



User Network Interface (UNI) Type 2 Implementation Agreement

Version 3.0

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1. Abstract

This document specifies an Implementation Agreement (IA) for MEF User to Network Interface (UNI) Type 2. This Implementation Agreement adds new functionalities to MEF UNI Type 1 [MEF13], such as E-LMI based on [MEF16], Link OAM based on clause 57 of [802.3], Service OAM based on [Y.1731], Protection based on clause 43 of [802.3], and Link Security based on [802.1AE].

Deleted: i...a...(IA) ...e...main objective of this version ...is to specify the MEF UNI characteristics and operation in which UNI-C is automatically configured by UNI-N. Additional objectives include support for Ethernet OAM (802.3ah, 802.1ag) over the UNI. This IA requires software or hardware upgrade to existing Ethernet devices (switch, router, workstation, etc) that support UNI Type 1 (MEF 13). The main functionality of this IA is to allow UNI-C to automatically discover the services offered by service provider, and to be able to configure itself using the traffic parameters that are supplied by UNI-N via E-LMI. Additionally this IA specifies functionalities needed to support the new service attributes defined by Ethernet Service Attributes, Phase 2 (ESA-2). The UNI Type 2 mode adds management-plane capabilities to UNI Type 1 (MEF 13), without adding control-plane capabilities such as dynamic connection setup. ... [1]

2. Terminology

Term	Definition
<u>AIS</u>	<u>Alarm Indication Signal</u>
<u>BW</u>	<u>Bandwidth</u>
<u>CCM</u>	<u>Connectivity Check Message</u>
<u>CE</u>	<u>Customer Equipment</u>
<u>CE-VLAN ID</u>	The identifier derivable from the content of a Service Frame that allows the Service Frame to be associated with an EVC at the UNI.
<u>Controlled port</u>	<u>An Ethernet port that is controlled by MAC Security (802.1AE)</u>
<u>CoS</u>	<u>Class of Service</u>
<u>Customer-ME</u>	<u>Customer Maintenance Entity</u>
<u>DTE</u>	<u>Data Terminal Equipment</u>
<u>Dual-ended</u>	<u>One-way</u>
<u>E-LMI</u>	<u>Ethernet Link management Interface</u>
<u>ETH-LM</u>	<u>Ethernet Loss Measurement</u>
<u>E-Tree</u>	<u>A type of Ethernet services that is P2MP.</u>
<u>EVC</u>	<u>Ethernet Virtual Connection, and association between two or more UNIs for the purpose of delivering Ethernet services.</u>
<u>IA</u>	<u>Implementation Agreement</u>
<u>LAG</u>	<u>Link Aggregation Group</u>
<u>LBM</u>	<u>Loopback Message</u>
<u>LBR</u>	<u>Loopback Reply</u>
<u>Leaf</u>	<u>A leaf node of an E-Tree EVC</u>
<u>Link OAM</u>	<u>OAM specific to a single link as per 802.3 clause 57.</u>
<u>LTM</u>	<u>Link Trace Message</u>
<u>LTR</u>	<u>Link Trace Reply</u>
<u>ME</u>	<u>Maintenance Entity</u>
<u>ME-Level</u>	<u>Maintenance Entity Level</u>
<u>MEP</u>	<u>Maintenance Entity End Point</u>
<u>MIP</u>	<u>Maintenance Entity Intermediate Point</u>
<u>MTU</u>	<u>Maximum Transfer Unit</u>
<u>OAM</u>	<u>Operation and Management</u>
<u>PE</u>	<u>Provider Equipment</u>
<u>RDI</u>	<u>Reverse Defect Identification</u>
<u>Root</u>	<u>A Root node of an E-Tree EVC</u>
<u>Service OAM</u>	<u>OAM based on Y.1731</u>
<u>Single-ended</u>	<u>Two-way</u>
<u>SLS</u>	<u>Service Level Specification</u>

- Deleted: Service Provider** ... [2]
- Deleted: Excess Information R** ... [3]
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- Deleted: Multicast Service Fra** ... [6]
- Deleted: User Network Interfa** ... [7]
- Deleted: CE-VLAN Tag** ... [8]
- Deleted: UNI-EVCID** ... [9]
- Deleted: EIR** ... [10]
- Deleted: Point-to-Point EVC** ... [11]
- Deleted: Ingress Frame** ... [12]
- Deleted: Service Frame** ... [13]
- Deleted: Service Multiplexing** ... [14]
- Deleted: Frame** ... [15]
- Deleted: Excess Burst Size** ... [16]
- Deleted: Multipoint-to-Multipoint EVC** ... [17]
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- Deleted: CPU** ... [19]
- Deleted: EVC Service Activation Time** ... [20]
- Deleted: UNI-EVC** ... [21]
- Deleted: Layer 2 Control Protocol Service Frame** ... [22]
- Deleted: Unicast Service Fra** ... [23]
- Deleted: EVC Availability** ... [24]

