Ethernet Local Management Interface at a Provider Edge

The advent of Ethernet as a metropolitan-area network (MAN) and WAN technology imposes a new set of operations, administration, and management (OAM) 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. More importantly, the timeliness in isolating and responding to a failure becomes mandatory for normal day-to-day operations, and OAM translates directly to the competitiveness of the service provider.

This module provides general information about configuring Ethernet Local Management Interface (LMI), an OAM protocol, on a provider edge (PE) device.

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 Local Management Interface at a Provider Edge" section on page 30.

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.

Contents

Prerequisites for Ethernet Local Management Interface at a Provider Edge

- Ethernet OAM must be operational in the network.
- For Ethernet OAM to operate, the PE side of a connection must be running Ethernet Connectivity Fault Management (CFM) and Ethernet LMI.
- All VLANs used on a PE device to connect to a customer edge (CE) device must also be created on that CE device.

Restrictions for Ethernet Local Management Interface at a Provider Edge

- Ethernet LMI is not supported on routed ports, EtherChannel port channels, or ports that belong to an EtherChannel, private VLAN ports, IEEE 802.1Q tunnel ports, or Ethernet over Multiprotocol Label Switching (MPLS) ports.
- Ethernet LMI cannot be configured on VLAN interfaces.

Information About Ethernet Local Management Interface at a Provider Edge

To configure Ethernet LMI on a PE device, you should understand the following concepts:

Ethernet Virtual Circuit

An Ethernet virtual circuit (EVC) as defined by the Metro Ethernet Forum is a port level point-to-point or multipoint-to-multipoint Layer 2 circuit. EVC status can be used by a CE device to find an alternative path in to the service provider network or in some cases, fall back to a backup path over Ethernet or another alternative service such as Frame Relay or ATM.

Ethernet LMI

Ethernet LMI is an Ethernet OAM protocol between a CE device and a PE device. Ethernet LMI provides CE devices with the status of EVCs for large Ethernet MANs and WANs and provides information that enables CE devices to autoconfigure. Specifically, Ethernet LMI runs on the PE-CE user network interface (UNI) link and notifies a CE device of the operating state of an EVC and the time when an EVC is added or deleted. Ethernet LMI also communicates the attributes of an EVC.

Ethernet LMI interoperates with Ethernet CFM, an OAM protocol that runs within the provider network to collect OAM status. Ethernet CFM runs at the provider maintenance level (user provider edge [UPE] to UPE at the UNI). Ethernet LMI relies on the OAM Ethernet Infrastructure (EI) to interwork with CFM to learn the end-to-end status of EVCs across CFM domains.

Ethernet LMI is disabled globally by default. When Ethernet LMI is enabled globally, all interfaces are automatically enabled. Ethernet LMI can also be enabled or disabled at the interface to override the global configuration. The last Ethernet LMI command issued is the command that has precedence. No EVCs, Ethernet service instances, or UNIs are defined, and the UNI bundling service is bundling with multiplexing.

Ethernet CFM

Ethernet CFM is an end-to-end per-service-instance (per VLAN) Ethernet layer OAM protocol that includes proactive connectivity monitoring, fault verification, and fault isolation. End-to-end CFM can be from PE device to PE device or from CE device to CE device. For more information about Ethernet CFM, see *Ethernet Connectivity Fault Management*.

OAM Manager

The OAM manager is an infrastructure element that streamlines interaction between OAM protocols. The OAM manager requires two interworking OAM protocols, in this case, Ethernet CFM and Ethernet LMI. No interactions are required between Ethernet LMI and the OAM manager on the CE side. On the UPE side, the OAM manager defines an abstraction layer that relays data collected from Ethernet CFM to the Ethernet LMI device.

Ethernet LMI and OAM manager interaction is unidirectional, from the OAM manager to Ethernet LMI on the UPE side of the device. An information exchange results from an Ethernet LMI request or is triggered by the OAM manager when it receives notification from the OAM protocol that the number of UNIs has changed. A change in the number of UNIs may cause a change in EVC status.

The OAM manager calculates EVC status given the number of active UNIs and the total number of associated UNIs. You must configure CFM to notify the OAM manager of all changes to the number of active UNIs or to the remote UNI ID for a given service provider VLAN (S-VLAN) domain.

The information exchanged includes the following:

- EVC name and availability status (active, inactive, partially active, or not defined)
- Remote UNI name and status (up, disconnected, administratively down, excessive frame check sequence [FCS] failures, or not reachable)
- Remote UNI counts (the total number of expected UNIs and the number of active UNIs)

Benefits of Ethernet LMI at a Provider Edge

Ethernet LMI on a PE device provides the following benefits:

- Communication of end-to-end status of the EVC to the CE device
- Communication of EVC and UNI attributes to a CE device
- Competitive advantage for service providers

How to Configure Ethernet Local Management Interface at a Provider Edge

Perform the following tasks to configure Ethernet LMI on a PE device.

