



# **Carrier Ethernet 2.0 Certification Understanding and Layer 2 Control Protocol Behaviour Across Cisco Carrier Ethernet Platforms Design Guide**

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Cisco ME3600X-24TS/ME3600-24CX/ME3800X Design Guide

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# Preface

## Introduction

The document outlines the fundamental understanding of Carrier Ethernet 2.0 certification and also outlines the L2 protocol forwarding behaviour differences between Cisco Carrier Ethernet platforms with configuration examples.

# Chapter 1 Carrier Ethernet (CE) 2.0 Certification

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## What is Carrier Ethernet (CE) 2.0 certification ?

**Introduced by Metro Ethernet Forum (MEF)**

**Standardizes** classes of service, performance tiers and objectives, service and traffic management as well as interconnected access services, the MEF is creating the most efficient path possible for the Carrier Ethernet industry to build products and deploy services that drive its expansion in the global telecommunications marketplace.

And by introducing Carrier Ethernet (CE) 2.0 certification for services and equipment, the MEF is also creating the most efficient path possible for the Carrier Ethernet community to align new products and new services to the higher standards of Carrier Ethernet.

## What is new in Carrier Ethernet 2.0 certification ?

**SERVICES** - CE2.0 standardizes new services like E-Tree and E-Access, along with E-Line and E-LAN services that were defined in CE1.0

**FEATURES** - CE 2.0 Standardizes and certifies three powerful services features: Multi-CoS, Manageability and Interconnect.

<b>CE 1.0</b> Certifying first generation of standardized services	<b>CE 2.0</b> Certifying next generation of standardized features & services		
Service Standardization	Multi-CoS	Manageability	Interconnect
<b>E-Line</b> (EPL, EVPL)	<b>E-Line</b> (EPL, EVPL)		
<b>E-LAN</b>	<b>E-LAN</b> (EP-LAN, EVP-LAN)		
	<b>E-Tree</b> (EP-Tree, EVP-Tree)		
	<b>E-Access</b> (Access EPL, Access EVPL)		
Based on MEF Technical Specifications MEF 6, MEF 10	Based on MEF Technical Specifications MEF 6.1, MEF 10.2, MEF 23.1, MEF 26.1, MEF 33		

## CE 2.0 Services

Each Service types can be further classified into :

- **Port Based Service** – EPL, EPLAN, EP-Tree
- **VLAN based service** - EVPL, EVPLAN, EVP-Tree

Service Type	Port Based Service	VLAN Based Service
<b>E-Line</b> Point-to-point EVC UNI to UNI	<b>EPL</b> Ethernet Private Line	<b>EVPL</b> Ethernet Virtual Private Line
<b>E-LAN</b> Multipoint-to-multipoint EVC UNI to UNI	<b>EP-LAN</b> Ethernet Private LAN	<b>EVP-LAN</b> Ethernet Virtual Private LAN

<b>E-Tree</b> Rooted-multipoint EVC UNI to UNI	<b>EP-Tree</b> Ethernet Private Tree	<b>EVP-Tree</b> Ethernet Virtual Private Tree
<b>E-Access</b> Point-to-point OVC UNI to ENNI	<b>Access EPL</b> Access Ethernet Private Line	<b>Access EVPL</b> Access Ethernet Virtual Private Line

