Certification Abstract Test Suite for MFAF 12.0.1

IP/MPLS Forum 21.0.0

IP/MPLS Forum Technical Committee

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Revision History

Version	Description	Date
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1 Introduction

This document defines the abstract test cases and test procedures for MFAF 12.0.1 implementation certification. This abstract test suite (ATS) is intended to form the basis of any derived executable test suites as well as set the requirements for vendors applying for MFAF 12.0.1 certification.
The tests specified in this document are derived from the MultiService Interworking - Ethernet over MPLS specification [MFAF 12.0.1]. This document serves two purposes. The first goal of this document is to provide procedures for the testing Ethernet service over various attachment circuit types. Both Point-to-point VPWS and Multi-Point VPLS are addressed by this document. The second goal is to provide a framework for the certification of an MFAF 12.0.1 implementation.
This document does not define the methods for measuring performance of the implementation, or Service Level Specifications (SLSs). This document does not define metrics or methods of benchmarking, however metric results will conform to IETF definitions. Certification testing is limited to the scope of this ATS.

1.1 Overview of MFAF 12.0.1 Certification

The MFAF 12.0.1 certification will provide the vendor that passes the certification the opportunity to declare that their equipment has fulfilled an applicable set of requirements of MFAF 12.0.1, as outlined in Section 7.1 of this document. Completion of the specifications described in this document certifies that the Device Under Test (DUT) supports standardized point-to-point Ethernet services, over the Ethernet and ATM Attachment Circuits across an MPLS core, as defined by MFAF 12.0.1, independent of Layer 3 or higher layer protocols.

This ATS concentrates on verifying following DUT functionalities:

- Mapping of Ethernet traffic received from an Ethernet AC to MPLS pseudowire and vice versa
- Mapping of Ethernet traffic received from an ATM AC to MPLS pseudowire and vice versa
- Transport of Ethernet traffic over an Ethernet AC
- Transport and encapsulation of Ethernet traffic over an ATM AC
- Transport and encapsulation of Ethernet traffic over MPLS pseudowires
- VLAN tagging of Ethernet Frames.

In addition, the ATS tests basic DUT capability for MPLS pseudowire signaling as defined in RFC 3985.

1.2 Interworking Models and Applicability

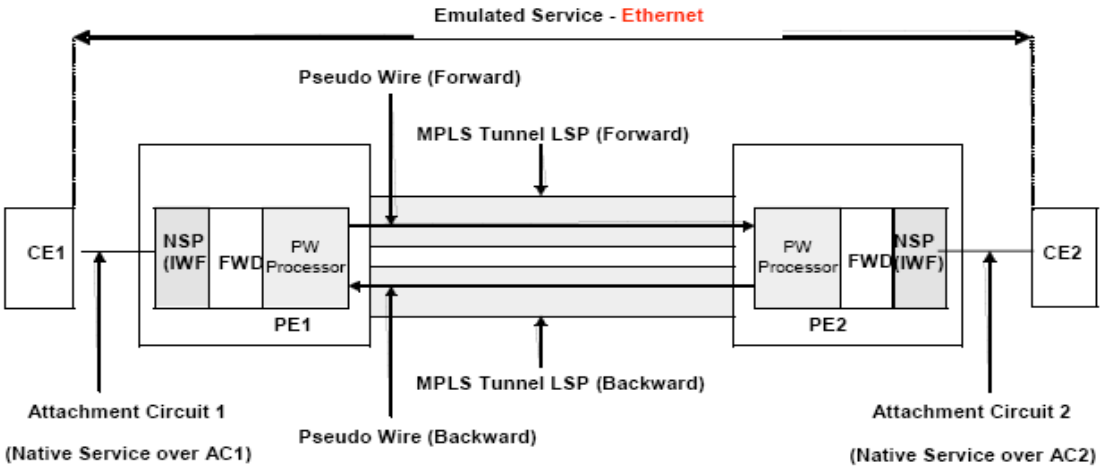

Figure 1 Interworking Model from MFAF 12.0.1

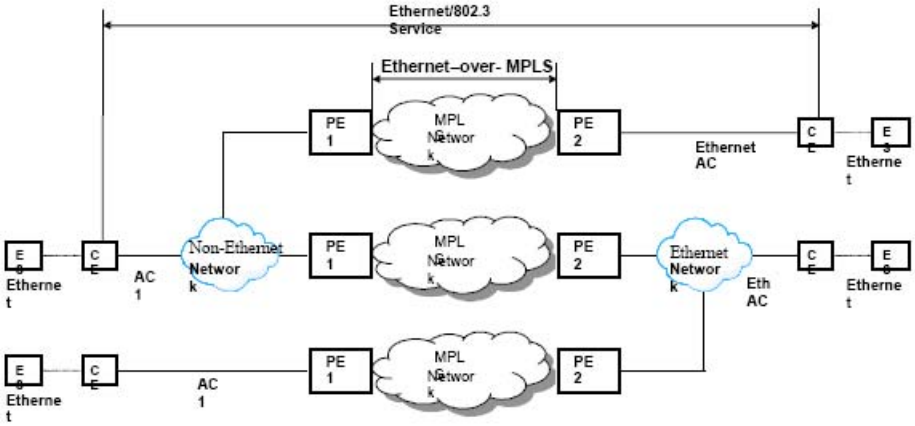

Figure 2 Ethernet Interworking Model from MFAF 12.0.1

1.3 Scope

The scope of the MFAF 12.0.1 ATS is a set of required and optional functionalities of MFAF 12.0.1, as outlined in Section 7.1, and more specifically, in Sections 7 and 8 of this document.

This test suite addresses the 2-sided model as described in section 4.1 of MFAF 12.0.1. A DUT that completes the MFAF 12.0.1 certification does not imply complete conformance to MFAF

12.0.1. Rather, the DUT claims compliance to the mandatory and zero or more of the optional functionalities outlined in the aforementioned sections, which are selected from MFAF 12.0.1.

This abstract test suite does not address the following

- FR
- PPP/HDLC

Performance benchmarking is beyond the scope of the MFAF 12.0.1 certification. Performance includes, but not limited to, scalability, latency, jitter, convergence time, and re-convergence time.

2 Definitions and Terminologies

2.1 Definitions

2.2 Acronyms and Abbreviations

AC	Attachment Circuit
AAL	ATM Adaptation Layer
ABR	Available Bit Rate
ATM	Asynchronous Transfer Mode
AUU	ATM User-to-User indication
Bc	Committed Burst
Be	Excess Burst
BECN	Backward Explicit Congestion Notification
BPDU	Bridge Protocol Data Unit
CBS	Committed Burst Size
C-VLAN	Customer Tag
CDVT	Cell Delay Variation Tolerance
CE	Customer Edge
CIR	Committed Information Rate
CLP	Cell Loss Priority
CoS	Ethernet Class of Service
CRC	Cyclic Redundancy Check
CW	Control Word
DA	Destination Address
DE	Discard Eligibility
DLCI	Data Link Connection Identifier
DSCP	DiffServ Code Point
DUT	Device Under Test
EBS	Excess Burst Size
EFCI	Explicit Forward Congestion Indicator
EIR	Excess Information Rate
EoPW Ethernet over PW	ESI Ethernet Service Instance
EVC	Ethernet Virtual Connection
EoPW	Ethernet over PW
ESI	Ethernet Service Instance
FECN	Forward Explicit Congestion Notification
NPE	Network Provider Edge

PW	Pseudowire
S-VLAN	Service Tag
SN	Sequence Number

2.3 References

2.3.1 Normative References

[MFAF12.0.1] Multi-Service Interworking – Ethernet over MPLS, IP/MPLS Forum 12.0.1

[MFAF13.0.0] Fault Management for Multiservice Interworking over MPLS Version 1.0

[RFC 4447] "Pseudowire Setup and Maintenance Using the Label Distribution Protocol (LDP)" RFC 4447

[RFC 4448] "Encapsulation Methods for Transport of Ethernet over MPLS Networks "RFC 4448

[RFC 5036] "LDP Specification" RFC 3036

[RFC 3985] S. Bryant, P. Pate, Pseudowire Emulation Edge-to-Edge (PWE3) Architecture, March 2005

3 Compliance Levels

Any DUT that is MFAF 12.0.1 certified must comply with all mandatory stated parts of this test suite.

