



**MEF Standard
MEF 91.0.1**

**Amendment to MEF 91:
Satellite Performance Tier**

November 2021

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1 List of Contributing Members

The following members of the MEF participated in the development of this document and have requested to be included in this list.

- Iometrix

2 Abstract

This amendment to MEF 91 [13] ‘Carrier Ethernet Test Requirements’ adds references to MEF 23.2.2 [7] (and MEF 23.2 [5]) in order to include Performance Tier (PT5) for satellite-based services to the existing set of Performance Tiers (PT0.3 through PT4).

3 Numerical Prefix Conventions

This document uses the prefix notation to indicate multiplier values as shown in Table 1.

Decimal		Binary	
Symbol	Value	Symbol	Value
k	10^3	Ki	2^{10}
M	10^6	Mi	2^{20}
G	10^9	Gi	2^{30}
T	10^{12}	Ti	2^{40}
P	10^{15}	Pi	2^{50}
E	10^{18}	Ei	2^{60}
Z	10^{21}	Zi	2^{70}
Y	10^{24}	Yi	2^{80}

Table 1 – Numerical Prefix Conventions

4 Compliance Levels

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "NOT RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in BCP 14 (RFC 2119 [2], RFC 8174 [3]) when, and only when, they appear in all capitals, as shown here. All key words must be in bold text.

Items that are **REQUIRED** (contain the words **MUST** or **MUST NOT**) are labeled as [Rx] for required. Items that are **RECOMMENDED** (contain the words **SHOULD** or **SHOULD NOT**) are labeled as [Dx] for desirable. Items that are **OPTIONAL** (contain the words **MAY** or **OPTIONAL**) are labeled as [Ox] for optional.

5 Introduction

MEF 91 [13] refers to Performance Tiers (PT0.3 to PT4) and associated Performance Objectives. However, with Geosynchronous Earth Orbit (GEO) satellites, it is only possible for Carrier Ethernet services to meet the performance objectives of PT4 CoS Label L, and only with FD (95th percentile). Also, Mean Frame Delay for PT4 CoS Label L is not achievable with GEO. By amending MEF 91 [13] satellite-based services certification will be achievable using the PT5 Performance Tier and associated Performance Objectives for CoS labels H, M and L.

References are added to the:

- Introduction section
- Table 4 (index 47: E-Line EVC Performance Service Attribute)
- Table 7 (index 95: E-LAN EVC Performance Service Attribute)
- Table 10 (index 143: E-Tree EVC Performance Service Attribute)
- Table 13 (index 195: Access E-Line SLS Service Attribute)
- Table 16 (index 250: Transit E-Line SLS Service Attribute)
- Reference section

In this amendment, changes are shown as follows:

- Instructions for how to apply the amendment are shown in *blue italics*
- Content modified by the amendment, text to be removed is shown with ~~red-strikethrough~~
- Content modified by the amendment, text to be added is shown in **red**

6 Changes to Section 4

6.1 Changes to Introduction

Modify the first paragraph of the Introduction as shown:

The MEF 3.0 CE certification for Carrier Ethernet Services extends CE 2.0 certification by adding two new connectivity services to the certification program; Access E-Line and Transit E-Line, based on MEF 51 ~~[H2]~~ [12] ‘OVC Services Definitions’ and MEF 26.2 ~~[9]~~ [9] ‘External Network-Network Interfaces and Operator Service Attributes’. It also enhances the existing E-Line, E-LAN and E-Tree connectivity services with new and re-defined service attributes, specified in MEF 6.2 [3] ‘Ethernet Services Definitions Phase 3’, MEF 10.3 [4] ‘Ethernet Services Attributes Phase 3’, MEF 23.2 [5] ‘CoS IA Phase 3’, MEF 23.2.1 [6] ‘Models for bandwidth profile with token sharing’, **MEF 23.2.2 [7] ‘Satellite Performance Tier’**, MEF 45 ~~[10]~~ [10] ‘Multi-CEN L2CP’ and MEF 45.0.1 ~~[H9]~~ [11] ‘OVC Services Requirements for L2CP’.

