Configuring Ethernet CFM and Y.1731 Performance Monitoring on Layer 3 Interfaces

This chapter provides procedures for configuring the network interface device functionality, Ethernet data plane loopback, IEEE connectivity fault management, and Y.1731 performance monitoring, and contains the following sections:

Configuring a Network Interface Device on the L3 Interface

Configuring a Network Interface Device (NID) enables support for the NID functionality on the router without including a NID hardware in the network. This feature combines the Customer-Premises Equipment (CPE) and the NID functionality into a physical device. The following are the advantages of configuring the NID functionality:

- Eliminates a physical device.
- Supports both the managed CPE feature set and the NID requirements.

Note This feature is supported only if you have purchased the DATA technology package functionality (*datak9*) licensing package. For more information about managing software activation licenses on the Cisco ISR and Cisco ISR G2 platforms, see http://www.cisco.com/en/US/docs/routers/access/sw_activation/SA_on_ISR.html.

Configuring the NID

The following steps describe how to configure the NID:

SUMMARY STEPS

Step 1 **enable**

Step 2 **configure terminal**

Step 3 **interface gigabitethernet** *slot/port*

Step 4 **port-tagging**

Step 5 **encapsulation dot1q** *vlan-id*

Step 6 **set cos** *cos-value*

Step 7 **end**

DETAILED STEPS

	Command	Purpose
Step 1	**enable** **Example:** `Router>enable`	Enables the privileged EXEC mode. Enter your password when prompted.
Step 2	**configure terminal** **Example:** `Router#configure terminal`	Enters the global configuration mode.
Step 3	**interface gigabitethernet** *slot/port* **Example:** `Router(config)#interface gigabitethernet 0/2`	Specifies an interface and enters the interface configuration mode.
Step 4	**port-tagging** **Example:** `Router(config-if)#port-tagging`	Inserts the VLAN ID into a packet header to identify which Virtual Local Area Network (VLAN) the packet belongs to.
Step 5	**encapsulation dot1q** *vlan-id* **Example:** `Router(config-if-port-tagging)#encapsulation dot1q 10`	Defines the encapsulation format as IEEE 802.1Q (dot1q), and specifies the VLAN identifier.
Step 6	**set cos** *cos-value* **Example:** `Router(config-if-port-tagging)#set cos 6`	Sets the Layer 2 class of service (CoS) value to an outgoing packet end.
Step 7	**end** **Example:** `Router(config-if-port-tagging)#end`	Exits the interface configuration mode.

Configuration Example

This configuration example shows how to configure the NID:

```
Router>enable
Router#configure terminal
Router(config)#interface gigabitethernet 0/2
Router(config-if)#port-tagging
Router(config-if-port-tagging)#encapsulation dot1q 10
Router(config-if-port-tagging)#set cos 6
Router(config-if-port-tagging)#end
```

Verifying the NID Configuration

Use the following commands to verify the port tagging sessions:

- **show run int**
- **ping**

Use the **show run int** command to display the port tagging sessions:

```
Router#show run int gi0/2
Building configuration...
Current configuration : 10585 bytes
!
interface GigabitEthernet0/2
 no ip address
 duplex auto
 speed auto
 port-tagging
  encapsulation dot1q 10
  set cos 6
  exit
end
!
interface GigabitEthernet0/2.1101
encapsulation dot1Q 100
ip address 132.1.101.4 255.255.255.0
!
interface GigabitEthernet0/2.1102
encapsulation dot1Q 100
ip address 132.1.102.4 255.255.255.0
!
```

Use the **ping** command to verify the connectivity with port tagging configured:

```
Router#ping 132.1.101.3
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 132.1.101.3, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/4 ms
router#
```

Troubleshooting the NID Configuration

Table 1 lists the debug commands to troubleshoot the issues pertaining to the NID functionality.

The Cisco IOS Master Command List at

http://www.cisco.com/en/US/docs/ios/mcl/allreleasemcl/all_book.html provides more information about these commands.

Caution Because debugging output is assigned high priority in the CPU process, it can diminish the performance of the router or even render it unusable. For this reason, use debug commands only to troubleshoot specific problems or during troubleshooting sessions with Cisco technical support staff.

Note Before you run any of the debug commands listed in the following table, ensure that you run the **logging buffered debugging** command, and then turn off console debug logging using the **no logging console** command.

Table 1 debug Commands for NID Configuration

debug Command	Purpose
debug ethernet nid configuration	Enables debugging of configuration-related issues.
debug ethernet nid packet egress	Enables debugging of packet processing (VLAN tag push) on the egress side.
debug ethernet nid packet ingress	Enables debugging of packet processing (VLAN tag pop) on the ingress side.

Ethernet Data Plane Loopback

The Ethernet Data Plane Loopback feature provides a means for remotely testing the throughput of an Ethernet port. You can verify the maximum rate of frame transmission with no frame loss.

Note This feature is supported only if you have purchased the DATA technology package functionality (*datak9*) licensing package. For more information about managing software activation licenses on the Cisco ISR and Cisco ISR G2 platforms, see http://www.cisco.com/en/US/docs/routers/access/sw_activation/SA_on_ISR.html.

Note Internal Ethernet data plane loopback is not supported.

Restrictions for Configuring External Ethernet Data Plane Loopback

Follow the guidelines and take note of the restrictions listed here when configuring Ethernet data plane loopback on a Layer 3 interface:

- Only external loopback (packets coming from the wire side) on the L3 dot1q subinterface and (untagged) main interface are supported.
- To perform a MAC swap, the destination address and source address must be swapped for the packets that are looped back. If the destination address is broadcast or multicast, the MAC address is used as the source address for the packets that are looped back.
- Loopback operations are supported at line rate.
- Untagged frames are not supported on a subinterface. However, the frames for *dot1q* and *qinq* are supported on a subinterface.

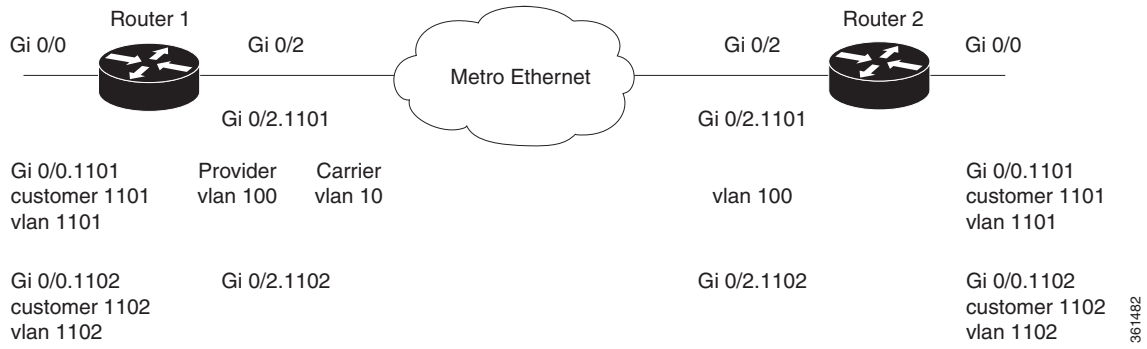
- *dot1ad* is not supported on the main interface. However, untagged frames are supported on the main interface.
- Single VLAN is supported as a filtering option for a subinterface, but VLAN list and VLAN range are not supported.
- Only MAC address is supported as a filtering option for the main interface.
- For the filtering option, the destination MAC cannot be combined with inner VLAN or outer VLAN.
- There is no support for L3 and L4 loopback. Source and destination IP address or source and destination ports will not be swapped.
- Connectivity Fault Management (CFM) packets are transparent to the data plane loopback configuration and cannot be looped back.
- Packets coming from the other side of the wire where loopback is configured and having the same destination MAC address are dropped.
- The broadcast and multicast IP addresses of the broadcast and multicast IP frames that are received cannot be used as the source IP address of the frame when it is sent back to the initiator. In such a case, the IP address of the subinterface is used as the source IP address of the frame when it is sent back to the initiator.