In addition, if the DUT implements optional features or aspects of MFAF 12.0.1, the DUT must comply with all required components of each optional MFAF 12.0.1 feature or aspects. Otherwise, the DUT must comply with the behavior as specified for devices not implementing the optional feature of MFAF 12.0.1, if applicable.

3.1 Pass/ Fail Criteria

A DUT must pass the following test cases to be declared compliant with MFAF12.0.1:

- All test cases designated as mandatory for a given DUT.
- All optional test cases required for supported optional features.

The required or optional designation of a test case is determined by what features are claimed to be supported for a DUT and what tests apply to the features supported.

A DUT must pass ***all*** designated tests to PASS the test suite and attain certification.

4 Definition of DUT

The DUT is defined as networking equipment(s) that shall indicate support for all MANDATORY test items outlined in Section 7.1 of this document. The DUT may indicate support for one or more OPTIONAL test items in Section 7.1 of this document.

The DUT shall have at least one (1) management interface, and at least one (1) MPLS enabled interface, and at least one (1) Attachment Circuit interface, of the following type:

1) Ethernet
2) ATM
3) FR
4) PPP

all of which are physically accessible externally.

The DUT shall provide a management interface that allows configuration of the system and protocol parameters for example, Command Line Interface (CLI), or a web interface.

The IP/MPLS Forum does not restrict the form factor of the DUT, as long as it meets or exceeds the above requirements. For example, the DUT may be composed of multiple physical units, each providing an exclusive component described above.

5 Test Environment and Reference Diagram

Figure 1 shows an MFAF 12.0.1 certification diagram testing a DUT (PE) with potential of singular or multiple ACs being tested, with either VPWS or VPLS service as the backbone**,** and the tester being attached to both sides of the service. The attachment circuits are to be tested in the scenarios as supported by the DUT.

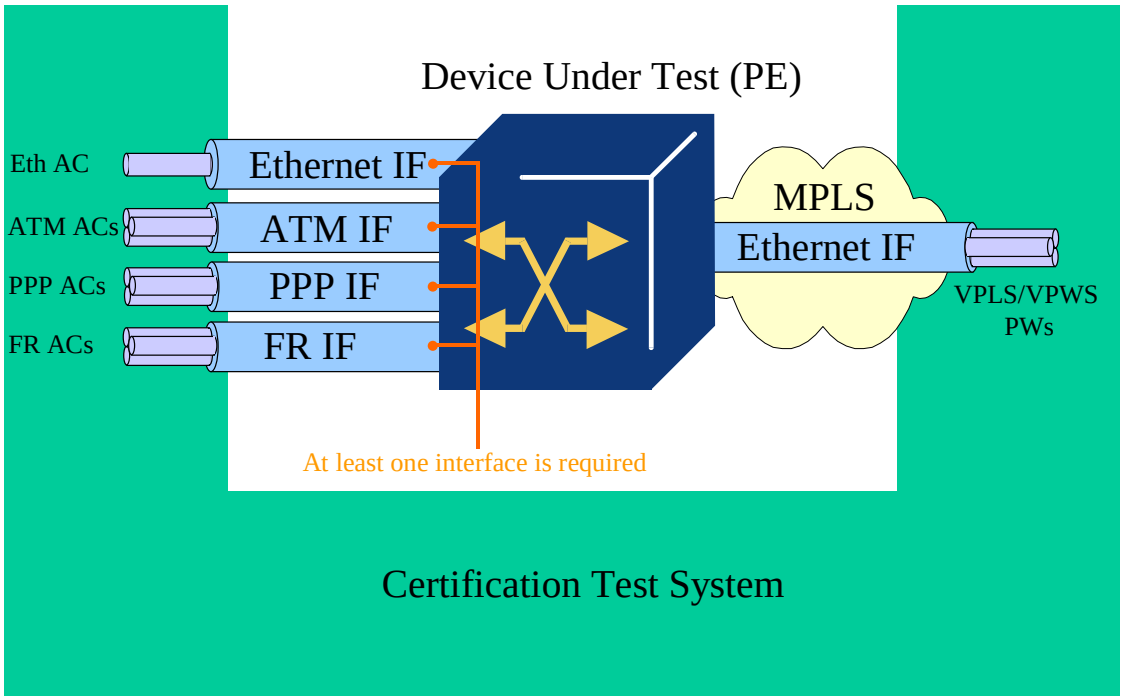

Figure 3: Reference Diagram for certification test bed

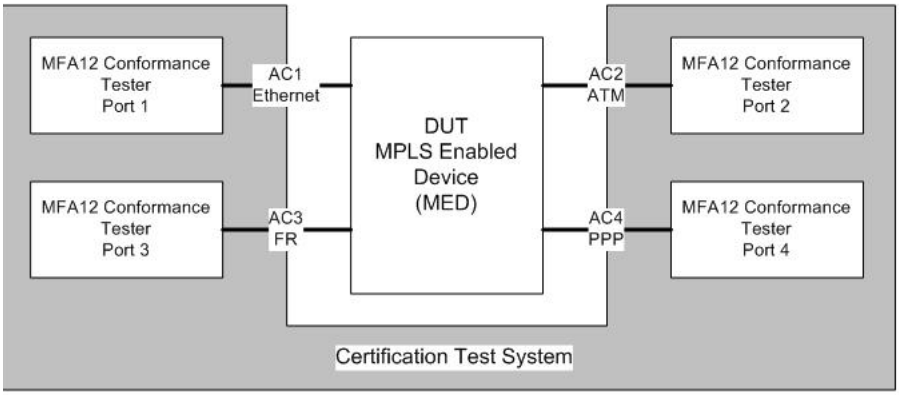

Figure 4: Reference Diagram for certification test bed

6 Test Case Template

ABSTRACT TEST CASES FOR MULTI-SERVICE INTERWORKING – Area of Test	
Test Case ID	Identification number
Reference Document Source	Documentation reference
Test Status	Test is either Mandatory or Optional based on PICs reference.
Spec. Quotation	Specification Reference
Test Purpose	What this test case is evaluating.
Features	Specific features that need to be implemented from the DUT for this test case.
Test Procedure	Procedures to be followed for execution of this test case.
Expected Results	Expected Test Results to determine Pass or Fail

7 Implementation Conformance Statement

The following tables list all mandatory and optional requirements for an implementation of MFAF 12.0.1. It follows the intent of an Implementation Conformance Statement (ICS) as specified in [ISO9646:2000].
The status column of the tables below indicates if the feature is mandatory (M) or optional (O). The status can be conditionally expressed:

- O.<n> means optional, but support of at least one of the group of features labeled by the same number <n> is required.
- <feature>:<s> means that if the support of the feature <feature> is true (the feature is referenced by its ID), then the requirements are as per the status <s>, M or O.