7 Changes to Section 6

7.1 Changes to section 6.1.3 E-Line - EVC Service Attributes and Test Requirements

Modify Table 4 as shown:

Index	Service Attributes	Service Reference	Test Requirements	Certification Applicability		Summary Description
				● = Tested	○ = Not Tested	
38	EVC Type	MEF 6.2 Tables 6, 9 and 12	MEF 6.2 R25	EPL ●	EVPL ●	MUST be Point-to-Point as specified in Section 8.1 of MEF 10.3
39	EVC ID	MEF 6.2 Tables 6, 9 and 12	-	EPL ○	EVPL ○	String as specified in Section 8.2 of MEF 10.3
40	UNI List	MEF 6.2 Tables 6, 9 and 12	MEF 10.3 R12	EPL ●	EVPL ●	List of <UNI ID, UNI Role> pairs as specified in Section 8.3 of MEF 10.3 for UNIs associated by the EVC
41	Maximum Number of UNIs	MEF 6.2 Tables 6, 9 and 12	MEF 10.3 R13	EPL ●	EVPL ●	MUST be two as specified in Section 8.4 of MEF 10.3
42	Unicast Service Frame Delivery	MEF 6.2 Tables 6, 9 and 12	MEF 6.2 R26 and MEF 10.3 R17	EPL ●	EVPL ●	Discard or Deliver Unconditionally or Deliver Conditionally as specified in Section 8.5.2 of MEF 10.3
43	Multicast Service Frame Delivery	MEF 6.2 Tables 6, 9 and 12	MEF 6.2 R27 and MEF 10.3 R18	EPL ●	EVPL ●	Discard or Deliver Unconditionally or Deliver Conditionally as specified in Section 8.5.2 of MEF 10.3
44	Broadcast Service Frame Delivery	MEF 6.2 Tables 6, 9 and 12	MEF 6.2 R28 and MEF 10.3 R19	EPL ●	EVPL ●	Discard or Deliver Unconditionally or Deliver Conditionally as specified in Section 8.5.2 of MEF 10.3
45	CE-VLAN ID Preservation ⁵	MEF 6.2 Tables 6, 9 and 12	MEF 6.2 R29 and MEF 10.3 R20, R21, R22, R23, R24, R25	EPL ●	EVPL ●	Enabled or disabled as specified in Section 8.6.1 of MEF 10.3
46	CE-VLAN CoS Preservation	MEF 6.2 Tables 6, 9 and 12	MEF 6.2 R30 and MEF 10.3 R26	EPL ●	EVPL ●	Enabled or disabled as specified in Section 8.6.2 of MEF 10.3
47	EVC Performance	MEF 6.2 Tables 6, 9 and 12	MEF 6.2 D13, D14	EPL ●	EVPL ●	List of performance metrics and associated parameters and performance objectives as specified in Section 8.8 of MEF 10.3, MEF 23.2 and MEF 23.2.2
48	EVC Maximum Service Frame Size	MEF 6.2 Table 6	MEF 10.3 R55, R56	EPL ●	EVPL ●	At least 1522 as specified in Section 8.9 of MEF 10.3

Table 4: E-Line - EVC Service Attributes and Test Requirements

7.2 Changes to section 6.2.3 E-LAN - EVC Service Attributes and Test Requirements

Modify Table 7 as shown:

Index	Service Attributes	Service Reference	Test Requirements	Certification Applicability		Summary Description
				● = Tested	○ = Not Tested	
86	EVC Type	MEF 6.2 Tables 6, 15 and 18	MEF 6.2 R38	EP-LAN ●	EVP-LAN ●	MUST be Multipoint-to-Multipoint as specified in Section 8.1 of MEF 10.3
87	EVC ID	MEF 6.2 Tables 6, 15 and 18	-	EP-LAN ○	EVP-LAN ○	String as specified in Section 8.2 of MEF 10.3
88	UNI List	MEF 6.2 Tables 6, 15 and 18	MEF 10.3 R12	EP-LAN ●	EVP-LAN ●	List of <UNI ID, UNI Role> pairs as specified in Section 8.3 of MEF 10.3 for UNIs associated by the EVC
89	Maximum Number of UNIs	MEF 6.2 Tables 6, 15 and 18	MEF 10.3 R14	EP-LAN ●	EVP-LAN ●	Two or three or greater as specified in Section 8.4 of MEF 10.3
90	Unicast Service Frame Delivery	MEF 6.2 Tables 6, 15 and 18	MEF 10.3 R17	EP-LAN ●	EVP-LAN ●	Discard or Deliver Unconditionally or Deliver Conditionally as specified in Section 8.5.2 of MEF 10.3
91	Multicast Service Frame Delivery	MEF 6.2 Tables 6, 15 and 18	MEF 10.3 R18	EP-LAN ●	EVP-LAN ●	Discard or Deliver Unconditionally or Deliver Conditionally as specified in Section 8.5.2 of MEF 10.3
92	Broadcast Service Frame Delivery	MEF 6.2 Tables 6, 15 and 18	MEF 10.3 R19	EP-LAN ●	EVP-LAN ●	Discard or Deliver Unconditionally or Deliver Conditionally as specified in Section 8.5.2 of MEF 10.3
93	CE-VLAN ID Preservation ⁵	MEF 6.2 Tables 6, 15 and 18	MEF 10.3 R20, R21, R22, R23, R24, R25	EP-LAN ●	EVP-LAN ●	Enabled or disabled as specified in Section 8.6.1 of MEF 10.3
94	CE-VLAN CoS Preservation	MEF 6.2 Tables 6, 15 and 18	MEF 10.3 R26	EP-LAN ●	EVP-LAN ●	Enabled or disabled as specified in Section 8.6.2 of MEF 10.3
95	EVC Performance	MEF 6.2 Tables 6, 15 and 18	MEF 6.2 D13, D14	EP-LAN ●	EVP-LAN ●	List of performance metrics and associated parameters and performance objectives as specified in Section 8.8 of MEF 10.3, MEF 23.2 and MEF 23.2.2
96	EVC Maximum Service Frame Size	MEF 6.2 Tables 6, 15 and 18	MEF 10.3 R55, R56	EP-LAN ●	EVP-LAN ●	At least 1522 as specified in Section 8.9 of MEF 10.3

Table 7: E-LAN - EVC Service Attributes and Test Requirements

7.3 Changes to section 6.3.3 E-Tree - EVC Service Attributes and Test Requirements

Modify Table 10 as shown:

Index	Service Attributes	Service Reference	Test Requirements	Certification Applicability		Summary Description
				● = Tested	○ = Not Tested	
134	EVC Type	MEF 6.2 Tables 6, 21 and 24	MEF 6.2 R47	EP-Tree ●	EVP-Tree ●	MUST be Rooted-Multipoint as specified in Section 8.1 of MEF 10.3
135	EVC ID	MEF 6.2 Tables 6, 21 and 24	-	EP-Tree ○	EVP-Tree ○	String as specified in Section 8.2 of MEF 10.3
136	UNI List	MEF 6.2 Tables 6, 21 and 24	MEF 10.3 R11	EP-Tree ●	EVP-Tree ●	List of <UNI ID, UNI Role> pairs as specified in Section 8.3 of MEF 10.3 for UNIs associated by the EVC
137	Maximum Number of UNIs	MEF 6.2 Tables 6, 21 and 24	MEF 10.3 R14	EP-Tree ●	EVP-Tree ●	Two or three or greater as specified in Section 8.4 of MEF 10.3
138	Unicast Service Frame Delivery	MEF 6.2 Tables 6, 21 and 24	MEF 10.3 R17	EP-Tree ●	EVP-Tree ●	Discard or Deliver Unconditionally or Deliver Conditionally as specified in Section 8.5.2 of MEF 10.3
139	Multicast Service Frame Delivery	MEF 6.2 Tables 6, 21 and 24	MEF 10.3 R18	EP-Tree ●	EVP-Tree ●	Discard or Deliver Unconditionally or Deliver Conditionally as specified in Section 8.5.2 of MEF 10.3
140	Broadcast Service Frame Delivery	MEF 6.2 Tables 6, 21 and 24	MEF 10.3 R19	EP-Tree ●	EVP-Tree ●	Discard or Deliver Unconditionally or Deliver Conditionally as specified in Section 8.5.2 of MEF 10.3
141	CE-VLAN ID Preservation ⁶	MEF 6.2 Tables 6, 21 and 24	MEF 10.3 R20, R21, R22, R23, R24, R25	EP-Tree ●	EVP-Tree ●	Enabled or disabled as specified in Section 8.6.1 of MEF 10.3
142	CE-VLAN CoS Preservation	MEF 6.2 Tables 6, 21 and 24	MEF 10.3 R26	EP-Tree ●	EVP-Tree ●	Enabled or disabled as specified in Section 8.6.2 of MEF 10.3
143	EVC Performance	MEF 6.2 Tables 6, 21 and 24	MEF 6.2 D13, D14	EP-Tree ●	EVP-Tree ●	List of performance metrics and associated parameters and performance objectives as specified in Section 8.8 of MEF 10.3, MEF 23.2 and MEF 23.2.2
144	EVC Maximum Service Frame Size	MEF 6.2 Tables 6, 21 and 24	MEF 10.3 R55, R56	EP-Tree ●	EVP-Tree ●	At least 1522 as specified in Section 8.9 of MEF 10.3

Table 10: E-Tree - EVC Service Attributes and Test Requirements

8 Changes to Section 7

8.1 Changes to section 7.1.3 Access E-Line - OVC Service Attributes and Test Requirements

Modify Table 13 as shown:

Index	Service Attributes	Service Reference	Test Requirements	Certification Applicability ● = Tested ○ = Not Tested	Summary Description
184	OVC Identifier	MEF 51 Table 5	-	Access E-Line ○	A unique identifier within the Operator's network for the OVC as specified in Table 6 of MEF 26.2
185	OVC Type	MEF 51 Table 8	MEF 51 R18	Access E-Line ●	OVC type as specified in Table 6 of MEF 26.2. Access E-Line MUST be Point-to-Point
186	OVC End Point List	MEF 51 Table 11	MEF 51 R26	Access E-Line ●	A list of OVC End Point Identifiers as specified in Table 6 of MEF 26.2. Access E-Line MUST have one OVC End Point at an ENNI and one OVC End Point at a UNI
187	Maximum Number of UNI OVC End Points	MEF 51 Table 11	MEF 51 R27	Access E-Line ●	An integer greater than or equal to 0 as specified in Table 6 of MEF 26.2. MUST be 1 for Access E-Line
188	Maximum Number of ENNI OVC End Points	MEF 51 Table 11	MEF 51 R28	Access E-Line ●	A strictly positive integer as specified in Table 6 of MEF 26.2. MUST be 1 for Access E-Line
189	OVC Maximum Frame Size	MEF 51 Table 5	MEF 26.2 R40, R41	Access E-Line ●	At least 1526 as specified in Table 6 of MEF 26.2
190	OVC CE-VLAN ID Preservation	MEF 51 Table 11	MEF 26.2 R42, R43	Access E-Line ●	Can be one of Preserve, Strip, or Retain as specified in Table 6 of MEF 26.2
191	OVC CE-VLAN CoS (PCP) Preservation	MEF 51 Table 11	MEF 26.2 R45	Access E-Line ●	Enabled or disabled as specified in Table 6 of MEF 26.2
192	OVC S-VLAN ID Preservation	MEF 51 Table 5	-	Access E-Line ○	Enabled or disabled in MEF 51 Table 5 and as defined in MEF 26.1. The attribute has been removed from 26.2
193	OVC S-VLAN CoS (PCP) Preservation	MEF 51 Table 5	-	Access E-Line ○	Enabled or disabled as specified in Table 6 of MEF 26.2
194	Color Forwarding	MEF 51 Table 5	-	Access E-Line ○	Yes or no in MEF 51 Table 5 and as defined in MEF 26.1. The attribute has been removed from 26.2
195	Service Level Specification	MEF 51 Table 5 & 8	MEF 51 D3, D4, D14	Access E-Line ●	Any combination of some or all of performance metrics defined in MEF 26.2 can be used in an SLS. Performance Tiers and Objectives from MEF 23.2 and MEF 23.2.2
196	Unicast Frame Delivery	MEF 51 Table 8	MEF 51 R20	Access E-Line ●	Conditional or Unconditional or Discard as specified in Table 6 of MEF 26.2. If Conditional, the conditions need to be specified. The Operator MUST support unconditional unicast frame delivery
197	Multicast Frame Delivery	MEF 51 Table 8	MEF 51 R21	Access E-Line ●	Conditional or Unconditional or Discard as specified in Table 6 of MEF 26.2. If Conditional, the conditions need to be specified. The Operator MUST support unconditional multicast frame delivery
198	Broadcast Frame Delivery	MEF 51 Table 8	MEF 51 22	Access E-Line ●	Conditional or Unconditional or Discard as specified in Table 6 of MEF 26.2. If Conditional, the conditions need to be specified. The Operator MUST support unconditional broadcast frame delivery
199	OVC Available MEG Level	MEF 51 Table 5	MEF 51 R4	Access E-Line ●	OVC Available MEG Level (0,1,2, ..., 7 or None) as specified in Table 6 of MEF 26.2. It specifies the lowest MEG Level available for the Service Provider or SOAM Super Operator

Table 13: Access E-Line - OVC Service Attributes and Test Requirements

8.2 Changes to section 7.2.2 Transit E-Line - OVC Service Attributes and Test Requirements

Modify Table 16 as shown:

Index	Service Attributes	Service Reference	Test Requirements	Certification Applicability ● = Tested ○ = Not Tested	Summary Description
239	OVC Identifier	MEF 51 Table 5	-	Transit E-Line ○	A unique identifier within the Operator's network for the OVC as specified in Table 6 of MEF 26.2
240	OVC Type	MEF 51 Table 8	MEF 51 R18	Transit E-Line ●	OVC type as specified in Table 6 of MEF 26.2. Access E-Line MUST be Point-to-Point
241	OVC End Point List	MEF 51 Table 17	MEF 51 R37	Transit E-Line ●	A list of OVC End Point Identifiers as specified in Table 6 of MEF 26.2. Access E-Line MUST have one OVC End Point at an ENNI and one OVC End Point at a UNI
242	Maximum Number of UNI OVC End Points	MEF 51 Table 17	-	Transit E-Line ○	An integer greater than or equal to 0 as specified in Table 6 of MEF 26.2. MUST be 1 for Access E-Line
243	Maximum Number of ENNI OVC End Points	MEF 51 Table 17	MEF 51 R39	Transit E-Line ●	A strictly positive integer as specified in Table 6 of MEF 26.2. MUST be 1 for Access E-Line
244	OVC Maximum Frame Size	MEF 51 Table 5	MEF 26.2 R40, R41	Transit E-Line ●	At least 1526 as specified in Table 6 of MEF 26.2
245	OVC CE-VLAN ID Preservation	MEF 51 Table 17	MEF 51 R40	Transit E-Line ●	Can be one of Preserve, Strip, or Retain as specified in Table 6 of MEF 26.2
246	OVC CE-VLAN CoS (PCP) Preservation	MEF 51 Table 17	MEF 51 R41	Transit E-Line ●	Enabled or disabled as specified in Table 6 of MEF 26.2
247	OVC S-VLAN ID Preservation	MEF 51 Table 5	MEF 26.1 R46, R47, R48	Transit E-Line ●	Enabled or disabled in MEF 51 Table 5 and as defined in MEF 26.1. The attribute has been removed from 26.2
248	OVC S-VLAN CoS (PCP) Preservation	MEF 51 Table 5	MEF 26.2 R49	Transit E-Line ●	Enabled or disabled as specified in Table 6 of MEF 26.2
249	Color Forwarding	MEF 51 Table 5	-	Transit E-Line ○	Yes or no in MEF 51 Table 5 and as defined in MEF 26.1. The attribute has been removed from 26.2
250	Service Level Specification	MEF 51 Table 5 & 8	MEF 51 D3, D4, D14	Transit E-Line ●	Any combination of some or all of performance metrics defined in MEF 26.2 can be used in an SLS. Performance Tiers and Objectives from MEF 23.2 and MEF 23.2.2
251	Unicast Frame Delivery	MEF 51 Table 8	MEF 51 R20	Transit E-Line ●	Conditional or Unconditional or Discard as specified in Table 6 of MEF 26.2. If Conditional, the conditions need to be specified. The Operator MUST support unconditional unicast frame delivery
252	Multicast Frame Delivery	MEF 51 Table 8	MEF 51 R21	Transit E-Line ●	Conditional or Unconditional or Discard as specified in Table 6 of MEF 26.2. If Conditional, the conditions need to be specified. The Operator MUST support unconditional multicast frame delivery
253	Broadcast Frame Delivery	MEF 51 Table 8	MEF 51 22	Transit E-Line ●	Conditional or Unconditional or Discard as specified in Table 6 of MEF 26.2. If Conditional, the conditions need to be specified. The Operator MUST support unconditional broadcast frame delivery
254	OVC Available MEG Level	MEF 51 Table 5	MEF 51 R4	Transit E-Line ●	OVC Available MEG Level (0,1,2, ..., 7 or None) as specified in Table 6 of MEF 26.2. It specifies the lowest MEG Level available for the Service Provider or SOAM Super Operator

Table 16: Transit E-Line - OVC Service Attributes and Test Requirements

9 Changes to Section 8

9.1 Changes to References section

- [1] Internet Engineering Task Force RFC 2119, *Key words for use in RFCs to Indicate Requirement Levels*, March 1997.
- [2] Internet Engineering Task Force RFC 8174, *Ambiguity of Uppercase vs Lowercase in RFC 2119 Key Words*, May 2017.
- [3] MEF 6.2, *EVC Ethernet Service Definitions – Phase 3*, August 2014
- [4] MEF 10.3, *Ethernet Services Attributes – Phase 3*, October 2013.
- [5] MEF 23.2, *Carrier Ethernet Class of Service – Phase 2*, January 2012.
- [6] MEF 23.2.1, *Models for Bandwidth Profiles with Token Sharing*, January 2017.
- [7] **MEF 23.2.2, *Satellite Performance Tier*, January 2021.**
- [8] MEF 26.1, *External Network Network Interface (ENNI) – Phase 2*, January 2012.
- [9] MEF 26.2, *External Network Network Interface (ENNI) and Operator Services Attributes*, August 2016.
- [10] MEF 45, *Multi-CEN L2CP*, August 2014.
- [11] MEF 45.0.1, *Amendment to MEF 45: OVC Services Requirements for L2CP*, April 2017.
- [12] MEF 51, *OVC Service Definitions*, August 2015.
- [13] **MEF 91, *Carrier Ethernet Test Requirements*, March 2021.**