Configuring External Ethernet Data Plane Loopback

Configuring external Ethernet data plane loopback is permitted on a Layer 3 main interface and subinterfaces.

Figure 1 represents a sample topology to configure Ethernet data plane loopback.

Figure 1 Sample Topology



The following steps show how to configure external Ethernet data plane loopback on a subinterface using single and double tagging. (The procedure to configure external Ethernet data plane loopback on the main interface is similar to this procedure.)

SUMMARY STEPS

Step 1 **enable**

Step 2 **configure terminal**

Step 3 **interface gigabitethernet** *slot/port.sub-port*

Step 4 **encapsulation dot1q** *vlan-id*

or

encapsulation dot1q *vlan-id* **second-dot1q** *inner vlan-id*

Step 5 **ethernet loopback permit external**

Step 6 **end**

DETAILED STEPS

	Command	Purpose
Step 1	**enable** **Example:** `Router>enable`	Enables the privileged EXEC mode. Enter your password when prompted.
Step 2	**configure terminal** **Example:** `Router#configure terminal`	Enters the global configuration mode.
Step 3	**interface gigabitethernet** *slot/port.sub-port* **Example:** `Router(config)#interface gigabitethernet 0/2.1101`	Specifies the subinterface and enters the subinterface configuration mode.
Step 4	**encapsulation dot1q** *vlan-id* or **encapsulation dot1q** *vlan-id* **second-dot1q** *inner vlan-id* **Example:** `Router(config-subif)#encapsulation dot1q 100` or `Router(config-subif)#encapsulation dot1q 100 second-dot1q 1101`	Defines the encapsulation format as IEEE 802.1Q (dot1q), and specifies the VLAN identifier. For double tagging, use the **second-dot1q** keyword and the *inner vlan-id* argument to specify the VLAN tag.
Step 5	**ethernet loopback permit external** **Example:** `Router(config-subif)#ethernet loopback permit external`	Configures Ethernet external loopback on the subinterface.
Step 6	**end** **Example:** `Router(config-subif)#end`	Exits the subinterface configuration mode.

To start Ethernet data plane loopback, run the following command:

	Command	Purpose
Step 1	**ethernet loopback start local interface gigabitethernet** *slot/port.sub-port* **external timeout** *none* **Example:** `Router#ethernet loopback start local interface gigabitethernet 0/2.1101 external timeout none`	Starts Ethernet external loopback on a subinterface. Enter timeout as *none* to have no time out period for the loopback.

To stop Ethernet data plane loopback, perform the following steps:

	Command	Purpose
Step 1	**ethernet loopback stop local interface gigabitethernet** *slot/port.sub-port* **id** *session-id* **Example:** `Router#ethernet loopback stop local interface gigabitethernet 0/2.1101 id 1`	Stops Ethernet external loopback on a subinterface. Enter the value of the loopback session ID to specify the loopback session that you want to stop.
Step 2	**show ethernet loopback active** **Example:** `Router#show ethernet loopback active`	Displays information to verify if the loopback session has ended.

Configuration Examples for Ethernet Data Plane Loopback

This example shows how to configure Ethernet data plane loopback using single tagging:

```
Router>enable
Router#configure terminal
Router(config)#interface gigabitethernet 0/2.1101
Router(config-subif)#encapsulation dot1q 100
Router(config-subif)#ethernet loopback permit external
Router(config-subif)#end
```

This example shows how to configure Ethernet data plane loopback using double tagging:

```
Router>enable
Router#configure terminal
Router(config)#interface gigabitethernet 0/2.1101
Router(config-subif)#encapsulation dot1q 100 second-dot1q 1101
Router(config-subif)#ethernet loopback permit external
Router(config-subif)#end
```

This example shows how to start an Ethernet data plane loopback:

```
Router#ethernet loopback start local interface gigabitethernet 0/2.1101 external timeout
none
```

```
This is an intrusive loopback and the packets matched with the service will not be able to
pass through. Continue? (yes/[no]):
```

Enter `yes` to continue.

This example shows how to stop an Ethernet data plane loopback:

```
Router#ethernet loopback stop local interface gigabitethernet 0/2.1101 id 1
Router#*Oct 21 10:16:17.887: %E_DLB-6-DATAPLANE_LOOPBACK_STOP: Ethernet Dataplane Loopback
Stop on interface GigabitEthernet0/2 with session id 1
Router#show ethernet loopback active
Total Active Session(s): 0
Total Internal Session(s): 0
Total External Session(s): 0
```

Verifying the Ethernet Data Plane Loopback Configuration

Use the following commands to verify the Ethernet data plane loopback configuration:

- **show ethernet loopback permitted**
- **show ethernet loopback active**

Use the **show ethernet loopback permitted** command to view the loopback capabilities per interface:

```
Router#show ethernet loopback permitted
------------------------------------------------------------------------------
Interface                               SrvcInst Direction
Dot1q/Dot1ad(s)                         Second-Dot1q(s)
------------------------------------------------------------------------------
Gi0/2.1101                              N/A      External
100                                     1101
```

Use the **show ethernet loopback active** command to display the summary of the active loopback sessions on a subinterface:

```
Router#show ethernet loopback active
Loopback Session ID     : 1
Interface               : GigabitEthernet0/2.1101
Service Instance        : N/A
Direction               : External
Time out(sec)           : none
Status                  : on
Start time              : *10:17:46.930 UTC Mon Oct 21 2013
Time left               : N/A
Dot1q/Dot1ad(s)         : 100
Second-dot1q(s)         : 1101
Source Mac Address      : Any
Destination Mac Address : Any
Ether Type              : Any
Class of service        : Any
Llc-oui                 : Any


Total Active Session(s): 1
Total Internal Session(s): 0
Total External Session(s): 1
```

Use the **show ethernet loopback active** command to display the summary of the active loopback sessions on the main interface:

```
Router#show ethernet loopback permitted
Loopback Session ID     : 1
Interface               : GigabitEthernet0/2
```

```
Service Instance        : N/A
Direction               : External
Time out(sec)           : none
Status                  : on
Start time              : *10:14:23.507 UTC Mon Oct 21 2013
Time left               : N/A
Dot1q/Dot1ad(s)         : 1-100
Second-dot1q(s)         : 1-1101
Source Mac Address      : Any
Destination Mac Address : Any
Ether Type              : Any
Class of service        : Any
Llc-oui                 : Any


Total Active Session(s): 1
Total Internal Session(s): 0
Total External Session(s): 1
```

Troubleshooting the Ethernet Data Plane Loopback Configuration

Table 2 lists the debug commands to troubleshoot issues pertaining to the Ethernet Data Plane Loopback feature.