Ethernet LMI Interaction with CFM

For Ethernet LMI to function with CFM, you must configure EVCs, Ethernet service instances, and Ethernet LMI customer VLAN mapping. Most of the configuration occurs on the PE device on the interfaces connected to the CE. On the CE device, you need only enable Ethernet LMI on the connecting interface. Also, you must configure some OAM parameters; for example, EVC definitions on PE devices on both sides of a metro network.

CFM and OAM interworking requires an inward facing MEP.

Configuring the OAM Manager

Note If you configure, change, or remove a UNI service type, EVC, Ethernet service instance, or CE-VLAN configuration, all configurations are checked to ensure that the configurations match (UNI service type with EVC or Ethernet service instance and CE-VLAN configuration). The configuration is rejected if the configurations do not match.

Perform this task to configure the OAM manager on a PE device.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **ethernet cfm domain** *domain-name* **level** *level-id* [**direction outward**]
4. **service** *csi-id* **vlan** *vlan-id*
5. **exit**
6. **ethernet evc** *evc-id*
7. **oam protocol** {**cfm svlan** *svlan-id* **domain** *domain-name* | **ldp**}

8. **uni count** *value* [**multipoint**]

9. **exit**

10. Repeat Steps 3 through 9 to define other CFM domains that you want OAM manager to monitor.

11. **interface** *type number*

12. **service instance** *id* **ethernet** [*evc-id*]

13. **ethernet lmi ce-vlan map** {*vlan-id* [**untagged**] | **any** | **default** | **untagged**}

14. **exit**

15. **ethernet uni** [**bundle** [**all-to-one**] | **id** *uni-id* | **multiplex**]

16. **end**

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	`ethernet cfm domain` *domain-name* `level` *level-id* [`direction outward`] **Example:** `Router(config)# ethernet cfm domain cstmr1 level 3`	Defines a CFM domain, sets the domain level and places the command-line interface (CLI) in Ethernet CFM configuration mode.
Step 4	`service` *csi-id* `vlan` *vlan-id* **Example:** `Router(config-ether-cfm)# service csi2 vlan 10`	Defines a universally unique customer service instance (CSI) and VLAN ID within the maintenance domain.

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

Step 6	`ethernet evc` *evc-id* **Example:** `Router(config)# ethernet evc 50`	Defines an EVC and places the CLI in EVC configuration mode.
Step 7	`oam protocol` {`cfm svlan` *svlan-id* `domain` *domain-name*	`ldp`} **Example:** `Router(config-evc)# oam protocol cfm svlan 10 domain cstmr1`	Configures the EVC OAM protocol as CFM and identifies the S-VLAN-ID for the CFM domain maintenance level as configured in Steps 3 and 4. **Note** If the CFM domain does not exist, this command is rejected, and an error message is displayed.

	Command or Action	Purpose
Step 8	**uni count** *value* [**multipoint**] **Example:** Router(config-evc)# uni count 3	(Optional) Sets the UNI count for the EVC. • If this command is not issued, the service defaults to a point-to-point service. If a value of 2 is entered, point-to-multipoint service becomes an option. If a value of 3 or greater is entered, the service is point-to-multipoint. Note If you enter a number greater than the number of endpoints, the UNI status is partially active even if all endpoints are up. If you enter a UNI count less than the number of endpoints, status might be active, even if all endpoints are not up.
Step 9	**exit** **Example:** Router(config-evc)# exit	Returns the CLI to global configuration mode.
Step 10	Repeat Steps 3 through 9 to define other CFM domains that you want OAM manager to monitor.	
Step 11	**interface** *type number* **Example:** Router(config)# interface ethernet 1/3	Specifies a physical interface connected to the CE device and places the CLI in interface configuration mode.
Step 12	**service instance** *id* **ethernet** [*evc-id*] **Example:** Router(config-if)# service instance 400 ethernet 50	Configures an Ethernet service instance on the interface and places the CLI in Ethernet service configuration mode. • The Ethernet service instance identifier is a per-interface service identifier and does not map to a VLAN.
Step 13	**ethernet lmi ce-vlan map** {*vlan-id* [**untagged**] | **any** | **default** | **untagged**} **Example:** Router(config-if-srv)# ethernet lmi ce-vlan map 30	Configures an Ethernet LMI customer VLAN-to-EVC map for a particular UNI.
Step 14	**exit** **Example:** Router(config-if-srv)# exit	Returns the CLI to interface configuration mode.
Step 15	**ethernet uni** [**bundle** [**all-to-one**] | **id** *uni-id* | **multiplex**] **Example:** Router(config-if)# ethernet uni bundle	Sets UNI bundling attributes.
Step 16	**end** **Example:** Router(config-if)# end	Returns the CLI to privileged EXEC mode.

Enabling Ethernet LMI

The order in which the global and interface configuration commands are issued determines the configuration. The last command that is issued has precedence.

