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Introduction

This document provides CFD configuration examples.

CFD is used for link connectivity detection, fault verification, and fault location in Layer 2 networks.

Prerequisites

The configuration examples in this document were created and verified in a lab environment, and all the devices were started with the factory default configuration. When you are working on a live network, make sure you understand the potential impact of every command on your network.

This document assumes that you have basic knowledge of CFD.

Example: Configuring CFD

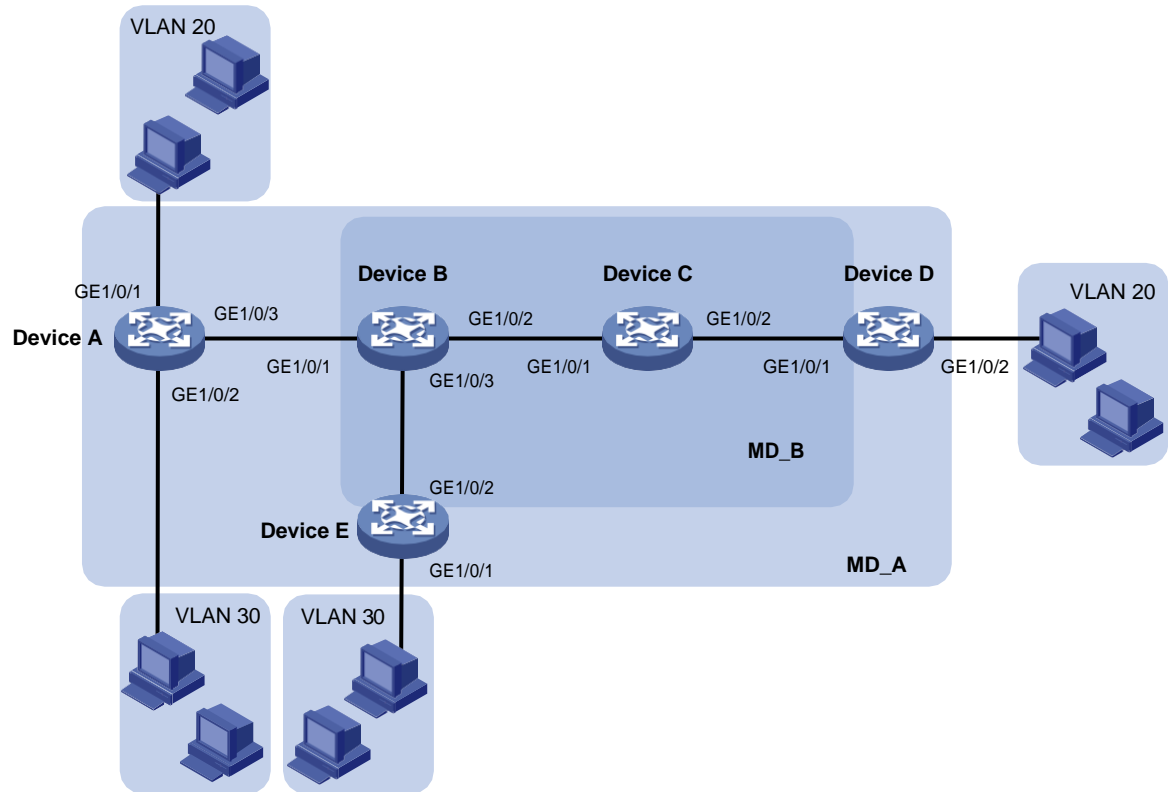
Network configuration

As shown in [Figure 1](#), Device B and Device C reside in the central equipment room of a company. Device A, Device D, and Device E reside in other areas.

- Research and development department users in VLAN 20 access the enterprise network through Device A and Device D.
- Marketing department users in VLAN 30 access the enterprise network through Device A and Device E.

Configure CFD to verify and locate link faults.

Figure 1 Network diagram



Analysis

To accurately locate link faults, assign the enterprise network to MD_A (level 5) and the central equipment room network to MD_B (level 3). MD_A nests MD_B.