Type of requirement:

- Mandatory support is marked “M”.
- Optional support is marked “O”.
- Conditional support is marked “C”, where each group of conditional options is numbered. A DUT must support at least one option of the conditional support group. It may support more than one option.
- Mutually exclusive support is marked “E”, where each group of mutually exclusive options is numbered. A DUT must support exactly one of the mutually exclusive options of the group.

7.1 Prerequisites

DUT must satisfy well-defined MPLS criteria, with particular regard to MFAF 12.0.1 and Ethernet over MPLS requirements. The DUT must satisfy the criteria of MFAF 12.0.1, for example, Ethernet encapsulation, Traffic Management, and PVC management Interworking. This implies that the DUT meets the accepted well-defined criteria of traffic performance, Ethernet functionality and MPLS functionality. These criteria will be presumed to be performed by the DUT prior to application for certification. This document focuses on the requirements of MFAF 12.0.1; the certification is contingent upon the DUT satisfying the requirements of the test suite.

7.1.1 PWE Support

[RFC 3985] The DUT must satisfy the Pseudo Wire Edge-to-Edge definition as defined in RFC 3985. PWE3 is a mechanism that emulates the essential attributes of a telecommunications service over a PSN tunnel.
The service functionality of PWE3 will include:

- Encapsulation of service-specific PDUs or circuit data arriving at the PE-bound port (logical or physical).
- Carriage of the encapsulated data across a PSN tunnel.
- Establishment of the PW, including the exchange and/or distribution of the PW identifiers used by the PSN tunnel endpoints.
- Managing the signaling, timing order, or other aspects of the service at the boundaries of the PW.
- Service specific status and alarm management.

- IETF PWE3 defined two modes of operation for Ethernet pseudo wires, raw mode versus tagged mode. Both raw and tagged modes can be used for Ethernet service interworking with any of the AC traffic mappings described before.

This is in reference to table 7 of MFAF 12.0.1, the applicability of customer tag (C-VLAN), service tag (S-VLAN), raw mode EoPW, and tagged mode for each possible mapping at the AC.

The DUT must satisfy the point-to-point PWE3 set up using LDP as defined in RFC 4447.

[RFC 4448]The DUT must satisfy the PWE3 Ethernet/802.3 encapsulation as defined in RFC 4448.

- PDU format used within the PW
- Procedures for using PW in order to provide a pair of customer Edge (CE) routers with an emulated (point-to-point) Ethernet service, including the procedures for the processing of Provider Edge (PE) – bound and CE-bound Ethernet PDUs [RFC 3985]
- Ethernet-specific quality of service (QoS) and security considerations.
- Inter-domain transport considerations for Ethernet PW.

The DUT must satisfy OAM message map as defined in MFAF 13.

7.1.2 Control Plane functionality verification (FR, ATM, Ethernet)

TBD

7.2 Major Functional Requirements

Item	String ID	Feature	Reference	Status	Support
MC 1	EoPW	Does the implementation support the raw-mode Ethernet pseudowire type (0x0005) RFC 4448?	[1] 5.1	M	Yes [] No []
MC 2	Tagged EoPW	Does the implementation support the tagged-mode Ethernet pseudowire type (0x0004) RFC 4448?	[1] 5.3	O	Yes [] No []

Item	String ID	Feature	Reference	Status	Support
MC 3	CW EoPW	Does the implementation require processing of the control word according to RFC4448?	[3] 4.6	O	Yes [] No []
MC 4	Dyn_PW	Does the implementation support the dynamic assignment of PW label over LDP for VPWS?	[2] 3	O.5	Yes [] No []
MC 5	St_PW	Does the implementation support the static assignment of PW label over LDP for VPWS?	[2] 3	O.5	Yes [] No []
MC 6	LDP FEC 128	Does the implementation support LDP FEC type 128?	[2] 5.2	MC4:M1	Yes [] No []
MC 7	PW Status via Label Withdraw Method	Is the implementation capable to signal the PW status via Label Withdraw Method?	[2], 5.4.1, 5.4.3	MC4:M	Yes [] No []
MC 8	PW Status via PW Status TLV Method	Is the implementation capable to signal the PW status via PW Status TLV?	[2], 5.4.1, 5.4.2, 5.4.3	MC4:O	Yes [] No []
MC 9	VPLS	Does the implementation support the multipoint-to-multipoint connectivity via VPLS?	[1] 5.1	O	Yes [] No []
MC 10	Eth_AC	Does the implementation support the Ethernet Attachment Circuits?	[1] 1.2	O.1	Yes [] No []
MC 11	ATM_AC	Does the implementation support the ATM Attachment Circuits?	[1] 1.2	O.1	Yes [] No []
MC 12	FR_AC	Does the implementation support the Frame Relay Attachment Circuits?	[1] 1.2	O.1	Yes [] No []
MC 13	PPP_AC	Does the implementation support the PPP Attachment Circuits?	[1] 1.2	O.1	Yes [] No []
MC 14	IEEE 802.1ad	Is the Service Tag procedure according to the IEEE 802.1ad standard supported?	[1] 6.2	MC2:M	Yes [] No []
MC 15	Port-based with untagged traffic mapping on Ethernet interface	Does the implementation support the port-based with untagged traffic Ethernet AC mapping type?	[1] 5.1	O.4	Yes [] No []
MC 16	Port-based with tagged & untagged traffic mapping on Ethernet interface	Does the implementation support the port-based with tagged & untagged traffic Ethernet AC mapping type?	[1] 5.1	O.4	Yes [] No []
MC 17	VLAN mapping type on Ethernet interface	Does the implementation support the VLAN Ethernet AC mapping type?	[1] 5.1	O.4	Yes [] No []

Item	String ID	Feature	Reference	Status	Support
MC 18	VLAN bundling mapping type on Ethernet interface	Does the implementation support the VLAN bundling Ethernet AC mapping type?	1] 5.1	O.4	Yes [] No []
MC 19	TBD	Does the implementation support the S-tag removing before a frame is delivered over an AC?	[1] 5.1	MC15 or MC16 or MC18:M	Yes [] No []
MC 20	S-tag to C-tag translating	Does the implementation support translation of S-tag to C-tag?	[1] 5.1	MC17:O	Yes [] No []
MC 21	S-tag to S-tag translating	Does the implementation support translation of an S-tag to another S-tag or pass the S-tag unchanged before a frame is delivered over a NNI AC?	[1] 5.1	MC17:O	Yes [] No []
MC 22	Tagging in tagged EoPW	Is the implementation capable to add an S-Tag to the Ethernet AC frames before it transmits them into a tagged mode Ethernet PW?	[1] 5.3	MC2:M	Yes [] No []
MC 23	Frame transmission over raw EoPW	Is the implementation capable to transmit the Ethernet UNI AC frames without adding any tag as they are over the raw EoPW?	[1] 5.3	MC1:M	Yes [] No []

8 Ethernet Service Interworking

8.1 Mapping Scenarios (Ethernet <-> Ethernet)

Reference table 3
Port-Based untagged Traffic – Port-Based untagged Traffic
Port-Based untagged Traffic – VLAN Mapping
Port-Based w/tagged & untagged Traffic – VLAN Mapping[1]
Port-Based w/tagged & untagged Traffic – VLAN Bundling[2]
VLAN Mapping – VLAN Mapping
VLAN Mapping – VLAN Bundling[3]
VLAN Bundling – VLAN Bundling

