# Technical Specification

# MEF 27

# Abstract Test Suite
# For

# UNI Type 2
# Part 5: Enhanced UNI Attributes
# & Part 6: L2CP Handling

# May 20th, 2010

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# 1. Abstract

This document includes the fifth and sixth parts of the Abstract Test Suite for User to Network Interface (UNI) Type 2. It defines test procedures based on requirements for UNI Type 2 described in MEF 20 *UNI Type 2 Implementation Agreement*. The overall Abstract Test Suite for UNI Type 2 will be composed of the following parts: Link OAM, E-LMI, Service OAM, Protection, Enhanced UNI Attributes and L2CP handling.

# 2. Terminology

| | |
|---|---|
| **Bandwidth Profile** | A characterization of ingress Service Frame arrival times and lengths at a reference point and a specification of the disposition of each Service Frame based on its level of compliance with the Bandwidth Profile. In this document the reference point is the UNI |
| **CBS** | Committed Burst Size |
| **CE** | Customer Edge |
| **CE-VLAN CoS** | Customer Edge VLAN CoS |
| **CE-VLAN ID** | Customer Edge VLAN ID |
| **CE-VLAN ID/EVC Map** | An association of CE-VLAN IDs with EVCs at a UNI |
| **CE-VLAN Tag** | Customer Edge VLAN Tag |
| **CIR** | Committed Information Rate |
| **Class of Service** | A set of Service Frames that have a commitment from the Service Provider to receive a particular level of performance |
| **Class of Service Identifier CoSID** | Information derivable from a) the EVC to which the Service Frame is mapped or b) the combination of the EVC to which the Service Frame is mapped and a set of one or more CE-VLAN CoS values |
| **Color Mode** | CM is a Bandwidth Profile parameter. The Color Mode parameter indicates whether the color-aware or color-blind property is employed by the Bandwidth Profile. It takes a value of "color-blind" or "color-aware" only |
| **Committed Burst Size** | CBS is a Bandwidth Profile parameter. It limits the maximum number of bytes available for a burst of ingress Service Frames sent at the UNI speed to remain CIR-conformant |
| **Committed Information Rate** | CIR is a Bandwidth Profile parameter. It defines the average rate in bits/s of ingress Service Frames up to which the network delivers Service Frames and meets the performance objectives defined by the CoS Service Attribute |
| **Customer Edge** | Equipment on the Subscriber side of the UNI |
| **Customer Edge VLAN CoS** | The user priority bits in the IEEE 802.1Q Tag in a Service Frame that is either tagged or priority tagged |
| **Customer Edge VLAN ID** | The identifier derivable from the content of a Service Frame that allows the Service Frame to be associated with an EVC at the UNI |
| **Customer Edge VLAN Tag** | The IEEE 802.1Q Tag in a tagged Service Frame |
| **EBS** | Excess Burst Size |

| | |
|---|---|
| **Egress Service Frame** | A Service Frame sent from the Service Provider network to the CE |
| **EIR** | Excess Information Rate |
| **E-LAN Service** | Ethernet LAN Service |
| **E-Line Service** | Ethernet Line Service |
| **E-Tree** | Ethernet Tree Service |
| **UNI-C** | Compound architectural component on the Subscriber side of the UNI that represents all the functions required to connect a subscriber to a MEN |
| **UNI-N** | Compound architectural component on the Service Provider side of the UNI that represents all the functions required to connect a MEN to a MEN subscriber |

# 3. Scope

The Enhanced UNI Attributes and L2CP Handling parts of the Abstract Test Suite for UNI Type 2 describes test procedures based on the requirements for UNI Type 2 enhanced attributes and L2CP handling described in MEF 20 *UNI Type 2 Implementation Agreement*.

An overview of the different groups of requirements that compose this test suite is provided as follows:

- o  Bandwidth Profile Requirements

- o  Maximum Transmission Unit Requirements

- o  Physical Medium and Auto-negotiation Requirements

- o  L2CP Requirements

The UNI Type 2 Link OAM, E-LMI, Service OAM and Protection functionalities are outside the scope of this Abstract Test Suite.

This document may be updated in the future to reflect new work done in the MEF Technical Committee.

# 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. Introduction

This document supplements the existing MEF test specifications MEF 9 *Abstract Test Suite for Ethernet Services at the UNI*, MEF 14 *Abstract Test Suite for Traffic Management Phase 1,* MEF 18 *Abstract Test Suite for Circuit Emulation Services*, MEF 19 *Abstract Test Suite for UNI Type 1,* MEF 21 *Abstract Test Suite for UNI Type 2 – Part 1: Link OAM,* MEF 24 *Abstract Test Suite for UNI Type 2 – Part 2: E-LMI* and MEF 25 *Abstract Test Suite for UNI Type 2 – Part 3: Service OAM* by adding test procedures based on the requirements for UNI Type 2 enhanced attributes and L2CP handling defined in MEF 20 *User Network Interface (UNI) Type 2 Implementation Agreement*.

As with existing Abstract Test Suites, vendors can refer to the requirements and test procedures defined in this specification in the development and commercial cycles of their products and carriers can use them to ensure that the network elements they deploy or add to their existing network will have the ability to deliver Ethernet Services based on the MEF technical specifications.

The requirements, framework and functional model on how the UNI reference point operates in a Metro Ethernet Network is defined in the Metro Ethernet Forum technical specification MEF 11 *User to Network Interface Requirements and Framework.*

# 6. Test Configuration for UNI-N Type 2 Enhanced UNI Attributes and L2CP Handling

Although some UNI-N test cases may require very specific test configurations, most UNI-N test cases defined in this document are to be executed using one of the three following test configurations for Point-to-Point (Figure 1), Multipoint-to-Multipoint (Figure 2) and Rooted-Multipoint (Figure 3) EVCs.
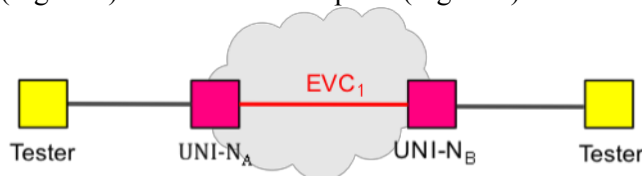


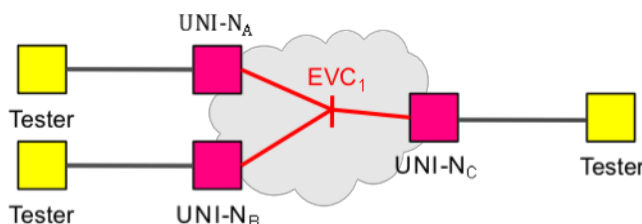**Figure 1: Test Configuration for UNI-N Type 2 – Point-to-Point EVC**



**Figure 2: Test Configuration for UNI-N Type 2 – Multipoint-to-Multipoint EVC**
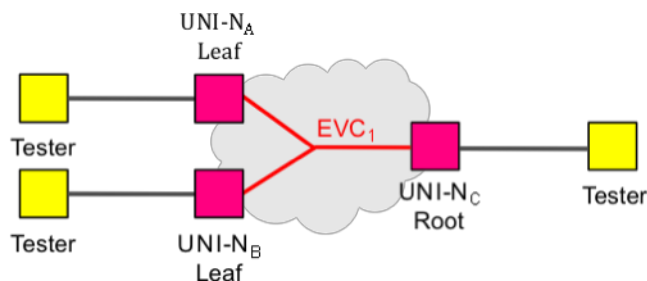
**Figure 3: Test Configuration for UNI-N Type 2 – Rooted-Multipoint EVC**

# 7. Test Configuration for UNI-C Type 2 Enhanced UNI Attributes

All UNI-C test cases defined in this document are to be executed using the following test configuration (Figure 4).
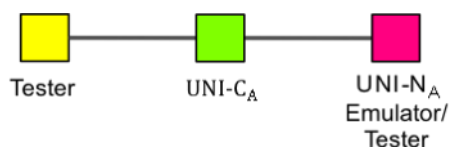


**Figure 4: Test Configuration for UNI-C Type 2 – Point-to-Point EVC**

# 8. Test Status Definitions

MANDATORY status: This means that a test case **MUST** be executed because it verifies an absolute requirement or an absolute requirement dependent on an optional feature.  If the requirement is absolute the test must be executed.  If the requirement is absolute but dependent on an optional feature and that feature is supported, the test case must be executed.  If the optional feature is not supported, the test case is not executed and it is declared as "not applicable".

OPTIONAL status: This word means that a test case **MAY** or **MAY NOT** be executed because it verifies a requirement that is not absolute.  The decision to execute such a test case will usually depend on the ability to support a particular feature that is not tied to an absolute requirement.  If such a test case is not executed it is declared as "not applicable".

