MEF

Technical Specification
MEF 6.1.1

Layer 2 Control Protocol Handling Amendment to MEF 6.1

January 2012

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This document replaces Section 8 of MEF 6.1.[1] The new Section 8 contains L2CP processing requirements that are in line with the current IEEE standards: 1588-2008, 802.1aj-2009, 802.1AB-2009, and 802.1X-2010 with the exception of the material related to EPL Option 2 that is retained from MEF 6.1., with supplemental information added.

In the document, it is assumed that:

- The UNI for EPL, EP-LAN, EP-Tree behaves as if it were implemented with an IEEE 802.1ad-2005 Provider Bridge S-VLAN Component.

- The UNI for EVPL, EVP-LAN, EVP-Tree behaves as if it were implemented with an IEEE 802.1ad-2005 Provider Bridge C-VLAN Component associated with an IEEE 802.1ad-2005 Provider Bridge S-VLAN Component.

Please note that while MEF 6.1 included requirements for 'All Bridges', requirements for this MAC Group Address are not included in this document. The All LANs Bridge Management Group Address (01-80-C2-00-00-10) has been officially deprecated in 802.1Q-2005, sub-clause 8.13.7. In the unlikely event that a Subscriber may use this MAC Destination Address, MEF services are expected to treat them as Data Service Frames.

Note: Numbered references (in square brackets) in the body of text refer to the MEF 6.1 original document.

Section 8 in MEF 6.1 is replaced by the following text.

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[1] Metro Ethernet Forum, MEF 6.1, *Ethernet Services Definitions – Phase 2, April, 2008.*

8. Layer 2 Control Protocol Processing Requirements (Normative)

This section provides requirements for the processing of a Subscriber's Layer 2 Control Protocol (L2CP) Service Frames[2] for the services defined in this document. The requirements are intended to provide guidance for actual deployments of the Ethernet services defined in this document, while at the same time allowing for flexibility among the Service Provider offerings. The actions defined in this section are in line with IEEE Standards: 802.1aj-2009[3], 802.1AB-2009[4], Precision Timing Protocol (PTP) 1588-2008[5] , 802.1ak-2007[6], and 802.1X-2010[7] and ITU G.8264 with Ethernet Synchronization Messaging Channel (ESMC).[8]

The requirements in this document address Service Frames carrying a MAC Destination Address (DA) within the range 01-80-C2-00-00-00 through 01-80-C2-00-00-0F and 01-80-C2-00-00-20 through 01-80-C2-00-00-2F. The treatment of Service Frames with other MAC DAs is outside of the scope of this Amendment. Requirements in this document apply to untagged and tagged Service Frames.

These recommendations are designed to be in line with standard IEEE 802.1ad-2005 Provider Bridge [10] behaviors. See Section 11, for more discussion of how the MEF terminology maps to IEEE 802.1 terminology with respect to L2CP processing.

For each service, L2CP protocols are configured to 'tunnel', 'peer', or 'discard'. 'Discard' means that the MEN will discard ingress L2CP frames[9]. 'Peer' means that the MEN will actively participate with the protocol[10]. For example, LACP/LAMP, Link OAM, Port Authentication, and E-LMI might be peered by the MEN. 'Tunnel' means that Service Frames containing the protocol will be transported across the MEN to the destination UNI(s) without change.[11]

Sections 8.1 and 8.2 that follow, define the L2CP processing requirements based on the IEEE 802.1 L2CP processing rules. Section 8.1 contains processing rules for the MEF service types of EPL Option 1, EP-Tree, EP-LAN, EVPL, EVP-LAN, and EVP-Tree based on the two-step logic explained below in Figure A. Section 8.2 provides the L2CP processing requirements for Service Frames carrying a MAC DA within the IEEE 802.1ak-2007 (GARP/MRP) range 01-80-C2-00-00-20 through 01-80-C2-00-00-2F. Section 8.3 provides the L2CP processing requirements for

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[2] The term "L2CP Service Frame" is defined in MEF 10.2, Section 6.5.1.4.

[3] IEEE 802.1aj-2009. *IEEE Standard for Local and metropolitan Area Networks – Virtual Bridged Local Area Networks Amendment 11*: *Two-Port Media Access Control (MAC) Relay.* - December 2009.

