



ABSTRACT TEST PLAN

ATP-247

GPON & XG-PON1 ONU Conformance Abstract Test Plan

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Comments or questions about this Broadband Forum Abstract Test Plan should be directed to help@broadband-forum.org.

Editors	Michael Shaffer	Alcatel-Lucent
	Lincoln Lavoie	UNH InterOperability Lab
	Yuan Liquan	ZTE
	Vincent Buchoux	LAN
FAN WG Chairs	Michael Shaffer	Alcatel-Lucent

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Executive Summary

In order to create a process for the ongoing promotion of GPON interoperability, Broadband Forum has embarked on a GPON certification program. The core feature of this program is the verification of GPON ONU adherence to the relevant BBF and ITU-T technical specifications by accredited testing agencies. To provide a consistent scope for this verification, BBF developed test plans that are to be used by the testing agencies in the verification process.

ATP-247 provides a test plan that may be used to verify conformance of a GPON ONU to the requirements defined in TR-156 [3]. Additionally, this plan verifies that the OMCI implementation contained in a GPON ONU adheres to the practices described in Appendix I and II of G.988.

Updates for Issue 3 include:

- Support of XG-PON1
- Inclusion of the Multi-managed ONU profile allowing the support of SFP/ONU and PON fed VDSL2 ONU types (including the already existing ONU/RG type)

Abstract Test Plan Notes:

The Abstract Test Plan (ATP) version of this document removes specific items from each test case, such as the test procedure and pass/fail metrics. These items are contained in the full text within IR-247i3. The full IR-247i3 is available to Broadband Forum members in good standing, and may be downloaded from the Broadband Forum website, http://www.broadband-forum.org/private/download/IR-247_Issue-3.pdf.

1 Purpose and Scope

1.1 Purpose

This test plan describes a series of tests that may be used to verify whether particular ONU implementations conform to TR-156 [3] functional requirements, and that the related configuration recommendations from the OMCI Implementer's Guide have been implemented.

1.2 Scope

The tests cases defined in ATP-247 are dedicated to testing standards conformance. This includes a limited set of key test cases that can verify the conformance of GPON ONU to a defined set of Broadband Forum TR-156 [3] requirements, and the related recommendations from Appendix I and II of G.988 [2].

These test cases include verification of conformance regarding both the required GPON equipment functionality, and the implementation of the OMCI protocol by that equipment. ATP-247 is designed to verify the particular functions of GPON implementations that are the most critical to real-world service providers' deployments.

Testing of system level performance of GPON equipment is for further study.

XG-PON1 ONUs compliant with the ITU-T G.987 series of specifications may be tested using the test cases defined here to verify their compliance with TR-156 [3] and G.988 [2]. Test cases that verify extensions found in G.988 that are unique to XG-PON1 are for future study.

Note: The remainder of this document uses the term GPON in a generic manner to refer to any ITU-T TDM PON including GPON, and XG-PON1. In the same way, the term GEM port refers to GEM port and XGEM port, and GTC refers to GTC and XGTC, PLOAM to PLOAM and XPLOAM.

2 References and Terminology

2.1 Conventions

In this Abstract Test Plan, several words are used to signify the requirements of the specification. These words are always capitalized. More information can be found in RFC 2119 [1].

MUST	This word, or the term “REQUIRED”, means that the definition is an absolute requirement of the specification.
MUST NOT	This phrase means that the definition is an absolute prohibition of the specification.
SHOULD	This word, or the term “RECOMMENDED”, means that there could exist valid reasons in particular circumstances to ignore this item, but the full implications need to be understood and carefully weighed before choosing a different course.
SHOULD NOT	This phrase, or the phrase "NOT RECOMMENDED" means that there could exist valid reasons in particular circumstances when the particular behavior is acceptable or even useful, but the full implications need to be understood and the case carefully weighed before implementing any behavior described with this label.
MAY	This word, or the term “OPTIONAL”, means that this item is one of an allowed set of alternatives. An implementation that does not include this option MUST be prepared to inter-operate with another implementation that does include the option.

2.2 References

The following references are of relevance to this Abstract Test Plan. At the time of publication, the editions indicated were valid. All references are subject to revision; users of this Abstract Test Plan are therefore encouraged to investigate the possibility of applying the most recent edition of the references listed below.

A list of currently valid Broadband Forum Technical Reports is published at www.broadband-forum.org.

Document	Title	Source	Year
[1] RFC 2119	<i>Key words for use in RFCs to Indicate Requirement Levels</i>	IETF	1997
[2] G.988	<i>ONU Management and Control Interface Specification (OMCI)</i>	ITU-T	2010
[3] TR-156 Issue 2	<i>Using GPON Access in the context of TR-101</i>	Broadband Forum	2010
[4] G.984.3	<i>Gigabit-capable Passive Optical Networks (G-PON): Transmission convergence layer specification</i>	ITU-T	2008
[5] G.984.2	<i>Gigabit-capable Passive Optical Networks (G-PON): Physical Media Dependent (PMD) layer specification</i>	ITU-T	2003
[6] TR-101 Issue 2	<i>Migration to Ethernet-Based Broadband Aggregation</i>	Broadband Forum	2011
[7] ID-283	<i>OMCI XML Schema for OD-247 Testing (bbf2010.781.06)</i>	Broadband Forum	2012
[8] ID-284	<i>OMCI Message Sequences for OD-247 Testing (bbf2010.887.16)</i>	Broadband Forum	2012
[9] G.993.2	<i>Very high speed digital subscriber line transceivers 2 (VDSL2)</i>	ITU-T	2011
[10] TR-114 issue 2	<i>VDSL2 Performance Test Plan</i>	Broadband Forum	2012
[11] TR-167 issue 2	<i>GPON-fed TR-101 Ethernet Access Node</i>	Broadband Forum	2012

- | | | | | |
|------|---------|---|-------|------|
| [12] | G.987.2 | <i>10-Gigabit-capable passive optical networks (XG-PON): Physical media dependent (PMD) layer specification</i> | ITU-T | 2010 |
| [13] | G.987.3 | <i>10-Gigabit-capable passive optical networks (XG-PON): Transmission convergence (TC) layer specification</i> | ITU-T | 2010 |

2.3 Definitions

The following terminology is used throughout this Abstract Test Plan.

Ethernet Traffic Generator	A device that generates and captures well formed Ethernet frames as defined by test personnel.
GEM Port	An abstraction on the GTC adaptation sublayer representing a logical connection associated with a specific client traffic flow. The GTC adaptation sublayer is a sublayer of the GPON Transmission Convergence layer that supports the functions of user data fragmentation and de-fragmentation, GEM encapsulation, GEM frame delineation, and GEM Port-ID filtering.
GEM Port Id	A 12-bit value which is assigned by the OLT to the individual logical connections transported over the GPON interface and which is carried in the header of all the GEM frames associated with the given logical connection.
GPON Analyzer	An external device, which may be included in a non-intrusive manner, between the R/S and S/R-interfaces to capture and analyze the traffic present in the ODN
GPON Network	An OLT connected using an Optical Distribution Network (ODN) to one or more ONUs or ONTs. A GPON network is a subset of the Access Network.
ODN	Optical Distribution Network including the fibers, splitters and connectors.
OLT	Optical Line Termination (OLT): A device that terminates the common (root) endpoint of an ODN, implements a PON protocol, such as that defined by G.984, and adapts PON PDUs for uplink communications over the provider service interface. The OLT provides management and maintenance functions for the subtended ODN and ONUs.
OLT Emulator	A device that terminates the common (root) endpoint of an ODN, implements the G.984/G.987 PMD and TC layers, and supports the transmission of OMCI messages as defined in the messages sequences in this document.
ONU	Optical Network Unit (ONU): A generic term denoting a device that terminates any one of the distributed (leaf) endpoints of an ODN, implements a PON protocol, and adapts PON PDUs to subscriber service interfaces.

ONU/L2	A generic term denoting a Layer-2 device that terminates any one of the distributed (leaf) endpoints of an ODN, implements a PON protocol, and adapts PON PDUs to subscriber service interfaces. An ONU, within the context of TR-156, does not include any Layer-3 (IP router) functions.
ONU/RG	An ONU (as defined above) that includes additional Layer-3 (IP routing) functionality as defined as “RG” below. The connection between the ONU subcomponent and RG subcomponent is made through a VEIP managed entity.
RG	A Residential Gateway is a device that interfaces between the WAN and LAN IP environment for a consumer broadband customer. It may route or bridge traffic, depending on its configuration and specifications.
T-CONT	A traffic-bearing object within an ONU that represents a group of logical connections, is managed via the ONU Management and Control Channel (OMCC), and is treated as a single entity for the purpose of upstream bandwidth assignment on the PON.
Traffic Flow	A sequence of frames or packets traversing a particular reference point within a network that share a specific frame/packet header pattern. For example, an Ethernet traffic flow can be identified by any combination of specific source MAC address, destination MAC, VLAN ID, 802.1p bits, etc.
Traffic Classes	(TC) - Traffic Classes are the set of upstream and downstream supported forwarding behaviours in the network element
U-interface	U-interface is a short form of expressing one or more of the interfaces defined in this Other Document or in TR-101 at the U reference point. It is also essentially equivalent to a subscriber-facing interface at the access node.
V-interface	V-interface is a short form of expressing one or more of the interfaces defined in TR-101 at the V reference point. It is also essentially equivalent to a network-facing interface at the access node
XGEM Port	An abstraction on the XGTC adaptation sublayer representing a logical connection associated with a specific client traffic flow. The XGTC adaptation sublayer is a sublayer of the XG-PON1 Transmission Convergence layer that supports the functions of user data fragmentation and de-fragmentation, XGEM encapsulation, XGEM frame delineation, and XGEM Port-ID filtering.
XGEM Port Id	A 16-bit value which is assigned by the OLT to the individual logical connections transported over the XG-PON1 interface and which is carried in the header of all the XGEM frames associated with the given logical connection.

2.4 Abbreviations

This Abstract Test Plan uses the following abbreviations:

ADSL	Asymmetric Digital Subscriber Line
AES	Advanced Encryption Standard
AN	Access Node
ASP	Application Service Provider
ATM	Asynchronous Transfer Mode
BTS	Base Transceiver Station
CB	Cellular Backhaul
CPE	Customer Premises Equipment
CPN	Customer Premises Network
DPU	Distribution Point Unit
DSCP	DiffServ Code Point
DSL	Digital Subscriber Line
FE	Fast Ethernet (100Mbps)
FITH	Fiber into the Home
FTTC	Fiber to the Curb
FTTH	Fiber to the Home
FTTO	Fiber to the Office
FOTP	Fiber to the Premises, including buildings
GE	Gigabit Ethernet (1000Mbps)
GEM	Generic Encapsulation Method

GPM	GPON Physical Media layer
GPON	Gigabit-capable Passive Optical Network
GTC	GPON Transmission Convergence layer – as defined in G.984.3[4] for GPON, and G.987.3 [13] for XG-PON1 (see XGTC)
L2-OCM	Layer 2 OMCI Common Model
MAC	Media Access Control
MDU	Multi-Dwelling Unit
ME	Managed Entity
MTU	Multi-Tenant Unit – or Maximum Transmission Unit
NSP	Network Service Provider
ODN	Optical Distribution Network – as defined in G.984.1 for GPON and G.987.1 for XG-PON1
OLT	Optical Line Termination – as defined in G.984.1 for GPON and G.987.1 for XG-PON1
OMCI	ONU Management and Control Interface
ONT	Optical Network Termination – as defined in G.984.1 for GPON and G.987.1 for XG-PON1
ONU	Optical Network Unit – as defined in G.984.1 for GPON and G.987.1 for XG-PON1
POTS	Plain Old Telephone Service
RBN	Regional Broadband Network
RG	Residential Gateway
RNC	Radio Network Controller
SFU	Single Family Unit – a type of residence
SFP	Small Form Factor Pluggable device
TDM	Time-Division Multiplexing
TLS	Transparent LAN Service – a common synonym for Business Ethernet Services

TR	Technical Report
VDSL	Very high speed Digital Subscriber Line
xDSL	Any variety of DSL
XG-PON	10-Gigabit-capable passive optical network
XGTC	XG-PON1 Transmission Convergence layer – as defined in G.987.3 [13]

3 Abstract Test Plan Impact

3.1 Energy Efficiency

ATP-247 has no impact on Energy Efficiency.

3.2 IPv6

ATP-247 has no impact on IPv6.

3.3 Security

ATP-247 has no impact on Security.

3.4 Privacy

Any issues regarding privacy are not affected by ATP-247.

4 Test Methodology

The implementers of this test plan are expected to adhere to a set of requirements that provide uniformity of test configurations and equipment across multiple test venues. The following subsections define these requirements.

4.1 Standards Conformance Testing

Conformance testing is intended to verify a specific implementation of an ONU, including the OMCI stack and configuration engines, is compliant with requirements of the specification. Within conformance testing, only the unit under test and any necessary test tools shall be connected to the ODN, as defined below in 4.3.5. It is recommended that the sequence of test cases in a conformance test be randomized such that the sequence of test cases varies between test sessions. It is also recommended that the ONU be reset to its factory default configuration between each test case.

4.2 ONU Testing Requirements

The certification program described in the present document applies to integrated ONU devices of the following types:

- Single User Port ONU/L2
- Multiple User Port ONU/L2
- Multi-managed ONUs
 - o Residential Gateway ONU (ONU/RG)
 - o SFP ONU (ONU/SFP)
 - o PON fed VDSL2 DPU ONU (VDSL2 DPU/ONU),

These ONU types are further discussed and defined in Sections 4.2.2 and 4.2.3, respectively. It may be possible to specify and test other ONU device types, however at this time, those device types are out of scope of the certification program.

4.2.1 ONU Clean-slate Requirements

Unless explicitly stated in each test case, the ONU must be returned to a “clean-slate” state before the beginning of each test run. Such clean-slate state may either be achieved through the following steps:

1. The ONU under test is connected to ODN and powered up.
2. The ONU is activated by the OLT Emulator, ranged, and a GEM port for OMCI is created as a result of ONU-ID assignment.
3. The OLT Emulator instructs the ONU to reset its MIB to factory default values.

Or by any mean specific to the ONU.

Note that these steps may be redundant with the first steps of a given test-case configuration: in such a case, they need not be repeated. It is also assumed that the testing equipment (OLT emulator, analyzers, etc.) has been powered up, connected to the ODN, and is configured such that it can perform the actions ascribed to it in the current test – how this is achieved, provided that the OLT emulator and GPON analyzer abide by the requirements defined in their respective sections (OLT emulator requirements and GPON analyzer requirements), is irrelevant. In particular, The OLT emulator may perform MIB uploads in order to obtain a precise knowledge of the actual state of the ONU.

Unless explicitly stated, identical steps may not be shared between test runs, and any given test must be run from start (including a return to its required pre-existing state, be it the defined clean-slate state or otherwise stated) to its end independently.

4.2.2 ONU/L2

An integrated ONU/L2 device is an ONU integrating and implementing Ethernet type user interface connections (that is, the U-interface of TR-156 [3]) that operates exclusively on and below Layer 2 of the protocol stack. In particular, an ONU/L2 excludes any IP routing or NAT functionality. To be certified, an ONU/L2 MUST successfully complete all mandatory and conditional test cases for each applicable profile. The applicable profiles, with the exception of the baseline profile, are selected by the manufacturer and communicated to the test laboratory prior to the start of testing. All ONU/L2 devices under certification must support the Baseline Profile requirements.

Note that a Single User Port ONU/L2 MUST successfully completes all mandatory and conditional test cases for Single User Port, whereas Multiple User Ports ONU/L2 MUST successfully completes all mandatory and conditional test cases for Multiple User Ports.

Table 4-1: Profile A – N:1 VLAN Architecture

Test Number	Test Name	Test Requirement(s)	Test Type
ONU.6.1.1	Single Untagged U-Interface	R-10, R-11, R-19	Mandatory
ONU.6.1.2	Single U-interface with symmetric VLAN tag translation	R-12, R-13, R-19	Mandatory
ONU.6.1.3	Deriving P-bits as a function of received P-bits (single user port)	R-48	Mandatory
ONU.6.1.13	VID Support for Untagged Frames (N:1 VLAN or 1:1 VLAN Single Tagged at the V Interface)	R-9	Mandatory

ONU.6.1.15	VID Support for Priority Tagged Frames with Priority Preservation (N:1 VLAN or 1:1 VLAN Single-Tagged at V Interface)	R-9	Mandatory
ONU.6.1.16	VID Support for Priority Tagged Frames without Priority Preservation (N:1 VLAN or 1:1 VLAN Single-Tagged at V Interface)	R-9	Mandatory
ONU 6.1.25	Deriving P-bits as a function of received VID for a 1:1 or N:1 architecture (single user port)	R-48	Mandatory
ONU 6.1.26	Deriving P-bits as a function of received Ethertype for a 1:1 or N:1 architecture (single user port).	R-48	Mandatory
ONU 6.1.27	Deriving P-bits as a function of received user port for a 1:1 or N:1 architecture (multiple user ports).	R-48	Conditionally Mandatory

Table 4-2: Profile B – 1:1 VLAN Architecture

Test Number	Test Name	Test Requirement(s)	Test Type
ONU.6.1.1	Single Untagged U-Interface	R-20, R-21, R-31	Mandatory
ONU.6.1.2	Single U-interface with symmetric VLAN tag translation	R-22, R-23, R-31	Mandatory
ONU.6.1.3	Deriving P-bits as a function of received P-bits (single user port)	R-48	Mandatory
ONU.6.1.13	VID Support for Untagged Frames (N:1 VLAN or 1:1 VLAN Single Tagged at the V Interface)	R-9	Mandatory
ONU.6.1.14	VID Support for Untagged Frames (1:1 VLAN Architecture Double Tagged at the V-Interface)	R-9	Mandatory
ONU.6.1.15	VID Support for Priority Tagged Frames with Priority Preservation (N:1 VLAN or 1:1 VLAN Single-Tagged at V Interface)	R-9	Mandatory
ONU.6.1.16	VID Support for Priority Tagged Frames without Priority Preservation (N:1 VLAN or 1:1 VLAN Single-Tagged at V Interface)	R-9	Mandatory

ONU.6.1.17	VID Support for Priority Tagged Frames with Priority Preservation (1:1 VLAN Architecture Double-Tagged at the V Interface)	R-9	Mandatory
ONU.6.1.18	VID Support for Priority Tagged Frames without Priority Preservation (1:1 VLAN Architecture Double-Tagged at the V Interface)	R-9	Mandatory
ONU.6.1.19	ONU addition and removal of C-Tag for 1:1 VLANs	R-20, R-21	Mandatory
ONU.6.1.20	ONU addition and removal of S-Tag for 1:1 VLANs	R-20, R-21	Mandatory
ONU.6.1.21	ONU translation between Q-Tag and C-Tag for 1:1 VLANs	R-22, R-23	Mandatory
ONU.6.1.22	ONU translation between Q-Tag and S-Tag for 1:1 VLANs	R-22, R-23	Mandatory
ONU 6.1.25	Deriving P-bits as a function of received VID for a 1:1 or N:1 architecture (single user port)	R-48	Mandatory
ONU 6.1.26	Deriving P-bits as a function of received Ethertype for a 1:1 or N:1 architecture (single user port).	R-48	Mandatory
ONU 6.1.27	Deriving P-bits as a function of received user port for a 1:1 or N:1 architecture (multiple user ports).	R-48	Conditionally Mandatory

Table 4-3: Profile C – VBES VLAN Architecture

Test Number	Test Name	Test Requirement(s)	Test Type
ONU.6.1.4	Addition of an S-Tag in the Upstream Direction in a VBES Architecture	R-34	Mandatory
ONU.6.1.5	Validation of an S-Tag in the Upstream Direction in a VBES Architecture	R-35	Mandatory
ONU.6.1.6	Translation of an S-Tag in the Upstream Direction in a VBES Architecture	R-35, R-42	Mandatory
ONU.6.1.7	Removal of an S-Tag in the Downstream Direction in a VBES Architecture	R-36	Mandatory

ONU.6.1.8	Translation of an S-Tag in the Downstream Direction in a VBES Architecture	R-43	Mandatory
ONU-6.1.10	Deriving P-bits as a function of received VID (single user port)	R-48	Mandatory
ONU.6.1.11	Deriving P-bits as a function of received Ethertype (single user port)	R-48	Mandatory
ONU.6.1.12	Deriving P-bits as a function of received user port (multiple user ports)	R-48	Conditionally Mandatory
ONU 6.1.24	Deriving P-bits as a function of received P-bits for a VBES architecture (single user port)	R-48	Mandatory
ONU 6.2.3	Mapping Traffic from GEM Ports to U Interface in Downstream Direction in a VBES Architecture	R-41	Mandatory

Table 4-4: Profile D – Multicast Operations

Test Number	Test Name	Test Requirement(s)	Test Type
ONU.6.3.1	ONU passing of downstream IGMP messages	R-81	Mandatory
ONU.6.3.3	ONU silent discarding of IGMPv1 messages	R-98	Mandatory
ONU.6.3.5	Marking Upstream IGMP Messages with Ethernet P-Bits	R-94	Mandatory
ONU.6.3.6	IGMP controlled Multicast	R-74, R-79	Mandatory
ONU.6.3.7	Multicast While List	R-76, R-84	Mandatory
ONU.6.3.8	IGMP rate limit	R-87	Mandatory
ONU.6.3.9	IGMP Immediate leave	R-91	Mandatory
ONU.6.3.10	Maximum number of multicast flows	R-97	Mandatory
ONU.6.3.11	IGMP transparent Snooping	R-88, R-89, R-90	Mandatory
ONU.6.3.12	Multicast VLAN membership based on user ports (Multiple User ports)	R-96	Conditionally Mandatory

ONU.6.3.13	IGMP transparent Snooping (Multiple User ports)	R-88, R-89, R-90	Conditionally Mandatory
ONU 6.3.14	IGMP Transparent forwarding	R-10, R-19, R-82	Mandatory

Table 4-5: Baseline Test Cases

Test Number	Test Name	Test Requirement(s)	Test Type
ONU.6.4.1	Downstream Broadcast Handling, Single U-interface	R-113	Mandatory
ONU.6.4.2	Downstream Broadcast Handling, Multiple U-interfaces	R-113	Conditionally Mandatory
ONU.6.6.1	2000-Byte Frames Supported by the ONU	R-4	Mandatory
ONU.6.7.1	Local setting of a registration ID at the ONU (ONU retains the Registration ID indefinitely)	R-152, R-153	Mandatory
ONU.6.8.1	New ONU Bring-up method on new ONU	G.988 Appendix I	Mandatory
ONU.6.8.2	New ONU Bring-up method for old ONU	G.988 Appendix I	Mandatory
ONU.6.8.3	Old ONU Bring-up method for ONU	G.988 Appendix I	Mandatory
ONU.6.8.4	New ONU Bring-up method for new ONU with encrypted OMCC	G.988 Appendix I	Mandatory
ONU.6.9.1	Alarm synchronization	G.988 Appendix I	Mandatory
ONU.6.9.2	MIB synchronization: Correct Data Sync	G.988 Appendix I	Mandatory
ONU.6.9.3	MIB synchronization: MIB Upload	G.988 Appendix I	Mandatory
ONU.6.10.1	Software Image Download, multiple window sizes, padded final window	G.988 Appendix I	Mandatory
ONU.6.10.2	Software Image Download, shortened final window final window	G.988 Appendix I	Mandatory
ONU.6.10.3	Failed Software Image Download, missing section	G.988 Appendix I	Mandatory
ONU.6.10.4	Failed Software Image Download, incorrect section CRC	G.988 Appendix I	Mandatory

ONU.6.10.5	Failed Software Image Download, incorrect software image CRC	G.988 Appendix I	Mandatory
ONU.6.10.7	Activate uncommitted software image	G.988 Appendix I	Mandatory
ONU.6.10.8	Commit software image	G.988 Appendix I	Mandatory
ONU.6.11.3	Cardholder or port mapping package for integrated ONU	G.988 Appendix I	Conditionally Mandatory
ONU.6.2.1	Single U-interface with multiple downstream GEM ports	R-19, R31, R-41	Mandatory
ONU.6.2.2	User Isolation on ONU Devices with Multiple U-Interfaces	R-3 (TR-101 R-40)	Conditionally Mandatory
ONU.6.2.4	Mapping traffic into GEM Ports based on P-bit values in the upstream direction (single user port)	R-51, R-52, R-53	Mandatory
ONU.6.2.5	Mapping traffic into GEM Ports based on VID values in the upstream direction (single user port)	R-51, R-52, R-53	Mandatory
ONU.6.2.6	Mapping traffic into GEM Ports based on VID & P-bit values in the upstream direction (single user port)	R-51, R-52, R-53	Mandatory
ONU.6.2.7	Mapping traffic into GEM Ports based on P-bit values in the upstream direction (multiple user port)	R-51, R-52, R-53	Conditionally Mandatory
ONU.6.2.8	Mapping traffic into GEM Ports based on VID values in the upstream direction (multiple user port)	R-51, R-52, R-53	Conditionally Mandatory
ONU.6.2.9	Mapping traffic into GEM Ports based on VID & P-bit values in the upstream direction (multiple user port)	R-51, R-52, R-53	Conditionally Mandatory
ONU.6.2.10	Mapping multiple P-bit values to the same GEM port (single user port)	R-51	Mandatory
ONU.6.2.12	Strict priority downstream scheduling among 4 queues on ONU	R-56, R-63, R-64	Mandatory
ONU.6.2.13	Indicating drop precedence using P-bits upstream	R-54	Mandatory
ONU.6.2.14	Indicating drop precedence using DEI bit upstream	R-55	Mandatory

ONU.6.2.15	Indicating drop precedence using P-bits downstream	R-54	Mandatory
ONU.6.2.16	Indicating drop precedence using DEI bit downstream	R-55	Mandatory
ONU.6.2.19	Mapping Traffic from GEM Ports to Multiple U Interfaces in the Downstream Direction	R-19, R-31, R-41	Conditionally Mandatory
ONU.6.2.21	Mapping Traffic from GEM Ports to Multiple U Interfaces in the Downstream Direction	R-19, R-31, R-41	Conditionally Mandatory

4.2.3 Multi-managed ONU

Multi-managed ONUs are devices integrating both an OMCI management domain and at least one or more non-OMCI management domains (like TR-069, SNMP, etc).

In such multi-managed ONU types, the U-interface is virtualized as the Virtual Ethernet Interface Point (VEIP) which represents the data plane hand-off point to the non-OMCI management domain(s). This point is however not directly accessible externally, and the certification program supports only the implementations in which at least one association between Ethernet UNI and VEIP is maintained by default (which means one VEIP per non-OMCI management domain). Whereas other possible implementations than VEIPs may exist for that purpose (the use of the IPhost OMCI object and freely associated PPTP Ethernet UNIs is possible when a separate IP management domain is present), testing of such other implementations is not covered in the present document and is for further study.

Multi-managed ONU devices covered in the present document are:

- Residential Gateway ONU (**ONU/RG**), see § 4.2.3.1 specific requirements
- Small Form Factor Pluggable ONU (**SFP/ONU**) and its related system under test, see §4.2.3.2 for specific requirements
- PON fed VDSL2 Distribution Point Unit ONU (**VDSL2 DPU/ONU**) and its related system under test, see § 4.2.3.3 for specific requirements

Each of these ONU devices and their related system under test may be either with a single VEIP or multiple VEIPs, except in the SFP/ONU case where the system under test (the SFP/ONU plus the Host device) is expected to be with a single VEIP only.