# 9. Test Cases Summary

| Number | Test Case Name | UNI Type | Test Status |
|---|---|---|---|
| 1 | Per UNI Egress Bandwidth Profile - CIR Configuration Granularity | UNI-N | Mandatory |
| 2 | Per EVC Egress Bandwidth Profile - CIR Configuration Granularity | UNI-N | Mandatory |
| 3 | Per CoS ID Egress Bandwidth Profile - CIR Configuration Granularity | UNI-N | Mandatory |
| 4 | Mandatory MTU Size | UNI-N & UNI-C | Mandatory |
| 5 | Recommended MTU Size | UNI-N & UNI-C | Optional |
| 6 | Optional MTU Size | UNI-N & UNI-C | Optional |
| 7 | Point-to-Point EVC Support | UNI-N | Mandatory |
| 8 | Multipoint-to-Multipoint EVC Support | UNI-N | Mandatory |
| 9 | Rooted-Multipoint EVC Support | UNI-N | Optional |
| 10 | UNI-N Root and Leaf Support | UNI-N | Optional |
| 11 | UNI-N Root and Leaf Concurrent Support | UNI-N | Optional |
| 12 | UNI-N Type 2 Physical Medium | UNI-N & UNI-C | Mandatory |
| 13 | Auto-Negotiation Support | UNI-N & UNI-C | Mandatory |
| 14 | Disabling the Auto-Negotiation Function | UNI-N & UNI-C | Mandatory |
| 15 | L2CP Mandated Filtering | UNI-N | Mandatory |
| 16 | L2CP Recommended Filtering | UNI-N | Optional |
| 17 | L2CP Mandated Configurability | UNI-N | Mandatory |

# 10. Template for Abstract Test Cases for UNI Type 2 Enhanced UNI Attributes and L2CP Handling

The following template is adopted for the definition of Abstract Test Cases for UNI Type 2 Enhanced UNI Attributes and L2CP Handling

| Abstract Test Suite for Enhanced UNI Attributes and L2CP Handling | |
|---|---|
| **Test Name** | Name derived from reference document |
| **Test Definition ID** | A punctuated alphanumeric string assigned to each defined requirement and test procedure couple using the following convention: Four characters defining the UNI type + 4 to 8 characters defining the MEF requirement number. Example: UNIC-R60[5] (UNIC: User Network Interface C under test, R73[2]: MEF 20 requirement 73, second Test Case related to requirement 73) |
| **Reference Document** | MEF Reference document and section |
| **Test Type** | Functional, Conformance, Interoperability or Performance |
| **Test Status** | Mandatory, Optional or Recommended |
| **MEF Requirement Description** | Brief description of the MEF requirement that **MUST**, **SHOULD** or **MAY** be satisfied |
| **Test Object** | Succinct description of test purpose |
| **Test Configuration** | Succinct description of test bed configuration |
| **Test Configuration Schematic** | Test bed schematic. The variables can augment it. |
| **CE-VLAN ID/EVC Map** | A sample CE-VLAN ID/EVC Map is suggested. Variables augment it. <table><tr><td colspan="2">INGRESS UNI 'A'</td><td></td><td colspan="2">EGRESS UNI 'B'</td></tr><tr><td>CE-VLAN ID</td><td>EVC</td><td></td><td>CE-VLAN ID</td><td>EVC</td></tr><tr><td>10</td><td>$EVC_1$</td><td></td><td>10</td><td>$EVC_1$</td></tr></table> Use of other CE-VLAN IDs is permitted provided that configuration of the CE-VLAN IDs conforms to MEF 10.1 [Ethernet Services Attributes Phase 2], Section 7.7 |
| **Bandwidth Profile** | A sample Bandwidth Profile table is suggested. Variables augment it. <table><tr><td colspan="2">Per Ingress UNI BP</td></tr><tr><td>UNI</td><td>Bandwidth Profile Parameters</td></tr><tr><td>$UNI_A$</td><td>$CIR_A$  $CBS_A$  $EIR_A$  $EBS_A$</td></tr></table> Note 1: ($0 < CIR_A \le$ UNI Speed), ($CBS_A \ge$ maximum Service Frame size) |
| **Test Procedure** | Succinct description of the test procedure |
| **Units** | Units can be time units, rates and counts in integers such as milliseconds, frames per second and numbers of valid frames |
| **Variables** | Variables such as number of UNIs, EVCs and CE-VLAN IDs and frame formats and lengths MUST be described |
| **Results** | Description of the textual, numerical and/or graphical format in which to display test results. Results can be Pass or Fail |
| **Remarks** | Description of any particular observations that might affect the test result |

# 11. Abstract Test Cases for UNI-N Type 2 Enhanced UNI Attributes and L2CP Handling

This section contains 17 Test Cases for UNI-N Type 2.  The section is divided in 2 different subsections as follows:
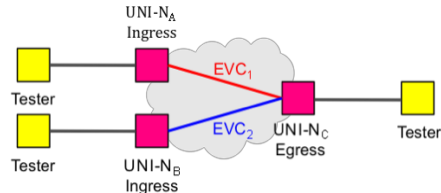
Section 11.1
Enhanced UNI Attributes Requirements contains a total of 14 Test Cases covering the UNI Type 2 Requirements R70, R71, R72, R73, R75, R76, R77, R78, R79 and R80.
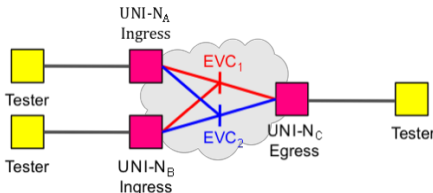
Section 11.2
L2CP Handling Requirements contains a total of 3 Test Cases covering the UNI Type 2 Requirements R81, R82 and R83.
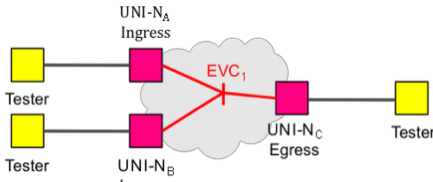
# 11.1 UNI-N Type 2 Enhanced UNI Attributes

## TEST CASE 1N: Per UNI Egress Bandwidth Profile - CIR Configuration Granularity

| Abstract Test Suite for Enhanced UNI Attributes & L2CP | |
|---|---|
| **Test Name** | Per UNI Egress Bandwidth Profile - CIR Configuration Granularity |
| **Test Definition ID** | UNIN-R70 |
| **Reference Document** | MEF 20 UNI Type 2 Implementation Agreement Section 12 |
| **Test Type** | Conformance |
| **Test Status** | Mandatory |
| **MEF Requirement Description** | A UNI-N Type 2 **MUST** be able to support Per UNI egress BW profiling of CIR as specified in MEF10.1, in the following granularities: • ≤ 1Mbps steps up to 10Mpbs [CIR range 1] <br> • ≤ 5 Mbps steps beyond 10Mbps and up to 100Mbps [CIR range 2] <br> • ≤ 50 Mbps steps beyond 100Mpbs and up to 1Gbps [CIR range 3] <br> • ≤ 500 Mbps steps beyond 1Gbps [CIR range 4] |
| **Test Object** | Verify that a UNI-N Type 2 supports per UNI egress BW profile configuration to modify CIR in the granularities described in the requirement description section above. |
| **Test Configuration** | At least two EVCs, each one associating a given ingress UNI and an egress UNI Type 2 are configured and at least one CE-VLAN ID is mapped per EVC. Per UNI egress bandwidth profile is applied at the egress UNI. Testers with proper PHY that matches each UNI are attached to all UNI-Ns in the configured EVCs. |
| **Test Configuration Schematic** |  |

**CE-VLAN ID/EVC Map**

| INGRESS UNI 'A' | | | INGRESS UNI 'B' | | | EGRESS UNI 'C' | |
|---|---|---|---|---|---|---|---|
| **CE-VLAN ID** | **EVC** | | **CE-VLAN ID** | **EVC** | | **CE-VLAN ID** | **EVC** |
| 11* | EVC$_1$ | | | | | 11* | EVC$_1$ |
| | | | 12 | EVC$_2$ | | 12 | EVC$_2$ |

Use of other CE-VLAN IDs is permitted provided that configuration of the CE-VLAN IDs conforms to MEF 10.1 [Ethernet Services Attributes Phase 2], Section 7.7

\* The CE-VLAN ID for untagged and priority tagged Service Frames is configured to 11 at both ingress and egress UNIs

**Bandwidth Profile**

| PER UNI EGRESS BP | |
|---|---|
| **UNI** | **Bandwidth Profile Parameters** |
| UNI 'C' | CIR$_C$   CBS$_C$   EIR$_C$   EBS$_C$ |

Note 1: (0 < Egress CIR$_C$ < Egress UNI Speed), (Egress CBS$_C$ ≥ Maximum Transmission Unit size among all of the EVCs that the Bandwidth Profile applies to)
Note 2: (Σ Ingress CIRs > Egress CIR$_C$)    Note 3: (EIRs = 0) and (EBSs = 0)

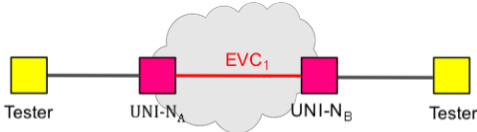| **Test Procedure** | Tester offers Service Frames with mapped CE-VLAN IDs of length $\lambda$ at rates equal to the ingress UNI speeds, to the ingress UNIs during a time interval $T$ and measures the number of Service Frames delivered at the associated egress UNI. The amount of traffic delivered at the associated egress UNI must fall within the range $X \leq W_G \leq Z$ where: <br><br> $W_G$ is the amount of traffic declared Green that should be delivered by the egress UNI over the time interval $T$ <br> $X_C = (CIR_C * T + CBS_C - F)$ *and* $Z_C = (CIR_C * T + CBS_C + F)$ <br><br> Begin the test with Egress CIR$_C$ set to the minimum value (i.e. 1 Mbps) and increment Egress CIR$_C$ by the step value defined for the CIR range. Repeat the test for each Egress CIR$_C$ value until Egress CIR$_C$ has been incremented to the Egress UNI speed. |
|---|---|
| **Units** | Number of valid Service Frames |
| **Variables** | Bandwidth Profile Parameters CIR$_C$, CBS$_C$, UNIs interface speed, time interval $T$, tolerated variance F, number and length $\lambda$ of the offered Service Frames |
| **Results** | Pass or fail |
| **Remarks** | |