To effectively implement CFD, assign MAs based on the VLANs of service traffic:

- Assign VLAN 20 in MD_A to MA_A_1.
- Assign VLAN 30 in MD_A to MA_A_2.
- Assign VLAN 20 in MD_B to MA_B_1.
- Assign VLAN 30 in MD_B to MA_A_2.

To verify link connectivity, configure MEPs on the interfaces located at the boundary of MAs, for example, MA_B_1:

- Configure MEPs on interface GE1/0/1 of Device B and Device D to allow CFD packets from VLAN 20 to pass through the following interfaces:
 - GE1/0/1 and GE1/0/2 of Device B.
 - GE1/0/1 and GE1/0/2 of Device C.
 - GE1/0/1 of Device D.
- Configure GE1/0/1 of Device B as an inward-facing MEP because CFD packets are forwarded through other interfaces on the device.
- Configure GE1/0/1 of Device D as an outward-facing MEP because CFD packets are forwarded through the interface.

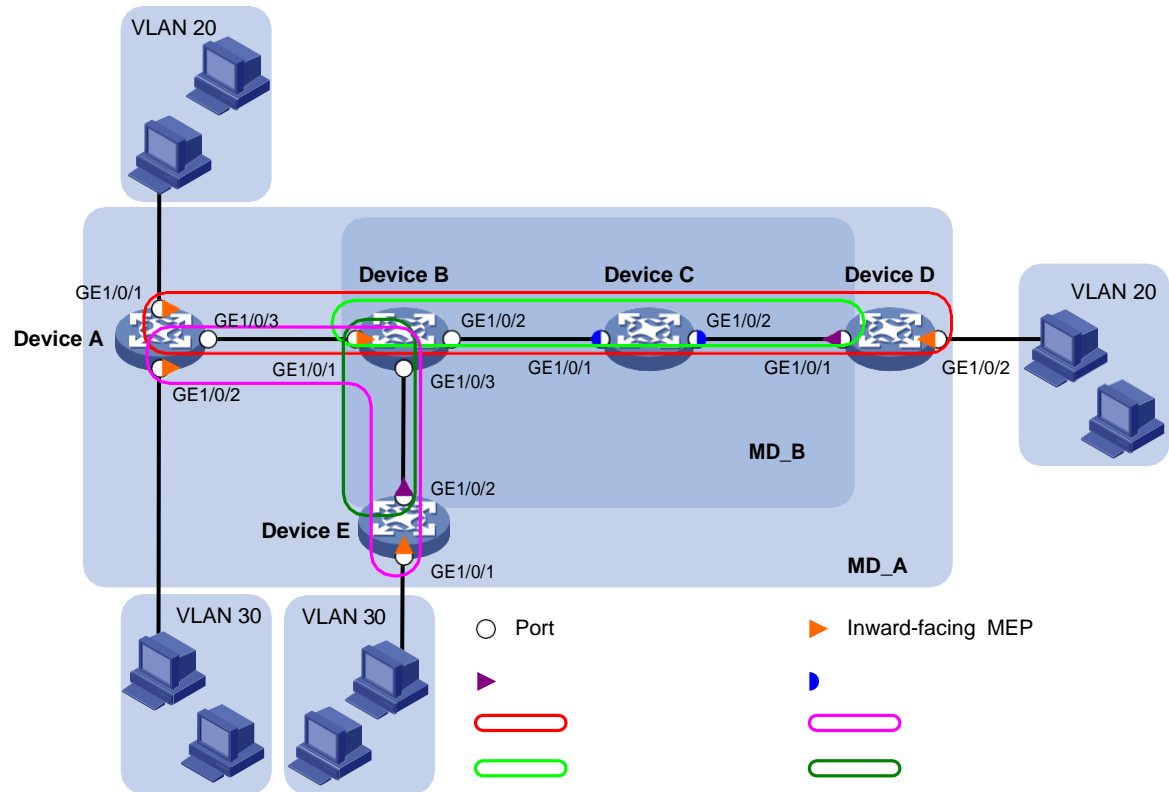
To accurately locate link faults between Device B and Device D, configure the default MIP generation rule on Device C.

To detect connectivity among MEPs, configure CC on the MEPs.

