CHAPTER 16

Monitoring Ethernet Operations, Administration, and Maintenance Tool Properties

The following topics describe how you can use Cisco Prime Network Vision (Prime Network Vision) to monitor Ethernet operations, administration, and maintenance (OAM) tools:

User Roles Required to View Ethernet OAM Tool Properties

This topic identifies the roles that are required to view Ethernet OAM tool properties. Prime Network determines whether you are authorized to perform a task as follows:

- For GUI-based tasks (tasks that do not affect elements), authorization is based on the default permission that is assigned to your user account.
- For element-based tasks (tasks that do affect elements), authorization is based on the default permission that is assigned to your account. That is, whether the element is in one of your assigned scopes and whether you meet the minimum security level for that scope.

For more information on user authorization, see the *Cisco Prime Network 3.10 Administrator Guide*.

The following tables identify the tasks that you can perform:

- Table 16-1 identifies the tasks that you can perform if a selected element **is not in** one of your assigned scopes.
- Table 16-2 identifies the tasks that you can perform if a selected element **is in** one of your assigned scopes.

By default, users with the Administrator role have access to all managed elements. To change the Administrator user scope, see the topic on device scopes in the *Cisco Prime Network 3.10 Administrator Guide*.

Table 16-1 Default Permission/Security Level Required for Viewing Ethernet OAM Tool Properties - Element Not in User's Scope

Task	Viewer	Operator	OperatorPlus	Configurator	Administrator
View CFM properties	—	—	—	—	X
View Ethernet LMI properties	—	—	—	—	X
View Link OAM properties	—	—	—	—	X
Using CFM Configure and Enable Commands	—	—	—	X	X
Using E-LMI Configure and Enable Commands	—	—	—	X	X
Using L-OAM Configuration, Assign, Enable, and Show Commands	—	—	—	X	X

Table 16-2 Default Permission/Security Level Required for Viewing Ethernet OAM Tool Properties - Element in User's Scope

Task	Viewer	Operator	OperatorPlus	Configurator	Administrator
View CFM properties	X	X	X	X	X
View Ethernet LMI properties	X	X	X	X	X
Using CFM Configure and Enable Commands	—	—	—	X	X
Using E-LMI Configure and Enable Commands	—	—	—	X	X
Using L-OAM Configuration, Assign, Enable, and Show Commands	—	—	—	X	X

Ethernet OAM Overview

Prime Network Vision supports three, interrelated OAM components, including:

- Connectivity Fault Management—Connectivity Fault Management (CFM) is an end-to-end per-service-instance (per VLAN) Ethernet layer OAM protocol that includes connectivity monitoring, fault verification, and fault isolation. CFM allows you to manage individual customer service instances. Ethernet Virtual Connections (EVCs) are the services that are sold to customers and are designated by service VLAN tags. CFM operates on a per-service-VLAN (or per-EVC) basis. It lets you know when an EVC fails and provides tools to isolate the failure. See Viewing Connectivity Fault Management Properties, page 16-3.

- Ethernet Local Management Interface—Ethernet Local Management Interface (Ethernet LMI) operates between the customer edge (CE) and the user-facing provider edge (U-PE) devices. Ethernet LMI allows you to automatically provision CEs based on EVCs and bandwidth profiles. See Viewing Ethernet LMI Properties, page 16-16.
- Link OAM—Link OAM allows you to monitor and troubleshoot a single Ethernet link. It is an optional sublayer implemented in the Data Link Layer between the Logical Link Control (LLC) and MAC sublayers of the Open Systems Interconnect (OSI) model. You can monitor a link for critical events and, if needed, put a remote device into loopback mode for link testing. Link OAM also discovers unidirectional links, which are created when one transmission direction fails. See Viewing Link OAM Properties, page 16-20.

Viewing Connectivity Fault Management Properties

CFM provides capabilities for detecting, verifying, and isolating connectivity failures in networks with bridges operated by multiple independent organizations, each with restricted management access to each other's equipment. CFM allows you to discover and verify end-to-end, Carrier Ethernet PE-to-PE or CE-to-CE paths through bridges and LANs.

CFM consists of maintenance domains. Maintenance domains are administrative regions used to manage and administer specific network segments. Maintenance domains are organized in a hierarchy. The administrator assigns a maintenance level to the domain from 0 (lowest level) to 7 (highest level); the maintenance level determines the domain’s position within the CFM hierarchy.

CFM maintenance domain boundaries are indicated by maintenance points. A maintenance point is an interface point that participates within a CFM maintenance domain. Maintenance point types include:

- Maintenance Endpoints—Maintenance endpoints (MEPs) are active CFM elements residing at the edge of a domain. MEPs can be inward or outward facing. They periodically transmit continuity check messages and expect to periodically receive similar messages from other MEPs within a domain. If requested, MEPs can also transmit traceroute and loopback messages. MEPs are responsible for keeping CFM messages within the boundaries of a maintenance domain.
- Maintenance Intermediate Points—Maintenance intermediate points (MIPs) are passive elements that catalog information received from MEPs and other MIPs. MIPs only respond to specific CFM messages such as traceroute and loopback, and they forward those messages within the maintenance domain.

Note Prime Network Vision does not display information for CFM maintenance endpoints or maintenance intermediate points for Cisco Viking devices if errors exist in their configurations. An error in the configuration is indicated by an exclamation point (!) in the CLI output.

For example, if you enter the command **`show ethernet cfm local maintenance-points`**, a configuration error is indicated as follows:

```
cfm_d100/2        cfm_s100        Te0/2/0/3.100        Up MEP 2100 eb:7a:53!
```

CFM uses standard Ethernet frames. CFM frames are distinguishable by EtherType and for multicast messages, by MAC address. CFM frames are sourced, terminated, processed, and relayed by bridges. Routers support only limited CFM functions.

Bridges that cannot interpret CFM messages forward them as normal data frames. All CFM messages are confined to a maintenance domain and to an S-VLAN (PE-VLAN or Provider-VLAN). CFM supports three types of messages

- Continuity check—Multicast heartbeat messages exchanged periodically among MEPs. They allow MEPs to discover other MEPs within a domain and allow maintenance intermediate points (MIPs) to discover MEPs. Continuity check messages (CCMs) are confined to a domain and S-VLAN.
- Loopback—Unicast frames that a MEP transmits, at the request of an administrator, to verify connectivity to a particular maintenance point. A reply to a loopback message indicates whether a destination is reachable but does not allow hop-by-hop discovery of the path. A loopback message is similar in concept to an Internet Control Message Protocol (ICMP) Echo (ping) message.
- Traceroute—Multicast frames that a MEP transmits, at the request of an administrator, to track the path (hop-by-hop) to a destination MEP. They allow the transmitting node to discover vital connectivity data about the path, and allow the discovery of all MIPs along the path that belong to the same maintenance domain. For each visible MIP, traceroute messages indicate ingress action, relay action, and egress action. Traceroute messages are similar in concept to User Datagram Protocol (UDP) traceroute messages.

From the Logical Inventory tree, you can troubleshoot MEPs using CFM ping, traceroute, MEP status, and MEP cross-check status. These commands, and all CFM commands, are described in Using CFM Configure and Enable Commands, page 16-10.

Prime Network associates alarms with the corresponding MEP or global CFM logical inventory objects. Prime Network correlates MEP down, MEP up, MEP missing, ETH-AIS, and ETH-RDI events with root cause alarms and corresponding tickets that exist along the path between the MEP on the reporting network element and the network element hosting the remote MEP.

To view CFM properties:

Step 1 In Prime Network Vision, double-click the required device for CFM.

Step 2 In the inventory window, choose **Logical Inventory > CFM**.

Figure 16-1 shows an example of CFM in logical inventory.