## CE 2.0 Features

Multi-CoS	Manageability	Interconnect
<ul style="list-style-type: none"> <li>➤ MULTIPLE CLASSES OF SERVICE</li> <li>➤ STANDARDIZED PERFORMANCE OBJECTIVES</li> </ul>	<ul style="list-style-type: none"> <li>➤ END-TO-END FAULT MANAGEMENT</li> <li>➤ STANDARDIZED GRANULARITIES FOR TRAFFIC MANAGEMENT</li> </ul>	<ul style="list-style-type: none"> <li>➤ STANDARDIZED WHOLESAL INTERCONNECT SERVICE</li> <li>➤ EXTENDS SERVICES COVERAGE</li> </ul>
<p>Standardized CoS Labels</p> <ul style="list-style-type: none"> <li>• High</li> <li>• Medium</li> <li>• Low</li> </ul> <p>Standardized Color Identifiers</p> <ul style="list-style-type: none"> <li>• S-Tag PCP bits without DEI support</li> <li>• S-Tag PCP bits with DEI support</li> <li>• C-Tag PCP bits</li> <li>• DSCP</li> </ul> <p>Standardized Performance Tiers</p> <ul style="list-style-type: none"> <li>• PT1 - Metro</li> <li>• PT2 - Regional</li> <li>• PT3 - Continental</li> <li>• PT4 - Global</li> </ul> <p>Standardized Performance Metrics &amp; Objectives</p> <ul style="list-style-type: none"> <li>• Frame Delay FD</li> <li>• Mean Frame Delay MFD</li> <li>• Inter-Frame Delay Variation IFDV</li> <li>• Frame Delay Range FDR</li> <li>• Frame Loss Ratio FLR</li> </ul>	<p>Service OAM</p> <ul style="list-style-type: none"> <li>• Subscriber and Test MEGs</li> <li>• Continuity Check - CCM</li> <li>• Linktrace - LTM &amp; LTR</li> <li>• Loopback - LBM &amp; LBR</li> </ul> <p>BWP Granularity UNI to UNI</p> <ul style="list-style-type: none"> <li>• Up to 10M in steps of 1M</li> <li>• From 10M to 100Ms in steps of 5M</li> <li>• From 100M to 1G in steps of 50M</li> <li>• From 1G to 10G in steps of 500M</li> </ul> <p>BWP Granularity UNI to ENNI</p> <ul style="list-style-type: none"> <li>• Up to 10M in steps of 1M</li> <li>• From 10M to 100Ms in steps of 10M</li> <li>• From 100M to 1G in steps of 100M</li> <li>• From 1G to 10G in steps of 1G</li> </ul> <p>Maximum Transmission Unit</p> <ul style="list-style-type: none"> <li>• UNI MTU, EVC MTU</li> <li>• ENNI MTU, OVC MTU</li> </ul> <p>L2CP Handling</p> <ul style="list-style-type: none"> <li>• Must Tunnel</li> <li>• Must Not Tunnel</li> </ul>	<p>UNI to ENNI Services</p> <ul style="list-style-type: none"> <li>• Access EPL</li> <li>• Access EVPL</li> </ul> <p>Standardized ENNI</p> <ul style="list-style-type: none"> <li>• ENNI Frame format – 802.1ad-2005</li> <li>• Single tagging option - S-tag</li> <li>• Double tagging option - C-Tag + S-Tag</li> <li>• ENNI MTU Size ≥ 1526 Bytes</li> <li>• ENNI End Point map</li> </ul> <p>Standardized OVC End Points</p> <ul style="list-style-type: none"> <li>• Color-Aware BWP at ENNI</li> <li>• CoS ID for ENNI Frames</li> <li>• Color-Blind BWP at UNI</li> <li>• CoS ID for Service Frames</li> </ul> <p>Standardized OVC</p> <ul style="list-style-type: none"> <li>• Point-to-Point OVC</li> <li>• Color Forwarding = Yes</li> <li>• CE-VLAN ID &amp; CoS Preservation</li> <li>• Service Level Specification</li> </ul>

## CE 2.0 Test Cases Scope

The tests carried out for CE2.0 certification are mentioned below, the tests vary from basic physical interface tests, Layer 2 Control Protocol handling, Performance to QoS.

### Test Cases for Physical Interface & Frame Format

- Physical Medium, Speed, Mode and MAC La
- Untagged, C-tagged, S-tagged frames – 802.1ad-2005

### Test Cases for UNI Attributes

- UNI Service Multiplexing
- UNI Bundling
- UNI All-to-One Bundling
- Maximum number of CE-VLAN ID per OVC

### Test Cases for EVC and OVC Support

- Point-to-point EVC and Point-to-point OVC
- Multipoint-to-multipoint EVC and Rooted-multipoint EVC
- CE-VLAN ID and CE-VLAN CoS Preservation
- CE-VLAN ID/EVC Map and OVC EP Map
- Unicast, Multicast, Broadcast Service Frame Delivery

