

FSOS

CFM Configuration

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## 1. CFM Configuration

### 1.1 CFM Overview

CFM (Connectivity Fault Management Protocol), defined by the IEEE 802.1ag standard, is a VLAN-based side-to-side OAM mechanism on Layer 2 link for fault management of carrier Ethernet.

#### 1.1.2 CFM Concept

CFM Concept

Concept	Description
Maintenance Domain	<p>The maintenance domain indicates the network covered by connectivity fault detection, whose boundaries are defined by a series of maintenance end points configured on the port. The maintenance domain is identified by the name of the maintenance domain. According to the network planning, the maintenance domain can be classified into eight levels.</p> <p>Different maintenance domains can be adjacent to each other or nested, but can not be crossed. Nesting can only be performed from high-level maintenance domain to low-level maintenance domain. That is, a low-level maintenance domain must be included in a high-level maintenance domain.</p>
Maintenance association	<p>You can configure multiple maintenance associations as required in the maintenance domain. Each maintenance association is a collection of maintenance points in the maintenance domain. The maintenance association is identified by the "Maintenance Domain Name + Maintenance Association Name".</p> <p>The maintenance association serves a VLAN. The packets sent by the maintenance point in the maintenance association are tagged with the VLAN. The maintenance point in the maintenance association can receive the packets sent from other maintenance points in the maintenance association.</p>
Maintenance point	<p>The maintenance point is configured on a port and belongs to a maintenance association. It can be classified into two types: maintenance end points and maintenance intermediate points.</p> <p>A maintenance end point is identified by a MEP ID, which determines the scope and boundaries of the maintenance domain. The maintenance end points are directional, and are classified into UP MEP and DOWN MEP. The direction of the maintenance end point indicates the location of the maintenance domain relative to the port. The DOWN MEP sends a packet to the port on which it resides. Instead of sending a packet to its port, the UP MEP sends a packet to the other port of the device.</p> <p>The maintenance intermediate point is located inside the maintenance domain, It can not actively send CFM protocol packets but can process and respond to CFM</p>

protocol packets.
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### 1.1.2 CFM Main Functions

The effective application of connectivity fault detection is based on reasonable network deployment and configuration. Its function is implemented between the configured maintenance points. The main functions are as follows:

CFM Main Functions

Function	Description
Continuity detection	It is an active OAM function used to detect the connectivity between maintenance end points. Failure to connect may be caused by a device failure or a configuration error.
Loopback function	It is an on-demand OAM function used to verify the connection status between the local device and the remote device.
Link tracing function	It is an on-demand OAM function that determines the path between the local device and the remote device to locate the link fault.

### 1.1.3 Configure CFM

Before configuring the CFM function, make the following planning for the network:

- a. The maintenance domain of the entire network is classified to determine the boundaries of the maintenance domains at each level.
- b. Identify the names of the various maintenance domains. The names of the same maintenance domain are the same on different devices.
- c. Determine the maintenance association in each maintenance domain according to the VLAN to be monitored.
- d. Determine the name of each maintenance association. The same maintenance association in the same maintenance domain has the same name on different devices.
- e. Determine the list of maintenance end points for the same maintenance association in the same maintenance domain, which should be the same on different devices.
- f. The maintenance end points can be planned on the boundary ports of the maintenance domain and the maintenance association. The maintenance intermediate points can be planned on the non-border devices or ports.

After you have completed the network planning, perform the following configuration.

## 1.2 CFM Configuration

### 1.2.1 Configure the MD(Maintenance Domain)

#### Configure the MD

Operation	Command	Remarks
Enter the global configuration mode	<b>configure terminal</b>	
Create a maintenance domain and enter maintenance domain configuration mode	<b>cfm md</b> <i>md-index</i>	required

### 1.2.2 Configure the Maintenance Domain Name and Level

In order to distinguish the various maintenance domains, you can specify different domain names for each maintenance domain. The domain name consists of two parts: name format and name content. The domain name is preferred to be unique throughout the network. To indicate nested relationships among maintenance domains, you must also specify maintenance domain level. Only a maintenance domain with a high level can nest a maintenance domain with a small level.

#### Configure the Maintenance Domain Name and Level

Operation	Command	Remarks
Enter the global configuration mode	<b>configure terminal</b>	
Enter the maintenance domain configuration mode	<b>cfm md</b> <i>md-index</i>	When a domain does not exist, the domain is created;
Delete the MD	<b>no cfm md</b> <i>md-index</i>	
Configure a maintenance domain with no name and specify only the level of the maintenance domain	<b>cfm md format none level</b> <i>md-level</i>	The two must be one
Configure the name of the maintenance domain, and specify the name and level of the maintenance domain	<b>cfm md format { dns-name   mac-uint   string } name</b> <i>md-name level</i> <i>md-level</i>	

### 1.2.3 Configure the Maintenance Association

#### Configure the Maintenance Association

Operation	Command	Remarks
Enter the global configuration mode	<b>configure terminal</b>	-
Enter the maintenance domain configuration mode	<b>cfm md</b> <i>md-index</i>	-
Create a maintenance association and enter the maintenance association configuration mode	<b>cfm ma</b> <i>ma-index</i>	required
Delete the maintenance association configuration	<b>no cfm ma</b> <i>ma-index</i>	-

## 1.2.4 Configure the Maintenance Association Name and Associated

### VLAN

In order to distinguish the maintenance association in each maintenance domain, you can specify different instance names for each maintenance association. The instance name consists of two parts: name format and name content. The domain name and the instance name of the maintenance domain where the maintenance association is located must be unique to the entire network.