Figure 16-1 CFM in Logical Inventory

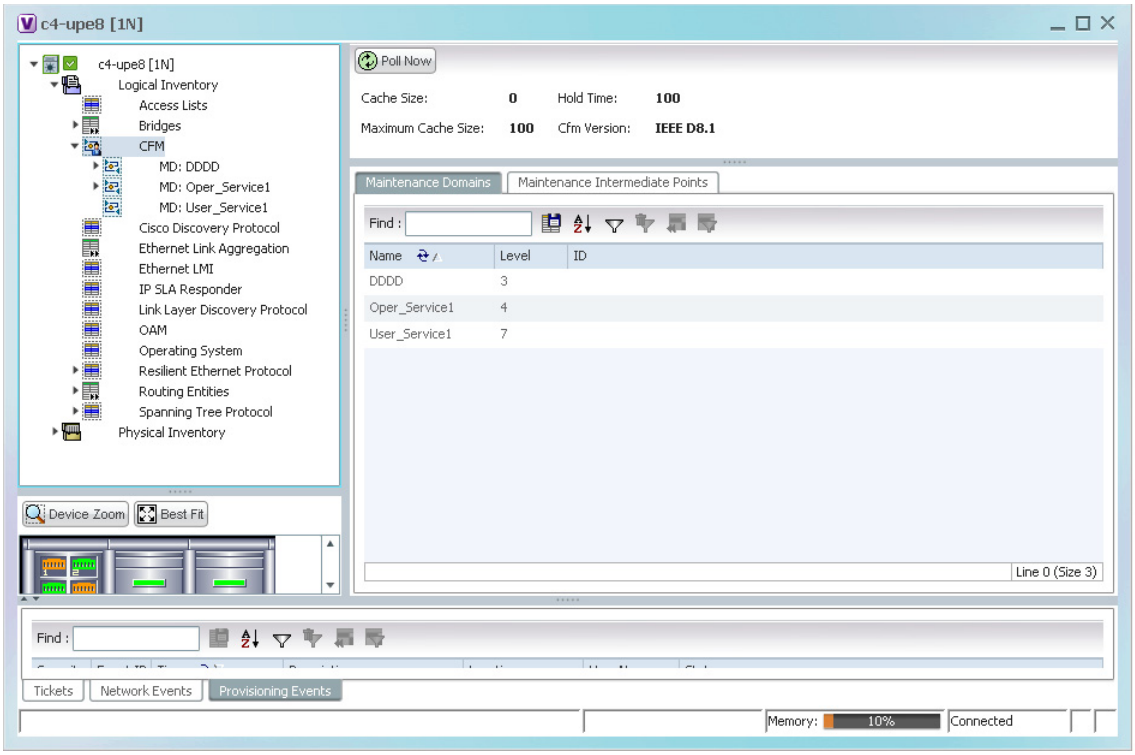


Table 16-3 describes the information displayed for CFM.

Table 16-3 CFM Properties

Field	Description
Cache Size	CFM traceroute cache size in number of lines.
Hold Time	Configured hold time (in minutes) that is used to indicate to the receiver the validity of traceroute and loopback messages transmitted by the device. The default value is 2.5 times the transmit interval.
Maximum Cache Size	Maximum CFM traceroute cache size in number of lines.
CFM Version	CFM version, such as IEEE D8.1.
Maintenance Domains Table	
Name	Domain name.
Level	Unique level the domain is managed on. Values range from 0 to 7.
ID	Optional domain identifier.

Step 3 Click the Maintenance Intermediate Points tab to view MIP information. See Figure 16-2.

Figure 16-2 CFM Maintenance Intermediate Points Tab

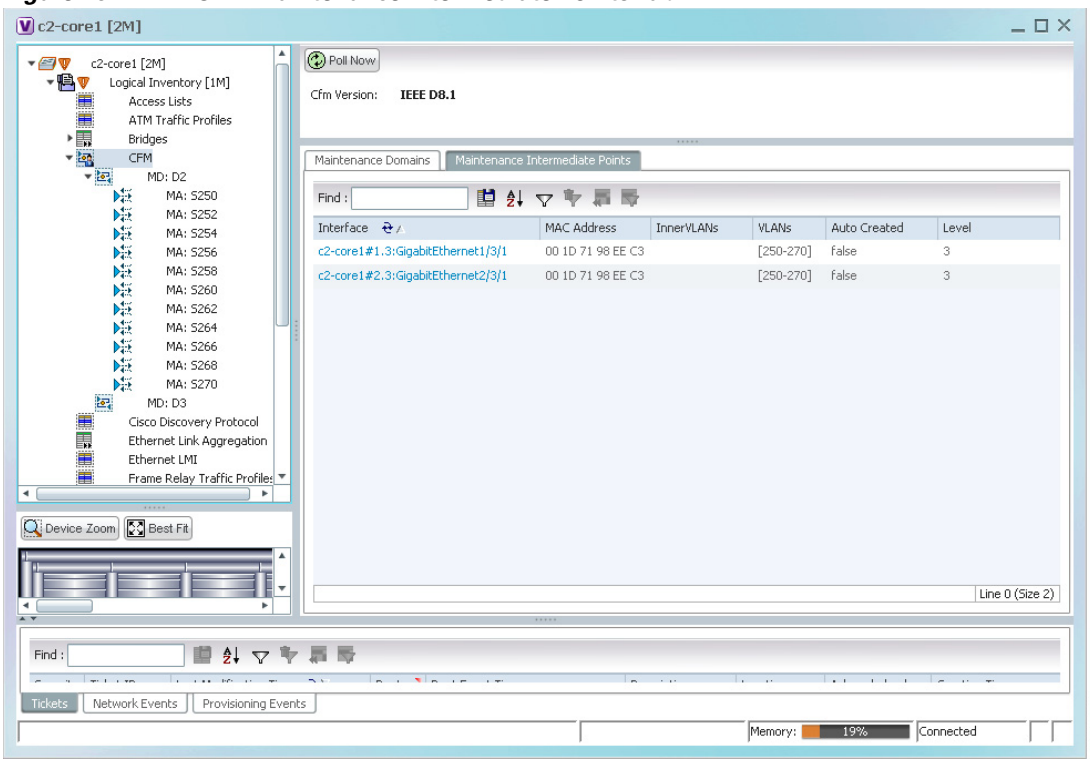


Table 16-4 describes the information that is displayed in the Maintenance Intermediate Points table.

Table 16-4 CFM Maintenance Intermediate Point Properties

Field	Description
Interface	Interface configured as a MIP, hyperlinked to its entry in physical inventory.
MAC Address	MAC address of the interface.
Inner VLANs	Inner VLAN identifiers.
VLANs	VLANs associated with the interface.
Auto Created	Whether or not the MIP was automatically created: True or False.
Level	Unique level the domain is managed on. Values range from 0 to 7.

Step 4 To view the details of a specific maintenance domain, do one of the following:

- Choose **Logical Inventory > CFM >** *domain*.
- Double-click the required entry in the Maintenance Domains table.

Figure 16-3 shows an example of the information displayed for the maintenance domain.

Figure 16-3 CFM Maintenance Domain Properties

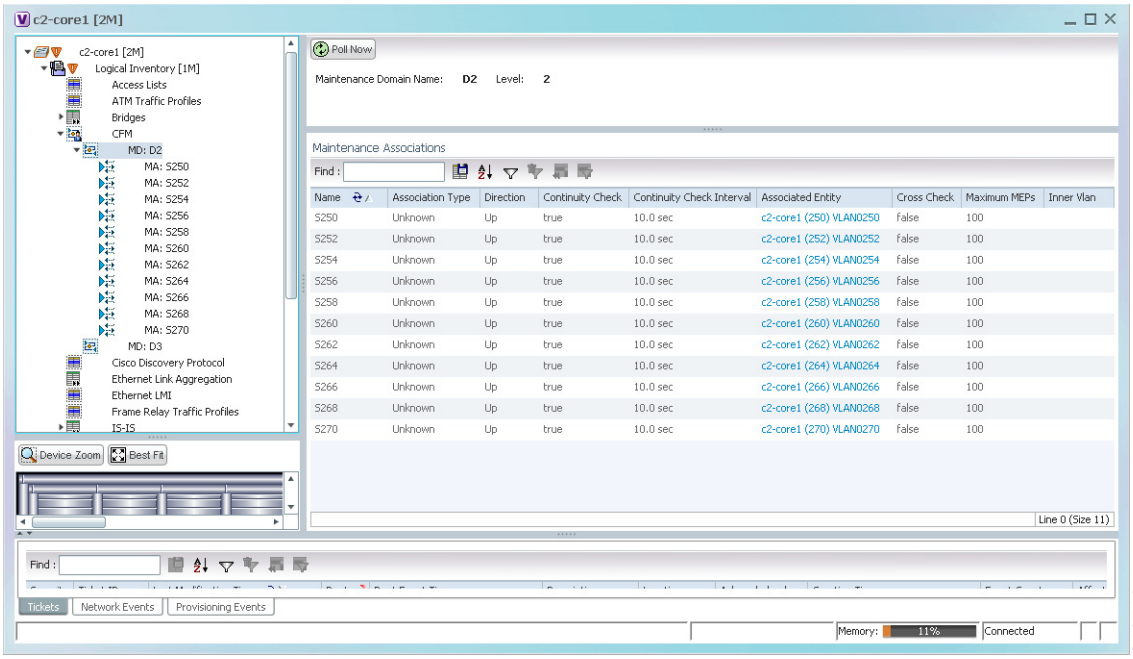


Table 16-5 describes the information that is displayed for CFM maintenance domains.

