monitor frame threshold low 10
Router(config-template)# ethernet oam link-monitor frame threshold high 100
Router(config-template)# ethernet oam link-monitor frame-period window 100
Router(config-template)# ethernet oam link-monitor frame-period threshold low 10
Router(config-template)# ethernet oam link-monitor frame-period threshold high 100
Router(config-template)# ethernet oam link-monitor frame-seconds window 1000
Router(config-template)# ethernet oam link-monitor frame-seconds threshold low 10
Router(config-template)# ethernet oam link-monitor frame-seconds threshold high 100
Router(config-template)# ethernet oam link-monitor receive-crc window 100
Router(config-template)# ethernet oam link-monitor receive-crc threshold high 100
Router(config-template)# ethernet oam link-monitor transmit-crc window 100
Router(config-template)# ethernet oam link-monitor transmit-crc threshold high 100
Router(config-template)# ethernet oam remote-failure dying-gasp action
error-disable-interface
Router(config-template)# exit
!

! Enable Ethernet OAM on the CE interface

!
Router(config)# interface gigabitethernet 4/1/1

Router(config-if)# ethernet oam
!

! Apply the global OAM template named "oam" to the interface.

!

Router(config-if)# source template oam
```

```
!

! Configure any interface-specific link monitoring commands to override the template
configuration. The following example disables the high threshold link monitoring for
receive CRC errors.
!

Router(config-if)# ethernet oam link-monitor receive-crc threshold high none
!

! Enable Ethernet OAM on the PE interface

!

Router(config)# interface gigabitethernet 8/1/1
Router(config-if)# ethernet oam
!

! Apply the global OAM template named "oam" to the interface.
!

Router(config-if)# source template oam
```

The following examples show how to verify various Ethernet OAM configurations and activities.

Verifying an OAM Session

The following example shows that the local OAM client, Gigabit Ethernet interface Gi6/1/1, is in session with a remote client with MAC address 0012.7fa6.a700 and OUI 00000C, which is the OUI for Cisco Systems. The remote client is in active mode and has established capabilities for link monitoring and remote loopback for the OAM session.

```
Router# show ethernet oam summary

Symbols:          * - Master Loopback State,  # - Slave Loopback State
Capability codes: L - Link Monitor,  R - Remote Loopback
                  U - Unidirection,  V - Variable Retrieval

  Local                       Remote
Interface       MAC Address    OUI    Mode    Capability
 Gi6/1/1       0012.7fa6.a700 00000C active      L R
```

Verifying OAM Discovery Status

The following example shows how to verify OAM discovery status of a local client and a remote peer:

```
Router# show ethernet oam discovery interface gigabitethernet6/1/1

GigabitEthernet6/1/1

Local client
------------
  Administrative configurations:
    Mode:              active
    Unidirection:      not supported
    Link monitor:      supported (on)
    Remote loopback:   not supported
    MIB retrieval:     not supported
    Mtu size:          1500

  Operational status:
Port status:       operational
    Loopback status:   no loopback
```

```
    PDU permission:    any
    PDU revision:      1

Remote client
-------------
  MAC address: 0030.96fd.6bfa
  Vendor(oui): 0x00 0x00 0x0C (cisco)

  Administrative configurations:
    Mode:              active
   Unidirection:      not supported
   Link monitor:      supported
   Remote loopback:   not supported
   MIB retrieval:     not supported
   Mtu size:          1500
```

Verifying Information OAMPDU and Fault Statistics

The following example shows how to verify statistics for information OAM PDUs and local and remote faults:

```
Router# show ethernet oam statistics interface gigabitethernet6/1/1

GigabitEthernet6/1/1
Counters:
---------
Information OAMPDU Tx                   : 588806
Information OAMPDU Rx                   : 988
Unique Event Notification OAMPDU Tx     : 0
Unique Event Notification OAMPDU Rx     : 0
Duplicate Event Notification OAMPDU TX  : 0
Duplicate Event Notification OAMPDU RX  : 0
Loopback Control OAMPDU Tx              : 1
Loopback Control OAMPDU Rx              : 0
Variable Request OAMPDU Tx              : 0
Variable Request OAMPDU Rx              : 0
Variable Response OAMPDU Tx             : 0
Variable Response OAMPDU Rx             : 0
Cisco OAMPDU Tx                         : 4
Cisco OAMPDU Rx                         : 0
Unsupported OAMPDU Tx                   : 0
Unsupported OAMPDU Rx                   : 0
Frames Lost due to OAM                  : 0

Local Faults:
-------------
0 Link Fault records
2 Dying Gasp records
Total dying gasps       : 4
Time stamp              : 00:30:39
Total dying gasps       : 3
Time stamp              : 00:32:39
0 Critical Event records

Remote Faults:
--------------
0 Link Fault records
0 Dying Gasp records
0 Critical Event records

Local event logs:
-----------------
0 Errored Symbol Period records
0 Errored Frame records
```

```
0 Errored Frame Period records
0 Errored Frame Second records

Remote event logs:
------------------
0 Errored Symbol Period records
0 Errored Frame records
0 Errored Frame Period records
0 Errored Frame Second records
```

Verifying Link Monitoring Configuration and Status

The following example shows how to verify link monitoring configuration and status on the local client. The highlighted Status field in the example shows that link monitoring status is supported and enabled (on).

```
Router# show ethernet oam status interface gigabitethernet6/1/1

GigabitEthernet6/1/1

General
-------
  Mode:                  active
  PDU max rate:          10 packets per second
  PDU min rate:          1 packet per 1 second
  Link timeout:          5 seconds
  High threshold action: no action

Link Monitoring
---------------
  Status: supported (on)

  Symbol Period Error
    Window:              1 million symbols
    Low threshold:       1 error symbol(s)
    High threshold:      none

  Frame Error
    Window:              10 x 100 milliseconds
    Low threshold:       1 error frame(s)
    High threshold:      none
Frame Period Error
    Window:              1 x 100,000 frames
    Low threshold:       1 error frame(s)
    High threshold:      none
  Frame Seconds Error
    Window:              600 x 100 milliseconds
    Low threshold:       1 error second(s)
    High threshold:      none
```

Verifying Status of a Remote OAM Client

The following example shows that the local client interface Gi6/1/1 is connected to a remote client. Note the values in the Mode and Capability fields.

```
Router# show ethernet oam summary

Symbols:          * - Master Loopback State,  # - Slave Loopback State
Capability codes: L - Link Monitor,  R - Remote Loopback
                  U - Unidirection,  V - Variable Retrieval