[4] IEEE P802.1AB-REV/D6.0-2009. *IEEE Standard for Local and metropolitan Area Networks - Station and Media Access Control Connectivity Discovery – June 2009.*

[5] IEEE Std 1588[TM]-2008. *IEEE Standard for a Precision Clock Synchronization Protocol for Networked Measurement and Control Systems* - 27 March 2008, Annex F

[6] IEEE 802.1ak-2007 *IEEE Standard for Local and metropolitan Area Networks –* Virtual Bridged Local Area Networks. Amendment 7: Multiple Registration Protocol

[7] IEEE 802.1X-2010 *IEEE Standard for Local and metropolitan Area Networks. Port-based Network Access Control.Draft - October 2010.*

[8] ITU G.8264-2008. *Distribution of Timing Through Packet Networks* - October 10, 2008

[9] The term 'Discard' is defined in MEF 10.2, Section 7.13.1.

[10] The term 'Peer' is defined in MEF 10.2, Section 7.13.2.

[11] The term 'Tunneling' for L2CP frames is defined in MEF 10.2, Section 6.7.

the EPL Service Type - Option 2. By definition, the EPL Option 2 service is more transparent to L2CP Service Frames than EPL Option 1.

8.1 L2CP Processing Requirements for Service Frames with a MAC DA in the range of

01-80-C2-00-00-00 to -0F

Requirements in this section are applicable only to Service Frames with a MAC DA from the 01-80-C2-00-00-00 through 01-80-C2-00-00-0F range. The action ('tunnel', 'peer', or 'discard') for each L2CP Service Frame will be decided using a two- step logic based, firstly, on the frame's MAC DA and then secondly, on the frame's Ethertype and subtype or LLC code. The logic for processing of the L2CP Service Frames is presented in the Flow Chart in Figure A. Thus, if for the specific frame, based on the frame's MAC DA, Table B or Table C mandates 'tunneling', the frame **MUST** be tunneled. For example, if the frame has MAC DA 01-80-C2-00-00-00, and it is to be carried by the EPL Option1, then tunneling the frame is mandated. If for this frame, based on the frame's MAC DA, Table B or Table C mandate 'peer or discard', the action for the L2CP frame is based on the frame's protocol type (defined by the Ethertype and subtype or LLC code) and is specified in subsequent, service specific tables, Table D, Table E, Table F, Table G, Table H, and Table I.
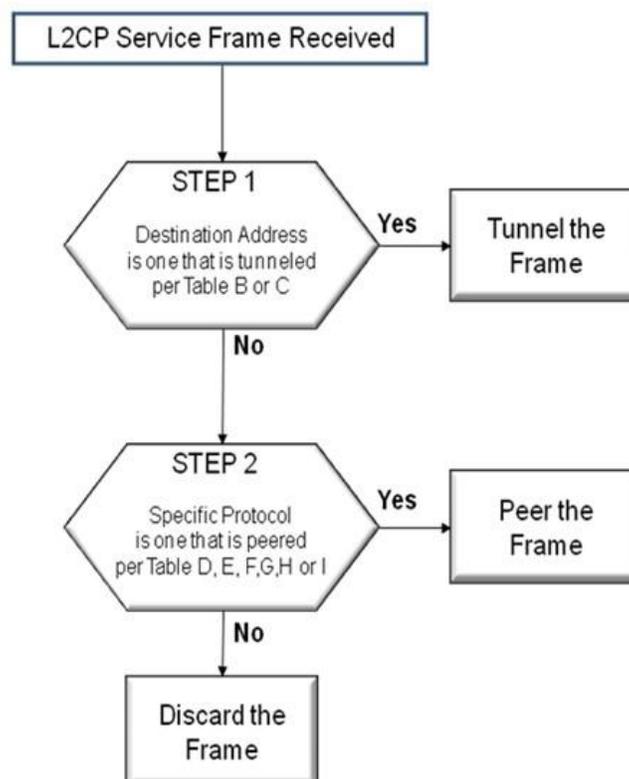

Figure A. The Logic Flow Chart for L2CP Service Frames

The Ethertypes and subtypes for the L2CP protocols discussed in this section are given in Table A below.