To verify link faults detected through CC, use LB. To trace faulty paths or locate link faults, use LT after the status information of the entire network is obtained.

Figure 2 shows a CFD configuration diagram based on the previous analysis.

Figure 2 CFD configuration diagram



Outward-facing MEP

MIP with default rule

MA_A_1

MA_A_2

MA_B_1

MA_B_2

Applicable hardware and software versions

The following matrix shows the hardware and software versions to which this configuration example is applicable:

Hardware	Software version
SC 3570 switch series	Release 11xx
SC 5525 switch series	Release 63xx, Release 65xx, Release 6615Pxx, Release 6628Pxx
SC 5520 switch series	Release 63xx, Release 65xx, Release 6615Pxx, Release 6628Pxx
SC 3170 switch series	Release 11xx
SC 3130 switch series	Release 63xx

Restrictions and guidelines

When you configure CFD, follow these restrictions and guidelines:

- You cannot create a MEP if the MEP ID is not included in the MEP list of the service instance.
- You can configure multiple MAs in an MD as needed. An MA serves only one VLAN.
- Configure the same CCM interval field value for all MEPs in the same MA. In this example, the MEPs use the default CCM interval field value.

Procedures

Enabling CFD

Enable CFD on Device A.

```
<DeviceA> system-view
```

```
[DeviceA] cfd enable
```

Enable CFD on Device B through Device E. (Details not shown.)

Creating VLANs and assigning interfaces to the VLANs

1. Configure Device A:

```
[DeviceA] vlan 20
```

```
[DeviceA-vlan20] quit
```

```
[DeviceA] vlan 30
```

```
[DeviceA-vlan30] quit
```

```
[DeviceA] interface gigabitethernet 1/0/1
[DeviceA-GigabitEthernet1/0/1] port access vlan 20
[DeviceA-GigabitEthernet1/0/1] quit
[DeviceA] interface gigabitethernet 1/0/2
[DeviceA-GigabitEthernet1/0/2] port access vlan 30
[DeviceA-GigabitEthernet1/0/2] quit
[DeviceA] interface gigabitethernet 1/0/3
[DeviceA-GigabitEthernet1/0/3] port link-type trunk
[DeviceA-GigabitEthernet1/0/3] port trunk permit vlan 20 30
[DeviceA-GigabitEthernet1/0/3] quit
```

2. Configure Device B:

```
[DeviceB] vlan 20
[DeviceB-vlan20] quit
[DeviceB] vlan 30
[DeviceB-vlan30] quit
[DeviceB] interface gigabitethernet 1/0/1
[DeviceB-GigabitEthernet1/0/1] port link-type trunk
[DeviceB-GigabitEthernet1/0/1] port trunk permit vlan 20 30
[DeviceB-GigabitEthernet1/0/1] quit
[DeviceB] interface gigabitethernet 1/0/2
[DeviceB-GigabitEthernet1/0/2] port link-type trunk
[DeviceB-GigabitEthernet1/0/2] port trunk permit vlan 20
[DeviceB-GigabitEthernet1/0/2] quit
[DeviceB] interface gigabitethernet 1/0/3
[DeviceB-GigabitEthernet1/0/3] port link-type trunk
[DeviceB-GigabitEthernet1/0/3] port trunk permit vlan 30
[DeviceB-GigabitEthernet1/0/3] quit
```

3. Configure Device C:

```
[DeviceC] vlan 20
[DeviceC-vlan20] quit
[DeviceC] interface gigabitethernet 1/0/1
[DeviceC-GigabitEthernet1/0/1] port link-type trunk
[DeviceC-GigabitEthernet1/0/1] port trunk permit vlan 20
[DeviceC-GigabitEthernet1/0/1] quit
[DeviceC] interface gigabitethernet 1/0/2
[DeviceC-GigabitEthernet1/0/2] port link-type trunk
[DeviceC-GigabitEthernet1/0/2] port trunk permit vlan 20
[DeviceC-GigabitEthernet1/0/2] quit
```