Table 16-5 CFM Maintenance Domain Properties

Field	Description
Maintenance Domain Name	Name of the domain.
Level	Level at which the domain is managed: 0-7.
ID	Optional maintenance domain identifier.
Maintenance Associations Table	
Name	Name of the maintenance association.
Association Type	Maintenance association type.
Direction	Direction of the maintenance association: Up or Down.
Continuity Check	Whether or not the continuity check is enabled: True or False.
Continuity Check Interval	Interval (in seconds) for checking continuity.
Associated Entity	Bridge, port, or pseudowire that the maintenance association uses for CFM. Click the hyperlinked entry to view the item in inventory.
Cross Check	Whether or not cross checking is enabled: True or False.
Maximum MEPs	Maximum number of maintenance endpoints (MEPs) that can be configured on the maintenance association.
Inner VLAN	Inner VLAN identifier.

Step 5 To view the properties for a maintenance association's endpoints, do one of the following:

- Choose **Logical Inventory > CFM >** *domain* **>** *association*.
- In the Maintenance Associations table, double-click the required association.

Figure 16-4 shows the information displayed for the maintenance association endpoints.

Figure 16-4 CFM Maintenance Association - Endpoint Properties

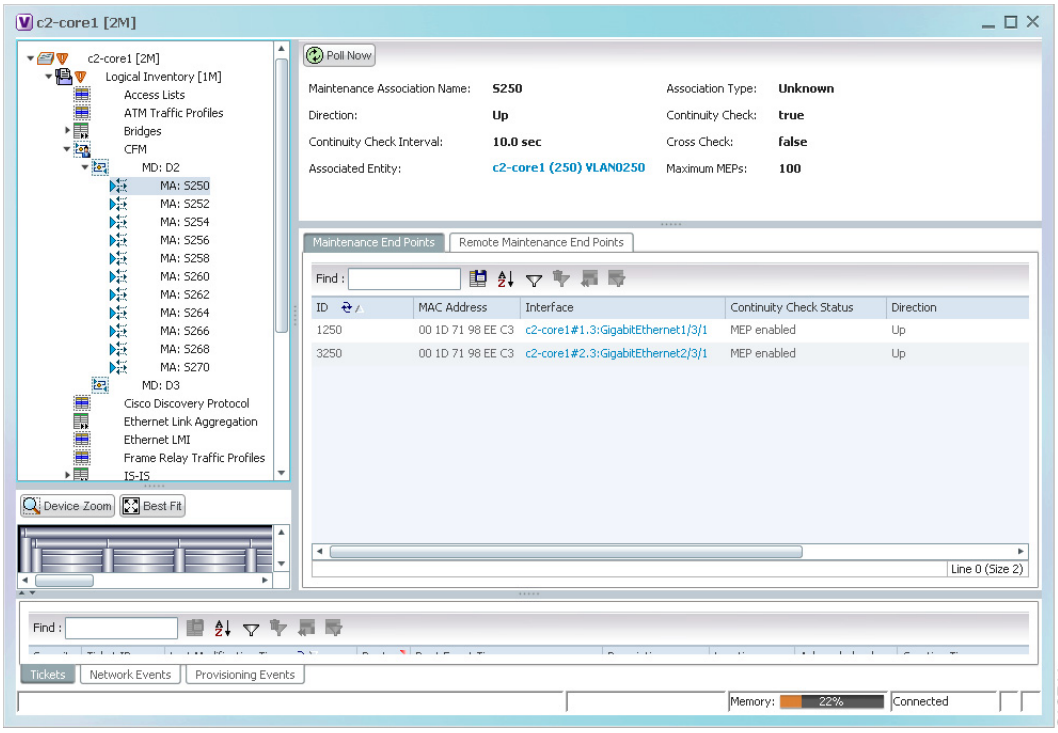


Table 16-6 describes the information that is displayed for CFM maintenance associations and MIPs.

Table 16-6 CFM Maintenance Association Properties

Field	Description
Maintenance Association Name	Name of the maintenance association.
Association Type	Maintenance association type, such as Bridge Domain.
Direction	Direction of the maintenance association: Up or Down.
Continuity Check	Whether or not the continuity check is enabled: True or False.
Continuity Check Interval	Interval (in seconds) for checking continuity.
Cross Check	Whether or not cross checking is enabled: True or False.
Associated Entity	Bridge that the maintenance association uses for CFM. Click the hyperlinked entry to view the bridge in logical inventory.
Maximum MEPs	Maximum number of MEPs that can be configured on the maintenance association.
Inner VLANs	Inner VLAN identifiers.
Maintenance End Points Table	
ID	Local identifier for the MEP.
MAC Address	MAC address that identifies the MEP.

Table 16-6 CFM Maintenance Association Properties (continued)

Field	Description
Interface	Interface on which the MEP is configured, hyperlinked to the respective EFP, VSI or interface in inventory.
Continuity Check Status	CFM continuity check status: MEP Active, MEP Inactive, MEP Enabled, MEP Disabled, or Unknown.
Direction	Direction of traffic on which the MEP is defined: Up, Down, or Unknown.

Step 6 Click the **Remote Maintenance End Points** tab to view the information displayed for remote MEPs. See Figure 16-5.

Figure 16-5 Remote Maintenance End Points Table

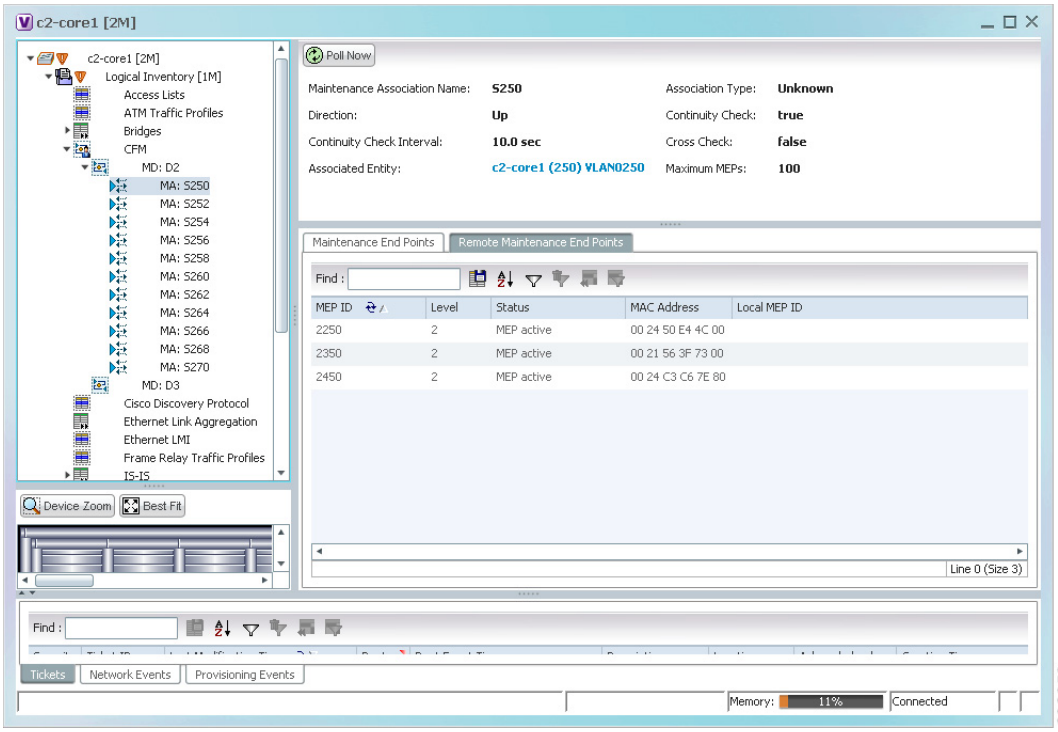


Table 16-7 describes the information presented for remote MEPs.