#### Configure the Maintenance Association Name and Associated VLAN

Operation	Command	Remarks
Enter the global configuration mode	<b>configure terminal</b>	-
Enter the maintenance domain configuration mode	<b>cfm md</b> <i>md-index</i>	-
Enter the maintenance association configuration mode	<b>cfm ma</b> <i>ma-index</i>	-
Configure the name of the MA and the primary VLAN	<b>cfm ma format</b> { <i>primary-vid</i>   <i>string</i>   <i>uint16</i>   <i>vpn-id</i> } <b>name</b> <i>ma-name</i> <b>primary-vlan</b> <i>vlan-id</i>	required

## 1.2.5 Configure the MEP (Maintenance End Points)

The CFM function is mainly used for various operations on the maintenance end points. You can configure the maintenance end points on the network edge ports according to the network planning.

#### Configure the MEP

Operation	Command	Remarks
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Enter the global configuration mode	<b>configure terminal</b>	-
Enter the maintenance domain configuration mode	<b>cfm md</b> <i>md-index</i>	-
Enter the maintenance association configuration mode	<b>cfm ma</b> <i>ma-index</i>	-
Create a MEP and specify its associated port	<b>cfm mep</b> <i>mep-id</i> <b>direction</b> { up   down } [ <b>primary-vlan</b> <i>vlan-id</i> ] <b>interface ethernet</b> <i>port-id</i>	required
Enable the MEP management state	<b>cfm mep</b> <i>mep-id</i> <b>state</b> enable	Required. By default, it is off
Close the management state of the MEP	<b>cfm mep</b> <i>mep-id</i> <b>state</b> disable	-
Configure the priority that the MEP sends to CCM and LTM	<b>cfm mep</b> <i>mep-id</i> <b>priority</b> <i>priority-id</i>	Optional By default, the priority is 0

### 1.2.6 Configure the Remote MEP

The remote MEP is relative to the local MEP. In the entire maintenance association, all MEPs other than the MEPs of the local should be configured as remote MEPs on the local.

#### Configure the Remote MEP

Operation	Command	Remarks
Enter the global configuration mode	<b>configure terminal</b>	-
Enter the maintenance domain configuration mode	<b>cfm md</b> <i>md-index</i>	-
Enter the maintenance association configuration mode	<b>cfm ma</b> <i>ma-index</i>	-
Create the remote MEP and specify the relative local MEP	<b>cfm rmep</b> <i>rmep-id</i> <b>mep</b> <i>mep-id</i>	required

### 1.2.7 Configure the MIP

The MIPs are used to respond to various CFM test packets. You can configure the MIPs on non-border devices or ports based on network planning.

#### Configure the MIP

Operation	Command	Remarks
Enter the global configuration mode	<b>configure terminal</b>	-
Enter the maintenance domain configuration mode	<b>cfm md</b> <i>md-index</i>	-
Enter the maintenance association configuration mode	<b>cfm ma</b> <i>ma-index</i>	-
Create a maintenance intermediate point and specify its associated port	<b>cfm mip</b> <i>mip-id</i> <b>interface ethernet</b> <i>port-id</i>	optional

### 1.2.8 Configure the Continuity Check Function

By configuring the continuity check function, you can enable the MEPs to send CCM packets between them to detect the connectivity between these MEPs, and thus to manage the link connectivity.

Configure the Continuity Check Function

Operation	Command	Remarks
Enter the global configuration mode	<b>configure terminal</b>	-
Enter the maintenance domain configuration mode	<b>cfm md</b> <i>md-index</i>	-
Enter the maintenance association configuration mode	<b>cfm ma</b> <i>ma-index</i>	-
Configure the interval at which CCMs are sent by the MEP	<b>cfm cc interval</b> { 1   10   60   600 }	Optional. The default is 1s.
Enable the ccm sending function on the MEP	<b>cfm mep</b> <i>mep-id</i> <b>cc enable</b>	Required. By default, it is off
Cancel the ccm sending function of the MEP	<b>cfm mep</b> <i>mep-id</i> <b>cc disable</b>	Optional

Note:

The time interval for sending CCMs must be the same on the maintenance end points in the same maintenance domain and the maintenance association on different devices.

### 1.2.9 Configure the Loopback Function

By configuring the loopback function, you can check the link status between the source

and destination MEPs or the MIPs to verify link connectivity.

