CHAPTER 42

Using Connectivity Fault Management Commands

Ethernet Connectivity Fault Management (CFM) is an end-to-end, per-service-instance 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.

End-to-end can be premises equipment (PE)-to-PE or customer equipment (CE)-to-CE. A service can be a service provider VLAN (S-VLAN) or an Ethernet virtual connection (EVC).

Cisco ANA discovers and represents device configurations for CFM 802.1ag (draft 8.1) and Cisco draft mode, including:

- Maintenance domains
- Maintenance endpoints (up-facing, down-facing)
- Maintenance intermediate points (up-facing, down-facing)
- Continuity check message status

For each CFM domain, Cisco ANA discovers and represents the following CFM domain attributes within the logical inventory:

- Domain name
- Maintenance level (a value from 0 to 7)
- Maintenance associations (802.1ag D8.1)
- VLAN IDs specified for a maintenance association

Cisco ANA discovers and represents CFM maintenance endpoints (MEPs) that are configured under:

- Switch port
- Port channel (that is, link aggregation group [LAG])
- Subinterface
- Service instance or bridge domain

You can navigate from the MEP logical inventory to the interface or port channel on which the MEP is configured.

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

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

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

From the Logical Inventory tree, you can launch the following troubleshooting commands for a MEP:

- CFM ping
- CFM traceroute
- CFM MEP status
- CFM MEP cross-check status

Cisco ANA associates alarms with the corresponding MEP or global CFM logical inventory objects.

Cisco ANA correlates MEP down, MEP missing, ETH-AIS, and ETH-RDI events with root cause alarms and corresponding tickets that exist along the path between the MEP on the reporting network element and the network element hosting the remote MEP.

Supported Network Elements

You can run the CFM commands on the following network elements:

- Cisco 7600 Series Routers
- Cisco ME 3400 Series Ethernet Access Switches
- Cisco Catalyst 3750 Series Switches
- Cisco ASR 9000 Series Aggregation Services Routers
- Cisco Mobile Wireless Router 2941 (Supported only for the Cisco CFM commands.)
- Cisco Catalyst 6500 Series (IOS) Switches

See Part 1—Cisco VNEs for details on the software versions Cisco ANA supports for these network elements. To run the CFM commands, the software on the network element must support the CFM technology.

Configuring CFM Components

The following commands facilitate the configuration of CFM components.

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

Configure CFM Maintenance Domain

Use the **Configure CFM Maintenance Domain** command to configure the CFM domain on a device.

A maintenance domain is a management space for the purpose of managing and administering a network. A domain is owned and operated by a single entity and defined by the set of ports internal to it and at its boundary.

Each maintenance domain can contain any number of maintenance associations. Each maintenance association identifies a service that can be uniquely identified within the maintenance domain. The CFM protocol runs within a particular maintenance association.

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

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

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

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

Step 4 To see the commands that will be applied on the device, click **Preview**.

You can view the commands in the Result tab. You can go back and make any required changes to the input parameters.

Step 5 To run the commands, click **Execute**.

Any errors are displayed in the Result tab.

Step 6 To close the dialog box, click **Close**.

Configure CFM Global Parameters

Use the **Configure CFM Global Parameters** command to enable CFM globally for a network element.

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

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

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

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

Step 4 To see the commands that will be applied on the device, click **Preview**.

You can view the commands in the Result tab. You can go back and make any required changes to the input parameters.

Step 5 To run the commands, click **Execute**.

Any errors are displayed in the Result tab.

Step 6 To close the dialog box, click **Close**.

Configure CFM MIP

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

- Per-maintenance domain (level) for all S-VLANs enabled or allowed on a port.
- Internal to a domain, not at the boundary.
- CFM frames received from MEPs and other MIPs are cataloged and forwarded, using both the wire and the relay function.
- All CFM frames at a lower level are stopped and dropped, independent of whether they originate from the wire or relay function.

- All CFM frames at a higher level are forwarded, independent of whether they arrive from the wire or relay function.
- Passive points respond only when triggered by CFM traceroute and loopback messages.
- Bridge-brain MAC addresses are used.

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

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

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

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

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

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

Step 4 To see the commands that will be applied on the device, click **Preview**.

You can view the commands in the Result tab. You can go back and make any required changes to the input parameters.

Step 5 To run the commands, click **Execute**.

Any errors are displayed in the Result tab.

Step 6 To close the dialog box, click **Close**.

Configure CFM Continuity Check

Use the **Configure CFM Continuity Check** command to configure the per-domain continuity check messages (CCMs).

CFM CCMs have the following characteristics:

- Transmitted at a configurable periodic interval by MEPs. The interval range is from 10 to 65535 seconds; the default is 30.
- Contain a configurable hold-time value to indicate to the receiver the validity of the message.
- Cataloged by MIPs at the same maintenance level.
- Terminated by remote MEPs at the same maintenance level.
- Unidirectional and do not solicit a response.
- Carry the status of the port on which the MEP is configured.