### Test Cases for L2CP Handling

- L2CP Must Tunnel
- L2CP Must Not Tunnel

### Test Cases for Service OAM Handling

- Subscriber MEG and Test MEG
- CCM, LBM, LBR, LTM and LTR messages

### Test Cases for Performance

- One-Way Frame Delay Performance
- One-Way Mean Frame Delay Performance
- One-Way Inter-Frame Delay Performance
- One-Way Frame Delay Range
- One-Way Frame Loss Ratio

### Test Cases for Ingress Bandwidth Profile

- CIR Enforcement
- CBS Enforcement
- EIR Enforcement
- EBS Enforcement



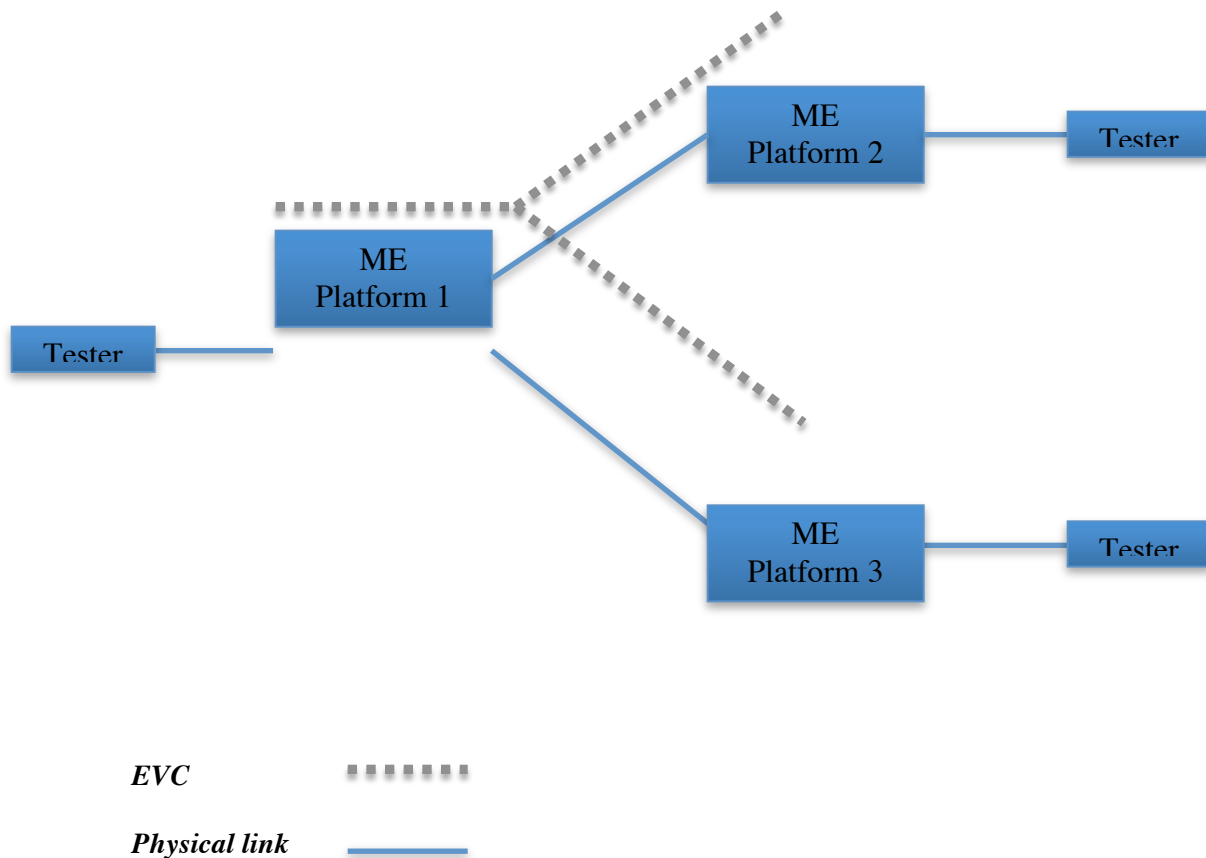
- Bandwidth Profile Granularity
- Per UNI bandwidth profile
- Per EVC bandwidth profile
- Per Class of Service (PCP, DSCP, L2CP) bandwidth profile
- Multiple ingress bandwidth profiles at the UHNI