Table 16-7 CFM Remote Maintenance End Points Table

Field	Description
MEP ID	Remote MEP identifier.
Level	Level at which the remote MEP is managed: 0-7.
Status	Status of the remote MEP, such as MEP Active.
MAC Address	MAC address of the remote MEP.
Local MEP ID	Numeric identifier assigned to the local MEP. Values range from 1 to 8191. **Note** If the remote MEP is in Up mode, the remote MEP is not associated to the local MEP. As a result, the Local MEP ID column is empty.

Using CFM Configure and Enable Commands

The following commands can be launched from the inventory by right-clicking a CFM node and selecting **Commands**. Before executing any commands, you can preview them and view the results. If desired, you can also schedule the commands. To find out if a device supports these commands, see the *Cisco Prime Network 3.10 Supported Cisco VNEs*. You can navigate from the MEP logical inventory to the interface or port channel on which the MEP is configured.

Note You might be prompted to enter your device access credentials while executing a command. Once you have entered them, these credentials will be used for every subsequent execution of a command in the same GUI client session. If you want to change the credentials, click **Edit Credentials**. Edit Credentials button will not be available for SNMP commands or if the command is scheduled for a later time.

Configure CFM Maintenance Domain

A maintenance domain is a management space for the purpose of managing and administering a network. A single entity owns and operates a domain and is defined by the set of ports internal to it and at its boundary. Each maintenance domain can contain any number of maintenance associations. Each maintenance association identifies a service that can be uniquely identified within the maintenance domain. The CFM protocol runs within a particular maintenance association.

Step 1 In the inventory window, expand the Logical Inventory tree.

Step 2 Right-click the CFM node and choose **Commands > Configure > Cisco > Maintenance Domain**.

Step 3 Enter values for the following parameters.

Input Parameter	Description
Domain Name	Name of the domain.
Maintenance Level	Maintenance level number. The range is from 0 to 7. A network administrator assigns a unique maintenance level to each domain. Levels and domain names are useful for defining the hierarchical relationship that exists among domains. The hierarchical relationship of domains parallel the structure of customer, service provider, and operator. The larger the domain, the higher the level value. For example, a customer domain would be larger than an operator domain. The customer domain may have a maintenance level of 7 and the operator domain may have a maintenance level of 0. Typically, operators have the smallest domains and customers the largest domains, with service provider domains between them in size. All levels of the hierarchy must operate together.
MEP Archive Hold Time	Maintenance endpoint archived hold time. The range is from 1 to 65535 minutes. A maintenance point is a demarcation point on an interface (port) that participates in CFM within a maintenance domain. Maintenance points on device ports act as filters that confine CFM frames within the bounds of a domain by dropping frames that do not belong to the correct level. Maintenance points must be explicitly configured on Cisco devices. Two classes of maintenance points exist: MEPs and maintenance intermediate points (MIPs).

Step 4 Preview, schedule, or run the command.

Configure CFM Global Parameters

The **Configure CFM Global Parameters** enables CFM globally for a network element.

Step 1 In the inventory window, expand the Logical Inventory tree.

Step 2 Right-click the CFM node and choose **Commands > Configure > Cisco > Global Parameters**.

Step 3 Enter values for the following parameters.

Input Parameter	Description
Trace Route Cache Size	Number of cached lines. The range is from 1 to 4095. Using CFM, you can configure the device to transmit traceroute and loopback messages. This parameter sets the CFM traceroute cache size used by the CFM service.
Trace Route Cache Hold Time	Hold time. The range is from 1 to 65535 minutes. A CFM service is configurable with a hold-time value to indicate to the receiver the validity of the message. The default is 2.5 times the transmit interval.

Step 4 Preview, schedule, or run the command.

Configure CFM Continuity Check

To enable continuity check parameters:

Step 1 In the inventory window, expand the Logical Inventory tree.

Step 2 Right-click the CFM node and choose **Commands > Enable > Cisco > Continuity Check**.

Step 3 Enter values for the following parameters.

Input Parameter	Description
Domain Name	The domain name on which to enable the continuity check.
Maintenance Level	Maintenance level number. The range is from 0 to 7. Alternatively, you can choose *any* to specify all maintenance levels.
VLANs for Cross-Check	VLAN ID on which to apply the continuity check. The VLAN ID range is from 1 to 4094. Alternatively, you can choose *any* to specify all VLAN IDs.
Service Name[1]	The service name on which to enable the continuity check.
Bridge Group Name[1]	The bridge group name on which to enable the continuity check.
Bridge Domain Name[1]	The bridge domain name on which to enable the continuity check.
Interval for CC Messages	Interval, in seconds, for continuity check messages. The default value is 30 seconds.
Loss Threshold Level for CC Packets	The loss threshold level for CC packets. The value ranges from 2 to 225. The default value is 2.

1. Applicable for Cisco ASR 9000 series that run on Cisco IOS XR software.

Step 4 Preview, schedule, or run the command.

Configure CFM MIP

The **Configure CFM MIP** command configures an operator-level maintenance intermediate point (MIP) for the domain-level ID. MIPs have the following characteristics:

- Per-maintenance domain (level) for all S-VLANs enabled or allowed on a port.
- Internal to a domain, not at the boundary.
- CFM frames received from MEPs and other MIPs are cataloged and forwarded, using both the wire and the relay function.
- All CFM frames at a lower level are stopped and dropped, independent of whether they originate from the wire or from relay function.
- All CFM frames at a higher level are forwarded, independent of whether they arrive from the wire or from relay function.
- Passive points respond only when triggered by CFM traceroute and loopback messages.
- Bridge-brain MAC addresses are used.

If the port on which a MIP is configured is blocked by Spanning-Tree Protocol (STP), the MIP cannot receive CFM messages or relay them toward the relay function side. The MIP can, however, receive and respond to CFM messages from the wire.

A MIP has only one level associated with it, and the command-line interface (CLI) does not allow you to configure a MIP for a domain that does not exist.

Note This command is not supported on the Cisco Carrier Packet Transport (CPT) System.

Step 1 In the inventory window, expand the Logical Inventory tree.

Step 2 Right-click the CFM node and choose **Commands > Configure > Cisco > MIP**.

Step 3 Enter values for the following parameters.

Input Parameter	Description
Interface Name	A physical interface or a port channel to configure.
Maintenance Level	Number between 0-7.
VLANs[1]	VLAN ID on which to apply the remote maintenance point identifier (ID). The VLAN ID range is from 1 to 4094. Alternatively, you can choose **any** to specify all VLAN IDs. **Note** You can execute the **any** command only if the sub mode **any** is supported by the software image version of the network element.
Inner VLAN[2]	Check the check box if you have an inner VLAN tag.
Inner VLANs[2]	Inner VLAN ID on which to apply the remote maintenance point ID. The VLAN ID range is from 1-4094.

1. Applicable only for Cisco ME 3400 Series and Cisco ME 3750 Ethernet Access Switches running Cisco IOS Release 12.2 (52) SE and Cisco 7600 Series Routers running Cisco IOS Release 12.2(33)SRE
2. Applicable only for Cisco ME 3400 Series and Cisco ME 3750 Ethernet Access Switches running Cisco IOS Release 12.2 (54) SE

Step 4 Preview, schedule, or run the command.