Protocol Type	Ethertype/subtype
STP[3]/RSTP[3]/MSTP[4]	NA[12]
PAUSE[5]	0x8808
LACP|LAMP[5]	0x8809/01|02
Link OAM[5]	0x8809/03
Port Authentication[7]	0x888E
E-LMI[9]	0x88EE
LLDP[8]	0x88CC
PTP Peer-Delay[5]	0x88F7
ESMC[8]	0x8809/0A

Table A: L2CP Protocols and Associated Ethertypes and Subtypes

EPL Option 1, EP-Tree, and EP-LAN **MUST** process L2CP Service Frames based on the Destination MAC address as specified in Table B. The first column identifies the MAC DA of the Service Frame used to carry that protocol data unit. The second column specifies the required action.

Destination MAC Address	L2CP Action for EPL, EP-Tree, EP-LAN
01-80-C2-00-00-00[13]	**MUST** Tunnel
01-80-C2-00-00-01 through 01-80-C2-00-00-0A	**MUST NOT** Tunnel (additional requirements may apply as per the sub-sections 8.1.1, 8.1.3, 8.1.5)
01-80-C2-00-00-0B	**MUST** Tunnel
01-80-C2-00-00-0C	**MUST** Tunnel
01-80-C2-00-00-0D	**MUST** Tunnel
01-80-C2-00-00-0E	**MUST NOT** Tunnel (additional requirements may apply as per the sub-sections 8.1.1, 8.1.3, 8.1.5)
01-80-C2-00-00-0F	**MUST** Tunnel

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[12] STP/RSTP/MSTP are 802.2 LLC frames, not Ethernet II type frames, and are determined by the LLC header information, not Ethertype and subtype.
[13] Since not all CEs in an EP-Tree service will see all BPDUs undesirable behavior may ensue. Service Providers should be careful to warn Subscribers about attaching bridges to such a service and expecting xSTP to work properly.

Table B: L2CP Processing Requirements for EPL, EP-LAN and EP-Tree Services

EVPL, EVP-Tree, and EVP-LAN **MUST** process L2CP Service Frames based on the MAC DA as specified in Table C. The first column identifies the MAC DA of the Service Frame used to carry that protocol data unit. The second column specifies the required action.

Destination MAC Address	L2CP Action for EVPL, EVP-Tree, EVP-LAN
01-80-C2-00-00-00 through 01-80-C2-00-00-0F	**MUST NOT** Tunnel (additional requirements may apply as per the subsections 8.1.2, 8.1.4, 8.1.6)

Table C: L2CP Action for EVPL, EVP-Tree, EVP-LAN Services

8.1.1 L2CP Processing Requirements for Ethernet Private Line (EPL) Option 1 Service

In the EPL Option 1 service, L2CP Service Frames for which Table B does not require Tunneling **MUST** be processed as specified in Table D. The first column identifies the standard protocol. The second column specifies the required action. Recall that the two-step logic will not always lead to this table. For example, the action for a frame with MAC DA 01-80-C2-00-00-00 that is carrying xSTP protocol is dictated by Table B.

Protocol Type	L2CP action
STP[3]/RSTP[3]/MSTP[4]	**MUST** Peer on all UNIs or Discard on all UNIs
PAUSE[5]	**MUST** Discard on all UNIs
LACP/LAMP[5]	**MUST** Peer or Discard per UNI
Link OAM[5]	**MUST** Peer or Discard per UNI
Port Authentication[7]	**MUST** Peer or Discard per UNI
E-LMI[9]	**MUST** Peer or Discard per UNI
LLDP[8]	**MUST** Peer or Discard per UNI
PTP Peer Delay[5]	**MUST** Peer or Discard per UNI
ESMC[8]	**MUST** Peer or Discard per UNI

Table D: L2CP Processing Requirements for the EPL Option 1 Service

8.1.2 L2CP Requirements for Ethernet Virtual Private Line (EVPL) Service

In the EVPL service, L2CP Service Frames for which Table C does not require Tunneling **MUST** be processed as specified in Table E. The first column identifies the standard protocol. The second column specifies the required action.

Protocol Type	L2CP Action
STP[3]/RSTP[3]/MSTP[4]	**MUST** Peer on all UNIs or Discard on all UNIs
PAUSE[5]	**MUST** Discard on all UNIs
LACP/LAMP[5]	**MUST** Peer or Discard per UNI
Link OAM[5]	**MUST** Peer or Discard per UNI
Port Authentication[7]	**MUST** Peer or Discard per UNI
E-LMI[9]	**MUST** Peer or Discard per UNI
LLDP[8]	**MUST** Discard on all UNIs
PTP Peer Delay[5]	**MUST** Peer on all UNIs or Discard on all UNIs
ESMC[8]	**MUST** Peer or Discard per UNI

Table E: L2CP Processing Requirements for the EVPL Service

8.1.3 L2CP Requirements for Ethernet Private LAN (EP-LAN) Service

In the EP-LAN service, L2CP Service Frames for which Table B does not require Tunneling **MUST** be processed as specified in Table F. The first column identifies the standard protocol. The second column specifies the required action. Recall that the two-step logic will not always lead to this table. For example, the action for a frame with MAC DA 01-80-C2-00-00-00 that is carrying xSTP protocol is dictated by Table B.

