Transparent CFM

CFM support on a customer VLAN (C-VLAN) allows a customer to provision maintenance intermediate points (MIPs) and Up maintenance endpoints (MEPs) on a C-VLAN component for EFP (Q-in-Q interfaces with dot1q or dot1ad C-UNI). MIPs and Up MEPs provide a customer with visibility to network traffic on the C-VLAN. CFM support on a C-VLAN also provides a common point for service verification and standardizes the user-network interface (UNI).

Transparent CFM is a mechanism to provide transparency on CFM frames between customer ends. Transparency helps the service provider network to pass the entire maintenance levels (0-7) of CFM frames from one customer end to another customer end by UP MEP that is configured on UNI-N port at any level.

Information About Transparent CFM

This section provides the information about transparent CFM.

EFP (Q-in-Q interfaces with dot1q or dot1ad C-UNI)

A EFP (Q-in-Q interfaces with dot1q or dot1ad C-UNI) represents a demarcation point between a C-VLAN space and an S-VLAN space. For purposes of CFM protocol processing, a dot1q-tunnel port is modeled as having two components: a C-VLAN component and an S- VLAN component. The C-VLAN component processes double-tagged packets from the relay-function and single-tagged packets from the wire. The S-VLAN component processes single-tagged packets from the relay-function and generates single tagged packets on relay.

CFM traffic belonging to each of the C-VLAN and S-VLAN components can be distinguished based on Ethernet layer encapsulation. This distinction allows each of the components to use the entire maintenance level range (0 to 7) without violating the maintenance domain hierarchy.

The CFM traffic generated by the C-VLAN component is transparent to the S-VLAN component if the maintenance levels of the C- VLAN component are lower than those of the S-VLAN component. The Ethernet encapsulation should be used in combination with the CFM maintenance level to determine which maintenance domain a particular traffic flow belongs to.

Benefits of Transparent CFM

The current implementation of IEEE 802.1ag CFM for EVC infrastructure provides for the provisioning of maintenance points only on S-VLANs; customers cannot monitor or troubleshoot their networks if they are provisioned on provider edge (PE) devices as aggregation nodes supporting QnQ or 802.1ad services.

The Transparent CFM support enhances the current IEEE CFM implementation by allowing customers to monitor the network at any level (0-7); CFM frames with single tag from the customer end and double tagged frames from network end are forwarded transparently.

S-VLAN Component with Transparent CFM Support

With the Transparent CFM support implemented, the S-VLAN component supports the following functions and attributes:

- Up MEPs at any level (0 to 7).

- All MEP uses the S-VLAN for processing.

- CFM frames transmitted and received by Up MEPs have a single VLAN tag (the Ethertype may be dot1q or dot1ad), and the VID is equal to the port's access VLAN (S-VLAN).

The reason for this configuration is that the dot1q-tunnel interface marks the endpoint of the S-VLAN domain; hence, its associated S-VLAN component should mark the endpoint of the CFM domain running over the S-VLAN space.

C-VLAN Component with Transparent CFM Support on C-VLANs

With the Transparent CFM support on C-VLANs feature implemented, the C-VLAN component supports the following functions and attributes:

- MIPs at any maintenance level (0 to 7).

- Transparent point functions.

- Up MEPs at any maintenance level (0 to 7).

- Up MEPs use a stack of two tags: an outer tag with a VID equal to the port's access VLAN (S-VLAN) and an inner tag with a selected C-VLAN that is allowed through the dot1q-tunnel port.

Prerequisites for Transparent CFM

- The CFM 802.1ag module must be present in the software image.

Restrictions for Transparent CFM

- Untagged encapsulation is not supported for transparent CFM.

- Transparent CFM is not supported on Smart SFP.

- Lower or similar level LTM/LTR cannot be forwarded on Transparent CFM service.

- Down MEP or Port MEP cannot be configured across EVC where Transparent CFM is configured.

- MIP on C-VLAN component is not supported.

- Transparent CFM is not supported on xConnect and VPLS.

- Transparent CFM should be configured only on Up MEPs.

- Transparent CFM is not supported on hardware offload (CCM interval < 1 second).

- The following table shows the supported rewrite combinations.