### Test Cases for Egress Bandwidth Profile

- CIR Enforcement
- Bandwidth Profile Granularity
- Per UNI bandwidth profile
- Per EVC bandwidth profile
- Per Class of Service (PCP, DSCP, L2CP) bandwidth profile

## How is the CE 2.0 hardware platform certification done ?

Two or three Routers (ME platforms) are used in the scenario below. The traffic is sent and received by the testers connected to the



## **Configuring for CE2.0 certification**

The EVC can be configured using 2 different ways :

1. Using Bridge domains (No MPLS or IGP involved) – Just Layer 2
2. Using xconnect and bridge domains (Using MPLS and IGP between the platforms) – Layer 3

## Chapter 2 CE 2.0 L2 Control Protocol (L2CP) Forwarding

### CE 2.0 L2 Control Protocol (L2CP) Forwarding requirements for different Services

Table 1 : EPL

Destination MAC	Protocol	Ethertype /Subtype	EPL Option 1	EPL Option 2
01-80-C2-00-00-00	STP/RSTP/MSTP		MUST Tunnel	MUST Tunnel
01-80-C2-00-00-01	Pause	0x8808	MUST NOT Tunnel	
01-80-C2-00-00-02	LACP/LAMP	0x8809/01/02	MUST NOT Tunnel	
01-80-C2-00-00-02	Link OAM	0x8809/03	MUST NOT Tunnel	
01-80-C2-00-00-02	ESMC	0x8809/0A	MUST NOT Tunnel	
01-80-C2-00-00-03	802.1X	0x888E	MUST NOT Tunnel	
01-80-C2-00-00-04	MAC Specific Control Protocols		MUST NOT Tunnel	
01-80-C2-00-00-05	Reserved		MUST NOT Tunnel	
01-80-C2-00-00-06	Reserved		MUST NOT Tunnel	
01-80-C2-00-00-07	E-LMI	0x88EE	MUST NOT Tunnel	MUST Tunnel
01-80-C2-00-00-08	Provider Bridge Group Address		MUST NOT Tunnel	
01-80-C2-00-00-09	Reserved		MUST NOT Tunnel	
01-80-C2-00-00-0A	Reserved		MUST NOT Tunnel	
01-80-C2-00-00-0B	Reserved		MUST Tunnel	
01-80-C2-00-00-0C	Reserved		MUST Tunnel	
01-80-C2-00-00-0D	Provider Bridge MVRP Address		MUST Tunnel	

01-80-C2-00-00-0E	LLDP	0x88CC	MUST NOT Tunnel	MUST Tunnel
01-80-C2-00-00-0E	PTP Peer Delay	0x88F7	MUST NOT Tunnel	MUST Tunnel
01-80-C2-00-00-0F	Reserved		MUST Tunnel	
01-80-C2-00-00-20 through 01-80-C2-00-00-2F	GARP/GMRP		MUST Tunnel	MUST Tunnel

**Table 2 : EP-LAN and EP-Tree**

Destination MAC	Protocol	Ethertype /Subtype	EP-LAN	EP-Tree
01-80-C2-00-00-00	STP/RSTP/MSTP		MUST Tunnel	MUST Tunnel
01-80-C2-00-00-01	Pause	0x8808	MUST NOT Tunnel	MUST NOT Tunnel
01-80-C2-00-00-02	LACP/LAMP	0x8809/01/02	MUST NOT Tunnel	MUST NOT Tunnel
01-80-C2-00-00-02	Link OAM	0x8809/03	MUST NOT Tunnel	MUST NOT Tunnel
01-80-C2-00-00-02	ESMC	0x8809/0A	MUST NOT Tunnel	MUST NOT Tunnel
01-80-C2-00-00-03	802.1X	0x888E	MUST NOT Tunnel	MUST NOT Tunnel
01-80-C2-00-00-04	MAC Specific Control Protocols		MUST NOT Tunnel	MUST NOT Tunnel
01-80-C2-00-00-05	Reserved		MUST NOT Tunnel	MUST NOT Tunnel
01-80-C2-00-00-06	Reserved		MUST NOT Tunnel	MUST NOT Tunnel
01-80-C2-00-00-07	E-LMI	0x88EE	MUST NOT Tunnel	MUST NOT Tunnel
01-80-C2-00-00-08	Provider Bridge Group Address		MUST NOT Tunnel	MUST NOT Tunnel
01-80-C2-00-00-09	Reserved		MUST NOT Tunnel	MUST NOT Tunnel
01-80-C2-00-00-0A	Reserved		MUST NOT Tunnel	MUST NOT Tunnel
01-80-C2-00-00-0B	Reserved		MUST Tunnel	MUST Tunnel
01-80-C2-00-00-0C	Reserved		MUST Tunnel	MUST Tunnel
01-80-C2-00-00-0D	Provider Bridge MVRP Address		MUST Tunnel	MUST Tunnel
01-80-C2-00-00-0E	LLDP	0x88CC	MUST NOT Tunnel	MUST NOT Tunnel