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

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

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

Input Parameter	Description
Maintenance Level	Maintenance level number. The range is from *0* to *7*. Alternatively, you can choose *any* to specify all maintenance levels.
VLANs for Cross-Check	VLAN ID on which to apply the cross check. The VLAN ID range is from 1 to 4094. You can choose: • A single VLAN ID from *1* to *4094* • A range of VLAN IDs separated by a hyphen (-) • A series of VLAN IDs separated by commas (,) • *any* to specify all VLAN IDs
Interval for CC Messages	Interval, in seconds, for continuity check messages. The default value is *30* seconds.
Loss Threshold Level for CC Packets	Loss threshold level for continuity check packets. The default value is *2* seconds.

Step 4 To see the commands that will be applied on the device, click **Preview**.

You can view the commands in the Result tab. You can go back and make any required changes to the input parameters.

Step 5 To run the commands, click **Execute**.

Any errors are displayed in the Result tab.

Step 6 To close the dialog box, click **Close**.

Configure CFM Service ID

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

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

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

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

Input Parameter	Description
Domain Name	Name of the domain.

Input Parameter	Description
Maintenance Level	Maintenance level number. The range is from *0* to *7*.
Service VLAN ID	Service VLAN ID. A customer service instance is an Ethernet virtual connection, which is identified by an S-VLAN within an Ethernet island, and is identified by a globally unique service ID.

Step 4 To see the commands that will be applied on the device, click **Preview**.

You can view the commands in the Result tab. You can go back and make any required changes to the input parameters.

Step 5 To run the commands, click **Execute**.

Any errors are displayed in the Result tab.

Step 6 To close the dialog box, click **Close**.

Configure CFM MEP

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

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

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

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

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

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

Input Parameter	Description
Maintenance End Point Identifier	Maintenance endpoint identifier, which must be unique for each VLAN (service instance). The MEP ID is a CFM identifier used to identify a MEP in CFM communications. It is also used to catalog CFM frames in the local CFM database. The MEP ID is significant throughout the CFM domain and the maintenance association. The range is from *1* to *8191*.
VLANs	VLAN ID on which to apply the maintenance endpoint. The VLAN ID range is from *1* to *4094*. Alternatively, you can choose *any* to specify all VLAN IDs.

Step 4 To see the commands that will be applied on the device, click **Preview**.

You can view the commands in the Result tab. You can go back and make any required changes to the input parameters.

Step 5 To run the commands, click **Execute**.

Any errors are displayed in the Result tab.

Step 6 To close the dialog box, click **Close**.

Enable CFM Continuity Check

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

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

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

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

Input Parameter	Description
Maintenance Level	Maintenance level number. The range is from *0* to *7*. Alternatively, you can choose *any* to specify all maintenance levels.
VLANs for Cross-Check	VLAN ID on which to apply the continuity check. The VLAN ID range is from 1 to 4094. Alternatively, you can choose *any* to specify all VLAN IDs.

Step 4 To see the commands that will be applied on the device, click **Preview**.

You can view the commands in the Result tab. You can go back and make any required changes to the input parameters.

Step 5 To run the commands, click **Execute**.

Any errors are displayed in the Result tab.

Step 6 To close the dialog box, click **Close**.

Enable CFM SNMP Server Traps

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

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

Step 2 Right-click the CFM node and choose **Commands > Enable > Cisco > SNMP Server Traps**. The SNMP Server Traps dialog box opens.

The command enables SNMP server traps and does not require any input parameters.

Step 3 To run the command, click **Execute**.

Any errors are displayed in the Result tab.

Step 4 To close the dialog box, click **Close**.

Diagnose CFM with Show MEP Status

Use the **Diagnose CFM with Show MEP Status** command to show the MEP status of CFM diagnostics.

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

Step 2 Right-click the CFM node and choose **Commands > Diagnose > Cisco > Show MEP Status**. The Show MEP Status dialog box opens.

The command checks the MEP status and does not require any input parameters.

Step 3 To run the command, click **Execute**.

Any errors are displayed in the Result tab.

Step 4 To close the dialog box, click **Close**.

Diagnose CFM with Show MEP Crosscheck Status

Use the **Diagnose CFM with Show MEP Crosscheck Status** command to show the cross-check status of CFM MEP diagnostics.

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

Step 2 Right-click the CFM node and choose **Commands > Diagnose > Cisco > Show MEP Crosscheck Status**. The Show MEP Crosscheck Status dialog box opens.

The command checks the MEP crosscheck status and does not require any input parameters.

Step 3 To run the command, click **Execute**.

Any errors are displayed in the Result tab.

Step 4 To close the dialog box, click **Close**.