  Local                        Remote
Interface       MAC Address    OUI    Mode    Capability
 Gi6/1/1       0012.7fa6.a700 00000C active      L R
```

Additional References

The following sections provide references related to Ethernet Operations, Administration, and Maintenance.

Related Documents

Related Topic	Document Title
Ethernet Connectivity Fault Management	• *Ethernet Connectivity Fault Management,* Release 12.2(33)SXH • *Ethernet Connectivity Fault Management*, Releases 12.4T and 12.2SR
Ethernet Local Management Interface	*Ethernet Local Management Interface*
Ethernet Local Management Interface at a Provider Edge	*Ethernet Local Management Interface at a Provider Edge*
Cisco IOS Carrier Ethernet commands	• *Cisco IOS Carrier Ethernet Command Reference*, Release 12.2SR • *Cisco IOS Carrier Ethernet Command Reference*, Release 12.4T

Standards

Standard	Title
IEEE Draft P802.3ah/D3.3	*Ethernet in the First Mile - Amendment*
IETF VPLS OAM	*L2VPN OAM Requirements and Framework*
ITU-T	*ITU-T Y.1731 OAM Mechanisms for Ethernet-Based Networks*

MIBs

MIB	MIBs Link
No new or modified MIBs are supported by this feature, and support for existing MIBs has not been modified by this feature.	To locate and download MIBs for selected platforms, Cisco IOS releases, and feature sets, use Cisco MIB Locator found at the following URL: http://www.cisco.com/go/mibs

RFCs

RFC	Title
No new or modified RFCs are supported by this feature, and support for existing RFCs has not been modified by this feature.	—

Technical Assistance

Description	Link
The Cisco Support website provides extensive online resources, including documentation and tools for troubleshooting and resolving technical issues with Cisco products and technologies. To receive security and technical information about your products, you can subscribe to various services, such as the Product Alert Tool (accessed from Field Notices), the Cisco Technical Services Newsletter, and Really Simple Syndication (RSS) Feeds. Access to most tools on the Cisco Support website requires a Cisco.com user ID and password.	http://www.cisco.com/techsupport

Command Reference

This section documents only commands that are new or modified.

- **clear ethernet oam statistics**
- **debug ethernet oam**
- **ethernet oam**
- **ethernet oam link-monitor frame**
- **ethernet oam link-monitor frame-period**
- **ethernet oam link-monitor frame-seconds**
- **ethernet oam link-monitor high-threshold action**
- **ethernet oam link-monitor on**
- **ethernet oam link-monitor receive-crc**
- **ethernet oam link-monitor supported**
- **ethernet oam link-monitor symbol-period**
- **ethernet oam link-monitor transmit-crc**
- **ethernet oam remote-loopback**
- **ethernet oam remote-loopback (interface)**
- **show ethernet oam discovery**
- **show ethernet oam statistics**
- **show ethernet oam status**
- **show ethernet oam summary**
- **source template (eoam)**
- **template (eoam)**

clear ethernet oam statistics

To reset Ethernet operations, maintenance, and administration (OAM) counters and event statistics on all interfaces or on a specific interface, use the **clear ethernet oam statistics** command in privileged EXEC mode.

clear ethernet oam statistics [**interface** {*type number*}]

Syntax Description

interface	(Optional) Specifies an interface.
type	(Optional) Type of Ethernet interface. Valid values are: FastEthernet, GigabitEthernet, TenGigabitEthernet.
number	(Optional) Integer from 1 to 9 that is the number of the Ethernet interface.

Command Modes

Privileged EXEC (#)

Command History

Release	Modification
12.2(33)SRA	This command was introduced.
12.4(15)T	This command was integrated into Cisco IOS Release 12.4(15)T.
12.2(33)SXH	This command was integrated into Cisco IOS Release 12.2(33)SXH.

Usage Guidelines

Use this command when you are debugging or testing and you want all statistics cleared. After this command is issued, the cleared statistics cannot be restored.

Examples

The following example shows how to clear counters and event statistics for all interfaces:

```
Router# clear ethernet oam statistics
```

Related Commands

Command	Description
show ethernet oam statistics	Displays detailed information about Ethernet OAM packets.

debug ethernet oam

To enable all Ethernet operations, administration, and maintenance (OAM) debugging, use the **debug ethernet oam** command in privileged EXEC mode. To disable Ethernet OAM debuging, use the **no** form of this command.

debug ethernet oam {**all** | **config** | **ha** | **link-monitor** | **loopback** | **packet** {**decode** | **rx** | **tx**} | **sm**}

no debug ethernet oam {**all** | **config** | **ha** | **link-monitor** | **loopback** | **packet** {**decode** | **rx** | **tx**} | **sm**}

Syntax Description

all	Debugging for all Ethernet OAM flags is on.
config	Debugging for Ethernet OAM configurations is on.
ha	Debugging for Ethernet OAM high-availability events is on.
link-monitor	Debugging for Ethernet OAM link monitoring is on.
loopback	Debugging for Ethernet OAM loopback messages is on.
packet	Debugging for Ethernet OAM protocol data units (PDUs) is on.
decode	Decoding for ingress or egress OAMPDUs, or both, is on.
rx	Debugging for Ethernet ingress OAMPDUs is on.
tx	Debugging for Ethernet egress OAMPDUs is on.
sm	Debugging for the Ethernet OAM state machine is on.

Command Default

All Ethernet OAM debug commands are enabled.

Command Modes

Privileged EXEC

Command History

Release	Modification
12.2(33)SRA	This command was introduced.
12.4(15)T	This command was integrated into Cisco IOS Release 12.4(15)T.
12.2(33)SXH	This command was integrated into Cisco IOS Release 12.2(33)SXH.

Usage Guidelines

When you use the **all** keyword, keep in mind the number of interfaces supporting Ethernet OAM. If many interfaces are supported, some messages may be lost and system performance can degrade.

The **ha** keyword is not available in Cisco IOS Release 12.4(15)T.

The output from this command is a log of activity. Use this command to troubleshoot Ethernet OAM in your network.

Examples

The following example shows output of the **debug ethernet oam all** command:

```
Router# debug ethernet oam all

*Aug 17 14:00:53.732:     ether_oam_port Gi2/9: during state INACTIVE,
got event 3(link_up)
*Aug 17 14:00:53.732: @@@ ether_oam_port Gi2/9: INACTIVE -> FAULT
*Aug 17 14:00:53.732:     ether_oam_port Gi2/9: idle during state FAULT
*Aug 17 14:00:53.732: @@@ ether_oam_port Gi2/9: FAULT -> FAULT2
*Aug 17 14:00:53.732:     ether_oam_port Gi2/9: during state FAULT2, got
event 6(mode_active)
*Aug 17 14:00:53.732: @@@ ether_oam_port Gi2/9: FAULT2 -> ACTIVE_SEND_LOCAL
*Aug 17 14:00:54.212: EOAM RX PAK(Gi2/9):
*Aug 17 14:00:54.212: 03 00 08 00 01 10 01 00 00 00 0D 05 DC 00 00 0C *Aug 17
14:00:54.212: 00 00 00 01 00 00 00 00 00 00 00 00 00 00 00 00
*Aug 17 14:00:54.212: 00 00 00 00 00 00 00 00
*Aug 17 14:00:54.212:     ether_oam_port Gi2/9: during state
SEND_LOCAL_REMOTE, got event 8(local_satisfied)
1w5d: %ETHERNET_OAM-6-ENTER_SESSION: The client on interface Gi2/11 has entered the OAM
session.
*Aug 17 14:00:55.212: EOAM RX PAK(Gi2/9):
*Aug 17 14:00:55.212: 03 00 50 00 01 10 01 00 00 00 0D 05 DC 00 00 0C
*Aug 17 14:00:55.212: 00 00 00 SYMPRD w=104857600 lt=1 ht=0
elapsed_time=1032(ms) rx_sym=1000000000 err_sym=0 *Aug 17 14:00:55.740: EOAM LM(Gi2/9):
FRM w=1 lt=1 ht=0 t_frm=0 err_frm=0
*Aug 17 14:00:55.740: EOAM LM(Gi2/9): FRMPRD w=10000000 lt=1 ht=0 t_frm=1 err_frm=0
*Aug 17 14:00:55.740: EOAM LM(Gi2/9): w=1 lt=10 ht=0 err_frm=0
*Aug 17 14:00:55.740: EOAM LM(Gi2/9): w=1 lt=10 ht=0 err_frm=0
*Aug 17 14:00:55.832: EOAM TX PAK(Gi2/9):
*Aug 17 14:00:55.832: 03 00 50 00 0 1 10 01 00 00 00 0D 05 DC 00 00 0C
*Aug 17 14:00:55.832: 00 00 00 01 02 10 01 00 00 00 0D 05 DC 00 00 0C *Aug 17
14:00:55.832: 00 00 00 01 *Aug 17 14:00:55.832: EOAM TX PAK(Gi2/9): 00 00 00 0D 05 DC 00
00 0C
*Aug 17 14:00:56.212: 00 00 00 01 02 10 01 00 00 00 0D 05 DC 00 00 0C
*Aug 17 14:00:56.212: 00 00 00 01 00 00 00 00 00 00 00 00 00 00 00 00
*Aug 17 14:00:56.212: EOAM RX PAK(Gi2/9): infotlv w/ same revision *Aug 17 14:00:56.820:
EOAM LM(Gi2/9): SYMPRD w=104857600 lt=1 ht=0
elapsed_time=1000(ms) rx_sym=1000000000 err_sym=0
*Aug 17 14:00:56.820: EOAM LM(Gi2/9): FRM w=1 lt=1 ht=0 t_frm=0 err_frm=0
*Aug 17 14:00:56.820: EOAM LM(Gi2/9): 05 FRMPRD w=10000000 lt=1 ht=0 t_frm=3 err_frm=0
*Aug 17 14:00:57.820: EOAM LM(Gi2/9): w=1 lt=10 ht=0 err_frm=0
*Aug 17 14:00:57.820: EOAM LM(Gi2/9): w=1 lt=10 ht=0 err_frm=0
*Aug 17 14:00:57.856: EOAM TX PAK(Gi2/9):
*Aug 17 14:00:57.856: 03 00 50 00 01 10 01 00 00 00 0D 05 DC 00 00 0C
*Aug 17 14:00:57.856: 00 00 00 01 02 10 01 00 00 00 0D 17 14:00:58.212: 05 DC 00 00 0C
*Aug 17 14:00:57.856: 00 00 00 01
*Aug 17 14:00:57.856: EOAM TX PAK(Gi2/9): sent OAMPDU w/ op=0
*Aug 17 14:00:58.212: EOAM RX PAK(Gi2/9):
*Aug 17 14:00:58.212: EOAM RX PAK(Gi2/9): infotlv w/ same revision
*Aug 17 14:00:58.820: EOAM LM(Gi2/9): SYMPRD w=104857600 lt=1 ht=0
elapsed_time=1000(ms) rx_sym=1000000000 err_sym=0
*Aug 17 14:00:58.820: EOAM LM(Gi2/9): FRM w=1 lt=1 ht=0 t_frm=0 err_frm=0
*Aug 17 14:00:58.820: EOAM LM(Gi2/9): FRMPRD w=10000000 lt=1 ht=0 t_frm=4 err_frm=0
*Aug 17 14:00:58.820: EOAM LM(Gi2/9): w=1 lt=10 ht=0 err_frm=0
*Aug 17 14:00:58.820: EOAM LM(Gi2/9): w=1 lt=10 ht=0 err_frm=0
*Aug 17 14:00:58.856: EOAM TX PAK(Gi2/9):
*Aug 17 14:00:58.856: 03 00 50 00 01 10 01 00 00 00 0D 05 DC 00 00 0C
*Aug 17 14:00:58.856: 00 00 00 01 02 10 01 00 00 00 0D 05 DC 00 00 0C
*Aug 17 14:00:58.856: 00 sent OAMPDU w/ op=0w=1 lt=10 ht=0 err_frm=0
```