The Cisco IOS Master Command List at

http://www.cisco.com/en/US/docs/ios/mcl/allreleasemcl/all_book.html provides more information about these commands.

Caution Because debugging output is assigned high priority in the CPU process, it can diminish the performance of the router or even render it unusable. For this reason, use debug commands only to troubleshoot specific problems or during troubleshooting sessions with Cisco technical support staff.

Note Before you run any of the debug commands listed in the following table, ensure that you run the **logging buffered debugging** command, and then turn off console debug logging using the **no logging console** command.

Table 2 debug Commands for Ethernet Data Plane Loopback Configuration

debug Command	Purpose
debug elb-pal-pd all	Displays all the debugging information about the Ethernet data plane loopback configuration.
debug elb-pal-pd error	Displays debugging information about Ethernet data plane loopback configuration errors.
debug elb-pal-pd event	Displays debugging information about Ethernet data plane loopback configuration changes.

CFM Support on Routed Port and Port MEP

IEEE Connectivity Fault Management (CFM) is an end-to-end per-service Ethernet-layer Operations, Administration, and Maintenance (OAM) protocol. CFM includes proactive connectivity monitoring, fault verification, and fault isolation for large Ethernet metropolitan-area networks (MANs) and WANs.

Note This feature is supported only if you have purchased the DATA technology package functionality (*datak9*) licensing package. For more information about managing software activation licenses on the Cisco ISR and Cisco ISR G2 platforms, see http://www.cisco.com/en/US/docs/routers/access/sw_activation/SA_on_ISR.html.

Restrictions for Configuring Ethernet CFM

- A specific domain must be configured. If it is not, an error message is displayed.
- Multiple domains (different domain names) having the same maintenance level can be configured. However, associating a single domain name with multiple maintenance levels is not permitted.

Configuring Ethernet CFM (Port MEP)

Complete these steps to configure and enable Ethernet CFM on a port Maintenance End Point (MEP):

SUMMARY STEPS

Step 1 **enable**

Step 2 **configure terminal**

Step 3 **ethernet cfm ieee**

Step 4 **ethernet cfm global**

Step 5 **ethernet cfm domain** *domain-name* **level** *value*

Step 6 **service** *service-name* **port**

Step 7 **continuity-check interval** *value*

Step 8 **end**

Step 9 **configure terminal**

Step 10 **interface gigabitethernet** *slot/port*

Step 11 **ethernet cfm mep domain** *domain-name* **mpid** *mpid-value* **service** *service-name*

Step 12 **end**

DETAILED STEPS

	Command	Purpose
Step 1	**enable** **Example:** `Router>enable`	Enables the privileged EXEC mode. Enter your password when prompted.
Step 2	**configure terminal** **Example:** `Router#configure terminal`	Enters the global configuration mode.
Step 3	**ethernet cfm ieee** **Example:** `Router(config)#ethernet cfm ieee`	Enables the IEEE version of CFM.
Step 4	**ethernet cfm global** **Example:** `Router(config)#ethernet cfm global`	Enables CFM processing globally on the router.
Step 5	**ethernet cfm domain** *domain-name* **level** *value* **Example:** `Router(config-ecfm)#ethernet cfm domain carrier level 2`	Defines a CFM maintenance domain at a specified level, and enters the Ethernet CFM configuration mode. **level** can be any value from 0 to 7.
Step 6	**service** *service-name* **port** **Example:** `Router(config-ecfm)#service carrier port`	Creates a service on the interface and sets the *config-ecfm-srv* submode.
Step 7	**continuity-check interval** *value* **Example:** `Router(config-ecfm-srv)#continuity-check interval 100m`	Enables sending continuity check messages at the set interval.
Step 8	**end** **Example:** `Router(config-ecfm-srv)#end`	Returns the router to the privileged EXEC mode.
Step 9	**configure terminal** **Example:** `Router#configure terminal`	Enters the global configuration mode.

	Command	Purpose
Step 10	**interface gigabitethernet** *slot/port* **Example:** `Router(config)#interface gigabitethernet 0/2`	Specifies an interface and enters the interface configuration mode.
Step 11	**ethernet cfm mep domain** *domain-name* **mpid** *mpid-value* **service** *service-name* **Example:** `Router(config-if)#ethernet cfm mep domain carrier mpid 44 service carrier`	Sets a port to a maintenance domain and defines it as an MEP. **Note** The values for **domain** and **service** must be the same as the values configured for CFM.
Step 12	**end** **Example:** `Router(config-if-ecfm-mep)#end`	Returns the router to the privileged EXEC mode.

Configuration Example for Ethernet CFM (Port MEP)

This example shows how to configure Ethernet CFM on a port MEP:

```
Router>enable
Router#configure terminal
Router(config)#ethernet cfm ieee
Router(config)#ethernet cfm global
Router(config-ecfm)#ethernet cfm domain carrier level 2
Router(config-ecfm)#service carrier port
Router(config-ecfm-srv)#continuity-check interval 100m
Router(config-ecfm-srv)#end
Router#configure terminal
Router(config)#interface gigabitethernet 0/2
Router(config-if)#ethernet cfm mep domain carrier mpid 44 service carrier
Router(config-if-ecfm-mep)#end
```

Verifying the Ethernet CFM Configuration on a Port MEP

Use the following commands to verify Ethernet CFM configured on a port MEP:

- **show ethernet cfm domain**
- **show ethernet cfm maintenance-points local**
- **show ethernet cfm maintenance-points remote**
- **ping ethernet mpid** *mpid-value* **domain** *domain-name* **service** *service-name* **cos** *value*
- **traceroute ethernet mpid** *mpid-value* **domain** *domain-name* **service** *service-name*
- **show ethernet cfm error configuration**

Use the **show ethernet cfm domain** command to view details about CFM maintenance domains:

```
Router#show ethernet cfm domain carrier
Domain Name: carrier
Level: 2
Total Services: 1
```

```
  Services:
  Type Id   Dir CC CC-int Static-rmep Crosscheck MaxMEP Source  MA-Name
  Port none Dwn Y  100ms  Disabled    Disabled   100    Static  carrier
Router#
```

Use the **show ethernet cfm maintenance-points local** command to view the MEPs that are configured locally on a router. The following is a sample output of the **show ethernet cfm maintenance-points local** command:

```
Router#show ethernet cfm maintenance-points local
Local MEPs:
--------------------------------------------------------------------------------
MPID Domain Name                                Lvl   MacAddress     Type  CC
Ofld Domain Id                                  Dir   Port           Id
     MA Name                                          SrvcInst       Source
     EVC name
--------------------------------------------------------------------------------
44   carrier                                    2     5657.a844.04fa Port  Y
No   carrier                                    Down  Gi0/2          none
     carrier                                          N/A            Static
     N/A


Total Local MEPs: 1

Local MIPs: None
```

Use the **show ethernet cfm maintenance-points remote** command to display information about remote maintenance point domains or levels. In the following example, carrier, Provider, and customer are the maintenance point domains that are configured.