Perform this task to enable Ethernet LMI on a device or on an interface.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **interface** *type number*
4. **ethernet lmi interface**
5. **ethernet lmi** {**n393** *value* | **t392** *value*}
6. **end**

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 ethernet 1/3	Defines an interface to configure as an Ethernet LMI interface and places the CLI in interface configuration mode.
Step 4	**ethernet lmi interface** Example: Router(config-if)# ethernet lmi interface	Configures Ethernet LMI on the interface. When Ethernet LMI is enabled globally, it is enabled on all interfaces unless you disable it on specific interfaces. If Ethernet LMI is disabled globally, you can use this command to enable it on specified interfaces.
Step 5	**ethernet lmi** {**n393** *value* | **t392** *value*} Example: Router(config-if)# ethernet lmi n393 10	Configures Ethernet LMI parameters for the UNI.
Step 6	**end** Example: Router(config-if)# end	Returns the CLI to privileged EXEC mode.

Displaying Ethernet LMI and OAM Manager Information

Perform this task to display Ethernet LMI or OAM manager information. All the steps are optional and can be performed in any order.

SUMMARY STEPS

1. **enable**
2. **show ethernet lmi** {{**evc** [**detail** *evc-id* [**interface** *type number*] | **map interface** *type number*]} | {**parameters** | **statistics**} **interface** *type number* | **uni map** [**interface** *type number*]}
3. **show ethernet service evc** [**detail** | **id** *evc-id* [**detail**] | **interface** *type number* [**detail**]]
4. **show ethernet service instance** [**detail** | **id** *id* | **interface** *type number* | **policy-map** | **stats**]
5. **show ethernet service interface** [*type number*] [**detail**]

DETAILED STEPS

	Command	Purpose
Step 1	**enable** **Example:** `Router> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**show ethernet lmi** {{**evc** [**detail** *evc-id* [**interface** *type number*] | **map interface** *type number*]} | {**parameters** | **statistics**} **interface** *type number* | **uni map** [**interface** *type number*]} **Example:** `Router# show ethernet lmi evc`	Displays information that was sent to the CE.
Step 3	**show ethernet service evc** [**detail** | **id** *evc-id* [**detail**] | **interface** *type number* [**detail**]] **Example:** `Router# show ethernet service evc`	Displays information about all EVCs or about a specified EVC.
Step 4	**show ethernet service instance** [**detail** | **id** *id* | **interface** *type number* | **policy-map** | **stats**] **Example:** `Router# show ethernet service instance detail`	Displays information about customer service instances. • This example shows detailed information about all service instances (see the following section).
Step 5	**show ethernet service interface** [*type number*] [**detail**] **Example:** `Router# show ethernet service interface ethernet 1/3 detail`	Displays interface-only information about Ethernet customer service instances for all interfaces or for a specified interface. • This example shows detailed information about service instances for interface Ethernet 1/3 (see the following section).

Examples

The following example shows sample output from the **show ethernet lmi** command using the **evc** keyword:

```
Router# show ethernet lmi evc

St  EVC Id                                                        Port
--- -------------------------------------------------------------- --------------
A   EVC_MP2MP_101                                                  Gi0/1
A   EVC_P2P_110                                                    Gi0/1
```

The following example shows sample output from the **show ethernet service evc** command:

```
R1# show ethernet service evc

Identifier                 Type  Act-UNI-cnt Status
50                         MP-MP   0         NotDefined
```

The following example shows sample output from the **show ethernet service interface** command using the **detail** keyword:

```
R1# show ethernet service interface ethernet 1/3 detail

Interface: Ethernet1/3
ID: uni2
CE-VLANS: 30
EVC Map Type: Bundling
Associated EVCs:
    EVC-ID                   CE-VLAN
    50                       30
Associated Service Instances:
    Service-Instance-ID CE-VLAN
    400                 30
```

The following example shows sample output from the **show ethernet service instance** command using the **detail** keyword:

```
R1# show ethernet service instance detail

Service Instance ID: 400
Associated Interface: Ethernet1/3
Associated EVC: 50
CE-Vlans: 30
State: AdminDown
EFP Statistics:
    Pkts In    Bytes In   Pkts Out  Bytes Out
         0          0          0          0
```

Configuration Examples for Ethernet Local Management Interface at a Provider Edge

This section contains the following example:

Ethernet OAM Manager on a PE Device Configuration: Example

This example shows a sample configuration of OAM manager, CFM, and Ethernet LMI on a PE device:

```
Router# configure terminal
Router(config)# ethernet cfm domain Top level 7
Router(config)# ethernet cfm domain Provider level 4
Router(config-ether-cfm)# service customer_1 vlan 101
Router(config-ether-cfm)# mep crosscheck mpid 404 vlan 101
Router(config-ether-cfm)# exit
Router(config)# ethernet cfm domain Operator_level 2
Router(config-ether-cfm)# service operator_1 vlan 101
Router(config-ether-cfm)# exit
Router(config)# ethernet cfm enable
Router(config)# ethernet evc test1
Router(config-evc)# oam protocol cfm svlan 101 domain Provider
Router(config-evc)# exit
Router(config)# ethernet evc 101
Router(config-evc)# uni count 3
Router(config-evc)# oam protocol cfm svlan 101 domain Operator
Router(config-evc)# exit
Router(config)# ethernet lmi global
Router(config)# interface gigabitethernet 1/0/2
Router(config-if)# service instance 101 ethernet test1
Router(config-if-srv)# ethernet lmi ce-vlan map 101
Router(config-if-srv)# exit
Router(config-if)# exit
Router(config)# ethernet cfm cc enable level 2-4 vlan 101
Router(config)# exit
```

Ethernet OAM Manager on a CE Device Configuration: Example

This example shows how to configure Ethernet LMI globally on a CE device:

```
Router# configure terminal
Router(config)# ethernet lmi global
Router(config)# exit
```

Additional References

The following sections provide references related to the Ethernet Local Management Interface at a Provider Edge Device feature.

Related Documents

Related Topic	Document Title
Ethernet CFM	*Ethernet Connectivity Fault Management*
Ethernet LMI	*Ethernet Local Management Interface*
Remote Port Shutdown feature	*Remote Port Shutdown*
IEEE 802.3ah	*IEEE 802.3ah Ethernet in the First Mile*

Standards

Standard	Title
IEEE P802.1ag/D5.2	Draft Standard for Local and Metropolitan Area Networks
ITU-T	*ITU-T Y.1731 OAM Mechanisms for Ethernet-Based Networks*
IETF VPLS OAM	*L2VPN OAM Requirements and Framework*
Metro Ethernet Forum 16 Technical Specification	*Technical Specification MEF 16- Ethernet Local Management Interface*
ITU-T Q.3/13	Liaison statement on Ethernet OAM (Y.17ethoam)

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. Access to most tools on the Cisco Support website requires a Cisco.com user ID and password. If you have a valid service contract but do not have a user ID or password, you can register on Cisco.com.	http://www.cisco.com/techsupport

Command Reference

This section documents only commands that are new or modified.

- **debug ethernet service**
- **ethernet evc**
- **ethernet lmi ce-vlan map**
- **ethernet uni**
- **oam protocol**
- **service instance ethernet**
- **show ethernet service evc**
- **show ethernet service instance**
- **show ethernet service interface**
- **uni count**

debug ethernet service

To enable debugging of Ethernet customer service instances, use the **debug ethernet service** command privileged EXEC mode. To disable debugging, use the **no** form of this command.

> **debug ethernet service** {**all** | **api** | **error** | **evc** [*evc-id*] | **instance** [**id** *id* | **interface** *type number* | **qos**] | **interface** *type number* | **microblock** | **oam-mgr**}

> **debug ethernet service** {**all** | **api** | **error** | **evc** | **instance** | **interface** | **microblock** | **oam-mgr**}

Syntax Description

all	Displays all Ethernet customer-service debug messages.
api	Displays debug messages about the interaction between the Ethernet infrastructure and its clients.
error	Displays Ethernet customer service error messages occurring in the Ethernet infrastructure subsystem.
evc	Displays Ethernet virtual connection (EVC) debug messages.
evc-id	(Optional) String from 1 to 100 characters that identifies an EVC for debugging.
instance	Displays debug messages related to Ethernet customer service instances.
id	(Optional) Displays Ethernet service-instance debug messages for a specific Ethernet service instance ID and interface.
id	(Optional) Integer in the range from 1 to 4294967295 that is the service identifier.
interface	Displays debugging for Ethernet services on all interfaces or on a specified interface.
	(Optional) When used as an option with the **instance** keyword, service instance debug messages for the interface are displayed.
type number	Type and number of the physical interface.
qos	Displays debug messages for the Ethernet service quality of service (QoS).
microblock	Displays debug messages for the Ethernet service microblocks.
oam-mgr	Displays debug messages for the Ethernet operations, administration, and maintenance (OAM) manager component of the infrastructure.

Command Default   Ethernet service debugging is disabled.

Command Modes   Privileged EXEC

Command History

Release	Modification
12.2(25)SEG	This command was introduced.
12.2(33)SRB	This command was implemented on the Cisco 7600 series routers.

Usage Guidelines   The **debug ethernet service** command is useful for troubleshooting. The **undebug ethernet service** command is the same as the **no debug ethernet service** command.

When you use the **evc** keyword without specifying an EVC ID, debugging is enabled for all EVCs on the system.

When you use the **instance** keyword without specifying options, debugging for all service instances is enabled. If a service instance ID and interface are specified, only debug messages for the associated service instance are displayed. If only an interface is specified, debug messages for all service instances on that interface only are displayed.