4. Configure Device D:

```
[DeviceD] vlan 20
[DeviceD-vlan20] quit
[DeviceD] interface gigabitethernet 1/0/1
[DeviceD-GigabitEthernet1/0/1] port link-type trunk
[DeviceD-GigabitEthernet1/0/1] port trunk permit vlan 20
[DeviceD-GigabitEthernet1/0/1] quit
[DeviceD] interface gigabitethernet 1/0/2
[DeviceD-GigabitEthernet1/0/2] port access vlan 20
[DeviceD-GigabitEthernet1/0/2] quit
```

5. Configure Device E:

```
[DeviceE] vlan 30
[DeviceE-vlan30] quit
[DeviceE] interface gigabitethernet 1/0/1
[DeviceE-GigabitEthernet1/0/1] port access vlan 30
[DeviceE-GigabitEthernet1/0/1] quit
[DeviceE] interface gigabitethernet 1/0/2
[DeviceE-GigabitEthernet1/0/2] port link-type trunk
[DeviceE-GigabitEthernet1/0/2] port trunk permit vlan 30
[DeviceE-GigabitEthernet1/0/2] quit
```

Configuring service instances

Based on the MAs to which the MEPs belong, perform the configurations as described in the following table:

Device	MD	MD level	MA	VLAN	Service instance
Device A	MD_A	5	MA_A_1	20	1
			MA_A_2	30	2
Device B	MD_B	3	MA_B_1	20	3
			MA_B_2	30	4
Device C	MD_B	3	MA_B_1	20	3
Device D	MD_A	5	MA_A_1	20	1
	MD_B	3	MA_B_1	20	3
Device E	MD_A	5	MA_A_2	30	2
	MD_B	3	MA_B_2	30	4

1. Configure Device A:

Create MD_A (level 5).

```
[DeviceA] cfd md MD_A level 5
```

Create service instance 1, in which the MA named **MA_A_1** serves VLAN 20.

```
[DeviceA] cfd service-instance 1 ma-id string MA_A_1 md MD_A vlan 20
```

Create service instance 2, in which the MA named **MA_A_2** serves VLAN 30.

```
[DeviceA] cfd service-instance 2 ma-id string MA_A_2 md MD_A vlan 30
```

Configure Device B through Device E in the same way Device A is configured.

2. Configure Device B:

```
[DeviceB] cfd md MD_B level 3
```

```
[DeviceB] cfd service-instance 3 ma-id string MA_B_1 md MD_B vlan 20
```

```
[DeviceB] cfd service-instance 4 ma-id string MA_B_2 md MD_B vlan 30
```

3. Configure Device C:

```
[DeviceC] cfd md MD_B level 3
```

```
[DeviceC] cfd service-instance 3 ma-id string MA_B_1 md MD_B vlan 20
```

4. Configure Device D:

```
[DeviceD] cfd md MD_A level 5
```

```
[DeviceD] cfd service-instance 1 ma-id string MA_A_1 md MD_A vlan 20
```

```
[DeviceD] cfd md MD_B level 3
```

```
[DeviceD] cfd service-instance 3 ma-id string MA_B_1 md MD_B vlan 20
```

5. Configure Device E:

```
[DeviceE] cfd md MD_A level 5
```

```
[DeviceE] cfd service-instance 2 ma-id string MA_A_2 md MD_A vlan 30
```

```
[DeviceE] cfd md MD_B level 3
```

```
[DeviceE] cfd service-instance 4 ma-id string MA_B_2 md MD_B vlan 30
```

Configuring MEPs

Assign MEP IDs as described in the following table:

Service instance	Device	Interface	MEP ID	MEP type
1	Device A	GigabitEthernet 1/0/1	1001	Inward-facing MEP
	Device D	GigabitEthernet 1/0/2	1002	Inward-facing MEP
2	Device A	GigabitEthernet 1/0/2	2001	Inward-facing MEP
	Device E	GigabitEthernet 1/0/1	2002	Inward-facing MEP
3	Device B	GigabitEthernet 1/0/1	3001	Inward-facing MEP
	Device D	GigabitEthernet 1/0/1	3002	Outward-facing MEP
4	Device B	GigabitEthernet 1/0/1	4001	Inward-facing MEP
	Device E	GigabitEthernet 1/0/2	4002	Outward-facing MEP