Term	Definition
Subscriber	The organization purchasing and/or using Ethernet Services.
Subscriber-ME	Subscriber Maintenance Entity
Uncontrolled port	A port that has no MAC SEC security (generally used for control and management)
UNI	User Network Interface. <u>The physical demarcation point between the responsibility of the Service Provider and the responsibility of the Subscriber</u>
UNI-C	Part of the UNI that is located at Customer Equipment
UNI-ME	UNI Maintenance Entity
UNI-N	Part of the UNI that is located at Service Provider Equipment

3. Scope

3.1 PURPOSE

The purpose of this document is an Implementation Agreement that defines the requirements for UNI Type 2. UNI Type 2 is based on UNI Type 1 [MEF13], with added functionalities. The new functionalities include capability for UNI-C to retrieve EVC status and configuration information including associated service attributes from UNI-N; capability for customer and service provider to check the UNI connectivity as well as verify Service Level Specification (SLS), and capability to protect UNI against failure and possible tampering or misuse.

3.2 UNI TYPES

[MEF 11] introduces 3 types of UNIs: UNI Type 1, UNI Type 2, and UNI Type 3. The UNI Type determines the CE's ability to negotiate and/or retrieve EVC status and attributes from a PE. The following section describes the main operational aspects of these three UNI types:

3.2.1 UNI Type 1

The MEF UNI Type 1 operates in manual configuration mode in which the Service Provider and Subscriber will have to manually configure the UNI-N and UNI-C for services. UNI Type 1 is described in [MEF13].

3.2.2 UNI Type 2

The UNI Type 2 mode of operation allows UNI-C to retrieve EVC status and configuration information from UNI-N. In addition UNI Type 2 adds management, protection and security functionalities beyond those specified in UNI Type 1. UNI Type 2 is the subject of this IA.

3.2.3 UNI Type 3

The UNI Type 3 Mode of operation allows the CE to request, signal and negotiate EVCs and its associated Service Attributes to the UNI-N. UNI Type 3 is out of the scope of this Implementation Agreement and is for further study.

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- ~~Deleted: A performance attribute of an EVC.~~
- ~~Deleted: Egress Frame~~
- ~~Deleted: A frame sent from the Service Provider network to the CE.~~
- ~~Deleted: Frame Delay~~
- ~~Deleted: A performance attribute of an EVC.~~
- ~~Deleted: Ethernet Virtual Connection~~
- ~~Deleted: An association of two or more UNIs that limits the exchange of frames to UNIs in the Ethernet Virtual Connection~~
- ~~Deleted: (UNI Type 2)~~
- ~~Deleted: allows the~~
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- ~~Deleted: and the associated service attributes to the UNI-C, and to allow the customer and service provider to check the UNI connectivity, as well as be able to verify the SLA, and to enable protecting the UNI against failure.~~
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- ~~Deleted: provision, configure~~
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- ~~Deleted: and distribute¶ EVC information and the associated service attributes to the UNI-C. In a manner akin to Frame¶ Relay LMI and ATM ILMI, the UNI-C in UNI Type 2 mode can retrieve c(... [25]~~
- ~~Deleted: This section will be c(... [26]~~

4. Compliance Levels

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in RFC 2119. All key words must be use upper case, bold text.

5. Backward Compatibility

5.1 SUPPORTING UNI TYPE 1

[R1] A UNI-N Type 2 **MUST** support all the mandatory requirements of UNI-N Type 1.1 and UNI-N Type 1.2 as per [MEF13]

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[R2] A UNI-N Type 2 **SHOULD** support all the optional requirements of UNI-N Type 1.1 and UNI-N Type 1.2 as per [MEF13]

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[R3] A UNI-C Type 2 **MUST** support all the mandatory requirements of UNI-C Type 1.1 and UNI-C Type 1.2 as per [MEF13]

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[R4] A UNI-C Type 2 **SHOULD** support all the optional requirements of UNI-C Type 1.1 and UNI-C Type 1.2 as per [MEF13]

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5.2 SUPPORTING UNI TYPE 2

[R5] A UNI-N Type 2 **MUST** support ALL the following UNI-N functionalities:

- 1) E-LMI, as per section 6
- 2) Link OAM, as per section 7.1
- 3) Service OAM, as per section 7.2
- 4) Protection, as per section 8
- 5) Security, as per section 9
- 6) Enhanced UNI Attributes, as per section 10

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[R6] A UNI-C Type 2 **MUST** support ALL the following UNI-C functionalities:

- 1) E-LMI, as per section 6
- 2) Link OAM, as per section 7.1
- 3) Service OAM, as per section 7.2

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- 4) Protection, as per section 8
- 5) Security, as per section 9
- 6) Enhanced UNI Attributes, as per section 10

5.3 SUPPORTING SUBSETS OF UNI TYPE 2

[R7] A UNI-N Type 2, after determining that its peer UNI-C does not support all UNI-C Type 2 functionalities (as specified in R6), **MUST** interoperate with those UNI-C Type 2 functionalities supported by UNI-C.

Note: A UNI-N Type 2 is not required to interoperate with the UNI-C Type 2 functionalities that are partially supported by UNI-C.

