Carrier Ethernet 2.0 Certification
Understanding and Layer 2 Control Protocol
Behaviour Across Cisco Carrier Ethernet Platforms
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

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.
<table>
<thead>
<tr>
<th><strong>CE 1.0</strong></th>
<th><strong>CE 2.0</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Certifying first generation of standardized services</td>
<td>Certifying next generation of standardized features &amp; services</td>
</tr>
<tr>
<td>Service Standardization</td>
<td>Multi-CoS</td>
</tr>
<tr>
<td>E-Line (EPL, EVPL)</td>
<td>E-Line (EPL, EVPL)</td>
</tr>
<tr>
<td>E-LAN</td>
<td>E-LAN (EP-LAN, EVP-LAN)</td>
</tr>
<tr>
<td>Based on MEF Technical Specifications MEF 6, MEF 10</td>
<td>Based on MEF Technical Specifications MEF 6.1, MEF 10.2, MEF 23.1, MEF 26.1, MEF 33</td>
</tr>
</tbody>
</table>

**CE 2.0 Services**

Each Service type can be further classified into:

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

<table>
<thead>
<tr>
<th><strong>Service Type</strong></th>
<th><strong>Port Based Service</strong></th>
<th><strong>VLAN Based Service</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>E-Line</strong></td>
<td>E-PL Ethernet Private Line</td>
<td>EVPL Ethernet Virtual Private Line</td>
</tr>
<tr>
<td>Point-to-point EVC UNI to UNI</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>E-LAN</strong></td>
<td>EP-LAN Ethernet Private LAN</td>
<td>EVP-LAN Ethernet Virtual Private LAN</td>
</tr>
<tr>
<td>Multipoint-to-multipoint EVC UNI to UNI</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### CE 2.0 Features

<table>
<thead>
<tr>
<th>Multi-CoS</th>
<th>Manageability</th>
<th>Interconnect</th>
</tr>
</thead>
<tbody>
<tr>
<td>➢ MULTIPLE CLASSES OF SERVICE</td>
<td>➢ END-TO-END FAULT MANAGEMENT</td>
<td>➢ STANDARDIZED WHOLESALE INTERCONNECT SERVICE</td>
</tr>
<tr>
<td>➢ STANDARDIZED PERFORMANCE OBJECTIVES</td>
<td>➢ STANDARDIZED GRANULARITIES FOR TRAFFIC MANAGEMENT</td>
<td>➢ EXTENDS SERVICES COVERAGE</td>
</tr>
</tbody>
</table>

**Standardized CoS Labels**
- High
- Medium
- Low

**Standardized Color Identifiers**
- S-Tag PCP bits without DEI support
- S-Tag PCP bits with DEI support
- C-Tag PCP bits
- DSCP

**Standardized Performance Tiers**
- PT1 - Metro
- PT2 - Regional
- PT3 - Continental
- PT4 - Global

**Standardized Performance Metrics & Objectives**
- Frame Delay FD
- Mean Frame Delay MFD
- Inter-Frame Delay Variation IFDV
- Frame Delay Range FDR
- Frame Loss Ratio FLR

**Service OAM**
- Subscriber and Test MEGs
- Continuity Check - CCM
- Linktrance - LTM & LTR
- Loopback - LBM & LBR

**BWP Granularity UNI to UNI**
- Up to 10M in steps of 1M
- From 10M to 100Ms in steps of 5M
- From 100M to 1G in steps of 50M
- From 1G to 10G in steps of 500M

**BWP Granularity UNI to ENNI**
- Up to 10M in steps of 1M
- From 10M to 100Ms in steps of 10M
- From 100M to 1G in steps of 100M
- From 1G to 10G in steps of 1G

**Maximum Transmission Unit**
- UNI MTU, EVC MTU
- ENNI MTU, OVC MTU
- L2CP Handling
- Must Tunnel
- Must Not Tunnel

**UNI to ENNI Services**
- Access EPL
- Access EVPL
- Standardized ENNI
- ENNI Frame format – 802.1ad-2005
- Single tagging option - S-tag
- Double tagging option - C-Tag + S-Tag

**ENNI MTU Size**
- ≥ 1526 Bytes

**ENNI End Point map**
- Standardized OVC End Points
- Color-Aware BWP at ENNI
- CoS ID for ENNI Frames
- Color-Blind BWP at UNI
- CoS ID for Service Frames
- OVC End Point Maps
- Standardized OVC
- Point-to-Point OVC
- Color Forwarding = Yes
- CE-VLAN ID & CoS Preservation
- Service Level Specification
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
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
CE 2.0 L2 Control Protocol (L2CP) Forwarding requirements for different Services