Examples   The following example shows output after issuing the **debug ethernet service all** command:

```
Router# debug ethernet service all
Ethernet service error debugging is on
Ethernet service api debugging is on
Ethernet service interface debugging is on
Ethernet service instance debugging is on
Ethernet service instance qos debugging is on
Ethernet service evc debugging is on
Ethernet service OAM Manager debugging is on
```

Related Commands

Command	Description
show debugging	Displays information about the types of debugging that are enabled.

ethernet evc

To define an Ethernet virtual connection (EVC) and to enter EVC configuration mode, use the **ethernet evc** command in global configuration mode. To delete the EVC, use the **no** form of this command.

ethernet evc *evc-id*

no ethernet evc *evc-id*

Syntax Description

evc-id	String from 1 to 100 characters that identifies the EVC.

Command Default   No EVCs are defined.

Command Modes   Global configuration

Command History

Release	Modification
12.2(25)SEG	This command was introduced.
12.2(33)SRB	This command was implemented on the Cisco 7600 series routers.

Usage Guidelines   After you enter the **ethernet evc** command, the device enters EVC configuration mode and the following configuration commands are available:

- **default**—Sets the EVC to its default states.
- **exit**—Exits EVC configuration mode and returns the CLI to global configuration mode.
- **no**—Negates a command or returns a command to its default setting.
- **oam protocol**—Configures the Ethernet operations, administration, and maintenance (OAM) protocol and sets parameters. See the **oam protocol** command for more information.
- **uni count**—Configures a UNI count for the EVC. See the **uni count** command for more information.

Examples   The following example shows how to define an EVC named test1 and to enter EVC configuration mode:

```
Router(config)# ethernet evc test1
Router(config-evc)#
```

Related Commands

Command	Description
oam protocol	Configures the EVC OAM protocol.
service instance	Configures an Ethernet service instance and attaches an EVC to it.
show ethernet service evc	Displays information about configured EVCs.
uni count	Sets the UNI count for an EVC.

ethernet lmi ce-vlan map

To configure Ethernet Local Management Interface (LMI) parameters, use the **ethernet lmi ce-vlan map** command in Ethernet service configuration mode. To remove the configuration, use the **no** form of this command.

ethernet lmi ce-vlan map {*vlan-id* [**untagged**] | **any** | **default** | **untagged**}

no ethernet lmi ce-vlan map {*vlan-id* | **any** | **default** | **untagged**}

Syntax Description		
	vlan-id	Integer in the range of 1 to 4094 that identifies the customer VLAN or VLANs to map to. • You can enter a range of VLAN IDs using a hyphen (-) between IDs or enter a series of VLAN IDs using a comma (,) to separate each one.
	untagged	Map untagged VLANs. (Optional) When used with a range or series of VLANs, the **untagged** keyword is optional.
	any	Map all VLANs (untagged and VLANs 1 to 4094).
	default	Map to the default service instance. • You can use the **default** keyword only if you have already mapped the service instance to a VLAN or a group of VLANs.

Command Default   No Ethernet LMI mapping parameters are defined.

Command Modes   Ethernet service configuration

Command History

Release	Modification
12.2(25)SEG	This command was introduced.
12.2(33)SRB	This command was implemented on the Cisco 7600 series routers.

Usage Guidelines   If you intend to use the **ethernet lmi ce-vlan map any** command, you must first configure all-to-one bundling on the interface.

Use this command to configure an Ethernet LMI customer VLAN-to-EVC map for a particular user-network interface (UNI).

Ethernet LMI mapping parameters are related to the bundling characteristics set by entering the **ethernet uni** command in interface configuration mode.

• Using the default UNI attribute (bundling and multiplexing) supports multiple EVCs and multiple VLANs.

• Entering the **ethernet uni bundle** command supports only one EVC with one or more VLANs.

- Entering the **ethernet uni bundle all-to-one** command supports multiple VLANs but only one EVC. If you use the **ethernet lmi ce-vlan map any** command in Ethernet service configuration mode, you must first configure all-to-one bundling on the interface.

- Entering the **ethernet uni multiplex** command supports multiple EVCs with only one VLAN per EVC.

Examples   The following example shows how to configure an Ethernet LMI customer VLAN-to-EVC map to test customer VLAN 101 in service instance 333 on the interface:

```
Router(config)# interface ethernet 2/1
Router(config-if)# service instance 333 ethernet test
Router(config-if-srv)# ethernet lmi ce-vlan map 101
```

Related Commands

Command	Description
service instance ethernet	Defines an Ethernet service instance and enters Ethernet service configuration mode.
show ethernet service instance	Displays information about configured Ethernet service instances.

ethernet uni

To set user-network interface (UNI) bundling attributes, use the **ethernet uni** command in interface configuration mode. To return to the default bundling configuration, use the **no** form of this command.

ethernet uni [**bundle** [**all-to-one**] | **id** *uni-id* | **multiplex**]

no ethernet uni

Syntax Description		
	bundle	(Optional) Configures the UNI to support bundling without multiplexing.
	all-to-one	(Optional) Configures the UNI to support bundling with a single Ethernet virtual connection (EVC) at the UNI and all CE VLANs mapped to that EVC.
	id	(Optional) Configures a UNI ID.
	uni-id	(Optional) String of 1 to 64 alphanumeric characters that identifies the UNI. The name should be unique for all UNIs that are part of a given service instance.
	multiplex	(Optional) Configures the UNI to support multiplexing without bundling.