On router 1:

```
Router1#show ethernet cfm maintenance-points remote
--------------------------------------------------------------------------------
MPID  Domain Name                                MacAddress          IfSt  PtSt
 Lvl  Domain ID                                  Ingress
 RDI  MA Name                                    Type Id             SrvcInst
      EVC Name                                                       Age
      Local MEP Info
--------------------------------------------------------------------------------
43    carrier                                    5657.a86c.fa92      Up    N/A
 2    carrier                                    Gi0/2
 -    carrier                                    Port none           N/A
      N/A                                                            0s
      MPID: 44 Domain: carrier MA: carrier
33    Provider                                   5657.a86c.fa92      Up    Up
 5    Provider                                   Gi0/2.100
 -    Provider                                   Vlan 100            N/A
      N/A                                                            0s
      MPID: 34 Domain: Provider MA: Provider
3101  customer                                   5657.a86c.fa92      Up    Up
 7    customer                                   Gi0/2.1101
 -    customer1101                               S,C  100,1101       N/A
      N/A                                                            0s
      MPID: 4101 Domain: customer MA: customer1101
3102  customer                                   5657.a86c.fa92      Up    Up
 7    customer                                   Gi0/2.1102
 -    customer1102                               S,C  100,1102       N/A
      N/A                                                            0s
      MPID: 4102 Domain: customer MA: customer1102
```

```
Total Remote MEPs: 4
```

Use the **show ethernet cfm maintenance-points remote** command to view the details of a remote maintenance point domain:

On router 1:

```
Router1#show ethernet cfm maintenance-points remote domain carrier service carrier
-------------------------------------------------------------------------------
MPID  Domain Name                                MacAddress          IfSt  PtSt
 Lvl  Domain ID                                  Ingress
 RDI  MA Name                                    Type Id             SrvcInst
      EVC Name                                                       Age
      Local MEP Info
-------------------------------------------------------------------------------
43    carrier                                    5657.a86c.fa92      Up    Up
 2    carrier                                    Gi0/2
 -    carrier                                    S,C  100,1101       N/A
      N/A                                                            0s
      MPID: 44 Domain: carrier MA: carrier
Total Remote MEPs: 1
```

On router 2:

```
Router2#show ethernet cfm maintenance-points remote domain carrier service carrier
-------------------------------------------------------------------------------
MPID  Domain Name                                MacAddress          IfSt  PtSt
 Lvl  Domain ID                                  Ingress
 RDI  MA Name                                    Type Id             SrvcInst
      EVC Name                                                       Age
      Local MEP Info
-------------------------------------------------------------------------------
44    carrier                                    5657.g945.04fa      Up    Up
 2    carrier                                    Gi0/2
 -    carrier                                    S,C  100,1101       N/A
      N/A                                                            0s
      MPID: 43 Domain: carrier MA: carrier
```

Use the **ping** command to verify if Loopback Messages (LBM) and Loopback Replies (LBR) are successfully sent and received between the routers:

```
Router1#ping ethernet mpid 44 domain carrier service carrier cos 5
Type escape sequence to abort.
Sending 5 Ethernet CFM loopback messages to 5657.a86c.fa92, timeout is 5 seconds:!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/1 ms
Router1#
```

Use the **traceroute** command to send the Ethernet CFM traceroute messages:

```
Router#traceroute ethernet mpid 44 domain carrier service carrier
Type escape sequence to abort. TTL 64. Linktrace Timeout is 5 seconds
Tracing the route to 5657.a86c.fa92 on Domain carrier, Level 2, service carrier
Traceroute sent via Gi0/2

B = Intermediary Bridge
! = Target Destination
* = Per hop Timeout
-------------------------------------------------------------------------------
                            MAC      Ingress        Ingr Action  Relay Action
  Hops   Host             Forwarded   Egress         Egr Action   Previous Hop
-------------------------------------------------------------------------------
```

```
! 1                   5657.a86c.fa92 Gi0/2          IngOk        RlyHit:MEP
                      Not Forwarded                               5657.g945.04fa
Router#
```

Configuring Ethernet CFM (Single-Tagged Packets)

Complete these steps to configure and enable Ethernet CFM for single-tagged packets:

SUMMARY STEPS

Step 1 **enable**

Step 2 **configure terminal**

Step 3 **ethernet cfm ieee**

Step 4 **ethernet cfm global**

Step 5 **ethernet cfm domain** *domain-name* **level** *level-id*

Step 6 **service** *service-name* **vlan** *vlan-id* **direction down**

Step 7 **continuity-check**

Step 8 **interface gigabitethernet** *slot/port*

Step 9 **ethernet cfm mep domain** *domain-name* **mpid** *value* **service** *service-name*

Step 10 **interface gigabitethernet** *slot/port.subinterface*

Step 11 **encapsulation dot1q** *vlan-id*

Step 12 **end**

DETAILED STEPS

	Command	Purpose
Step 1	**enable** **Example:** `Router>enable`	Enables the privileged EXEC mode. Enter your password when prompted.
Step 2	**configure terminal** **Example:** `Router#configure terminal`	Enters the global configuration mode.
Step 3	**ethernet cfm ieee** **Example:** `Router(config)#ethernet cfm ieee`	Enables the IEEE version of CFM.
Step 4	**ethernet cfm global** **Example:** `Router(config)#ethernet cfm global`	Enables CFM processing globally on the router.

	Command	Purpose
Step 5	**ethernet cfm domain** *domain-name* **level** *value* **Example:** `Router(config)#ethernet cfm domain customer level 7`	Defines a CFM maintenance domain at a specified level, and enters the Ethernet CFM configuration mode. **level** can be any value from 0 to 7.
Step 6	**service** *service-name* **vlan** *vlan-id* **direction down** **Example:** `Router(config-ecfm)#service customer1101 vlan 100 direction down`	Enters the CFM service configuration mode. **vlan**—Specifies the VLAN.
Step 7	**continuity-check** **Example:** `Router(config-ecfm-srv)#continuity-check`	Enables sending continuity check messages.
Step 8	**interface gigabitethernet** *slot/port* **Example:** `Router(config-ecfm-srv)#interface gigabitethernet 0/2`	Specifies an interface and enters the interface configuration mode.
Step 9	**ethernet cfm mep domain** *domain-name* **mpid** *mpid-value* **service** *service-name* **Example:** `Router(config-if)#ethernet cfm mep domain customer mpid 100 service customer1101`	Sets a port to a maintenance domain and defines it as an MEP. **Note** The values for **domain** and **service** must be the same as the values that were configured for CFM.
Step 10	**interface gigabitethernet** *slot/port.subinterface* **Example:** `Router(config-if-ecfm-mep)#interface gigabitethernet 0/2.1`	Specifies a subinterface and enters the subinterface configuration mode.
Step 11	**encapsulation dot1q** *vlan-id* **Example:** `Router(config-subif)#encapsulation dot1q 100`	Defines the encapsulation format as IEEE 802.1Q (dot1q), and specifies the VLAN identifier.
Step 12	**end** **Example:** `Router(config-subif)#end`	Returns the router to the privileged EXEC mode.