01-80-C2-00-00-0E	PTP Peer Delay	0x88F7	MUST NOT Tunnel	MUST NOT Tunnel
01-80-C2-00-00-0F	Reserved		MUST Tunnel	MUST Tunnel
01-80-C2-00-00-20 through 01-80-C2-00-00-2F	GARP/GMRP		MUST Tunnel	MUST Tunnel

**NOTE:**

1. For VLAN based services CE 2.0 requirement is to drop all L2 Control Protocol frames.
2. No explicit requirement for E-access

## CE 2.0 L2 Protocol Forwarding across Platforms

Platforms	EPL	EPL	EPLAN	E-TREE
	Option 1	Option 2		
Cisco ME3600X,ME3800X, ME3600X24CX	Supported	Supported	Supported	Supported
Cisco ASR 903	Supported	Supported	Supported	Supported
Cisco ASR 9000	Supported	Supported in IOS XR 5.1.1 *	Supported	Supported
Cisco 7600	Not Supported	Supported	Supported	Supported

\* Cisco ASR 9000 does not forward of the ELMI frames today and hence it does not support EPL option 2. This is being tracked using CSCud49282 and will be fixed in IOSXR in 5.1.1 which will be release in December 2013.

## Cisco 7600 - CE 2.0 L2 Protocol Forwarding configurations

### EPL

- ⇒ On Cisco 7600 only EPL option 2 is supported.
- ⇒ Configure the port as a «UNI S-PORT» to forward all the L2 protocol control frames required to be forwarded by EPL option 2.
- ⇒ No EXPLICIT L2 protocol forward configuration is required.
- ⇒ Always certify the network on EPL option 2 when 7600 is being deployed in the network.

### Cisco 7600 Configuration - EPL option 2

```
interface GigabitEthernet1/21
description connected to Tester A.1
no ip address
ethernet dot1ad uni s-port
service instance 2 ethernet
encapsulation default
xconnect 10.1.1.2 1002 encapsulation mpls
```

Destination MAC	Protocol	EPL Option 2	Default behavior Xconnect	With dot1ad uni s-port xconnect
01-80-C2-00-00-00	STP/RSTP/MSTP	MUST Tunnel	Yes	Yes(forwarded)
01-80-C2-00-00-01	Pause		x	X
01-80-C2-00-00-02	LACP/LAMP		x	x
01-80-C2-00-00-02	Link OAM		x	x
01-80-C2-00-00-02	ESMC		x	x
01-80-C2-00-00-03	802.1X		X	Yes
01-80-C2-00-00-04	MAC Specific Control Protocols		yes	Yes
01-80-C2-00-00-05	Reserved		yes	Yes
01-80-C2-00-00-06	Reserved		yes	Yes
01-80-C2-00-00-07	E-LMI	MUST Tunnel	X	Yes
01-80-C2-00-00-08	Provider Bridge Group Address		X	X
01-80-C2-00-00-09	Reserved		yes	Yes
01-80-C2-00-00-0A	Reserved		yes	Yes
01-80-C2-00-00-0B	Reserved		Yes	Yes
01-80-C2-00-00-0C	Reserved		Yes	Yes
01-80-C2-00-00-0D	Provider Bridge MVRP Address		yes	Yes
01-80-C2-00-00-0E	LLDP	MUST Tunnel	x	Yes
01-80-C2-00-00-0E	PTP Peer Delay	MUST Tunnel	x	Yes
01-80-C2-00-00-0F	Reserved		Yes	Yes
01-80-C2-00-00-20 through 01-80-C2-00-00-2F	GARP/GMRP	MUST Tunnel	yes	Yes

## EPLAN

- ⇒ Configure the port as a «UNI S-PORT» to forward all the L2 protocol control frames required to be forwarded by EPLAN
- ⇒ No EXPLICIT L2 protocol forward configuration is required.