## TEST CASE 2N:       Per EVC Egress Bandwidth Profile - CIR Configuration Granularity

| Abstract Test Suite for Enhanced UNI Attributes & L2CP | |
|---|---|
| **Test Name** | Per EVC Egress Bandwidth Profile - CIR Configuration Granularity |
| **Test Definition ID** | UNIN-R71 |
| **Reference Document** | MEF 20 UNI Type 2 Implementation Agreement Section 12 |
| **Test Type** | Conformance |
| **Test Status** | Mandatory |
| **MEF Requirement Description** | A UNI-N Type 2 **MUST** be able to support Per EVC egress BW profiling of CIR as specified in MEF10.1, in the following granularities: • ≤ 1Mbps steps up to 10Mpbs [CIR range 1]<br>• ≤ 5 Mbps steps beyond 10Mbps and up to 100Mbps [CIR range 2]<br>• ≤ 50 Mbps steps beyond 100Mpbs and up to 1Gbps [CIR range 3]<br>• ≤ 500 Mbps steps beyond 1Gbps [CIR range 4] |
| **Test Object** | Verify that a UNI-N Type 2 supports per EVC egress BW profile configuration to modify CIR in the granularities described in the requirement description section above. |
| **Test Configuration** | At least two EVCs, associating ingress UNIs and an egress UNI Type 2 are configured and at least one CE-VLAN ID is mapped per EVC.  Per EVC egress bandwidth profile is applied at the egress UNI.  Testers with proper PHY that matches each UNI are attached to all UNI-Ns in the configured EVCs. |
| **Test Configuration Schematic** |  |

| INGRESS UNI 'A' | | | INGRESS UNI 'B' | | | EGRESS UNI 'C' | |
|---|---|---|---|---|---|---|---|
| **CE-VLAN ID** | **EVC** | | **CE-VLAN ID** | **EVC** | | **CE-VLAN ID** | **EVC** |
| 11* | EVC$_1$ | | 11* | EVC$_1$ | | 11* | EVC$_1$ |
| 12 | EVC$_2$ | | 12 | EVC$_2$ | | 12 | EVC$_2$ |

**CE-VLAN ID/EVC Map**

Use of other CE-VLAN IDs is permitted provided that configuration of the CE-VLAN IDs conforms to MEF 10.1 [Ethernet Services Attributes Phase 2], Section 7.7

* The CE-VLAN ID for untagged and priority tagged Service Frames is configured to 11 at both ingress and egress UNIs

**Bandwidth Profile**

| PER EVC EGRESS BP | |
|---|---|
| **EVC** | **Bandwidth Profile Parameters** |
| EVC$_1$ | CIR$_1$     CBS$_1$     EIR$_1$     EBS$_1$ |
| EVC$_2$ | CIR$_2$     CBS$_2$     EIR$_2$     EBS$_2$ |

Note 1: (0 < (Σ Egress CIRs) < Egress UNI Speed), (Egress CBS$_s$ ≥ Maximum Transmission Unit size of the EVC that the Bandwidth Profile applies to)
Note 2: (Σ Ingress CIR$_1$ > Egress CIR$_1$), (Σ Ingress CIR$_2$ > Egress CIR$_2$)
Note 3: (EIRs = 0) and (EBSs = 0)

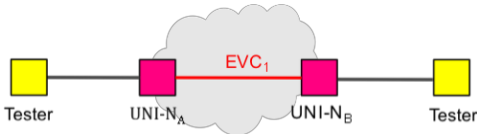| **Test Procedure** | Tester offers Service Frames with mapped CE-VLAN IDs of length $\lambda$ into the configured EVCs at the ingress UNIs during a time interval $T$, at rates equal to the ingress UNI speeds and measures the number of Service Frames delivered at the associated egress UNI.  For each EVC the amount of traffic delivered at the associated egress UNI must fall within the range $X \leq W_G \leq Z$ where:<br><br>   $W_G$ is the amount of traffic declared Green that should be delivered by the egress UNI over the time interval $T$<br>      $X_1 = (CIR_1 * T + CBS_1 - F)$ *and* $Z_1 = (CIR_1 * T + CBS_1 + F)$<br>      $X_2 = (CIR_2 * T + CBS_2 - F)$ *and* $Z_2 = (CIR_2 * T + CBS_2 + F)$<br><br>Begin the test with Egress CIRs set to the minimum value (i.e. 1 Mbps) and increment Egress CIRs by the step value defined for the CIR range.  Repeat the test for each Egress CIR value until (Σ Egress CIRs) has been incremented to the Egress UNI speed. |
|---|---|
| **Units** | Number of valid Service Frames |
| **Variables** | Bandwidth Profile Parameters CIR$_{1, 2}$, CBS$_{1, 2}$, UNIs interface speed, time interval $T$, tolerated variance F, number and length $\lambda$ of the offered Service Frames |
| **Results** | Pass or fail |
| **Remarks** | |

## TEST CASE 3N: Per CoS ID Egress Bandwidth Profile - CIR Configuration Granularity

| Abstract Test Suite for Enhanced UNI Attributes & L2CP | |
|---|---|
| **Test Name** | Per CoS ID Egress Bandwidth Profile - CIR Configuration Granularity |
| **Test Definition ID** | UNIN-R72 |
| **Reference Document** | MEF 20 UNI Type 2 Implementation Agreement Section 12 |
| **Test Type** | Conformance |
| **Test Status** | Mandatory |
| **MEF Requirement Description** | A UNI-N Type 2 **MUST** be able to support Per CoS ID egress BW profiling of CIR as specified in MEF10.1, in the following granularities: • ≤ 1Mbps steps up to 10Mpbs [CIR range 1]<br>• ≤ 5 Mbps steps beyond 10Mbps and up to 100Mbps [CIR range 2]<br>• ≤ 50 Mbps steps beyond 100Mpbs and up to 1Gbps [CIR range 3]<br>• ≤ 500 Mbps steps beyond 1Gbps [CIR range 4] |
| **Test Object** | Verify that a UNI-N Type 2 supports per CoS ID egress BW profile configuration to modify CIR in the granularities described in the requirement description section above. |
| **Test Configuration** | At least one EVC, associating two ingress UNIs and one egress UNI Type 2 is configured. At least one CE-VLAN ID is mapped per EVC with 2 CoS IDs. Per CoS ID egress bandwidth profiles are applied at the egress UNI. Testers with proper PHY that matches each UNI are attached to all UNI-Ns in the configured EVCs. |
| **Test Configuration Schematic** |  |

| INGRESS UNI 'A' | | | INGRESS UNI 'B' | | | EGRESS UNI 'C' | |
|---|---|---|---|---|---|---|---|
| **CE-VLAN ID** | **EVC** | | **CE-VLAN ID** | **EVC** | | **CE-VLAN ID** | **EVC** |
| 11* | $EVC_1$ | | 11* | $EVC_1$ | | 11* | $EVC_1$ |

**CE-VLAN ID/EVC Map**

Use of other CE-VLAN IDs is permitted provided that configuration of the CE-VLAN IDs conforms to MEF 10.1 [Ethernet Services Attributes Phase 2], Section 7.7

\* The CE-VLAN ID for untagged and priority tagged Service Frames is configured to 11 at both ingress and egress UNIs

**Bandwidth Profile**

| PER CoS ID EGRESS BP | | |
|---|---|---|
| **EVC** | **CoS ID** | **Bandwidth Profile Parameters** |
| $VC_1$ | 1 | $CIR_{11}$  $CBS_{11}$  $EIR_{11}$  $EBS_{11}$ |
| | 3 | $CIR_{13}$  $CBS_{13}$  $EIR_{13}$  $EBS_{13}$ |

Note 1: ($0 < (\Sigma$ Egress CIRs) < Egress UNI Speed), (Egress $CBS_s \geq$ Maximum Transmission Unit size of the EVC that the Bandwidth Profile applies to)
Note 2: ($\Sigma$ Ingress $CIR_{11} >$ Egress $CIR_{11}$), ($\Sigma$ Ingress $CIR_{13} >$ Egress $CIR_{13}$)
Note 3: (EIRs = 0) and (EBSs = 0)

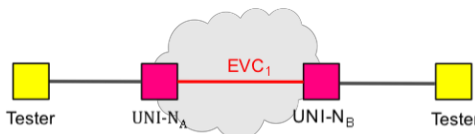| **Test Procedure** | Tester offers Service Frames with mapped CE-VLAN IDs/CoS IDs of length $\lambda$ into the configured EVC at the ingress UNIs during a time interval $T$, at rates equal to the ingress UNI speeds and measures the number of Service Frames delivered at the associated egress UNI. For each CoS ID the amount of traffic delivered at the associated egress UNI must fall within the range $X \leq W_G \leq Z$ where:<br><br>$W_G$ is the amount of traffic declared Green that should be delivered by the egress UNI over the time interval $T$<br>$X_1 = (CIR_{11}*T + CBS_{11} - F)$ and $Z_1 = (CIR_{11}*T + CBS_{11} + F)$<br>$X_2 = (CIR_{13}*T + CBS_{13} - F)$ and $Z_2 = (CIR_{13}*T + CBS_{13} + F)$<br><br>Begin the test with Egress CIRs set to the minimum value (i.e. 1 Mbps) and increment Egress CIRs by the step value defined for the CIR range. Repeat the test for each Egress CIR value until ($\Sigma$ Egress CIRs) has been incremented to the Egress UNI speed. |
|---|---|
| **Units** | Number of valid Service Frames |
| **Variables** | Bandwidth Profile Parameters $CIR_{11, 13}$, $CBS_{11, 13}$, UNIs interface speed, time interval $T$, tolerated variance F, number and length $\lambda$ of the offered Service Frames |
| **Results** | Pass or fail |
| **Remarks** | |