[1] *In this asymmetric mapping scenario, it is assumed that the CE device with a 'VLAN mapping' AC is a Provider Bridge, as defined by (IEEE 802.1ad), because it will receive Ethernet frames with two tags; the outer tag is S-VLAN and the inner tag is C-VLAN received from 'port-based' AC.*
[2] *In this asymmetric mapping scenario, it is assumed that the vlan tags in the port-based AC are identical to the VLAN tags in the 'VLAN bundle' AC, and the PE passes them to the CE device transparently without any processing. Furthermore, it is assumed that the untagged frames (if any) from the port-based UNI are dropped, unless the PE on the 'VLAN Bundle' AC side has the capability to process a single untagged control stream and branch it into multiple streams (one per bundle), as described in [IEEE 802.1ad].*
[3] *In this asymmetric mapping scenario, it is assumed that the CE device with a 'VLAN Mapping' AC is a Provider Bridge, as defined [IEEE 802.1ad], because it will receive Ethernet frames with two tags; the outer tag is S-VLAN and the inner tag is C-VLAN, received from a 'VLAN bundling' AC.*

8.2 Mapping Scenarios (ATM <-> Ethernet)

Reference
Port-Based untagged Traffic – Port-Based untagged Traffic
Port-Based untagged Traffic – VLAN Mapping
Port-Based w/tagged & untagged Traffic -- Port-Based w/tagged & untagged Traffic
Port-Based w/tagged & untagged Traffic – VLAN Mapping (Note 1)
Port-Based w/tagged & untagged Traffic – VLAN Bundling(Note 2)

8.3 ATM <-> Ethernet Interworking Capabilities

Item	String ID	Feature	Reference	Status	Support
ATM_E 1	EoATM	In general does the implementation support the bridged forms of the Ethernet over ATM encapsulation according to RFC 2684?	[1] 6.2	MC11:M	Yes [] No []
ATM_E 2	0x0E PID RX	Does the implementation support receiving and transmitting of the PID 0x0E Multiprotocol over ATM encapsulated frames (RFC2684)?	[1] 6.2	ATM_E 1:O	Yes [] No []
ATM_E 3	0x07 PID RX	Does the implementation support receiving and transmitting of the PID 0x07 Multiprotocol over ATM encapsulated frames (RFC2684)?	[1] 6.2	ATM_E 1:O.1	Yes [] No []
ATM_E 4	EoATM to EoPW BPDU translating	Upon receiving a BPDU frame over the ATM VC, is the implementation able to add a BPDU multicast MAC address as the MAC DA and a dummy unicast MAC address as the MAC SA before forwarding the BPDU frame to the egress PE over the EoPW?	[1] 6.2	ATM_E 2:M	Yes [] No []
ATM_E 5	EoPW to EoATM BPDU translating	Upon receiving a BPDU frame over EoPW is the implementation able to remove the MAC header and encapsulate the frame based upon RFC 2684 before delivering it over the ATM VC?	[1] 6.2	ATM_E 2:M	Yes [] No []
ATM_E 6	Non-FCS retention	Does the implementation support the non-FCS retention on the PW?	[1] 6.2	ATM_E 2:M	Yes [] No []
ATM_E 7	Port-based with untagged traffic mapping on ATM VC	Does the implementation support the port-based untagged Ethernet traffic over an ATM VC?	[1] 5.1	O.3	Yes [] No []
ATM_E 8	Port-based with tagged & untagged traffic mapping on ATM VC	Does the implementation support the port-based with tagged & untagged Ethernet traffic over an ATM VC?	[1] 5.1	O.3	Yes [] No []

Item	String ID	Feature	Reference	Status	Support
ATM_E 9	S-tag stripping on ATM VC	Does the implementation support the S-tag removing before a frame is delivered over an ATM VC used to carry an Enet UNI?	[1] 5.1	(ATM_E 7OR ATM_E 8):M	Yes [] No []

9 Test Group: Major Functionality

9.1 LDP Session Establishment and Timers Negotiation

ABSTRACT TEST CASES FOR MULTI-SERVICE INTERWORKING – ETHERNET OVER MPLS	
Test Case ID	MAJOR_FUNCTIONALITY_MC4.1
Reference Document Source	"Pseudowire Setup and Maintenance Using the Label Distribution Protocol (LDP)" RFC 4447; "LDP Specification" RFC 3036; Section 2.5, 3.5.1
Test Status	Optional
Spec. Quotation	RFC 4448: "The PW label bindings are distributed using the LDP downstream unsolicited mode. The PEs will establish an LDP session using the Extended Discovery mechanism." RFC3036: "The exchange of LDP Discovery Hellos between two LSRs triggers LDP session establishment. Session establishment is a two step process: - Transport connection establishment - Session initialization"
Test Purpose	Verify that the DUT properly initializes and establish a LDP session with a non-directly connected LDP peer. Verify that Hello Hold Time and Keep Alive Interval are properly negotiated.
Features	Enabled: Dyn_PW
Test Procedure	a) The tester starts sending LDP targeted Hello messages with targeted Hello interval after it has received first LDP targeted Hello message from DUT. The Hello Hold Time value in the issued Hello messages is set to the ¼ of the Hello Hold Time value configured on the DUT *Part A: If DUT plays passive role* b) The tester initiates LDP session by initiating of a TCP connection and sending a LDP Initialization message after is has received the second Hello message from DUT. The Keep Alive Time value in the issued Initialization messages is set to ¼ of the Keep Alive Time value configured on the DUT. c) If a valid Initialization message is received, the tester sends a LDP KeepAlive message *Part B: If DUT plays active role* d) The tester accepts a TCP connection initiated by the DUT. e) If a valid Initialization message is received, the tester sends a LDP Initialization and KeepAlive messages. The Keep Alive Time value in the issued Initialization messages is set to ¼ of the Keep Alive Time value configured on the DUT.
Expected Results	a) The DUTs Hello message should be received within 60s and it must pass its validation b) and d): The TCP connection between tester and DUT must be established, and DUT must issue a valid Initialization message. c) and e): The DUT must send a valid KeepAlive messages. Tester receives KeepAlive messages before DUT's Keep Alive timer expiration. Tester receives Hello messages before DUT's Hello Hold Timer expiration.

9.2 Dynamic Assignment of PW Label via PWid FEC (FEC type 128)

ABSTRACT TEST CASES FOR MULTI-SERVICE INTERWORKING – ETHERNET OVER MPLS	
Test Case ID	MAJOR_FUNCTIONALITY_MC6.1
Reference Document Source	Pseudowire Setup and Maintenance Using the Label Distribution Protocol (LDP) (RFC 4447); Section 5.2
Test Status	Optional
Spec. Quotation	Using the PWid FEC, each of the two pseudowire endpoints independently initiates the setup of a unidirectional LSP. An outgoing LSP and an incoming LSP are bound together into a single pseudowire if they have the same PW ID and PW type.
Test Purpose	Verify the PW activation via FEC type 128.
Features	Enabled: LDP FEC 128
Test Procedure	The tester validates the received Label Mapping messages for PWs which are using FEC type 128.
Expected Results	The tester must receive Label Mapping messages for all PWs configured to use FEC type 128. The received Label Mapping messages must contain FEC of type 128 with expected PW type, PW info Length, Group ID, PW ID and Interface Parameter Sub-TLV.

9.3 Control Word Negotiation for PW Types Requiring The Control Word Usage

ABSTRACT TEST CASES FOR MULTI-SERVICE INTERWORKING – ETHERNET OVER MPLS	
Test Case ID	MAJOR_FUNCTIONALITY_MC4.2
Reference Document Source	Pseudowire Setup and Maintenance Using the Label Distribution Protocol (LDP) (RFC 4447); Section 6.1
Test Status	Optional
Spec. Quotation	If the PWs are of the PW Type, which require the usage of the Control Word, then “the Label Mapping messages that are sent in order to set up these PWs MUST have c=1.”
Test Purpose	Verify the proper negotiation of the Control Word for PWs requiring the Control Word usage.
Features	Enabled: Dyn_PW and CW EoPW
Test Procedure	The tester validates the received Label Mapping messages for PWs which were configured for using Control Word
Expected Results	The received Label Mapping messages must have c bit set to 1.