Configuration Example for Ethernet CFM (Single-Tagged Packets)

This example shows how to configure Ethernet CFM for single-tagged packets:

```
Router>enable
Router#configure terminal
Router(config)#ethernet cfm ieee
Router(config)#ethernet cfm global
Router(config)#ethernet cfm domain customer level 7
Router(config-ecfm)#service customer1101 vlan 100 direction down
Router(config-ecfm-srv)#continuity-check
Router(config)#interface gigabitethernet 0/2
Router(config-if)#ethernet cfm mep domain customer mpid 100 service customer1101
Router(config-if-ecfm-mep)#interface gigabitethernet 0/2.1
Router(config-subif)#encapsulation dot1q 100
Router(config-subif)#end
```

Verifying the Ethernet CFM Configuration for Single-Tagged Packets

Use the following commands to verify Ethernet CFM configured for single-tagged packets:

- **show ethernet cfm domain**
- **show ethernet cfm maintenance-points local**
- **show ethernet cfm maintenance-points remote**
- **show ethernet cfm error configuration**

Use the **show ethernet cfm domain** command to display the maintenance point domains configured in the network. In the following example, customer, enterprise, and carrier maintenance point domains are configured:

```
Router#show ethernet cfm domain
Domain Name: customer
Level: 7
Total Services: 1
  Services:
  Type Id   Dir CC CC-int Static-rmep Crosscheck MaxMEP Source  MA-Name
  Vlan 100  Dwn Y  10s    Disabled    Disabled   100    Static  customer1101

Domain Name: enterprise
Level: 6
Total Services: 1
  Services:
  Type Id   Dir CC CC-int Static-rmep Crosscheck MaxMEP Source  MA-Name
  Vlan 110  Dwn Y  10s    Disabled    Disabled   100    Static  custservice

Domain Name: carrier
Level: 2
Total Services: 1
  Services:
  Type Id   Dir CC CC-int Static-rmep Crosscheck MaxMEP Source  MA-Name
  Vlan 200  Dwn Y  10s    Disabled    Disabled   100    Static  carrier
Router#
```

Use the **show ethernet cfm maintenance-points local** command to view the local MEPs. The following is a sample output of the **show ethernet cfm maintenance-points local** command:

```
Router#show ethernet cfm maintenance-points local
-------------------------------------------------------------------------------
MPID Domain Name                                Lvl   MacAddress     Type  CC
Ofld Domain Id                                  Dir   Port           Id
     MA Name                                          SrvcInst       Source
     EVC name
-------------------------------------------------------------------------------
100  customer                                   7     70ca.9b4d.a400 Vlan  Y
```

```
No   customer                                  Down  Gi0/2          100
     customer1101                                  N/A            Static
     N/A
400  enterprise                                6     70ca.9b4d.a400 Vlan  I
No   enterprise                                Down  Gi0/1          110
     custservice                                   N/A            Static
     N/A
44   carrier                                   2     70ca.9b4d.a400 Vlan  N
No   carrier                                   Down  Gi0/2          200
     carrier                                       N/A            Static
     N/A

Total Local MEPs: 3

Local MIPs: None
Router#
```

Use the **show ethernet cfm maintenance-points remote** command to display information about remote maintenance point domains or levels.

The following example displays the continuity check messages exchanged between remote MEPs:

On router 1:

```
Router1#show ethernet cfm maintenance-points remote
-------------------------------------------------------------------------------------------
MPID Domain Name             MacAddress           IfSt               PtSt
 Lvl Domain                  Ingress
 RDI MA                      Type Id              SrvcInst
     EVC Name                                     Age
     Local MEP Info
-------------------------------------------------------------------------------------------
110  customer                70ca.9b4d.a400       Up                  Up
 7   customer                Gi0/2
 -   customer1101            Vlan 100             N/A
     N/A                                          12s
     MPID: 100 Domain: customer MA: customer1101

410  enterprise              70ca.9b4d.a400       Up                  Up
 6   enterprise              Gi0/1
 -   custservice             Vlan 110             N/A
     N/A                                          12s
     MPID: 400 Domain: enterprise MA: custservice

43   carrier                 70ca.9b4d.a400       Up                  Up
 2   carrier                 Gi0/2
 -   carrier                 Vlan 200             N/A
     N/A                                          12s
     MPID: 44  Domain: carrier MA: carrier

Total Remote MEPs: 3
Router1#
```

On router 2:

```
Router2#show ethernet cfm maintenance-points remote
-------------------------------------------------------------------------------------------
MPID Domain Name             MacAddress           IfSt               PtSt
 Lvl Domain                  Ingress
 RDI MA                      Type Id              SrvcInst
     EVC Name                                     Age
     Local MEP Info
-------------------------------------------------------------------------------------------
```

```
100  customer                0026.99f7.0b41       Up                  Up
 7   customer                Gi0/2
 -   customer1101            Vlan 100             N/A
     N/A                                          2s
     MPID: 110 Domain: customer MA: customer1101

400  enterprise              0026.99f7.0b41       Up                  Up
 6   enterprise              Gi0/1
 -   custservice             Vlan 110             N/A
     N/A                                          2s
     MPID: 410 Domain: enterprise MA: custservice

44   carrier                 0026.99f7.0b41       Up                  Up
 2   carrier                 Gi0/2
 -   carrier                 Vlan 200             N/A
     N/A                                          2s
     MPID: 43  Domain: carrier MA: carrier

Total Remote MEPs: 3
Router2#
```

Use the **show ethernet cfm error configuration** command to view Ethernet CFM configuration errors (if any). The following is a sample output of the **show ethernet cfm error configuration** command:

```
Router#show ethernet cfm error configuration
------------------------------------------------------------------------------
CFM Interface      Type  Id       Level    Error type
------------------------------------------------------------------------------
Gi0/2              S,C   100      5        CFMLeak
```

Configuring Ethernet CFM (Double-Tagged Packets)

Complete these steps to configure and enable Ethernet CFM for double-tagged packets:

SUMMARY STEPS

Step 1 **enable**

Step 2 **configure terminal**

Step 3 **ethernet cfm ieee**

Step 4 **ethernet cfm global**

Step 5 **ethernet cfm domain** *domain-name* **level** *value*

Step 6 **service** *service-name* **vlan** *vlan-id* **inner-vlan** *inner-vlan-id* **direction down**

Step 7 **continuity-check**

Step 8 **interface gigabitethernet** *slot/port*

Step 9 **ethernet cfm mep domain** *domain-name* **mpid** *mpid-value* **service** *service-name*

Step 10 **interface gigabitethernet** *slot/port.subinterface*

Step 11 **encapsulation dot1q** *vlan-id* **second-dot1q** *inner vlan-id*

Step 12 **end**

DETAILED STEPS

	Command	Purpose
Step 1	**enable** **Example:** `Router>enable`	Enables the privileged EXEC mode. Enter your password when prompted.
Step 2	**configure terminal** **Example:** `Router#configure terminal`	Enters the global configuration mode.
Step 3	**ethernet cfm ieee** **Example:** `Router(config)#ethernet cfm ieee`	Enables the IEEE version of CFM.
Step 4	**ethernet cfm global** **Example:** `Router(config)#ethernet cfm global`	Enables CFM processing globally on the router.
Step 5	**ethernet cfm domain** *domain-name* **level** *0 to 7* **Example:** `Router(config-ecfm)#ethernet cfm domain customer level 7`	Defines a CFM maintenance domain at a specified level, and enters Ethernet CFM configuration mode. **level** can be any value from 0 to 7.
Step 6	**service** *service-name* **vlan** *vlan-id* **inner-vlan** *inner vlan-id* **direction down** **Example:** `Router(config-ecfm)#service customer1101 vlan 100 inner-vlan 30 direction down`	Enters the CFM service configuration mode. The following are the parameters: • **vlan**—Specifies the VLAN. • **inner-vlan**—The **inner-vlan** keyword and the *inner vlan-id* argument specify the VLAN tag for double-tagged packets.
Step 7	**continuity-check** **Example:** `Router(config-ecfm-srv)#continuity-check`	Enables sending continuity check messages.
Step 8	**interface gigabitethernet** *slot/port* **Example:** `Router(config-ecfm-srv)#interface gigabitethernet 0/2`	Specifies an interface and enters the interface configuration mode.