## TEST CASE 4N:     Mandatory MTU Size

| | |
|---|---|
| **Abstract Test Suite for Enhanced UNI Attributes & L2CP** ||
| **Test Name** | Mandatory MTU Size |
| **Test Definition ID** | UNIN-R73[1] |
| **Reference Document** | MEF 20 UNI Type 2 Implementation Agreement Section 12 |
| **Test Type** | Conformance |
| **Test Status** | Mandatory |
| **MEF Requirement Description** | A UNI-N Type 2 **MUST** support an MTU size of 1522 Bytes as per [IEEE 802.3]. |
| **Test Object** | Verify that a UNI-N Type 2 supports an MTU size of 1522 Bytes as per [IEEE 802.3]. |
| **Test Configuration** | At least one EVC associating at least two Type 2 UNIs is configured and at least one CE-VLAN ID is mapped per EVC. Testers with proper PHY that matches each UNI are attached to all UNI-Ns in the configured EVCs. |
| **Test Configuration Schematic** |  |
| **CE-VLAN ID/EVC Map** | (table below) |
| **Bandwidth Profile** | Not specified |
| **Test Procedure** | Tester offers 1522-Byte Service Frames, as specified in IEEE 802.3 bidirectionally at each UNI-N configured in the EVC and verifies that the corresponding Service Frames are delivered at the associated UNI-N. |
| **Units** | Number of valid Service Frames |
| **Variables** | None |
| **Results** | Pass or fail |
| **Remarks** | |

CE-VLAN ID/EVC Map table:

| UNI 'A' | | | UNI 'B' | |
|---|---|---|---|---|
| **CE-VLAN ID** | **EVC** | | **CE-VLAN ID** | **EVC** |
| 11* | EVC$_1$ | | 11* | EVC$_1$ |
| Use of other CE-VLAN IDs is permitted provided that configuration of the CE-VLAN IDs conforms to MEF 10.1 [Ethernet Services Attributes Phase 2], Section 7.7 |||||
| * The CE-VLAN ID for untagged and priority tagged Service Frames is configured to 11 at both ingress and egress UNIs |||||
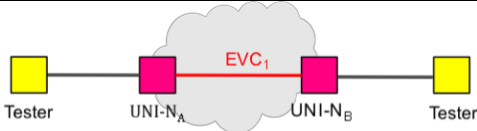
## TEST CASE 5N:     Recommended MTU Size

| Abstract Test Suite for Enhanced UNI Attributes & L2CP | |
|---|---|
| **Test Name** | Recommended MTU Size |
| **Test Definition ID** | UNIN-R73[2] |
| **Reference Document** | MEF 20 UNI Type 2 Implementation Agreement Section 12 |
| **Test Type** | Conformance |
| **Test Status** | Optional |
| **MEF Requirement Description** | A UNI-N Type 2 **SHOULD** support an MTU size of 2000 Bytes as per [IEEE 802.3as]. |
| **Test Object** | Verify that a UNI-N Type 2 supports an MTU size of 2000 Bytes as per [IEEE 802.3as]. |
| **Test Configuration** | At least one EVC associating at least two Type 2 UNIs is configured and at least one CE-VLAN ID is mapped per EVC. Testers with proper PHY that matches each UNI are attached to all UNI-Ns in the configured EVCs. |
| **Test Configuration Schematic** |  |
| **CE-VLAN ID/EVC Map** | (see table below) |
| **Bandwidth Profile** | Not specified |
| **Test Procedure** | Tester offers 2000-Byte Service Frames, as specified in IEEE 802.3as, bidirectionally at each UNI-N configured in the EVC and verifies that the corresponding Service Frames are delivered at the associated UNI-N. |
| **Units** | Number of valid Service Frames |
| **Variables** | None |
| **Results** | Pass or fail |
| **Remarks** | |

CE-VLAN ID/EVC Map:

| UNI 'A' | | UNI 'B' | |
|---|---|---|---|
| **CE-VLAN ID** | **EVC** | **CE-VLAN ID** | **EVC** |
| 11* | $EVC_1$ | 11* | $EVC_1$ |
| Use of other CE-VLAN IDs is permitted provided that configuration of the CE-VLAN IDs conforms to MEF 10.1 [Ethernet Services Attributes Phase 2], Section 7.7 | | | |
| * The CE-VLAN ID for untagged and priority tagged Service Frames is configured to 11 at both ingress and egress UNIs | | | |

## TEST CASE 6N:     Optional MTU Size

| Abstract Test Suite for Enhanced UNI Attributes & L2CP | |
|---|---|
| **Test Name** | Optional MTU Size |
| **Test Definition ID** | UNIN-R73[3] |
| **Reference Document** | MEF 20 UNI Type 2 Implementation Agreement Section 12 |
| **Test Type** | Conformance |
| **Test Status** | Optional |
| **MEF Requirement Description** | A UNI-N Type 2 **MAY** support 9600-Byte jumbo frames. |
| **Test Object** | Verify that a UNI-N Type 2 supports 9600-Byte jumbo frames. |
| **Test Configuration** | At least one EVC associating at least two Type 2 UNIs is configured and at least one CE-VLAN ID is mapped per EVC. Testers with proper PHY that matches each UNI are attached to all UNI-Ns in the configured EVCs. |
| **Test Configuration Schematic** |  |
| **CE-VLAN ID/EVC Map** | (table below) |
| **Bandwidth Profile** | Not specified |
| **Test Procedure** | Tester offers 9600-Byte jumbo Service Frames bidirectionally at each UNI-N configured in the EVC and verifies that the corresponding Service Frames are delivered at the associated UNI-N. |
| **Units** | Number of valid Service Frames |
| **Variables** | None |
| **Results** | Pass or fail |
| **Remarks** |  |

CE-VLAN ID/EVC Map:

| UNI 'A' | | UNI 'B' | |
|---|---|---|---|
| **CE-VLAN ID** | **EVC** | **CE-VLAN ID** | **EVC** |
| 11* | $EVC_1$ | 11* | $EVC_1$ |

Use of other CE-VLAN IDs is permitted provided that configuration of the CE-VLAN IDs conforms to MEF 10.1 [Ethernet Services Attributes Phase 2], Section 7.7

* The CE-VLAN ID for untagged and priority tagged Service Frames is configured to 11 at both ingress and egress UNIs

## TEST CASE 7N: Point-to-Point EVC Support

| Abstract Test Suite for Enhanced UNI Attributes & L2CP | |
|---|---|
| **Test Name** | Point-to-Point EVC Support |
| **Test Definition ID** | UNIN-R75[1] |
| **Reference Document** | MEF 20 UNI Type 2 Implementation Agreement Section 12 |
| **Test Type** | Conformance |
| **Test Status** | Mandatory |
| **MEF Requirement Description** | A UNI-N Type 2 **MUST** be able to support Point-to-point EVCs. |
| **Test Object** | Verify that a UNI-N Type 2 supports Point-to-point EVCs. |
| **Test Configuration** | At least one Point-to-Point EVC associating at least two Type 2 UNIs is configured and at least one CE-VLAN ID is mapped per EVC.  The UNI Type must be Root for each UNI.  Testers with proper PHY that matches each UNI are attached to all UNI-Ns in the configured EVC. |
| **Test Configuration Schematic** |  |

| | UNI 'A' | | | UNI 'B' | |
|---|---|---|---|---|---|
| | CE-VLAN ID | EVC | | CE-VLAN ID | EVC |
| **CE-VLAN ID/EVC Map** | 11* | $EVC_1$ | | 11* | $EVC_1$ |
| | Use of other CE-VLAN IDs is permitted provided that configuration of the CE-VLAN IDs conforms to MEF 10.1 [Ethernet Services Attributes Phase 2], Section 7.7 | | | | |
| | * The CE-VLAN ID for untagged and priority tagged Service Frames is configured to 11 at both ingress and egress UNIs | | | | |

| | |
|---|---|
| **Bandwidth Profile** | Not specified |
| **Test Procedure** | Tester offers Service Frames bidirectionally at each UNI-N configured in the EVC and verifies that the corresponding Service Frames are delivered at the associated UNI-N. |
| **Units** | Number of valid Service Frames |
| **Variables** | None |
| **Results** | Pass or fail |
| **Remarks** | |