Command Default If bundling or multiplexing attributes are not configured, the default is bundling with multiplexing. The UNI then has one or more EVCs with one or more CE VLANs mapped to each EVC.

Command Modes Interface configuration

Command History	Release	Modification
	12.2(25)SEG	This command was introduced.
	12.2(33)SRB	This command was implemented on the Cisco 7600 series routers.

Usage Guidelines UNI options determine the functionality that the interface has regarding bundling VLANs and multiplexing EVCs.

If you want only the bundling or only the multiplexing service, you must configure the service appropriately. Bundling supports only one EVC at the UNI with one or multiple customer edge (CE)-VLAN IDs mapped to the EVC.

When multiplexing is configured, the UNI can have one or more EVCs with a single CE-VLAN ID mapped to each EVC.

When you configure a UNI ID on a port, that ID is used as the default name for all maintenance end points (MEPs) configured on the port.

You must enter the **ethernet uni** command with the **id** keyword and *id* argument on all ports that are directly connected to CE devices. When the specified ID is not unique on a device, an error message is displayed.

When you configure, change, or remove a UNI service type, the EVC and CE-VLAN ID configurations are checked to ensure that the configurations and the UNI service types match. If the configurations do not match, the command is rejected.

Examples   The following example shows how to configure bundling without multiplexing:

```
Router(config)# interface ethernet 2/1
Router(config-if)# ethernet uni bundle
```

This example shows how to identify a UNI as test2:

```
Router(config)# interface ethernet 2/1
Router(config-if)# ethernet uni id test2
```

Related Commands

Command	Description
show ethernet service interface	Displays information about Ethernet service instances on an interface, including service type.

oam protocol

To specify an operations, maintenance, and administration (OAM) protocol for an Ethernet virtual connection (EVC), use the **oam protocol** command in EVC configuration mode. To remove an OAM protocol configuration for an EVC, use the **no** form of this command.

oam protocol {**cfm svlan** *svlan-id* **domain** *domain-name* | **ldp**}

no oam protocol

Syntax Description

cfm	Specifies Connectivity Fault Management (CFM) as the protocol.
svlan	Specifies a service provider VLAN.
svlan-id	Integer in the range of 1 to 4094 that identifies the service provider VLAN.
domain	Specifies a CFM maintenance domain.
domain-name	String of a maximum of 256 characters that identifies the domain.
ldp	Specifies Lightweight Directory Protocol (LDP).

Command Default   An OAM protocol is not specified.

Command Modes   EVC configuration

Command History

Release	Modification
12.2(33)SRB	This command was introduced.

Usage Guidelines   Use this command to specify the OAM protocol to use for communicating link status in an Ethernet over Multiprotocol Label Switching (EoMPLS) network.

Examples   The following example shows how to specify CFM as the OAM protocol:

```
Router(config)# ethernet evc evc10
Router(config-evc)# oam protocol cfm svlan 10 domain cstmr
```

service instance ethernet

To configure an Ethernet service instance on an interface and to enter Ethernet service configuration mode, use the **service instance ethernet** command in interface configuration mode. To delete a service instance, use the **no** form of this command.

service instance *id* **ethernet** [*evc-id*]

no service instance *id*

Syntax Description

id	Integer in the range of 1 to 4294967295 that identifies an interface service instance that does not map to a VLAN.
evc-id	(Optional) Associates an Ethernet virtual connection (EVC) to the service instance.

Command Default No Ethernet service instances are defined.

Command Modes Interface configuration

Command History

Release	Modification
12.2(25)SEG	This command was introduced.
12.2(33)SRB	This command was implemented on the Cisco 7600 series routers.

Usage Guidelines After you enter the **service instance ethernet** command, the device enters Ethernet service configuration mode, and these configuration commands are available:

- **default**—Sets the service instance to its default state.
- **ethernet lmi ce-vlan map**—Configures Ethernet Local Management Interface (E-LMI) parameters. See the **ethernet lmi ce-vlan map** command.
- **exit**— Exits EVC configuration mode and returns to global configuration mode.
- **no**—Negates a command or returns a command to its default setting.