9.4 Control Word Negotiation for PW Types Do Not Requiring The Control Word Usage

ABSTRACT TEST CASES FOR MULTI-SERVICE INTERWORKING – ETHERNET OVER MPLS	
Test Case ID	MAJOR_FUNCTIONALITY_MC4.3
Reference Document Source	Pseudowire Setup and Maintenance Using the Label Distribution Protocol (LDP) (RFC 4447); Section 6.2
Test Status	Optional
Spec. Quotation	If the PWs are of the PW Type, which do not require the usage of the Control Word, then the c bit may or may not be set, depending on the configuration for the PW type.
Test Purpose	Verify the proper negotiation of the Control Word for PWs not requiring the Control Word usage.
Features	Enabled: Dyn_PW Disabled: CW EoPW
Test Procedure	The tester validates the received Label Mapping messages for PWs which were not configured for using Control Word
Expected Results	The received Label Mapping messages must have c bit set to 0.

9.5 PW Status Signaling via PW Status TLV Method

ABSTRACT TEST CASES FOR MULTI-SERVICE INTERWORKING – ETHERNET OVER MPLS	
Test Case ID	MAJOR_FUNCTIONALITY_MC8.2
Reference Document Source	Pseudowire Setup and Maintenance Using the Label Distribution Protocol (LDP) (RFC 4447); Sections 5.4.2 and 5.4.3
Test Status	Optional
Spec. Quotation	If the negotiation process results in the usage of the PW status TLV, then the actual PW status is determined by the PW status TLV that was sent within the initial PW Label Mapping message. Subsequent updates of PW status are conveyed through the notification message.
Test Purpose	Verify the PW status signaling, if PW Status TLV method is used.
Features	Enabled: a) PW Status via PW Status TLV Method
Test Procedure	a) Tester establishes LDP session. b) Tester listens for incoming Label Mapping messages on each of the configured pseudowires and responds to them by sending Label Mapping messages with PW Status TLV. c) Confirm that all pseudowires are established. d) Disable ACs on DUT side and verify that they are down. e) Wait for <AC-DOWN-DURATION> seconds. f) Enable ACs that were previously disabled.
Expected Results	In step b) : Label Mapping messages are received for all pseudowires In step d) : Notification messages are received for all pseudowires associated with disabled ACs, containing PW Status TLV with an indication of PW being down. In step f) : Notification messages are received for all pseudowires associated with re-enabled ACs, containing PW Status TLV with an indication of PW being up.

9.6 PW Status Signaling via Label Withdraw Method

ABSTRACT TEST CASES FOR MULTI-SERVICE INTERWORKING – ETHERNET OVER MPLS	
Test Case ID	MAJOR_FUNCTIONALITY_MC7.2
Reference Document Source	Pseudowire Setup and Maintenance Using the Label Distribution Protocol (LDP) (RFC 4447); Section 5.4.1 “LDP Specification” RFC 3036; Section 3.5.10, 3.5.10.1, 3.5.11, and 3.5.11.1
Test Status	Optional
Spec. Quotation	RFC 4447: “The PEs MUST send Label Mapping Messages to their peers as soon as the PW is configured and administratively enabled, regardless of the attachment circuit state. The PW label should not be withdrawn unless the operator administratively configures the pseudowire down (or the PW configuration is deleted entirely). … a simple label withdraw method MAY also be supported as a legacy means of signaling PW status and AC status. … If the label withdraw method for PW status communication is selected for the PW, it will result in the Label Mapping Message being advertised only if the attachment circuit is active.” RFC 3036: “An LSR sends a Label Withdraw Message to an LDP peer to signal the peer that the peer may not continue to use specific FEC-label mappings the LSR had previously advertised. This breaks the mapping between the FECs and the labels.”
Test Purpose	Verify the PW status signaling, if Label Withdraw method is used.
Features	Enabled: a) PW Status via Label Withdraw Method

Test Procedure	a) Tester establishes LDP session. b) Tester listens for incoming Label Mapping messages on each of the configured pseudowires and responds to them by sending Label Mapping messages that do not contain PW Status TLV. c) Wait for <AC-UP-DURATION> seconds. d) Disable ACs on DUT side and verify that they are down. e) Wait for <AC-DOWN-DURATION> seconds. f) Enable ACs that were previously disabled.
Expected Results	In step b) : Label Mapping messages are received for all pseudowires In step d) : Label Withdraw messages are received for all pseudowires associated with disabled ACs. In step f) : Label Mapping messages are received for all pseudowires associated with re-enabled ACs.

9.7 Forwarding over Ethernet Pseudowire without Control Word

ABSTRACT TEST CASES FOR MULTI-SERVICE INTERWORKING – ETHERNET OVER MPLS	
Test Case ID	MAJOR_FUNCTIONALITY_MC3.1
Reference Document Source	Multi-Service Interworking – Ethernet over MPLS, MFAF 12.0.1; Section 5.3 Encapsulation Methods for Transport of Ethernet over MPLS Networks (RFC 4448); Section 4.6
Test Status	Optional
Spec. Quotation	MFAF 12.0.1: “Both raw and tagged modes can be used for Ethernet service interworking with any of the AC traffic mappings”.
Test Purpose	Verify the correct frame forwarding of Ethernet frames of various sizes up to MTU over an Ethernet PW without control word.
Features	Enabled: EoPW Disabled: Tagged EoPW and CW EoPW
Test Procedure	Tester sends Ethernet frames on AC to be forwarded to an Ethernet PW without control word.
Expected Results	Frames are received on PW associated with this AC. Control word is not added to the frame. Payload and VLAN tags of the frames are left unmodified.

9.8 Forwarding over Ethernet Pseudowire with Control Word

ABSTRACT TEST CASES FOR MULTI-SERVICE INTERWORKING – ETHERNET OVER MPLS	
Test Case ID	MAJOR_FUNCTIONALITY_MC3.2
Reference Document Source	Multi-Service Interworking – Ethernet over MPLS, MFAF 12.0.1; Section 5.3 Encapsulation Methods for Transport of Ethernet over MPLS Networks (RFC 4448); Section 4.6
Test Status	Optional
Spec. Quotation	MFAF 12.0.1: “Both raw and tagged modes can be used for Ethernet service interworking with any of the AC traffic mappings”.
Test Purpose	Verify the correct frame forwarding of Ethernet frames of various sizes up to MTU over Ethernet PW with control word.
Features	Enabled: EoPW and CW EoPW Disabled: Tagged EoPW
Test Procedure	Tester sends Ethernet frames on AC to be forwarded to an Ethernet PW with control word.
Expected Results	Frames are received on PW associated with this AC. Control word is added to the frame. The order of the control word sequence number values assigned to the frames corresponds to the order these frames were sent on AC. Payload and VLAN tags of the frames are left unmodified.