[R8] A UNI-C Type 2, after determining that its peer UNI-N does not support all UNI-N Type 2 functionalities (as specified in R5), **MUST** interoperate with those UNI-N Type 2 functionalities supported by UNI-N.

Note: A UNI-C Type 2 is not required to interoperate with the UNI-N Type 2 functionalities that are partially supported by UNI-N.

[R9] A UNI-N Type 2 **SHALL** use the procedures outlined in section 5.6.11.2 of [MEF16] to determine the UNI-C support of E-LMI.

[R10] A UNI-C Type 2 **SHALL** use the procedures outlined in section 5.6.11.1 of [MEF16] to determine the UNI-N support of E-LMI.

[R11] A UNI-N Type 2 **SHALL** use the Link OAM discovery process as outlined in clause 57.3.2.1 of [IEEE 802.3] to determine the peer UNI-C support of Link OAM.

[R12] A UNI-C Type 2 **SHALL** use the Link OAM discovery process as outlined in clause 57.3.2.1 of [IEEE 802.3] to determine the UNI-N support of Link OAM.

[R13] A UNI-N Type 2 **SHALL** use the procedures in clause 57.3.2.1 of [IEEE 802.3] to determine the UNI-C support of Link Aggregation.

[R14] A UNI-C Type 2 **SHALL** use the procedures in clause 57.3.2.1 of [IEEE 802.3] to determine the UNI-N support of Link Aggregation.

[R15] A UNI-N Type 2 **SHALL** use the procedures in section 7.2.3 of this document to determine the UNI-C support of Service OAM for UNI-ME.

[R16] A UNI-C Type 2 **SHALL** use the procedures in section 7.2.3 of this document to determine the UNI-N support of Service OAM for UNI-ME.

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- Deleted: A UNI-N Type 2 learns that its peer UNI-C doesn't fully support UNI-C Type 2 if any of the following conditions is true:¶
- ¶
- a) When UNI-C does not support E-LMI¶
- b) When UNI-C does not support Link OAM¶
- c) When UNI-C does not support Link Aggregation
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- Deleted: learns that its peer UN ... [28]

[R17] A UNI-C Type 2 SHALL use the procedures in section 7.2.3 of this document to determine the UNI-N support of Service OAM for Customer-ME.

6. Supporting E-LMI

[R18] A UNI-N Type 2 MUST support all mandatory UNI-N aspects of E-LMI as specified in [MEF 16].

[R19] A UNI-N Type 2 SHOULD support all optional UNI-N aspects of E-LMI as specified in [MEF 16] with the exception that it MAY disable the Polling Verification Timer.

[R20] A UNI-C Type 2 MUST support all mandatory UNI-C aspects of E-LMI as specified in [MEF 16].

[R21] A UNI-C Type 2 SHOULD support all optional UNI-C aspects of E-LMI as specified in [MEF 16].

7. Supporting Ethernet OAM

7.1 LINK OAM

Link OAM is based on clause 57 of [IEEE 802.3]. Link OAM monitors UNI s operation and health and improves fault isolation. Link OAM frames run between UNI-C and UNI-N. This section lists the Link OAM requirements for UNI-N and UNI-C.

[R22] A UNI-N Type 2 MUST support Active DTE mode capabilities as specified in clause 57.2.9 of [IEEE 802.3] and summarized in Table 1 of this IA.

[R23] A UNI-C Type 2 MUST support Passive DTE mode capabilities as specified in clause 57.2.9 of [IEEE 802.3] and summarized in Table 1 of this IA.

[R24] A UNI-C Type 2 MAY support Active DTE mode capabilities as specified in clause 57.2.9 of [IEEE 802.3] and summarized in Table 1 of this IA.

[R25] A UNI-N Type 2 SHOULD support unidirectional OAM operation as per clause 57.2.12 of [IEEE 802.3], when the UNI is one of the physical layers specified in clause 66 of [IEEE 802.3].

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 ¶ a) When UNI-N does not support E-LMI ¶
 b) When UNI-N does not support Link OAM ¶
 c) When UNI-N does not support Link Aggregation ¶
 d) When UNI-N does not support customer service OAM MIP ¶
 ¶
 <#>A UNI-C Type 2 learns that its peer UNI-N does not support E-LMI, when no Status message has been received from UNI-N in response to E-LMI Status Inquiry messages sent by UNI-C.¶
 ¶
 <#>A UNI-C Type 2 learns that its peer UNI-N does not support Link OAM, when Link OAM discovery is not successful as per clause 57.3.2.1 of IEEE 802.3-2004¶
 ¶
 <#>A UNI-C Type 2 learns that its peer UNI-N does not support Link ... [29]

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 <#>¶ ... [33]

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[R26] A UNI-C Type 2 **SHOULD** support unidirectional OAM operation as per clause 57.2.12 of [IEEE 802.3], when the UNI is one of the physical layers specified in clause 66 of [IEEE 802.3].