To be certified, an multi-managed ONU **MUST** successfully complete all mandatory and conditional test cases for each applicable profile. Available profiles are identical to those defined above for the ONU/L2 type. The applicable profiles tested, with the

exception of the baseline profile, are selected by the manufacturer and communicated to the approved test laboratory prior to the start of testing. All multi-managed ONU devices under certification **MUST** support the Baseline Profile requirements.

In order to be applicable to multi-managed ONUs, the ATP-247 test cases require textual modifications of their OMCI message sequences. Each OMCI test script differs indeed from the scripts used for testing ONU/L2 devices in the following ways:

1. All references to the PPTP Ethernet ME are changed to the VEIP ME. This largely includes changing the bridge-port configuration data and extended VLAN tagging configuration data OMCI commands and associations.
2. The unlocking operation at the end of each script should apply to the VEIP rather than to the PPTP Ethernet Port.

All applicable and required OMCI message sequences, including the modified sequences for the testing of multi-managed ONUs, are referenced in the Annex B: of the present document.

The certification program supports only ONU implementations (and their related system under test) that do not require provisioning of IP parameters via OMCI. To simplify the testing and remove the necessity of the inclusion of IP information in test packets, all multi-managed ONU and its associated system under test **MUST** support and allow the implementation of at least one of the following modes:

Mode 1

A pure bridging mode, where all packets are forwarded between the physical user-facing Ethernet ports of the system under test and the VEIP point, regardless of VLAN tagging, P-bit value, etc.

Mode 2

A stripped mode, where a physical Ethernet user-facing port of the system under test receives only untagged Ethernet frames, and where it is the responsibility of the internal non-OMCI management domain of the system under test to perform the correct tag addition or manipulation so that the traffic at the VEIP point equals the traffic at the U interface as defined for each test-case.

4.2.3.1 Residential Gateway ONU (ONU/RG)

An integrated ONU/RG device is an ONU that combines the Layer 2 functionality with that of the residential gateway. The certification program supports only the ONU/RG device implementations that do not require provisioning of IP parameters via OMCI.

To meet the requirements of mode 2, the internal RG device **MUST/SHOULD** support the following requirements from TR-101 [6]:

TR-101 Requirements

- R-01 The RG **MUST** support sending the following frame types: untagged frames, priority-tagged frames and VLAN-tagged Ethernet frames in the upstream direction for stacks a, b, e, f and g in Figure 4 [of TR-101.]
- R-02 The RG used to support business customers **SHOULD** support sending double-tagged Ethernet frames in the upstream direction for stacks a, b, e, f and g in Figure 4 [of TR-101.]
- R-03 The RG **MUST** support setting the priority tag and VLAN ID values.
- R-04 The RG **MUST** support receiving untagged and VLAN tagged Ethernet frames in the downstream direction, and **MUST** be able to strip the VLAN tagging from the ones received with tags.

4.2.3.2 Small Form Factor Pluggable ONU (SFP/ONU)

SFP/ONUs are ONU devices whose purpose is to be hosted within L2 switch or L3 router devices and which cannot be tested alone as such. The testing of SFP/ONUs **MUST** therefore be done along with the use of a host device specified by the manufacturer and communicated to the approved test laboratory prior to the start of testing. The system under test will thus result in the combination of the SFP/ONU and its host device. The model part number and all relevant HW and SW references of the hosting device will be reported by the approved test laboratory in the test report along with the related SFP/ONU information.

Host devices may be of great variety and of different natures, making the entire system under test be potentially assimilated to an already covered type of ONUs: for instance, the SFP/ONU and its host may result into an ONU/RG, or into a xDSL DPU/ONU. In such case, the requirements of the equivalent ONU type then applies to the system under test composed of the SFP/ONU and its host device.

The certification program supports only implementations (SFP/ONU device and its host) where the host does not require any provisioning via OMCI.

4.2.3.3 PON fed VDSL2 Distribution Point Unit ONU (VDSL2 DPU/ONU)

VDSL2 DPU/ONU devices are integrated PON-fed (G-PON or XG-PON1) VDSL2 access equipments (DSLAMs) that combine a PON ONU entity along with a VDSL2 access node entity. In such case, the IR-247 test setup **MUST** include an active VDSL2 link from the VDSL2 DPU/ONU to the VDSL2 end-user CPE, the system under test resulting in the combination of the VDSL2 DPU/ONU itself plus a VDSL2 CPE with an active VDSL2 link. It is of responsibility of the manufacturer in accordance with the approved test laboratory to make a proper choice of the VDSL2 CPE hardware & software, as well of the VDSL2 link configuration used during the certification tests. The VDSL2 configuration information **MUST** be reported by the approved test laboratory in the test report in order to allow the IR-247 tests be re-executed in the same configuration. Such information **MUST** include all needed

VDSL2 parameters such as Band Profiles and Line Settings, including parameters among with: used G.993.2 annex, band plans, US0 band, PSD mask, spectrum/service profiles, UPBO/DPBO, latency, INP. Further information might be reported as necessary to allow the testing being reproduced, and settings examples can be taken from the section 6.2 of the BBF TR-114 issue 2 test plan [10].

Special care in the elaboration and choice of the VDSL2 link must be taken as this additional link might be of great influence upon the IR-247 tests. Especially, manufacturer in accordance with the approved test laboratory MUST define the VDSL2 settings so that it does not preclude the succesfull execution of the IR-247 test plan.

The certification program supports only implementations of VDSL2 DPU/ONUs and their related system under test which support the following requirements from TR-167:

TR-167 Requirements

- **R-68** All the configurable features of the GPON ONU entity defined in this Technical Report MUST only be managed via the OLT using OMCI and PLOAM as per G. 984
- **R-69** The GPON ONU entity MUST allow the TR-101 access node entity to be managed by a protocol other than OMCI independent of the OLT (see Figure 1)

An entity description is given in the Figure 1 from TR-167 issue 2 [11]

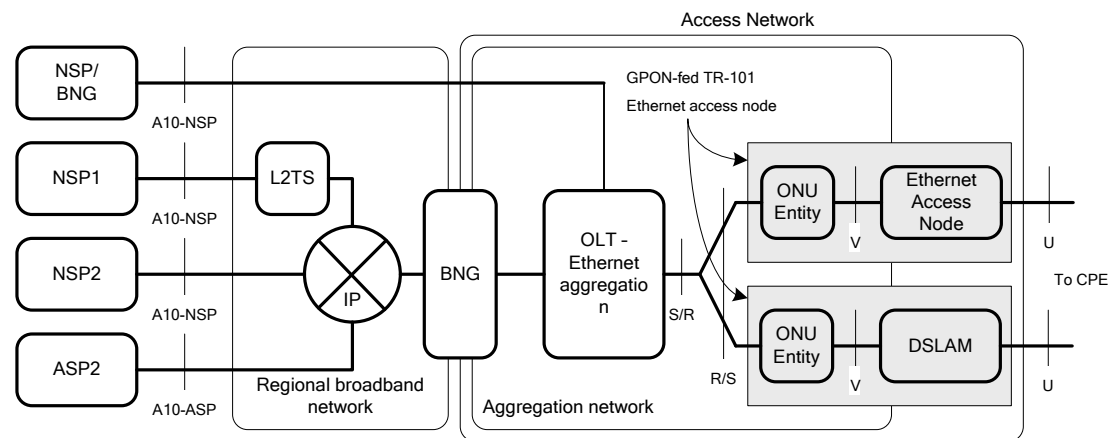


Figure 1 – Network architecture for Ethernet-based GPON aggregation (TR-167 issue 2 [11])

4.3 Test Setup

4.3.1 OLT Emulator Requirements

The OLT Emulator is required to perform conformance testing of ONU devices and takes the place of the OLT. The OLT Emulator must meet the following minimum requirements. Before commencement of the testing involving an OLT emulator, each participating ONU manufacturer will be given an opportunity to verify the OLT emulator conformance with the GTC layer requirements to the extent required to conduct testing. It is expected that any claims of the OLT emulator non-conformance respectively with G.984.3 [4] for GPON and G.987.3 [13] for XG-PON1 will be investigated by an ad-hoc committee composed of the emulator vendor, the ONU vendor, and three third party GTC layer experts.

- R-1 The OLT emulator **MUST** conform , within the scope of ONU activation, OMCI channel establishment, upstream bandwidth assignment, point-to-multipoint communication and encryption mechanisms, for GPON to the GPON Transmission Convergence layer requirements, specified in ITU-T Recommendation G.984.3[4] (2008), for XG-PON1 to the XG-PON1 Transmission Convergence layer requirements specified in ITU-T Recommendation G.987.3 (2010) within the scope of ONU activation, OMCI channel establishment, upstream bandwidth assignment, and point-to-multipoint communication within the scope of ONU activation, OMCI channel establishment, upstream bandwidth assignment, and point-to-multipoint communication.
- R-2 The OLT emulator **SHOULD** recognize and handle gracefully any GTC layer features that it does not support.
- R-3 The OLT Emulator **MUST** support generation, transmission, and reception of OMCI messages, according to the Appendix I and II of G.988 [2].
- R-4 The OLT Emulator **MUST** support transmission and reception of Ethernet frames encapsulated within GEM frames.
- R-5 The OLT emulator **MUST** provide a user interface that allows the tester to monitor OMCI messages and Ethernet/GEM frames and their content. This interface **MUST** provide a log capability of the executed test case.

- R-6 The OLT Emulator **MUST** support generation of PLOAM messages to activate and configure the OMCC GEM port and at least 6 other GEM ports for user traffic, and provide ONU with an active upstream timeslot for any activated T-CONTs (including the one used for the OMCC).
- R-7 The OLT Emulator **MUST** act as the OMCI master.
- R-8 The OLT Emulator **SHOULD** transmit an OMCI command 3 times before declaring the ONU failed for lack of response.
- R-9 The OLT Emulator **SHOULD** provision allocations for T-CONTs prior to the start of the message sequence defined for each test case.
- R-10 Verification by the OLT emulator of the consistency of the MIB held in the ONU and the MIB held in the OLT emulator **MUST** be performed using either one of the following two methods on the OLT emulator:
- via requesting a full MIB upload to the ONU under test, or
 - via performing Get Requests on Manage Entities to the ONU under test upon specific attributes of the ONU MIB.

In any of the above retrieval methods, only these parts of the ONU MIB being modified by the OLT emulator during the test case **MUST** be verified for consistency.

A MIB consistency check **MUST** be considered as successful only when all these modified attributes have been checked consistent with the MIB held in the OLT emulator.

In respect to R-1:

- for G-PON ONUs, the activation process is specified in G.984.3 [4] Annex A, and encryption mechanisms in G.984.3 [4] section 12.2 (Encryption system) and G.984.3 [4] section 12.3 (Key exchange and switch-over)
- for XG-PON1 ONUs, the activation process is specified in G.987.3 [13] section 12 (ONU Activation) and encryption mechanisms in G.987.3 [13] section 15.5 (Data encryption key exchange and activation mechanism)

4.3.2 GPON Analyzer Requirements

The G-PON Analyzer is an optional piece of equipment, which may be included in the ODN during conformance or interoperability testing to capture and analyze the traffic present on that network.

- R-11 The GPON Analyzer **MUST NOT** alter, correct, or otherwise disturb any of the traffic present on the ODN.

R-12 The GPON Analyzer **MUST NOT** significantly attenuate the optical signals such that the requirements of G.984.2 [5] for GPON, G.987.2 [13], for XG-PON cannot be met.

4.3.3 Optical Distribution Network Requirements

The optical distribution network is outside of the scope of this test plan, however, care should be taken to ensure each optical transceiver is operating in roughly the mid-point of its dynamic range as defined respectively in G.984.2 [5] and G.987.2 [12] for GPON and XG-PON1; ensuring the receiver is not operating in a stressed mode, which could cause bit errors. This may be accomplished using either real fiber or an optical attenuator.

4.3.4 Unit under Test Management Interface Requirements

R-13 All configurations done on the ONU under test for the purpose of executing the test cases specified in this document **MUST** be performed using a G.988 [3] compliant management interface.

4.3.5 Selection of Random Values Used in Test Cases

Many of the test cases defined in section 6 require the tester to select random values for attributes such as VID, P-bits, and GEM ports. To ensure a wide coverage of the possible value range of each attribute type, the tester must select the values in a way that provides for testing the entire value range of the attribute value being selected. For example, VID values should be selected from across the entire range of 0 – 4094. This will not only verify the flexibility of the unit under test but will also specifically address the following requirement from TR-156 [3].

- TR-156 R-8: The ONU and OLT **MUST** support all VID values from the range: 1-4094 as specified in IEEE 802.1Q, on all ports

R-14 The selection of random values for attributes used in the test cases **MUST** be performed such that the values are distributed across the possible range for each attribute. This **MUST** include the minimum, maximum and median values for the attribute. This requirement applies to the entirety of the test cases and is not intended to be a requirement for each test case.

4.3.6 ONU Conformance Test Setup

The figures below show the basic test setup used when the unit under test is an ONU. A specific test case may include an additional figure to further refine the test setup by including additional information and parameters such as, and not limited to, VLAN tags, priority bits, etc.

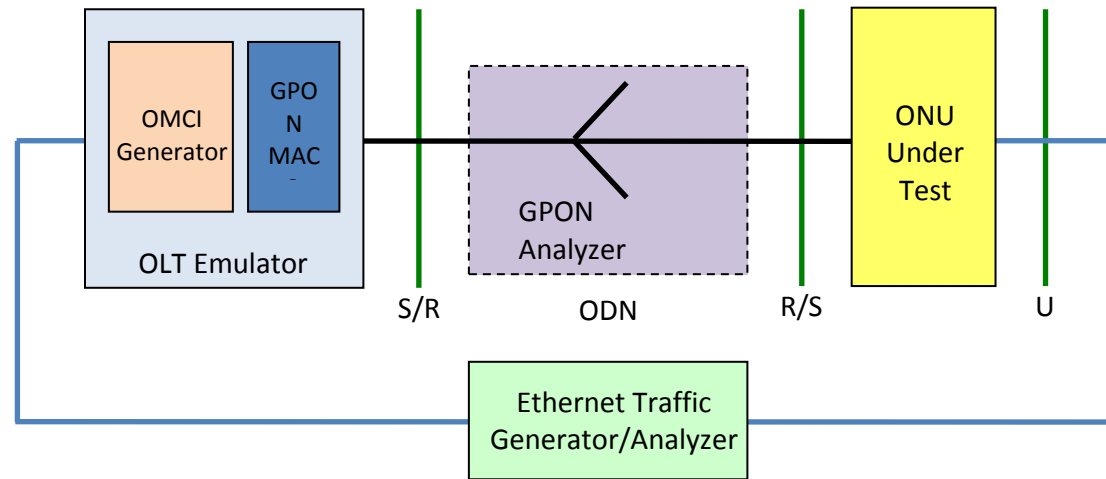


Figure 2 - Basic test setup for ONU conformance testing

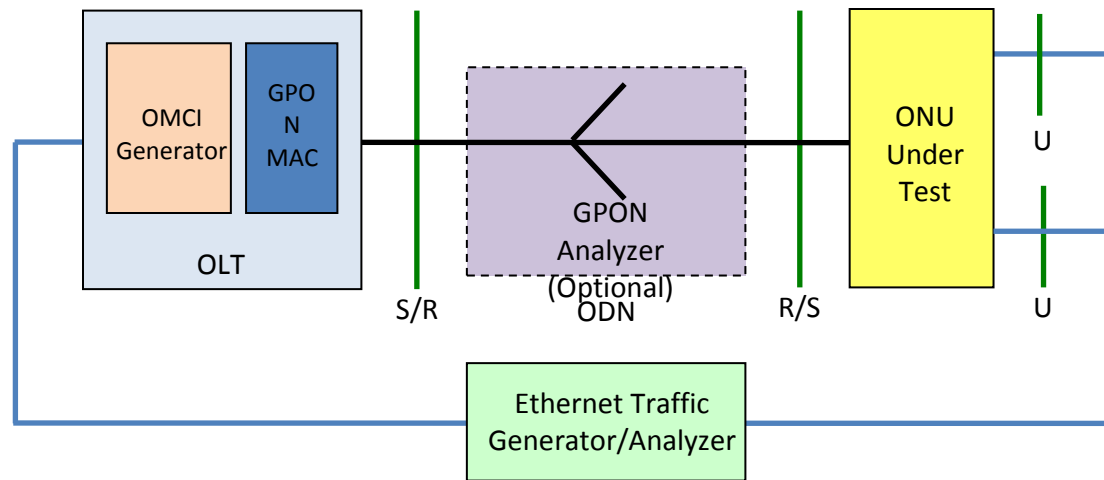


Figure 3 – Basic test setup for multiple subscriber ONU

5 Test Case Summary

Refer to tables within Section 4.2 ONU Testing Requirements.

6 ONU Conformance Tests

The following conformance tests verify:

- Compliance to the requirements of TR-156 [3].
- The implementation of TR-156 requirements on the ONU under test has followed the guidelines found in G.988 [2] Appendix I and II.

Each test case identifies the specific TR-156 [2] requirements that it addresses but not the specific clauses of G.988 [2] because Appendix I and Appendix II are both written as informative rather than normative text.

The following conditions apply to all test cases unless expressly stated otherwise:

- The EtherType of all frames is 0x0800
- All test cases that involve multicast assume proxy snooping for IGMP v3 in the ONU under test.
- Each variable in test cases that contain multiple VID or P-bit variables must be set to unique values.

6.1 Classification and Tagging

6.1.1 Single untagged U-interface

Test Name

Single untagged U-interface

Test Definition ID

ONU.6.1.1

Reference Document

BBF TR-156 [3]

ITU-T G.988 [2]

Test Type

Conformance

Test Requirement Type

Mandatory

Unit Under Test

ONU

Requirement Description**BBF TR-156:**

- **R-10** The ONU MUST support adding an S-Tag to upstream untagged traffic received from the U-interface.
- **R-11** The ONU MUST support removing an S-Tag from downstream traffic received from the OLT.
- **R-19** The ONU MUST support mapping traffic from one or more GEM Ports to a U-interface in the downstream direction.
- **R-20** The ONU MUST support adding a C-Tag or S-Tag to upstream untagged traffic.
- **R-21** The ONU MUST support removing the tag from downstream traffic.
- **R-31** The ONU MUST support mapping traffic from one or more GEM Ports to a U interface in the downstream direction.

Test Objective

The purpose of this test is to verify the ONU’s OMCI implementation, MAC bridge, and filter tables support the minimum functionality to configure a single U-interface on the ONU to pass untagged traffic across the U-interface. This test verifies both the OMCI configuration responses and support of active user traffic. The VLAN S-Tag is added to upstream traffic by the ONU before crossing the R/S-interface and removed from the downstream traffic by the ONU before crossing the U-interface.

Test Configuration

1. ONU is powered and connected to ODN
2. ONU has been activated by the OLT Emulator, has been ranged, and a GEM port for OMCI has been created as a result of ONU-ID assignment.
3. The OLT Emulator has instructed the ONU to reset its MIB to factory default values.
4. The Ethernet Traffic Generator should be configured to transmit Ethernet frames upstream with the following parameters:

Upstream Direction																								
Traffic Stream	U Interface														R/S Interface									
	UNI	MAC DA	MAC SA	Outer VLAN Tag				Inner VLAN Tag			Ethertype	IP DA	IP SA	Outer VLAN Tag				Inner VLAN Tag			GEM	T-CONT		
	Port #	Value	Value	TPID	Pbits	DEI	VID	TPID	Pbits	CFI or DEI	VID	Value	Value	Value	TPID	Pbits	DEI	VID	TPID	Pbits	CFI or DEI	VID	Port #	Number
A	1	MAC1	MAC2	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	x	x	x	n/a	n/a	n/a	n/a	0x88A8	0	x	SVID1	GEM1	TCONT1
B	1	MAC3	MAC4	n/a	n/a	n/a	n/a	0x8100	x	x	Any CVID	x	x	x	-	-	-	-	-	-	-	-	-	-
C	1	MAC5	MAC6	n/a	n/a	n/a	n/a	0x88A8	x	x	Any SVID	x	x	x	-	-	-	-	-	-	-	-	-	-

5. The OLT Emulator should be configured to transmit Ethernet frames downstream with the following parameters:

Downstream Direction																							
Traffic Stream	S/R Interface														U Interface								
	MAC DA	MAC SA	Outer VLAN Tag				Inner VLAN Tag			Ethertype	IP DA	IP SA	GEM	Outer VLAN Tag				Inner VLAN Tag			UNI		
	Value	Value	TPID	Pbits	DEI	VID	TPID	Pbits	CFI or DEI	VID	Value	Value	Value	Port #	TPID	Pbits	DEI	VID	TPID	Pbits	CFI or DEI	VID	Port #
E	MAC2	MAC1	n/a	n/a	n/a	n/a	0x88A8	0	x	SVID1	x	x	x	GEM1	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1

6. Only 1 user traffic class should be configured on the ONU (via defined OMCI messages below), requiring 1 GEM port (Alloc-ID, T-CONT, Port-ID).

Test Procedure

Omitted in Abstract Test Plan: Refer to http://www.broadband-forum.org/technical/test_cert_programs.php

OMCI Procedure Details

Refer to Annex B

Pass/Fail Criteria

Omitted in Abstract Test Plan: Refer to http://www.broadband-forum.org/technical/test_cert_programs.php

Remarks

No MAC filtering should be enabled on the ONU during these tests, or it should be configured to allow the test user traffic to pass through the ONU.

6.1.2 Single U-interface with symmetric VLAN tag translation

Test Name

Single U-interface with symmetric VLAN tag translation

Test Definition ID

ONU.6.1.2

Reference Document

BBF TR-156 [3]

ITU-T G.988 [2]

Test Type

Conformance

Test Requirement Type

Mandatory

Unit Under Test

ONU

Requirement Description**BBF TR-156:**

- **R-12** The ONU MUST support unique, symmetric translation of Q-Tag VIDs received from the U-interface into S-Tag VIDs.
- **R-13** The ONU MUST support unique, symmetric translation of the S-Tag VIDs used in the downstream-tagged traffic into the Q-Tag VIDs sent to the U-interface.
- **R-19** The ONU MUST support mapping traffic from one or more GEM Ports to a U-interface in the downstream direction.
- **R-22** The ONU MUST support VID translation of the Q-Tag received from the **U** interface into the C-Tag or S-Tag for upstream-tagged traffic.
- **R-23** The ONU MUST support VID translation of the tag used in the downstream-tagged traffic into the Q-Tag sent to the **U** interface.

- **R-31** The ONU MUST support mapping traffic from one or more GEM Ports to a U interface in the downstream direction.

Test Objective

The purpose of this test is to verify the ONU’s OMCI implementation, MAC bridge, and filter tables support the minimum functionality to configure a single U-interface on the ONU to pass tagged traffic across the U-interface, while translating the VID values present on the U and R/S-interfaces. This test verifies both the OMCI configuration responses and support of active user traffic. In the upstream direction, tagged traffic with VID1 received over the U-interface is transmitted over the R/S-interface with VID2. In the downstream direction, tagged traffic with VID2 received over the R/S-interface is transmitted over the U-interface with VID1. No further changes to the Ethernet frame are permitted, including changes to P-bit values, etc.

Test Configuration

1. ONU is powered and connected to ODN.
2. ONU has been activated by the OLT Emulator, has been ranged, and a GEM port for OMCI has been created as a result of ONU-ID assignment.
3. The OLT Emulator has instructed the ONU to reset its MIB to factory default values.
4. The Ethernet Traffic Generator should be configured to transmit Ethernet frames upstream with the following parameters:

Upstream Direction																								
Traffic Stream	U Interface												R/S Interface											
	UNI	MAC DA	MAC SA	Outer VLAN Tag				Inner VLAN Tag				Ethertype	IP DA	IP SA	Outer VLAN Tag				Inner VLAN Tag				GEM	T-CONT
	Port #	Value	Value	TPID	Pbits	DEI	VID	TPID	Pbits	CFI or DEI	VID	Value	Value	Value	TPID	Pbits	DEI	VID	TPID	Pbits	CFI or DEI	VID	Port #	Number
A	1	MAC1	MAC2	n/a	n/a	n/a	n/a	0x8100	CPbits1	x	CVID1	x	x	x	n/a	n/a	n/a	n/a	0x88A8	SPbits1	x	SVID2	GEM1	TCONT1
B	1	MAC1	MAC3	n/a	n/a	n/a	n/a	0x8100	x	x	Any CVID*	x	x	x	-	-	-	-	-	-	-	-	-	-
C	1	MAC1	MAC4	n/a	n/a	n/a	n/a	0x88A8	x	x	SVID1	x	x	x	-	-	-	-	-	-	-	-	-	-
D	1	MAC1	MAC5	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	x	x	x	-	-	-	-	-	-	-	-	-	-

5. The OLT Emulator should be configured to transmit Ethernet frames downstream with the following parameters:

Downstream Direction																							
Traffic Stream	S/R Interface														U Interface								
	MAC DA	MAC SA	Outer VLAN Tag				Inner VLAN Tag				Ethertype	IP DA	IP SA	GEM	Outer VLAN Tag				Inner VLAN Tag				UNI
	Value	Value	TPID	Pbits	DEI	VID	TPID	Pbits	CFI or DEI	VID	Value	Value	Value	Port #	TPID	Pbits	DEI	VID	TPID	Pbits	CFI or DEI	VID	Port #
E	MAC2	MAC1	n/a	n/a	n/a	n/a	0x88A8	SPbits1	x	SVID2	x	x	x	GEM1	n/a	n/a	n/a	n/a	0x8100	CPbits1	x	CVID1	1

6. Only 1 user traffic class should be configured on the ONU (via defined OMCI messages below), requiring 1 GEM port (Alloc-ID, T-CONT, Port-ID).

Test Procedure

Omitted in Abstract Test Plan: Refer to http://www.broadband-forum.org/technical/test_cert_programs.php

OMCI Procedure Details

Refer to Annex B

Pass/Fail Criteria

Omitted in Abstract Test Plan: Refer to http://www.broadband-forum.org/technical/test_cert_programs.php

Remarks

No MAC filtering should be enabled on the ONU during these tests, or it should be configured to allow the test user traffic to pass through the ONU.

6.1.3 Deriving P-bits as a function of received P-bits (single user port)

Test Name

Deriving P-bits as a function of received P-bits (single user port).

Test Definition Number

ONU.6.1.3

Reference Document

BBF TR-156[3]

ITU-T G.988[2]

Test Type

Conformance

Test Requirement Type

Mandatory

Unit Under Test

ONU

Requirement Description**BBF TR-156:**

- **R-48** The ONU MUST support deriving P-bit markings in the upstream direction based on an arbitrary combination of: user port, VID, received P-bit markings, and EtherType.

Note: Only derivation from received P-bit markings is verified by this test case.

Also, R-6, 7, 46, 50.

Test Objective

Show that ONU can derive P-bit marking as a function of received P-bits.

Test Configuration

For this test, only a single user port is assumed.

ONU must be set-up with the standard L2-OCM (single user) with one upstream queues and one associated T-CONT. The intent of the test is to define two flows based on different P-bit values at the U-interface. Each flow will have an S-tag with a different P-bit value.

The U-interface and S/R-interface values for each test are shown below, along with the GEM port and T-CONT configuration.