Protocol Type	L2CP action
STP[3]/RSTP[3]/MSTP[4]	**MUST** Peer on all UNIs or Discard on all UNIs
PAUSE[5]	**MUST** Discard on all UNIs
LACP/LAMP[5]	**MUST** Peer or Discard per UNI
Link OAM[5]	**MUST** Peer or Discard per UNI
Port Authentication[7]	**MUST** Peer or Discard per UNI
E-LMI[9]	**MUST** Peer or Discard per UNI
LLDP[8]	**MUST** Discard on all UNIs
PTP Peer Delay[5]	**MUST** Peer on all UNIs or Discard on all UNIs
ESMC[8]	**MUST** Peer or Discard per UNI

Table F: L2CP Processing Requirements for the EP-LAN Service

8.1.4 L2CP Requirements for Ethernet Virtual Private LAN (EVP-LAN) Service

In the EVP-LAN service, L2CP Service Frames for which Table C does not require Tunneling **MUST** be processed as specified in Table G. The first column identifies the standard protocol. The second column specifies the required action.

Protocol Type	L2CP action
STP[3]/RSTP[3]/MSTP[4]	**MUST** Peer on all UNIs or Discard on all UNIs
PAUSE[5]	**MUST** Discard on all UNIs
LACP/LAMP[5]	**MUST** Peer or Discard per UNI
Link OAM[5]	**MUST** Peer or Discard per UNI
Port Authentication[7]	**MUST** Peer or Discard per UNI
E-LMI[9]	**MUST** Peer or Discard per UNI
LLDP[8]	**MUST** Discard on all UNIs
PTP Peer Delay[5]	**MUST** Peer on all UNIs or Discard on all UNIs
ESMC[8]	**MUST** Peer or Discard per UNI

Table G: L2CP Processing Requirements for the EVP-LAN Service

8.1.5 L2CP Requirements for Ethernet Private Tree LAN (EP-Tree) Service

In the EP-Tree service, L2CP Service Frames for which Table B does not require Tunneling **MUST** be processed as specified in Table H. The first column identifies the standard protocol. The second column specifies the required action. Recall that the two-step logic will not always lead to this table. For example, the action for a frame with MAC DA 01-80-C2-00-00-00 that is carrying xSTP protocol is dictated by Table B.

Protocol Type	L2CP action
STP[3]/RSTP[3]/MSTP[4]	**MUST** Peer on all UNIs or Discard on all UNIs
PAUSE[5]	**MUST** Discard on all UNIs
LACP/LAMP[5]	**MUST** Peer or Discard per UNI
Link OAM[5]	**MUST** Peer or Discard per UNI
Port Authentication[7]	**MUST** Peer or Discard per UNI
E-LMI[9]	**MUST** Peer or Discard per UNI
LLDP[8]	**MUST** Discard on all UNIs
PTP Peer Delay[5]	**MUST** Peer on all UNIs or Discard on all UNIs
ESMC[8]	**MUST** Peer or Discard per UNI

Table H: L2CP Processing Requirements for the EP-Tree Service

8.1.6 L2CP Requirements for Ethernet Private Tree LAN (EVP-Tree) Service

In the EVP-Tree service, L2CP Service Frames for which Table C does not require Tunneling MUST be processed as specified in Table I. The first column identifies the standard protocol. The second column specifies the required action.