#### Configure the Loopback Function

Operation	Command	Remarks
Enter the global configuration mode	<b>configure terminal</b>	-
Enter the maintenance domain configuration mode	<b>cfm md</b> <i>md-index</i>	-
Enter the maintenance association configuration mode	<b>cfm ma</b> <i>ma-index</i>	-
Enable the loopback function	<b>cfm loopback mep</b> <i>mep-id</i> { <b>dst-mac</b> <i>mac-address</i>   <b>dst-mep</b> <i>rmep-id</i> } [ <b>priority</b> <i>pri-id</i>   <b>count</b> <i>pkt-num</i>   <b>length</b> <i>data-len</i>   <b>data</b> <i>pkt-data</i> ]	optional

### 1.2.10 Configure the Link Tracking Function

By configuring the link tracking function, you can locate the path between the source and destination MEPs or the MIPs, and locate the link faults.

#### Configure the Link Tracking Function

Operation	Command	Remarks
Enter the global configuration mode	<b>configure terminal</b>	-
Enter the maintenance domain configuration mode	<b>cfm md</b> <i>md-index</i>	-
Enter the maintenance association configuration mode	<b>cfm ma</b> <i>ma-index</i>	-
Enable link tracking	<b>cfm linktrace mep</b> <i>mep-id</i> { <b>dst-mac</b> <i>mac-address</i>   <b>dst-mep</b> <i>rmep-id</i> } [ <b>timeout</b> <i>pkt-time</i>   <b>ttl</b> <i>pkt-ttl</i>   <b>flag</b> { <i>use-mpdb</i>   <i>unuse-mpdb</i> } ]	optional

### 1.2.11 Y.1731 Frame Loss Rate Detection Function

#### Y.1731 Frame Loss Rate Detection Function

Operation	Command	Remarks
Enter the global configuration mode	<b>configure terminal</b>	-
Enter the maintenance domain configuration mode	<b>cfm md</b> <i>md-index</i>	-
Enter the maintenance association configuration mode	<b>cfm ma</b> <i>ma-index</i>	-

Perform the frame loss rate detection function	<b>cfm eth-slm mep</b> <i>mep-id</i> { <b>dst-mac</b> <i>mac-address</i>   <b>dst-mep</b> <i>rmep-id</i> } [ <b>timeout</b> <i>pkt-time</i>   <b>priority</b> <i>priority-identifier</i>   <b>interval</b> <i>second</i> / <b>count</b> <i>packet-num</i> ]	optional
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### 1.2.12 Y.1731 Frame Delay Measurement Function

Y.1731 Frame Delay Measurement Function

Operation	Command	Remarks
Enter the global configuration mode	<b>configure terminal</b>	-
Enter the maintenance domain configuration mode	<b>cfm md</b> <i>md-index</i>	-
Enter the maintenance association configuration mode	<b>cfm ma</b> <i>ma-index</i>	-
Perform frame delay measurement	<b>cfm eth-2dm mep</b> <i>mep-id</i> { <b>dst-mac</b> <i>mac-address</i>   <b>dst-mep</b> <i>rmep-id</i> } [ <b>timeout</b> <i>pkt-time</i>   <b>priority</b> <i>priority-identifier</i>   <b>interval</b> <i>second</i> / <b>count</b> <i>packet-num</i> ]	optional

### 1.2.13 CFM Display and Maintenance

After completing the above configuration, you can use the following command to display the CFM configuration.

CFM Display and Maintenance

Operation	Command	Remarks
Clear the CCM statistics	<b>clear cfm cc</b>	Enter global configuration mode
Clear the CCM database information	<b>clear cfm cc database</b>	
Display the maintenance domain information	<b>show cfm md</b> [ <i>md-index</i> ]	Any mode can be viewed
Display the maintenance association information	<b>show cfm ma</b>	
Display the local maintenance points information	<b>show cfm mp local</b>	
Display the remote maintenance point information	<b>show cfm mp remote</b>	
Display CCM statistics	<b>show cfm cc</b>	
Display CCM database	<b>show cfm cc database</b>	

information		
Display CFM alarm information	<b>show cfm errors</b>	

### 1.3 Configuration Examples

```
Switch(config)#cfm md 1 // Create a maintenance domain
```

```
Switch (config-cfm-md-1)#cfm md format none level 1 // Enter the maintenance domain configuration mode, configure a maintenance domain with no name and the maintenance domain level is 1.
```

```
Switch (config)#cfm md 1 // Enter the maintenance domain configuration mode
```

```
Switch (config-cfm-md-1)#cfm ma 1 // Enter the maintenance association configuration mode and set the name of the maintenance association to 1
```

```
Switch (config-cfm-md-1-ma-1)#cfm ma format primary-vid name 1 primary-vlan 2
```

```

// The associated VLAN is
VLAN 2
```

```
Switch (config-cfm-md-1-ma-1)#cfm mep 1 direction up primary-vlan 2 interface
```

```
ethernet 0/0/2 // Create MEP 1 and specify the associated port as VLAN 2
```

```
Switch (config-cfm-md-1-ma-1)#cfm mep 1 state enable
```

```
Switch (config-cfm-md-1-ma-1)#cfm mep 1 priority 1 // Set the priority of sending CCMs and LTM to 1 by the MEP
```