## TEST CASE 8N:    Multipoint-to-Multipoint EVC Support

| Abstract Test Suite for Enhanced UNI Attributes & L2CP | |
|---|---|
| **Test Name** | Multipoint-to-Multipoint EVC Support |
| **Test Definition ID** | UNIN-R75[2] |
| **Reference Document** | MEF 20 UNI Type 2 Implementation Agreement Section 12 |
| **Test Type** | Conformance |
| **Test Status** | Mandatory |
| **MEF Requirement Description** | A UNI-N Type 2 **MUST** be able to support Multipoint-to-Multipoint EVCs. |
| **Test Object** | Verify that a UNI-N Type 2 supports Multipoint-to-Multipoint EVCs. |
| **Test Configuration** | At least one Multipoint-to-Multipoint EVC associating at least three Type 2 UNIs is configured and at least one CE-VLAN ID is mapped per EVC.  The UNI Type must be Root for each UNI.  Testers with proper PHY that matches each UNI are attached to all UNI-Ns in the configured EVC. |
| **Test Configuration Schematic** |  |

| **CE-VLAN ID/EVC Map** | UNI 'A' | | | UNI 'B' | | | UNI 'C' | |
|---|---|---|---|---|---|---|---|---|
| | CE-VLAN ID | EVC | | CE-VLAN ID | EVC | | CE-VLAN ID | EVC |
| | 11* | $EVC_1$ | | 11* | $EVC_1$ | | 11* | $EVC_1$ |
| | Use of other CE-VLAN IDs is permitted provided that configuration of the CE-VLAN IDs conforms to MEF 10.1 [Ethernet Services Attributes Phase 2], Section 7.7 | | | | | | | |
| | * The CE-VLAN ID for untagged and priority tagged Service Frames is configured to 11 at both ingress and egress UNIs | | | | | | | |

| | |
|---|---|
| **Bandwidth Profile** | Not specified |
| **Test Procedure** | Tester offers Service Frames bidirectionally at each UNI-N configured in the EVC and verifies that the corresponding Service Frames are delivered at the associated UNI-N. |
| **Units** | Number of valid Service Frames |
| **Variables** | None |
| **Results** | Pass or fail |
| **Remarks** | |

# TEST CASE 9N: Rooted-Multipoint EVC Support

| Abstract Test Suite for Enhanced UNI Attributes & L2CP | |
|---|---|
| **Test Name** | Rooted-Multipoint EVC Support |
| **Test Definition ID** | UNIN-R75[3] |
| **Reference Document** | MEF 20 UNI Type 2 Implementation Agreement Section 12 |
| **Test Type** | Conformance |
| **Test Status** | Optional |
| **MEF Requirement Description** | A UNI-N Type 2 **SHOULD** be able to support Rooted-Multipoint EVCs. |
| **Test Object** | Verify that a UNI-N Type 2 supports Rooted-Multipoint EVCs. |
| **Test Configuration** | At least one Rooted-Multipoint EVC associating at least three Type 2 UNIs is configured and at least one CE-VLAN ID is mapped per EVC. The UNI Type of one UNI must be Root and all UNIs that are not UNI Type Root must be UNI Type Leaf. Testers with proper PHY that matches each UNI are attached to all UNI-Ns in the configured EVC. |
| **Test Configuration Schematic** |  |

| **CE-VLAN ID/EVC Map** | UNI 'A' | | UNI 'B' | | UNI 'C' | |
|---|---|---|---|---|---|---|
| | **CE-VLAN ID** | **EVC** | **CE-VLAN ID** | **EVC** | **CE-VLAN ID** | **EVC** |
| | 11* | $EVC_1$ | 11* | $EVC_1$ | 11* | $EVC_1$ |
| | Use of other CE-VLAN IDs is permitted provided that configuration of the CE-VLAN IDs conforms to MEF 10.1 [Ethernet Services Attributes Phase 2], Section 7.7 | | | | | |
| | * The CE-VLAN ID for untagged and priority tagged Service Frames is configured to 11 at both ingress and egress UNIs | | | | | |

| **Bandwidth Profile** | Not specified |
|---|---|
| **Test Procedure** | Tester offers Service Frames, at the UNI-N of the Type Root UNI configured in the EVC and verifies that the corresponding Service Frames are delivered at the associated UNI-Ns of the Type Leaf UNIs. Then, tester offers Service Frames, at the UNI-Ns of the Type Leaf UNIs configured in the EVC and verifies that the corresponding Service Frames are only delivered at the associated UNI-N of the Type Root UNI. |
| **Units** | Number of valid Service Frames |
| **Variables** | None |
| **Results** | Pass or fail |
| **Remarks** | |
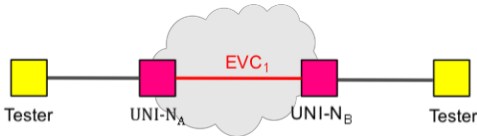
## TEST CASE 10N:     UNI-N Root and Leaf Support

| Abstract Test Suite for Enhanced UNI Attributes & L2CP | |
|---|---|
| **Test Name** | UNI-N Root and Leaf Support |
| **Test Definition ID** | UNIN-R76 |
| **Reference Document** | MEF 20 UNI Type 2 Implementation Agreement Section 12 |
| **Test Type** | Conformance |
| **Test Status** | Optional |
| **MEF Requirement Description** | A UNI-N Type 2 **SHOULD** be able to take on the role of a "Root" or "Leaf" for each Rooted-Multipoint EVC it supports. |
| **Test Object** | Verify that a UNI-N Type 2 can take on the role of a "Root" or "Leaf" for each Rooted-Multipoint EVC it supports. |
| **Test Configuration** | At least one Rooted-Multipoint EVC associating at least three Type 2 UNIs is configured and at least one CE-VLAN ID is mapped per EVC.  The UNI Type of one UNI must be Root and all UNIs that are not UNI Type Root must be UNI Type Leaf.  Testers with proper PHY that matches each UNI are attached to all UNI-Ns in the configured EVC. |
| **Test Configuration Schematic** |  |

| CE-VLAN ID/EVC Map | UNI 'A' | | UNI 'B' | | UNI 'C' | |
|---|---|---|---|---|---|---|
| | **CE-VLAN ID** | **EVC** | **CE-VLAN ID** | **EVC** | **CE-VLAN ID** | **EVC** |
| | 11* | $EVC_1$ | 11* | $EVC_1$ | 11* | $EVC_1$ |

Use of other CE-VLAN IDs is permitted provided that configuration of the CE-VLAN IDs conforms to MEF 10.1 [Ethernet Services Attributes Phase 2], Section 7.7

\* The CE-VLAN ID for untagged and priority tagged Service Frames is configured to 11 at both ingress and egress UNIs

| | |
|---|---|
| **Bandwidth Profile** | Not specified |
| **Test Procedure** | Tester offers Service Frames, at the UNI-N of the Type Root UNI configured in the EVC and verifies that the corresponding Service Frames are delivered at the associated UNI-Ns of the Type Leaf UNIs.  Then, tester offers Service Frames, at the UNI-Ns of the Type Leaf UNIs configured in the EVC and verifies that the corresponding Service Frames are only delivered at the associated UNI-N of the Type Root UNI.<br>Re-configure one of the UNI Type Root as a Type Leaf and one of the UNI Type Leaf as a Type Root and repeat the test. |
| **Units** | Number of valid Service Frames |
| **Variables** | None |
| **Results** | Pass or fail |
| **Remarks** | |
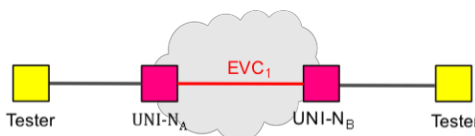
# TEST CASE 11N:    UNI-N Root and Leaf Concurrent Support

| Abstract Test Suite for Enhanced UNI Attributes & L2CP | |
|---|---|
| **Test Name** | UNI-N Root and Leaf Concurrent Support |
| **Test Definition ID** | UNIN-R77 |
| **Reference Document** | MEF 20 UNI Type 2 Implementation Agreement Section 12 |
| **Test Type** | Conformance |
| **Test Status** | Optional |
| **MEF Requirement Description** | A UNI-N Type 2 **SHOULD** be capable of operating as a "root" on one Rooted-Multipoint EVC and as a "leaf" on another Rooted-Multipoint EVC concurrently. |
| **Test Object** | Verify that a UNI-N Type 2 is capable of operating as a "root" on one Rooted-Multipoint EVC and as a "leaf" on another Rooted-Multipoint EVC concurrently. |
| **Test Configuration** | At least two Rooted-Multipoint EVCs associating at least three Type 2 UNIs are configured and at least one CE-VLAN ID is mapped per EVC.  One UNI must be Type Root for the first Rooted-Multipoint EVC and Type Leaf for the second one.  Another UNI must be Type Root for the second Rooted-Multipoint EVC and Type Leaf for the first one.  All other UNIs must be Type Leaf.  Testers with proper PHY that matches each UNI are attached to all UNI-Ns in the configured EVC. |
| **Test Configuration Schematic** |  |

| UNI 'A' | | | UNI 'B' | | | UNI 'C' | |
|---|---|---|---|---|---|---|---|
| **CE-VLAN ID** | **EVC** | | **CE-VLAN ID** | **EVC** | | **CE-VLAN ID** | **EVC** |
| 11* | EVC$_1$ | | 11* | EVC$_1$ | | 11* | EVC$_1$ |
| 12 | EVC$_2$ | | 12 | EVC$_2$ | | 12 | EVC$_2$ |

Use of other CE-VLAN IDs is permitted provided that configuration of the CE-VLAN IDs conforms to MEF 10.1 [Ethernet Services Attributes Phase 2], Section 7.7