### Cisco 7600 Configuration - EPLAN

```
interface GigabitEthernet2/20
Description connected_Tester
ip arp inspection limit none
ethernet dot1ad uni s-port
service instance 3 ethernet
encapsulation default
bridge-domain 3
```

Destination MAC	Protocol	EP-LAN	With dot1ad uni s-port vpls
01-80-C2-00-00-00	STP/RSTP/MSTP	MUST Tunnel	Yes
01-80-C2-00-00-01	Pause		X
01-80-C2-00-00-02	LACP/LAMP		x
01-80-C2-00-00-02	Link OAM		x
01-80-C2-00-00-02	ESMC		x
01-80-C2-00-00-03	802.1X		X
01-80-C2-00-00-04	MAC Specific Control Protocols		X
01-80-C2-00-00-05	Reserved		X
01-80-C2-00-00-06	Reserved		X
01-80-C2-00-00-07	E-LMI	MUST Tunnel	X
01-80-C2-00-00-08	Provider Bridge Group Address		X
01-80-C2-00-00-09	Reserved		X
01-80-C2-00-00-0A	Reserved		X
01-80-C2-00-00-0B	Reserved		Yes
01-80-C2-00-00-0C	Reserved		yes



01-80-C2-00-00-0D	Provider Bridge MVRP Address		Yes
01-80-C2-00-00-0E	LLDP	MUST Tunnel	X
01-80-C2-00-00-0E	PTP Peer Delay	MUST Tunnel	X
01-80-C2-00-00-0F	Reserved		Yes
01-80-C2-00-00-20 through 01-80-C2-00-00-2F	GARP/GMRP	MUST Tunnel	yes

## EP-Tree

- ⇒ Configure the port as a «UNI S-PORT» to forward all the l2 protocol control frames required to be forwarded by EPLAN
- ⇒ No EXPLICIT L2 protocol forward configuration is required.

### Cisco 7600 Configuration : EP-Tree

```
interface GigabitEthernet2/20
Description connected_Tester
ip arp inspection limit none
ethernet dot1ad uni s-port
service instance 3 ethernet
encapsulation default
bridge-domain 3
```

Destination MAC	Protocol	EP-Tree	With dot1ad uni s-port vpls
01-80-C2-00-00-00	STP/RSTP/MSTP	MUST Tunnel	Yes
01-80-C2-00-00-01	Pause		X
01-80-C2-00-00-02	LACP/LAMP		x
01-80-C2-00-00-02	Link OAM		x
01-80-C2-00-00-02	ESMC		x
01-80-C2-00-00-03	802.1X		X
01-80-C2-00-00-04	MAC Specific Control Protocols		X

01-80-C2-00-00-05	Reserved		X
01-80-C2-00-00-06	Reserved		X
01-80-C2-00-00-07	E-LMI	MUST Tunnel	X
01-80-C2-00-00-08	Provider Bridge Group Address		X
01-80-C2-00-00-09	Reserved		X
01-80-C2-00-00-0A	Reserved		X
01-80-C2-00-00-0B	Reserved		Yes
01-80-C2-00-00-0C	Reserved		yes
01-80-C2-00-00-0D	Provider Bridge MVRP Address		Yes
01-80-C2-00-00-0E	LLDP	MUST Tunnel	X
01-80-C2-00-00-0E	PTP Peer Delay	MUST Tunnel	X
01-80-C2-00-00-0F	Reserved		Yes
01-80-C2-00-00-20 through 01-80-C2-00-00-2F	GARP/GMRP	MUST Tunnel	yes