		Upstream Direction																						
Traffic Stream	U Interface													R/S Interface										
	UNI	MAC DA	MAC SA	Outer VLAN Tag				Inner VLAN Tag				Ethertype	IP DA	IP SA	Outer VLAN Tag				Inner VLAN Tag				GEM	T-CONT
	Port #	Value	Value	TPID	Pbits	DEI	VID	TPID	Pbits	CFI or DEI	VID	Value	Value	Value	TPID	Pbits	DEI	VID	TPID	Pbits	CFI or DEI	VID	Port #	Number
A	1	MAC1	MAC2	n/a	n/a	n/a	n/a	0x8100	CPbits1	x	CVID1	x	x	x	n/a	n/a	n/a	n/a	0x88A8	SPbits1	x	SVID1	GEM1	TCONT1
B	1	MAC3	MAC4	n/a	n/a	n/a	n/a	0x8100	CPbits3	x	CVID1	x	x	x	n/a	n/a	n/a	n/a	0x88A8	SPbits2	x	SVID1	GEM2	TCONT1

Traffic corresponding to each flow will produce a different P-bit marking.

Test Procedure

Omitted in Abstract Test Plan: Refer to http://www.broadband-forum.org/technical/test_cert_programs.php

OMCI Procedure Details

Refer to Annex B

Pass/Fail Criteria

Omitted in Abstract Test Plan: Refer to http://www.broadband-forum.org/technical/test_cert_programs.php

Remarks

None

6.1.4 Addition of an S-Tag in the Upstream Direction in a VBES Architecture

Test Name

Addition of an S-Tag in the Upstream Direction in a VBES Architecture

Test Definition Number

ONU.6.1.4

Reference Document

BBF TR-156 [3]

ITU-T G.988 [2]

Test Type

Conformance

Test Requirement Type

Mandatory

Unit Under Test

ONU

Requirement Description

BBF TR-156:

- **R-34** The ONU MUST support adding an S-Tag in the upstream direction for Q-tagged, untagged, and priority-tagged frames

Test Objective

- Verify that the ONU supports adding an S-Tag in the upstream direction for Q-tagged, untagged, and priority-tagged frames

Test Configuration

1. OLT Emulator and ONU under test are powered and connected to ODN
2. ONU under test has been activated by the OLT Emulator, has been ranged, and a GEM port for OMCI has been created as a result of ONU-ID assignment.

3. The Ethernet Traffic Generator is configured to transmit tagged Ethernet frames upstream with the following parameters (Stream 1):
4. The Ethernet Traffic Generator is configured to transmit priority tagged Ethernet frames upstream with the following parameters (Stream 2):
5. The Ethernet Traffic Generator is configured to transmit untagged Ethernet frames upstream with the following parameters (Stream 3):

Upstream Direction																								
Traffic Stream	U Interface												R/S Interface											
	UNI	MAC DA	MAC SA	Outer VLAN Tag				Inner VLAN Tag				Ethertype	IP DA	IP SA	Outer VLAN Tag				Inner VLAN Tag				GEM	T-CONT
	Port #	Value	Value	TPID	Pbits	DEI	VID	TPID	Pbits	CFI or DEI	VID	Value	Value	Value	TPID	Pbits	DEI	VID	TPID	Pbits	CFI or DEI	VID	Port #	Number
A	1	MAC1	MAC2	n/a	n/a	n/a	n/a	0x8100	x	x	CVID1	x	x	x	0x88A8	SPbits1	0	SVID1	0x8100	x	x	CVID1	GEM1	TCONT1
B	1	MAC1	MAC2	n/a	n/a	n/a	n/a	n/a	x	x	0	x	x	x	0x88A8	SPbits2	0	SVID1	n/a	x	x	0	GEM2	TCONT2
C	1	MAC1	MAC2	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	x	x	x	n/a	n/a	n/a	n/a	0x88A8	SPbits3	0	SVID1	GEM3	TCONT3

Test Procedure

Omitted in Abstract Test Plan: Refer to http://www.broadband-forum.org/technical/test_cert_programs.php

OMCI Procedure Details

Refer to Annex B

Pass/Fail Criteria

Omitted in Abstract Test Plan: Refer to http://www.broadband-forum.org/technical/test_cert_programs.php

Remarks

None

6.1.5 Validation of an S-Tag in the Upstream Direction in a VBES Architecture

Test Name

Validation of an S-Tag in the Upstream Direction in a VBES Architecture

Test Definition Number

ONU.6.1.5

Reference Document

BBF TR-156 [3]

ITU-T G.988 [2]

Test Type

Conformance

Test Requirement Type

Mandatory

Unit Under Test

ONU

Requirement Description

BBF TR-156:

- **R-35** Part 1: The ONU **MUST** support validating an S-Tag in the upstream direction for S-tagged frames

Test Objective

- Verify that the ONU supports validating an S-Tag in the upstream direction for S-tagged frames

Test Configuration

1. OLT Emulator and ONU under test are powered and connected to ODN
2. ONU under test has been activated by the OLT Emulator, has been ranged, and a GEM port for OMCI has been created as a result of ONU-ID assignment.

3. The Ethernet Traffic Generator is configured to transmit tagged Ethernet frames upstream with the following parameters (Stream 1)
4. The Ethernet Traffic Generator is configured to transmit double-tagged Ethernet frames upstream with the following parameters (Stream 2)
5. The Ethernet Traffic Generator is configured to transmit tagged Ethernet frames upstream with the following parameters (Stream 3)

Upstream Direction																								
Traffic Stream	U Interface													R/S Interface										
	UNI	MAC DA	MAC SA	Outer VLAN Tag				Inner VLAN Tag			Ethertype	IP DA	IP SA	Outer VLAN Tag				Inner VLAN Tag				GEM	T-CONT	
	Port #	Value	Value	TPID	Pbits	DEI	VID	TPID	Pbits	CFI or DEI	VID	Value	Value	Value	TPID	Pbits	DEI	VID	TPID	Pbits	CFI or DEI	VID	Port #	Number
A	1	MAC1	MAC2	n/a	n/a	n/a	n/a	0x88A8	SPbits1	0	SVID1	x	x	x	n/a	n/a	n/a	n/a	0x88A8	SPbits1	0	SVID1	GEM1	TCONT1
B	1	MAC1	MAC2	0x88A8	SPbits2	0	SVID2	0x8100	x	x	CVID2	x	x	x	0x88A8	SPbits2	0	SVID2	0x8100	x	x	CVID2	GEM2	TCONT2
C	1	MAC1	MAC2	n/a	n/a	n/a	n/a	0x88A8	SPbits2	x	SVID3	x	x	x	-	-	-	-	-	-	-	-	-	-

Test Procedure

Omitted in Abstract Test Plan: Refer to http://www.broadband-forum.org/technical/test_cert_programs.php

OMCI Procedure Details

Refer to Annex B

Pass/Fail Criteria

Omitted in Abstract Test Plan: Refer to http://www.broadband-forum.org/technical/test_cert_programs.php

Remarks

None

6.1.6 Translation of an S-Tag in the Upstream Direction in a VBES Architecture

Test Name

Translation of an S-Tag in the Upstream Direction in a VBES Architecture

Test Definition Number

ONU.6.1.6

Reference Document

BBF TR-156 [3]

ITU-T G.988 [2]

Test Type

Conformance

Test Requirement Type

Mandatory

Unit Under Test

ONU

Requirement Description

BBF TR-156:

- **R-35** Part 2: The ONU **MUST** support translating an S-Tag in the upstream direction for S-tagged frames
- **R-42** The ONU **MUST** support VID translation of the S-Tag received from the U-interface into a new S- Tag for upstream double-tagged traffic

Test Objective

- Verify that the ONU supports translating an S-Tag in the upstream direction for S-tagged frames

Test Configuration

1. OLT Emulator and ONU under test are powered and connected to ODN
2. ONU under test has been activated by the OLT Emulator, has been ranged, and a GEM port for OMCI has been created as a result of ONU-ID assignment.

3. The Ethernet Traffic Generator is configured to transmit tagged Ethernet frames upstream with the following parameters (Stream 1)
4. The Ethernet Traffic Generator is configured to transmit double-tagged Ethernet frames upstream with the following parameters (Stream 2)
5. The Ethernet Traffic Generator is configured to transmit tagged Ethernet frames upstream with the following parameters (Stream 3)

Upstream Direction																								
Traffic Stream	U Interface													R/S Interface										
	UNI	MAC DA	MAC SA	Outer VLAN Tag				Inner VLAN Tag				Ethertype	IP DA	IP SA	Outer VLAN Tag				Inner VLAN Tag				GEM	T-CONT
	Port #	Value	Value	TPID	Pbits	DEI	VID	TPID	Pbits	CFI or DEI	VID	Value	Value	Value	TPID	Pbits	DEI	VID	TPID	Pbits	CFI or DEI	VID	Port #	Number
A	1	MAC1	MAC2	n/a	n/a	n/a	n/a	0x88A8	SPbits1	x	SVID1	x	x	x	n/a	n/a	n/a	n/a	0x88A8	SPbits1	x	SVID10	GEM1	TCONT1
B	1	MAC1	MAC2	0x88A8	SPbits2	x	SVID2	0x8100	x	x	CVID2	x	x	x	0x88A8	SPbits2	x	SVID20	0x8100	x	x	CVID2	GEM2	TCONT2
C	1	MAC1	MAC2	n/a	n/a	n/a	n/a	0x88A8	SPbits3	x	SVID3	x	x	x	-	-	-	-	-	-	-	-	-	-

Note: SVID3 and SPbits3 must not be configured as part of the VBES Service

Test Procedure

Omitted in Abstract Test Plan: Refer to http://www.broadband-forum.org/technical/test_cert_programs.php

OMCI Procedure Details

Refer to Annex B

Pass/Fail Criteria

Omitted in Abstract Test Plan: Refer to http://www.broadband-forum.org/technical/test_cert_programs.php

Remarks

None

6.1.7 Removal of an S-Tag in the Downstream Direction in a VBES Architecture

Test Name

Removal of an S-Tag in the Downstream Direction in a VBES Architecture

Test Definition Number

ONU.6.1.7

Reference Document

BBF TR-156 [3]

ITU-T G.988 [2]

Test Type

Conformance

Test Requirement Type

Mandatory

Unit Under Test

ONU

Requirement Description

BBF TR-156:

- **R-36** The ONU **MUST** support removing an S-Tag in the downstream direction

Test Objective

- Verify that the ONU supports removing an S-Tag in the downstream direction

Test Configuration

1. OLT Emulator and ONU under test are powered and connected to ODN
2. ONU under test has been activated by the OLT Emulator, has been ranged, and a GEM port for OMCI has been created as a result of ONU-ID assignment.

3. The OLT Emulator is configured to transmit double-tagged Ethernet frames downstream with the following parameters (Stream 1)
4. The OLT Emulator is configured to transmit double-tagged Ethernet frames downstream with the following parameters (Stream 2)
5. The OLT Emulator is configured to transmit tagged Ethernet frames downstream with the following parameters (Stream 3)

Downstream Direction																							
Traffic Stream	S/R Interface														U Interface								
	MAC DA	MAC SA	Outer VLAN Tag				Inner VLAN Tag				Ethertype	IP DA	IP SA	GEM	Outer VLAN Tag				Inner VLAN Tag				UNI
	Value	Value	TPID	Pbits	DEI	VID	TPID	Pbits	CFI or DEI	VID	Value	Value	Value	Port #	TPID	Pbits	DEI	VID	TPID	Pbits	CFI or DEI	VID	Port #
A	MAC1	MAC2	0x88A8	SPbits1	0	SVID1	0x8100	x	x	CVID1	x	x	x	GEM1	n/a	n/a	n/a	n/a	0x8100	x	x	CVID1	1
B	MAC1	MAC2	0x88A8	SPbits2	0	SVID1	0x8100	x	x	0	x	x	x	GEM2	n/a	n/a	n/a	n/a	0x8100	x	x	0	1
C	MAC1	MAC2	n/a	n/a	n/a	n/a	0x88A8	SPbits3	0	SVID1	x	x	x	GEM3	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1

Test Procedure

Omitted in Abstract Test Plan: Refer to http://www.broadband-forum.org/technical/test_cert_programs.php

OMCI Procedure Details

Refer to Annex B

Pass/Fail Criteria

Omitted in Abstract Test Plan: Refer to http://www.broadband-forum.org/technical/test_cert_programs.php

Remarks

None

6.1.8 Translation of an S-Tag in the Downstream Direction in a VBES Architecture

Test Name

Translation of an S-Tag in the Downstream Direction in a VBES Architecture

Test Definition Number

ONU.6.1.8

Reference Document

BBF TR-156 [3]

ITU-T G.988 [2]

Test Type

Conformance

Test Requirement Type

Mandatory

Unit Under Test

ONU

Requirement Description

BBF TR-156:

- **R-43** The ONU **MUST** support VID translation of the S-Tag received from the GPON interface into a new S-Tag for downstream double-tagged traffic sent to the U-interface

Test Objective

- Verify that the ONU supports VID translation of the S-Tag received from the GPON interface into a new S-Tag for downstream double-tagged traffic sent to the U-interface

Test Configuration

The same test configuration as used for 6.1.6 is used for this test but with the traffic running in the downstream direction:

1. OLT Emulator and ONU under test are powered and connected to ODN

2. ONU under test has been activated by the OLT Emulator, has been ranged, and a GEM port for OMCI has been created as a result of ONU-ID assignment.
3. The Ethernet Traffic Generator is configured to transmit tagged Ethernet frames downstream with the following parameters (Stream A)
4. The Ethernet Traffic Generator is configured to transmit double-tagged Ethernet frames downstream with the following parameters (Stream B)

Downstream Direction																							
Traffic Stream	S/R Interface														U Interface								
	MAC DA	MAC SA	Outer VLAN Tag				Inner VLAN Tag				Ethertype	IP DA	IP SA	GEM	Outer VLAN Tag				Inner VLAN Tag				UNI
	Value	Value	TPID	Pbits	DEI	VID	TPID	Pbits	CFI or DEI	VID	Value	Value	Value	Port #	TPID	Pbits	DEI	VID	TPID	Pbits	CFI or DEI	VID	Port #
A	MAC1	MAC2	0x88A8	SPbits1	0	SVID10	0x8100	x	x	CVID1	x	x	x	GEM1	0x88A8	SPbits1	0	SVID1	0x8100	x	x	CVID1	1
B	MAC1	MAC2	0x88A8	SPbits2	0	SVID20	0x8100	x	x	CVID2	x	x	x	GEM2	0x88A8	SPbits2	0	SVID2	0x8100	x	x	CVID2	1

Test Procedure

Omitted in Abstract Test Plan: Refer to http://www.broadband-forum.org/technical/test_cert_programs.php

OMCI Procedure Details

Refer to Annex B

Pass/Fail Criteria

Omitted in Abstract Test Plan: Refer to http://www.broadband-forum.org/technical/test_cert_programs.php

Remarks

None

6.1.9 Test Case Reserved For Future Use

6.1.10 Deriving P-bits as a function of received VID (single user port)

Test Name

Deriving P-bits as a function of received VID (single user port).

Test Definition Number

ONU.6.1.10

Reference Document

BBF TR-156 [3]

ITU-T G.988 [2]

Test Type

Conformance

Test Requirement Type

Mandatory

Unit Under Test

ONU

Requirement Description**BBF TR-156:**

- **R-48** The ONU MUST support deriving P-bit markings in the upstream direction based on an arbitrary combination of: user port, VID, received P-bit markings, and EtherType.

Also, R-6, 7, 50.

Test Objective

Show that ONU can derive P-bit marking as a function of received VID.

Test Configuration

For this test, only a single user port is assumed.

ONU must be set-up with the standard L2 OCM (single user) with three upstream queues and two associated T-CONTs. The intent of the test is to define two flows based on 2 different VID values at the U-interface. Each flow will have an S-tag added with a specified P-bit value.

The U-interface and S/R-interface values for each test are shown below, along with the GEM port and T-CONT configuration.

Upstream Direction																								
Traffic Stream	U Interface													R/S Interface										
	UNI	MAC DA	MAC SA	Outer VLAN Tag				Inner VLAN Tag				Ethertype	IP DA	IP SA	Outer VLAN Tag				Inner VLAN Tag				GEM	T-CONT
	Port #	Value	Value	TPID	Pbits	DEI	VID	TPID	Pbits	CFI or DEI	VID	Value	Value	Value	TPID	Pbits	DEI	VID	TPID	Pbits	CFI or DEI	VID	Port #	Number
A	1	MAC1	MAC2	n/a	n/a	n/a	n/a	0x8100	x	x	CVID1	x	x	x	0x88A8	SPbits1	x	SVID1	0x8100	x	x	CVID1	GEM1	TCONT1
B	1	MAC1	MAC2	n/a	n/a	n/a	n/a	0x8100	x	x	CVID2	x	x	x	0x88A8	SPbits2	x	SVID1	0x8100	x	x	CVID2	GEM2	TCONT2

Traffic corresponding to each flow will produce a different P-bit marking.

Test Procedure

Omitted in Abstract Test Plan: Refer to http://www.broadband-forum.org/technical/test_cert_programs.php

OMCI Procedure Details

Refer to Annex B

Pass/Fail Criteria

Omitted in Abstract Test Plan: Refer to http://www.broadband-forum.org/technical/test_cert_programs.php

Remarks

None

6.1.11 Deriving P-bits as a function of received Ethertype (single user port)

Test Name

Deriving P-bits as a function of received Ethertype (single user port).

Test Definition Number

ONU.6.1.11

Reference Document

BBF TR-156 [3]

ITU-T G.988 [2]

Test Type

Conformance

Test Requirement Type

Mandatory

Unit Under Test

ONU

Requirement Description**BBF TR-156:**

- **R-48** The ONU MUST support deriving P-bit markings in the upstream direction based on an arbitrary combination of: user port, VID, received P-bit markings, and EtherType.

Also, R-6, 7, 50.

Test Objective

Show that ONU can derive P-bit marking as a function of received Ethertype.

Test Configuration

For this test, only a single user port is assumed.

ONU must be set-up with the standard L2 OCM (single user) with two upstream queues and two associated T-CONTs. The intent of the test is to define two flows based on different Ethertype values at the U-interface. (Ethertype=0x8863 is PPPoE; Ethertype=0x0800 is IPoE) Each flow will have an S-tag added with P-bit value different from the other flow.

The U-interface and S/R-interface values for each test are shown below, along with the GEM port and T-CONT configuration.

Upstream Direction																								
Traffic Stream	U Interface														R/S Interface									
	UNI	MAC DA	MAC SA	Outer VLAN Tag				Inner VLAN Tag			Ethertype	IP DA	IP SA	Outer VLAN Tag				Inner VLAN Tag				GEM	T-CONT	
	Port #	Value	Value	TPID	Pbits	DEI	VID	TPID	Pbits	CFI or DEI	VID	Value	Value	Value	TPID	Pbits	DEI	VID	TPID	Pbits	CFI or DEI	VID	Port #	Number
A	1	MAC1	MAC2	n/a	n/a	n/a	n/a	0x8100	CPbits1	x	CVID1	0x8863	x	x	0x88A8	SPbits1	x	SVID1	0x8100	CPbits1	x	CVID1	GEM1	TCONT1
B	1	MAC1	MAC2	n/a	n/a	n/a	n/a	0x8100	CPbits1	x	CVID1	0x0800	x	x	0x88A8	SPbits2	x	SVID1	0x8100	CPbits1	x	CVID1	GEM2	TCONT2

Traffic corresponding to each flow will produce a different P-bit marking.

Test Procedure

Omitted in Abstract Test Plan: Refer to http://www.broadband-forum.org/technical/test_cert_programs.php

OMCI Procedure Details

Refer to Annex B

Pass/Fail Criteria

Omitted in Abstract Test Plan: Refer to http://www.broadband-forum.org/technical/test_cert_programs.php

Remarks

None

6.1.12 Deriving P-bits as a function of received user port

Test Name

Deriving P-bits as a function of received user port (multiple user ports).

Test Definition Number

ONU.6.1.12

Reference Document

BBF TR-156 [3]

ITU-T G.988 [2]

Test Type

Conformance

Test Requirement Type

Conditionally Mandatory (if ONT has multiple user ports)

Unit Under Test

ONU

Requirement Description**TR-156**

- **R-48** The ONU **MUST** support deriving P-bit markings in the upstream direction based on an arbitrary combination of: user port, VID, received P-bit markings, and EtherType.

Also, R-6, 7, 50.

Test Objective

Show that ONU can derive P-bit marking as a function of received user port.

Test Configuration

For this test, multiple user ports are assumed. Therefore multiple bridges must be provisioned in the OMCI model.

ONU must be set-up with the standard L2 OCM (multiple user port) with two upstream queues and two associated T-CONTs. The intent of the test is to define two streams per user ports. Each stream will have an S-tag added with P-bit value based on user port.

The U-interface and S/R interface values for each test are shown below, along with the GEM port and T-CONT configuration.

Upstream Direction																								
Traffic Stream	U Interface														R/S Interface									
	UNI	MAC DA	MAC SA	Outer VLAN Tag				Inner VLAN Tag			Ethertype	IP DA	IP SA	Outer VLAN Tag				Inner VLAN Tag				GEM	T-CONT	
	Port #	Value	Value	TPID	Pbits	DEI	VID	TPID	Pbits	CFI or DEI	VID	Value	Value	Value	TPID	Pbits	DEI	VID	TPID	Pbits	CFI or DEI	VID	Port #	Number
A	1	MAC1	MAC2	n/a	n/a	n/a	n/a	0x8100	CPbits1	x	CVID1	x	x	x	0x88A8	SPbits1	0	SVID1	0x8100	CPbits1	x	CVID1	GEM1	TCONT1
B	2	MAC3	MAC4	n/a	n/a	n/a	n/a	0x8100	CPbits1	x	CVID1	x	x	x	0x88A8	SPbits2	0	SVID1	0x8100	CPbits1	x	CVID1	GEM2	TCONT2
C	1	MAC1	MAC2	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	x	x	x	n/a	n/a	n/a	n/a	0x88A8	SPbits1	x	SVID1	GEM1	TCONT1
D	2	MAC3	MAC4	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	x	x	x	n/a	n/a	n/a	n/a	0x88A8	SPbits2	x	SVID1	GEM2	TCONT2

Traffic corresponding to each flow will produce a different P-bit marking.

Test Procedure

Omitted in Abstract Test Plan: Refer to http://www.broadband-forum.org/technical/test_cert_programs.php

OMCI Procedure Details

Refer to Appendix B

Pass/Fail Criteria

Omitted in Abstract Test Plan: Refer to http://www.broadband-forum.org/technical/test_cert_programs.php

Remarks

None

6.1.13 VID Support for Untagged Frames (N:1 VLAN or 1:1 VLAN Architecture Single-Tagged at the V Interface)

Test Name

VID Support for Untagged Frames (N:1 VLAN or 1:1 VLAN Single-Tagged at the V Interface)

Test Definition Number

ONU.6.1.13

Reference Document

BBF TR-156 [3]

ITU-T G.988 [2]

Test Type

Conformance

Test Requirement Type

Mandatory

Unit Under Test

ONU

Requirement Description

BBF TR-156:

- R-9 The ONU **MUST** support setting VID for untagged and priority tagged frames in the upstream direction based on EtherType, except on VLANs used for Business Ethernet Services.

Test Objective

Verify that the ONU supports setting VID for untagged frames in the upstream direction based on EtherType, for N:1 VLAN or 1:1 VLAN single-tagged at the V-interface

Test Configuration

1. OLT Emulator and ONU under test are powered and connected to ODN
2. ONU under test has been activated by the OLT Emulator, has been ranged, and a GEM port for OMCI has been created as a result of ONU-ID assignment.

3. The Ethernet Traffic Generator is configured to transmit untagged Ethernet frames upstream with the following parameters (Stream A - IPv4)
4. The Ethernet Traffic Generator is configured to transmit untagged Ethernet frames upstream with the following parameters (Stream B - PPPoE Discovery)
5. The Ethernet Traffic Generator is configured to transmit untagged Ethernet frames upstream with the following parameters (Stream C - PPPoE Session)
6. The Ethernet Traffic Generator is configured to transmit untagged Ethernet frames upstream with the following parameters (Stream D - ARP)

Upstream Direction																								
Traffic Stream	U Interface												R/S Interface											
	UNI	MAC DA	MAC SA	Outer VLAN Tag				Inner VLAN Tag				Ethertype	IP DA	IP SA	Outer VLAN Tag				Inner VLAN Tag				GEM	T-CONT
	Port #	Value	Value	TPID	Pbits	DEI	VID	TPID	Pbits	CFI or DEI	VID	Value	Value	Value	TPID	Pbits	DEI	VID	TPID	Pbits	CFI or DEI	VID	Port #	Number
A	1	MAC1	MAC2	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0x0800	x	x	n/a	n/a	n/a	n/a	0x88A8	SPbits1	x	SVID1	GEM1	TCONT1
B	1	MAC3	MAC4	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0x8863	x	x	n/a	n/a	n/a	n/a	0x88A8	SPbits2	x	SVID2	GEM1	TCONT1
C	1	MAC5	MAC6	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0x8864	n/a	n/a	n/a	n/a	n/a	n/a	0x88A8	SPbits2	x	SVID2	GEM1	TCONT1
D	1	MAC7	MAC8	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0x0806	n/a	n/a	n/a	n/a	n/a	n/a	0x88A8	SPbits1	x	SVID1	GEM1	TCONT1

7. For N:1 VLAN or 1:1 VLAN single-tagged at the V-interface, an S-Tag is added at the ONU for upstream traffic, as defined in the table above

Test Procedure

Omitted in Abstract Test Plan: Refer to http://www.broadband-forum.org/technical/test_cert_programs.php

OMCI Procedure Details

Refer to Annex B

Pass/Fail Criteria

Omitted in Abstract Test Plan: Refer to http://www.broadband-forum.org/technical/test_cert_programs.php

Remarks

For more details see R-26/TR-101 [6] and R-27/TR-101 [6].

6.1.14 VID Support for Untagged Frames (1:1 VLAN Architecture Double-Tagged at the V Interface)

Test Name

VID Support for Untagged Frames (1:1 VLAN Double-Tagged at the V Interface)

Test Definition Number

ONU.6.1.14

Reference Document

BBF TR-156 [3]

ITU-T G.988 [2]

Test Type

Conformance

Test Requirement Type

Mandatory

Unit Under Test

ONU

Requirement Description

BBF TR-156:

- R9: The ONU **MUST** support setting VID for untagged and priority tagged frames in the upstream direction based on EtherType, except on VLANs used for Business Ethernet Services.

Test Objective

Verify that the ONU supports setting VID for untagged frames in the upstream direction based on EtherType, for 1:1 VLAN double-tagged at the V-interface

Test Configuration

1. OLT Emulator and ONU under test are powered and connected to ODN
2. ONU under test has been activated by the OLT Emulator, has been ranged, and a GEM port for OMCI has been created as a result of ONU-ID assignment.

3. The Ethernet Traffic Generator is configured to transmit untagged Ethernet frames upstream with the following parameters (Stream 1 - IPv4)
4. The Ethernet Traffic Generator is configured to transmit untagged Ethernet frames upstream with the following parameters (Stream 2 – PPPoE Discovery)
5. The Ethernet Traffic Generator is configured to transmit untagged Ethernet frames upstream with the following parameters (Stream 3 – PPPoE Session)
6. The Ethernet Traffic Generator is configured to transmit untagged Ethernet frames upstream with the following parameters (Stream 4 – ARP)

Upstream Direction																								
Traffic Stream	U Interface														R/S Interface									
	UNI	MAC DA	MAC SA	Outer VLAN Tag				Inner VLAN Tag			Ethertype	IP DA	IP SA	Outer VLAN Tag				Inner VLAN Tag				GEM	T-CONT	
	Port #	Value	Value	TPID	Pbits	DEI	VID	TPID	Pbits	CFI or DEI	VID	Value	Value	Value	TPID	Pbits	DEI	VID	TPID	Pbits	CFI or DEI	VID	Port #	Number
A	1	MAC1	MAC2	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0x0800	x	x	n/a	n/a	n/a	n/a	0x8100	CPbits1	x	CVID1	GEM1	TCONT1
B	1	MAC3	MAC4	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0x8863	x	x	n/a	n/a	n/a	n/a	0x8100	CPbits2	x	CVID2	GEM1	TCONT1
C	1	MAC5	MAC6	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0x8864	n/a	n/a	n/a	n/a	n/a	n/a	0x8100	CPbits2	x	CVID2	GEM1	TCONT1
D	1	MAC7	MAC8	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0x0806	n/a	n/a	n/a	n/a	n/a	n/a	0x8100	CPbits1	x	CVID1	GEM1	TCONT1

7. For 1:1 VLAN double-tagged at the V-interface, a C-Tag is added at the ONU for upstream traffic, as defined in the table above.