\* The CE-VLAN ID for untagged and priority tagged Service Frames is configured to 11 at both ingress and egress UNIs

| | |
|---|---|
| **CE-VLAN ID/EVC Map** | *(see table above)* |
| **Bandwidth Profile** | Not specified |
| **Test Procedure** | Tester offers Service Frames, at the UNI-N of the Root Type UNIs configured in the EVCs.  For each EVC, tester verifies that the Service Frames ingressing at the UNI-N of the Root Type UNI are only delivered at the associated UNI-Ns of the Leaf Type UNIs associated with the specific EVC.  Then Tester offers Service Frames at the UNI-Ns of the Leaf Type UNIs and verifies that frames ingressing at the UNI-Ns of Leaf Type are only delivered at the associated UNI-Ns of the Root Type UNIs associated with the specific EVC. |
| **Units** | Number of valid Service Frames |
| **Variables** | None |
| **Results** | Pass or fail |
| **Remarks** | |
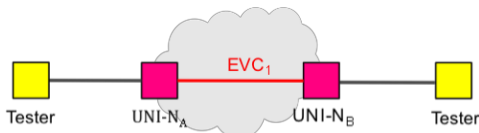
# TEST CASE 12N: UNI-N Type 2 Physical Medium

| Abstract Test Suite for Enhanced UNI Attributes & L2CP | |
|---|---|
| **Test Name** | UNI-N Type 2 Ethernet Physical Medium |
| **Test Definition ID** | UNIN-R78[1] |
| **Reference Document** | MEF 20 UNI Type 2 Implementation Agreement Section 12 |
| **Test Type** | Conformance |
| **Test Status** | Mandatory |
| **MEF Requirement Description** | A UNI-N Type 2 **MUST** support at least one of the PHYs listed in [IEEE 802.3], excluding 1000BASE-PX-D and 1000BASE-PX-U, since Link OAM is not supported on these PHYs. |
| **Test Object** | Verify that a UNI-N Type 2 supports at least one of the PHYs listed in [IEEE 802.3], excluding 1000BASE-PX-D and 1000BASE-PX-U. |
| **Test Configuration** | At least one EVC associating at least two Type 2 UNIs is configured and at least one CE-VLAN ID is mapped per EVC. Testers with proper PHY that matches each UNI and is one of the PHYs listed in [IEEE802.3] excluding 1000BASE-PX-D and 1000BASE-PX-U are attached to all UNI-Ns in the configured EVCs. |
| **Test Configuration Schematic** |  |
| **CE-VLAN ID/EVC Map** | (see table below) |
| **Bandwidth Profile** | Not specified |
| **Test Procedure** | Tester offers Service Frames bidirectionally at each UNI-N configured in the EVC and verifies that the corresponding Service Frames are delivered at the associated UNI-N. |
| **Units** | Number of valid Service Frames |
| **Variables** | UNIs interface speed |
| **Results** | Pass or fail |
| **Remarks** | |

CE-VLAN ID/EVC Map:

| UNI 'A' | | UNI 'B' | |
|---|---|---|---|
| **CE-VLAN ID** | **EVC** | **CE-VLAN ID** | **EVC** |
| 11* | $EVC_1$ | 11* | $EVC_1$ |
| Use of other CE-VLAN IDs is permitted provided that configuration of the CE-VLAN IDs conforms to MEF 10.1 [Ethernet Services Attributes Phase 2], Section 7.7 | | | |
| * The CE-VLAN ID for untagged and priority tagged Service Frames is configured to 11 at both ingress and egress UNIs | | | |

## TEST CASE 13N:    Auto-Negotiation Support

| Abstract Test Suite for Enhanced UNI Attributes & L2CP | |
|---|---|
| **Test Name** | Auto-Negotiation Support |
| **Test Definition ID** | UNIN-R79 |
| **Reference Document** | MEF 20 UNI Type 2 Implementation Agreement Section 12 |
| **Test Type** | Conformance |
| **Test Status** | Mandatory |
| **MEF Requirement Description** | A UNI-N Type 2 **MUST** support auto-negotiation for 10/100 and 10/100/1000 UNI rates for the PHYs that support auto-negotiation. |
| **Test Object** | Verify that a UNI-N Type 2 supports auto-negotiation for 10/100 and 10/100/1000 UNI rates for the PHYs that support auto-negotiation. |
| **Test Configuration** | At least one EVC associating at least two Type 2 UNIs is configured and at least one CE-VLAN ID is mapped per EVC. Testers with proper PHY that matches each UNI are attached to all UNI-Ns in the configured EVCs. |
| **Test Configuration Schematic** |  |
| **CE-VLAN ID/EVC Map** | (see table below) |
| **Bandwidth Profile** | Not specified |
| **Test Procedure** | Enable auto-negotiation on the UNI-Ns under test.  Set speed and mode of the tester to advertise 10 Mbps Full Duplex and verify that the UNI-Ns under tests automatically adjust their speed and mode to 10 Mbps full Duplex.  Then, tester offers Service Frames bidirectionally at each UNI-N configured in the EVC and verifies that the corresponding Service Frames are delivered at the associated UNI-N. Set speed and mode of the tester to advertise 100 Mbps Full Duplex and repeat the test. If the UNI-Ns support 10/100/1000, set speed and mode of the tester to advertise 1000 Mbps Full Duplex and repeat the test. |
| **Units** | Number of valid Service Frames |
| **Variables** | UNIs interface speed |
| **Results** | Pass or fail |
| **Remarks** | |

CE-VLAN ID/EVC Map detail:

| UNI 'A' | | | UNI 'B' | |
|---|---|---|---|---|
| CE-VLAN ID | EVC | | CE-VLAN ID | EVC |
| 11* | EVC$_1$ | | 11* | EVC$_1$ |
| Use of other CE-VLAN IDs is permitted provided that configuration of the CE-VLAN IDs conforms to MEF 10.1 [Ethernet Services Attributes Phase 2], Section 7.7 | | | | |
| * The CE-VLAN ID for untagged and priority tagged Service Frames is configured to 11 at both ingress and egress UNIs | | | | |

## TEST CASE 14N:    Disabling the Auto-Negotiation Function
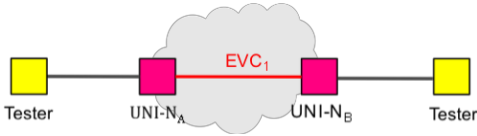
| | |
|---|---|
| **Abstract Test Suite for Enhanced UNI Attributes & L2CP** | |
| **Test Name** | Disabling the Auto-Negotiation Function |
| **Test Definition ID** | UNIN-R80 |
| **Reference Document** | MEF 20 UNI Type 2 Implementation Agreement Section 12 |
| **Test Type** | Conformance |
| **Test Status** | Mandatory |
| **MEF Requirement Description** | A UNI-N Type 2 **MUST** support the capability to disable the auto-negotiation function. Note: The Auto-negotiation function may need to be disabled for unidirectional link operation |
| **Test Object** | Verify that a UNI-N Type 2 supports the capability to disable the auto-negotiation function. |
| **Test Configuration** | At least one EVC associating at least two Type 2 UNIs is configured and at least one CE-VLAN ID is mapped per EVC. Testers with proper PHY that matches each UNI are attached to all UNI-Ns in the configured EVCs. |
| **Test Configuration Schematic** |  |

| | | | | | |
|---|---|---|---|---|---|
| **UNI 'A'** | | | | **UNI 'B'** | |
| **CE-VLAN ID** | **EVC** | | | **CE-VLAN ID** | **EVC** |
| 11* | $EVC_1$ | | | 11* | $EVC_1$ |

Use of other CE-VLAN IDs is permitted provided that configuration of the CE-VLAN IDs conforms to MEF 10.1 [Ethernet Services Attributes Phase 2], Section 7.7

\* The CE-VLAN ID for untagged and priority tagged Service Frames is configured to 11 at both ingress and egress UNIs

The above table is the content of the **CE-VLAN ID/EVC Map** row.

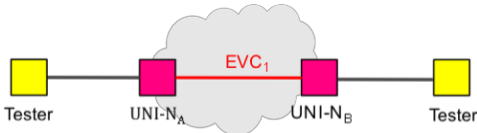| | |
|---|---|
| **Bandwidth Profile** | Not specified |
| **Test Procedure** | Disable auto-negotiation on the UNI-Ns under test and on the tester ports.  Force the speed and mode of the tester ports to 10 Mbps Full Duplex and the UNI-Ns to 100 Mbps Half Dulpex** and verify that the UNI-Ns under tests do not automatically adjust their speed and mode to 10 Mbps full Duplex.  Then, tester offers Service Frames bidirectionally at each UNI-N configured in the EVC and verifies that the corresponding Service Frames are not delivered at the associated UNI-N. |
| **Units** | Number of valid Service Frames |
| **Variables** | UNIs interface speed |
| **Results** | Pass or fail |
| **Remarks** | \*\* If 100 Mbps Half Duplex mode is not supported, use 100 Mbps Full Duplex mode |