## Cisco ME3600X/3800X/3600X-24CX and Cisco ASR 903 - CE 2.0 L2 Protocol Forwarding configurations

### CISCO ME3600X/3800X and CISCO ASR 903 behaviour

- ⇒ By default all layer 2 control frames are dropped on the EFP.
- ⇒ The layer 2 control protocol forwarding is enabled using the command “l2protocol forward”
- ⇒ By enabling just the command “ l2protocol forwarding” All layer 2 control protocols will be forwarded.
- ⇒ There is also a flexibility to forward a particular set of protocols as well by mentioning

### CISCO ME3600X/3800X and CISCO ASR 903 Configuration

```
ME3600-1(config-if-srv)#l2protocol forward ?
R4      Reserved Protocol using DA Mac 0180.C200.0004
R5      Reserved Protocol using DA Mac 0180.C200.0005
R6      Reserved Protocol using DA Mac 0180.C200.0006
R8      Reserved Protocol using DA Mac 0180.C200.0008
R9      Reserved Protocol using DA Mac 0180.C200.0009
RA      Reserved Protocol using DA Mac 0180.C200.000A
RB      Reserved Protocol using DA Mac 0180.C200.000B
RC      Reserved Protocol using DA Mac 0180.C200.000C
```

```
RD    Reserved Protocol using DA Mac 0180.C200.000D
RF    Reserved Protocol using DA Mac 0180.C200.000F
cdp   Cisco Discovery Protocol
dtp   Dynamic Trunking Protocol
elmi  ELMI Protocol
esmc  ESMC Protocol
lacp  LACP Protocol
lldp  Link Layer Discovery Protocol
loam  Link OAM Protocol
pagp  Port Aggregation Protocol
ptppd PTP Peer Delay Protocol
stp   Spanning Tree Protocol
udld  UDLD Protocol
vtp   Vlan Trunking Protocol
<cr>
```

## EPL (Option 1 and Option 2)

### Cisco ME3600X/3800X/3600X-24CX and Cisco ASR 903 Configuration : EPL option1

```
interface GigabitEthernet0/4
switchport trunk allowed vlan none
switchport mode trunk
service instance 100 ethernet
encapsulation default
l2protocol forward stp RB RC RD RF
xconnect 121.1.1.1 100 encapsulation mpls
```

### Cisco ME3600X/3800X/3600X-24CX and Cisco ASR 903 Configuration : EPL option2

```
interface GigabitEthernet0/4
switchport trunk allowed vlan none
switchport mode trunk
service instance 100 ethernet
encapsulation default
l2protocol forward
xconnect 121.1.1.1 100 encapsulation mpls
```

#### NOTE :

GARP/GMRP messages are forwarded as Data traffic by default when the L2 protocol forward command is mentioned. So there is no option in the l2 protocol forward command to forward GARP/GMRP messages.

## EPLAN

### Cisco ME3600X/3800X/3600X-24CX and Cisco ASR 903 Configuration

```
interface GigabitEthernet0/5
  switchport trunk allowed vlan none
  switchport mode trunk
  service instance 1 ethernet
  encapsulation default
  l2protocol forward stp RB RC RD RF
  bridge-domain 101
!
```

## EP-Tree

### Cisco ME3600X/3800X/3600X-24CX and Cisco ASR 903 Configuration

```
interface GigabitEthernet0/5
  switchport trunk allowed vlan none
  switchport mode trunk
  service instance 1 ethernet
  encapsulation default
  l2protocol forward stp RB RC RD RF
  bridge-domain 101
!
```

## Cisco ASR 9000 - CE 2.0 L2 Protocol Forwarding configurations

### CISCO ASR 9000 behaviour

- On the CISCO ASR 9000 all the L2 control frames are forwarded by default on the EFP.
- In order to block or permit a certain set of protocols. The L2 access lists need to be configured.

## EPL

### Cisco ASR 9000 Configuration

```
ethernet-services access-list L2CP_epl
 10 permit any host 0180.c200.0000
 20 permit any host 0180.c200.000b
 30 permit any host 0180.c200.000c
 40 permit any host 0180.c200.000d
 50 permit any host 0180.c200.000f
 60 permit any 0180.c200.0020 0000.0000.000f
 70 deny any 0180.c200.0000 0000.0000.000f
 80 permit any any

interface TenGigE0/0/0/0
 l2transport
 ethernet-services access-group L2CP_epl ingress
 !
 l2vpn
 bridge group ce20
 bridge-domain evcl
 interface TenGigE0/0/0/0
 !
 neighbor 10.10.10.203 pw-id 100
```

### NOTE :

ASR 9000 does not support forwarding of the ELMI frames today and hence it does not support EPL option 2. This is being tracked using CSCud49282 and will be fixed in IOSXR in 5.1.1 which will be release in December 2013.