9.9 Reordering of Frames on an Ethernet Pseudowire

ABSTRACT TEST CASES FOR MULTI-SERVICE INTERWORKING – ETHERNET OVER MPLS	
Test Case ID	MAJOR_FUNCTIONALITY_MC3.3
Reference Document Source	Multi-Service Interworking – Ethernet over MPLS, MFAF 12.0.1; Section 5.3 Encapsulation Methods for Transport of Ethernet over MPLS Networks (RFC 4448); Section 4.4.3
Test Status	Optional only if DUT supports sequence number checking.
Spec. Quotation	An Ethernet PW can, through use of the control word, provide strict frame ordering. If this option is enabled, any frames that get misordered by the PSN will be dropped or reordered by the receiving PW endpoint. If strict frame ordering is a requirement for a particular PW, this option MUST be enabled.
Test Purpose	Verify that the implementation applies frame reordering process according to RFC4385 if the implementation supports processing of control word and sequence number check on an Ethernet PW with control word.
Features	Enabled: EoPW and CW EoPW Disabled: Tagged EoPW
Test Procedure	Tester sends Ethernet Frames over an Ethernet PW with control word. Used SN values in the control word are in the range 1...10. The SN values are misordered according to the following schemes: a) One SN value 5 is left out of the sequence, i.e. frames sent have SN values [1,2,3,4,6,7,8,9,10] b) Two SN values 5 and 6 are swapped, i.e. frames sent have SN values [1,2,3,4,6,5,7,8,9,10] c) One SN value 5 is duplicated, i.e. frames sent have SN values [1,2,3,4,5,5,6,7,8,9,10]
Expected Results	In cases a), b), c), the order of all frames received on AC is in accordance with the strict incremental order of the SN values in the control word used to send respective frames on the PW. Depending on implementation of DUT, which may decide to drop or reorder the misordered frames, following order of the frames is expected on AC: In case a) • [1,2,3,4,6,7,8,9,10] In case b) either • [1,2,3,4,5,6,7,8,9,10], or • [1,2,3,4,6,7,8,9,10] In case c) • [1,2,3,4,5,6,7,8,9,10]

9.10 Forwarding over Tagged Mode Ethernet VPWS

ABSTRACT TEST CASES FOR MULTI-SERVICE INTERWORKING – ETHERNET OVER MPLS	
Test Case ID	MAJOR_FUNCTIONALITY_MC3.4
Reference Document Source	Multi-Service Interworking – Ethernet over MPLS, MFAF 12.0.1; Section 5.3 Encapsulation Methods for Transport of Ethernet over MPLS Networks (RFC 4448); Section 4.6
Test Status	Optional
Spec. Quotation	MFAF 12.0.1: “Both raw and tagged modes can be used for Ethernet service interworking with any of the AC traffic mappings”.
Test Purpose	Verify the correct frame forwarding over tagged Ethernet VPWS of Ethernet frames of various sizes up to MTU if the implementation supports tagged EoPW without control word.
Features	Enabled: Tagged EoPW Disabled: CW EoPW
Test Procedure	Tester sends Ethernet frames on AC to be forwarded to a tagged mode PW. Control Word is included based on DUT configuration.

Expected Results	Frames are received on PW associated with this AC. Control word is not added to the frame. An S-Tag identifying service instance of the PW is added to the frame, the format of the resulting frame must adhere to IEEE 802.1ad. Payload of the frames is left unmodified.

9.11 Reordering on a Tagged Mode Ethernet VPWS

ABSTRACT TEST CASES FOR MULTI-SERVICE INTERWORKING – ETHERNET OVER MPLS	
Test Case ID	MAJOR_FUNCTIONALITY_MC3.6
Reference Document Source	Multi-Service Interworking – Ethernet over MPLS, MFAF 12.0.1; Section 5.3 Encapsulation Methods for Transport of Ethernet over MPLS Networks (RFC 4448); Section 4.4.3
Test Status	Optional only if DUT supports sequence number checking.
Spec. Quotation	An Ethernet PW can, through use of the control word, provide strict frame ordering. If this option is enabled, any frames that get misordered by the PSN will be dropped or reordered by the receiving PW endpoint. If strict frame ordering is a requirement for a particular PW, this option MUST be enabled.
Test Purpose	Verify that the implementation applies frame reordering process according to RFC 4448 if the implementation supports processing of control word and sequence number check on a tagged mode Ethernet VPWS with control word.
Features	Enabled: Tagged EoPW and CW EoPW
Test Procedure	Tester sends Ethernet Frames over a tagged mode PW with control word. Used SN values in the control word are in the range 1...10. The SN values are misordered according to the following schemes: a) One SN value 5 is left out of the sequence, i.e. frames sent have SN values [1,2,3,4,6,7,8,9,10] b) Two SN values 5 and 6 are swapped, i.e. frames sent have SN values [1,2,3,4,6,5,7,8,9,10] c) One SN value 5 is duplicated, i.e. frames sent have SN values [1,2,3,4,5,5,6,7,8,9,10]
Expected Results	In cases a), b), c), the order of all frames received on AC is in accordance with the strict incremental order of the SN values in the control word used to send respective frames on the PW. Depending on implementation of DUT, which may decide to drop or reorder the misordered frames, following order of the frames is expected on AC: In case a) • [1,2,3,4,6,7,8,9,10] In case b) either • [1,2,3,4,5,6,7,8,9,10], or • [1,2,3,4,6,7,8,9,10] In case c) • [1,2,3,4,5,6,7,8,9,10]

9.12 Frames Larger Than the Configured PSN MTU Size

ABSTRACT TEST CASES FOR MULTI-SERVICE INTERWORKING – ETHERNET OVER MPLS	
Test Case ID	MAJOR_FUNCTIONALITY_MC1.2
Reference Document Source	Encapsulation Methods for Transport of Ethernet over MPLS Networks (RFC 4448); Section 4.4.2
Test Status	Mandatory
Spec. Quotation	If an egress router receives an encapsulated layer 2 PDU whose payload length (i.e., the length of the PDU itself without any of the encapsulation headers) exceeds the MTU of the destination layer 2 interface, the PDU MUST be dropped.

Test Purpose	Verify that the frames received on an AC are discarded that would cause a resulting packet larger than the configured PSN MTU.
Features	Fragmentation disabled on the DUT
Test Procedure	Tester sends Ethernet frames on AC with the size larger than configured PSN MTU of the PW associated with this AC.
Expected Results	Frames are dropped by the PE and are not forwarded into PW.

9.13 Ethernet PAUSE Frames

ABSTRACT TEST CASES FOR MULTI-SERVICE INTERWORKING – ETHERNET OVER MPLS	
Test Case ID	MAJOR_FUNCTIONALITY_MC1.5
Reference Document Source	Encapsulation Methods for Transport of Ethernet over MPLS Networks (RFC 4448); Section 4.4.5
Test Status	Mandatory
Spec. Quotation	IEEE 802.3x PAUSE frames MUST NOT be carried across the PW.
Test Purpose	Verify that the Ethernet PAUSE frames received on an AC are not forwarded across PW.
Features	none
Test Procedure	Tester sends Ethernet PAUSE frames on Ethernet AC.
Expected Results	Frames are dropped by the PE and are not forwarded into PW.

9.14 VLAN Mapping Type on an Ethernet Interface

ABSTRACT TEST CASES FOR MULTI-SERVICE INTERWORKING – ETHERNET OVER MPLS	
Test Case ID	MAJOR_FUNCTIONALITY_MC1.1
Reference Document Source	Multi-Service Interworking – Ethernet over MPLS, IP/MPLS Forum 12.0.0; Section 5.1
Test Status	Optional
Spec. Quotation	The table 2: “Mappings Modes Supported for Different Interface Types” lists different mappings of customer Ethernet traffic at an AC to its corresponding service instance… In the third scenario it is assumed that only a single VLAN from the Ethernet physical interface is mapped to the corresponding service instance (ESI); this is referred to as “VLAN mapping”.
Test Purpose	Verify the correct mapping of customer frames received at an AC to their corresponding service instance if the implementation supports VLAN mapping type on Ethernet interface.
Features	Enabled: Specific VLAN mapping type on Ethernet interface
Test Procedure	Tester sends a) tagged Ethernet frames b) untagged Ethernet Frames On Ethernet AC with VLAN tag value configured to be forwarded into a PW.
Expected Results	Frames are received or discarded dependent upon the specific VLAN mapping.