Examples The following example shows how to define an Ethernet service instance and to enter Ethernet service configuration mode for an EVC:

```
Router(config-if)# service instance 333 ethernet test
Router(config-if-srv)#
```

Related Commands

Command	Description
show ethernet service instance	Displays information about configured Ethernet service instances.

show ethernet service evc

To display information about Ethernet virtual connections (EVCs), use the **show ethernet service evc** command in privileged EXEC mode.

show ethernet service evc [**detail** | **id** *evc-id* [**detail**] | **interface** *type number* [**detail**]]

Syntax Description

detail	(Optional) Displays detailed information about service instances or the specified service instance ID or interface.
id	(Optional) Displays EVC information for the specified service.
evc-id	(Optional) String from 1 to 100 characters that identifies the EVC.
interface	(Optional) Displays service instance information for the specified interface.
type	(Optional) Type of interface.
number	(Optional) Number of the interface.

Command Modes   Privileged EXEC

Command History

Release	Modification
12.2(25)SEG	This command was introduced.
12.2(33)SRB	This command was implemented on the Cisco 7600 series routers.

Usage Guidelines   This command is useful for system monitoring and troubleshooting.

Examples   Following is sample output from the **show ethernet service evc** command:

```
Router# show ethernet service evc

Identifier                  Type  Act-UNI-cnt Status
BLUE                        P-P       2       Active
PINK                        MP-MP     2       PartiallyActive
PURPLE                      P-P       2       Active
BROWN                       MP-MP     2       Active
GREEN                       P-P       3       Active
YELLOW                      MP-MP     2       PartiallyActive
BANANAS                     P-P       0       InActive
TEST2                       P-P       0       NotDefined
ORANGE                      P-P       2       Active
TEAL                        P-P       0       InActive
```

Table 1 describes the significant fields in the output.

Table 1   *show ethernet service evc Field Descriptions*

Field	Description
Identifier	EVC identifier.
Type	Type of connection, for example point-to-point (P-P) or multipoint-to-multipoint (MP-MP).
Act-UNI-cnt	Number of active user network interfaces (UNIs).
Status	Availability status of the EVC.

Related Commands

Command	Description
show ethernet instance	Displays information about Ethernet customer service instances.
show ethernet interface	Displays interface-only information about Ethernet customer service instances.

show ethernet service instance

To display information about Ethernet customer service instances, use the **show ethernet service instance** command in privileged EXEC mode.

show ethernet service instance [**detail** | **id** *id* | **interface** *type number* | **policy-map** | **stats**]

Syntax Description

detail	(Optional) Displays detailed information about service instances or the specified service instance ID or interface.
id	(Optional) Displays a specific service instance on an interface that does not map to a VLAN.
id	(Optional) Integer in the range of 1 to 4294967295 that identifies a service instance on an interface that does not map to a VLAN.
interface	(Optional) Displays service instance information for a configured interface.
type	(Optional) Type of interface.
number	(Optional) Number of the interface.
policy-map	(Optional) Displays the policy map for the service instance.
stats	(Optional) Displays service instance statistics.

Command Modes   Privileged EXEC

Command History

Release	Modification
12.2(25)SEG	This command was introduced.
12.2(33)SRB	This command was implemented on the Cisco 7600 series routers.

Usage Guidelines   This command is useful for system monitoring and troubleshooting.

Examples   Following is an example of output from the **show ethernet service instance** command:

```
Router# show ethernet service instance

Identifier Interface           CE-Vlans
222        FastEthernet0/1     untagged,1-4094
10         FastEthernet0/2
222        FastEthernet0/2     200
333        FastEthernet0/2     default
10         FastEthernet0/3     300
11         FastEthernet0/3
10         FastEthernet0/4     300
10         FastEthernet0/6     untagged,1-4094
10         FastEthernet0/7     untagged,1-4094
10         FastEthernet0/8     untagged,1-4094
10         FastEthernet0/9     untagged
20         FastEthernet0/9
222        FastEthernet0/11    300-350,900-999
333        FastEthernet0/11    100-200,1000,1999-4094
```

```
222        FastEthernet0/12      20
333        FastEthernet0/12      10
10         FastEthernet0/13      10
20         FastEthernet0/13      20
30         FastEthernet0/13      30
200        FastEthernet0/13      222
200        FastEthernet0/14      200,222
300        FastEthernet0/14      333
555        FastEthernet0/14      555
```

Table 2 describes the significant fields in the output.

Table 2 ***show ethernet service instance Field Descriptions***

Field	Description
Identifier	Service instance identifier.
Interface	Interface type and number with which the service instance is associated.
CE-Vlans	Customer edge (CE) device VLAN ID.

Related Commands	Command	Description
	show ethernet evc	Displays information about Ethernet customer service instances.
	show ethernet interface	Displays interface-only information about Ethernet customer service instances.

show ethernet service interface

To display interface-only information about Ethernet customer service instances for all interfaces or for a specified interface, use the **show ethernet service interface** in privileged EXEC mode.

show ethernet service interface [*type number*] [**detail**]

Syntax Description

type	(Optional) Type of interface.
number	(Optional) Number of the interface.
detail	(Optional) Displays detailed information about interfaces or a specified service instance ID or interface.