Table 1: EPL

<table>
<thead>
<tr>
<th>Destination MAC</th>
<th>Protocol</th>
<th>Ethertype/Subtype</th>
<th>EPL Option 1</th>
<th>EPL Option 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>01-80-C2-00-00-00</td>
<td>STP/RSTP/MSTP</td>
<td>0x8800-00</td>
<td>MUST Tunnel</td>
<td>MUST Tunnel</td>
</tr>
<tr>
<td>01-80-C2-00-00-01</td>
<td>Pause</td>
<td>0x8808</td>
<td>MUST NOT Tunnel</td>
<td></td>
</tr>
<tr>
<td>01-80-C2-00-00-02</td>
<td>LACP/LAMP</td>
<td>0x8809/01/02</td>
<td>MUST NOT Tunnel</td>
<td></td>
</tr>
<tr>
<td>01-80-C2-00-00-02</td>
<td>Link OAM</td>
<td>0x8809/03</td>
<td>MUST NOT Tunnel</td>
<td></td>
</tr>
<tr>
<td>01-80-C2-00-00-02</td>
<td>ESMC</td>
<td>0x8809/0A</td>
<td>MUST NOT Tunnel</td>
<td></td>
</tr>
<tr>
<td>01-80-C2-00-00-03</td>
<td>802.1X</td>
<td>0x888E</td>
<td>MUST NOT Tunnel</td>
<td></td>
</tr>
<tr>
<td>01-80-C2-00-00-04</td>
<td>MAC Specific Control Protocols</td>
<td></td>
<td>MUST NOT Tunnel</td>
<td></td>
</tr>
<tr>
<td>01-80-C2-00-00-05</td>
<td>Reserved</td>
<td></td>
<td>MUST NOT Tunnel</td>
<td></td>
</tr>
<tr>
<td>01-80-C2-00-00-06</td>
<td>Reserved</td>
<td></td>
<td>MUST NOT Tunnel</td>
<td></td>
</tr>
<tr>
<td>01-80-C2-00-00-07</td>
<td>E-LMI</td>
<td>0x88EE</td>
<td>MUST NOT Tunnel</td>
<td>MUST Tunnel</td>
</tr>
<tr>
<td>01-80-C2-00-00-08</td>
<td>Provider Bridge Group Address</td>
<td></td>
<td>MUST NOT Tunnel</td>
<td></td>
</tr>
<tr>
<td>01-80-C2-00-00-09</td>
<td>Reserved</td>
<td></td>
<td>MUST NOT Tunnel</td>
<td></td>
</tr>
<tr>
<td>01-80-C2-00-00-0A</td>
<td>Reserved</td>
<td></td>
<td>MUST NOT Tunnel</td>
<td></td>
</tr>
<tr>
<td>01-80-C2-00-00-0B</td>
<td>Reserved</td>
<td></td>
<td>MUST Tunnel</td>
<td></td>
</tr>
<tr>
<td>01-80-C2-00-00-0C</td>
<td>Reserved</td>
<td></td>
<td>MUST Tunnel</td>
<td></td>
</tr>
<tr>
<td>01-80-C2-00-00-0D</td>
<td>Provider Bridge MVRP Address</td>
<td></td>
<td>MUST Tunnel</td>
<td></td>
</tr>
</tbody>
</table>
Table 2: EP-LAN and EP-Tree