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[R27] A UNI-N and UNI-C Type 2 **MUST** be able to turn off the 802.3x (PAUSE) frame generation to enable proper Link OAM operation over the UNI as per clause 57.1.5.3 of [IEEE 802.3].

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Deleted: A Type 2 UNI-C **SHOULD** support unidirectional link operation, when the UNI PHY is one of the physical layers specified in clause 66 of [EFM].¶
 ¶
 A Type 2 UNI-N **MUST** support unidirectional link operation, when the UNI PHY is 1000BASE-X used in a 1000BASE-PX network (P2MP), as specified in clause 65 of [EFM].¶
 ¶
 <#>A Type 2 UNI-N and UNI-C **MUST** be able to turn off the 802.3x (PAUSE) frame generation. ¶
 ¶

Table 1 – UNI-N and UNI-C Link OAM Capabilities Summary

Capability	UNI-N	UNI-C
Initiates OAM Discovery process	<u>MUST</u>	<u>MAY</u>
Reacts to OAM Discovery process initiation	<u>MUST</u>	<u>MUST</u>
Required to send Information OAMPDUs	<u>MUST</u>	<u>MUST</u>
Permitted to send Event Notification OAMPDUs	<u>MUST</u>	<u>MUST</u>
Permitted to send Variable Request OAMPDUs	<u>MUST</u>	<u>MAY</u>
Permitted to send Variable Response OAMPDUs	<u>MUST</u>	<u>MUST</u>
Permitted to send Loopback Control OAMPDUs	<u>MUST</u>	<u>MAY</u>
Reacts to Loopback Control OAMPDUs	<u>MUST</u>	<u>MUST</u>
Permitted to send Organization Specific OAMPDUs	<u>MUST</u>	<u>MUST</u>
Support Unidirectional OAM operation	<u>SHOULD</u>	<u>SHOULD</u>
Support turning off PAUSE frame generation	<u>MUST</u>	<u>MUST</u>

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Deleted: The scope of this version of the document is single-hop UNI. Multi-interface UNI (e.g. dual-homed, multi-homed) and Multi-hop UNI (e.g. SNI interfaced UNI) are all out of scope of this version of the document.

7.2 SERVICE OAM

The service OAM is based on [Y.1731]. This documents specifies the requirements for the UNI-N and UNI-C in order to support the UNI Maintenance Entity (UNI-ME) that spans between UNI-C and UNI-N, and to support Customer Maintenance Entities that span between two UNI-Cs. It is assumed that the UNI-ME has 1:N relationship with Subscriber-MEs.

UNI-ME support is required especially for cases where UNI-N is not directly connected to UNI-C (e.g., when a demarcation device is between UNI-N and UNI-C).

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Connectivity Fault Management¶

This section specifies various functions that need to be supported by UNI-N and UNI-C in order to detect and diagnose connectivity faults.¶

¶
 (Editor: Most of the requirements in this section are top-level requirements, which need to be broken down to specific Implantation requirements, which should include the specific OAM frame type, MEG level, DA, etc)

7.2.1 UNI-ME Support

This section lists the UNI-C and UNI-N requirements for supporting a UNI Maintenance Entity (UNI-ME) between UNI-N and UNI-C.

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[R28] A UNI-N Type 2 **MUST** support a MEP for UNI-ME.

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¶
 (Editor's note: Since Link OAM does the job of UNI ME, it seems that this requirement should not be a MUST requirement)

[R29] A UNI-N Type 2 **MUST** support a configurable ME-level for UNI-N MEP corresponding to UNI-ME, from the permitted Operator ME-levels as specified in section 5.6 of [Y.1731]. The default value **MUST** be set to “0”.

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[R30] A UNI-C Type 2 **MUST** support a MEP for UNI-ME.

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[R31] A UNI-C Type 2 **MUST** support a configurable ME-level for UNI-C MEP corresponding to UNI-ME, from the permitted Operator ME-levels as specified in section 5.6 of [Y.1731]. The default value **MUST** be set to “0”.

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7.2.2 Subscriber-ME Support

[R32] A UNI-N Type 2 **MUST** support a MIP for a Subscriber-ME.

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Deleted: The MEG Level of...the s... [37]

[R33] A UNI-N Type 2 **MUST** support a minimum number of UNI-N MIPs corresponding to subscriber-MEs, which is greater than or equal to the minimum number of EVCs supported on that UNI as per section 6.2.1 of [MEF 13], so that at least one MIP could be associated with each EVC.

Deleted: **MUST** be configurable¶ (Editor: We should state which MEG levels are valid, for example 5, 6 and 7)¶

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Deleted: UNI-N MIP **MUST**

[R34] A UNI-N Type 2 **MUST** support a configurable ME-level for each UNI-N MIP corresponding to a Subscriber-ME, from the permitted Customer-ME levels as specified in section 5.6 of [Y.1731]. The default value **MUST** be set to “1”.

Deleted: the ...frames... [38]

[R35] A UNI-N Type 2 **SHOULD** have the capability to rate limit selected OAM flows that are received from UNI-C, by specifying either the bit rate in granularity of Kilo-bits per second or the frame rate with granularity of 1 frame per second.