1. Configure Device A:

Configure a MEP list in service instances 1 and 2.

```
[DeviceA] cfd meplist 1001 1002 service-instance 1
```

```
[DeviceA] cfd meplist 2001 2002 service-instance 2
```

Create inward-facing MEP 1001 in service instance 1 on GigabitEthernet 1/0/1.

```
[DeviceA] interface gigabitethernet 1/0/1
```

```
[DeviceA-GigabitEthernet1/0/1] cfd mep 1001 service-instance 1 inbound
```

```
[DeviceA-GigabitEthernet1/0/1] quit
```

Create inward-facing MEP 2001 in service instance 2 on GigabitEthernet 1/0/2.

```
[DeviceA] interface gigabitethernet 1/0/2
```

```
[DeviceA-GigabitEthernet1/0/2] cfd mep 2001 service-instance 2 inbound
```

```
[DeviceA-GigabitEthernet1/0/2] quit
```

Configure Device B, Device D, and Device E in the same way Device A is configured.

2. Configure Device B:

```
[DeviceB] cfd meplist 3001 3002 service-instance 3
```

```
[DeviceB] cfd meplist 4001 4002 service-instance 4
```

```
[DeviceB] interface gigabitethernet 1/0/1
```

```
[DeviceB-GigabitEthernet1/0/1] cfd mep 3001 service-instance 3 inbound
```

```
[DeviceB-GigabitEthernet1/0/1] cfd mep 4001 service-instance 4 inbound
```

```
[DeviceB-GigabitEthernet1/0/1] quit
```

3. Configure Device D:

```
[DeviceD] cfd meplist 1001 1002 service-instance 1
```

```
[DeviceD] cfd meplist 3001 3002 service-instance 3
```

```
[DeviceD] interface gigabitethernet 1/0/2
```

```
[DeviceD-GigabitEthernet1/0/2] cfd mep 1002 service-instance 1 inbound
```



```
[DeviceD-GigabitEthernet1/0/2] quit
[DeviceD] interface gigabitethernet 1/0/1
[DeviceD-GigabitEthernet1/0/1] cfd mep 3002 service-instance 3 outbound
[DeviceD-GigabitEthernet1/0/1] quit
```

4. Configure Device E:

```
[DeviceE] cfd meplist 2001 2002 service-instance 2
[DeviceE] cfd meplist 4001 4002 service-instance 4
[DeviceE] interface gigabitethernet 1/0/1
[DeviceE-GigabitEthernet1/0/1] cfd mep 2002 service-instance 2 inbound
[DeviceE-GigabitEthernet1/0/1] quit
[DeviceE] interface gigabitethernet 1/0/2
[DeviceE-GigabitEthernet1/0/2] cfd mep 4002 service-instance 4 outbound
[DeviceE-GigabitEthernet1/0/2] quit
```

Configuring a MIP generation rule

Configure the MIP generation rule in service instance 3 on Device C as default.

```
[DeviceC] cfd mip-rule default service-instance 3
```

Configuring CC on MEPS

1. Configure Device A:

Enable the sending of CCM frames for MEP 1001 in service instance 1 on GigabitEthernet 1/0/1.

```
[DeviceA] interface gigabitethernet 1/0/1
[DeviceA-GigabitEthernet1/0/1] cfd cc service-instance 1 mep 1001 enable
[DeviceA-GigabitEthernet1/0/1] quit
```

Enable the sending of CCM frames for MEP 2001 in service instance 2 on GigabitEthernet 1/0/2.

```
[DeviceA] interface gigabitethernet 1/0/2
[DeviceA-GigabitEthernet1/0/2] cfd cc service-instance 2 mep 2001 enable
[DeviceA-GigabitEthernet1/0/2] quit
```

Configure Device B, Device D, and Device E in the same way Device A is configured.