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>01-80-C2-00-00-00</td>
<td>STP/RSTP/MSTP</td>
<td>0x8800</td>
<td>MUST Tunnel</td>
<td>MUST Tunnel</td>
</tr>
<tr>
<td>01-80-C2-00-00-01</td>
<td>Pause</td>
<td>0x8808</td>
<td>MUST NOT Tunnel</td>
<td>MUST NOT Tunnel</td>
</tr>
<tr>
<td>01-80-C2-00-00-02</td>
<td>LACP/LAMP</td>
<td>0x8809/01/02</td>
<td>MUST NOT Tunnel</td>
<td>MUST NOT Tunnel</td>
</tr>
<tr>
<td>01-80-C2-00-00-02</td>
<td>Link OAM</td>
<td>0x8809/03</td>
<td>MUST NOT Tunnel</td>
<td>MUST NOT Tunnel</td>
</tr>
<tr>
<td>01-80-C2-00-00-02</td>
<td>ESMC</td>
<td>0x8809/0A</td>
<td>MUST NOT Tunnel</td>
<td>MUST NOT Tunnel</td>
</tr>
<tr>
<td>01-80-C2-00-00-03</td>
<td>802.1X</td>
<td>0x888E</td>
<td>MUST NOT Tunnel</td>
<td>MUST NOT Tunnel</td>
</tr>
<tr>
<td>01-80-C2-00-00-04</td>
<td>MAC Specific Control Protocols</td>
<td></td>
<td>MUST NOT Tunnel</td>
<td>MUST NOT Tunnel</td>
</tr>
<tr>
<td>01-80-C2-00-00-05</td>
<td>Reserved</td>
<td></td>
<td>MUST NOT Tunnel</td>
<td>MUST NOT Tunnel</td>
</tr>
<tr>
<td>01-80-C2-00-00-06</td>
<td>Reserved</td>
<td></td>
<td>MUST NOT Tunnel</td>
<td>MUST NOT Tunnel</td>
</tr>
<tr>
<td>01-80-C2-00-00-07</td>
<td>E-LMI</td>
<td>0x88EE</td>
<td>MUST NOT Tunnel</td>
<td>MUST NOT Tunnel</td>
</tr>
<tr>
<td>01-80-C2-00-00-08</td>
<td>Provider Bridge Group Address</td>
<td></td>
<td>MUST NOT Tunnel</td>
<td>MUST NOT Tunnel</td>
</tr>
<tr>
<td>01-80-C2-00-00-09</td>
<td>Reserved</td>
<td></td>
<td>MUST NOT Tunnel</td>
<td>MUST NOT Tunnel</td>
</tr>
<tr>
<td>01-80-C2-00-00-0A</td>
<td>Reserved</td>
<td></td>
<td>MUST NOT Tunnel</td>
<td>MUST NOT Tunnel</td>
</tr>
<tr>
<td>01-80-C2-00-00-0B</td>
<td>Reserved</td>
<td></td>
<td>MUST NOT Tunnel</td>
<td>MUST NOT Tunnel</td>
</tr>
<tr>
<td>01-80-C2-00-00-0C</td>
<td>Reserved</td>
<td></td>
<td>MUST NOT Tunnel</td>
<td>MUST NOT Tunnel</td>
</tr>
<tr>
<td>01-80-C2-00-00-0D</td>
<td>Provider Bridge MVRP Address</td>
<td></td>
<td>MUST NOT Tunnel</td>
<td>MUST NOT Tunnel</td>
</tr>
<tr>
<td>01-80-C2-00-00-0E</td>
<td>LLDP</td>
<td>0x88CC</td>
<td>MUST NOT Tunnel</td>
<td>MUST NOT Tunnel</td>
</tr>
</tbody>
</table>
**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

<table>
<thead>
<tr>
<th>Platforms</th>
<th>EPL</th>
<th>EPL</th>
<th>EPLAN</th>
<th>E-TREE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Option 1</td>
<td>Option 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cisco ME3600X, ME3800X,</td>
<td>Supported</td>
<td>Supported</td>
<td>Supported</td>
<td>Supported</td>
</tr>
<tr>
<td>ME3600X24CX</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cisco ASR 903</td>
<td>Supported</td>
<td>Supported</td>
<td>Supported</td>
<td>Supported</td>
</tr>
<tr>
<td>Cisco ASR 9000</td>
<td>Supported</td>
<td>Supported</td>
<td>Supported</td>
<td>Supported</td>
</tr>
<tr>
<td>Cisco 7600</td>
<td>Not Supported</td>
<td>Supported</td>
<td>Supported</td>
<td>Supported</td>
</tr>
</tbody>
</table>

* 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

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

```plaintext
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
```
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
```

<table>
<thead>
<tr>
<th>Destination MAC</th>
<th>Protocol</th>
<th>EP-Tree</th>
<th>With dot1ad uni s-port vpls</th>
</tr>
</thead>
<tbody>
<tr>
<td>01-80-C2-00-00-00</td>
<td>STP/RSTP/MSTP</td>
<td>MUST Tunnel</td>
<td>Yes</td>
</tr>
<tr>
<td>01-80-C2-00-00-01</td>
<td>Pause</td>
<td></td>
<td>X</td>
</tr>
<tr>
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<td>x</td>
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<tr>
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<td>Link OAM</td>
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<tr>
<td>01-80-C2-00-00-02</td>
<td>ESMC</td>
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<tr>
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<td>802.1X</td>
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<td>X</td>
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<tr>
<td>01-80-C2-00-00-04</td>
<td>MAC Specific</td>
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<td>X</td>
</tr>
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<td></td>
<td>Control Protocols</td>
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<td></td>
</tr>
</tbody>
</table>
### 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
```
**Reserved Protocol using DA Mac 0180.C200.000D**

**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

---

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

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

```plaintext
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

```plaintext
ether
net
- 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 evc1
  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 released in December 2013.

EPLAN

Cisco ASR 9000 Configuration

```plaintext
ether
net
- 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

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:

```
<table>
<thead>
<tr>
<th>NNI</th>
<th>EPL/EVPL</th>
<th>UNI</th>
</tr>
</thead>
<tbody>
<tr>
<td>CE --------</td>
<td>ASR9K/7600-----</td>
<td>ME/ASR 903 ---------</td>
</tr>
<tr>
<td>CE2</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
```

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**
12vpn
   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