Configure CFM Service ID

Use the **Configure CFM Service ID** command to configure the CFM service ID.

Step 1 In the inventory window, expand the Logical Inventory tree.

Step 2 Right-click the CFM node and choose **Commands > Configure > Cisco > Service ID**. The Service ID dialog box opens.

Step 3 By default, the General tab is selected. Enter values for the following parameters.

Input Parameter	Description
Domain Name	Name of the domain.
Maintenance Level	Number between 0-7.
Service VLAN ID ([1-4094])	Service VLAN ID. A customer service instance is an Ethernet virtual connection, which is identified by an S-VLAN within an Ethernet island. You can identify an S-VLAN by using a globally unique service ID. The Service VLAN ID range is from 1 to 4094.

Input Parameter	Description
Inner VLAN [1]	Check the check box if you have an inner VLAN tag.
Inner VLANs[1]	Inner VLAN ID on which to apply the remote maintanance point ID. The VLAN ID range is from 1 to 4094.
EVC Name	The EVC name.

1. Applicable only for Cisco ME 3400 Series and Cisco ME 3750 Ethernet Access Switches running Cisco IOS Release 12.2 (54) SE and later.

Step 4 Preview, schedule, or run the command.

Configure CFM MEP

Use the **Configure CFM MEP** command to configure maintenance endpoints (MEPs), which have the following characteristics:

- Per-maintenance domain (level) and service (S-VLAN or EVC)
- At the edge of a domain, define the boundary
- Within the bounds of a maintenance domain, confine CFM messages
- When configured to do so, proactively transmit CFM continuity check messages (CCMs)
- At the request of an administrator, transmit traceroute and loopback messages

Note This command is not supported on the Cisco Carrier Packet Transport (CPT) System.

Step 1 In the inventory window, expand the Logical Inventory tree.

Step 2 Right-click the CFM node and choose **Commands > Configure > Cisco > MEP**.

Step 3 Enter values for the following parameters.

Input Parameter	Description
Domain Name	Name of the domain.
Interface Name	Name of the interface. Specify a physical interface or a port channel to configure.
Maintenance Level	Maintenance level number. The range is from 0 to 7.

Input Parameter	Description
Maintenance End Point Identifier	Maintenance endpoint identifier, which must be unique for each VLAN (service instance). The MEP ID is a CFM identifier used to: • Identify a MEP in CFM communications. • Catalog CFM frames in the local CFM database. The MEP ID is significant throughout the CFM domain and the maintenance association. The range is from 1 to 8191.
VLANs	VLAN ID on which to apply the maintenance endpoint. The VLAN ID range is from 1 to 4095. Alternatively, you can choose *any* to specify all VLAN IDs. **Note** You can execute the **any** command only if the sub mode **any** is supported by the software image version of the network element.

Step 4 You can preview, schedule, or run the command immediately.

Enable CFM Continuity Check

Use the **Enable CFM Continuity Check** command to enable continuity check parameters.

Step 1 In the inventory window, expand the Logical Inventory tree.

Step 2 Right-click the CFM node and choose **Commands > Enable > Cisco > Continuity Check**.

Step 3 Enter values for the following parameters.

Input Parameter	Description
Domain Name	The domain name on which to enable the continuity check.
Maintenance Level	Maintenance level number. The range is from 0 to 7. Alternatively, you can choose *any* to specify all maintenance levels.
VLANs for Cross-Check	VLAN ID on which to apply the continuity check. The VLAN ID range is from 1 to 4094. Alternatively, you can choose *any* to specify all VLAN IDs.
Service Name[1]	The service name on which to enable the continuity check.
Bridge Group Name[1]	The bridge group name on which to enable the continuity check.
Bridge Domain Name[1]	The bridge domain name on which to enable the continuity check.
Interval for CC Messages	Interval, in seconds, for continuity check messages. The default value is 30 seconds.
Loss Threshold Level for CC Packets	The loss threshold level for CC packets. The value ranges from 2 to 225. The default value is 2.

1. Applicable for Cisco ASR 9000 series that run on Cisco IOS XR software.

Step 4 Preview, schedule, or run the command.

Enable CFM SNMP Server Traps

Use the **Enable CFM SNMP Server Traps** command to enable Ethernet CFM continuity check traps and Ethernet CFM cross-check traps.

Step 1 In the inventory window, expand the Logical Inventory tree.

Step 2 Right-click the CFM node and choose **Commands > Enable > Cisco > SNMP Server Traps**. The command enables SNMP server traps and does not require any input parameters.

Viewing Ethernet LMI Properties

Ethernet Local Management Interface (E-LMI) is a protocol that operates between the customer edge (CE) network element and the provider edge (PE) network element. Ethernet LMI is a protocol between the CE network element and the provider edge (PE) network element. It runs only on the PE-CE UNI link and notifies the CE of connectivity status and configuration parameters of Ethernet services available on the CE port. Ethernet LMI interoperates with an OAM protocol, such as CFM, that runs within the provider network to collect OAM status. CFM runs at the provider maintenance level. Ethernet LMI relies on the OAM Ethernet Infrastructure (EI) to work with CFM for end-to-end status of EVCs across CFM domains.

The IOS OAM manager streamlines interaction between OAM protocols, and handles the interaction between CFM and E-LMI. Ethernet LMI interaction with the OAM manager is unidirectional, running only from the OAM manager to E-LMI on the U-PE side of the switch. Information is exchanged either as a result of a request from E- LMI or triggered by the OAM manager when it receives notification of a change from the OAM protocol. Information that is relayed includes the EVC name and availability status, remote UNI name and status, and remote UNI counts.

To summarize, E-LMI:

- Runs only on the PE-CE User Network Interface (UNI) link.
- Notifies the CE of connectivity status and configuration parameters of Ethernet services available on the CE port.

To view Ethernet LMI properties:

Step 1 In Prime Network Vision, double-click the device configured for Ethernet LMI.

Step 2 In the inventory window, choose **Logical Inventory > Ethernet LMI**.

Figure 16-6 shows an example of Ethernet LMI properties in logical inventory.

Figure 16-6 Ethernet LMI in Logical Inventory

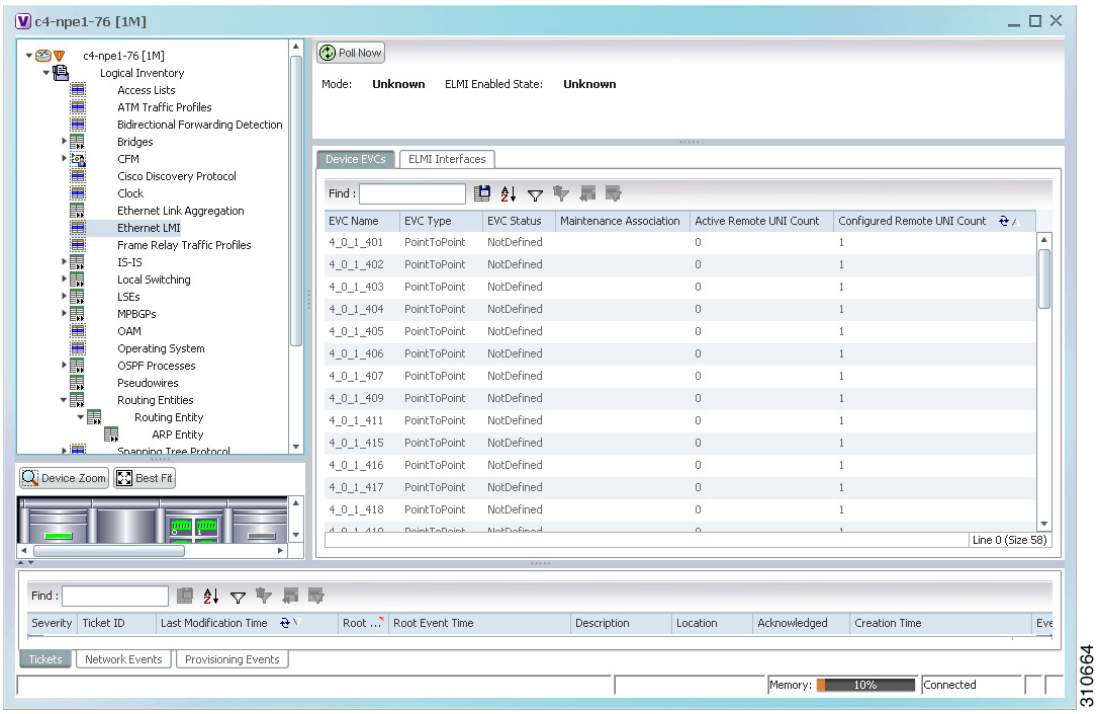


Table 16-8 describes the information displayed for Ethernet LMI.