```
*Aug 17 14:00:59.856: EOAM TX PAK(Gi2/9):
*Aug 17 14:00:59.856: 03 00 50 00 01 10 01 00 00
*Aug 17 14:01:00.832: EOAM LM(Gi2/9): SYMPRD w=104857600 lt=1 ht=0
elapsed_time=1008(ms) rx_sym=1000000000 err_sym=0
*Aug 17 14:01:00.832: EOAM LM(Gi2/9): FRM w=1 lt=1 ht=0 t_frm=0 err_frm=0
*Aug 17 14:01:00.832: EOAM LM(Gi2/9): FRMPRD w=10000000 lt=1 ht=0 t_frm=6 err_frm=0
*Aug 17 14:01:00.832: EOAM LM(Gi2/9): w=1 lt=10 ht=0 err_frm=0
*Aug 17 14:01:00.832: EOA M LM(Gi2/9): w=1 lt=10 ht=0 err_frm=0
*Aug 17 14:01:00.856: EOAM TX PAK(Gi2/9):
*Aug 17 14:01:00.856: 03 00 50 00 01 10 01 00 00 00 0D 05 DC 00 00 0C
*Aug 17 14:01:00.856: 00 00
```

ethernet oam

To enable Ethernet operations, maintenance, and administration (OAM) on an interface, use the **ethernet oam** command in interface configuration mode. To disable Ethernet OAM on an interface, use the **no** form of this command.

ethernet oam [**max-rate** *oampdus* | **min-rate** *num-seconds* | **mode** {**active** | **passive**} | **timeout** *seconds*]

no ethernet oam [**max-rate** | **min-rate** | **mode** {**active** | **passive**} | **timeout**]

Syntax Description

max-rate	(Optional) Sets the maximum rate that OAM protocol data units (PDUs) can be sent per second.
oampdus	(Optional) Integer in the range of 1 to 10 that is the number of OAM PDUs transmitted. The default is 10 for the maximum rate.
min-rate	(Optional) Controls the minimum rate that OAM PDUs are transmitted, in seconds.
num-seconds	(Optional) Integer in the range of 1 to 10 that is the number of seconds during which at least one OAM PDU must be sent.
mode	(Optional) Sets the OAM client mode.
active	(Optional) Sets the OAM client mode to active after the interface was previously placed in passive mode. Active is the default.
passive	(Optional) Sets the OAM client mode to passive. In passive mode, a device cannot inititate discovery, inquire about variables, or set loopback mode.
timeout	(Optional) Specifies the amount of time, in seconds, after which a device declares its OAM peer to be nonoperational and resets its state machine.
seconds	(Optional) Integer in the range of 2 to 30 that is the number of seconds of the timeout period. The default is 5.

Command Default

Ethernet OAM is disabled.

Command Modes

Interface configuration (config-if)

Command History

Release	Modification
12.2(33)SRA	This command was introduced.
12.4(15)T	This command was integrated into Cisco IOS Release 12.4(15)T.
12.2(33)SXH	This command was integrated into Cisco IOS Release 12.2(33)SXH.

Usage Guidelines

When Ethernet OAM is configured on an interface, the default mode of the OAM client is active. When the Ethernet OAM mode is enabled on two interfaces passing traffic, both interfaces cannot be in passive mode. Both interfaces can be in active mode, and one can be in active mode and the other in passive mode. You can toggle between Ethernet OAM modes without disabling OAM.

The **min-rate** *num-seconds* keyword and argument pair controls the minimum rate at which OAM PDUs can be sent on an interface, in seconds. A value of *n*, where 1 is less than or equal to *n* and *n* is less than or equal to 10, indicates that an OAM PDU must be sent at least once per *n* seconds. If no other OAM PDU is to be sent within an *n*-second window, an information OAM PDU must be sent.

Examples

The following example shows how to activate an Ethernet OAM interface that was previously configured to be in passive mode:

```
Router(config)# interface gigabitethernet 0/1
Router(config-if)# ethernet oam mode active
```

The following example shows how to set the maximum transmission rate of OAM PDUs on interface GigabitEthernet 0/1 to 5 transmissions per second:

```
Router(config)# interface gigabitethernet 0/1
Router(config-if)# ethernet oam max-rate 5
```

The following example shows how to set the timeout period to 25 seconds on interface GigabitEthernet 0/1:

```
Router(config)# interface gigabitethernet 0/1
Router(config-if)# ethernet oam timeout 25
```

ethernet oam link-monitor frame

To configure an error frame threshold or window on an Ethernet operations, maintenance, and administration (OAM) interface, use the **ethernet oam link-monitor frame** command in configuration template mode or interface configuration mode. To remove the threshold or window, use the **no** form of this command.

ethernet oam link-monitor frame {**threshold** {**high** {**none** | *high-frames*} | **low** *low-frames*} | **window** *milliseconds*}

no ethernet oam link-monitor frame {**threshold** {**high** | **low**} | **window**}

Syntax Description

threshold	Sets a number of error frames at, above, or below which an action is triggered.
high	Sets a high error frame threshold in number of frames.
none	Disables a high threshold.
high-frames	Integer in the range of 1 to 65535 that is the high threshold in number of frames.
low	Sets a low error frame threshold.
low-frames	Integer in the range of 0 to 65535 that sets the low threshold in number of frames. The default is 1.
window	Sets a window and period of time during which error frames are counted.
milliseconds	Integer in the range of 10 to 600 that represents a number of milliseconds in a multiple of 100. The default is 100.

Command Default

The **ethernet oam link-monitor frame** command is not configured.

Command Modes

Configuration template (config-template)
Interface configuration (config-if)

Command History

Release	Modification
12.2(33)SRA	This command was introduced.
12.4(15)T	This command was integrated into Cisco IOS Release 12.4(15)T.
12.2(33)SXH	This command was integrated into Cisco IOS Release 12.2(33)SXH.

Usage Guidelines

The **ethernet oam link-monitor frame** command configures a number of error frames that triggers an action or a period of time in which error frames are counted.

Examples

The following example shows how to configure an Ethernet OAM link-monitor frame window of 3000 milliseconds:

```
Router(config-template)# ethernet oam link-monitor frame window 300
```

Related Commands

ethernet oam link-monitor frame-period	Configures an error frame period on an Ethernet OAM interface.
ethernet oam link-monitor frame-seconds	Configures a frame-seconds period on an Ethernet OAM interface.
ethernet oam link-monitor high-threshold action	Configures a specific action to occur when a high threshold for an error is exceeded on an Ethernet OAM interface.
ethernet oam link-monitor receive-crc	Configures an Ethernet OAM interface to monitor frames received with CRC errors for a period of time.
ethernet oam link-monitor symbol-period	Configures an error symbol period on an Ethernet OAM interface.
ethernet oam link-monitor transmit-crc	Configures an Ethernet OAM interface to monitor frames transmitted with CRC errors for a period of time.

ethernet oam link-monitor frame-period

To configure an error frame period on an Ethernet operations, maintenance, and administration (OAM) interface, use the **ethernet oam link-monitor frame-period** command in configuration template or interface configuration mode. To remove the frame period, use the **no** form of this command.

ethernet oam link-monitor frame-period {**threshold** {**high** {**none** | *high-frames*} | **low** *low-frames*} | **window** *frames*}

no ethernet oam link-monitor frame-period {**threshold** {**high** | **low**} | **window**}

Syntax Description

threshold	Sets a number of error frames for the period at, above, or below which an action is triggered.
high	Sets a high threshold for the error frame period in number of frames.
none	Disables a high threshold.
high-frames	Integer in the range of 1 to 65535 that is the high threshold in number of frames. There is no default. The high threshold must be configured.
low	Sets a low threshold for the error frame period in number of frames.
low-frames	Integer in the range of 0 to 65535 that is the low threshold in number of frames. The default is 1.
window	Sets a polling window and window size.
frames	Integer in the range of 1 to 65535 that is the window size in number of frames. Each value is a multiple of 10000. The default is 1000.

Command Default

The **ethernet oam link-monitor frame-period** command is not configured.

Command Modes

Configuration template (config-template)
Interface configuration (config-if)

Command History

Release	Modification
12.2(33)SRA	This command was introduced.
12.4(15)T	This command was integrated into Cisco IOS Release 12.4(15)T.
12.2(33)SXH	This command was integrated into Cisco IOS Release 12.2(33)SXH.

Usage Guidelines

The **ethernet oam link-monitor frame-period** command configures an error frame period in number of frames. When a high threshold is configured, it must be at least as great as the low threshold for frame errors.

The number of frames polled is user defined. Note that the system can poll only by time, not by frames. The number of frames you specify is converted internally to seconds using a formula that includes interface speed.

Examples

The following example shows how to configure an Ethernet OAM link-monitor frame-period window of 20000 frames:

```
Router(config-template)# ethernet oam link-monitor frame-period window 2
```

The following example shows how to configure an Ethernet OAM link-monitor frame-period low threshold of 500 frames:

```
Router(config-template)# ethernet oam link-monitor frame-period threshold low 500
```

Related Commands

ethernet oam link-monitor frame	Configures an error frame threshold or window on an Ethernet OAM interface.
ethernet oam link-monitor frame-seconds	Configures a frame-seconds period on an Ethernet OAM interface.
ethernet oam link-monitor high-threshold action	Configures a specific action to occur when a high threshold for an error is exceeded on an Ethernet OAM interface.
ethernet oam link-monitor receive-crc	Configures an Ethernet OAM interface to monitor frames received with CRC errors for a period of time.
ethernet oam link-monitor symbol-period	Configures an error symbol period on an Ethernet OAM interface.
ethernet oam link-monitor transmit-crc	Configures an Ethernet OAM interface to monitor frames transmitted with CRC errors for a period of time.

ethernet oam link-monitor frame-seconds

To configure a frame-seconds period on an Ethernet operations, maintenance, and administration (OAM) interface, use the **ethernet oam link-monitor frame-seconds** command in configuration template and interface configuration mode. To remove the threshold or window, use the **no** form of this command.

ethernet oam link-monitor frame-seconds {**threshold** {**high** {**none** | *high-frames*} | **low** *low-frames*} | **window** *milliseconds*}

no ethernet oam link-monitor frame-seconds {**threshold** {**high** | **low**} | **window**}

Syntax Description

threshold	Sets a number at, above, or below which an action is triggered.
high	Sets a high error frame-seconds threshold in number of seconds.
none	Disables a high threshold.
high-frames	Integer in the range of 1 to 900 that is the high threshold in number of frames. There is no default. The high threshold must be configured.
low	Sets a low error frame-seconds threshold in number of seconds.
low-frames	Integer in the range of 1 to 900 that sets the low threshold in number of frames. The default is 1.
window	Sets a polling window during which error frames are counted.
milliseconds	Integer in the range of 100 to 9000 that represents a number of milliseconds in a multiple of 100. The default is 1000.

Command Default

The **ethernet oam link-monitor frame-seconds** command is not configured.

Command Modes

Configuration template (config-template)
Interface configuration (config-if)

Command History

Release	Modification
12.2(33)SRA	This command was introduced.
12.4(15)T	This command was integrated into Cisco IOS Release 12.4(15)T.
12.2(33)SXH	This command was integrated into Cisco IOS Release 12.2(33)SXH.

Usage Guidelines

The **ethernet oam link-monitor frame-seconds** command configures a number of error frames that triggers an action or a period of time in which error frames are counted.

Examples

The following example shows how to configure an Ethernet OAM link-monitor frame-seconds window of 30000 milliseconds (30 seconds):

```
Router(config-template)# ethernet oam link-monitor frame-seconds window 300
```

Related Commands

ethernet oam link-monitor frame	Configures an error frame threshold or window on an Ethernet OAM interface.
ethernet oam link-monitor frame-period	Configures an error frame period on an Ethernet OAM interface.
ethernet oam link-monitor high-threshold action	Configures a specific action to occur when a high threshold for an error is exceeded on an Ethernet OAM interface.
ethernet oam link-monitor receive-crc	Configures an Ethernet OAM interface to monitor frames received with CRC errors for a period of time.
ethernet oam link-monitor symbol-period	Configures an error symbol period on an Ethernet OAM interface.
ethernet oam link-monitor transmit-crc	Configures an Ethernet OAM interface to monitor frames transmitted with CRC errors for a period of time.

ethernet oam link-monitor high-threshold action

To configure a specific action to occur when a high threshold for an error is exceeded on an Ethernet operations, maintenance, and administration (OAM) interface, use the **ethernet oam link-monitor high-threshold action** command in configuration template mode. To remove the high-threshold action, use the **no** form of this command.

ethernet oam link-monitor high-threshold action {**error-disable-interface** | **failover**}

no ethernet oam link-monitor high-threshold action

Syntax Description

error-disable-interface	Performs an error-disable function on the interface.
failover	Performs a failover to another port in the same PortChannel.

Command Default

A high-threshold action is not configured.

Command Modes

Configuration template (config-template)

Command History

Release	Modification
12.2(33)SRA	This command was introduced.
12.4(15)T	This command was integrated into Cisco IOS Release 12.4(15)T.
12.2(33)SXH	This command was integrated into Cisco IOS Release 12.2(33)SXH.

Usage Guidelines

The failover action is applicable only to EtherChannel interfaces. It provides an automatic failover of traffic from one port in an EtherChannel to another port in the same EtherChannel when one of the ports in the channel exceeds the high threshold for an error within the specified interval. The port failover occurs only if at least one operational port is in the EtherChannel. The failed port is put into an error-disable state. If the failed port is the last port in the EtherChannel, the port will not be put into the error-disable state and will continue to pass traffic regardless of the types of errors received.

Single, nonchanneling ports go into the error-disable state when the error high threshold is exceeded within the specified interval.

Examples

The following example shows how to configure an error-disable-interface action to occur when the high threshold for an error is exceeded:

```
Router(config-template)# ethernet oam link-monitor high-threshold action
error-disable-interface
```

Related Commands

ethernet oam link-monitor frame	Configures an error frame threshold or window on an Ethernet OAM interface.
ethernet oam link-monitor frame-period	Configures an error frame period on an Ethernet OAM interface.
ethernet oam link-monitor frame-seconds	Configures a frame-seconds period on an Ethernet OAM interface.
ethernet oam link-monitor receive-crc	Configures an Ethernet OAM interface to monitor frames received with CRC errors for a period of time.
ethernet oam link-monitor symbol-period	Configures an error symbol period on an Ethernet OAM interface.
ethernet oam link-monitor transmit-crc	Configures an Ethernet OAM interface to monitor frames transmitted with CRC errors for a period of time.

ethernet oam link-monitor on

To enable link monitoring on an Ethernet operations, maintenance, and administration (OAM) interface, use the **ethernet oam link-monitor on** command in interface configuration mode. To disable link monitoring, use the **no** form of this command.

ethernet oam link-monitor on

no ethernet oam link-monitor on

Syntax Description

This command has no arguments or keywords.

Command Default

Link monitoring is turned on when Ethernet OAM is enabled.

Command Modes

Interface configuration (config-if)

Command History

Release	Modification
12.2(33)SRA	This command was introduced.
12.4(15)T	This command was integrated into Cisco IOS Release 12.4(15)T.
12.2(33)SXH	This command was integrated into Cisco IOS Release 12.2(33)SXH.

Usage Guidelines

When link monitoring is enabled, the interface sends event OAM protocol data units (PDUs) when errors occur and interprets event OAM PDUs from the remote peer. Link monitoring can be effective only if both the local client and remote peer agree to support it.

The **ethernet oam link-monitor on** command is enabled by default when Ethernet OAM is enabled and does not display in the configuration when the **show running-config** command is issued.

When link monitoring is enabled by default, to turn it off you must explicitly disable it by issuing the **no** form of this command.

Examples

The following example shows how to disable link monitoring on Ethernet OAM interface Ethernet 0/1:

```
Router(config)# interface ethernet 0/1
Router(config-if)# no ethernet oam link-monitor on
```

Related Commands

ethernet oam link-monitor supported	Enables support for link monitoring on an Ethernet OAM interface.

ethernet oam link-monitor receive-crc

To configure an Ethernet operations, maintenance, and administration (OAM) interface to monitor ingress frames received with cyclic redundancy code (CRC) errors for a period of time, use the **ethernet oam link-monitor receive-crc** command in configuration template or interface configuration mode. To disable monitoring, use the **no** form of this command.

ethernet oam link-monitor receive-crc {**threshold** {**high** {*high-frames* | **none**} | **low** *low-frames*} | **window** *milliseconds*}

no ethernet oam link-monitor receive-crc {**threshold** {**high** | **low**} | **window**}

Syntax Description

threshold	Sets a number of frames with CRC errors received at, above, or below which an action is triggered.
high	Sets a high threshold in number of frames.
high-frames	Integer in the range of 1 to 65535 that is the high threshold in number of frames.
none	Disables a high threshold.
low	Sets a low threshold.
low-frames	Integer in the range of 0 to 65535 that sets the low threshold in number of frames. The default is 10.
window	Sets a window and period of time during which frames with CRC errors are counted.
milliseconds	Integer in the range of 10 to 1800 that represents a number of milliseconds in a multiple of 100. The default is 1000.

Command Default

The **ethernet oam link-monitor receive-crc** command is not configured.

Command Modes

Configuration template (config-template)
Interface configuration (config-if)

Command History

Release	Modification
12.2(33)SRA	This command was introduced.
12.4(15)T	This command was integrated into Cisco IOS Release 12.4(15)T.
12.2(33)SXH	This command was integrated into Cisco IOS Release 12.2(33)SXH.

Usage Guidelines

OAM must be operational on the interface before you issue this command.

Examples

The following example shows how to configure a receive-crc period with a low threshold of 3000:

```
Router(config-if)# ethernet oam link-monitor receive-crc threshold low 3000
```

Related Commands

ethernet oam link-monitor frame	Configures an error frame threshold or window on an Ethernet OAM interface.
ethernet oam link-monitor frame-period	Configures an error frame period on an Ethernet OAM interface.
ethernet oam link-monitor frame-seconds	Configures a frame-seconds period on an Ethernet OAM interface.
ethernet oam link-monitor high-threshold action	Configures a specific action to occur when a high threshold for an error is exceeded on an Ethernet OAM interface.
ethernet oam link-monitor symbol-period	Configures an error symbol period on an Ethernet OAM interface.
ethernet oam link-monitor transmit-crc	Configures an Ethernet OAM interface to monitor frames transmitted with CRC errors for a period of time.

ethernet oam link-monitor supported

To enable support for link monitoring on an Ethernet operations, maintenance, and administration (OAM) interface, use the **ethernet oam link-monitor supported** command in interface configuration mode. To disable link monitoring support, use the **no** form of this command.

ethernet oam link-monitor supported

no ethernet oam link-monitor supported

Syntax Description

This command has no arguments or keywords.

Command Default

Link monitoring is supported when Ethernet OAM is enabled.

Command Modes

Interface configuration (config-if)

Command History

Release	Modification
12.2(33)SRA	This command was introduced.
12.4(15)T	This command was integrated into Cisco IOS Release 12.4(15)T.
12.2(33)SXH	This command was integrated into Cisco IOS Release 12.2(33)SXH.

Usage Guidelines

Use this command to help establish an OAM session for performing OAM functions, such as remote loopback. For example, if your device is connected to a third-party device that does not support link monitoring, you must disable link monitoring support on your device to establish an OAM session with the third-party device.

When the **ethernet oam link-monitor supported** command has been issued, remote loopback will not function, whether or not an interface has been configured to support it.

The **ethernet oam link-monitor supported** command is enabled by default when Ethernet OAM is enabled and does not display in the configuration when the **show running-config** command is issued.

When support for link monitoring is enabled by default, to turn it off you must explicitly disable it by issuing the **no** form of this command.

Examples

The following example shows how to disable support for link monitoring on the GigabitEthernet 0/1 OAM interface:

```
Router(config)# interface gigabitethernet 0/1
Router(config-if)# no ethernet oam link-monitor supported
```

The following example shows how to reenable support for link monitoring on the GigabitEthernet 0/1 OAM interface after support has been disabled:

```
Router(config)# interface gigabitethernet 0/1
Router(config-if)# ethernet oam link-monitor supported
```

Related Commands		
	ethernet oam link-monitor on	Enables link monitoring on an Ethernet OAM interface.

ethernet oam link-monitor symbol-period

To configure an error symbol period on an Ethernet operations, maintenance, and administration (OAM) interface, use the **ethernet oam link-monitor symbol-period** command in configuration template or interface configuration mode. To remove the symbol period, use the **no** form of this command.

ethernet oam link-monitor symbol-period {**threshold** {**high** {**none** | *high-symbols*} | **low** *low-symbols*} | **window** *symbols*}

no ethernet oam link-monitor symbol-period {**threshold** {**high** | **low**} | **window**}

Syntax Description

threshold	Sets a number of error symbols at, above, or below which an action is triggered.
high	Sets a high threshold for the period in number of error symbols.
none	Disables a high threshold.
high-symbols	Integer in the range of 1 to 65535 that is the high threshold in number of symbols. There is no default. The high threshold must be configured.
low	Sets a low threshold for the period in number of error symbols.
low-symbols	Integer in the range of 0 to 65535 that is the low threshold in number of symbols.
window	Sets a window and window size.
symbols	Integer in the range of 1 to 65535 that is the window size in number of symbols. Each value represents one million.

Command Default

The **ethernet oam link-monitor symbol-period** command is not configured.

Command Modes

Configuration template (config-template)
Interface configuration (config-if)

Command History

Release	Modification
12.2(33)SRA	This command was introduced.
12.4(15)T	This command was integrated into Cisco IOS Release 12.4(15)T.
12.2(33)SXH	This command was integrated into Cisco IOS Release 12.2(33)SXH.

Usage Guidelines

The **ethernet oam link-monitor symbol-period** command configures an error symbol threshold or error symbol window in number of symbols. When a high threshold is configured, it must be at least as great as the low threshold for symbol errors.

This command can be applied to an Ethernet OAM template and to an interface. The value configured on an interface takes precedence over the value configured by this command for the template.

This command is prefixed with “ether oam” in interface configuration mode.

Examples

The following example shows how to configure a symbol-period window of 500 million error symbols:

```
Router(config-template)# ethernet oam link-monitor symbol-period window 500
```

The following example shows how to configure a symbol-period low threshold of 500 error symbols:

```
Router(config-template)# ethernet oam link-monitor symbol-period threshold low 500
```

Related Commands

ethernet oam link-monitor frame	Configures an error frame threshold or window on an Ethernet OAM interface.
ethernet oam link-monitor frame-period	Configures an error frame period on an Ethernet OAM interface.
ethernet oam link-monitor frame-seconds	Configures a frame-seconds period on an Ethernet OAM interface.
ethernet oam link-monitor high-threshold action	Configures a specific action to occur when a high threshold for an error is exceeded on an Ethernet OAM interface.
ethernet oam link-monitor receive-crc	Configures an Ethernet OAM interface to monitor frames received with CRC errors for a period of time.
ethernet oam link-monitor transmit-crc	Configures an Ethernet OAM interface to monitor frames transmitted with CRC errors for a period of time.

ethernet oam link-monitor transmit-crc

To configure an Ethernet operations, maintenance, and administration (OAM) interface to monitor egress frames transmitted with cyclic redundancy code (CRC) errors for a period of time, use the **ethernet oam link-monitor transmit-crc** command in configuration template or interface configuration mode. To disable monitoring, use the **no** form of this command.

ethernet oam link-monitor transmit-crc {**threshold** {**high** {*high-frames* | **none**} | **low** *low-frames*} | **window** *milliseconds*}

no ethernet oam link-monitor transmit-crc {**threshold** {**high** | **low**} | **window**}

Syntax Description

threshold	Sets a number of frames with CRC errors transmitted at, above, or below which an action is triggered.
high	Sets a high threshold in number of frames.
high-frames	Integer in the range of 1 to 65535 that is the high threshold in number of frames.
none	Disables a high threshold.
low	Sets a low threshold.
low-frames	Integer in the range of 0 to 65535 that sets the low threshold in number of frames. The default is 10.
window	Sets a window and period of time during which frames with transmit CRC errors are counted.
milliseconds	Integer in the range of 10 to 1800 that represents a number of milliseconds in a multiple of 100. The default is 100.

Command Default

The **ethernet oam link-monitor transmit-crc** command is not configured.

Command Modes

Configuration template (config-template)
Interface configuration (config-if)

Command History

Release	Modification
12.2(33)SRA	This command was introduced.
12.4(15)T	This command was integrated into Cisco IOS Release 12.4(15)T.
12.2(33)SXH	This command was integrated into Cisco IOS Release 12.2(33)SXH.

Usage Guidelines

OAM must be operational on the interface before you issue this command.

Examples

The following example shows how to configure a transmit CRC window of 2500 milliseconds:

```
Router(config-if)# ethernet oam link-monitor transmit-crc window 25
```

Related Commands

ethernet oam link-monitor frame	Configures an error frame threshold or window on an Ethernet OAM interface.
ethernet oam link-monitor frame-period	Configures an error frame period on an Ethernet OAM interface.
ethernet oam link-monitor frame-seconds	Configures a frame-seconds period on an Ethernet OAM interface.
ethernet oam link-monitor high-threshold action	Configures a specific action to occur when a high threshold for an error is exceeded on an Ethernet OAM interface.
ethernet oam link-monitor receive-crc	Configures an Ethernet OAM interface to monitor frames received with CRC errors for a period of time.
ethernet oam link-monitor symbol-period	Configures an error symbol period on an Ethernet OAM interface.

ethernet oam remote-loopback

To turn on or off Ethernet operations, maintenance, and administration (OAM) remote loopback functionality on an interface, use the **ethernet oam remote-loopback** command in privileged EXEC mode. This command does not have a no form.

ethernet oam remote-loopback {**start** | **stop**} {**interface** *type number*}

Syntax Description.

start	Starts the remote loopback operation.
stop	Stops the remote loopback operation.
interface	Specifies an interface.
type	Type of Ethernet interface. Valid values are: FastEthernet, GigabitEthernet, TenGigabitEthernet.
number	Integer from 1 to 9 that is the number of the Ethernet interface.

Command Default

Remote loopback functionality is turned off.

Command Modes

Privileged EXEC (#)

Command History

Release	Modification
12.2(33)SRA	This command was introduced.
12.4(15)T	This command was integrated into Cisco IOS Release 12.4(15)T.
12.2(33)SXH	This command was integrated into Cisco IOS Release 12.2(33)SXH.

Usage Guidelines

There is no **no** form of this command.

When Ethernet OAM remote loopback functionality is enabled on an interface, traffic sent out on this interface will be discarded or sent back (and dropped locally) by the remote interface.

Remote loopback will not function, whether or not an interface has been configured to support it, when the **no ethernet oam link-monitor supported** command has been issued.

Examples

The following example shows how to start a remote loopback session on interface GigabitEthernet 2/1:

```
Router# ethernet oam remote-loopback start interface gigabitethernet2/1
```

Related Commands

ethernet oam remote-loopback (interface)	Enables the support of Ethernet OAM remote loopback operation on an interface or sets a remote loopback timeout period.

ethernet oam remote-loopback (interface)

To enable the support of Ethernet operations, maintenance, and administration (OAM) remote loopback operations on an interface or set a remote loopback timeout period, use the **ethernet oam remote-loopback (interface)** command in interface configuration mode. To disable support or remove the timeout setting, use the **no** form of this command.

ethernet oam remote-loopback {**supported** | **timeout** *seconds*}

no ethernet oam remote-loopback {**supported** | **timeout**}

Syntax Description

supported	Supports the remote loopback functionality.
timeout	Sets a master loopback timeout setting.
seconds	Integer from 1 to 10 that is the number seconds of the timeout period.

Command Default

Remote loopback is not supported.

Command Modes

Interface configuration (config-if)

Command History

Release	Modification
12.2(33)SRA	This command was introduced.
12.4(15)T	This command was integrated into Cisco IOS Release 12.4(15)T.
12.2(33)SXH	This command was integrated into Cisco IOS Release 12.2(33)SXH.

Usage Guidelines

This command enables the support of OAM remote-loopback on an interface. Only after this functionality is enabled can the local OAM client initiate the OAM remote loopback operation. Changing this setting causes the local OAM client to exchange configuration information with its remote peer.

The **no** form of the command is rejected if the interface is in the loopback mode.

Examples

The following example shows how to enable remote loopback support on interface GigabitEthernet 2/1:

```
Router(config)# interface gigabitethernet 2/1
Router(config-if)# ethernet oam remote-loopback supported
```

Related Commands

ethernet oam remote-loopback	Turns on or off the remote loopback functionality.

show ethernet oam discovery

To display discovery information for all Ethernet operations, maintenance, and administration (OAM) interfaces or for a specific interface, use the **show ethernet oam discovery** command in privileged EXEC mode.

show ethernet oam discovery [**interface** *type number*]

Syntax Description

interface	(Optional) Specifies an interface.
type	(Optional) Type of Ethernet interface. Valid values are: FastEthernet, GigabitEthernet, TenGigabitEthernet.
number	(Optional) Integer from 1 to 9 that is the number of the Ethernet interface.

Command Modes

Privileged EXEC (#)

Command History

Release	Modification
12.2(33)SRA	This command was introduced.
12.4(15)T	This command was integrated into Cisco IOS Release 12.4(15)T.
12.2(33)SXH	This command was integrated into Cisco IOS Release 12.2(33)SXH.

Usage Guidelines

This command displays the following information pertaining to Ethernet OAM discovery:

- Remote device which is directly connected to this device
- Local and remote OAM configuration and capability
- Local and remote OAM mode
- Remote platform identity
- State of the local discovery state machine

If an interface is specified, only data pertaining to the OAM peer on that interface is displayed; otherwise, data for all OAM peers (on all interfaces) is displayed.

Examples

The following example shows output from a **show ethernet oam discovery** command for interface GigabitEthernet 6/11:

```
Router# show ethernet oam discovery interface gigabitethernet6/11

GigabitEthernet6/11
Local client
------------
```

```
  Administrative configurations:
    Mode:               active
    Unidirection:       not supported
    Link monitor:       supported (on)
    Remote loopback:    supported
    MIB retrieval:      not supported
    Mtu size:           1500
Operational status:
    Port status:        operational
    Loopback status:    no loopback
    PDU revision:       1

Remote client
-------------
  MAC address: 0030.96fd.6bfa
  Vendor(oui): 0x00 0x00 0x0C (cisco)

  Administrative configurations:
    Mode:               active
    Unidirection:       not supported
    Link monitor:       supported
    Remote loopback:    supported
    MIB retrieval:      not supported
    Mtu size:           1500
```

Table 4 describes the significant fields shown in the display.

Table 1 show ethernet oam discovery Field Descriptions

Field	Description
Administrative configurations	
Mode	Active or passive mode of the interface
Unidirection	Operational mode
Link monitor	Status of link monitor support
Remote loopback	Status of remote loopback support
MIB retrieval	Capability of requesting MIB objects.
Mtu size	Size of the maximum transmission unit
Operational status	
Port status	Operational state of the port
Loopback status	Operational status of the loopback interface
PDU revision	Revision of the OAM configuration. A new revision results from each change to the configuration.
Remote client	
MAC address	MAC address of the remote client
Vendor (oui)	Vendor number in hexidecimal

Related Commands

Command	Description
show ethernet oam statistics	Displays detailed information about Ethernet OAM packets.
show ethernet oam status	Displays Ethernet OAM configurations for all interfaces or for a specific interface.
show ethernet oam summary	Displays active Ethernet OAM sessions.

show ethernet oam statistics

To display detailed information about Ethernet operations, maintenance, and administration (OAM) packets, use the **show ethernet oam statistics** command in privileged EXEC mode.

show ethernet oam statistics [**interface** *type number*]

Syntax Description

interface	(Optional) Specifies an interface.
type	(Optional) Type of Ethernet interface. Valid values are: FastEthernet, GigabitEthernet, TenGigabitEthernet.
number	(Optional) Integer from 1 to 9 that is the number of the Ethernet interface.

Command Modes

Privileged EXEC (#)

Command History

Release	Modification
12.2(33)SRA	This command was introduced.
12.4(15)T	This command was integrated into Cisco IOS Release 12.4(15)T.
12.2(33)SXH	This command was integrated into Cisco IOS Release 12.2(33)SXH.

Usage Guidelines

Statistics that this command displays include the following:

- Rx/Tx OAM Protocol Data Unit (PDU) counters
- Link monitoring events, including event logs, if available
- Remote fault detection events
- Remote loopback events

Examples

The following example shows output from a **show ethernet oam statistics** command for interface GigabitEthernet 6/11:

```
Router# show ethernet oam statistics interface gigabitethernet 6/11

GigabitEthernet6/11
Counters:
---------
  Information OAMPDU Tx                   : 9723
  Information OAMPDU Rx                   : 9712
  Unique Event Notification OAMPDU Tx     : 0
  Unique Event Notification OAMPDU Rx     : 0
  Duplicate Event Notification OAMPDU TX  : 0
  Duplicate Event Notification OAMPDU RX  : 0
  Loopback Control OAMPDU Tx              : 0
  Loopback Control OAMPDU Rx              : 0
  Variable Request OAMPDU Tx              : 0
  Variable Request OAMPDU Rx              : 0
  Variable Response OAMPDU Tx             : 0
  Variable Response OAMPDU Rx             : 0
```

```
  Cisco OAMPDU Tx                         : 0
  Cisco OAMPDU Rx                         : 0
  Unsupported OAMPDU Tx                   : 0
  Unsupported OAMPDU Rx                   : 0
  Frames Lost due to OAM                  : 0

Local event logs:
-----------------
  0 Errored Symbol Period records
  0 Errored Frame records
  0 Errored Frame Period records
  0 Errored Frame Second records

Remote event logs:
------------------
  0 Errored Symbol Period records
  0 Errored Frame records
  0 Errored Frame Period records
  0 Errored Frame Second records
```

Table 2 describes the significant fields shown in the display.

Table 2 show ethernet oam statistics Field Descriptions

Field	Description
Counters	
Information OAMPDU Tx	Number of OAM PDUx transmitted
Information OAMPDU Rx	Number of OAM PDUs received
Unique Event Notification OAMPDU Tx	Number of unique event notification OAM PDUs transmitted
Unique Event Notification OAMPDU Rx	Number of unique event notification OAM PDUs received
Duplicate Event Notification OAMPDU Tx	Number of duplicate event notification OAM PDUs transmitted
Duplicate Event Notification OAMPDU Rx	Number of duplicate event notification OAM PDUs received
Loopback Control OAMPDU Tx	Number of loopback control OAM PDUs transmitted
Loopback Control OAMPDU Rx	Number of loopback control OAM PDUs received
Variable Request OAMPDU Tx	Number of OAM PDUs sent to request MIB objects on a remote device
Variable Request OAMPDU Rx	Number of OAM PDUs received and requesting MIB objects on a local device
Variable Response OAMPDU Tx	Number of OAM PDUs sent by the local device in response to a request from a remote device
Variable Response OAMPDU Rx	Number of OAM PDUs sent by the remote device in response to a request from a local device
Cisco OAMPDU Tx	Number of Cisco specific OAM PDUs sent
Cisco OAMPDU Rx	Number of Cisco specific OAM PDUs received
Unsupported OAMPDU Tx	Number of unsupported OAM PDUs sent

Table 2 show ethernet oam statistics Field Descriptions (continued)

Field	Description
Unsupported OAMPDU Rx	Number of unsupported OAM PDUs received
Frames lost due to OAM	Number of frames discarded by the OAM client
Local event logs	Log of events on the local device
Remote event logs	Log of events on the remote device

Related Commands

Command	Description
show ethernet oam discovery	Displays discovery information for all Ethernet OAM interfaces or for a specific interface.
show ethernet oam status	Displays Ethernet OAM configurations for all interfaces or for a specific interface.
show ethernet oam summary	Displays active Ethernet OAM sessions.

show ethernet oam status

To display Ethernet operations, maintenance, and administration (OAM) configurations for all interfaces or for a specific interface, use the **show ethernet oam status** command in privileged EXEC mode.

show ethernet oam status [**interface** *type number*]

Syntax Description

interface	(Optional) Specifies an interface.
type	(Optional) Type of Ethernet interface. Valid values are: FastEthernet, GigabitEthernet, TenGigabitEthernet.
number	(Optional) Integer from 1 to 9 that is the number of the Ethernet interface.

Command Modes

Privileged EXEC (#)

Command History

Release	Modification
12.2(33)SRA	This command was introduced.
12.4(15)T	This command was integrated into Cisco IOS Release 12.4(15)T.
12.2(33)SXH	This command was integrated into Cisco IOS Release 12.2(33)SXH.

Usage Guidelines

Use this command to display the runtime settings of link-monitoring and general OAM operations for all interfaces or for a specific interface.

OAM must be operational on the interface or interfaces before you issue this command.

Examples

The following example shows output from a **show ethernet oam status** command for interface GigabitEthernet 6/11:

```
Router# show ethernet oam status interface gigabitethernet 6/11

GigabitEthernet6/11
General
-------
  Mode:                  active
  PDU max rate:          10 packets per second
  PDU min rate:          1 packet per 1 second
  Link timeout:          5 seconds
  High threshold action: no action

Link Monitoring
---------------
  Status: supported (on)

  Symbol Period Error
    Window:              1 million symbols
    Low threshold:       1 error symbol(s)
    High threshold:      none
```

```
Frame Error
  Window:               10 x 100 milliseconds
  Low threshold:        1 error frame(s)
  High threshold:       none

Frame Period Error
  Window:               1 x 100,000 frames
  Low threshold:        1 error frame(s)
  High threshold:       none

Frame Seconds Error
  Window:               600 x 100 milliseconds
  Low threshold:        1 error second(s)
  High threshold:       none
```

Table 3 describes the significant fields shown in the display.

Table 3 show ethernet oam status Field Descriptions

Field	Description
General	
Mode	Active or passive mode of the interface.
PDU max rate	Maximum number of protocol data units (PDUs) transmitted per second.
PDU min rate	Minimum number of PDUs transmitted per second.
Link timeout	Amount of time with inactivity before the link is dropped.
High threshold action	Action that occurs when the high threshold for an error is exceeded.
Link Monitoring	
Status	Operational state of the port.
Symbol Period Error	
Window	Specified number of error symbols.
Low threshold	Minimum number of error symbols.
High threshold	Maximum number of error symbols.
Frame Error	
Window	Specified amount of time in milleseconds.
Low threshold	Minimum number of error frames.
High threshold	Maximum number of error frames.
Frame Period Error	
Window	Frequency at which the measurement is taken, in milliseconds.
Low threshold	Minimum number of error frames.
High threshold	Maximum number of error frames.
Frame Seconds Error	
Window	Frequency at which the measurement is taken, in milliseconds.

Table 3 show ethernet oam status Field Descriptions (continued)

Field	Description
Low threshold	Lowest value at which an event will be triggered.
High threshold	Highest value at which an event will be triggered.

Related Commands

Command	Description
show ethernet oam discovery	Displays discovery information for all Ethernet OAM interfaces or for a specific interface.
show ethernet oam statistics	Displays detailed information about Ethernet OAM packets.
show ethernet oam summary	Displays active Ethernet OAM sessions.

show ethernet oam summary

To display active Ethernet operations, maintenance, and administration (OAM) sessions on a device, use the **show ethernet oam summary** command in privileged EXEC mode.

show ethernet oam summary

Syntax Description

This command has no arguments or keywords.

Command Modes

Privileged EXEC (#)

Command History

Release	Modification
12.2(33)SRA	This command was introduced.
12.4(15)T	This command was integrated into Cisco IOS Release 12.4(15)T.
12.2(33)SXH	This command was integrated into Cisco IOS Release 12.2(33)SXH.

Examples

The following example shows output from a **show ethernet oam summary** command:

```
Router# show ethernet oam summary

Symbols:          * - Master Loopback State,  # - Slave Loopback State
Capability codes: L - Link Monitor,  R - Remote Loopback
                  U - Unidirection,  V - Variable Retrieval

  Local                         Remote
Interface       MAC Address     Vendor Mode    Capability

  Fa3/1         0080.09ff.e4a0 00000C active   L R
  Gi6/11        0030.96fd.6bfa 00000C active   L R
```

Table 4 describes the significant fields shown in the display.

Table 4 show ethernet oam summary Field Descriptions

Field	Description
Local Interface	Type of local interface
MAC Address	MAC address of the local interface
Remote Vendor	The vendor for the remote device.
Mode	Operational state of the local interface
Capability	Functions the local interface can perform

Related Commands

Command	Description
show ethernet oam discovery	Displays discovery information for all Ethernet OAM interfaces or for a specific interface.
show ethernet oam status	Displays Ethernet OAM configurations for all interfaces or for a specific interface.
show ethernet oam statistics	Displays detailed information about Ethernet OAM packets.

source template (eoam)

To associate a template to an Ethernet operations, maintenance, and administration (OAM) interface, use the **source template (eoam)** command in interface configuration mode. To remove the source template association, use the **no** form of this command.

source template *template-name*

no source template *template-name*

Syntax Description

template-name	String that identifies the source template.

Command Default

No source template is configured.

Command Modes

Interface configuration (config-if)

Command History

Release	Modification
12.2(33)SRA	This command was introduced.
12.4(15)T	This command was integrated into Cisco IOS Release 12.4(15)T.
12.2(33)SXH	This command was integrated into Cisco IOS Release 12.2(33)SXH.

Usage Guidelines

When this command is used, the interface inherits all the configurations in the template. A benefit of using a source template is that it helps reduce the overall configuration size by grouping repeating commands.

Examples

The following example shows how to create a source template named oam on OAM interface Ethernet 0/1:

```
Router(config)# interface ethernet 0/1
Router(config-if)# source template oam
```

Related Commands

template (eoam)	Configures a template for use on Ethernet OAM interfaces and places the device in configuration template mode.

template (eoam)

To configure a template for use on Ethernet operations, maintenance, and administration (OAM) interfaces and enter configuration template mode, use the **template (eoam)** command in global configuration mode. To remove the template, use the **no** form of this command.

template *template-name*

no template *template-name*

Syntax Description

template-name	String that identifies the template.

Command Default

No templates are configured.

Command Modes

Global configuration (config)

Command History

Release	Modification
12.2(33)SRA	This command was introduced.
12.4(15)T	This command was integrated into Cisco IOS Release 12.4(15)T.
12.2(33)SXH	This command was integrated into Cisco IOS Release 12.2(33)SXH.

Usage Guidelines

This command groups parameters that can be applied (bound) to one or more interfaces that share the same OAM characteristics. A benefit of using the **template (eoam)** command is that it helps reduce the overall configuration size by grouping repeating commands and streamlines Ethernet OAM interface configuration.

More than one template can be configured but only one template can be associated with a single Ethernet OAM interface. Commands defined in a template may be overridden by explicitly configuring those commands on the interface in interface configuration mode.

Examples

The following example shows how to create an OAM template named oam and enter configuration template mode:

```
Router(config)# template oam
Router(config-template)#
```

Related Commands

source template (eoam)	Associates a template to an Ethernet OAM interface.

Feature Information for Ethernet Operations, Administration, and Maintenance

Table 5 lists the feature release history for this feature.

Not all commands may be available in your Cisco IOS software release. For release information about a specific command, see the command reference documentation.

Use Cisco Feature Navigator to find information about platform support and software image support. Cisco Feature Navigator enables you to determine which Cisco IOS and Catalyst OS software images support a specific software release, feature set, or platform. To access Cisco Feature Navigator, go to http://www.cisco.com/go/cfn. An account on Cisco.com is not required.

Note Table 5 lists only the Cisco IOS software release that introduced support for a given feature in a given Cisco IOS software release train. Unless noted otherwise, subsequent releases of that Cisco IOS software release train also support that feature.

Table 5 Feature Information for Ethernet Operations, Administration, and Maintenance

Feature Name	Releases	Feature Information
Ethernet Operations, Administration, and Maintenance	12.2(33)SRA 12.4(15)T	Ethernet OAM is a protocol for installing, monitoring, and troubleshooting metro Ethernet networks and Ethernet WANs. It relies on a new, optional sublayer in the data link layer of the OSI model. The OAM features covered by this protocol are Discovery, Link Monitoring, Remote Fault Detection, Remote Loopback, and Cisco Proprietary Extensions. The following sections provide information about this feature: • Ethernet OAM, page 2 • Cisco IOS Implementation of Ethernet OAM, page 3 • OAM Features, page 4 • OAM Messages, page 5 • How to Set Up and Configure Ethernet Operations, Administration, and Maintenance, page 6 The Ethernet Operations, Administration, and Maintenance feature was integrated into Cisco IOS Release 12.4(15)T.