Deleted: <#>UNI-C MEP¶

¶ <#>UNI-C **SHOULD** support a MEP for UNI ME.¶

¶ <#>The MEG Level of the UNI-C MEP corresponding to the UNI ME **MUST** be configurable.¶ (Editor: We should state which MEG levels are valid, for example 0,1 and 2)

Note 1: Complete drop of a particular OAM flow is considered rate limiting to 0 Kb/s or 0 frame/s.

Note 2: This requirement is meant to improve security and prevent DoS attacks.

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7.2.3 Fault Management Support

[R36] A UNI-N Type 2 **MUST** be able to generate CCM toward UNI-C on UNI-ME with configurable rate as specified in [Y.1731].

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[R37] A UNI-N Type 2 **MUST** be able to process received CCM from UNI-C on UNI-ME with configurable rate as specified in [Y.1731].

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[R38] A UNI-N Type 2 **MUST** be able to generate LBM toward UNI-C on UNI-ME, as specified in [Y.1731].

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- [\[R39\]](#) A UNI-N Type 2 **MUST** be able to process received LBM from UNI-C on UNI-ME and generate LBR on UNI-ME, as specified in [Y.1731].
- [\[R40\]](#) A UNI-N Type 2 **MUST** be able to generate LTM toward UNI-C on UNI-ME, as specified in [Y.1731].
- [\[R41\]](#) A UNI-N Type 2 **MUST** be able to process received LTM from UNI-C on UNI-ME and generate LTR on UNI-ME, as specified in [Y.1731].
- [\[R42\]](#) A UNI-N Type 2, upon detection of a fault in UNI ME, **MUST** be able to generate AIS on Subscriber-MEs, as specified in [Y.1731].
- [\[R43\]](#) A UNI-N Type 2, upon detection of a fault in UNI ME, **MUST** be able to generate RDI toward UNI-C on UNI-ME, as specified in [Y.1731].
- [\[R44\]](#) A UNI-C Type 2 **MUST** be able to generate CCM toward UNI-N on UNI-ME with configurable rate as specified in [Y.1731].
- [\[R45\]](#) A UNI-C Type 2 **MUST** be able to process received CCM from UNI-N on UNI-ME with configurable rate as specified in [Y.1731].
- [\[R46\]](#) A UNI-C Type 2 **MUST** be able to generate LBM toward UN-N on UNI-ME, as specified in [Y.1731].
- [\[R47\]](#) A UNI-C Type 2 **MUST** be able to process received LBM from UNI-N on UNI-ME and generate LBR on UNI-ME, as specified in [Y.1731].
- [\[R48\]](#) A UNI-C Type 2 **MUST** be able to generate LTM toward UNI-N on UNI-ME, as specified in [Y.1731].
- [\[R49\]](#) A UNI-C Type 2 **MUST** be able to process received LTM from UNI-N on UNI-ME and generate LTR on UNI-ME, as specified in [Y.1731].
- [\[R50\]](#) A UNI-C Type 2, upon detection of a fault in UNI ME, **MUST** be able to generate AIS on Subscriber-MEs, as specified in [Y.1731].
- [\[R51\]](#) A UNI-C Type 2, upon detection of a fault in UNI ME, **MUST** be able to generate RDI toward UNI-N on UNI-ME, as specified in [Y.1731].

7.2.4 Performance Management Support

Since the delay and delay variation across UNI negligible, there is no requirement for UNI-C and UNI-N to support any delay or delay variation measurement in this version of the IA.

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Deleted: to the UNI-C MEP in the UNIME¶
 ¶
 (Editor's note: Assuming UNI ME is optional, then the MUST requirement should be changed to MAY/SHOULD)¶
 ¶
 <#>UNI-C MEP **MUST** be able to detect Loss of continuity to the UNI-N MEP in the UNI ¶
 ME¶
 ¶
 (Editor's note: Assuming UNI ME is optional, then the MUST requirement should be changed to MAY/SHOULD)¶
 ¶
 <#>UNI-N MEP **SHOULD** able to detect presence of Loop from UNI-N towards UNI-C¶
 ¶
 <#>UNI-C MEP **SHOULD** be able to detect presence of Loop ¶
 <#>from UNI-C towards UNI-N¶
 <#>¶
 (Editor: We should state which type of OAM PDU and with what parameters must be used)¶
<#>On-demand Fault Detection/Verification¶
 (Editor: In this subsection we should state which type of OAM PDUs and with what parameters must be used)¶
 ¶
 <#>UNI-N MEP **MUST** be able to detect/verify Loss of connectivity to the UNI-C MEP in the UNI ME¶
 ((Editor's note: Assuming UNI N ... [42])

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7.2.4.1 Single-ended Frame Loss

[R52] A UNI-N Type 2 MUST be able to generate LMM toward UNI-C and processes received LMR from UNI-C on UNI-ME and calculate single-ended UNI frame loss as specified in [Y.1731].

[R53] A UNI-N Type 2 MUST be able to process received LMM from UNI-C and generate LMR on UNI-ME, as specified in [Y.1731].