Test Procedure

Omitted in Abstract Test Plan: Refer to http://www.broadband-forum.org/technical/test_cert_programs.php

OMCI Procedure Details

Refer to Annex B

Pass/Fail Criteria

Omitted in Abstract Test Plan: Refer to http://www.broadband-forum.org/technical/test_cert_programs.php

Remarks

For more details see R-26/TR-101 [6] and R-27/TR-101 [6].

6.1.15 VID Support for Priority Tagged Frames with Priority Preservation (N:1 VLAN or 1:1 VLAN Architecture Single-Tagged at the V Interface)

Test Name

VID Support for Priority Tagged Frames with Priority Preservation (N:1 VLAN or 1:1 VLAN Single-Tagged at the V Interface)

Test Definition Number

ONU.6.1.15

Reference Document

BBF TR-156 [3]

BBF TR-101 [6]

ITU-T G.988 [2]

Test Type

Conformance

Test Requirement Type

Mandatory

Unit Under Test

ONU

Requirement Description

BBF TR-156:

- **R-9** The ONU **MUST** support setting VID for untagged and priority-tagged frames in the upstream direction based on EtherType, except on VLANs used for Business Ethernet Services.

BBF TR-101:

- For each port configured as 'untagged or priority-tagged' or 'admit all', the Access Node **MUST** allow the operator to configure whether it should copy the priority marking of the received upstream priority-tagged frame to the S-tag (and C-tag, if applicable) or whether it should override it using an ingress to egress priority mapping

Test Objective

Verify that the ONU supports setting VID for priority-tagged frames in the upstream direction based on EtherType, for N:1 VLAN or

1:1 VLAN single-tagged at the V-interface, with priority preservation

Test Configuration

1. OLT Emulator and ONU under test are powered and connected to ODN
2. ONU under test has been activated by the OLT Emulator, has been ranged, and a GEM port for OMCI has been created as a result of ONU-ID assignment.
3. The Ethernet Traffic Generator is configured to transmit priority tagged Ethernet frames upstream with the following parameters

Upstream Direction																								
Traffic Stream	U Interface														R/S Interface									
	UNI	MAC DA	MAC SA	Outer VLAN Tag				Inner VLAN Tag			Ethertype	IP DA	IP SA	Outer VLAN Tag				Inner VLAN Tag				GEM	T-CONT	
	Port #	Value	Value	TPID	Pbits	DEI	VID	TPID	Pbits	CFI or DEI	VID	Value	Value	Value	TPID	Pbits	DEI	VID	TPID	Pbits	CFI or DEI	VID	Port #	Number
A	1	MAC1	MAC2	n/a	n/a	n/a	n/a	0x8100	CPbits1	x	0	0x0800	x	x	n/a	n/a	n/a	n/a	0x88A8	SPbits1	x	SVID1	GEM1	TCONT1
B	1	MAC3	MAC4	n/a	n/a	n/a	n/a	0x8100	CPbits2	x	0	0x8863	x	x	n/a	n/a	n/a	n/a	0x88A8	SPbits2	x	SVID2	GEM1	TCONT1
C	1	MAC5	MAC6	n/a	n/a	n/a	n/a	0x8100	CPbits2	x	0	0x8864	n/a	n/a	n/a	n/a	n/a	n/a	0x88A8	SPbits2	x	SVID2	GEM1	TCONT1
D	1	MAC7	MAC8	n/a	n/a	n/a	n/a	0x8100	CPbits4	x	0	0x0806	n/a	n/a	n/a	n/a	n/a	n/a	0x88A8	SPbits4	x	SVID1	GEM1	TCONT1

4. For N:1 VLAN or 1:1 VLAN single-tagged at the V-interface, an S-Tag is added at the ONU for upstream traffic, as defined in the table above

Test Procedure

Omitted in Abstract Test Plan: Refer to http://www.broadband-forum.org/technical/test_cert_programs.php

OMCI Procedure Details

Refer to Annex B

Pass/Fail Criteria

Omitted in Abstract Test Plan: Refer to http://www.broadband-forum.org/technical/test_cert_programs.php

Remarks

For more details see R-26/TR-101 [6] and R-27/TR-101 [6].

6.1.16 VID Support for Priority Tagged Frames without Priority Preservation (N:1 VLAN or 1:1 VLAN Architecture Single-Tagged at the V Interface)

Test Name

VID Support for Priority Tagged Frames without Priority Preservation (N:1 VLAN or 1:1 VLAN Single-Tagged at the V Interface)

Test Definition Number

ONU.6.1.16

Reference Document

BBF TR-156 [3]

BBF TR-101 [6]

ITU-T G.988 [2]

Test Type

Conformance

Test Requirement Type

Mandatory

Unit Under Test

ONU

Requirement Description

BBF TR-156:

- **R-9** The ONU **MUST** support setting VID for untagged and priority-tagged frames in the upstream direction based on EtherType, except on VLANs used for Business Ethernet Services.

BBF TR-101:

- For each port configured as 'untagged or priority-tagged' or 'admit all', the Access Node **MUST** allow the operator to configure whether it should copy the priority marking of the received upstream priority-tagged frame to the S-tag (and C-tag, if applicable) or whether it should override it using an ingress to egress priority mapping

Test Objective

Verify that the ONU supports setting VID for priority-tagged frames in the upstream direction based on EtherType, for N:1 VLAN or 1:1 VLAN single-tagged at the V-interface, without priority preservation

Test Configuration

1. OLT Emulator and ONU under test are powered and connected to ODN
2. ONU under test has been activated by the OLT Emulator, has been ranged, and a GEM port for OMCI has been created as a result of ONU-ID assignment.
3. The Ethernet Traffic Generator is configured to transmit priority tagged Ethernet frames upstream with the following parameters

Upstream Direction																								
Traffic Stream	U Interface													R/S Interface										
	UNI	MAC DA	MAC SA	Outer VLAN Tag				Inner VLAN Tag			Ethertype	IP DA	IP SA	Outer VLAN Tag				Inner VLAN Tag				GEM	T-CONT	
	Port #	Value	Value	TPID	Pbits	DEI	VID	TPID	Pbits	CFI or DEI	VID	Value	Value	Value	TPID	Pbits	DEI	VID	TPID	Pbits	CFI or DEI	VID	Port #	Number
A	1	MAC1	MAC2	n/a	n/a	n/a	n/a	0x8100	CPbits1	x	0	0x0800	x	x	n/a	n/a	n/a	n/a	0x88A8	SPbits1	x	SVID1	GEM1	TCONT1
B	1	MAC3	MAC4	n/a	n/a	n/a	n/a	0x8100	CPbits2	x	0	0x8863	x	x	n/a	n/a	n/a	n/a	0x88A8	SPbits1	x	SVID2	GEM1	TCONT1
C	1	MAC5	MAC6	n/a	n/a	n/a	n/a	0x8100	CPbits3	x	0	0x8864	n/a	n/a	n/a	n/a	n/a	n/a	0x88A8	SPbits1	x	SVID2	GEM1	TCONT1
D	1	MAC7	MAC8	n/a	n/a	n/a	n/a	0x8100	CPbits4	x	0	0x0806	n/a	n/a	n/a	n/a	n/a	n/a	0x88A8	SPbits1	x	SVID1	GEM1	TCONT1

4. For N:1 VLAN or 1:1 VLAN single-tagged at the V-interface, an S-Tag is added at the ONU for upstream traffic, as defined in the table above

Test Procedure

Omitted in Abstract Test Plan: Refer to http://www.broadband-forum.org/technical/test_cert_programs.php

OMCI Procedure Details

Refer to Annex B

Pass/Fail Criteria

Omitted in Abstract Test Plan: Refer to http://www.broadband-forum.org/technical/test_cert_programs.php

Remarks

For more details see R-26/TR-101 [6] and R-27/TR-101 [6].

6.1.17 VID Support for Priority Tagged Frames with Priority Preservation (1:1 VLAN Architecture Double-Tagged at the V Interface)

Test Name

VID Support for Priority Tagged Frames with Priority Preservation (1:1 VLAN Double-Tagged at the V Interface)

Test Definition Number

ONU.6.1.17

Reference Document

BBF TR-156 [3]

BBF TR-101 [6]

ITU-T G.988 [2]

Test Type

Conformance

Test Requirement Type

Mandatory

Unit Under Test

ONU

Requirement Description

BBF TR-156:

- **R-9** The ONU **MUST** support setting VID for untagged and priority-tagged frames in the upstream direction based on EtherType, except on VLANs used for Business Ethernet Services.

BBF TR-101:

- For each port configured as 'untagged or priority-tagged' or 'admit all', the Access Node **MUST** allow the operator to configure whether it should copy the priority marking of the received upstream priority-tagged frame to the S-tag (and C-tag, if applicable) or whether it should override it using an ingress to egress priority mapping

Test Objective

Verify that the ONU supports setting VID for priority-tagged frames in the upstream direction based on EtherType, for 1:1 VLAN double-tagged at the V-interface, with priority preservation

Test Configuration

1. OLT Emulator and ONU under test are powered and connected to ODN
2. ONU under test has been activated by the OLT Emulator, has been ranged, and a GEM port for OMCI has been created as a result of ONU-ID assignment.
3. The Ethernet Traffic Generator is configured to transmit priority tagged Ethernet frames upstream with the following parameters

Upstream Direction																								
Traffic Stream	U Interface														R/S Interface									
	UNI	MAC DA	MAC SA	Outer VLAN Tag				Inner VLAN Tag				Ethertype	IP DA	IP SA	Outer VLAN Tag				Inner VLAN Tag				GEM	T-CONT
	Port #	Value	Value	TPID	Pbits	DEI	VID	TPID	Pbits	CFI or DEI	VID	Value	Value	Value	TPID	Pbits	DEI	VID	TPID	Pbits	CFI or DEI	VID	Port #	Number
A	1	MAC1	MAC2	n/a	n/a	n/a	n/a	0x8100	CPbits1	x	0	0x0800	x	x	n/a	n/a	n/a	n/a	0x8100	CPbits1	x	CVID1	GEM1	TCONT1
B	1	MAC3	MAC4	n/a	n/a	n/a	n/a	0x8100	CPbits2	x	0	0x8863	x	x	n/a	n/a	n/a	n/a	0x8100	CPbits2	x	CVID2	GEM1	TCONT1
C	1	MAC5	MAC6	n/a	n/a	n/a	n/a	0x8100	CPbits2	x	0	0x8864	n/a	n/a	n/a	n/a	n/a	n/a	0x8100	CPbits2	x	CVID2	GEM1	TCONT1
D	1	MAC7	MAC8	n/a	n/a	n/a	n/a	0x8100	CPbits4	x	0	0x0806	n/a	n/a	n/a	n/a	n/a	n/a	0x8100	CPbits4	x	CVID1	GEM1	TCONT1

4. For 1:1 VLAN double-tagged at the V-interface, a C-Tag is added at the ONU for upstream traffic, as defined in the table above.

Test Procedure

Omitted in Abstract Test Plan: Refer to http://www.broadband-forum.org/technical/test_cert_programs.php

OMCI Procedure Details

Refer to Annex B

Pass/Fail Criteria

Omitted in Abstract Test Plan: Refer to http://www.broadband-forum.org/technical/test_cert_programs.php

Remarks

For more details see R-26/TR-101 [6] and R-27/TR-101 [6].

6.1.18 VID Support for Priority Tagged Frames without Priority Preservation (1:1 VLAN Architecture Double-Tagged at the V Interface)

Test Name

VID Support for Priority Tagged Frames without Priority Preservation (1:1 VLAN Double-Tagged at the V Interface)

Test Definition Number

ONU.6.1.18

Reference Document

BBF TR-156 [3]

BBF TR-101 [6]

ITU-T G.988 [2]

Test Type

Conformance

Test Requirement Type

Mandatory

Unit Under Test

ONU

Requirement Description

BBF TR-156:

- **R-9** The ONU **MUST** support setting VID for untagged and priority-tagged frames in the upstream direction based on EtherType, except on VLANs used for Business Ethernet Services.

BBF TR-101:

- For each port configured as 'untagged or priority-tagged' or 'admit all', the Access Node **MUST** allow the operator to configure whether it should copy the priority marking of the received upstream priority-tagged frame to the S-tag (and C-tag, if applicable) or whether it should override it using an ingress to egress priority mapping

Test Objective

Verify that the ONU supports setting VID for priority-tagged frames in the upstream direction based on EtherType, for 1:1 VLAN

double-tagged at the V-interface, without priority preservation

Test Configuration

1. OLT Emulator and ONU under test are powered and connected to ODN
2. ONU under test has been activated by the OLT Emulator, has been ranged, and a GEM port for OMCI has been created as a result of ONU-ID assignment.
3. The Ethernet Traffic Generator is configured to transmit priority tagged Ethernet frames upstream with the following parameters

Upstream Direction																								
Traffic Stream	U Interface														R/S Interface									
	UNI	MAC DA	MAC SA	Outer VLAN Tag				Inner VLAN Tag			Ethertype	IP DA	IP SA	Outer VLAN Tag				Inner VLAN Tag				GEM	T-CONT	
	Port #	Value	Value	TPID	Pbits	DEI	VID	TPID	Pbits	CFI or DEI	VID	Value	Value	Value	TPID	Pbits	DEI	VID	TPID	Pbits	CFI or DEI	VID	Port #	Number
A	1	MAC1	MAC2	n/a	n/a	n/a	n/a	0x8100	CPbits1	x	0	0x0800	x	x	n/a	n/a	n/a	n/a	0x8100	CPbits2	x	CVID1	GEM1	TCONT1
B	1	MAC3	MAC4	n/a	n/a	n/a	n/a	0x8100	CPbits2	x	0	0x8863	x	x	n/a	n/a	n/a	n/a	0x8100	CPbits2	x	CVID2	GEM1	TCONT1
C	1	MAC5	MAC6	n/a	n/a	n/a	n/a	0x8100	CPbits3	x	0	0x8864	n/a	n/a	n/a	n/a	n/a	n/a	0x8100	CPbits2	x	CVID2	GEM1	TCONT1
D	1	MAC7	MAC8	n/a	n/a	n/a	n/a	0x8100	CPbits4	x	0	0x0806	n/a	n/a	n/a	n/a	n/a	n/a	0x8100	CPbits2	x	CVID1	GEM1	TCONT1

4. For 1:1 VLAN double-tagged at the V-interface, a C-Tag is added at the ONU for upstream traffic, as defined in the table above

Test Procedure

Omitted in Abstract Test Plan: Refer to http://www.broadband-forum.org/technical/test_cert_programs.php

OMCI Procedure Details

Refer to Annex B

Pass/Fail Criteria

Omitted in Abstract Test Plan: Refer to http://www.broadband-forum.org/technical/test_cert_programs.php

Remarks

For more details see R-26/TR-101 [6] and R-27/TR-101 [6].

6.1.19 ONU addition and removal of C-Tag for 1:1 VLANs

Test Name

ONU addition and removal of C-Tag for 1:1 VLANs

Test Definition Number

ONU.6.1.19

Reference Document

BBF TR-156 [3]

ITU-T G.988 [2]

Test Type

Conformance

Test Requirement Type

Mandatory

Unit Under Test

ONU

Requirement Description

BBF TR-156:

- **R-20** The ONU MUST support adding a C-Tag or S-Tag to upstream untagged traffic.
- **R-21** The ONU MUST support removing the tag from downstream traffic.

Test Objective

To verify that the ONU implementation supports the addition and removal of an C-Tag to upstream and downstream frames respectively.

Test Configuration

1. OLT emulator and ONU under test are connected to the ODN and powered on.
2. ONU activation and OMCC establishment processes have been successfully completed.

3. The OLT Emulator has instructed the ONU to reset its MIB to factory default values
4. The OLT emulator will be configured to send the sequence of OMCI messages required to provision the ONU under test to support the following configuration:
5. Single untagged U-interface (removal of C-Tag from downstream packets and addition of C-Tag to upstream packets).
6. One unicast GEM port
7. The OLT emulator will be used to capture/report any upstream packets and generate any downstream packets.
8. The Ethernet traffic generator will be configured to capture/report any downstream packets and generate any upstream packets.

Upstream Direction																								
Traffic Stream	U Interface														R/S Interface									
	UNI	MAC DA	MAC SA	Outer VLAN Tag				Inner VLAN Tag				Ethertype	IP DA	IP SA	Outer VLAN Tag				Inner VLAN Tag				GEM	T-CONT
	Port #	Value	Value	TPID	Pbits	DEI	VID	TPID	Pbits	CFI or DEI	VID	Value	Value	Value	TPID	Pbits	DEI	VID	TPID	Pbits	CFI or DEI	VID	Port #	Number
A	1	MAC1	MAC2	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	x	x	x	n/a	n/a	n/a	n/a	0x8100	CPbits1	x	CVID1	GEM1	TCONT1
B	1	MAC1	MAC2	n/a	n/a	n/a	n/a	0x8100	CPbits1	x	CVID1	x	x	x	-	-	-	-	-	-	-	-	-	-
C	1	MAC1	MAC2	n/a	n/a	n/a	n/a	0x88A8	SPbits1	x	SVID1	x	x	x	-	-	-	-	-	-	-	-	-	-

Downstream Direction																							
Traffic Stream	S/R Interface														U Interface								
	MAC DA	MAC SA	Outer VLAN Tag				Inner VLAN Tag				Ethertype	IP DA	IP SA	GEM	Outer VLAN Tag				Inner VLAN Tag				UNI
	Value	Value	TPID	Pbits	DEI	VID	TPID	Pbits	CFI or DEI	VID	Value	Value	Value	Port #	TPID	Pbits	DEI	VID	TPID	Pbits	CFI or DEI	VID	Port #
D	MAC2	MAC1	n/a	n/a	n/a	n/a	0x8100	CPbits1	x	CVID1	x	x	x	GEM1	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1

Test Procedure

Omitted in Abstract Test Plan: Refer to http://www.broadband-forum.org/technical/test_cert_programs.php

OMCI Procedure Details

Refer to Annex B

Pass/Fail Criteria

Omitted in Abstract Test Plan: Refer to http://www.broadband-forum.org/technical/test_cert_programs.php

Remarks

None

6.1.20 ONU addition and removal of S-Tag for 1:1 VLANs

Test Name

ONU addition and removal of S-Tag for 1:1 VLANs

Test Definition Number

ONU.6.1.20

Reference Document

BBF TR-156 [3]

ITU-T G.988 [2]

Test Type

Conformance

Test Requirement Type

Mandatory

Unit Under Test

ONU

Requirement Description

BBF TR-156:

- **R-20** The ONU MUST support adding a C-Tag or S-Tag to upstream untagged traffic.
- **R-21** The ONU MUST support removing the tag from downstream traffic.

Test Objective

To verify that the ONU implementation supports the addition and removal of an S-Tag to upstream and downstream frames respectively.

Test Configuration

1. OLT emulator and ONU under test are connected to the ODN and powered on.
2. ONU activation and OMCC establishment processes have been successfully completed.
3. The OLT Emulator has instructed the ONU to reset its MIB to factory default values

4. The OLT emulator will be configured to send the sequence of OMCI messages required to provision the ONU under test to support the following configuration:
5. Single untagged U-interface (removal of S-Tag from downstream packets and addition of S-Tag to upstream packets).
6. One unicast GEM port
7. The OLT emulator will be used to capture/report any upstream packets and generate any downstream packets.
8. The Ethernet traffic generator will be configured to capture/report any downstream packets and generate any upstream packets.

Upstream Direction																								
Traffic Stream	U Interface													R/S Interface										
	UNI	MAC DA	MAC SA	Outer VLAN Tag				Inner VLAN Tag				Ethertype	IP DA	IP SA	Outer VLAN Tag				Inner VLAN Tag				GEM	T-CONT
	Port #	Value	Value	TPID	Pbits	DEI	VID	TPID	Pbits	CFI or DEI	VID	Value	Value	Value	TPID	Pbits	DEI	VID	TPID	Pbits	CFI or DEI	VID	Port #	Number
A	1	MAC1	MAC2	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	x	x	x	n/a	n/a	n/a	n/a	0x88A8	SPbits1	x	SVID1	GEM1	TCONT1
B	1	MAC1	MAC2	n/a	n/a	n/a	n/a	0x8100	CPbits1	x	CVID1	x	x	x	-	-	-	-	-	-	-	-	-	-
C	1	MAC1	MAC2	n/a	n/a	n/a	n/a	0x88A8	SPbits1	x	SVID1	x	x	x	-	-	-	-	-	-	-	-	-	-

Downstream Direction																							
Traffic Stream	S/R Interface														U Interface								
	MAC DA	MAC SA	Outer VLAN Tag				Inner VLAN Tag				Ethertype	IP DA	IP SA	GEM	Outer VLAN Tag				Inner VLAN Tag				UNI
	Value	Value	TPID	Pbits	DEI	VID	TPID	Pbits	CFI or DEI	VID	Value	Value	Value	Port #	TPID	Pbits	DEI	VID	TPID	Pbits	CFI or DEI	VID	Port #
D	MAC2	MAC1	n/a	n/a	n/a	n/a	0x88A8	SPbits1	x	SVID1	x	x	x	GEM1	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1

Test Procedure

Omitted in Abstract Test Plan: Refer to http://www.broadband-forum.org/technical/test_cert_programs.php

OMCI Procedure Details

Refer to Annex B

Pass/Fail Criteria

Omitted in Abstract Test Plan: Refer to http://www.broadband-forum.org/technical/test_cert_programs.php

Remarks

None

6.1.21 ONU translation between Q-Tag and C-Tag for 1:1 VLANs

Test Name

ONU translation between Q-Tag and C-Tag for 1:1 VLANs

Test Definition Number

ONU.6.1.21

Reference Document

BBF TR-156 [3]

ITU-T G.988 [2]

Test Type

Conformance

Test Requirement Type

Mandatory

Unit Under Test

ONU

Requirement Description

BBF TR-156:

- **R-22** The ONU MUST support VID translation of the Q-Tag received from the U-interface into the C-Tag or S-Tag for upstream-tagged traffic.
- **R-23** The ONU MUST support VID translation of the tag used in the downstream-tagged traffic into the Q-Tag sent to the U-interface.

Test Objective

To verify that the ONU implementation supports the translation of Q-Tags into C-Tags and C-Tags into Q-Tags for upstream and downstream frames respectively.

Test Configuration

1. OLT emulator and ONU under test are connected to the ODN and powered on.
2. ONU activation and OMCC establishment processes have been successfully completed.
3. The OLT Emulator has instructed the ONU to reset its MIB to factory default values
4. The OLT emulator will be configured to send the sequence of OMCI messages required to provision the ONU under test to support the following configuration:
 - Single tagged U-interface
 - Translation of Q-Tag into C-Tag in upstream direction and C-Tag into Q-Tag in the downstream direction
 - One unicast GEM port
5. The OLT emulator will be used to capture/report any upstream packets and generate any downstream packets.
6. The Ethernet traffic generator will be configured to capture/report any downstream packets and generate any upstream packets.

Upstream Direction																								
Traffic Stream	U Interface														R/S Interface									
	UNI	MAC DA	MAC SA	Outer VLAN Tag				Inner VLAN Tag				Ethertype	IP DA	IP SA	Outer VLAN Tag				Inner VLAN Tag				GEM	T-CONT
	Port #	Value	Value	TPID	Pbits	DEI	VID	TPID	Pbits	CFI or DEI	VID	Value	Value	Value	TPID	Pbits	DEI	VID	TPID	Pbits	CFI or DEI	VID	Port #	Number
A	1	MAC1	MAC2	n/a	n/a	n/a	n/a	0x8100	x	x	QVID1	x	x	x	n/a	n/a	n/a	n/a	0x8100	x	x	CVID2	GEM1	TCONT1
B	1	MAC1	MAC2	n/a	n/a	n/a	n/a	0x8100	x	x	QVID2	x	x	x	-	-	-	-	-	-	-	-	-	-
C	1	MAC1	MAC2	n/a	n/a	n/a	n/a	0x88A8	x	x	SVID2	x	x	x	-	-	-	-	-	-	-	-	-	-
D	1	MAC1	MAC2	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	x	x	x	-	-	-	-	-	-	-	-	-	-

Downstream Direction																							
Traffic Stream	S/R Interface															U Interface							
	MAC DA	MAC SA	Outer VLAN Tag				Inner VLAN Tag				Ethertype	IP DA	IP SA	GEM	Outer VLAN Tag				Inner VLAN Tag				UNI
	Value	Value	TPID	Pbits	DEI	VID	TPID	Pbits	CFI or DEI	VID	Value	Value	Value	Port #	TPID	Pbits	DEI	VID	TPID	Pbits	CFI or DEI	VID	Port #
E	MAC2	MAC1	n/a	n/a	n/a	n/a	0x8100	x	x	CVID2	x	x	x	GEM1	n/a	n/a	n/a	n/a	0x8100	x	x	QVID1	1

Test Procedure

Omitted in Abstract Test Plan: Refer to http://www.broadband-forum.org/technical/test_cert_programs.php

OMCI Procedure Details

Refer to Annex B

Pass/Fail Criteria

Omitted in Abstract Test Plan: Refer to http://www.broadband-forum.org/technical/test_cert_programs.php

Remarks

None

6.1.22 ONU translation between Q-Tag and S-Tag for 1:1 VLANs

Test Name

ONU translation between Q-Tag and S-Tag for 1:1 VLANs

Test Definition Number

ONU.6.1.22

Reference Document

BBF TR-156 [3]

ITU-T G.988 [2]

Test Type

Conformance

Test Requirement Type

Mandatory

Unit Under Test

ONU

Requirement Description

BBF TR-156:

- **R-22** The ONU MUST support VID translation of the Q-Tag received from the U-interface into the C-Tag or S-Tag for upstream-tagged traffic.
- **R-23** The ONU MUST support VID translation of the tag used in the downstream-tagged traffic into the Q-Tag sent to the U-interface.

Test Objective

To verify that the ONU implementation supports the translation of Q-Tags into S-Tags and S-Tags into Q-Tags for upstream and downstream frames respectively.

Test Configuration

1. OLT emulator and ONU under test are connected to the ODN and powered on.
2. ONU activation and OMCC establishment processes have been successfully completed.
3. The OLT Emulator has instructed the ONU to reset its MIB to factory default values
4. The OLT emulator will be configured to send the sequence of OMCI messages required to provision the ONU under test to support the following configuration:
 - Single tagged U-interface
 - Translation of Q-Tag into S-Tag in upstream direction and S-Tag into Q-Tag in the downstream direction
 - One unicast GEM port
5. The OLT emulator will be used to capture/report any upstream packets and generate any downstream packets.
6. The Ethernet traffic generator will be configured to capture/report any downstream packets and generate any upstream packets.