Table 16-8 Ethernet LMI Properties in Logical Inventory

Field	Description
Globally Enabled	Whether or not Ethernet LMI is enabled globally: True or False.
Mode	Ethernet LMI mode: CE or PE.
Device EVCs Tab	
EVC Name	Name of the EVC.
EVC Type	Type of EVC: Point-to-point or Multipoint.
EVC Status	EVC status: Active, Inactive, Not Defined, or Partially Active.
Maintenance Association	Hyperlinked entry to the maintenance association in CFM in logical inventory. For more information about maintenance associations, see Table 16-6.
Active Remote UNI Count	Number of active remote UNIs.
Configured Remote UNI Count	Number of configured remote UNIs.

Table 16-8 Ethernet LMI Properties in Logical Inventory (continued)

Field	Description
ELMI Interfaces Tab	
Interface Name	Hyperlinked entry to the interface in physical inventory. For more information, see Step 4 in this procedure.
T391	Frequency at which the customer equipment sends status inquiries. The range is 5-30 seconds, with a default of 10 seconds.
T392	Frequency at which the metro Ethernet network verifies that status enquiries have been received. The range is 5-30 seconds, with a default of 15 seconds. A value of 0 (zero) indicates the timer is disabled.
N391	Frequency at which the customer equipment polls the status of the UNI and all EVCs. The range is 1-65000 seconds, with a default of 360 seconds.
N393	Error count for the metro Ethernet network. The range is 1-10, with a default of 4.

Step 3 To view device EVC properties, double-click an EVC name in the Device EVCs tab.

The Device EVC Properties window is displayed as shown in Figure 16-7.

Figure 16-7 Device EVC Properties Window

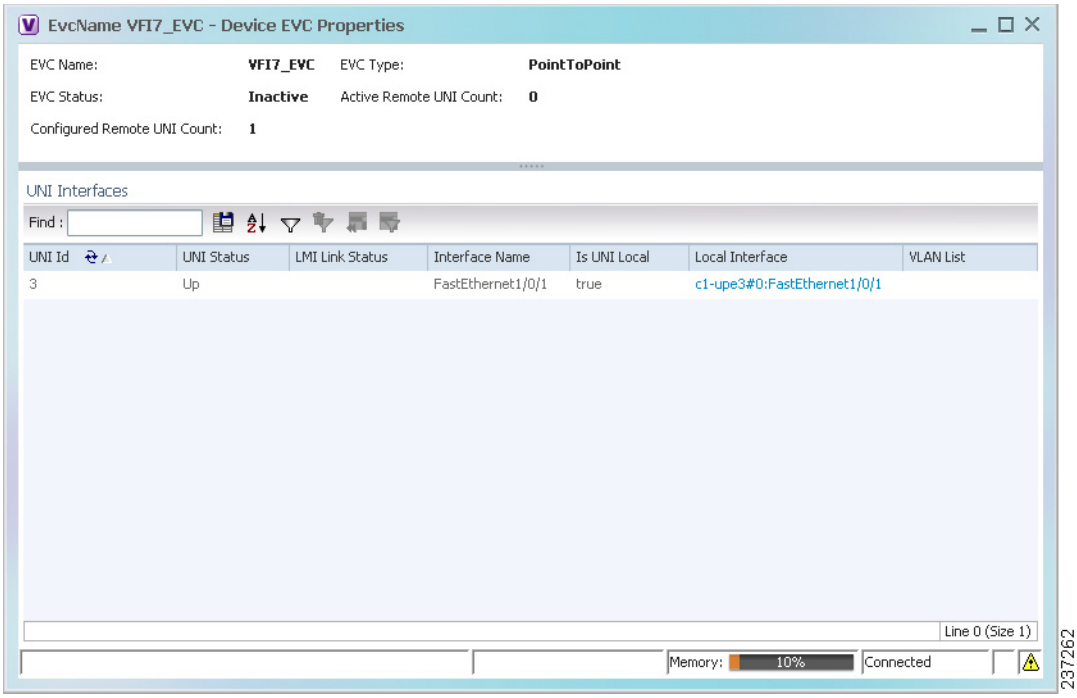


Table 16-9 describes the information displayed in the Device EVC Properties window.

Table 16-9 Device EVC Properties in Logical Inventory

Field	Description
EVC Name	Name of the EVC.
EVC Type	Type of EVC: Point-to-point or Multipoint.
EVC Status	EVC status: Active, Inactive, Not Defined, or Partially Active.
Maintenance Association	Hyperlinked entry to the maintenance association in CFM in logical inventory. For more information about maintenance associations, see Table 16-6.
Active Remote UNI Count	Number of active remote UNIs.
Configured Remote UNI Count	Number of configured remote UNIs.
UNI Interfaces Table	
UNI Id	UNI identifier.
UNI Status	Status of the UNI: Up or Down.
LMI Link Status	Status of the LMI link: Up or Down.
Interface Name	Interface on which UNI is configured.
Is UNI Local	Whether or not UNI is local: True or False.
Local Interface	Hyperlinked entry to the interface in physical inventory.
VLAN List	Name of the VLAN associated with the UNI interface.

Step 4 To view properties for an Ethernet LMI interface in physical interface, click the required interface name in the ELMI Interfaces table.

Table 16-10 describes the information displayed in the UNI Properties area in physical inventory.

Table 16-10 Ethernet LMI UNI Properties in Physical Inventory

Field	Description
Service Multiplexing Enabled	Whether or not the interface is configured for UNI multiplexing: True or False.
Bundling Enabled	Whether or not the interface is configured for UNI bundling: True or False.
UNI Id	UNI identifier.
Bundling Type	Type of bundling applied: All-to-One or None. This field appears only when a bundling type is set.

Using E-LMI Configure and Enable Commands

The following commands can be launched from the inventory by right-clicking an E-LMI node and selecting **Commands**. Before executing any commands, you can preview them and view the results. If desired, you can also schedule the commands. To find out if a device supports these commands, see the *Cisco Prime Network 3.10 Supported Cisco VNEs*. In the GUI, parameters that are displayed in bold text are mandatory.

Note You might be prompted to enter your device access credentials while executing a command. Once you have entered them, these credentials will be used for every subsequent execution of a command in the same GUI client session. If you want to change the credentials, click **Edit Credentials**. Edit Credentials button will not be available for SNMP commands or if the command is scheduled for a later time.

Table 16-11 E-LMI Commands

Command	Input Required and Notes
Enable > Global E-LMI	N/A; performed from command launch point. Not supported on Cisco IOS XR.
Enable On Interface	Interface name (if E-LMI is disabled globally, you can use this command to enable E-LMI on specific interfaces)
Configure MultiPoint To MultiPoint or Point To Point EVC	EVC name
	UNI count: The range of the Unified network interface(UNI) is 2 to 1024; the default is 2. If you enter a value of 2, you have the option to select point-to-multipoint service. If you configure a value of 3 or greater, the service is point-to-multipoint.
	VLANS to apply across check to: VLAN ID range from 1 to 4094.
	Domain name
Configure UNI in an Interface	Interface name
	UNI ID
Configure Service Instance Vlan Id on Interface	Interface name
	Service instance ID: Per-interface Ethernet service instance identifier that does not map to a VLAN (between1-8000).
	EVC name
	VLAN to EVC mapvalue: 1-4094, any, default, or untagged

Viewing Link OAM Properties

Link OAM is an optional sublayer implemented in the OSI Data Link Layer between the Logical Link Control and MAC sublayers. Link (802.3AH) OAM (L-OAM) can be implemented on any full-duplex point-to-point or emulated point-to-point Ethernet link.