# 11.2 UNI-N Type 2 L2CP Handling

## TEST CASE 15N:    L2CP Mandated Filtering

| Abstract Test Suite for Enhanced UNI Attributes & L2CP | |
|---|---|
| **Test Name** | L2CP Mandated Filtering |
| **Test Definition ID** | UNIN-R81 |
| **Reference Document** | MEF 20 UNI Type 2 Implementation Agreement Section 12 |
| **Test Type** | Conformance |
| **Test Status** | Mandatory |
| **MEF Requirement Description** | A UNI-N Type 2 **MUST** "Filter" all L2CP packets with the following Multicast MAC DA:<br><br>• 01-80-C2-00-00-02 to 01-80-C2-00-00-0A<br>• 01-80-C2-00-00-0D<br>• 01-80-C2-00-00-0E |
| **Test Object** | Verify that a UNI-N Type 2 filters all L2CP packets with the Multicast MAC DA defined in the requirement description section. |
| **Test Configuration** | At least one EVC associating at least two Type 2 UNIs is configured and at least one CE-VLAN ID is mapped per EVC. Testers with proper PHY that matches each UNI are attached to all UNI-Ns in the configured EVCs. |
| **Test Configuration Schematic** |  |
| **CE-VLAN ID/EVC Map** | (table below) |
| **Bandwidth Profile** | Not specified |
| **Test Procedure** | Tester offers Layer 2 Control protocol frames with multicast MAC DAs defined in the requirement description at the ingress UNI and verifies that they are not delivered at the egress UNI. |
| **Units** | Number of valid Service Frames |
| **Variables** | Service Type |
| **Results** | Pass or fail |
| **Remarks** | "Filter" means the L2CP could be either Peered or Discarded depending on the service type.  See MEF 6.1 section 8.1 |

CE-VLAN ID/EVC Map:

| UNI 'A' | | UNI 'B' | |
|---|---|---|---|
| **CE-VLAN ID** | **EVC** | **CE-VLAN ID** | **EVC** |
| 11* | EVC$_1$ | 11* | EVC$_1$ |
| Use of other CE-VLAN IDs is permitted provided that configuration of the CE-VLAN IDs conforms to MEF 10.1 [Ethernet Services Attributes Phase 2], Section 7.7 | | | |
| * The CE-VLAN ID for untagged and priority tagged Service Frames is configured to 11 at both ingress and egress UNIs | | | |

# TEST CASE 16N: L2CP Recommended Filtering

| Abstract Test Suite for Enhanced UNI Attributes & L2CP | |
|---|---|
| **Test Name** | L2CP Recommended Filtering |
| **Test Definition ID** | UNIN-R82 |
| **Reference Document** | MEF 20 UNI Type 2 Implementation Agreement Section 12 |
| **Test Type** | Conformance |
| **Test Status** | Optional |
| **MEF Requirement Description** | A UNI-N Type 2 **SHOULD** "Filter" PAUSE frames with the following Multicast MAC DA: <br><br> • 01-80-C2-00-00-01 |
| **Test Object** | Verify that a UNI-N Type 2 filters PAUSE frames with the Multicast MAC DA defined in the requirement description section. |
| **Test Configuration** | At least one EVC associating at least two Type 2 UNIs is configured and at least one CE-VLAN ID is mapped per EVC. Testers with proper PHY that matches each UNI are attached to all UNI-Ns in the configured EVCs. |
| **Test Configuration Schematic** |  |

| **CE-VLAN ID/EVC Map** | UNI 'A' | | UNI 'B' | |
|---|---|---|---|---|
| | **CE-VLAN ID** | **EVC** | **CE-VLAN ID** | **EVC** |
| | 11* | $EVC_1$ | 11* | $EVC_1$ |
| | Use of other CE-VLAN IDs is permitted provided that configuration of the CE-VLAN IDs conforms to MEF 10.1 [Ethernet Services Attributes Phase 2], Section 7.7 | | | |
| | * The CE-VLAN ID for untagged and priority tagged Service Frames is configured to 11 at both ingress and egress UNIs | | | |

| | |
|---|---|
| **Bandwidth Profile** | Not specified |
| **Test Procedure** | Tester offers Layer 2 Control protocol frames with multicast MAC DA defined in the requirement description section at the ingress UNI and verifies that they are not delivered at the egress UNI. |
| **Units** | Number of valid Service Frames |
| **Variables** | Service Type |
| **Results** | Pass or fail |
| **Remarks** | "Filter" means the L2CP could be either Peered or Discarded depending on the service type.  See MEF 6.1 section 8.1 |

# TEST CASE 17N:    L2CP Mandated Configurability

| Abstract Test Suite for Enhanced UNI Attributes & L2CP | |
|---|---|
| **Test Name** | L2CP Recommended Filtering |
| **Test Definition ID** | UNIN-R83 |
| **Reference Document** | MEF 20 UNI Type 2 Implementation Agreement Section 12 |
| **Test Type** | Conformance |
| **Test Status** | Mandatory |
| **MEF Requirement Description** | A UNI-N Type 2 **MUST** have the capability to be configured to either "Pass to EVC" or "Filter" all packets with the following Multicast MAC DA:<br>• 01-80-C2-00-00-00<br>• 01-80-C2-00-00-0B<br>• 01-80-C2-00-00-0C<br>• 01-80-C2-00-00-0F<br>• 01-80-C2-00-00-20 to 01-80-C2-00-00-2F<br>• 01-80-C2-00-00-30 to 01-80-C2-00-00-3F |
| **Test Object** | Verify that a UNI-N Type 2 has the capability to be configured to either "Pass to EVC" or "Filter" all packets with the Multicast MAC DA defined in the requirement description section. |
| **Test Configuration** | At least one EVC associating at least two Type 2 UNIs is configured and at least one CE-VLAN ID is mapped per EVC. Testers with proper PHY that matches each UNI are attached to all UNI-Ns in the configured EVCs. |
| **Test Configuration Schematic** |  |

| UNI 'A' | | | UNI 'B' | |
|---|---|---|---|---|
| **CE-VLAN ID** | **EVC** | | **CE-VLAN ID** | **EVC** |
| 11* | EVC$_1$ | | 11* | EVC$_1$ |

| **CE-VLAN ID/EVC Map** | Use of other CE-VLAN IDs is permitted provided that configuration of the CE-VLAN IDs conforms to MEF 10.1 [Ethernet Services Attributes Phase 2], Section 7.7 |
|---|---|
| | * The CE-VLAN ID for untagged and priority tagged Service Frames is configured to 11 at both ingress and egress UNIs |

| | |
|---|---|
| **Bandwidth Profile** | Not specified |
| **Test Procedure** | Configure the UNI-N to "Pass to EVC" all packets with the Multicast MAC DA defined in the requirement description section.  Tester offers Layer 2 Control protocol frames with the Multicast MAC DA defined in the requirement description section at the ingress UNI and verifies that they are delivered at the egress UNI and that they are identical to the corresponding ingress frames.  Configure the UNI-N to "Filter" all packets with the Multicast MAC DA defined in the requirement description section.  Tester offers Layer 2 Control protocol frames with multicast MAC DA defined in the requirement description section at the ingress UNI and verifies that they are not delivered at the egress UNI |
| **Units** | Number of valid Service Frames |
| **Variables** | Service Type |
| **Results** | Pass or fail |
| **Remarks** | "Filter" means the L2CP could be either Peered or Discarded depending on the service type.  See MEF 6.1 section 8.1 |

# 12. Abstract Test Cases for UNI-C Type 2 Enhanced UNI Attributes

This section contains 6 Test Cases for UNI-C Type 2.

Section 12.1
Enhanced UNI Attributes Requirements contains a total of 6 Test Cases covering the UNI Type 2 Requirements R74, R78, R79 and R80.

# 12.1 UNI-C Type 2 Enhanced UNI Attributes

## TEST CASE 4C:     Mandatory MTU Size

| Abstract Test Suite for Enhanced UNI Attributes & L2CP | |
|---|---|
| **Test Name** | Mandatory MTU Size |
| **Test Definition ID** | UNIC-R74[1] |
| **Reference Document** | MEF 20 UNI Type 2 Implementation Agreement Section 12 |
| **Test Type** | Conformance |
| **Test Status** | Mandatory |
| **MEF Requirement Description** | A UNI-C Type 2 **MUST** support an MTU size of 1522 Bytes as per [IEEE 802.3]. |
| **Test Object** | Verify that a UNI-C Type 2 supports an MTU size of 1522 Bytes as per [IEEE 802.3]. |
| **Test Configuration** | Tester and UNI-N emulator with proper PHY that match the UNI-C are exchanging Service Frames across the UNI-C |
| **Test Configuration Schematic** |  |
| **CE-VLAN ID/EVC Map** | Not specified |
| **Bandwidth Profile** | Not specified |
| **Test Procedure** | Tester offers 1522-Byte Service Frames, as specified in IEEE 802.3, to the UNI-C and UNI-N Emulator verifies that the corresponding Service Frames are delivered across the UNI-C. Then in the opposite direction, UNI-N Emulator offers 1522-Byte Service Frames, as specified in IEEE 802.3, to the UNI-C and the tester verifies that the corresponding Service Frames are delivered across the UNI-C |
| **Units** | Number of valid Service Frames |
| **Variables** | None |
| **Results** | Pass or fail |
| **Remarks** | |