	Command	Purpose
Step 9	**ethernet cfm mep domain** *domain-name* **mpid** *mpid-value* **service** *service-name* **Example:** `Router(config-if)#ethernet cfm mep domain customer mpid 100 service customer1101`	Sets a port to a maintenance domain and defines it as an MEP. **Note** The values for **domain** and **service** must be the same as the values configured for CFM. **MPID**—Specifies the maintenance endpoint identifier.
Step 10	**interface gigabitethernet** *slot/port.subinterface* **Example:** `Router(config-if-ecfm-mep)#interface gigabitethernet 0/2.1101`	Specifies a subinterface and enters the subinterface configuration mode.
Step 11	**encapsulation dot1q** *vlan-id* **second-dot1q** *inner vlan-id* **Example:** `Router(config-subif)#encapsulation dot1q 100 second-dot1q 30`	Defines the encapsulation format as IEEE 802.1Q (dot1q), and specifies the VLAN identifier. Use the **second-dot1q** keyword and the *inner vlan-id* argument to specify the VLAN tag.
Step 12	**end** **Example:** `Router(config-subif)#end`	Returns the router to the privileged EXEC mode.

Configuration Example for Ethernet CFM (Double-Tagged Packets)

This example shows how to configure Ethernet CFM for double-tagged packets:

```
Router>enable
Router#configure terminal
Router(config)#ethernet cfm ieee
Router(config)#ethernet cfm global
Router(config-ecfm)#ethernet cfm domain customer level 7
Router(config-ecfm)#service customer1101 vlan 100 inner-vlan 30 direction down
Router(config-ecfm-srv)#continuity-check
Router(config-ecfm-srv)#interface gigabitethernet 0/2
Router(config-if)#ethernet cfm mep domain customer mpid 100 service customer1101
Router(config-if-ecfm-mep)#interface gigabitethernet 0/2.1101
Router(config-subif)#encapsulation dot1q 100 second-dot1q 30
Router(config-subif)#end
```

Verifiying the Ethernet CFM Configuration for Double-Tagged Packets

Use the following commands to verify Ethernet CFM configured for double-tagged packets:

- **show ethernet cfm maintenance-points local**
- **show ethernet cfm maintenance-points remote**
- **ping ethernet mpid** *mpid-value* **domain** *domain-name* **service** *service-name* **cos** *value*
- **traceroute ethernet mpid** *mpid-value* **domain** *domain-name* **service** *service-name*
- **show ethernet cfm error configuration**

Use the **show ethernet cfm maintenance-points local** command to view the local MEPs. The following is a sample output of the **show ethernet cfm maintenance-points local** command:

```
Router#show ethernet cfm maintenance-points local
-------------------------------------------------------------------------------
MPID Domain Name          MacAddress                 IfSt                    PtSt
 Lvl Domain ID          Ingress
 RDI MA Name              Type Id                    SrvcInst
     EVC Name                              Age
     Local MEP Info
-------------------------------------------------------------------------------
100  customer             8843.e154.6f01             Up                      Up
 7   customer             Gi0/2.1101
 -   customer1101         S, C 100, 30               N/A
     N/A                                   58s
     MPID: 100 Domain: customer MA: customer1101
Router#
```

Use the **show ethernet cfm maintenance-points remote** command to display the remote maintenance point domains. In the following example, customer, carrier, and enterprise are the maintenance point domains that are configured:

On router 1:

```
Router1#show ethernet cfm maintenance-points remote
-------------------------------------------------------------------------------
MPID Domain Name          MacAddress                 IfSt                    PtSt
 Lvl Domain ID          Ingress
 RDI MA Name              Type Id                    SrvcInst
     EVC Name                                       Age
     Local MEP Info
-------------------------------------------------------------------------------
110  customer             8843.e154.6f01             Up                      Up
 7   customer             Gi0/2.1101
 -   customer1101         S, C 100, 30               N/A
     N/A                                            58s
     MPID: 100 Domain: customer MA: customer1101

43   carrier              8843.e154.6f01             Up                      Up
 2   carrier              Gi0/2.2
 -   carrier              S, C 50, 20                N/A
     N/A                                            58s
     MPID: 44 Domain: carrier MA: carrier

410  enterprise           8843.e154.6f01             Up                      Up
 6   enterprise           Gi0/1.1
 -   custservice          S, C 200, 70               N/A
     N/A                                            58s
     MPID: 400 Domain: enterprise MA: custservice

Router1#
```

On router 2:

```
Router2#show ethernet cfm maintenance-points remote
-------------------------------------------------------------------------------
MPID Domain Name          MacAddress                 IfSt                    PtSt
 Lvl Domain ID          Ingress
 RDI MA Name              Type Id                    SrvcInst
     EVC Name                                       Age
     Local MEP Info
-------------------------------------------------------------------------------
```

```
100  customer             0026.99f7.0b41             Up                    Up
 7   customer             Gi0/2.1101
 -   customer1101         S, C 100, 30               N/A
     N/A                                             40s
     MPID: 110 Domain: customer MA: customer1101

44   carrier              0026.99f7.0b41             Up                    Up
 2   carrier              Gi0/2.2
 -   carrier              S, C 50, 20                N/A
     N/A                                             40s
     MPID: 43 Domain: carrier MA: carrier

400  enterprise           0026.99f7.0b41             Up                    Up
 6   enterprise           Gi0/1.1
 -   custservice          S, C 200, 70               N/A
     N/A                                             40s
     MPID: 410 Domain: enterprise MA: custservice

Router2#
```

Use the **ping** command to verify if Ethernet CFM loopback messages are successfully sent and received between the routers:

```
Router#ping ethernet mpid 100 domain customer service customer1101  cos 5
Type escape sequence to abort.
Sending 5 Ethernet CFM loopback messages to 8843.e154.6f01, timeout is 5 seconds:!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/1 ms
Router#
```

Use the **traceroute** command to send the Ethernet CFM traceroute messages:

```
Router#traceroute ethernet mpid 100 domain customer service customer1101
Type escape sequence to abort. TTL 64. Linktrace Timeout is 5 seconds
Tracing the route to 8843.e154.6f01 on Domain customer, Level 7, service customer1101,
vlan 100 inner-vlan 30
Traceroute sent via Gi0/2.1101

B = Intermediary Bridge
! = Target Destination
* = Per hop Timeout
-------------------------------------------------------------------------------
                            MAC      Ingress        Ingr Action  Relay Action
  Hops   Host             Forwarded  Egress         Egr Action   Previous Hop
-------------------------------------------------------------------------------
! 1                   8843.e154.6f01 Gi0/2.1101 IngOk        RlyHit:MEP
                     Not Forwarded                              5657.a86c.fa92
```

Use the **show ethernet cfm error configuration** command to view Ethernet CFM configuration errors (if any). The following is a sample output of the **show ethernet cfm error configuration** command:

```
Router#show ethernet cfm error configuration
-------------------------------------------------------------------------------
CFM Interface      Type  Id         Level    Error type
-------------------------------------------------------------------------------
Gi0/2              S,C   100,30     5        CFMLeak
Gi0/2              S,C   100,30     1        CFMLeak
```

Troubleshooting Ethernet CFM Configuration

Table 3 lists the debug commands to troubleshoot issues pertaining to the Ethernet CFM configuration.