Table 1: Rewrite Combinations

Ingress Frame	Ingress Port	Egress Port
Single Tag	No Rewrite	POP1
	Translate 1-to-1	
Double Tag	No Rewrite	
	Translate 1-to-1	

Configuring Transparent CFM

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **ethernet cfm global**
4. **ethernet cfm ieee**
5. **ethernet cfm domain** *domain-name* **level** *level-id*
6. **service** *MA-name* **evc** *evc-name* **vlan** *vlan-id*
7. **continuity-check**
8. **continuity-check** [*interval cc-interval*]

DETAILED STEPS

	Command or Action	Purpose
Step 1	**enable**	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal**	Enters global configuration mode.
Step 3	**ethernet cfm global**	Enables CFM processing globally on the device.
Step 4	**ethernet cfm ieee**	Enables the CFM IEEE version of CFM. • This command is automatically issued when the **ethernet cfm global** command is issued.

	Command or Action	Purpose
Step 5	**ethernet cfm domain** *domain-name* **level** *level-id*	Defines a CFM maintenance domain at a particular maintenance level and enters Ethernet CFM configuration mode.
Step 6	**service** *MA-name* **evc** *evc-name* **vlan** *vlan-id*	Configures an Ethernet service instance on an interface and enters EVC configuration mode.
Step 7	**continuity-check**	Enable sending and receiving of continuity check messages.
Step 8	**continuity-check** [*interval cc-interval*]	Specifies the number of continuity-check messages that are lost before CFM declares that a MEP is down (unreachable). Range is 2 to 255. Used in conjunction with **interval**.

Configuring Transparent CFM on EFP

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **interface gigabitethernet** *slot* / *subslot* / *port*
4. **no ip address**
5. **negotiation auto**
6. **service instance** *id* **ethernet** *evc-name*
7. **encapsulation dot1q** *vlan-id*
8. **transparent-cfm**
9. **bridge-domain** *domain-number*
10. **ethernet cfm mep domain** *domain-name* **mpid** *mpid*

DETAILED STEPS

	Command or Action	Purpose
Step 1	**enable**	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal**	Enters global configuration mode.
Step 3	**interface gigabitethernet** *slot* / *subslot* / *port*	Specifies the Gigabit Ethernet or Ten Gigabit Ethernet interface to configure and enters interface configuration mode, where: • *slot* / *subslot* / *port*: The location of the interface.
Step 4	**no ip address**	Removes an IP address or disable IP processing.
Step 5	**negotiation auto**	Enables autonegotiation on a Gigabit Ethernet interface. Advertisement of flow control occurs.

	Command or Action	Purpose
Step 6	**service instance** *id* **ethernet** *evc-name*	Configures an Ethernet service instance on an interface and enters EVC configuration mode.
Step 7	**encapsulation dot1q** *vlan-id*	Configures the encapsulation. Defines the matching criteria that maps the ingress dot1q or untagged frames on an interface for the appropriate service instance. • Use the **second-dot1q** keyword and the *vlan-id* argument to specify the VLAN tags to be terminated on the subinterface
Step 8	**transparent-cfm**	Configures transparent CFM.
Step 9	**bridge-domain** *domain-number*	Binds a service instance to a bridge domain instance.
Step 10	**ethernet cfm mep domain** *domain-name* **mpid** *mpid*	Configures a CFM MEP domain.

Configuration Examples for Transparent CFM

This section shows the configuration examples for Transparent CFM.

Example: Configuration of Transparent CFM on EFP

The following example shows the sample configuration of Transparent CFM on EFP.

```
interface GigabitEthernet0/0/1
no ip address
negotiation auto
service instance 1 ethernet EVC
encapsulation dot1q 10
transparent-cfm
bridge-domain 4000
cfm mep domain MD5 mpid 100
```

Example: Configuration of Transparent CFM

The following example shows the sample output of configuration of Transparent CFM.

```
ethernet cfm ieee
ethernet cfm global
ethernet cfm alarm notification all

ethernet cfm domain MD2 level 5
service PMA2 evc evc1 vlan 4000
continuity-check
continuity-check interval 1s
!
ethernet cfm logging
ethernet evc evc1

interface TenGigabitEthernet0/0/3
no ip address
negotiation auto
service instance 1 ethernet evc1
encapsulation dot1q 10
transparent-cfm
bridge-domain 4000
cfm mep domain MD2 mpid 100
```

```
!
!
interface TenGigabitEthernet0/0/5
no ip address
negotiation auto
service instance 1 ethernet evc1
encapsulation dot1q 20
rewrite ingress tag pop 1 symmetric
bridge-domain 4000
!
!
```

interface TenGigabitEthernet0/0/5