2. Configure Device B:

```
[DeviceB] interface gigabitethernet 1/0/1
[DeviceB-GigabitEthernet1/0/1] cfd cc service-instance 3 mep 3001 enable
[DeviceB-GigabitEthernet1/0/1] cfd cc service-instance 4 mep 4001 enable
[DeviceB-GigabitEthernet1/0/1] quit
```

3. Configure Device D:

```
[DeviceD] interface gigabitethernet 1/0/1
[DeviceD-GigabitEthernet1/0/1] cfd cc service-instance 3 mep 3002 enable
[DeviceD-GigabitEthernet1/0/1] quit
[DeviceD] interface gigabitethernet 1/0/2
[DeviceD-GigabitEthernet1/0/2] cfd cc service-instance 1 mep 1002 enable
[DeviceD-GigabitEthernet1/0/2] quit
```

4. Configure Device E:

```
[DeviceE] interface gigabitethernet 1/0/1
[DeviceE-GigabitEthernet1/0/1] cfd cc service-instance 2 mep 2002 enable
[DeviceE-GigabitEthernet1/0/1] quit
[DeviceE] interface gigabitethernet 1/0/2
[DeviceE-GigabitEthernet1/0/2] cfd cc service-instance 4 mep 4002 enable
```

```
[DeviceE-GigabitEthernet1/0/2] quit
```

Verifying the configuration

In this example, the MAC addresses of Device A through Device E are 0010-FC01-6511, 0010-FC02-6512, 0010-FC03-6513, 0010-FC04-6514, and 0010-FC05-6515, respectively.

1. Verify the configuration when the network is operating correctly:

Display information about remote MEP 1001 in service instance 1 on Device A.

```
[DeviceA] display cfd remote-mep service-instance 1 mep 1001
```

MEP ID	MAC address	State	Time	MAC status
1002	0010-fc04-6514	OK	2019/07/26 12:54:52	UP

The output shows that the remote MEP is operating correctly.

Enable LB on Device A to verify the status of the link between MEP 1001 and MEP 1002 in service instance 1.

```
[DeviceA] cfd loopback service-instance 1 mep 1001 target-mep 1002
```

Loopback to MEP 1002 with the sequence number start from 1001-43404:

Reply from 0010-fc04-6514: sequence number=1001-43404 Time=5ms

Reply from 0010-fc04-6514: sequence number=1001-43405 Time=5ms

Reply from 0010-fc04-6514: sequence number=1001-43406 Time=5ms

Reply from 0010-fc04-6514: sequence number=1001-43407 Time=5ms

Reply from 0010-fc04-6514: sequence number=1001-43408 Time=5ms

Sent: 5	Received: 5	Lost: 0
---------	-------------	---------

The output shows that no link fault occurs on the link between MEP 1001 and MEP 1002 in service instance 1.

2. Verify the configuration when a link fault occurs:

Display information about remote MEP 1001 in service instance 1 on Device A.

```
[DeviceA] display cfd remote-mep service-instance 1 mep 1001
```

MEP ID	MAC address	State	Time	MAC status
1002	0010-fc04-6514	FAILED	2019/07/26 13:01:52	DOWN

The output shows that the remote MEP is operating incorrectly.

Enable LB on Device A to verify the status of the link between MEP 1001 and MEP 1002 in service instance 1.

```
[DeviceA] cfd loopback service-instance 1 mep 1001 target-mep 1002
```

Loopback to MEP 1002 with the sequence number start from 1001-43904:

Sent: 5	Received: 0	Lost: 5
---------	-------------	---------

The output shows that a link fault occurs on the link between MEP 1001 and MEP 1002 in service instance 1.

Identify the path between MEP 3001 and MEP 3002 in service instance 3 on Device B.

```
[DeviceB] cfd linktrace service-instance 3 mep 3001 target-mep 3002
```

Linktrace to MEP 3002 with the sequence number 3001-43862:

MAC Address	TTL	Last Mac	Relay Action
0010-fc03-6513	63	0010-fc02-6512	MPDB

The output shows that MEP 3001 receives only the LTR messages from the MIP. No LTR messages are sent from MEP 3002 (GigabitEthernet 1/0/1 on Device D). The link between Device C and Device D fails, and you do not need to troubleshoot the network outside MD_B.

Configuration files

NOTE:

Support for the **port link-mode bridge** command depends on the device model.