The Cisco IOS Master Command List at

http://www.cisco.com/en/US/docs/ios/mcl/allreleasemcl/all_book.html provides more information about these commands.

Caution Because debugging output is assigned high priority in the CPU process, it can diminish the performance of the router or even render it unusable. For this reason, use debug commands only to troubleshoot specific problems or during troubleshooting sessions with Cisco technical support staff.

Note Before you run any of the debug commands listed in the following table, ensure that you run the **logging buffered debugging** command, and then turn off console debug logging using the **no logging console** command.

Table 3 debug Commands for Ethernet CFM Configuration

debug Command	Purpose
debug ethernet cfm all	Enables all Ethernet CFM debug messages.
debug ethernet cfm diagnostic	Enables low-level diagnostic debugging of Ethernet CFM general events or packet-related events.
debug ethernet cfm error	Enables debugging of Ethernet CFM errors.
debug ethernet cfm packets	Enables debugging of Ethernet CFM message packets.
debug ecfmpal all	Enables debug messages for all Ethernet CFM platform events.
debug ecfmpal api	Displays debug messages for all Ethernet CFM platform API events.
debug ecfmpal common	Displays debug messages for all Ethernet CFM platform common events.
debug ecfmpal ecfmpal	Enables debugging of all Ethernet CFM platform events.
debug ecfmpal epl	Enables debugging of all Ethernet CFM platform endpoint list (EPL) events.
debug ecfmpal isr	Enables debugging of all Ethernet CFM platform interrupt service request (ISR) events.

Support for Y.1731 Performance Monitoring on a Routed Port (L3 Subinterface)

Y.1731 Performance Monitoring (PM) provides a standard Ethernet PM function that includes measurement of Ethernet frame delay, frame delay variation, frame loss, and frame throughput measurements specified by the ITU-T Y-1731 standard and interpreted by the Metro Ethernet Forum (MEF) standards group.

Note This feature is supported only if you have purchased the DATA technology package functionality (*datak9*) licensing package. For more information about managing software activation licenses on the Cisco ISR and Cisco ISR G2 platforms, see http://www.cisco.com/en/US/docs/routers/access/sw_activation/SA_on_ISR.html.

Frame Delay

Ethernet frame delay measurement is used to measure frame delay and frame delay variations. Ethernet frame delay is measured using the Delay Measurement Message (DMM) method.

Restrictions for Configuring Two-Way Delay Measurement

Follow the guidelines and restrictions listed here when you configure two-way delay measurement:

- Y.1731 PM measurement works only for a point-to-point network topology.
- The granularity of the clock for delay measurement is in seconds and nanoseconds.
- CFM Y.1731 packets work with a maximum of two VLAN tags. The expected behavior is not observed with more VLAN tags. Also, CFM Y.1731 packets do not work with untagged cases.

Configuring Two-Way Delay Measurement

The following steps show how to configure two-way delay measurement. Both single and double tagging methods are included in the steps listed below.

SUMMARY STEPS

Step 1 **enable**

Step 2 **configure terminal**

Step 3 **ip sla** *operation number*

Step 4 **ethernet y1731 delay** *DMM* **domain** *value* **vlan** *vlan-id* **mpid** *value* **cos** *value* **source mpid** *value*

or

ethernet y1731 delay *DMM* **domain** *value* **vlan** *vlan-id* **inner-vlan** *inner vlan-id* **mpid** *value* **cos** *value* **source mpid** *value*

Step 5 **aggregate interval** *seconds*

Step 6 **exit**

Step 7 **ip sla schedule** *operation number* **start-time** {*start time* | *now*}

Step 8 **end**

DETAILED STEPS

	Command	Purpose
Step 1	**enable** **Example:** `Router> enable`	Enables the privileged EXEC mode. Enter your password when prompted.
Step 2	**configure terminal** **Example:** `Router# configure terminal`	Enters the global configuration mode.
Step 3	**ip sla** *operation number* **Example:** `Router(config)# ip sla 1101`	Enables the IP SLA configuration. *operation-number*—The IP SLA operation you want to configure.
Step 4	**ethernet y1731 delay** *DMM* **domain** *value* **vlan** *vlan-id* **mpid** *value* **cos** *value* **source mpid** *value* or **ethernet y1731 delay** *DMM* **domain** *value* **vlan** *vlan-id* **inner-vlan** *inner vlan-id* **mpid** *value* **cos** *value* **source mpid** *value* **Example:** `Router(config-ip-sla)# ethernet y1731 delay DMM domain customer vlan 100 mpid 3101 cos 1 source mpid 4101` or `Router(config-ip-sla)# ethernet y1731 delay DMM domain customer vlan 100 inner-vlan 1101 mpid 3101 cos 1 source mpid 4101`	Configures a two-way delay measurement. **Note** Both single tagging and double tagging are supported. The following are the parameters: • **delay**—Specifies the delay distribution parameter. **Note** DMM is the only supported delay distribution parameter. • **vlan**—Specifies the VLAN. • **inner-vlan**—The **inner-vlan** keyword and the *inner vlan-id* argument specify the VLAN tag for double-tagged packets. • **cos**—Specifies the CoS. The value can be any number between 0 and 7. **Note** For double-tagged packets, the **cos** value corresponds to the value specified for the outer tag. • **mpid**—Specifies the destination MPID. • **source**—Specifies the source MPID.
Step 5	**aggregate interval** *seconds* **Example:** `Router(config-sla-y1731-delay)# aggregate interval 30`	Configures the Y.1731 aggregation parameter, where **aggregate interval** refers to the interval at which the packets are sent. *seconds*—Specifies the length of time, in seconds.

	Command	Purpose
Step 6	**exit** **Example:** `Router(config-sla-y1731-delay)# exit`	Exits the router configuration mode.
Step 7	**ip sla schedule** *operation number* **life** {*value* | *forever*} **start-time** *value* **Example:** `Router(config)#ip sla schedule 1101 life forever start-time now`	Schedules the two-way delay measurement. • **life**—Specifies a period of time (in seconds) to execute. The value can also be set as *forever.* • **start-time**—Specifies the time at which to start the entry. The options available are *after, hh:mm, hh:mm:ss, now,* and *pending*.
Step 8	**end** **Example:** `Router(config)#end`	Exits the router configuration mode and returns to the privileged EXEC mode.