9.15 VLAN Bundling Mapping Type on an Ethernet Interface

ABSTRACT TEST CASES FOR MULTI-SERVICE INTERWORKING – ETHERNET OVER MPLS	
Test Case ID	MAJOR_FUNCTIONALITY_MC1.1
Reference Document Source	Multi-Service Interworking – Ethernet over MPLS, IP/MPLS Forum 12.0.0; Section 5.1
Test Status	Optional
Spec. Quotation	The table 2: “Mappings Modes Supported for Different Interface Types” lists different mappings of customer Ethernet traffic at an AC to its corresponding service instance… in the fourth scenario it is assumed that a group of VLANs from the Ethernet physical interface is mapped to the corresponding service instance (ESI); this is referred to as “VLAN bundling”.

Test Purpose	Verify the correct mapping of customer frames received at an AC to their corresponding service instance if the implementation supports VLAN bundling and All-to-One bundling Ethernet AC mapping type.
Features	Enabled: VLAN bundling mapping type on Ethernet interface
Test Procedure	Tester sends tagged Ethernet frames on Eth AC all possible VLAN tags associated with this PW
Expected Results	All frames are forwarded into PW associated with this AC and VLAN tag group.

9.16 Service Delimiting at the UNI

ABSTRACT TEST CASES FOR MULTI-SERVICE INTERWORKING – ETHERNET OVER MPLS	
Test Case ID	MAJOR_FUNCTIONALITY_MC1.1
Reference Document Source	Multi-Service Interworking – Ethernet over MPLS, IP/MPLS Forum 12.0.0; Section 5.1, RFC 4448; Section 4.4.1; Appendix A.
Test Status	Optional
Spec. Quotation	When a port-based or a VLAN-bundling traffic mapping is used at an AC, and if the PE uses an additional S-VLAN tag to mark the customer traffic received over that AC as belonging to a given ESI, then that PE shall strip the S-VLAN tag before sending the customer frames over the same AC.
Test Purpose	Verify that a PE delivers the S-tagged frames from a PW to an Ethernet AC without the S-Tag. Verify that a PE adds an S-tag to the untagged Ethernet frames before it transmits them over a tagged Ethernet VPWS. Verify that a PE adds an S-tag to the tagged Ethernet frames before it transmits them over a tagged Ethernet VPWS.
Features	Enabled: a) Port-based with untagged traffic mapping on Ethernet interface, OR b) Port-based with tagged & untagged traffic mapping on Ethernet interface, OR c) VLAN bundling mapping type on Ethernet interface. S-tag can be added and then subsequently removed before delivery.
Test Procedure	Tester sends IEEE 802.1q C-tagged Ethernet frames over a tagged mode PW towards an Enet PE. PE would add S-tag, and then is removed. Untagged 802.1q frames sent
Expected Results	Verify the S-tag is added. Tester verifies S-Tag is not received on the AC.

9.17 Service Delimiting at the NNI

ABSTRACT TEST CASES FOR MULTI-SERVICE INTERWORKING – ETHERNET OVER MPLS	
Test Case ID	MAJOR_FUNCTIONALITY_MC17.4
Reference Document Source	Multi-Service Interworking – Ethernet over MPLS, MFAF 12.0.1; Section 5.1; RFC 4448; Section 4.4.1; Appendix A
Test Status	Optional
Spec. Quotation	If the Ethernet interface is an NNI, then the tagged frames over this interface shall have a frame format based upon [IEEE 802.1ad], and the PE may need to translate the tagged frames from one S-VLAN tag into another S-VLAN tag over this AC.
Test Purpose	Verify that a PE delivers the S-tagged frames from a PW to the NNI by mapping the S-Tag to another S-Tag or passing the S-tag unchanged.
Features	Enabled: a) VLAN mapping type on Ethernet interface
Test Procedure	Tester sends IEEE 802.1q [S-tag] tagged Ethernet frames over tagged mode PW towards an Ethernet PE configured for VLAN mapping and terminating an NNI Ethernet AC
Expected Results	Frames are received on Ethernet AC. S-tag of the EoPW encapsulated frame is replaced with the S-tag according to VLAN mapping configuration of the Ethernet AC. Frame transmitted into AC adheres to IEEE 802.1ad format. Verify the addition of the S-tag

10 Test Group: ATM <-> Ethernet Interworking

10.1 PID 0x07 Multiprotocol over ATM Encapsulated Frames

ABSTRACT TEST CASES FOR MULTI-SERVICE INTERWORKING – ETHERNET OVER MPLS	
Test Case ID	ATM_ETHERNET_INTERWORKING_ATM_E1.1
Reference Document Source	Multi-Service Interworking – Ethernet over MPLS, IP/MPLS Forum 12.0.0; Section 6.2
Test Status	Optional
Spec. Quotation	Ethernet encapsulation over ATM is based upon RFC 2684.
Test Purpose	Verify that the DUT correctly supports PID 0x07 Multiprotocol over ATM encapsulation, if this encapsulation type is enabled on the DUT for that ATM AC, and payload is aligned to 4-octet boundary by inserting two zero padding octets after PID field.
Features	Enabled: 0x07 PID TX
Test Procedure	Tester sends Ethernet frames on PW to be forwarded to ATM AC.
Expected Results	Frames are received on associated ATM VC as PID 0x07 LLC Encapsulation according to RFC2684. MAC addresses, EtherType and payload with possible exception of VLAN tags are left unmodified. Two padding octets with value 00-00 are inserted after the PID field, so that payload of the encapsulated frame is aligned to a 4-octet boundary within AAL5 PDU.

10.2 Transmission of PID 0x0E Multiprotocol over ATM Encapsulated Frames

ABSTRACT TEST CASES FOR MULTI-SERVICE INTERWORKING – ETHERNET OVER MPLS	
Test Case ID	ATM_ETHERNET_INTERWORKING_ATM_E 2.1
Reference Document Source	Multi-Service Interworking – Ethernet over MPLS, MFAF 12.0.1; Section 6.2
Test Status	Optional
Spec. Quotation	It should be noted that the BPDU frames are treated differently at the ATM PE. The PID is 0x0E and the encapsulation does not contain a MAC addresses. … In the opposite direction, upon receiving a BPDU frame over EoPW, the IWF at the ATM PE shall remove the MAC header, length field and LLC control information and shall encapsulate the frame based upon [RFC-2684] before delivering it over the ATM VC. [IP/MPLS 12.0.1]
Test Purpose	Verify that the DUT correctly supports BPDU frames using PID 0x0E Multiprotocol over ATM encapsulation, while removing MAC fields, if this encapsulation type is enabled on the DUT for BPDUs on that ATM AC.
Features	Enabled: 0x0E PID TX
Test Procedure	Tester sends BPDU frames on PW to be forwarded to ATM AC.
Expected Results	Frames are received on associated ATM VC using PID 0x0E LLC Encapsulation according to RFC2684. MAC addresses, Length field and LLC control information are removed

10.3 Forwarding of short PID 0x07 Multiprotocol over ATM Encapsulated Ethernet Frames to PW

ABSTRACT TEST CASES FOR MULTI-SERVICE INTERWORKING – ETHERNET OVER MPLS	
Test Case ID	ATM_ETHERNET_INTERWORKING_3.2
Reference Document Source	Multi-Service Interworking – Ethernet over MPLS, IP/MPLS Forum 12.0.0; Section 6.2
Test Status	Optional
Spec. Quotation	A bridge that uses the Bridged Ethernet/802.3 encapsulation format without the preserved LAN FCS MAY either include padding, or omit it. (RFC2684).