The frames (OAM Protocol Data Units [OAMPDUs]) cannot propagate beyond a single hop within an Ethernet network and have modest bandwidth requirements (frame transmission rate is limited to a maximum of 10 frames per second).

Link OAM processes include:

- Discovery—Discovery is the first Link OAM process. During discovery, Link OAM identifies the devices at each end of the link and learns their OAM capabilities.
- Link monitoring—Link OAM link monitoring includes:
  - Monitoring links and issuing notifications when error thresholds are exceeded or faults occur.
  - Collecting statistics on the number of frame errors (or percent of frames that have errors) and the number of coding symbol errors.
- Remote MIB Variable Retrieval—Provides 802.3ah MIB polling and response (but not writing).
- Remote Failure indication—Informs peers when a received path goes down. Because link connectivity faults caused by slowly deteriorating quality are difficult to detect, Link OAM communicates such failure conditions to its peer using OAMPDU flags. The failure conditions that can be communicated are a loss of signal in one direction on the link, an unrecoverable error (such as a power failure), or some other critical event.
- Remote Loopback—Puts the peer device in (near-end) intrusive loopback mode using the OAMPDU loopback control. Statistics can be collected during the link testing. In loopback mode, every frame received is transmitted back unchanged on the same port (except for OAMPDUs, which are needed to maintain the OAM session). Loopback mode helps ensure the quality of links during installation or troubleshooting. Loopback mode can be configured so that the service provider device can put the customer device into loopback mode, but the customer device cannot put the service provider device in loopback mode.

Prime Network Vision supports topology discovery based on Link OAM information and enables you to view Link OAM properties.

For information on CFM and Ethernet LMI, see Viewing Connectivity Fault Management Properties, page 16-3 and Viewing Ethernet LMI Properties, page 16-16.

To view Link OAM properties:

Step 1 In Prime Network Vision, double-click the device configured for Link OAM.

Step 2 In the inventory window, choose **Logical Inventory > OAM**.

Figure 16-8 shows an example of Link OAM properties in logical inventory.

Figure 16-8 Link OAM Properties in Logical Inventory

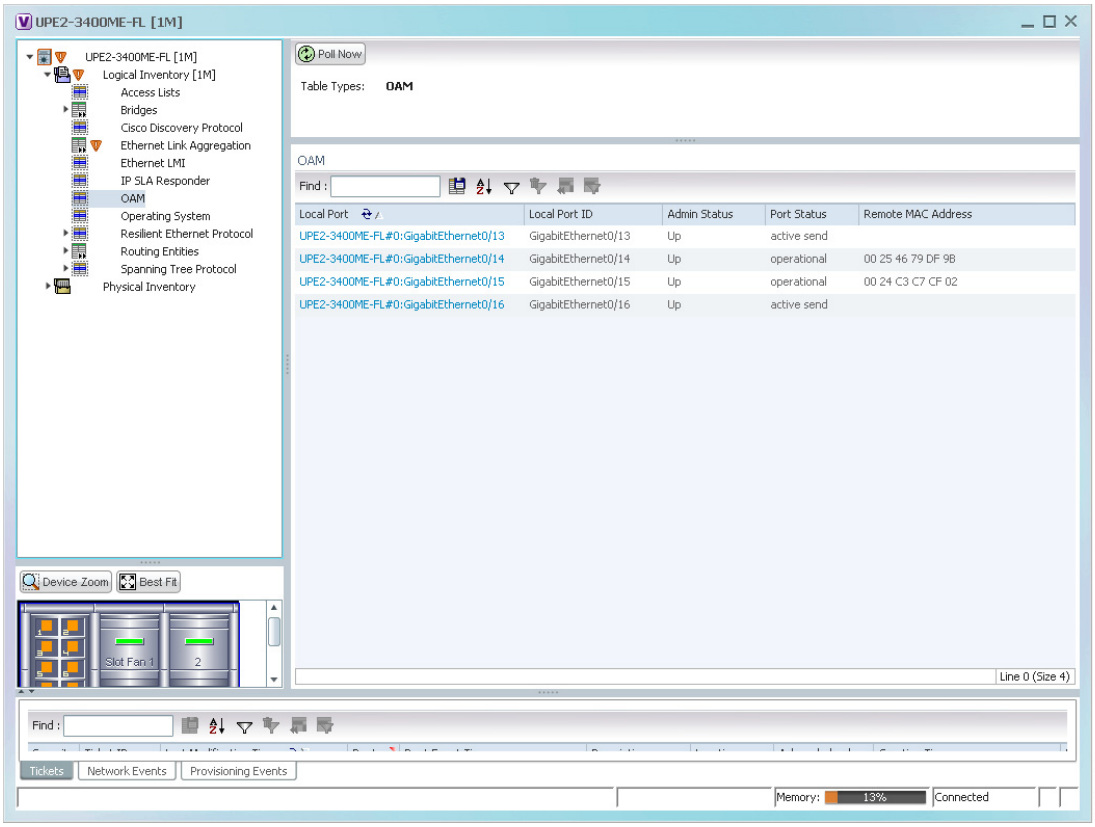


Table 16-12 describes the information displayed for Link OAM.

Table 16-12 Link OAM Properties in Logical Inventory

Field	Description
Table Types	Type of table. In this case, it is OAM.
OAM Table	
Local Port	Name of the OAM-supported interface, hyperlinked to the location in physical inventory.
Local Port ID	Local port identifier, such as FastEthernet1/0/9.
Admin Status	Administrative status of the interface.
Port Status	Status of the port.
Remote MAC Address	Remote client MAC address.

Step 3 To view detailed information about an entry in the table, double-click the required entry.

The Link OAM Data Properties window is displayed as shown in Figure 16-9.

Figure 16-9 Link OAM Data Properties Window

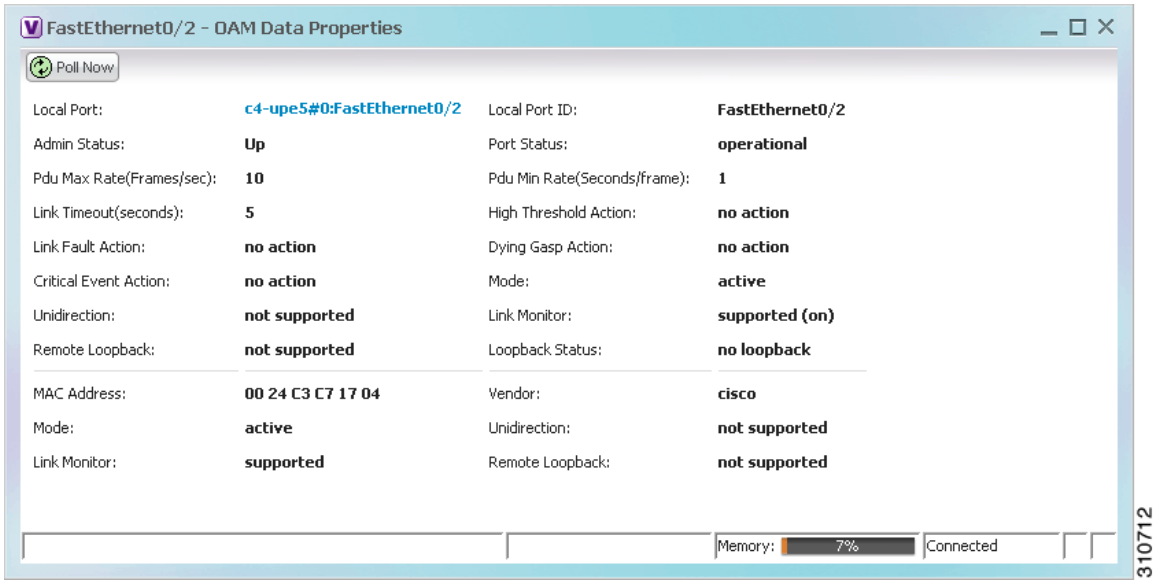


Table 16-13 describes the information that is displayed in the Link OAM Data Properties window.