- **Device A:**

```
#
 cfd enable
 cfd md MD_A index 1 level 5
 cfd service-instance 1 ma-id string MA_A_1 ma-index 1 md MD_A vlan 20
 cfd meplist 1001 to 1002 service-instance 1
 cfd service-instance 2 ma-id string MA_A_2 ma-index 1 md MD_A vlan 30
 cfd meplist 2001 to 2002 service-instance 2
#
vlan 20
#
vlan 30
#
interface GigabitEthernet1/0/1
 port link-mode bridge
 port access vlan 20
 cfd mep 1001 service-instance 1 inbound
 cfd cc service-instance 1 mep 1001 enable
#
interface GigabitEthernet1/0/2
 port link-mode bridge
 port access vlan 30
 cfd mep 2001 service-instance 2 inbound
 cfd cc service-instance 2 mep 2001 enable
#
interface GigabitEthernet1/0/3
 port link-mode bridge
 port link-type trunk
 port trunk permit vlan 20 30
```

- **Device B:**

```
#
 cfd enable
 cfd md MD_B index 1 level 3
 cfd service-instance 3 ma-id string MA_B_1 ma-index 1 md MD_B vlan 20
 cfd meplist 3001 to 3002 service-instance 3
 cfd service-instance 4 ma-id string MA_B_2 ma-index 2 md MD_B vlan 30
 cfd meplist 4001 to 4002 service-instance 4
#
vlan 20
#
vlan 30
#
```

```

interface GigabitEthernet1/0/1
port link-mode bridge
port link-type trunk
port trunk permit vlan 20 30
cfd mep 3001 service-instance 3 inbound
cfd cc service-instance 3 mep 3001 enable
cfd mep 4001 service-instance 4 inbound
cfd cc service-instance 4 mep 4001 enable
#
interface GigabitEthernet1/0/2
port link-mode bridge
port link-type trunk
port trunk permit vlan 20
#
interface GigabitEthernet1/0/3
port link-mode bridge
port link-type trunk
port trunk permit vlan 30

```

- **Device C:**

```

#
cfd enable
cfd md MD_B index 1 level 3
cfd service-instance 3 ma-id string MA_B_1 ma-index 1 md MD_B vlan 20
cfd mip-rule default service-instance 3
#
vlan 20
#
interface GigabitEthernet1/0/1
port link-mode bridge
port link-type trunk
port trunk permit vlan 20
#
interface GigabitEthernet1/0/2
port link-mode bridge
port link-type trunk
port trunk permit vlan 20

```

- **Device D:**

```

#
cfd enable
cfd md MD_A index 1 level 5
cfd md MD_B index 2 level 3
cfd service-instance 1 ma-id string MA_A_1 ma-index 1 md MD_A vlan 20
cfd meplist 1001 to 1002 service-instance 1
cfd service-instance 3 ma-id string MA_B_1 ma-index 1 md MD_B vlan 20
cfd meplist 3001 to 3002 service-instance 3
#
vlan 20
#

```

```

interface GigabitEthernet1/0/1
port link-mode bridge
port link-type trunk
port trunk permit vlan 20
cfd mep 3002 service-instance 3 outbound
cfd cc service-instance 3 mep 3002 enable
#
interface GigabitEthernet1/0/2
port link-mode bridge
port access vlan 20
cfd mep 1002 service-instance 1 inbound
cfd cc service-instance 1 mep 1002 enable

```

- **Device E:**

```

#
cfd enable
cfd md MD_A index 1 level 5
cfd md MD_B index 2 level 3
cfd service-instance 2 ma-id string MA_A_2 ma-index 1 md MD_A vlan 30
cfd meplist 2001 to 2002 service-instance 2
cfd service-instance 4 ma-id string MA_B_2 ma-index 2 md MD_B vlan 30
cfd meplist 4001 to 4002 service-instance 4
#
vlan 30
#
interface GigabitEthernet1/0/1
port link-mode bridge
port access vlan 30
cfd mep 2002 service-instance 2 inbound
cfd cc service-instance 2 mep 2002 enable
#
interface GigabitEthernet1/0/2
port link-mode bridge
port link-type trunk
port trunk permit vlan 30
cfd mep 4002 service-instance 4 outbound
cfd cc service-instance 4 mep 4002 enable

```