Configuration Examples for Two-Way Delay Measurement

This example shows how to configure two-way delay measurement using single tagging:

```
router>enable
router#configure terminal
router(config)#ip sla 1101
router(config-ip-sla)#ethernet y1731 delay DMM domain customer vlan 100 mpid 3101 cos 1
router(config-sla-y1731-delay)#aggregate interval 30
router(config-sla-y1731-delay)#exit
router(config)#ip sla schedule 1102 life forever start-time now
router(config)#end
```

This example shows how to configure two-way delay measurement using double tagging:

```
router>enable
router#configure terminal
router(config)#ip sla 1101
router(config-ip-sla)#ethernet y1731 delay DMM domain customer vlan 100 inner-vlan 1101
mpid 3101 cos 1 source mpid 4101
router(config-sla-y1731-delay)#aggregate interval 30
router(config-sla-y1731-delay)#exit
router(config)#ip sla schedule 1101 life forever start-time now
router(config)#end
```

Verifying Two-Way Delay Measurement Configuration

Use the following commands to verify the performance-monitoring sessions:

- **show run | sec ip sla**
- **show ip sla summary**
- **show ip sla statistics** *entry-number*
- **show ip sla configuration** *entry-number*
- **show ethernet cfm pm session summary**
- **show ethernet cfm pm session detail** *session-id*

- **show ethernet cfm pm session db** *session-id*

The following are the sample outputs of the commands listed above:

```
Router#show run | sec ip sla
ip sla auto discovery
ip sla 1101
 ethernet y1731 delay DMM domain customer vlan 100 inner-vlan 1101 mpid 3101 cos
 1 source mpid 4101
ip sla schedule 1101 life forever start-time now

Router#show ip sla summary
IPSLAs Latest Operation Summary
Codes: * active, ^ inactive, ~ pending

ID           Type        Destination       Stats       Return      Last
                                           (ms)        Code        Run
---------------------------------------------------------------------
*1101        y1731-delay Domain:customer V -           OK          27 seconds ag
                         lan:100 CVlan:110                         o
                         1 Mpid:3101

Router#show ip sla statistics
IPSLAs Latest Operation Statistics

IPSLA operation id: 1101
Delay Statistics for Y1731 Operation 1101
Type of operation: Y1731 Delay Measurement
Latest operation start time: *10:43:12.930 UTC Mon Oct 21 2013
Latest operation return code: OK
Distribution Statistics:
Interval
 Start time:  *10:43:12.930 UTC Mon Oct 21 2013
 Elapsed time: 15 seconds
 Number of measurements initiated: 7
 Number of measurements completed: 7
 Flag: OK

Router#show ip sla configuration 1101
IP SLAs Infrastructure Engine-III
Entry number: 1101
Owner:
Tag:
Operation timeout (milliseconds): 5000
Ethernet Y1731 Delay Operation
Frame Type: DMM
Domain: customer
Vlan: 100
CVlan: 1101
Target Mpid: 3101
Source Mpid: 4101
CoS: 1
   Max Delay: 5000
   Request size (Padding portion): 64
   Frame Interval: 1000
   Clock: Not In Sync
Threshold (milliseconds): 5000
Schedule:
   Operation frequency (seconds): 30  (not considered if randomly scheduled)
   Next Scheduled Start Time: Start Time already passed
   Group Scheduled : FALSE
   Randomly Scheduled : FALSE
   Life (seconds): Forever
   Entry Ageout (seconds): never
```

```
   Recurring (Starting Everyday): FALSE
   Status of entry (SNMP RowStatus): Active
Statistics Parameters
  Frame offset: 1
  Distribution Delay Two-Way:
   Number of Bins 10
   Bin Boundaries: 5000,10000,15000,20000,25000,30000,35000,40000,45000,-1
  Distribution Delay-Variation Two-Way:
   Number of Bins 10
   Bin Boundaries: 5000,10000,15000,20000,25000,30000,35000,40000,45000,-1
  Aggregation Period: 30
History
  Number of intervals: 2

Router#show ethernet cfm pm session summary
Number of Configured Session : 150
Number of Active Session: 2
Number of Inactive Session: 148
Router#

Router(config)#show ethernet cfm pm session detail 0
Session ID: 0
Sla Session ID: 1101
Level: 7
Service Type: S,C
Service Id: 100,1101
Direction: Down
Source Mac: 5352.a824.04fr
Destination Mac: 5067.a87c.fa92
Session Version: 0
Session Operation: Proactive
Session Status: Active
MPID: 4101
Tx active: yes
Rx active: yes
RP monitor Tx active: yes
RP monitor Rx active: yes
Timeout timer: stopped
Last clearing of counters: *00:00:00.000 UTC Mon Jan 1 1900
DMMs:
   Transmitted: 117
DMRs:
   Rcvd: 117
1DMs:
   Transmitted: 0
   Rcvd: 0
LMMs:
   Transmitted: 0
LMRs:
   Rcvd: 0
VSMs:
   Transmitted: 0
VSRs:
   Rcvd: 0
SLMs:
   Transmitted: 0
SLRs:
   Rcvd: 0
Test ID 0
Router1#

Router#show ethernet cfm pm session db 0
------------------------------------------------------------------------------
      TX Time FWD                   RX Time FWD
```

```
      TX Time BWD                    RX Time BWD              Frame Delay
      Sec:nSec                       Sec:nSec                  Sec:nSec
--------------------------------------------------------------------------------
Session ID: 0
********************************************************************************
3591340722:930326034           3591340663:866791722
3591340663:866898528           3591340722:930707484            0:274644
********************************************************************************
3591340723:927640626           3591340664:864091056
3591340664:864182604           3591340723:927976302            0:244128
********************************************************************************
3591340724:927640626           3591340665:864091056
3591340665:864167346           3591340724:927961044            0:244128
********************************************************************************
3591340725:927671142           3591340666:864121572
3591340666:864213120           3591340725:928006818            0:244128
********************************************************************************
3591340726:927655884           3591340667:864106314
3591340667:864197862           3591340726:927991560            0:244128
********************************************************************************
3591340727:927732174           3591340668:864167346
3591340668:864533538           3591340727:928327236            0:228870
********************************************************************************
3591340728:927655884           3591340669:864121572
3591340669:864197862           3591340728:928006818            0:274644
********************************************************************************
3591340729:927671142           3591340670:864121572
3591340670:864197862           3591340729:927991560            0:244128
********************************************************************************
```

Troubleshooting Two-Way Delay Measurement Configuration

Table 4 lists the debug commands to troubleshoot issues pertaining to the two-way delay measurement configuration. The Cisco IOS Master Command List at

http://www.cisco.com/en/US/docs/ios/mcl/allreleasemcl/all_book.html provides more information about these commands.

Caution Because debugging output is assigned high priority in the CPU process, it can diminish the performance of the router or even render it unusable. For this reason, use debug commands only to troubleshoot specific problems or during troubleshooting sessions with Cisco technical support staff.

Note Before you run any of the debug commands listed in the following table, ensure that you run the **logging buffered debugging** command, and then turn off console debug logging using the **no logging console** command.

Table 4 debug Commands for Two-Way Delay Measurement Configuration

debug Command	Purpose
debug epmpal all	Enables debugging of all Ethernet performance monitoring (PM) events.
debug epmpal api	Enables debugging of Ethernet PM API events.

Table 4 debug Commands for Two-Way Delay Measurement Configuration (continued)

debug Command	Purpose
debug epmpal rx	Enables debugging of Ethernet PM packet-receive events.
debug epmpal tx	Enables debugging of Ethernet PM packet-transmit events.