## TEST CASE 5C:     Recommended MTU Size

| Abstract Test Suite for Enhanced UNI Attributes & L2CP | |
|---|---|
| **Test Name** | Recommended MTU Size |
| **Test Definition ID** | UNIC-R74[2] |
| **Reference Document** | MEF 20 UNI Type 2 Implementation Agreement Section 12 |
| **Test Type** | Conformance |
| **Test Status** | Optional |
| **MEF Requirement Description** | A UNI-C Type 2 **SHOULD** support an MTU size of 2000 Bytes as per [IEEE 802.3as]. |
| **Test Object** | Verify that a UNI-C Type 2 supports an MTU size of 2000 Bytes as per [IEEE 802.3as]. |
| **Test Configuration** | Tester and UNI-N emulator with proper PHY that match the UNI-C are exchanging Service Frames across the UNI-C |
| **Test Configuration Schematic** |  |
| **CE-VLAN ID/EVC Map** | Not specified |
| **Bandwidth Profile** | Not specified |
| **Test Procedure** | Tester offers 2000-Byte Service Frames, as specified in IEEE 802.3as, to the UNI-C and UNI-N Emulator verifies that the corresponding Service Frames are delivered across the UNI-C. Then in the opposite direction, UNI-N Emulator offers 2000-Byte Service Frames, as specified in IEEE 802.3, to the UNI-C and the tester verifies that the corresponding Service Frames are delivered across the UNI-C |
| **Units** | Number of valid Service Frames |
| **Variables** | None |
| **Results** | Pass or fail |
| **Remarks** | |

## TEST CASE 6C: Optional MTU Size

| Abstract Test Suite for Enhanced UNI Attributes & L2CP | |
|---|---|
| **Test Name** | Optional MTU Size |
| **Test Definition ID** | UNIC-R74[3] |
| **Reference Document** | MEF 20 UNI Type 2 Implementation Agreement Section 12 |
| **Test Type** | Conformance |
| **Test Status** | Optional |
| **MEF Requirement Description** | A UNI-C Type 2 **MAY** support 9600-Byte jumbo frames. |
| **Test Object** | Verify that a UNI-C Type 2 supports 9600-Byte jumbo frames. |
| **Test Configuration** | Tester and UNI-N emulator with proper PHY that match the UNI-C are exchanging Service Frames across the UNI-C |
| **Test Configuration Schematic** | <br>Tester    UNI-C_A    UNI-N_A Emulator |
| **CE-VLAN ID/EVC Map** | Not specified |
| **Bandwidth Profile** | Not specified |
| **Test Procedure** | Tester offers 9600-Byte jumbo Service Frames to the UNI-C and UNI-N Emulator verifies that the corresponding Service Frames are delivered across the UNI-C.<br>Then in the opposite direction, UNI-N Emulator offers 9600-Byte Service Frames to the UNI-C and the tester verifies that the corresponding Service Frames are delivered across the UNI-C |
| **Units** | Number of valid Service Frames |
| **Variables** | None |
| **Results** | Pass or fail |
| **Remarks** | |

## TEST CASE 12C:    UNI-C Type 2 Physical Medium

| Abstract Test Suite for Enhanced UNI Attributes & L2CP | |
|---|---|
| **Test Name** | UNI-C Type 2 Ethernet Physical Medium |
| **Test Definition ID** | UNIC-R78[1] |
| **Reference Document** | MEF 20 UNI Type 2 Implementation Agreement Section 12 |
| **Test Type** | Conformance |
| **Test Status** | Mandatory |
| **MEF Requirement Description** | A UNI-C Type 2 **MUST** support at least one of the PHYs listed in [IEEE 802.3], excluding 1000BASE-PX-D and 1000BASE-PX-U, since Link OAM is not supported on these PHYs. |
| **Test Object** | Verify that a UNI-C Type 2 supports at least one of the PHYs listed in [IEEE 802.3], excluding 1000BASE-PX-D and 1000BASE-PX-U. |
| **Test Configuration** | Tester and UNI-N emulator with proper PHYs that match the UNI-C and are one of the PHYs listed in [IEEE802.3] excluding 1000BASE-PX-D and 1000BASE-PX-U are exchanging Service Frames across the UNI-C |
| **Test Configuration Schematic** | <br><br>Tester        UNI-C$_A$        UNI-N$_A$ Emulator |
| **CE-VLAN ID/EVC Map** | Not specified |
| **Bandwidth Profile** | Not specified |
| **Test Procedure** | Tester offers Service Frames to the UNI-C and UNI-N Emulator verifies that the corresponding Service Frames are delivered across the UNI-C.<br>Then in the opposite direction, UNI-N Emulator offers Service Frames to the UNI-C and the tester verifies that the corresponding Service Frames are delivered across the UNI-C |
| **Units** | Number of valid Service Frames |
| **Variables** | UNIs interface speed |
| **Results** | Pass or fail |
| **Remarks** | |

## TEST CASE 13C:    Auto-Negotiation Support

| Abstract Test Suite for Enhanced UNI Attributes & L2CP | |
|---|---|
| **Test Name** | Auto-Negotiation Support |
| **Test Definition ID** | UNIC-R79 |
| **Reference Document** | MEF 20 UNI Type 2 Implementation Agreement Section 12 |
| **Test Type** | Conformance |
| **Test Status** | Mandatory |
| **MEF Requirement Description** | A UNI-C Type 2 **MUST** support auto-negotiation for 10/100 and 10/100/1000 UNI rates for the PHYs that support auto-negotiation. |
| **Test Object** | Verify that a UNI-C Type 2 supports auto-negotiation for 10/100 and 10/100/1000 UNI rates for the PHYs that support auto-negotiation. |
| **Test Configuration** | Tester and UNI-N emulator with proper PHY that match the UNI-C are exchanging Service Frames across the UNI-C |
| **Test Configuration Schematic** | <br>Tester          UNI-C$_A$          UNI-N$_A$ Emulator |
| **CE-VLAN ID/EVC Map** | Not specified |
| **Bandwidth Profile** | Not specified |
| **Test Procedure** | Enable auto-negotiation on the UNI-C under test and on the tester port.  Set speed and mode of the tester to advertise 10 Mbps Full Duplex and verify that the UNI-C under tests automatically adjusts its speed and mode to 10 Mbps full Duplex. Then, tester offers Service Frames to the UNI-C and UNI-N Emulator verifies that the corresponding Service Frames are delivered across the UNI-C.  In the opposite direction, UNI-N Emulator offers Service Frames to the UNI-C and the tester verifies that the corresponding Service Frames are delivered across the UNI-C.<br>Set speed and mode of the tester to advertise 100 Mbps Full Duplex and repeat the test.<br>If the UNI-C supports 10/100/1000, set speed and mode of the tester to advertise 1000 Mbps Full Duplex and repeat the test. |
| **Units** | Number of valid Service Frames |
| **Variables** | UNIs interface speed |
| **Results** | Pass or fail |
| **Remarks** | |

## TEST CASE 14C: Disabling the Auto-Negotiation Function

| Abstract Test Suite for Enhanced UNI Attributes & L2CP | |
|---|---|
| **Test Name** | Disabling the Auto-Negotiation Function |
| **Test Definition ID** | UNIC-R80 |
| **Reference Document** | MEF 20 UNI Type 2 Implementation Agreement Section 12 |
| **Test Type** | Conformance |
| **Test Status** | Mandatory |
| **MEF Requirement Description** | A UNI-C Type 2 **MUST** support the capability to disable the auto-negotiation function. Note: The Auto-negotiation function may need to be disabled for unidirectional link operation |
| **Test Object** | Verify that a UNI-C Type 2 supports the capability to disable the auto-negotiation function. |
| **Test Configuration** | Tester and UNI-N emulator with proper PHY that match the UNI-C are exchanging Service Frames across the UNI-C |
| **Test Configuration Schematic** |   Tester    UNI-C$_A$    UNI-N$_A$ Emulator |
| **CE-VLAN ID/EVC Map** | Not specified |
| **Bandwidth Profile** | Not specified |
| **Test Procedure** | Disable auto-negotiation on the UNI-C under test and on the tester port. Force the speed and mode of the tester port to10 Mbps Full Duplex and the UNI-C to 100 Mbps Half Dulpex** and verify that the UNI-C under test does not automatically adjust its speed and mode to 10 Mbps full Duplex. Then, tester offers Service Frames to the UNI-C and UNI-N Emulator verifies that the corresponding Service Frames are not delivered across the UNI-C. In the opposite direction, UNI-N Emulator offers Service Frames to the UNI-C and the tester verifies that the corresponding Service Frames are not delivered across the UNI-C. |
| **Units** | Number of valid Service Frames |
| **Variables** | UNIs interface speed |
| **Results** | Pass or fail |
| **Remarks** | ** If 100 Mbps Half Duplex mode is not supported, use 100 Mbps Full Duplex mode |

# 13. References

| References | Details |
|---|---|
| MEF 20 | UNI Type 2 Implementation Agreement |
| MEF 10.1 | Ethernet Services Attributes Phase 2 |
| MEF 6.1 | Ethernet Services Definition Phase 2 |
| IEEE 802.3 | IEEE, Carrier sense multiple access with collision detection (CSMA/CD) access method and physical layer specifications |
| RFC 2119 | RFC 2119, "Key words for use in RFCs to Indicate Requirement Levels", S. Bradner, http://www.ietf.org/rfc/rfc2119.txt (Normative) |
| RFC 2285 | RFC 2285, "Benchmarking Terminology for LAN Switching Devices", R. Mandeville, http://www.ietf.org/rfc/rfc2285.txt |
| RFC 2544 | RFC 2544, "Benchmarking Methodology for Network Interconnect Devices", S. Bradner, J. McQuaid, http://www.ietf.org/rfc/rfc2544.txt |
| RFC 2889 | RFC 2889, "Benchmarking Methodology for LAN Switching Devices", R. Mandeville, J. Perser, http://www.ietf.org/rfc/rfc2889.txt |