Upstream Direction																								
Traffic Stream	U Interface														R/S Interface									
	UNI	MAC DA	MAC SA	Outer VLAN Tag				Inner VLAN Tag				Ethertype	IP DA	IP SA	Outer VLAN Tag				Inner VLAN Tag				GEM	T-CONT
	Port #	Value	Value	TPID	Pbits	DEI	VID	TPID	Pbits	CFI or DEI	VID	Value	Value	Value	TPID	Pbits	DEI	VID	TPID	Pbits	CFI or DEI	VID	Port #	Number
A	1	MAC1	MAC2	n/a	n/a	n/a	n/a	0x8100	x	x	QVID1	x	x	x	n/a	n/a	n/a	n/a	0x88A8	x	x	SVID2	GEM1	TCONT1
B	1	MAC1	MAC2	n/a	n/a	n/a	n/a	0x8100	x	x	QVID2	x	x	x	-	-	-	-	-	-	-	-	-	-
C	1	MAC1	MAC2	n/a	n/a	n/a	n/a	0x88A8	x	x	SVID2	x	x	x	-	-	-	-	-	-	-	-	-	-
D	1	MAC1	MAC2	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	x	x	x	-	-	-	-	-	-	-	-	-	-

Downstream Direction																								
Traffic Stream	S/R Interface															U Interface								
	MAC DA	MAC SA	Outer VLAN Tag				Inner VLAN Tag				Ethertype	IP DA	IP SA	GEM	Outer VLAN Tag				Inner VLAN Tag				UNI	
	Value	Value	TPID	Pbits	DEI	VID	TPID	Pbits	CFI or DEI	VID	Value	Value	Value	Port #	TPID	Pbits	DEI	VID	TPID	Pbits	CFI or DEI	VID	Port #	
E	MAC2	MAC1	n/a	n/a	n/a	n/a	0x88A8	x	x	SVID2	x	x	x	GEM1	n/a	n/a	n/a	n/a	0x8100	x	x	QVID1	1	

Test Procedure

Omitted in Abstract Test Plan: Refer to http://www.broadband-forum.org/technical/test_cert_programs.php

OMCI Procedure Details

Refer to Annex B

Pass/Fail Criteria

Omitted in Abstract Test Plan: Refer to http://www.broadband-forum.org/technical/test_cert_programs.php

Remarks

None

6.1.23 Test case reserved for future use.

6.1.24 Deriving P-bits as a function of received P-bits for a VBES architecture (single user port)

Test Name

Deriving P-bits as a function of received P-bits for a VBES architecture (single user port).

Test Definition Number

ONU.6.1.24

Reference Document

BBF TR-156 [3]

ITU-T G.988 [2]

Test Type

Conformance

Test Requirement Type

Mandatory

Unit Under Test

ONU

Requirement Description**BBF TR-156:**

- **R-48** The ONU MUST support deriving P-bit markings in the upstream direction based on an arbitrary combination of: user port, VID, received P-bit markings, and EtherType.

Note: Only derivation from received P-bit markings is verified by this test case.

Also, R-6, 7, 46, 50.

Test Objective

Show that ONU can derive P-bit marking as a function of received P-bits.

Test Configuration

For this test, only a single user port is assumed.

ONU must be set-up with the standard L2-OCM (single user) with one upstream queues and one associated T-CONT. The intent of the test is to define two flows based on different P-bit values at the U-interface. Each flow at R/S will have an S-tag with a different P-bit value.

The U-interface and S/R-interface values for each test are shown below, along with the GEM port and T-CONT configuration.

Upstream Direction																								
Traffic Stream	U Interface															R/S Interface								
	UNI	MAC DA	MAC SA	Outer VLAN Tag				Inner VLAN Tag				Ethertype	IP DA	IP SA	Outer VLAN Tag				Inner VLAN Tag			GEM	T-CONT	
	Port #	Value	Value	TPID	Pbits	DEI	VID	TPID	Pbits	CFI or DEI	VID	Value	Value	Value	TPID	Pbits	DEI	VID	TPID	Pbits	CFI or DEI	VID	Port #	Number
A	1	MAC1	MAC2	n/a	n/a	n/a	n/a	0x88A8	SPbits3	x	SVID2	x	x	x	n/a	n/a	n/a	n/a	0x88A8	SPbits1	x	SVID1	GEM1	TCONT1
B	1	MAC3	MAC4	n/a	n/a	n/a	n/a	0x88A8	SPbits4	x	SVID2	x	x	x	n/a	n/a	n/a	n/a	0x88A8	SPbits2	x	SVID1	GEM2	TCONT1

Traffic corresponding to each flow will produce a different P-bit marking.

Test Procedure

Omitted in Abstract Test Plan: Refer to http://www.broadband-forum.org/technical/test_cert_programs.php

OMCI Procedure Details

Refer to Annex B

Pass/Fail Criteria

Omitted in Abstract Test Plan: Refer to http://www.broadband-forum.org/technical/test_cert_programs.php

Remarks

- None

6.1.25 Deriving P-bits as a function of received VID for a 1:1 or N:1 architecture (single user port)**Test Name**

Deriving P-bits as a function of received VID for a 1:1 or N:1 architecture (single user port).

Test Definition Number

ONU. 6.1.25

Reference Document

BBF TR-156 [3]

ITU-T G.988 [2]

Test Type

Conformance

Test Requirement Type

Mandatory

Unit Under Test

ONU

Requirement Description**BBF TR-156:**

- **R-48** The ONU MUST support deriving P-bit markings in the upstream direction based on an arbitrary combination of: user port, VID, received P-bit markings, and EtherType.

Also, R-6, 7, 50.

Test Objective

Show that ONU can derive P-bit marking as a function of received VID.

Test Configuration

For this test, only a single user port is assumed.

ONU must be set-up with the standard L2 OCM (single user) with three upstream queues and two associated T-CONTs. The intent of the test is to define two flows based on 2 different VID values at the U-interface. Each flow at R/S will have an S-tag with a specified P-bit value.

The U-interface and S/R-interface values for each test are shown below, along with the GEM port and T-CONT configuration.

Upstream Direction																								
Traffic Stream	U Interface														R/S Interface									
	UNI	MAC DA	MAC SA	Outer VLAN Tag				Inner VLAN Tag				Ethertype	IP DA	IP SA	Outer VLAN Tag				Inner VLAN Tag				GEM	T-CONT
	Port #	Value	Value	TPID	Pbits	DEI	VID	TPID	Pbits	CFI or DEI	VID	Value	Value	Value	TPID	Pbits	DEI	VID	TPID	Pbits	CFI or DEI	VID	Port #	Number
A	1	MAC1	MAC2	n/a	n/a	n/a	n/a	0x8100	x	x	CVID1	x	x	x	n/a	n/a	n/a	n/a	0x88A8	SPbits1	X	SVID1	GEM1	TCONT1
B	1	MAC1	MAC2	n/a	n/a	n/a	n/a	0x8100	x	x	CVID2	x	x	x	n/a	n/a	n/a	n/a	0x88A8	SPbits2	X	SVID1	GEM2	TCONT2

Traffic corresponding to each flow will produce a different P-bit marking.

Test Procedure

Omitted in Abstract Test Plan: Refer to http://www.broadband-forum.org/technical/test_cert_programs.php

OMCI Procedure Details

Refer to Annex B

Pass/Fail Criteria

Omitted in Abstract Test Plan: Refer to http://www.broadband-forum.org/technical/test_cert_programs.php

Remarks

- None

6.1.26 Deriving P-bits as a function of received Ethertype for a 1:1 or N:1 architecture (single user port)**Test Name**

Deriving P-bits as a function of received Ethertype for a 1:1 or N:1 architecture (single user port).

Test Definition Number

ONU. 6.1.26

Reference Document

BBF TR-156 [3]

ITU-T G.988 [2]

Test Type

Conformance

Test Requirement Type

Mandatory

Unit Under Test

ONU

Requirement Description**BBF TR-156:**

- **R-48** The ONU MUST support deriving P-bit markings in the upstream direction based on an arbitrary combination of: user port, VID, received P-bit markings, and EtherType.

Also, R-6, 7, 50.

Test Objective

Show that ONU can derive P-bit marking as a function of received Ethertype.

Test Configuration

For this test, only a single user port is assumed.

ONU must be set-up with the standard L2 OCM (single user) with two upstream queues and two associated T-CONTs. The intent of the test is to define two flows based on different Ethertype values at the U-interface. (Ethertype=0x8863 is PPPoE; Ethertype=0x0800 is IPoE) Each flow at R/S will have an S-tag with P-bit value different from the other flow.

The U-interface and S/R-interface values for each test are shown below, along with the GEM port and T-CONT configuration.

Upstream Direction																								
Traffic Stream	U Interface															R/S Interface								
	UNI	MAC DA	MAC SA	Outer VLAN Tag				Inner VLAN Tag			Ethertype	IP DA	IP SA	Outer VLAN Tag				Inner VLAN Tag				GEM	T-CONT	
	Port #	Value	Value	TPID	Pbits	DEI	VID	TPID	Pbits	CFI or DEI	VID	Value	Value	Value	TPID	Pbits	DEI	VID	TPID	Pbits	CFI or DEI	VID	Port #	Number
A	1	MAC1	MAC2	n/a	n/a	n/a	n/a	0x8100	CPbits1	x	CVID1	0x8863	x	x	n/a	n/a	n/a	n/a	0x88A8	SPbits1	x	SVID1	GEM1	TCONT1
B	1	MAC1	MAC2	n/a	n/a	n/a	n/a	0x8100	CPbits1	x	CVID1	0x0800	x	x	n/a	n/a	n/a	n/a	0x88A8	SPbits2	x	SVID1	GEM2	TCONT2

Traffic corresponding to each flow will produce a different P-bit marking.

Test Procedure

Omitted in Abstract Test Plan: Refer to http://www.broadband-forum.org/technical/test_cert_programs.php

OMCI Procedure Details

Refer to Annex B

Pass/Fail Criteria

Omitted in Abstract Test Plan: Refer to http://www.broadband-forum.org/technical/test_cert_programs.php

Remarks

- None

6.1.27 Deriving P-bits as a function of received user port for a 1:1 or N:1 architecture**Test Name**

Deriving P-bits as a function of received user port for a 1:1 or N:1 architecture (multiple user ports).

Test Definition Number

ONU.6.1.27

Reference Document

BBF TR-156 [3]

ITU-T G.988 [2]

Test Type

Conformance

Test Requirement Type

Conditionally Mandatory (if ONT has multiple user ports)

Unit Under Test

ONU

Requirement Description**TR-156:**

- **R-48** The ONU **MUST** support deriving P-bit markings in the upstream direction based on an arbitrary combination of: user port, VID, received P-bit markings, and EtherType.

Also, R-6, 7, 50.

Test Objective

Show that ONU can derive P-bit marking as a function of received user port.

Test Configuration

For this test, multiple user ports are assumed. Therefore multiple bridges must be provisioned in the OMCI model.

ONU must be set-up with the standard L2 OCM (multiple user port) with two upstream queues and two associated T-CONTs. The intent of the test is to define two streams per user ports. Each stream at R/S will have an S-tag with P-bit value based on user port.

The U-interface and S/R interface values for each test are shown below, along with the GEM port and T-CONT configuration.

Upstream Direction																								
Traffic Stream	U Interface														R/S Interface									
	UNI	MAC DA	MAC SA	Outer VLAN Tag				Inner VLAN Tag				Ethertype	IP DA	IP SA	Outer VLAN Tag				Inner VLAN Tag				GEM	T-CONT
	Port #	Value	Value	TPID	Pbits	DEI	VID	TPID	Pbits	CFI or DEI	VID	Value	Value	Value	TPID	Pbits	DEI	VID	TPID	Pbits	CFI or DEI	VID	Port #	Number
A	1	MAC1	MAC2	n/a	n/a	n/a	n/a	0x8100	CPbits1	x	CVID1	x	x	x	n/a	n/a	n/a	n/a	0x88A8	SPbits1	0	SVID1	GEM1	TCONT1
B	2	MAC3	MAC4	n/a	n/a	n/a	n/a	0x8100	CPbits1	x	CVID1	x	x	x	n/a	n/a	n/a	n/a	0x88A8	SPbits2	0	SVID1	GEM2	TCONT2
C	1	MAC1	MAC2	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	x	x	x	n/a	n/a	n/a	n/a	0x88A8	SPbits1	x	SVID1	GEM1	TCONT1
D	2	MAC3	MAC4	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	x	x	x	n/a	n/a	n/a	n/a	0x88A8	SPbits2	x	SVID1	GEM2	TCONT2

Traffic corresponding to each flow will produce a different P-bit marking.

Test Procedure

Omitted in Abstract Test Plan: Refer to http://www.broadband-forum.org/technical/test_cert_programs.php

OMCI Procedure Details

Refer to Appendix B

Pass/Fail Criteria

Omitted in Abstract Test Plan: Refer to http://www.broadband-forum.org/technical/test_cert_programs.php

Remarks

- None

6.2 Frame Mapping and QoS

6.2.1 Single U-interface with multiple downstream GEM ports

Test Name

Single U-interface with multiple downstream GEM ports

Test Definition ID

ONU.6.2.1

Reference Document

BBF TR-156 [3]

ITU-T G.988 [2]

Test Type

Conformance

Test Requirement Type

Mandatory

Unit Under Test

ONU

Requirement Description**BBF TR-156:**

- **R-19** The ONU **MUST** support mapping traffic from one or more GEM Ports to a U-interface in the downstream direction.
- **R-31** The ONU **MUST** support mapping traffic from one or more GEM Ports to a U interface in the downstream direction.
- **R-41** The ONU **MUST** support mapping traffic from one or more GEM Ports to a **U** interface in the downstream direction.

Test Objective

The purpose of this test is to verify the ONU’s OMCI implementation, support the minimum functionality to configure a single U-interface on the ONU and associate that U-interface with downstream flows from multiple GEM ports. This test verifies both the OMCI configuration responses and support of active user traffic. In the downstream direction, GEM ports, identified by Port-IDs, are used to differentiate traffic classes. This test verifies the ONU’s ability to receive downstream traffic through multiple GEM ports and forward that traffic out a single U-interface. This test does not verify the performance of the traffic classifier or scheduler.

Test Configuration

1. ONU is powered and connected to ODN.
2. ONU has been activated by the OLT Emulator, has been ranged, and a GEM port for OMCI has been created as a result of ONU-ID assignment.
3. The OLT Emulator should be configured to transmit two streams of Ethernet frames downstream, with frames transmitted in each stream and the following parameters applied to each stream:
 - a. Stream 1:
 - MAC destination address: 10:22:33:44:55:aa
 - MAC source address: 10:22:33:44:55:66
 - Frames transmitted on GEM Port 1
 - b. Stream 2:
 - MAC destination address: 10:22:33:44:55:bb
 - MAC source address: 10:22:33:44:55:cc
 - Frames transmitted on GEM Port 2

Downstream Direction																								
Traffic Stream	S/R Interface														U Interface									
	MAC DA	MAC SA	Outer VLAN Tag				Inner VLAN Tag				Ethertype	IP DA	IP SA	GEM	Outer VLAN Tag				Inner VLAN Tag				UNI	
	Value	Value	TPID	Pbits	DEI	VID	TPID	Pbits	CFI or DEI	VID	Value	Value	Value	Port #	TPID	Pbits	DEI	VID	TPID	Pbits	CFI or DEI	VID	Port #	
A	MAC1	MAC2	n/a	n/a	n/a	n/a	0x8100	SPbits1	0	SVID1	x	x	x	GEM1	n/a	n/a	n/a	n/a	0x8100	SPbits1	0	SVID1	1	
B	MAC3	MAC4	n/a	n/a	n/a	n/a	0x8100	SPbits2	0	SVID1	x	x	x	GEM2	n/a	n/a	n/a	n/a	0x8100	SPbits2	0	SVID1	1	

Test Procedure

Omitted in Abstract Test Plan: Refer to http://www.broadband-forum.org/technical/test_cert_programs.php

OMCI Procedure Details

Refer to Annex B

Pass/Fail Criteria

Omitted in Abstract Test Plan: Refer to http://www.broadband-forum.org/technical/test_cert_programs.php

Remarks

- No MAC filtering should be enabled on the ONU during these tests, or it should be configured to allow the test user traffic to pass through the ONU.

6.2.2 User Isolation on ONU Devices with Multiple U-interfaces

Test Name

User Isolation on ONU Devices with Multiple U-interfaces

Test Definition ID

ONU.6.2.2

Reference Document

BBF TR-156 [3]

BBF TR-101 [6]

ITU-T G.988 [2]

Test Type

Conformance

Test Requirement Type

Conditionally Mandatory (if ONT has multiple user ports)

Unit Under Test

ONU

Requirement Description

BBF TR-101:

- **R-40** The Access Node **MUST** be able to prevent forwarding traffic between user ports (user isolation). This behavior **MUST** be configurable per S-VID.

BBF TR-156:

- **R-3** The OLT **MUST** support user isolation as defined in TR-101¹

¹User isolation at the ONU is an inherent feature of the TR-156 [3] architecture.

Test Objective

The purpose of this test is to verify an ONU with multiple U-interfaces (one subscriber per interface), typically used for the MDU and MTU deployment scenarios depicted in TR-156, does not forward traffic between the U-interfaces when the GPON has been configured to support user isolation.

Test Configuration

1. ONU is powered and connected to ODN
2. ONU has been activated by the OLT Emulator, has been ranged, and a GEM port for OMCI has been created as a result of ONU-ID assignment.
3. The OLT Emulator has instructed the ONU to reset its MIB to factory default values.
4. The Ethernet Traffic Generator should be configured to untagged Ethernet frames upstream, towards U-interface A (shown above) with the following parameters:

		Upstream Direction																						
Traffic Stream	U Interface												R/S Interface											
	UNI	MAC DA	MAC SA	Outer VLAN Tag				Inner VLAN Tag				Ethertype	IP DA	IP SA	Outer VLAN Tag				Inner VLAN Tag				GEM	T-CONT
	Port #	Value	Value	TPID	Pbits	DEI	VID	TPID	Pbits	CFI or DEI	VID	Value	Value	Value	TPID	Pbits	DEI	VID	TPID	Pbits	CFI or DEI	VID	Port #	Number
A	1	MAC1	MAC2	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0x0800	x	x	n/a	n/a	n/a	n/a	0x88A8	SPbits1	x	SVID1	GEM1	TCONT1
B	2	MAC2	MAC1	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0x0800	x	x	n/a	n/a	n/a	n/a	0x88A8	SPbits2	x	SVID1	GEM2	TCONT2

5. The Ethernet Traffic Generator should be configured to untagged Ethernet frames upstream, towards U-interface B (shown above)
6. Only 1 user traffic class should be configured on the ONU (via defined OMCI messages below), requiring 1 GEM port (Alloc-ID, T-CONT, Port-ID).

Test Procedure

Omitted in Abstract Test Plan: Refer to http://www.broadband-forum.org/technical/test_cert_programs.php

OMCI Procedure Details

Refer to Annex B

Pass/Fail Criteria

Omitted in Abstract Test Plan: Refer to http://www.broadband-forum.org/technical/test_cert_programs.php

Remarks

- No MAC filtering should be enabled on the ONU during these tests, or it should be configured to allow the test user traffic to pass through the ONU.

6.2.3 Mapping Traffic from GEM Ports to U Interface in the Downstream Direction in a VBES Architecture

Test Name

Mapping Traffic from GEM Ports to U Interface in the Downstream Direction in a VBES Architecture

Test Definition Number

ONU.6.2.3

Reference Document

BBF TR-156 [3]

ITU-T G.988 [2]

Test Type

Conformance

Test Requirement Type

Mandatory

Unit Under Test

ONU

Requirement Description**BBF TR-156:**

- **R-41** The ONU **MUST** support mapping traffic from one or more GEM Ports to a U-interface in the downstream direction

Test Objective

- Verify that the ONU supports mapping traffic from one or more GEM Ports to a U-interface in the downstream direction

Test Configuration

1. OLT Emulator and ONU under test are powered and connected to ODN
2. ONU under test has been activated by the OLT Emulator, has been ranged, and a GEM port for OMCI has been created as a result of ONU-ID assignment.

3. The OLT Emulator is configured to transmit double-tagged Ethernet frames downstream with the following parameters (Stream 1)
4. The OLT Emulator is configured to transmit double-tagged Ethernet frames downstream with the following parameters (Stream 2)

Downstream Direction																								
Traffic Stream	S/R Interface														U Interface									
	MAC DA	MAC SA	Outer VLAN Tag				Inner VLAN Tag				Ethertype	IP DA	IP SA	GEM	Outer VLAN Tag				Inner VLAN Tag				UNI	
	Value	Value	TPID	Pbits	DEI	VID	TPID	Pbits	CFI or DEI	VID	Value	Value	Value	Port #	TPID	Pbits	DEI	VID	TPID	Pbits	CFI or DEI	VID	Port #	
A	MAC1	MAC2	0x88A8	SPbits1	0	SVID1	0x8100	x	x	CVID1	x	x	x	GEM1	n/a	n/a	n/a	n/a	0x8100	x	x	CVID1	1	
B	MAC1	MAC2	0x88A8	SPbits1	0	SVID2	0x8100	x	x	CVID2	x	x	x	GEM2	n/a	n/a	n/a	n/a	0x8100	x	x	CVID2	1	

Test Procedure

Omitted in Abstract Test Plan: Refer to http://www.broadband-forum.org/technical/test_cert_programs.php

OMCI Procedure Details

Refer to Annex B

Pass/Fail Criteria

Omitted in Abstract Test Plan: Refer to http://www.broadband-forum.org/technical/test_cert_programs.php

Remarks

- None

6.2.4 Mapping traffic into GEM Ports based on P-bit values in the upstream direction (single user port)

Test Name

Mapping traffic into GEM Ports based on P-bit values in the upstream direction (single user port)

Test Definition Number

ONU.6.2.4

Reference Document

BBF TR-156 [3]

ITU-T G.988 [2]

Test Type

Conformance

Test Requirement Type

Mandatory

Unit Under Test

ONU

Requirement Description**BBF TR-156:**

- **R-51** The ONU MUST support mapping traffic into GEM Ports based on arbitrary combination of user port, VID and P-bit values in the upstream direction.
- **R-52** The ONU MUST NOT prevent multiple P-bit values being used in the same VLAN.
- **R-53** The ONU MUST NOT prevent multiple VLANs from using the same P-bits.

Also, R-6, 7.

Test Objective

Show that ONU can map upstream traffic to GEM ports from P-bit values. Also show that there are no restrictions on multiple P-bit values in the same VLAN, nor on multiple VLANs using the same P-bit value.

Test Configuration

For this test, only a single user port is assumed.

ONU must be set-up with the standard L2 OCM (single user) with two upstream queues and two associated T-CONTs. The intent of the test is to define four flows based on different combinations of received VLANs and P-bits at the U-interface. Each flow will map to the specified GEM port and T-CONT; tags will not be modified. The flows and their corresponding tags, GEM ports and T-CONTs are given in the table below.

Upstream Direction																								
Traffic Stream	U Interface														R/S Interface									
	UNI	MAC DA	MAC SA	Outer VLAN Tag				Inner VLAN Tag			Ethertype	IP DA	IP SA	Outer VLAN Tag				Inner VLAN Tag				GEM	T-CONT	
	Port #	Value	Value	TPID	Pbits	DEI	VID	TPID	Pbits	CFI or DEI	VID	Value	Value	Value	TPID	Pbits	DEI	VID	TPID	Pbits	CFI or DEI	VID	Port #	Number
A	1	MAC1	MAC2	n/a	n/a	n/a	n/a	0x8100	CPbits1	x	CVID1	x	x	x	n/a	n/a	n/a	n/a	0x8100	CPbits1	x	CVID1	GEM1	TCONT1
B	1	MAC1	MAC2	n/a	n/a	n/a	n/a	0x8100	CPbits2	x	CVID1	x	x	x	n/a	n/a	n/a	n/a	0x8100	CPbits2	x	CVID1	GEM2	TCONT2
C	1	MAC1	MAC2	n/a	n/a	n/a	n/a	0x8100	CPbits1	x	CVID2	x	x	x	n/a	n/a	n/a	n/a	0x8100	CPbits1	x	CVID2	GEM1	TCONT1
D	1	MAC1	MAC2	n/a	n/a	n/a	n/a	0x8100	CPbits2	x	CVID2	x	x	x	n/a	n/a	n/a	n/a	0x8100	CPbits2	x	CVID2	GEM2	TCONT2

Test Procedure

Omitted in Abstract Test Plan: Refer to http://www.broadband-forum.org/technical/test_cert_programs.php

OMCI Procedure Details

Refer to Annex B

Pass/Fail Criteria

Omitted in Abstract Test Plan: Refer to http://www.broadband-forum.org/technical/test_cert_programs.php

Remarks

- None

6.2.5 Mapping traffic into GEM Ports based on VID values in the upstream direction (single user port)

Test Name

Mapping traffic into GEM Ports based on VID values in the upstream direction (single user port)

Test Definition Number

ONU.6.2.5

Reference Document

BBF TR-156 [3]

ITU-T G.988 [2]

Test Type

Conformance

Test Requirement Type

Mandatory

Unit Under Test

ONU

Requirement Description**BBF TR-156:**

- **R-51** The ONU MUST support mapping traffic into GEM Ports based on arbitrary combination of user port, VID and P-bit values in the upstream direction.
- **R-52** The ONU MUST NOT prevent multiple P-bit values being used in the same VLAN.
- **R-53** The ONU MUST NOT prevent multiple VLANs from using the same P-bits.

Also, R-6, 7.

Test Objective

Show that ONU can map upstream traffic to GEM ports and T-CONTs from VID values. Also show that there are no restrictions on multiple P-bit values in the same VLAN, nor on multiple VLANs using the same P-bit value.

Test Configuration

For this test, only a single user port is assumed.

ONU must be set-up with the standard L2 OCM (single user) with two queues and two associated T-CONTs. The intent of the test is to define four flows based on different combinations of received VIDs and P-bits at the U-interface. Each flow will map to the specified GEM port and T-CONT; tags will not be modified. The flows and their corresponding tags, GEM ports and T-CONTs are given in the table below.

Upstream Direction																								
Traffic Stream	U Interface													R/S Interface										
	UNI	MAC DA	MAC SA	Outer VLAN Tag				Inner VLAN Tag			Ethertype	IP DA	IP SA	Outer VLAN Tag				Inner VLAN Tag			GEM	T-CONT		
	Port #	Value	Value	TPID	Pbits	DEI	VID	TPID	Pbits	CFI or DEI	VID	Value	Value	Value	TPID	Pbits	DEI	VID	TPID	Pbits	CFI or DEI	VID	Port #	Number
A	1	MAC1	MAC2	n/a	n/a	n/a	n/a	0x8100	CPbits1	x	CVID1	x	x	x	n/a	n/a	n/a	n/a	0x8100	CPbits1	x	CVID1	GEM1	TCONT1
B	1	MAC1	MAC2	n/a	n/a	n/a	n/a	0x8100	CPbits2	x	CVID1	x	x	x	n/a	n/a	n/a	n/a	0x8100	CPbits2	x	CVID1	GEM1	TCONT1
C	1	MAC1	MAC2	n/a	n/a	n/a	n/a	0x8100	CPbits1	x	CVID2	x	x	x	n/a	n/a	n/a	n/a	0x8100	CPbits1	x	CVID2	GEM2	TCONT2
D	1	MAC1	MAC2	n/a	n/a	n/a	n/a	0x8100	CPbits2	x	CVID2	x	x	x	n/a	n/a	n/a	n/a	0x8100	CPbits2	x	CVID2	GEM2	TCONT2

Test Procedure

Omitted in Abstract Test Plan: Refer to http://www.broadband-forum.org/technical/test_cert_programs.php

OMCI Procedure Details

Refer to Annex B

Pass/Fail Criteria

Omitted in Abstract Test Plan: Refer to http://www.broadband-forum.org/technical/test_cert_programs.php

Remarks

- None

6.2.6 Mapping traffic into GEM Ports based on VID & P-bit values in the upstream direction (single user port)**Test Name**

Mapping traffic into GEM Ports based on VID & P-bit values in the upstream direction (single user port)

Test Definition Number

ONU.6.2.6

Reference Document

BBF TR-156 [3]

ITU-T G.988 [2]

Test Type

Conformance

Test Requirement Type

Mandatory

Unit Under Test

ONU

Requirement Description**BBF TR-156:**

- **R-51** The ONU MUST support mapping traffic into GEM Ports based on arbitrary combination of user port, VID and P-bit values in the upstream direction.
- **R-52** The ONU MUST NOT prevent multiple P-bit values being used in the same VLAN.
- **R-53** The ONU MUST NOT prevent multiple VLANs from using the same P-bits.