Command Modes   Privileged EXEC

Command History

Release	Modification
12.2(25)SEG	This command was introduced.
12.2(33)SRB	This command was implemented on the Cisco 7600 series routers.

Usage Guidelines   Expressions are case sensitive. For example, if you enter | **exclude output**, the lines that contain *output* are not displayed, but the lines that contain "Output" are displayed.

Examples   Following are examples of output from the **show ethernet service interface** command:

```
Router# show ethernet service interface gigabitethernet0/1


Interface         Identifier
GigabitEthernet0/1 PE2-G101

Router# show ethernet service interface detail


Interface: FastEthernet0/1
ID:
CE-VLANS:
EVC Map Type: Bundling-Multiplexing
Interface: FastEthernet0/2
ID:
CE-VLANS:
EVC Map Type: Bundling-Multiplexing
Interface: FastEthernet0/3
ID:
CE-VLANS:
EVC Map Type: Bundling-Multiplexing

<output truncated>

Interface: GigabitEthernet0/1
ID: PE2-G101
CE-VLANS: 10,20,30
```

```
EVC Map Type: Bundling-Multiplexing
Associated EVCs:
EVC-ID CE-VLAN
WHITE 30
RED 20
BLUE 10
Associated Service Instances:
Service-Instance-ID CE-VLAN
10 10
20 20
30 30
```

Table 3 describes the significant fields in the output.

Table 3   *show ethernet service interface Field Descriptions*

Field	Description
Interface	Interface type and number.
Identifier	EVC identifier.
ID	EVC identifier.
CE-VLANS	VLANs associated with the customer edge (CE) device.
EVC Map Type	UNI service type; for example, Bundling, Multiplexing, All-to-one Bundling.
Associated EVCs	EVCs associated with a device.
EVC-ID CE-VLAN	EVC identifier and associated VLAN.
Associated Service Instances	Service instances associated with a device.
Service-Instance-ID CE-VLAN	Service instance identifier and its associated CE VLAN.

Related Commands

Command	Description
service instance ethernet	Defines an Ethernet service instance and enters Ethernet service configuration mode.
show ethernet evc	Displays information about Ethernet customer service instances.
show ethernet interface	Displays interface-only information about Ethernet customer service instances.

uni count

To set the user-network interface (UNI) count for an Ethernet virtual connection (EVC), use the **uni count** command in EVC configuration mode. To return to the default setting, use the **no** form of this command.

uni count *value* [**multipoint**]

no uni count

Syntax Description

value	Integer in the range of 2 to 1024 that is the number of UNIs in the EVC. The default is 2.
multipoint	(Optional) Indicates point-to-multipoint service. This option is available only with a uni count value of 2.

Command Default   The UNI count defaults to 2 and the service defaults to point-to-point service.

Command Modes   EVC configuration

Command History

Release	Modification
12.2(25)SEG	This command was introduced.
12.2(33)SRB	This command was implemented on the Cisco 7600 series routers.

Usage Guidelines   The UNI count determines the type of service in the EVC.

- A UNI count value of 1 or 2—The service defaults to point-to-point service.
- A UNI value of 2—You can leave the service at the default or you can configure point-to-multipoint service by entering the **multipoint** keyword.
- A UNI value of 3 or greater—The service is point-to-multipoint.

You should know the correct number of maintenance end points (MEPs) in the domain. If you enter a UNI count value greater than the number of endpoints, the UNI status shows as partially active even if all endpoints are up. If you enter a UNI count less than the number of endpoints, UNI status shows as active, even if all endpoints are not up.

⚠ **Caution**   Configuring a UNI count does not prevent you from configuring more endpoints than the configured number of UNIs. For example, if you configure a UNI count of 5, but you create 10 MEPs, any 5 MEPs in the domain can go down without the status changing to partially active.

Examples   The following example shows how to set a UNI count of 2 with point-to-multipoint service:

```
Router(config)# ethernet evc test1
Router(config-evc)# uni count 2 multipoint
```

Related Commands

Command	Description
ethernet evc	Defines an EVC and enters EVC configuration mode.

Feature Information for Ethernet Local Management Interface at a Provider Edge

Table 4 lists the 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 4 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 4   *Feature Information for Ethernet Local Management Interface at a Provider Edge*

Feature Name	Releases	Feature Information
Ethernet Local Management Interface at a Provider Edge	12.2(33)SRB	Ethernet LMI is an Ethernet OAM protocol between a CE device and a PE device. Ethernet LMI provides CE devices with the status of EVCs for large Ethernet MANs and WANs and provides information that enables CE devices to autoconfigure. Specifically, Ethernet LMI runs on the PE-CE UNI link and notifies a CE device of the operating state of an EVC and when an EVC is added or deleted. Ethernet LMI also communicates the attributes of an EVC. In Cisco IOS Release 12.2(33)SRB, this feature was introduced on the Cisco 7600 series router.