Diagnose CFM with Ping Remote MEP with MAC

Use the **Diagnose CFM with Ping Remote MEP with MAC** command to ping the remote maintenance endpoint that supplies the MAC address.

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

Step 2 Right-click the CFM node and choose **Commands > Diagnose > IEEE > Ping Remote MEP with MAC**. The Ping Remote MEP with MAC dialog box opens.

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

Input Parameter	Description
Remote MAC Address	MAC address of the remote interface on which the remote MEP is configured. The MAC address has the format *aaaa.bbbb.cccc*; the default is 0000.0000.0000. CFM frames are distinguishable by EtherType and, for multicast messages, by MAC address.
Domain Name	Domain name for the remote MEP.
VLAN ID	VLAN ID on which to apply the remote MAC address. The VLAN ID range is from *1* to *4094*.

Step 4 To see the commands that will be applied on the device, click **Preview**.

You can view the commands in the Result tab. You can go back and make any required changes to the input parameters.

Step 5 To run the commands, click **Execute**.

Any errors are displayed in the Result tab.

Step 6 To close the dialog box, click **Close**.

Diagnose CFM with Ping Remote MEP with MPID

Use the **Diagnose CFM with Ping Remote MEP with MPID** command to ping the remote maintenance endpoint that supplies the maintenance point ID (MPID).

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

Step 2 Right-click the CFM node and choose **Commands > Diagnose > IEEE > Ping Remote MEP with MPID**. The Ping Remote MEP with MPID dialog box opens.

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

Input Parameter	Description
Remote MPID Address	Address of the remote maintenance point ID.

Input Parameter	Description
Domain Name	Name of the domain.
VLAN ID	VLAN ID on which to apply the remote maintenance point ID. The VLAN ID range is from *1* to *4094*.

Step 4 To see the commands that will be applied on the device, click **Preview**.

You can view the commands in the Result tab. You can go back and make any required changes to the input parameters.

Step 5 To run the commands, click **Execute**.

Any errors are displayed in the Result tab.

Step 6 To close the dialog box, click **Close**.

Diagnose CFM with Ping Remote MEP with Multicast

Use the **Diagnose CFM with Ping Remote MEP with Multicast** command to ping the remote maintenance endpoint that supplies the multicast.

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

Step 2 Right-click the CFM node and choose **Commands > Diagnose > IEEE > Ping Remote MEP with Multicast**. The Ping Remote MEP with Multicast dialog box opens.

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

Input Parameter	Description
Domain Name	Name of the domain.
VLAN ID	VLAN ID on which to apply the remote maintenance endpoint with multicast. The VLAN ID range is from *1* to *4094*.

Step 4 To see the commands that will be applied on the device, click **Preview**.

You can view the commands in the Result tab. You can go back and make any required changes to the input parameters.

Step 5 To run the commands, click **Execute**.

Any errors are displayed in the Result tab.

Step 6 To close the dialog box, click **Close**.

Diagnose CFM with Traceroute Remote MEP with MAC

Use the **Diagnose CFM with Traceroute Remote MEP with MAC** command to traceroute the remote maintenance endpoint that supplies the MAC address.

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

Step 2 Right-click the CFM node and choose **Commands > Diagnose > IEEE > Traceroute Remote MEP with MAC**. The Traceroute Remote MEP with MAC dialog box opens.

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

Input Parameter	Description
Remote MAC Address	Remote MAC address, in the format *aaaa.bbbb.cccc*. The default MAC address is 0000.0000.0000.
Domain Name	Name of the domain.
VLAN ID	VLAN ID on which to apply the remote MAC address. The VLAN ID range is from *1* to *4094*.

Step 4 To see the commands that will be applied on the device, click **Preview**.

You can view the commands in the Result tab. You can go back and make any required changes to the input parameters.

Step 5 To run the commands, click **Execute**.

Any errors are displayed in the Result tab.

Step 6 To close the dialog box, click **Close**.

Diagnose CFM with Traceroute Remote MEP with MPID

Use the **Diagnose CFM with Traceroute Remote MEP with MPID** command to traceroute the remote maintenance endpoint that supplies the maintenance point ID.

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

Step 2 Right-click the CFM node and choose **Commands > Diagnose > IEEE > Traceroute Remote MEP with MPID**. The Traceroute Remote MEP with MPID dialog box opens.

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

Input Parameter	Description
Remote MPID Address	Address of the remote maintenance endpoint identifier.
Domain Name	Name of the domain.
VLAN ID	VLAN ID on which to apply the remote MPID address. The VLAN ID range is from 1 to 4094.

Step 4 To see the commands that will be applied on the device, click **Preview**.

You can view the commands in the Result tab. You can go back and make any required changes to the input parameters.

Step 5 To run the commands, click **Execute**.

Any errors are displayed in the Result tab.

Step 6 To close the dialog box, click **Close**.