Also, R-6, 7, 46, 57, 67.

Test Objective

Show that ONU can map upstream traffic to GEM ports and T-CONTs from VID & P-bit values. Also show that there are no restrictions on multiple P-bit values in the same VLAN, nor on multiple VLANs using the same P-bit value.

Test Configuration

For this test, only a single user port is assumed.

ONU must be set-up with the standard L2 OCM (single user) with four queues and four associated T-CONTs. The intent of the test is to define four flows based on different combinations of received VIDs and P-bits at the U-interface. Each flow will map to the specified GEM port and T-CONT; tags will not be modified. The flows and their corresponding tags, GEM ports and T-CONTs are given in the table below.

Upstream Direction																								
Traffic Stream	U Interface													R/S Interface										
	UNI	MAC DA	MAC SA	Outer VLAN Tag				Inner VLAN Tag			Ethertype	IP DA	IP SA	Outer VLAN Tag				Inner VLAN Tag				GEM	T-CONT	
	Port #	Value	Value	TPID	Pbits	DEI	VID	TPID	Pbits	CFI or DEI	VID	Value	Value	Value	TPID	Pbits	DEI	VID	TPID	Pbits	CFI or DEI	VID	Port #	Number
A	1	MAC1	MAC2	n/a	n/a	n/a	n/a	0x8100	CPbits1	x	CVID1	x	x	x	n/a	n/a	n/a	n/a	0x8100	CPbits1	x	CVID1	GEM1	TCONT1
B	1	MAC1	MAC2	n/a	n/a	n/a	n/a	0x8100	CPbits2	x	CVID1	x	x	x	n/a	n/a	n/a	n/a	0x8100	CPbits2	x	CVID1	GEM2	TCONT2
C	1	MAC1	MAC2	n/a	n/a	n/a	n/a	0x8100	CPbits1	x	CVID2	x	x	x	n/a	n/a	n/a	n/a	0x8100	CPbits1	x	CVID2	GEM3	TCONT3
D	1	MAC1	MAC2	n/a	n/a	n/a	n/a	0x8100	CPbits2	x	CVID2	x	x	x	n/a	n/a	n/a	n/a	0x8100	CPbits2	x	CVID2	GEM4	TCONT4

Test Procedure

Omitted in Abstract Test Plan: Refer to http://www.broadband-forum.org/technical/test_cert_programs.php

OMCI Procedure Details

Refer to Annex B

Pass/Fail Criteria

Omitted in Abstract Test Plan: Refer to http://www.broadband-forum.org/technical/test_cert_programs.php

Remarks

- None

6.2.7 Mapping traffic into GEM Ports based on P-bit values in the upstream direction (multiple user port)**Test Name**

Mapping traffic into GEM Ports based on P-bit values in the upstream direction (multiple user port)

Test Definition Number

ONU.6.2.7

Reference Document

BBF TR-156 [3]

ITU-T G.988 [2]

Test Type

Conformance

Test Requirement Type

Conditionally Mandatory (if ONT has multiple user ports)

Unit Under Test

ONU

Requirement Description**BBF TR-156:**

- **R-51** The ONU MUST support mapping traffic into GEM Ports based on arbitrary combination of user port, VID and P-bit values in the upstream direction.
- **R-52** The ONU MUST NOT prevent multiple P-bit values being used in the same VLAN.
- **R-53** The ONU MUST NOT prevent multiple VLANs from using the same P-bits.

Also, R-6, 7.

Test Objective

Show that ONU can map upstream traffic to GEM ports and T-CONTs from P-bit values. Also show that there are no restrictions on multiple P-bit values in the same VLAN, nor on multiple VLANs using the same P-bit value.

Test Configuration

ONU must be set-up with the standard L2 OCM (multiple user) with two queues and two associated T-CONTs. The intent of the test is to define eight flows based on different combinations of received VIDs and P-bits and user port. Each flow will map to the specified GEM port and T-CONT; tags will not be modified. The flows and their corresponding tags, GEM ports and T-CONTs are given in the table below.

Traffic Stream		Upstream Direction																						
		U Interface												R/S Interface										
		UNI	MAC DA	MAC SA	Outer VLAN Tag				Inner VLAN Tag				Ethertype	IP DA	IP SA	Outer VLAN Tag				Inner VLAN Tag				GEM
Port #	Value	Value	TPID	Pbits	DEI	VID	TPID	Pbits	CFI or DEI	VID	Value	Value	Value	TPID	Pbits	DEI	VID	TPID	Pbits	CFI or DEI	VID	Port #	Number	
A	1	MAC1	MAC2	n/a	n/a	n/a	n/a	0x8100	CPbits1	x	CVID1	x	x	x	n/a	n/a	n/a	n/a	0x8100	CPbits1	x	CVID1	GEM1	TCONT1
B	1	MAC1	MAC2	n/a	n/a	n/a	n/a	0x8100	CPbits2	x	CVID1	x	x	x	n/a	n/a	n/a	n/a	0x8100	CPbits2	x	CVID1	GEM2	TCONT2
C	1	MAC1	MAC2	n/a	n/a	n/a	n/a	0x8100	CPbits1	x	CVID2	x	x	x	n/a	n/a	n/a	n/a	0x8100	CPbits1	x	CVID2	GEM1	TCONT1
D	1	MAC1	MAC2	n/a	n/a	n/a	n/a	0x8100	CPbits2	x	CVID2	x	x	x	n/a	n/a	n/a	n/a	0x8100	CPbits2	x	CVID2	GEM2	TCONT2
E	2	MAC3	MAC4	n/a	n/a	n/a	n/a	0x8100	CPbits1	x	CVID1	x	x	x	n/a	n/a	n/a	n/a	0x8100	CPbits1	x	CVID1	GEM3	TCONT1
F	2	MAC3	MAC4	n/a	n/a	n/a	n/a	0x8100	CPbits2	x	CVID1	x	x	x	n/a	n/a	n/a	n/a	0x8100	CPbits2	x	CVID1	GEM4	TCONT2
G	2	MAC3	MAC4	n/a	n/a	n/a	n/a	0x8100	CPbits1	x	CVID2	x	x	x	n/a	n/a	n/a	n/a	0x8100	CPbits1	x	CVID2	GEM3	TCONT1
H	2	MAC3	MAC4	n/a	n/a	n/a	n/a	0x8100	CPbits2	x	CVID2	x	x	x	n/a	n/a	n/a	n/a	0x8100	CPbits2	x	CVID2	GEM4	TCONT2

Test Procedure

Omitted in Abstract Test Plan: Refer to http://www.broadband-forum.org/technical/test_cert_programs.php

OMCI Procedure Details

Refer to Annex B

Pass/Fail Criteria

Omitted in Abstract Test Plan: Refer to http://www.broadband-forum.org/technical/test_cert_programs.php

Remarks

- None

6.2.8 Mapping traffic into GEM Ports based on VID values in the upstream direction (multiple user port)**Test Name**

Mapping traffic into GEM Ports based on VID values in the upstream direction (multiple user port)

Test Definition Number

ONU.6.2.8

Reference Document

BBF TR-156 [3]

ITU-T G.988 [2]

Test Type

Conformance

Test Requirement Type

Conditionally Mandatory (if ONT has multiple user ports)

Unit Under Test

ONU

Requirement Description**BBF TR-156:**

- **R-51** The ONU MUST support mapping traffic into GEM Ports based on arbitrary combination of user port, VID and P-bit values in the upstream direction.
- **R-52** The ONU MUST NOT prevent multiple P-bit values being used in the same VLAN.
- **R-53** The ONU MUST NOT prevent multiple VLANs from using the same P-bits.

Also, R-6, 7.

Test Objective

Show that ONU can map upstream traffic to GEM ports and T-CONTs from VID values. Also show that there are no restrictions on multiple P-bit values in the same VLAN, nor on multiple VLANs using the same P-bit value.

Test Configuration

ONU must be set-up with the standard L2 OCM (multiple user) with two queues and two associated T-CONTs. The intent of the test is to define eight flows based on different combinations of received VIDs and P-bits and user port. Each flow will map to the specified GEM port and T-CONT; tags will not be modified. The flows and their corresponding tags, GEM ports and T-CONTs are given in the table below.

Upstream Direction																								
Traffic Stream	U Interface														R/S Interface									
	UNI	MAC DA	MAC SA	Outer VLAN Tag				Inner VLAN Tag			Ethertype	IP DA	IP SA	Outer VLAN Tag				Inner VLAN Tag				GEM	T-CONT	
	Port #	Value	Value	TPID	Pbits	DEI	VID	TPID	Pbits	CFI or DEI	VID	Value	Value	Value	TPID	Pbits	DEI	VID	TPID	Pbits	CFI or DEI	VID	Port #	Number
A	1	MAC1	MAC2	n/a	n/a	n/a	n/a	0x8100	CPbits1	x	CVID1	x	x	x	n/a	n/a	n/a	n/a	0x8100	CPbits1	x	CVID1	GEM1	TCONT1
B	1	MAC1	MAC2	n/a	n/a	n/a	n/a	0x8100	CPbits2	x	CVID1	x	x	x	n/a	n/a	n/a	n/a	0x8100	CPbits2	x	CVID1	GEM1	TCONT1
C	1	MAC1	MAC2	n/a	n/a	n/a	n/a	0x8100	CPbits1	x	CVID2	x	x	x	n/a	n/a	n/a	n/a	0x8100	CPbits1	x	CVID2	GEM2	TCONT2
D	1	MAC1	MAC2	n/a	n/a	n/a	n/a	0x8100	CPbits2	x	CVID2	x	x	x	n/a	n/a	n/a	n/a	0x8100	CPbits2	x	CVID2	GEM2	TCONT2
E	2	MAC3	MAC4	n/a	n/a	n/a	n/a	0x8100	CPbits1	x	CVID1	x	x	x	n/a	n/a	n/a	n/a	0x8100	CPbits1	x	CVID1	GEM3	TCONT1
F	2	MAC3	MAC4	n/a	n/a	n/a	n/a	0x8100	CPbits2	x	CVID1	x	x	x	n/a	n/a	n/a	n/a	0x8100	CPbits2	x	CVID1	GEM3	TCONT1
G	2	MAC3	MAC4	n/a	n/a	n/a	n/a	0x8100	CPbits1	x	CVID2	x	x	x	n/a	n/a	n/a	n/a	0x8100	CPbits1	x	CVID2	GEM4	TCONT2
H	2	MAC3	MAC4	n/a	n/a	n/a	n/a	0x8100	CPbits2	x	CVID2	x	x	x	n/a	n/a	n/a	n/a	0x8100	CPbits2	x	CVID2	GEM4	TCONT2

Test Procedure

Omitted in Abstract Test Plan: Refer to http://www.broadband-forum.org/technical/test_cert_programs.php

OMCI Procedure Details

Refer to Annex B

Pass/Fail Criteria

Omitted in Abstract Test Plan: Refer to http://www.broadband-forum.org/technical/test_cert_programs.php

Remarks

- None

6.2.9 Mapping traffic into GEM Ports based on VID & P-bit values in the upstream direction (multiple user port)**Test Name**

Mapping traffic into GEM Ports based on VID & P-bit values in the upstream direction (multiple user port)

Test Definition Number

ONU.6.2.9

Reference Document

BBF TR-156 [3]

ITU-T G.988 [2]

Test Type

Conformance

Test Requirement Type

Conditionally Mandatory (if ONT has multiple user ports)

Unit Under Test

ONU

Requirement Description**BBF TR-156**

- **R-51** The ONU MUST support mapping traffic into GEM Ports based on arbitrary combination of user port, VID and P-bit values in the upstream direction.
- **R-52** The ONU MUST NOT prevent multiple P-bit values being used in the same VLAN.
- **R-53** The ONU MUST NOT prevent multiple VLANs from using the same P-bits.

Also, R-6, 7, 46, 57, 67.

Test Objective

Show that ONU can map upstream traffic to GEM ports and T-CONTs from VID & P-bit values. Also show that there are no restrictions on multiple P-bit values in the same VLAN, nor on multiple VLANs using the same P-bit value.

Test Configuration

ONU must be set-up with the standard L2 OCM (multiple user) with four queues and four associated T-CONTs. The intent of the test is to define eight flows based on different combinations of received VIDs and P-bits and user ports. Each flow will map to the specified GEM port and T-CONT; tags will not be modified. The flows and their corresponding tags, GEM ports and T-CONTs are given in the table below.

Upstream Direction																								
Traffic Stream	U Interface													R/S Interface										
	UNI	MAC DA	MAC SA	Outer VLAN Tag				Inner VLAN Tag			Ethertype	IP DA	IP SA	Outer VLAN Tag				Inner VLAN Tag				GEM	T-CONT	
	Port #	Value	Value	TPID	Pbits	DEI	VID	TPID	Pbits	CFI or DEI	VID	Value	Value	Value	TPID	Pbits	DEI	VID	TPID	Pbits	CFI or DEI	VID	Port #	Number
A	1	MAC1	MAC2	n/a	n/a	n/a	n/a	0x8100	CPbits1	x	CVID1	x	x	x	n/a	n/a	n/a	n/a	0x8100	CPbits1	x	CVID1	GEM1	TCONT1
B	1	MAC1	MAC2	n/a	n/a	n/a	n/a	0x8100	CPbits2	x	CVID1	x	x	x	n/a	n/a	n/a	n/a	0x8100	CPbits2	x	CVID1	GEM2	TCONT2
C	1	MAC1	MAC2	n/a	n/a	n/a	n/a	0x8100	CPbits1	x	CVID2	x	x	x	n/a	n/a	n/a	n/a	0x8100	CPbits1	x	CVID2	GEM3	TCONT3
D	1	MAC1	MAC2	n/a	n/a	n/a	n/a	0x8100	CPbits2	x	CVID2	x	x	x	n/a	n/a	n/a	n/a	0x8100	CPbits2	x	CVID2	GEM4	TCONT4
E	2	MAC3	MAC4	n/a	n/a	n/a	n/a	0x8100	CPbits1	x	CVID1	x	x	x	n/a	n/a	n/a	n/a	0x8100	CPbits1	x	CVID1	GEM5	TCONT1
F	2	MAC3	MAC4	n/a	n/a	n/a	n/a	0x8100	CPbits2	x	CVID1	x	x	x	n/a	n/a	n/a	n/a	0x8100	CPbits2	x	CVID1	GEM6	TCONT2
G	2	MAC3	MAC4	n/a	n/a	n/a	n/a	0x8100	CPbits1	x	CVID2	x	x	x	n/a	n/a	n/a	n/a	0x8100	CPbits1	x	CVID2	GEM7	TCONT3
H	2	MAC3	MAC4	n/a	n/a	n/a	n/a	0x8100	CPbits2	x	CVID2	x	x	x	n/a	n/a	n/a	n/a	0x8100	CPbits2	x	CVID2	GEM8	TCONT4

Test Procedure

Omitted in Abstract Test Plan: Refer to http://www.broadband-forum.org/technical/test_cert_programs.php

OMCI Procedure Details

Refer to Annex B

Pass/Fail Criteria

Omitted in Abstract Test Plan: Refer to http://www.broadband-forum.org/technical/test_cert_programs.php

Remarks

- None

6.2.10 Mapping multiple P-bit values to the same GEM port (single user port)

Test Name

Mapping multiple P-bit values to the same GEM port (single user port).

Test Definition Number

ONU.6.2.10

Reference Document

BBF TR-156 [3]

ITU-T G.988 [2]

Test Type

Conformance

Test Requirement Type

Mandatory

Unit Under Test

ONU

Requirement Description**BBF TR-156:**

- **R-51** The ONU MUST support mapping traffic into GEM ports based on arbitrary combination of user port, VID and P-bit values in the upstream direction.

Also, R-6, R-7

Test Objective

Demonstrate that ONU can map multiple P-bit values to the same GEM port.

Test Configuration

1. OLT Emulator and ONU under test are powered and connected to ODN

2. ONU under test has been activated by the OLT emulator, has been ranged, and a GEM port for OMCI has been created as a result of ONU-ID assignment.
3. A single user port is assumed
4. ONU must be set-up with the standard L2 OMCI Common Model (single user) with two upstream queues and TCONTs.
5. The intent of the test is to demonstrate that multiple P-bit values at the U-interface can be mapped to the same GEM port. Four upstream flows are mapped into two GEM ports and T-CONTs based on four different P-bit values at the U-interface. Tags will not be modified.
6. The flows and their corresponding tags, GEM ports and T-CONTs are given in the table below.

Upstream Direction																								
Traffic Stream	U Interface														R/S Interface									
	UNI	MAC DA	MAC SA	Outer VLAN Tag				Inner VLAN Tag				Ethertype	IP DA	IP SA	Outer VLAN Tag				Inner VLAN Tag				GEM	T-CONT
	Port #	Value	Value	TPID	Pbits	DEI	VID	TPID	Pbits	CFI or DEI	VID	Value	Value	Value	TPID	Pbits	DEI	VID	TPID	Pbits	CFI or DEI	VID	Port #	Number
A	1	MAC1	MAC2	n/a	n/a	n/a	n/a	0x8100	CPbits1	x	CVID1	x	x	x	n/a	n/a	n/a	n/a	0x8100	CPbits1	x	CVID1	GEM1	TCONT1
B	1	MAC1	MAC2	n/a	n/a	n/a	n/a	0x8100	CPbits2	x	CVID1	x	x	x	n/a	n/a	n/a	n/a	0x8100	CPbits2	x	CVID1	GEM1	TCONT1
C	1	MAC1	MAC2	n/a	n/a	n/a	n/a	0x8100	CPbits3	x	CVID1	x	x	x	n/a	n/a	n/a	n/a	0x8100	CPbits3	x	CVID1	GEM2	TCONT2
D	1	MAC1	MAC2	n/a	n/a	n/a	n/a	0x8100	CPbits4	x	CVID1	x	x	x	n/a	n/a	n/a	n/a	0x8100	CPbits4	x	CVID1	GEM2	TCONT2

7. All untagged upstream traffic from the U-interface should be silently discarded

Test Procedure

Omitted in Abstract Test Plan: Refer to http://www.broadband-forum.org/technical/test_cert_programs.php

OMCI Procedure Details

Refer to Annex B

Pass/Fail Criteria

Omitted in Abstract Test Plan: Refer to http://www.broadband-forum.org/technical/test_cert_programs.php

Remarks

- None

6.2.11 Test Case Reserved For Future Use

6.2.12 Strict priority downstream scheduling among 4 queues on ONU

Test Name

Strict priority downstream scheduling among 4 queues on ONU

Test Definition Number

ONU-6.2.12

Reference Document

BBF TR-156 [3]

ITU-T G.988 [2]

Test Type

Conformance

Test Requirement Type

Mandatory

Unit Under Test

ONU

Requirement Description**BBF TR-156:**

- **R-56** In the downstream direction, the ONU MUST support at least 4 queues per user port, one per traffic class
- **R-63** The OLT and ONU MUST support scheduling of downstream queues according to strict priority among at least 4 TCs.
- **R-64** The OLT and ONU MUST support assigning an individual TC to a downstream queue.

Also

- **R-46:** The OLT and ONU MUST support at least 4 traffic classes for Ethernet frames.

Test Objective

To verify that the ONU implementation supports four queues on the downstream direction, that each queue can be assigned to one specific traffic class and that it supports strict priority scheduling among those four traffic classes.

Test Configuration

1. OLT emulator and ONU under test are connected to the ODN and powered on.
2. ONU activation and OMCC establishment processes have been successfully completed.
3. The OLT emulator will be configured to send the sequence of OMCI messages required to provision the ONU under test
 - to support 4 traffic classes, each one associated to a different P-bit value
 - with 4 GEM ports and 4 downstream queues, each pair of GEM port-downstream queue assigned to one traffic classes
 - with strict priority scheduling between the four downstream queues
4. The OLT emulator will be configured to transmit four interleaved flows of 802.1ad tagged Ethernet frames with the parameters in the next table. Also, GEM port mapping is shown. Tags won't be modified on the ONU; expected frame format at the U-interface is also shown in the table.

Downstream Direction																							
Traffic Stream	S/R Interface														U Interface								
	MAC DA	MAC SA	Outer VLAN Tag				Inner VLAN Tag				Ethertype	IP DA	IP SA	GEM	Outer VLAN Tag				Inner VLAN Tag				UNI
	Value	Value	TPID	Pbits	DEI	VID	TPID	Pbits	CFI or DEI	VID	Value	Value	Value	Port #	TPID	Pbits	DEI	VID	TPID	Pbits	CFI or DEI	VID	Port #
A	MAC1	MAC2	n/a	n/a	n/a	n/a	0x8100	CPbits1	x	CVID1	x	x	x	GEM1	n/a	n/a	n/a	n/a	0x8100	CPbits1	x	CVID1	1
B	MAC3	MAC4	n/a	n/a	n/a	n/a	0x8100	CPbits2	x	CVID1	x	x	x	GEM2	n/a	n/a	n/a	n/a	0x8100	CPbits2	x	CVID1	1
C	MAC5	MAC6	n/a	n/a	n/a	n/a	0x8100	CPbits3	x	CVID1	x	x	x	GEM3	n/a	n/a	n/a	n/a	0x8100	CPbits3	x	CVID1	1
D	MAC7	MAC8	n/a	n/a	n/a	n/a	0x8100	CPbits4	x	CVID1	x	x	x	GEM4	n/a	n/a	n/a	n/a	0x8100	CPbits4	x	CVID1	1

Test Procedure

Omitted in Abstract Test Plan: Refer to http://www.broadband-forum.org/technical/test_cert_programs.php

OMCI Procedure Details

Refer to Annex B

Pass/Fail Criteria

Omitted in Abstract Test Plan: Refer to http://www.broadband-forum.org/technical/test_cert_programs.php

Remarks

- This test case is designed to overload the UNI in the downstream resulting in frame discard. As the downstream frame rate increases, the frame loss for the lower priority frames should be observed at the UNI. Therefore, the tester should select a line rate for the UNI that is below the overall throughput capacity of the ONU under test.

6.2.13 Indicating drop precedence using P-bits upstream

Test Name

Indicating drop precedence using P-bits upstream

Test Definition Number

ONU.6.2.13

Reference Document

BBF TR-156 [3]

ITU-T G.988 [2]

Test Type

Conformance

Test Requirement Type

Mandatory

Unit Under Test

ONU

Requirement Description**TR-156:**

- **R-54** The OLT and ONU MUST support drop precedence within at least 2 traffic classes and MUST support configurable mapping to these classes and drop precedence from the 8 possible values of the Ethernet P-bits.

Test Objective

Show that ONU can implement drop precedence using P-bits upstream

Test Configuration

ONU must be set-up with the standard L2 OCM (single user) with two upstream queues and two associated T-CONTs. ONU queues are set up with the following: drop precedence indication = PCP 6P2D; yellow thresholds set to half the queue size; green thresholds

set to the queue size. The intent of the test is to define four flows, two per traffic class. For each traffic class, one of the flows is marked with drop precedence. Each T-CONT should be serviced at a fixed rate, E. Each flow rate is set to R=0.7E.

The U-interface and S/R-interface values for each test are shown below, along with the GEM port and T-CONT configuration.

Upstream Direction																								
Traffic Stream	U Interface													R/S Interface										
	UNI	MAC DA	MAC SA	Outer VLAN Tag				Inner VLAN Tag				Ethertype	P DA	IP SA	Outer VLAN Tag				Inner VLAN Tag				GEM	T-CONT
	Port #	Value	Value	TPID	Pbits	DEI	VID	TPID	Pbits	CFI or DEI	VID	Value	Value	Value	TPID	Pbits	DEI	VID	TPID	Pbits	CFI or DEI	VID	Port #	Number
A*	1	MAC1	MAC2	n/a	n/a	n/a	n/a	0x8100	2	x	SVID1	x	x	x	n/a	n/a	n/a	n/a	0x8100	2	x	SVID1	GEM1	TCONT1
B	1	MAC1	MAC2	n/a	n/a	n/a	n/a	0x8100	3	x	SVID1	x	x	x	n/a	n/a	n/a	n/a	0x8100	3	x	SVID1	GEM1	TCONT1
C*	1	MAC1	MAC2	n/a	n/a	n/a	n/a	0x8100	4	x	SVID1	x	x	x	n/a	n/a	n/a	n/a	0x8100	4	x	SVID1	GEM2	TCONT2
D	1	MAC1	MAC2	n/a	n/a	n/a	n/a	0x8100	5	x	SVID1	x	x	x	n/a	n/a	n/a	n/a	0x8100	5	x	SVID1	GEM2	TCONT2

* Drop Precedence Flow

Test Procedure

Omitted in Abstract Test Plan: Refer to http://www.broadband-forum.org/technical/test_cert_programs.php

OMCI Procedure Details

Refer to Annex B

Pass/Fail Criteria

Omitted in Abstract Test Plan: Refer to http://www.broadband-forum.org/technical/test_cert_programs.php

Remarks

- None

6.2.14 Indicating drop precedence using DEI bit upstream

Test Name

Indicating drop precedence using DEI bit upstream

Test Definition Number

ONU.6.2.14

Reference Document

BBF TR-156 [3]

ITU-T G.988 [2]

Test Type

Conformance

Test Requirement Type

Mandatory

Unit Under Test

ONU

Requirement Description**TR-156:**

- **R-55** The OLT and ONU MUST support drop precedence within all supported traffic classes based on the DEI bit value of the 802.1ad header.

Test Objective

Show that ONU can implement drop precedence using DEI bit upstream

Test Configuration

ONU must be set-up with the standard L2 OCM (single user) with four upstream queues and four associated T-CONTs. ONU queues are set up with the following: drop precedence indication = DEI; yellow thresholds set to half the queue size; green thresholds set to

the queue size. The intent of the test is to define eight flows, two per traffic class. For each traffic class, one of the flows is marked with drop precedence. Each T-CONT should to be serviced at a fixed rate, E. Each flow is set to rate R=0.7E.

The U-interface and S/R-interface values for each test are shown below, along with the GEM port and T-CONT configuration.