Protocol Type	L2CP action
STP[3]/RSTP[3]/MSTP[4]	**MUST** Peer on all UNIs or Discard on all UNIs
PAUSE[5]	**MUST** Discard on all UNIs
LACP/LAMP[5]	**MUST** Peer or Discard per UNI
Link OAM[5]	**MUST** Peer or Discard per UNI
Port Authentication[7]	**MUST** Peer or Discard per UNI
E-LMI[9]	**MUST** Peer or Discard per UNI
LLDP[8]	**MUST** Discard on all UNIs
PTP Peer Delay[5]	**MUST** Peer on all UNIs or Discard on all UNIs
ESMC[8]	**MUST** Peer or Discard per UNI

Table I: L2CP Processing Requirements for the EVP-Tree Service

8.2 L2CP Requirements for Processing of Service Frames with MAC DA of 01-80-C2-00-00-20 to -2F

Requirements in this section are applicable only to Service Frames with the MAC DA from the 01-80-C2-00-00-20 through 01-80-C2-00-00-2F Block, which are the IEEE 802.1ak-2007 Multicast Registration Protocols (MRP). The Service Frames with the MAC DA from this block will be processed as specified in Table J. The first column identifies the service type. The second column identifies the required action.

Service Type	L2CP action
EPL, EP-LAN, EP-Tree	**MUST** Tunnel on all UNIs
EVPL, EVP-LAN, EVP-Tree	**SHOULD** Peer on all UNIs or Tunnel on all UNIs

Table J: L2CP Processing Requirements for MRP Protocols

In defining the proper L2CP action specified in Table J one must consider MEF 10.2 requirements for processing of Service Frames. According to MEF 10.2, tunneling a L2CP frame must be done via the EVC that the frame maps to via the CE-VLAN ID/EVC Map. If an untagged frame ingresses at a UNI and if the CE-VLAN ID/EVC Map does not contain the CE-VLAN ID for untagged/priority tagged frames, MEF 10.2 mandates that the frame be discarded. If the CE-

VLAN ID/EVC Map does contain the CE-VLAN ID for untagged/priority tagged frames, then MEF 10.2 mandates that the frame be tunneled on just that associated EVC.

8.3   L2CP Requirements for Ethernet Private Line (EPL) Option 2 Service

Requirements in this section are applicable only to L2CP Service Frames in the EPL Option 2 service. The EPL Option 2 service does not follow the two-step logic detailed in Section 8.1 as it must align with 6.1 L2CP processing requirements that are NOT in line with the current IEEE standards: 1588-2008, 802.1aj-2009, 802.1AB-2009, and 802.1X-2010. EPL Option 2 **MUST** process L2CP Service Frames as specified in Table K. The first column of Table K identifies the L2CP protocol. The second column identifies the MAC DA in the Service Frame used to carry that protocol data unit. The third column specifies the required action. The fourth column specifies the applicability, i.e., whether the action taken must be the same at all UNIs in the EVC or can be different on different UNIs in the EVC.

Protocol Type	MAC DA	L2CP Action	Applicability
STP[3]/RSTP[3]/MSTP[4]	01-80-C2-00-00-00	**MUST** Tunnel	All UNIs in the EVC
PAUSE[5]	01-80-C2-00-00-01	**SHOULD** Discard	All UNIs in the EVC
LACP/LAMP[5]	01-80-C2-00-00-02	**SHOULD** Tunnel	All UNIs in the EVC
Link OAM[5]	01-80-C2-00-00-02	**SHOULD** Tunnel	All UNIs in the EVC
Port Authentication[7]	01-80-C2-00-00-03	**SHOULD** Tunnel	All UNIs in the EVC
E-LMI[9]	01-80-C2-00-00-07	**MUST** Tunnel[14]	All UNIs in the EVC
LLDP[8]	01-80-C2-00-00-0E	**MUST** Tunnel	All UNIs in the EVC
PTP Peer Delay[5]	01-80-C2-00-00-0E	**MUST** Tunnel	All UNIs in the EVC
ESMC[8]	01-80-C2-00-00-02	**SHOULD** Tunnel[15]	All UNIs in the EVC
GARP[4]/MRP[17] Block	01-80-C2-00-00-20 through 01-80-C2-00-00-2F	**MUST** Tunnel	All UNIs in the EVC

Table K: L2CP Processing Requirements for the EPL Option 2 Service

[14] When using EPL Option 2, it is recommended for the Subscriber to turn off E-LMI in the equipment that is attached to the UNI. Trying to run E-LMI with EPL Option 2 in this equipment may lead to unpredictable results.
[15] When using EPL Option 2, it is recommended for the Subscriber to turn off ESMC in the equipment that is attached to the UNI. Trying to run ESMC with EPL Option 2 in this equipment may lead to unpredictable results. Tunneled ESMC frames may not accurately represent the state of the timing attributes of the physical interface the Subscriber interface is attached to.