Table 16-13 Link OAM Data Properties Window

Field	Description
Local Interface	
Local Port	Name of the OAM-supported interface, hyperlinked to the location in physical inventory.
Local Port ID	Local port identifier.
Admin Status	Administrative status of the interface: Up or Down.
Port Status	Status of the port, such as Operational.
PDU Max Rate (Frames/sec)	Maximum transmission rate measured by the number of OAM PDUs per second; for example, 10 packets per second.
PDU Min Rate (Seconds/frame)	Minimum transmission rated measured by the number of seconds required for one OAM PDU; for example, 1 packet per 2 seconds.
Link Timeout	Number of seconds of inactivity on a link before the link is dropped.
High Threshold Action	Action that occurs when the high threshold for an error is exceeded.
Link Fault Action	Action that occurs when the signal is lost.

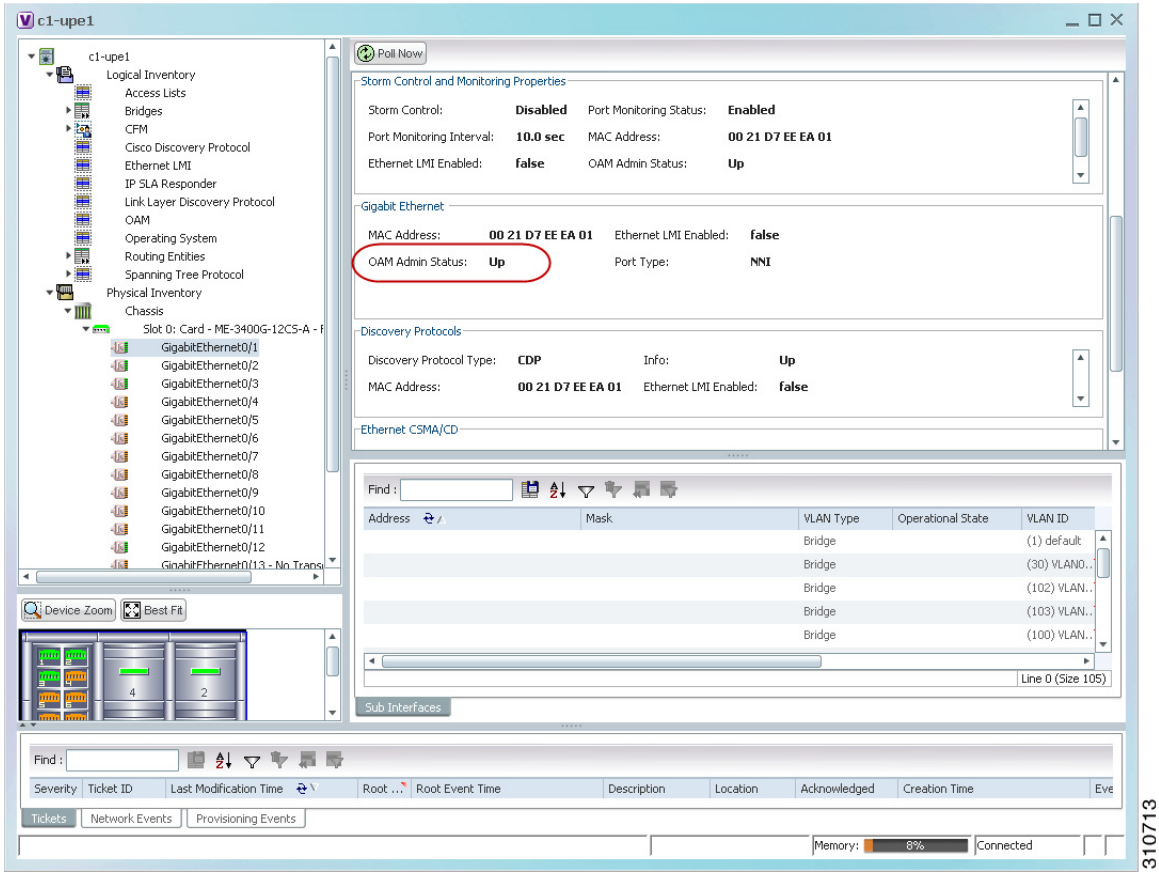
Table 16-13 Link OAM Data Properties Window (continued)

Field	Description
Dying Gasp Action	Action that occurs when an unrecoverable condition is encountered.
Critical Event Action	Action that occurs when an unspecified vendor-specific critical event occurs.
Mode	Mode of the interface: Active or Passive.
Unidirection	Status of unidirectional Ethernet on the local interface: Supported or Not supported.
Link Monitor	Status of link monitoring on the local interface: Supported or Not supported.
Remote Loopback	Status of remote loopback on the local interface: Supported or Not supported.
Loopback Status	Status of loopback on the local interface: Supported or No loopback.
Remote Client	
MAC Address	MAC address for the remote client.
Vendor	Vendor of the remote client.
Mode	Mode of the remote client: Active or Passive.
Unidirection	Status of unidirectional Ethernet on the remote client interface: Supported or Not supported.
Link Monitor	Status of link monitoring on the remote client interface: Supported or Not supported.
Remote Loopback	Status of loopback on the remote client interface: Supported or Not supported.

Step 4 To view Link OAM status in physical inventory, choose **Physical Inventory** > *chassis* > *slot* > *interface*.

The Link OAM administrative status is displayed as shown in Figure 16-10.

Figure 16-10 Link OAM Administrative Status in Physical Inventory



Using L-OAM Configuration, Assign, Enable, and Show Commands

The following commands can be launched from the inventory by right-clicking a L-OAM node and selecting **Commands**. Before executing any commands, you can preview them and view the results. If desired, you can also schedule the commands. To find out if a device supports these commands, see the *Cisco Prime Network 3.10 Supported Cisco VNEs*.

Note You might be prompted to enter your device access credentials while executing a command. Once you have entered them, these credentials will be used for every subsequent execution of a command in the same GUI client session. If you want to change the credentials, click **Edit Credentials**. Edit Credentials button will not be available for SNMP commands or if the command is scheduled for a later time.

Note In the GUI, parameters that are displayed in bold text are mandatory.

Table 16-14 Link-OAM Commands

Command	Input Required and Notes
Assign Template on Interface	Interface name
	Template name
Configure MultiPoint To MultiPoint or Point To Point EVC	Template name
	Symbol-period threshold low: Between 1-65535
	Symbol-period threshold high: Between 1-65535
	Frame window: Between 10-600, where the value represents milliseconds in multiples of 100 (default is 100)
	Frame threshold low: Between 1-900 (default is 1)
	Frame threshold high: Between 1-900 (default is 1)
	Frame-period window: Between 100-65535, where the value represents a multiple of 10000 frames (default is 1000)
	Frame-period Threshold Low
	Frame-Period threshold high: Between 0-65535
	Frame-seconds window: Between 100-9000, where the value represents a multiple of 100 milliseconds (default is 1000)
	Frame-seconds threshold low: Between 1-900 (default is 1)
	Frame-seconds threshold high: Between 1-900
	Receive-Crc window: Between 10-1800, where the value represents a multiple of 100 milliseconds (default is 100)
	Receive-Crc threshold high: Between 1-65535
	Transmit-Crc window: Between 10-1800
	Transmit-Crc threshold high: Between 1-65535
Enable OAM on Interface	Interface name, Template Name
Disable OAM on Interface	Interface name
Enable E-LMI On Interface	Interface name (if E-LMI is disabled globally, you can use this command to enable E-LMI on specific interfaces)
Configure OAM Parameter on Interface	Interface name
	Max-rate: Maximum number of OAM PDUs sent per second (1-10)
	Min-rate: Minimum transmission rate, in seconds, when one OAM PDU is sent per second (1-10)
	Mode: OAM client mode (active or passive).
	Remote loopback: Support or unsupport Ethernet remote loopback on the interface.
	Timeout range (2-30)
Start Remote Loopback	Interface name
Stop Remote Loopback	Interface name