[R54] A UNI-C Type 2 SHOULD be able to generate LMM toward UNI-N and processes received LMR from UNI-N on UNI-ME and calculate single-ended UNI frame loss as specified in [Y.1731].

[R55] A UNI-C Type 2 MUST be able to process received LMM from UNI-N and generate LMR on UNI-ME, as specified in [Y.1731].

7.2.4.2 Dual-ended Frame Loss

[R56] A UNI-N Type 2 MUST be able to generate dual-ended ETH-LM CCM toward UNI-C on UNI-ME, as specified in [Y.1731].

[R57] A UNI-N Type 2 MUST be able to process received dual-ended ETH-LM CCM from UNI-C on UNI-ME and calculate dual-ended UNI frame loss as specified in [Y.1731].

[R58] A UNI-C Type 2 SHOULD be able to generate dual-ended ETH-LM CCM toward UNI-N on UNI-ME, as specified in [Y.1731].

[R59] A UNI-C Type 2 SHOULD be able to process received dual-ended ETH-LM CCM from UNI-N on UNI-ME and calculate dual-ended UNI frame loss as specified in [Y.1731].

8. Supporting Protection

This section specifies requirements for UNI-N and UNI-C to enable protecting the UNI, in case of a failure.

[R60] A UNI-N and UNI-C Type 2 SHALL support Link Aggregation as specified in clause 43 of [IEEE 802.3], for UNI protection.

[R61] A UNI-N and UNI-C Type 2 MUST support two (2) links in the Link Aggregation group (LAG). They MAY support four (4) or eight (8) links. The speeds of links MUST be identical.

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Deleted: UNI-C MEP SHOULD have capability to measure single-ended Frame Loss for all Service Frames associated with a particular CoS Identifier between the UNI-C and UNI-N during a time interval T¶

¶ <#>UNI-N MEP MUST have capability to measure dual-ended Frame Loss for all Service Frames associated with a particular CoS Identifier between the UNI-N and UNI-C during a time interval T¶

<#>UNI-C MEP SHOULD have capability to measure dual-ended Frame Loss for all Service Frames associated with a particular CoS Identifier between the UNI-C and UNI-N during a time interval T¶

<#>Supporting CoS Identifier¶ (Editor note: Specify requirements related to a Class of Service identifier (e.g., to enable the UNI-N to communicate the CoS (gold, silver, bronze) for a given service instance to the UNI-C. This would probably require new TLV... [43])

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¶ ... [44]

[R62] A UNI-N and UNI-C Type 2 **SHOULD** map the frames belonging to the same EVC to the same link in the LAG.

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[R63] A UNI-N and UNI-C Type 2 **MAY** map the frames with the same CE-VLAN ID to the same link in the LAG.

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9. Supporting Security

[R64] A UNI-N and UNI-C Type 2 **MUST** support controlled and uncontrolled ports as specified in [802.1AE].

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[R65] A UNI-N and UNI-C Type 2 **MUST** support Data Origin Authenticity as specified in [802.1AE].

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[R66] A UNI-N and UNI-C Type 2 **MUST** Integrity Protection as specified in [802.1AE].

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[R67] A UNI-N and UNI-C Type 2 **MAY** support Confidentiality Protection as specified in [802.1AE].

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10. Supporting Enhanced UNI Attributes

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[R68] A UNI-N Type 2 **MUST** support Per-UNI, Per-EVC and Per-CoS Egress BW profiling as specified in [ESA2].

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[R69] A UNI-N Type 2 **MUST** support an MTU that is greater than or equal to the UNI MTU Attribute as specified in section 7.4 of [ESA2].

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[R70] A UNI-C Type 2 **MUST** support an MTU that is greater than or equal to the UNI MTU Attribute as specified in section 7.4 of [ESA2].

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[R71] A UNI-N Type 2 **MUST** support both Root and Leaf functions of E-Tree service type, as specified in [ESA2].

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[R72] A UNI-C Type 2 **MUST** support both Root and Leaf functions of E-Tree service type, as specified in [ESA2].

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[R73] A UNI-N and UNI-C Type 2 **MUST** support Auto-negotiation for 10/100 and 10/100/1000 UNI rates.

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References

Reference	Reference Details
MEF 11	Metro Ethernet Forum UNI Requirements and Frame work, Nov 2004
MEF 13	Metro Ethernet Forum, UNI Type 1, Nov 2005
MEF 16	Metro Ethernet Forum, Ethernet Local Management Interface (E-LMI), Jan 2006
IEEE 802.3	IEEE, Carrier sense multiple access with collision detection (CSMA/CD) access method and physical layer specifications, Dec 2005
IEEE 802.1AE	IEEE, Media Access Control (MAC) Security, Aug 2006
ESA2	Metro Ethernet Forum, Ethernet Service Attributes, Phase 2

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(Editor note: Requirements related to Authentication and Authorization of customers as well as encryption on UNI.)