Upstream Direction																								
Traffic Stream	U Interface														R/S Interface									
	UNI	MAC DA	MAC SA	Outer VLAN Tag				Inner VLAN Tag				Ethertype	IP DA	IP SA	Outer VLAN Tag				Inner VLAN Tag				GEM	T-CONT
	Port #	Value	Value	TPID	Pbits	DEI	VID	TPID	Pbits	CFI or DEI	VID	Value	Value	Value	TPID	Pbits	DEI	VID	TPID	Pbits	CFI or DEI	VID	Port #	Number
A*	1	MAC1	MAC2	n/a	n/a	n/a	n/a	0x8100	SPbits1	1	SVID1	x	x	x	n/a	n/a	n/a	n/a	0x8100	SPbits1	1	SVID1	GEM1	TCONT1
B	1	MAC1	MAC2	n/a	n/a	n/a	n/a	0x8100	SPbits1	0	SVID1	x	x	x	n/a	n/a	n/a	n/a	0x8100	SPbits1	0	SVID1	GEM1	TCONT1
C*	1	MAC1	MAC2	n/a	n/a	n/a	n/a	0x8100	SPbits2	1	SVID1	x	x	x	n/a	n/a	n/a	n/a	0x8100	SPbits2	1	SVID1	GEM2	TCONT2
D	1	MAC1	MAC2	n/a	n/a	n/a	n/a	0x8100	SPbits2	0	SVID1	x	x	x	n/a	n/a	n/a	n/a	0x8100	SPbits2	0	SVID1	GEM2	TCONT2
E*	1	MAC1	MAC2	n/a	n/a	n/a	n/a	0x8100	SPbits3	1	SVID1	x	x	x	n/a	n/a	n/a	n/a	0x8100	SPbits3	1	SVID1	GEM3	TCONT3
F	1	MAC1	MAC2	n/a	n/a	n/a	n/a	0x8100	SPbits3	0	SVID1	x	x	x	n/a	n/a	n/a	n/a	0x8100	SPbits3	0	SVID1	GEM3	TCONT3
G*	1	MAC1	MAC2	n/a	n/a	n/a	n/a	0x8100	SPbits4	1	SVID1	x	x	x	n/a	n/a	n/a	n/a	0x8100	SPbits4	1	SVID1	GEM4	TCONT4
H	1	MAC1	MAC2	n/a	n/a	n/a	n/a	0x8100	SPbits4	0	SVID1	x	x	x	n/a	n/a	n/a	n/a	0x8100	SPbits4	0	SVID1	GEM4	TCONT4

* Drop Precedence Flow

Test Procedure

Omitted in Abstract Test Plan: Refer to http://www.broadband-forum.org/technical/test_cert_programs.php

OMCI Procedure Details

Refer to Annex B

Pass/Fail Criteria

Omitted in Abstract Test Plan: Refer to http://www.broadband-forum.org/technical/test_cert_programs.php

Remarks

- None

6.2.15 Indicating drop precedence using P-bits downstream

Test Name

Indicating drop precedence using P-bits downstream

Test Definition Number

ONU.6.2.15

Reference Document

BBF TR-156 [3]

ITU-T G.988 [2]

Test Type

Conformance

Test Requirement Type

Mandatory

Unit Under Test

ONU

Requirement Description**TR-156:**

- **R-54** The OLT and ONU MUST support drop precedence within at least 2 traffic classes and MUST support configurable mapping to these classes and drop precedence from the 8 possible values of the Ethernet P-bits.

Test Objective

Show that ONU can implement drop precedence using P-bits downstream

Test Configuration

ONU must be set-up with the standard L2 OCM (single user) with two downstream queues. ONU queues are set up with the following: drop precedence indication = PCP 6P2D; yellow thresholds set to half the queue size; green thresholds set to the queue

size. The intent of the test is to define four flows, two per traffic class. For each traffic class, one of the flows is marked with drop precedence. For a user port egress rate of E, each flow rate is set to $R=0.7E$.

The U-interface and S/R-interface values for each test are shown below, along with the GEM port configuration.

Downstream Direction																							
Traffic Stream	S/R Interface														U Interface								
	MAC	DAMAC	SA	Outer VLAN Tag			Inner VLAN Tag				Ethertype	IP DA	IP SA	GEM	Outer VLAN Tag				Inner VLAN Tag				UNI
	Value	Value		TPID	Pbits	DEI	VID	TPID	Pbits	CFI or DEI	VID	Value	Value	Value	Port #	TPID	Pbits	DEI	VID	TPID	Pbits	CFI or DEI	VID
A*	MAC1	MAC2	n/a	n/a	n/a	n/a	0x8100	2	x	SVID1	x	x	x	GEM1	n/a	n/a	n/a	n/a	0x8100	2	x	SVID1	1
B	MAC1	MAC2	n/a	n/a	n/a	n/a	0x8100	3	x	SVID1	x	x	x	GEM1	n/a	n/a	n/a	n/a	0x8100	3	x	SVID1	1
C*	MAC1	MAC2	n/a	n/a	n/a	n/a	0x8100	4	x	SVID1	x	x	x	GEM2	n/a	n/a	n/a	n/a	0x8100	4	x	SVID1	1
D	MAC1	MAC2	n/a	n/a	n/a	n/a	0x8100	5	x	SVID1	x	x	x	GEM2	n/a	n/a	n/a	n/a	0x8100	5	x	SVID1	1

* Drop Precedence Flow

Test Procedure

Omitted in Abstract Test Plan: Refer to http://www.broadband-forum.org/technical/test_cert_programs.php

OMCI Procedure Details

Refer to Annex B

Pass/Fail Criteria

Omitted in Abstract Test Plan: Refer to http://www.broadband-forum.org/technical/test_cert_programs.php

Remarks

- None

6.2.16 Indicating drop precedence using DEI bit downstream

Test Name

Indicating drop precedence using DEI bit downstream

Test Definition Number

ONU.6.2.16

Reference Document

BBF TR-156 [3]

ITU-T G.988 [2]

Test Type

Conformance

Test Requirement Type

Mandatory

Unit Under Test

ONU

Requirement Description**TR-156:**

- **R-55** The OLT and ONU MUST support drop precedence within all supported traffic classes based on the DEI bit value of the 802.1ad header.

Test Objective

Show that ONU can implement drop precedence using DEI bit downstream

Test Configuration

ONU must be set-up with the standard L2 OCM (single user) with four downstream queues. ONU queues are set up with the following: drop precedence indication = DEI; yellow thresholds set to half the queue size; green thresholds set to the queue size. The

intent of the test is to define eight flows, two per traffic class. For each traffic class, one of the flows is marked with drop precedence. For a user port egress rate of E, each flow rate is set to R=0.7E.

The U-interface and S/R-interface values for each test are shown below, along with the GEM port configuration.

Downstream Direction																								
Traffic Stream	S/R Interface														U Interface									
	MAC DA	MAC SA	Outer VLAN Tag				Inner VLAN Tag				Ethertype	IP DA	IP SA	GEM	Outer VLAN Tag				Inner VLAN Tag				UNI	
	Value	Value	TPID	Pbits	DEI	VID	TPID	Pbits	CFI or DEI	VID	Value	Value	Value	Port #	TPID	Pbits	DEI	VID	TPID	Pbits	CFI or DEI	VID	Port #	
A*	MAC1	MAC2	n/a	n/a	n/a	n/a	0x8100	SPbits1	1	SVID1	x	x	x	GEM1	n/a	n/a	n/a	n/a	0x8100	SPbits1	1	SVID1	1	
B	MAC1	MAC2	n/a	n/a	n/a	n/a	0x8100	SPbits1	0	SVID1	x	x	x	GEM1	n/a	n/a	n/a	n/a	0x8100	SPbits1	0	SVID1	1	
C*	MAC1	MAC2	n/a	n/a	n/a	n/a	0x8100	SPbits2	1	SVID1	x	x	x	GEM2	n/a	n/a	n/a	n/a	0x8100	SPbits2	1	SVID1	1	
D	MAC1	MAC2	n/a	n/a	n/a	n/a	0x8100	SPbits2	0	SVID1	x	x	x	GEM2	n/a	n/a	n/a	n/a	0x8100	SPbits2	0	SVID1	1	
E*	MAC1	MAC2	n/a	n/a	n/a	n/a	0x8100	SPbits3	1	SVID1	x	x	x	GEM3	n/a	n/a	n/a	n/a	0x8100	SPbits3	1	SVID1	1	
F	MAC1	MAC2	n/a	n/a	n/a	n/a	0x8100	SPbits3	0	SVID1	x	x	x	GEM3	n/a	n/a	n/a	n/a	0x8100	SPbits3	0	SVID1	1	
G*	MAC1	MAC2	n/a	n/a	n/a	n/a	0x8100	SPbits4	1	SVID1	x	x	x	GEM4	n/a	n/a	n/a	n/a	0x8100	SPbits4	1	SVID1	1	
H	MAC1	MAC2	n/a	n/a	n/a	n/a	0x8100	SPbits4	0	SVID1	x	x	x	GEM4	n/a	n/a	n/a	n/a	0x8100	SPbits4	0	SVID1	1	

* Drop Precedence Flow

Test Procedure

Omitted in Abstract Test Plan: Refer to http://www.broadband-forum.org/technical/test_cert_programs.php

OMCI Procedure Details

Refer to Annex B

Pass/Fail Criteria

Omitted in Abstract Test Plan: Refer to http://www.broadband-forum.org/technical/test_cert_programs.php

Remarks

- None

6.2.17 Test Case Reserved For Future Use

6.2.18 Test Case Reserved For Future Use

6.2.19 Mapping Traffic from GEM Ports to Multiple U Interfaces in the Downstream Direction

Test Name

Mapping Traffic from GEM Ports to Multiple U Interfaces in the Downstream Direction

Test Definition Number

ONU.6.2.19

Reference Document

BBF TR-156 [3]

ITU-T G.988 [2]

Test Type

Conformance

Test Requirement Type

Conditionally Mandatory (if ONT has multiple user ports)

Unit Under Test

ONU

Requirement Description

BBF TR-156:

- **R-41** The ONU **MUST** support mapping traffic from one or more GEM Ports to a U-interface in the downstream direction
- **R-31** The ONU **MUST** support mapping traffic from one or more GEM Ports to a U interface in the downstream direction.
- **R-19** The ONU **MUST** support mapping traffic from one or more GEM Ports to a U interface in the downstream direction.

Test Objective

- Verify that the ONU supports mapping traffic from GEM Ports to multiple U-interfaces in the downstream direction

Test Configuration

1. OLT Emulator and ONU under test are powered and connected to ODN
2. ONU under test has been activated by the OLT Emulator, has been ranged, and a GEM port for OMCI has been created as a result of ONU-ID assignment.

3. The OLT Emulator is configured to transmit S-tagged Ethernet frames downstream with the following parameters (Stream 1)
4. The OLT Emulator is configured to transmit S-tagged Ethernet frames downstream with the following parameters (Stream 2)

Downstream Direction																							
Traffic Stream	S/R Interface														U Interface								
	MAC DA	MAC SA	Outer VLAN Tag				Inner VLAN Tag				EtherType	PP DA	IP SA	GEM	Outer VLAN Tag				Inner VLAN Tag				UNI
	Value	Value	TPID	Pbits	DEI	VID	TPID	Pbits	CFI or DEI	VID	Value	Value	Value	Port #	TPID	Pbits	DEI	VID	TPID	Pbits	CFI or DEI	VID	Port #
A	MAC1	MAC2	n/a	n/a	n/a	n/a	0x8100	Spbits1	x	SVID1	x	x	x	GEM1	n/a	n/a	n/a	n/a	0x8100	Spbits1	x	SVID1	1
B	MAC3	MAC2	n/a	n/a	n/a	n/a	0x8100	Spbits1	x	SVID1	x	x	x	GEM2	n/a	n/a	n/a	n/a	0x8100	Spbits1	x	SVID1	2

Test Procedure

Omitted in Abstract Test Plan: Refer to http://www.broadband-forum.org/technical/test_cert_programs.php

OMCI Procedure Details

Refer to Annex B

Pass/Fail Criteria

Omitted in Abstract Test Plan: Refer to http://www.broadband-forum.org/technical/test_cert_programs.php

Remarks

- None

6.2.20 Test Case Reserved For Future Use

6.2.21 Mapping Traffic from GEM Ports to Multiple U Interfaces in the Downstream Direction

Test Name

Mapping Traffic from GEM Ports to Multiple U Interfaces in the Downstream Direction

Test Definition Number

ONU.6.2.21

Reference Document

BBF TR-156 [3]

ITU-T G.988 [2]

Test Type

Conformance

Test Requirement Type

Mandatory if Multiple U Interfaces are supported by the ONU

Unit Under Test

ONU

Requirement Description

BBF TR-156:

- **R-31** The ONU MUST support mapping traffic from one or more GEM Ports to a U-interface in the downstream direction
- **R-19** The ONU MUST support mapping traffic from one or more GEM Ports to a U-interface in the downstream direction.
- **R-41** The ONU MUST support mapping traffic from one or more GEM Ports to a U-interface in the downstream direction.

Test Objective

- Verify that the ONU supports mapping traffic from GEM Ports to multiple U-interfaces in the downstream direction

Test Configuration

1. OLT Emulator and ONU under test are powered and connected to ODN
2. ONU under test has been activated by the OLT Emulator, has been ranged, and a GEM port for OMCI has been created as a result of ONU-ID assignment.

3. The OLT Emulator is configured to transmit tagged Ethernet frames downstream with the following parameters (Stream 1)
4. The OLT Emulator is configured to transmit tagged Ethernet frames downstream with the following parameters (Stream 2)
5. The OLT Emulator is configured to transmit tagged Ethernet frames downstream with the following parameters (Stream 3)

Downstream Direction																							
Traffic Stream	S/R Interface														U Interface								
	MAC DA	MAC SA	Outer VLAN Tag				Inner VLAN Tag				Ethertype	IP DA	IP SA	GEM	Outer VLAN Tag				Inner VLAN Tag				UNI
	Value	Value	TPID	Pbits	DEI	VID	TPID	Pbits	CFI or DEI	VID	Value	Value	Value	Port #	TPID	Pbits	DEI	VID	TPID	Pbits	CFI or DEI	VID	Port #
A	MAC1	MAC2	n/a	n/a	n/a	n/a	0x8100	CPbits1	x	CVID1	x	x	x	GEM1	n/a	n/a	n/a	n/a	0x8100	CPbits1	x	CVID1	1
B	MAC3	MAC4	n/a	n/a	n/a	n/a	0x8100	CPbits2	x	CVID1	x	x	x	GEM2	n/a	n/a	n/a	n/a	0x8100	CPbits2	x	CVID1	1
C	MAC1	MAC2	n/a	n/a	n/a	n/a	0x8100	CPbits1	x	CVID2	x	x	x	GEM3	n/a	n/a	n/a	n/a	0x8100	CPbits1	x	CVID2	2

* In the upstream direction, mapping to traffic classes is done using C-Tag Pbits

Test Procedure

Omitted in Abstract Test Plan: Refer to http://www.broadband-forum.org/technical/test_cert_programs.php

OMCI Procedure Details

Refer to Annex B

Pass/Fail Criteria

Omitted in Abstract Test Plan: Refer to http://www.broadband-forum.org/technical/test_cert_programs.php

Remarks

- None

6.2.22 Test Case Reserved For Future Use

6.2.23 Test Case Reserved For Future Use

6.2.24 Test Case Reserved For Future Use

6.3 IGMP Controlled Multicast

6.3.1 ONU passing of downstream IGMP messages

Test Name

ONU passing of downstream IGMP messages

Test Definition Number

ONU.6.3.1

Reference Document

BBF TR-156 [3]

ITU-T G.988 [2]

Test Type

Conformance

Test Requirement Type

Mandatory

Unit Under Test

ONU

Requirement Description

BBF TR-156:

- **R-81** The ONU MUST support receiving downstream multicast IGMP messages (e.g. Global Query messages) on either a unicast GEM port, or the multicast GEM port that is used to carry the multicast content.

Test Objective

To verify that the ONU implementation supports receiving and passing IGMP messages received on either the downstream multicast GEM port or a unicast GEM port.

Test Configuration

1. OLT emulator and ONU under test are connected to the ODN and powered on.

2. ONU activation and OMCC establishment processes have been successfully completed.
3. The OLT Emulator has instructed the ONU to reset its MIB to factory default values
4. The OLT emulator will be configured to send the sequence of OMCI messages required to provision the ONU under test to support the following configuration:
 - Single untagged U-interface (removal of S-Tag from downstream packets and addition of S-Tag to upstream packets).
 - One unicast GEM port
 - One downstream multicast GEM port
5. The OLT emulator will be configured to transmit two downstream IGMP global/general query message. The first IGMP message will be transmitted to the unicast GEM port, and will be carried within a GEM encapsulated Ethernet frame that includes the provisioned S-Tag VLAN header. The second IGMP message will transmitted to the multicast GEM port, and will be carried within a GEM encapsulated Ethernet frame that includes the provisioned S-Tag VLAN header.
6. The Ethernet traffic generator will be configured to report/capture the receipt of the IGMP messages.

Test Procedure

Omitted in Abstract Test Plan: Refer to http://www.broadband-forum.org/technical/test_cert_programs.php

OMCI Procedure Details

Refer to Annex B

Pass/Fail Criteria

Omitted in Abstract Test Plan: Refer to http://www.broadband-forum.org/technical/test_cert_programs.php

Remarks

- It is the responsibility of the tester to ensure it is possible to verify which received IGMP message corresponds to which transmitted message (i.e. at the Ethernet traffic generator, the two received frames will appear identical).

6.3.2 Test Case Reserved For Future Use

6.3.3 ONU silent discarding of IGMPv1 messages

Test Name

ONU silent discarding of IGMPv1 messages

Test Definition Number

ONU.6.3.3

Reference Document

BBF TR-156 [3]

ITU-T G.988 [2]

Test Type

Conformance

Test Requirement Type

Mandatory

Unit Under Test

ONU

Requirement Description

BBF TR-156:

- **R-98** The ONU MUST silently discard IGMP v1 messages.

Test Objective

To verify that the ONU implementation supports silently discarding of IGMPv1 messages.

Test Configuration

1. OLT emulator and ONU under test are connected to the ODN and powered on.
2. ONU activation and OMCC establishment processes have been successfully completed.
3. The OLT Emulator has instructed the ONU to reset its MIB to factory default values
4. The OLT emulator will be configured to send the sequence of OMCI messages required to provision the ONU under test to support the following configuration:

- Single untagged U-interface (removal of S-Tag from downstream packets and addition of S-Tag to upstream packets).
 - One unicast GEM port
 - One downstream multicast GEM port
5. The OLT emulator will be used to report/capture any upstream packets.
 6. The Ethernet traffic generator will be configured to generate and transmit an upstream IGMPv1 membership report/group join message into the U-interface.

Test Procedure

Omitted in Abstract Test Plan: Refer to http://www.broadband-forum.org/technical/test_cert_programs.php

OMCI Procedure Details

Refer to Annex B

Pass/Fail Criteria

Omitted in Abstract Test Plan: Refer to http://www.broadband-forum.org/technical/test_cert_programs.php

Remarks

- None

6.3.4 Test Case Reserved For Future Use

6.3.5 Marking Upstream IGMP Messages with Ethernet P-Bits

Test Name

Marking Upstream IGMP Messages with Ethernet P-Bits

Test Definition Number

ONU.6.3.5

Reference Document

BBF TR-156 [3]

ITU-T G.988 [2]

Test Type

Conformance

Test Requirement Type

Mandatory

Unit Under Test

ONU

Requirement Description

BBF TR-156:

- **R-94** The ONU MUST support marking, in the upstream direction, user-initiated IGMP messages with Ethernet P-bits

Test Objective

Verify that the ONU supports marking, in the upstream direction, of user-initiated IGMP messages with Ethernet P-bits

Test Configuration

1. OLT Emulator and ONU under test are powered and connected to ODN
2. ONU under test has been activated by the OLT Emulator, has been ranged, and a GEM port for OMCI has been created as a result of ONU-ID assignment.
3. The following Multicast group definition is applied at the OLT Emulator and transmitted by the OLT to the ONU under test using the Manage Entity “MULTICAST OPERATION PROFILE” (attribute: dynamic access control list table)..

IPTV Channel (Group)	1
IP Multicast Group	IP_G1
MAC Multicast Group	MAC_G1

Multicast Server (Source)	1
Multicast Server IP Address	IP_S1
Multicast Server MAC Address	MAC_S1

4. The ONU under test is configured to add an S-Tag to upstream untagged traffic

Test Procedure

Omitted in Abstract Test Plan: Refer to http://www.broadband-forum.org/technical/test_cert_programs.php

OMCI Procedure Details

Refer to Annex B

Pass/Fail Criteria

Omitted in Abstract Test Plan: Refer to http://www.broadband-forum.org/technical/test_cert_programs.php

Remarks

- None

6.3.6 IGMP controlled Multicast

Test Name

IGMP controlled Multicast

Test Definition ID

ONU.6.3.6

Reference Document

BBF TR-156 [3]

ITU-T G.988 [2]

Test Type

Conformance

Test Requirement Type

Mandatory

Unit Under Test

ONU

Requirement Description**BBF TR-156:**

- **R-74** The GPON network **MUST** be able to forward all multicast VLAN using a single downstream multicast GEM port
- **R-79** The GPON network **MUST** use a bidirectional GEM port for upstream IGMP messages. This GEM port can be shared by other VLANs from the same U-interface that share the same TC

Test Objective

The purpose of this test is to verify that the ONU is able to receive all multicast-VLAN traffic using a single downstream multicast GEM port and IGMP messages use a bidirectional GEM port. This GEM port can be shared by other VLANs from the same U-interface that share the same TC

Test Configuration

1. ONU under test and OLT emulator are powered and connected to ODN
2. ONU under test has been activated by the OLT emulator, has been ranged, and a GEM port for OMCI has been created as a result of ONU-ID assignment.
3. A single U-interface is used
4. The Ethernet traffic generator connected to the OLT Emulator generates multicast Ethernet frames.

Multicast flow	Multicast IP source address	Multicast group IP destination address	Multicast MAC group address	VID	p bit
Ch1	IP-S1	IP-G1	MAC-G1	VID1	Pbit1
Ch2	IP-S2	IP-G2	MAC-G2	VID2	Pbit1

5. The Ethernet traffic generator connected to the OLT Emulator generates unicast Ethernet frames

unicast destination MAC address	unicast Source MAC address	VID	Pbit
MAC-U1	MAC-V1	VID3	Pbit1

6. The Ethernet Traffic Generator connected to the U-interface generates unicast Ethernet frames

unicast destination MAC address	unicast Source MAC address	VID	Pbit
MAC-V1	MAC-U1	VID3	Pbit1

7. The Ethernet Traffic Generator connected to the U-interface is configured as follows. The IP and MAC addresses will be used to send IGMP V2 messages

Source IP address	Source MAC address	Multicast IP group address	VID	P bit
IP-U2	MAC-U2	IP-G1	VID1	Pbit1

8. The Ethernet Traffic Generator connected to the U-interface is configured as follow. The IP and MAC addresses will be used to send IGMP V3 messages

Source IP address	Source MAC address	Multicast IP group address	Multicast source IP address	VID	p bit
0.0.0.0	MAC-U3	IP-G2	IP-S2	VID2	Pbit1

9. This table shows the bidirectionnal GEM port mapping (unicast flow, and IGMP messages)

U-interface			GEM Port	T-CONT	S/R-interface
User Port	TPID	P-bit value			P-bit
1	0x8100	Pbit1	GEM1	TCONT1	Pbit1

10. All the previous flows have the same Traffic Class

Test Procedure

Omitted in Abstract Test Plan: Refer to http://www.broadband-forum.org/technical/test_cert_programs.php

OMCI Procedure Details

Refer to Annex B

Pass/Fail Criteria

Omitted in Abstract Test Plan: Refer to http://www.broadband-forum.org/technical/test_cert_programs.php

Remarks

- None

6.3.7 Multicast White List

Test Name

Multicast White List

Test Definition ID

ONU.6.3.7

Reference Document

BBF TR-156 [3]

ITU-T G.988 [2]

Test Type

Conformance

Test Requirement Type

Mandatory

Unit Under Test

ONU

Requirement Description

BBF TR-156:

- **R-76** The ONU MUST allow the configuration of the IP multicast groups that are acceptable per user port based on:
 - Source address matching
 - Group address matching
 - VLAN membership
- **R-84** The ONU MUST support matching groups conveyed by IGMP messages on a user port to the list of groups (R-76) associated with this port. When there is no match, the copy of IGMP message directed toward the multicast-VLAN MUST be silently discarded. When there is a match, the IGMP message SHOULD be forwarded within a multicast-VLAN, and enter the IGMP snooping function.

Test Objective

The purpose of this test is to verify that the ONU is able to allow the configuration of the IP multicast groups that are acceptable per user port based on source address matching, group address matching and VLAN membership

Test Configuration

1. ONU under test and OLT emulator are powered and connected to ODN
2. ONU under test has been activated by the OLT emulator, has been ranged, and a GEM port for OMCI has been created as a result of ONU-ID assignment.
3. ONU and OLT MUST support IGMP V3
4. A single U-interface is used
5. A bidirectional GEM port between the ONU under test U-interface and the OLT emulator has been created by OMCI, for IGMP messages
6. A downstream multicast GEM port between the ONU under test and the OLT emulator has been created by OMCI, for multicast Ethernet frames.
7. The OLT Emulator generates multicast Ethernet frames as follows

Multicast flow	Multicast source IP address	Multicast IP group address	Multicast MAC group address	VID	p bit
Ch1	IP-S1	IP-G1	MAC-G1	CVID1	CPbit1
Ch2	IP-S2	IP-G2	MAC-G2	CVID1	CPbit1
Ch3	IP-S3	IP-G3	MAC-G3	CVID1	CPbit1
Ch4	IP-S3	IP-G4	MAC-G4	CVID1	CPbit1
Ch5	IP-S4	IP-G5	MAC-G5	CVID2	CPbit1
Ch6	IP-S5	IP-G5	MAC-G5	CVID3	CPbit1

Test Procedure

Omitted in Abstract Test Plan: Refer to http://www.broadband-forum.org/technical/test_cert_programs.php

OMCI Procedure Details

Refer to Annex B

Pass/Fail Criteria

Omitted in Abstract Test Plan: Refer to http://www.broadband-forum.org/technical/test_cert_programs.php

Remarks

- None

6.3.8 IGMP rate limit

Test Name

IGMP rate limit

Test Definition ID

ONU.6.3.8

Reference Document

BBF TR-156 [3]

ITU-T G.988 [2]

Test Type

Conformance

Test Requirement Type

Mandatory

Unit Under Test

ONU

Requirement Description

BBF TR-156:

- **R-87** The ONU MUST be able to rate-limit IGMP messages received from user ports on a multicast-VLAN.

Test Objective

The purpose of this test is to verify that the ONU is able to rate-limit IGMP messages received from user ports on a multicast-VLAN.

Test Configuration

1. ONU under test and OLT emulator are powered and connected to ODN
2. ONU under test has been activated by the OLT emulator, has been ranged, and a GEM port for OMCI has been created as a result of ONU-ID assignment.
3. A single U-interface is used

4. A bidirectional GEM port between the ONU under test U-interface and the OLT emulator has been created by OMCI, for IGMP messages
5. A multicast GEM port between the ONU under test and the OLT emulator has been created by OMCI, for multicast Ethernet frames.
6. The Ethernet Traffic Generator connected to the U-interface is configured to use the following IP and MAC addresses for sending IGMP messages

Source IP address	Source MAC address	Multicast IP group address	Multicast MAC group address	VID	Pbit
IP-U1	MAC-U1	IP-G1	MAC-G1	VID 1	pbit 1

Test Procedure

Omitted in Abstract Test Plan: Refer to http://www.broadband-forum.org/technical/test_cert_programs.php

OMCI Procedure Details

Refer to Annex B

Pass/Fail Criteria

Omitted in Abstract Test Plan: Refer to http://www.broadband-forum.org/technical/test_cert_programs.php

Remarks

- None

6.3.9 IGMP immediate leave

Test Name

IGMP immediate leave

Test Definition ID

ONU.6.3.9

Reference Document

BBF TR-156 [3]

ITU-T G.988 [2]

Test Type

Conformance

Test Requirement Type

Mandatory

Unit Under Test

ONU

Requirement Description

BBF TR-156:

- **R-91** The ONU MUST support IGMP immediate leave as part of the IGMP transparent snooping.