## EPLAN

### Cisco ASR 9000 Configuration

```
ethernet-services access-list L2CP_evplan
 10 permit any host 0180.c200.0000
 20 permit any host 0180.c200.000b
 30 permit any host 0180.c200.000c
 40 permit any host 0180.c200.000d
 50 permit any host 0180.c200.000f
 60 permit any 0180.c200.0020 0000.0000.000f
 70 deny any 0180.c200.0000 0000.0000.000f
 80 permit any any

interface TenGigE0/0/0/0
 l2transport
 ethernet-services access-group L2CP_evplan ingress
 !
 l2vpn
```

```
bridge group ce20
  bridge-domain evc1
  interface TenGigE0/0/0/0
  !
  neighbor 10.10.10.203 pw-id 100
```

## EP-Tree

### Cisco ASR 9000 Configuration

```
ethernet-services access-list L2CP_eptree
  10 permit any host 0180.c200.0000
  20 permit any host 0180.c200.000b
  30 permit any host 0180.c200.000c
  40 permit any host 0180.c200.000d
  50 permit any host 0180.c200.000f
  60 permit any 0180.c200.0020 0000.0000.000f
  70 deny any 0180.c200.0000 0000.0000.000f
  80 permit any any

interface TenGigE0/0/0/0
  l2transport
  ethernet-services access-group L2CP_eptree ingress
  !
l2vpn
  bridge group ce20
  bridge-domain evc1
  interface TenGigE0/0/0/0
  !
  neighbor 10.10.10.203 pw-id 100
```

## Chapter 3 CE 2.0 E-Access

---

For E-access type of the deployments the Metro Ethernet network should be able to match customer frames coming with dot1Q tags and push dot1ad tag and send it across to the remote location.

### How to certify a network for E-access when you have Cisco ME3600X/3800X/3600X-24CX or Cisco ASR 903 ?

Carry the dot1Q tag (inner) from the access network (where Cisco ME3600X/3800X/3600X-24CX or Cisco ASR 903 is deployed) to the aggregation (where Cisco ASR 9000 or Cisco 7600 deployed) and configure the aggregation routers to PUSH dot1ad tag and send the frames across the core network.

Below is an used case example :

```

          NNI                EPL/EVPL                UNI
CE ----- ASR9K/7600-----ME/ASR 903 ----- CE2
```

Let the Flow of the traffic be left to right. The CE2 sends the frame with dot1Q tag to the ME or ASR 903 and the 802.1 ad tag is pushed on NNI side on the egress side on ASR9k and 7600.

#### **ASR9K configuration (NNI port)**

```
interface GigabitEthernet0/0/0/3.100 l2transport
encapsulation dot1ad 100
rewrite ingress tag pop 1 symmetric
```

#### **ASR9K other configurations**

```
l2vpn
xconnect group EPL
p2p EPL
interface GigabitEthernet0/0/0/3.100
neighbor 100.100.100.1 pw-id 100
!
```

#### **ME/ASR903 Configuration**

```
interface GigabitEthernet0/9
switchport trunk allowed vlan none
switchport mode trunk
service instance 100 ethernet
encapsulation default
l2protocol forward cdp
xconnect 1.1.1.1 100 encapsulation mpls
!
```

Did a simple ping test from CE1 to CE2 using the SVIs created to validate the forwarding.

```
RP/0/RSP0/CPU0:CE-2#ping 102.2.2.1
Fri Sep 20 13:38:51.768 PDT
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 102.2.2.1, timeout is 2 seconds:
!!!!!
```

**7600 Configuration (NNI port)**

```
interface GigabitEthernet4/8
 no ip address
 speed nonegotiate
 no keepalive
 ethernet dot1ad nni
 service instance 100 ethernet
 encapsulation dot1q 100
 rewrite ingress tag pop 1 symmetric
 xconnect 100.100.100.2 100 encapsulation mpls
```

---