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11. Appendix

11.1 REVISION HISTORY

Rev	Date	Change Description
0.0	13-Feb-06	First draft.
0.3	12-Apr-06	Second draft
1.0	Apr 2006	First approved draft
2.0	July 2006	Second draft
3.0	Oct 2006	3rd draft

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i

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a

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(IA)

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e

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main objective of this version

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is to specify the MEF UNI characteristics and operation in which UNI-C is automatically configured by UNI-N. Additional objectives include support for Ethernet OAM (802.3ah, 802.1ag) over the UNI. This IA requires software or hardware upgrade to existing Ethernet devices (switch, router, workstation, etc) that support UNI Type 1 (MEF 13). The main functionality of this IA is to allow UNI-C to automatically discover the services offered by service provider, and to be able to configure itself using the traffic parameters that are supplied by UNI-N via E-LMI. Additionally this IA specifies functionalities needed to support the new service attributes defined by Ethernet Service Attributes, Phase 2 (ESA-2). The UNI Type 2 mode adds management-plane capabilities to UNI Type 1 (MEF 13), without adding control-plane capabilities such as dynamic connection setup.

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Service Provider

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The organization providing Ethernet Service(s).

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Excess Information Rate

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A measure of long term average bit rate for a set of Service Frames at the UNI.

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EVC Mean Time to Restore

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A performance attribute of an EVC.

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Frame Jitter

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A performance attribute of an EVC.

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Multicast Service Frame

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A Service Frame that has a multicast destination MAC address.

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User Network Interface

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The physical demarcation point between the responsibility of the Service Provider and the responsibility of the Subscriber

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CE-VLAN Tag

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The whole 802.1Q tag of customer service frames over the UNI.

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UNI-EVCID

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The ID that identifies the part of the EVC between the UNI-N and UNI-C. This can be derived from CE-VLAN ID, Physical Port, TRANs Tag or combination of these.

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Excess Information Rate

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Point-to-Point EVC

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An EVC with exactly 2 UNIs.

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Ingress Frame

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A frame sent from the CE into the Service Provider network.

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Service Frame

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An Ethernet frame transmitted across the UNI toward the Service Provider or an Ethernet frame transmitted across the UNI toward the Subscriber.

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Service Multiplexing

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A UNI attribute in which the UNI can be in more than one EVC instance.

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Frame

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Short for Ethernet frame.

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Excess Burst Size		
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A measure of the amount of bytes sent in back-to-back Service Frames at the UNI		
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Multipoint-to-Multipoint EVC		
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An EVC with two or more UNIs.		
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EBS		
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Excess Burst Size		
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CPU		
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Central Processing Unit		
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EVC Service Activation Time		
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A performance attribute of an EVC.		
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UNI-EVC		
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The part of the EVC between the UNI-N and UNI-C		
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Layer 2 Control Protocol Service Frame		
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A Service Frame that is used for Layer 2 control, e.g., Spanning Tree Protocol.		
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Unicast Service Frame		
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A Service Frame that has a unicast destination MAC address.		
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EVC Availability		
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A performance attribute of an EVC.		
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and distribute

EVC information and the associated service attributes to the UNI-C. In a manner akin to Frame

Relay LMI and ATM ILMI, the UNI-C in UNI Type 2 mode can retrieve certain information from the network through an automated link management interface. The customer equipment (CE) is able to communicate with Service Provider equipment to ascertain the properties of a given EVC, such as the availability and status of the EVC that exist at the UNI. Upon initialization, the CE uses the link management interface to learn about the EVCs at a given UNI and configures itself appropriately for those EVCs.

It is worth noting that the link management interface in UNI Type 2 mode is valuable both to Service Providers and to Subscribers. The automated capability significantly reduces turn-up time, turn-up cost, and turn-up errors, providing a much preferable alternative to the often-inefficient manual provision process. UNI Type 2 is the subject of this Implementation Agreement.

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This section will be completed in future versions of this document.

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does not support Link OAM, when Link OAM discovery is not successful as per clause 57.3.2.1 of IEEE 802.3-2004

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learns that its peer UNI-C does not support Link Aggregation, when UNI-N has determined that UNI-C can't participate in Link-Aggregation, via LACP and LLDP protocols.

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A UNI-C Type 2 learns that its peer UNI-N doesn't fully support UNI-N Type 2 if any of the following conditions is true:

- a) When UNI-N does not support E-LMI
- b) When UNI-N does not support Link OAM
- c) When UNI-N does not support Link Aggregation
- d) When UNI-N does not support customer service OAM MIP

A UNI-C Type 2 learns that its peer UNI-N does not support E-LMI, when no Status message has been received from UNI-N in response to E-LMI Status Inquiry messages sent by UNI-C.

A UNI-C Type 2 learns that its peer UNI-N does not support Link OAM, when Link OAM discovery is not successful as per clause 57.3.2.1 of IEEE 802.3-2004

A UNI-C Type 2 learns that its peer UNI-N does not support Link Aggregation, via LACP and LLDP protocols.