Test Purpose	Verify that ATM PE does not reject PID 0x07 Multiprotocol over ATM Encapsulated Ethernet Frames without sufficient padding to make frame at least minimal allowed size, and forwards them to PW.
Features	Enabled: 0x07 PID RX
Test Procedure	Tester sends Ethernet frames on ATM AC using PID 0x07 Multiprotocol over ATM LLC Encapsulation format. Frame length including MAC addresses, EtherType and payload is less than 60 octets.
Expected Results	Frames are received on associated PW. MAC addresses, EtherType and payload with possible exception of VLAN tags are left unmodified.

10.4 Forwarding of PID 0x07 Multiprotocol over ATM Encapsulated BPDU Frames to PW

ABSTRACT TEST CASES FOR MULTI-SERVICE INTERWORKING – ETHERNET OVER MPLS	
Test Case ID	ATM_ETHERNET_INTERWORKING_4.1
Reference Document Source	Multi-Service Interworking – Ethernet over MPLS, IP/MPLS Forum 12.0.0; Section 6.2
Test Status	Optional
Spec. Quotation	BPDU frames may be sent as a regular Ethernet frames with PID 0x07 or 0x01 without the MAC SA and DA being removed. In this case no additional processing is required by ATM PE.
Test Purpose	Verify that the implementation forwards the BPDU frames unchanged from ATM AC to a PW and from PW to an ATM AC, if 0x07 PID encapsulation is used.
Features	Enabled: 0x07 PID RX
Test Procedure	Tester sends BPDUs on ATM AC encapsulated using PID 0x07 Multiprotocol over ATM LLC Encapsulation format.
Expected Results	Frames are received on associated PW. MAC addresses, Length field and payload are left unmodified.

10.5 Port-based With Untagged Traffic Mapping Type on an ATM VC

ABSTRACT TEST CASES FOR MULTI-SERVICE INTERWORKING – ETHERNET OVER MPLS	
Test Case ID	MAJOR_FUNCTIONALITY_ATM_E 7.1
Reference Document Source	Multi-Service Interworking – Ethernet over MPLS, MFAF 12.0.1; Section 5.1
Test Status	Optional
Spec. Quotation	The table 2: “Mappings Modes Supported for Different Interface Types” lists different mappings of customer Ethernet traffic at an AC to its corresponding service instance. In the first scenario it is assumed that a physical port (Ethernet/PPP) or a logical port (ATM/FR VC) only carries untagged traffic, and all the traffic is mapped to the corresponding service instance (ESI); this is referred to as “port-based w/ untagged traffic”.
Test Purpose	Verify the correct mapping of customer frames receiving at an ATM VC to their corresponding service instance if the implementation supports port-based with untagged traffic mapping type on an ATM VC.
Features	Enabled: Port-based with untagged traffic mapping on ATM VC
Test Procedure	Tester sends untagged Ethernet frames on an ATM AC VC.
Expected Results	All frames are received on PW associated with this VC.

10.6 Port-based With Tagged & Untagged Mapping Type on an ATM VC

ABSTRACT TEST CASES FOR MULTI-SERVICE INTERWORKING – ETHERNET OVER MPLS	
Test Case ID	MAJOR_FUNCTIONALITY_ATM_E 8.1

Reference Document Source	Multi-Service Interworking – Ethernet over MPLS, MFAF 12.0.1; Section 5.1
Test Status	Optional
Spec. Quotation	The table 2: "Mappings Modes Supported for Different Interface Types" lists different mappings of customer Ethernet traffic at an AC to its corresponding service instance… In the second scenario it is assumed that a physical or a logical port carries both tagged and untagged traffic, and all that traffic is mapped to the corresponding service instance (ESI); this is referred to as "port-based w/ tagged and untagged traffic".
Test Purpose	Verify the correct mapping of customer frames receiving at an Ethernet interface to their corresponding service instance if the implementation supports port-based with tagged & untagged traffic mapping type on an ATM VC.
Features	Enabled: Port-based with tagged & untagged traffic mapping on ATM VC
Test Procedure	Tester sends a) tagged and b) untagged Ethernet frames on an ATM AC VC If PW is raw it checks that frames passed If PW is tagged it checks for S-tag.
Expected Results	All frames sent in a) and b) are received on PW associated with this VC.

10.7 Removing S-Tag before Delivering Frame to a ATM VC

ABSTRACT TEST CASES FOR MULTI-SERVICE INTERWORKING – ETHERNET OVER MPLS	
Test Case ID	MAJOR_FUNCTIONALITY_ATM_E 9.1
Reference Document Source	Multi-Service Interworking – Ethernet over MPLS, MFAF 12.0.1; Section 5.1
Test Status	Optional
Spec. Quotation	When a port-based or a VLAN-bundling traffic mapping is used at an AC, and if the PE uses an additional S-VLAN tag to mark the customer traffic received over that AC as belonging to a given ESI, then that PE shall strip the S-VLAN tag before sending the customer frames over the same AC.
Test Purpose	Verify that a PE delivers the S-tagged frames from a PW to an ATM VC without the S-Tag.
Features	Enabled: S-tag stripping on ATM VC
Test Procedure	Tester sends Ethernet frames on a tagged mode PW to be forwarded to ATM AC.
Expected Results	All frames are received on associated ATM AC. The outer (S-VLAN) tag is removed.

10.8 Adding S-Tag before Delivering Frame to a PW

ABSTRACT TEST CASES FOR MULTI-SERVICE INTERWORKING – ETHERNET OVER MPLS	
Test Case ID	MAJOR_FUNCTIONALITY_ATM_Ex.x
Reference Document Source	TBD (is not specified in IP/MPLS Forum 12.0.0)
Test Status	Optional
Spec. Quotation	TBD (is not specified in MFAF 12.0.0)
Test Purpose	Verify that a PE adds an S-tag to the tagged Ethernet frames before it transmits them over a tagged Ethernet VPWS.
Features	Enabled: Tagged EoPW
Test Procedure	Tester sends Ethernet frames on a ATM VC to be forwarded to a tagged mode PW.
Expected Results	All frames are received on associated Pseudowire. Frames transmitted over PW adhere to IEEE 802.1ad format. S-tag is added to the frames, with VLAN ID associated with the service instance of this PW.

The following sections are not within scope of this document, and will be addressed TBD.

11 Test Group: Frame relay <-> Ethernet Interworking

TBD

12 Test Group: Frame relay <-> ATM Interworking

TBD

13 Test Group: PPP <-> Ethernet Bridge Interworking

TBD

14 Ethernet Interworking OAM

TBD

14.1 Attachment Circuit Defect Entry/ Exit Procedures

14.1.1 FR <-> Ethernet

14.1.2 ATM <-> Ethernet

14.1.3 FR <-> ATM

15 Traffic Management Mapping

TBD

15.1 Mapping of Ethernet Traffic Descriptor to FR/ ATM (Bi-directional)

15.2 Mapping of Discard Eligibility Indication (Bi-Directional)

15.3 Mapping of Drop Precedence (Bi-Directional)

END OF DOCUMENT