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A UNI-C Type 2 learns that its peer UNI-N does not support customer service OAM MIP, when a Link-Trace does not show any MIP at UNI-N

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A Type 2 UNI-C **SHOULD** support all mandatory UNI-C aspects of E-LMI as specified in [MEF 16].

(Editor: Automatic configuration was the main reason for having UNI Type 2. It seems this requirement should be mandatory)

A UNI Type 2 UNI-C **SHOULD** support all optional UNI-C aspects of E-LMI as specified in [MEF 16].

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A Type 2 UNI-N **MUST** support Active DTE mode as specified in clause 57 of [EFM]

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A Type 2 UNI-N **SHOULD** be capable of OAM Loop-back mode, to support possible UNI-C Active DTE mode.

A Type 2 UNI-C **MUST** be capable of OAM Loop-back mode

A Type 2 UNI-N **SHOULD** support sending Variable Response OAMPDUs.

A Type 2 UNI-C **MUST** supports sending Variable Response OAMPDUs.

A Type 2 UNI-N **MUST** support interpreting Link Events.

A Type 2 UNI-C **SHOULD** support interpreting Link Events.

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The MEG Level of UNI-N MEP

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corresponding to the UNI ME **MUST** be configurable

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supported for

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MUST be

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inline

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with

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CE-VLAN-ID

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The MEG Level of

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frames

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MEP

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be capable of discovering peer UNI-C MEP

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in UNI ME

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(Editor's note: Assuming UNI ME is optional, then the MUST requirement should be changed to MAY/SHOULD)

UNI-C MEP **MUST** be capable of discovering peer UNI-N MEP in UNI ME

((Editor's note: Assuming UNI ME is optional, then the MUST requirement should be changed to MAY/SHOULD))

Proactive Fault Detection

(Editor: In this subsection we should state which type of OAM PDUs and with what parameters must be used)

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MEP

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be able to detect Loss of continuity

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to the UNI-C MEP in the UNIME

(Editor's note: Assuming UNI ME is optional, then the MUST requirement should be changed to MAY/SHOULD)

UNI-C MEP **MUST** be able to detect Loss of continuity to the UNI-N MEP in the UNI ME

(Editor's note: Assuming UNI ME is optional, then the MUST requirement should be changed to MAY/SHOULD)

UNI-N MEP **SHOULD** able to detect presence of Loop from UNI-N towards UNI-C

UNI-C MEP **SHOULD** be able to detect presence of Loop from UNI-C towards UNI-N

(Editor: We should state which type of OAM PDU and with what parameters must be used)

On-demand Fault Detection/Verification

(Editor: In this subsection we should state which type of OAM PDUs and with what parameters must be used)

UNI-N MEP **MUST** be able to detect/verify Loss of connectivity to the UNI-C MEP in the UNI ME

((Editor's note: Assuming UNI ME is optional, then the MUST requirement should be changed to MAY/SHOULD)

UNI-C MEP **MUST** be able to detect/verify Loss of connectivity to the UNI-N MEP in the UNI ME

((Editor's note: Assuming UNI ME is optional, then the MUST requirement should be changed to MAY/SHOULD)

UNI-N MEP **SHOULD** able to detect/verify presence of Loop from UNI-N towards UNI-C

UNI-C MEP **SHOULD** be able to detect/verify presence of Loop from UNI-C towards UNI-N

Fault Notification

(Editor: In this subsection we should state which type of OAM PDUs and with what parameters must be used)

Upon detection of a fault in a UNI ME, UNI-N MEP **MUST** notify all Subscriber MEGs that are carried in the UNI ME.

Upon detection of fault in a UNI ME, UNI-N MEP **MUST** notify the peer UNI-C MEP about this condition.

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UNI-C MEP **SHOULD** have capability to measure single-ended Frame Loss for all Service Frames associated with a particular CoS Identifier between the UNI-C and UNI-N during a time interval T

UNI-N MEP **MUST** have capability to measure dual-ended Frame Loss for all Service Frames associated with a particular CoS Identifier between the UNI-N and UNI-C during a time interval T

UNI-C MEP **SHOULD** have capability to measure dual-ended Frame Loss for all Service Frames associated with a particular CoS Identifier between the UNI-C and UNI-N during a time interval T

Supporting CoS Identifier

(Editor note: Specify requirements related to a Class of Service identifier (e.g., to enable the UNI-N to communicate the CoS (gold, silver, bronze) for a given service instance to the UNI-C. This would probably require new TLV to be added to E-LMI.)

Supporting Enhanced Service Attributes

(Editor note: Specify requirements related to the new UNI and EVC service attributes defined in Ethernet Services Attributes – Phase 2, such as egress bandwidth profile, rooted multipoint EVC, etc.)

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UNI Type 2 UNI-N and UNI-C **MAY** support ITU-T G.8031 protection mechanism across UNI, though no particular strengths of such method are currently identified.

UNI Type 2 UNI-N and UNI-C **MAY** support Dual homing, considering that all dual homing protocols are currently proprietary and there is no standard for it.

UNI Type 2 UNI-N and UNI-C **MUST** map the same microflow to the same link in the LAG.