Test Objective

The purpose of this test is to verify that the ONU is able to support IGMP immediate leave as part of the IGMP transparent snooping.

Test Configuration

1. ONU under test and OLT emulator are powered and connected to ODN
2. ONU under test has been activated by the OLT emulator, has been ranged, and a GEM port for OMCI has been created as a result of ONU-ID assignment.
3. A single U-interface is used

4. A bidirectional GEM port between the ONU under test U-interface and the OLT emulator has been created by OMCI, for IGMP messages
5. A multicast GEM port between the ONU under test and the OLT emulator has been created by OMCI, for multicast Ethernet frames.
6. The OLT Emulator generates downstream multicast Ethernet frames:

Channel	Multicast source IP address	Multicast IP group address	Multicast MAC group address	VID	p bit
Ch1	IP-S1	IP-G1	MAC-G1	VID 1	Pbit1

7. The Ethernet frames analyser is connected between ONU and the Ethernet traffic Generator

Test Procedure

Omitted in Abstract Test Plan: Refer to http://www.broadband-forum.org/technical/test_cert_programs.php

OMCI Procedure Details

Refer to Annex B

Pass/Fail Criteria

Omitted in Abstract Test Plan: Refer to http://www.broadband-forum.org/technical/test_cert_programs.php

Remarks

- None

6.3.10 Maximum number of multicast flows

Test Name

Maximum number of multicast flows

Test Definition ID

ONU.6.3.10

Reference Document

BBF TR-156 [3]

ITU-T G.988 [2]

Test Type

Conformance

Test Requirement Type

Mandatory

Unit Under Test

ONU

Requirement Description

BBF TR-156:

R-97 The ONU MUST be able to configure per U-interface the maximum number of simultaneous multicast groups allowed.

Test Objective

The purpose of this test is to verify that the ONU is able to configure per U-interface the maximum number of simultaneous multicast groups allowed.

Test Configuration

1. ONU under test and OLT emulator are powered and connected to ODN
2. ONU under test has been activated by the OLT emulator, has been ranged, and a GEM port for OMCI has been created as a result of ONU-ID assignment.

3. A single U-interface is used
4. A bidirectional GEM port between the ONU under test U-interface and the OLT emulator has been created by OMCI, for IGMP messages
5. A multicast GEM port between the ONU under test and the OLT emulator has been created by OMCI, for multicast Ethernet frames.
6. The OLT Emulator generates downstream multicast Ethernet frames

Channel	Multicast source IP address	Multicast IP group address	Multicast MAC group address	VID	p bit
Ch1	IP-S1	IP-G1	MAC-G1	VID1	Pbit1
Ch2	IP-S1	IP-G2	MAC-G2	VID1	Pbit1
Ch3	IP-S1	IP-G3	MAC-G3	VID1	Pbit1

Test Procedure

Omitted in Abstract Test Plan: Refer to http://www.broadband-forum.org/technical/test_cert_programs.php

OMCI Procedure Details

Refer to Annex B

Pass/Fail Criteria

Omitted in Abstract Test Plan: Refer to http://www.broadband-forum.org/technical/test_cert_programs.php

Remarks

- None

6.3.11 IGMP transparent Snooping

Test Name

IGMP transparent Snooping

Test Definition Number

ONU.6.3.11

Reference Document

BBF TR-156 [3]

ITU-T G.988 [2]

Test Type

Conformance

Test Requirement Type

Mandatory

Unit Under Test

ONU

Requirement Description**TR-156:**

- **R-88** The ONU and OLT MUST support an IGMP v3 (as per RFC 3376) transparent snooping function.
- **R-89** The ONU and OLT IGMP v3 transparent snooping function MUST support the capability to snoop the multicast source IP address and destination IP group address in IGMP messages and to set the corresponding MAC group address filters as specified in R-90.
- **R-90** The ONU and OLT IGMP v3 transparent snooping function MUST be able to dynamically create and delete MAC-level Group Filter entries, enabling in turn, selective multicast forwarding from network-facing VLANs to user-facing ports.

Test Objective

Verify the ONU supports the IGMP transparent snooping function and this functionality can be enabled for a multicast VLAN. Note, this test case does not cover the second MUST within R-88, and has been intentionally removed from the above requirements.

Test Configuration

1. ONU is powered and connected to ODN
2. ONU has been activated by the OLT Emulator, has been ranged, and a GEM port for OMCI has been created as a result of ONU-ID assignment.
3. The OLT Emulator has instructed the ONU to reset its MIB to factory default values.
4. ONU has successfully completed test cases in section 6.1.
5. The OLT Emulator should configure the ONU to support the following configuration:
 - One multicast VLANs, VID1
 - Enable IGMP transparent snooping on VLAN VID1
 - One bi-directional GEM port
 - One multicast GEM port
 - Singled-tagged U-interface, with no translation of VID values between the R/S and U-interfaces.
 - No restrictions for IGMP dynamic access (all flows are allowed)
6. The OLT Emulator will be configured to generate the following downstream, multicast flows. All flows should use the same multicast GEM port.

Flow	DST MAC Addr.	SRC MAC Addr.	DST IP Addr.	SRC IP Addr.	VID	TPID	Pbits
A	MAC-G1	MAC-S1	IP-G1	IP-S1	SVID1	0x8100	Any
B	MAC-G2	MAC-S2	IP-G2	IP-S2	SVID1	0x8100	Any

C	MAC-G3	MAC-S3	IP-G3	IP-S3	SVID1	0x8100	Any
D	MAC-G4	MAC-S4	IP-G4	IP-S4	SVID1	0x8100	Any

7. The Ethernet Traffic Generator should be configured to transmit the following upstream IGMP join/leave messages for each of the above multicast groups using the following parameters:

Flow	SRC MAC Addr.	SRC IP Addr.	VID	TPID	Pbits
E	MAC-S7	IP-S7	SVID1	0x8100	Any

Test Procedure

Omitted in Abstract Test Plan: Refer to http://www.broadband-forum.org/technical/test_cert_programs.php

OMCI Procedure Details

Refer to Annex B

Pass/Fail Criteria

Omitted in Abstract Test Plan: Refer to http://www.broadband-forum.org/technical/test_cert_programs.php

Remarks

- None

6.3.12 Multicast VLAN membership based on user ports (Multiple User ports)

Test Name

Multicast VLAN membership based on user ports

Test Definition ID

ONU.6.3.12

Reference Document

- BBF TR-156 [3] Section 5.3.2
- ITU-T G.988 [2]

Test Type

Conformance

Test Requirement Type

Conditional Mandatory (ONU with multiple user ports)

Unit Under Test

ONU

Requirement Description

BBF TR-156:

- **R-96** The ONU MUST support configuring which user ports are members of a given multicast-VLAN

Test Objective

The purpose of this test is to verify that the support configuring which user ports are members of a given multicast-VLAN

Test Configuration

1. ONU under test and OLT emulator are powered and connected to ODN
2. ONU under test has been activated by the OLT emulator, has been ranged, and a GEM port for OMCI has been created by PLOAM.
3. Multiple U interfaces are used

4. The Ethernet Traffic Generator connected to the OLT Emulator generates multicast Ethernet frames.

Multicast flow	Multicast IP source address	Multicast group IP destination address	Multicast MAC group address	VID	p bit
Ch1	IP-S1	IP-G1	MAC-G1	VID1	Pbit1
Ch2	IP-S2	IP-G2	MAC-G2	VID2	Pbit2

5. The Ethernet Traffic Generator connected to the U interface (user port 1) is configured as follow. The IP and MAC addresses will be used to send IGMP V2 messages

Source IP address	Source MAC address	Multicast IP group address	VID	p bit
IP-U1	MAC-U1	IP-G1	VID1	Pbit1

6. The Ethernet Traffic Generator connected to the U interface (user port 2) is configured as follow. The IP and MAC addresses will be used to send IGMP V2 messages

Source IP address	Source MAC address	Multicast IP group address	VID	p bit
IP-U2	MAC-U2	IP-G2	VID2	Pbit2

7. User port Multicast VLAN association at the ONU

User port	Multicast VLAN members
1	VID1
2	VID2

Test Procedure

Omitted in Abstract Test Plan: Refer to http://www.broadband-forum.org/technical/test_cert_programs.php

OMCI Procedure Details

Refer to Appendix B

Pass/Fail Criteria

Omitted in Abstract Test Plan: Refer to http://www.broadband-forum.org/technical/test_cert_programs.php

Remarks

- None

6.3.13 IGMP transparent Snooping (Multiple User ports)

Test Name

IGMP transparent Snooping (Multiple User ports)

Test Definition Number

ONU.6.3.13

Reference Document

BBF TR-156 [3]

Test Type

Conformance

Test Requirement Type

Conditionally Mandatory (if ONT has multiple user ports)

Unit Under Test

ONU

Requirement Description**TR-156:**

- R-88: The ONU and OLT MUST support an IGMP v3 (as per RFC 3376) transparent snooping function.
- R-89: The ONU and OLT IGMP v3 transparent snooping function MUST support the capability to snoop the multicast source IP address and destination IP group address in IGMP messages and to set the corresponding MAC group address filters as specified in R-90.
- R-90: The ONU and OLT IGMP v3 transparent snooping function MUST be able to dynamically create and delete MAC-level Group Filter entries, enabling in turn, selective multicast forwarding from network-facing VLANs to user-facing ports.

Test Objective

Verify the ONU supports the IGMP transparent snooping function and this functionality can be enabled for a multicast VLAN for ONU with multiple U Interfaces. Note, this test case does not cover the second MUST within R-88, and has been intentionally removed from the above requirements.

Test Configuration

1. ONU is powered and connected to ODN
2. ONU has been activated by the OLT Emulator, has been ranged, and a GEM port for OMCI has been created by PLOAM.
3. The OLT Emulator has instructed the ONU to reset its MIB to factory default values.
4. The OLT Emulator should configure the ONU to support the following configuration:
 - One multicast VLAN, VID1
 - Enable IGMP transparent snooping on VLAN VID1
 - One bi-directional GEM port per U-interface
 - One multicast GEM port
 - Symmetric user port tagging rules

User port	U interface Q-Tag	R/S interface S-Tag
1	none	SVID1
2	none	SVID1

- All U-interfaces are member of VID1
 - No restrictions for IGMP dynamic access (all flows are allowed)
5. The OLT Emulator will be configured to generate the following downstream, multicast flows. All flows should use the same multicast GEM port.

Flow	DST MAC Addr.	SRC MAC Addr.	DST IP Addr.	SRC IP Addr.	VID	TPID	Pbits
A	MAC- G1	MAC- S1	IP-G1	IP-S1	SVID1	0x88a8	Any

B	MAC-G2	MAC-S2	IP-G2	IP-S2	SVID1	0x88a8	Any
C	MAC-G3	MAC-S3	IP-G3	IP-S3	SVID1	0x88a8	Any
D	MAC-G3	MAC-S4	IP-G4	IP-S4	SVID1	0x88a8	Any

6. The Ethernet Traffic Generator should be configured to transmit the following upstream IGMP join/leave messages for each of the above multicast groups using the following parameters:

Flow	User port	SRC MAC Addr.	SRC IP Addr.	VID	TPID	Pbits
E	1	MAC-U1	IP-U1	None	None	None
F	2	MAC-U2	IP-U2	None	None	None

Test Procedure

Omitted in Abstract Test Plan: Refer to http://www.broadband-forum.org/technical/test_cert_programs.php

OMCI Procedure Details

Refer to Appendix B

Pass/Fail Criteria

Omitted in Abstract Test Plan: Refer to http://www.broadband-forum.org/technical/test_cert_programs.php

Remarks

- None

6.3.14 IGMP Transparent forwarding

Test Name

IGMP Transparent forwarding

Test Definition ID

ONU. 6.3.14

Reference Document

BBF TR-156 [3]

ITU-T G.988 [2]

Test Type

Conformance

Test Requirement Type

Mandatory

Unit Under Test

ONU

Requirement Description**BBF TR-156:**

- **R-10** The ONU MUST support adding an S-Tag to upstream untagged traffic received from the U-interface.
- **R-20** The ONU MUST support adding a C-Tag or S-Tag to upstream untagged traffic.
- **R-34** The ONU MUST support adding an S-Tag in the upstream direction for Q-tagged, untagged, and priority-tagged frames.
- **R-82** The ONU and OLT MUST support the identification and processing of upstream IGMP messages. When this function is disabled on a port and/or VLAN, these messages are transparently forwarded.

Note: Only the second sentence in R-82 is verified by this test.

Test Objective

Verify the ONU supports the IGMP transparent forwarding function on a single U-interface configured to pass untagged traffic across the U-interface. This test verifies both the OMCI configuration responses and support of active user traffic. The VLAN S-Tag is added to upstream traffic by the ONU before crossing the R/S-interface. Note that only the default behaviour described in the second half of R-82 is verified in this test.

Test Configuration

1. ONU is powered and connected to ODN
2. ONU has been activated by the OLT Emulator, has been ranged, and a GEM port for OMCI has been created as a result of ONU-ID assignment.
3. The OLT Emulator has instructed the ONU to reset its MIB to factory default values.
4. The Ethernet Traffic Generator should be configured to transmit Ethernet frames upstream with the following parameters:

Upstream Direction																								
Traffic Stream	U Interface												R/S Interface											
	UNI	MAC DA	MAC SA	Outer VLAN Tag				Inner VLAN Tag				Ethertype	IP DA	IP SA	Outer VLAN Tag				Inner VLAN Tag				GEM	T-CONT
	Port #	Value	Value	TPID	Pbits	DEI	VID	TPID	Pbits	CFI or DEI	VID	Value	Value	Value	TPID	Pbits	DEI	VID	TPID	Pbits	CFI or DEI	VID	Port #	Number
A	1	MAC_MC1	MAC2	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0x0800	IP_MC1	IP1	n/a	n/a	n/a	n/a	0x88A8	0	x	SVID1	GEM1	TCONT1

5. Only 1 user traffic class should be configured on the ONU (via defined OMCI messages below), requiring 1 GEM port (Alloc-ID, T-CONT, Port-ID).

Test Procedure

Omitted in Abstract Test Plan: Refer to http://www.broadband-forum.org/technical/test_cert_programs.php

OMCI Procedure Details

Refer to Annex B

Pass/Fail Criteria

Omitted in Abstract Test Plan: Refer to http://www.broadband-forum.org/technical/test_cert_programs.php

Remarks

- No MAC filtering should be enabled on the ONU during these tests, or it should be configured to allow the test user traffic to pass through the ONU.

6.4 Non-IGMP Controlled Multicast and Broadcast

6.4.1 Downstream Broadcast Handling, Single U-interface

Test Name

Downstream Broadcast Handling, Single U-interface

Test Definition Number

ONU.6.4.1

Reference Document

BBF TR-156 [3]

ITU-T G.988 [2]

Test Type

Conformance

Test Requirement Type

Mandatory

Unit Under Test

ONU

Requirement Description**TR-156:**

- **R-113** If the ONU receives a tagged frame on a downstream GEM Port, it MUST forward it to all U-interfaces that are members of that VLAN.

Test Objective

Verify the ONU passes frames with broadcast destination MAC addresses in the downstream direction to all U-interfaces that are members of the VLAN contained in the frame's headers. This test is performed on ONU devices with 1 U-interface.

Test Configuration

1. The ONU is powered and connected to the ODN
2. The ONU has been activated by the OLT Emulator, has been ranged, and a GEM port for OMCI has been created as a result of ONU-ID assignment.
3. The OLT Emulator has instructed the ONU to reset its MIB to factory default values.
4. ONU has successfully completed test cases in section 6.1.
5. The OLT Emulator should be configure to transmit the following downstream Ethernet frames:

Downstream Direction																							
Traffic Stream	S/R Interface														U Interface								
	MAC DA	MAC SA	Outer VLAN Tag				Inner VLAN Tag				Ethertype	IP DA	IP SA	GEM	Outer VLAN Tag				Inner VLAN Tag			UNI	
	Value	Value	TPID	Pbits	DEI	VID	TPID	Pbits	CFI or DEI	VID	Value	Value	Value	Port #	TPID	Pbits	DEI	VID	TPID	Pbits	CFI or DEI	VID	Port #
A	MAC-BRD	MAC1	n/a	n/a	n/a	n/a	0x88A8	0	0	SVID1	x	x	x	GEM2	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1
B	MAC-BRD	MAC1	n/a	n/a	n/a	n/a	0x88A8	0	0	SVID2	x	x	x	GEM2	-	-	-	-	-	-	-	-	-

Test Procedure

Omitted in Abstract Test Plan: Refer to http://www.broadband-forum.org/technical/test_cert_programs.php

OMCI Procedure Details

Refer to Annex B

Pass/Fail Criteria

Omitted in Abstract Test Plan: Refer to http://www.broadband-forum.org/technical/test_cert_programs.php

Remarks

- None

6.4.2 Downstream Broadcast Handling, Multiple U-interfaces

Test Name

Downstream Broadcast Handling, Multiple U-interfaces

Test Definition Number

ONU.6.4.2

Reference Document

BBF TR-156 [3]

ITU-T G.988 [2]

Test Type

Conformance

Test Requirement Type

Conditionally Mandatory (if ONT has multiple user ports)

Unit Under Test

ONU

Requirement Description

BBF TR-156:

- **R-113** If the ONU receives a tagged frame on a downstream GEM Port, it MUST forward it to all U-interfaces that are members of that VLAN.

Test Objective

Verify the ONU passes frames with broadcast destination MAC addresses in the downstream direction to all U-interfaces that are members of the VLAN contained in the frame's headers. This test is performed on ONU devices with multiple U-interfaces.

Test Configuration

1. The ONU is powered and connected to the ODN

2. The ONU has been activated by the OLT Emulator, has been ranged, and a GEM port for OMCI has been created as a result of ONU-ID assignment.
3. The OLT Emulator has instructed the ONU to reset its MIB to factory default values.
4. ONU has successfully completed test cases in section 6.1.
5. The OLT Emulator should be configure to transmit the following downstream Ethernet frames:

Downstream Direction																							
Traffic Stream	S/R Interface														U Interface								
	MAC DA	MAC SA	Outer VLAN Tag				Inner VLAN Tag				Ethertype	IP DA	IP SA	GEM	Outer VLAN Tag				Inner VLAN Tag				UNI
	Value	Value	TPID	Pbits	DEI	VID	TPID	Pbits	CFI or DEI	VID	Value	Value	Value	Port #	TPID	Pbits	DEI	VID	TPID	Pbits	CFI or DEI	VID	Port #
A	MAC-BRD	MAC1	n/a	n/a	n/a	n/a	0x88A8	0	0	SVID1	x	x	x	GEM3	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1 & 2
B	MAC-BRD	MAC1	n/a	n/a	n/a	n/a	0x88A8	0	0	SVID2	x	x	x	GEM3	-	-	-	-	-	-	-	-	-

Test Procedure

Omitted in Abstract Test Plan: Refer to http://www.broadband-forum.org/technical/test_cert_programs.php

OMCI Procedure Details

Refer to Annex B

Pass/Fail Criteria

Omitted in Abstract Test Plan: Refer to http://www.broadband-forum.org/technical/test_cert_programs.php

Remarks

- None

6.5 Filtering

6.5.1 Test Case Reserved For Future Use

6.5.2 Test Case Reserved For Future Use

6.5.3 Test Case Reserved For Future Use

6.5.4 Test Case Reserved For Future Use

6.5.5 Test Case Reserved For Future Use

6.5.6 Test Case Reserved For Future Use

6.5.7 Test Case Reserved For Future Use

6.5.8 Test Case Reserved For Future Use

6.5.9 Test Case Reserved For Future Use

6.6 TR-156 Other

6.6.1 2000-Byte Frames Supported by the ONU

Test Name

2000-Byte Frames Supported by the ONU

Test Definition Number

ONU.6.6

Reference Document

BBF TR-156 [3] Section 4.4

ITU-T G.988 [2]

Test Type

Conformance

Test Requirement Type

Mandatory

Unit Under Test

ONU

Requirement Description

BBF TR-156

- R-4 The ONU/ONT **MUST** support frame size of 2000 bytes as per IEEE 802.3as

Test Objective

Verify that the ONU supports frame size of 2000 bytes as per IEEE 802.3as

Test Configuration

1. OLT Emulator and ONU under test are powered and connected to ODN
2. ONU under test has been activated by the OLT Emulator, has been ranged, and a GEM port for OMCI has been created by PLOAM.

- The Ethernet Traffic Generator is configured to transmit tagged Ethernet frames with frame size of 2000 bytes as per IEEE 802.3as upstream with the following parameters:

Upstream Direction																								
Traffic Stream	U Interface														R/S Interface									
	UNI	MAC DA	MAC SA	Outer VLAN Tag				Inner VLAN Tag				Ethertype	IP DA	IP SA	Outer VLAN Tag				Inner VLAN Tag			GEM	T-CONT	
	Port #	Value	Value	TPID	Pbits	DEI	VID	TPID	Pbits	CFI or DEI	VID	Value	Value	Value	TPID	Pbits	DEI	VID	TPID	Pbits	CFI or DEI	VID	Port #	Number
A	1	MAC1	MAC2	n/a	n/a	n/a	n/a	0x8100	SPbits1	x	SVID1	x	x	x	n/a	n/a	n/a	n/a	0x8100	SPbits1	x	SVID1	GEM1	TCONT1

- The Ethernet Traffic Generator is configured to transmit tagged Ethernet frames with frame size of 2000 bytes as per IEEE 802.3as downstream with the following parameters:

Downstream Direction																							
Traffic Stream	S/R Interface														U Interface								
	MAC DA	MAC SA	Outer VLAN Tag				Inner VLAN Tag				Ethertype	IP DA	IP SA	GEM	Outer VLAN Tag				Inner VLAN Tag			UNI	
	Value	Value	TPID	Pbits	DEI	VID	TPID	Pbits	CFI or DEI	VID	Value	Value	Value	Port #	TPID	Pbits	DEI	VID	TPID	Pbits	CFI or DEI	VID	Port #
A	MAC2	MAC1	n/a	n/a	n/a	n/a	0x8100	SPbits1	x	SVID1	x	x	x	GEM1	n/a	n/a	n/a	n/a	0x8100	SPbits1	x	SVID1	1

Test Procedure

Omitted in Abstract Test Plan: Refer to http://www.broadband-forum.org/technical/test_cert_programs.php

OMCI Procedure Details

Refer to Appendix B

Pass/Fail Criteria

Omitted in Abstract Test Plan: Refer to http://www.broadband-forum.org/technical/test_cert_programs.php

Remarks

- None

6.6.2 Test Case Reserved For Future Use

6.7 Initial provisioning of ONU

6.7.1 Local setting of a registration ID at the ONU (ONU retains the Registration ID indefinitely)

Test Name

Local setting of a registration ID at the ONU (ONU retains the Registration ID indefinitely)

Test Definition Number

ONU.6.7.1

Reference Document

BBF TR-156 [3]

ITU-T G.988 [2]

Test Type

Conformance

Test Requirement Type

Mandatory

Unit Under Test

ONU

Requirement Description

- **R-152** ONU that support the registration ID approach **MUST** support the local setting of a registration ID
- **R-153** ONU that support the registration ID approach **MUST** retain the registration ID indefinitely

Test Objective

To verify that the ONU retains indefinitely the Registration ID

Test Configuration

1. The OLT emulator and ONU under test are connected to the same ODN
2. The ONU under test is power off.
3. Deactivate ONU autodiscover mode if this functionality is available at the OLT emulator

Test Procedure

Omitted in Abstract Test Plan: Refer to http://www.broadband-forum.org/technical/test_cert_programs.php

OMCI Procedure Details

Refer to Annex B

Pass/Fail Criteria

Omitted in Abstract Test Plan: Refer to http://www.broadband-forum.org/technical/test_cert_programs.php

Remarks

- None

6.8 ONU Bring-up

6.8.1 New ONU Bring-up method for new ONU

Test Name

New ONU Bring-up method on new ONU

Test Definition Number

ONU.6.8.1

Reference Document

ITU-T G.988 [2]

Test Type

Conformance

Test Requirement Type

Mandatory

Unit Under Test

ONU

Requirement Description

ITU-T G.988 Appendix I

Test Objective

To verify that a new ONU, that is, an ONU that has never completed the OLT's MIB synchronization process, correctly completes the New ONU Bring-up method as described in ITU-T G.988 [2].

Test Configuration

1. ONU has never been provisioned or if it has, it has been de-provisioned.
2. ONU is powered off and connected to the ODN.
3. OLT emulator is powered on, active and connected to the ODN.

4. The OLT emulator should be configured to send the sequence of PLOAM and OMCI messages required to fulfill the ONU activation process, the OMCC establishment, MIB synchronization and MIB upload processes.

Test Procedure

Omitted in Abstract Test Plan: Refer to http://www.broadband-forum.org/technical/test_cert_programs.php

OMCI Procedure Details

Refer to Annex B

Pass/Fail Criteria

Omitted in Abstract Test Plan: Refer to http://www.broadband-forum.org/technical/test_cert_programs.php

Remarks

- Old and new ONU as defined in G.988 [2] Appendix I.

6.8.2 New ONU Bring-up method for old ONU

Test Name

New ONU Bring-up method for old ONU

Test Definition Number

ONU.6.8.2

Reference Document

ITU-T G.988 [2]

Test Type

Conformance

Test Requirement Type

Mandatory

Unit Under Test

ONU

Requirement Description

ITU-T G.988 Appendix I

Test Objective

To verify that an old ONU, that is, an ONU that has previously completed the OLT's MIB synchronization process, correctly completes the New ONU Bring-up method.

Test Configuration

1. ONU has previously been provisioned. For example, it has successfully passed test ONU-6.8.1.
2. OLT emulator is powered on, active and connected to the ODN.
3. ONU is powered on and has successfully achieved MIB synchronization.
4. The OLT emulator should be configured to send the sequence of PLOAM and OMCI messages required to fulfill the ONU activation process, the OMCC establishment, MIB synchronization and MIB upload processes.

Test Procedure

Omitted in Abstract Test Plan: Refer to http://www.broadband-forum.org/technical/test_cert_programs.php

OMCI Procedure Details

Refer to Annex B

Pass/Fail Criteria

Omitted in Abstract Test Plan: Refer to http://www.broadband-forum.org/technical/test_cert_programs.php

Remarks

- None

6.8.3 Old ONU Bring-up method for ONU

Test Name

Old ONU Bring-up method for ONU

Test Definition Number

ONU.6.8.3

Reference Document

ITU-T G.988 [2]

Test Type

Conformance

Test Requirement Type

Mandatory

Unit Under Test

ONU

Requirement Description

ITU-T G.988 Appendix I

Test Objective

To verify that an old ONU, that is, an ONU that has previously completed the OLT's MIB synchronization process, correctly completes the Old ONU Bring-up method as described in Appendix I of ITU-T G.988 [2].

Test Configuration

1. ONU has previously been provisioned. For example, it has successfully passed test ONU-6.8.1.
2. OLT emulator is powered on, active and connected to the ODN.
3. ONU is powered on and has successfully achieved MIB synchronization.
4. The OLT emulator should be configured to send the sequence of PLOAM and OMCI messages required to fulfill the ONU activation process, the OMCC establishment, MIB synchronization and MIB upload processes.

Test Procedure

Omitted in Abstract Test Plan: Refer to http://www.broadband-forum.org/technical/test_cert_programs.php

OMCI Procedure Details

Refer to Annex B

Pass/Fail Criteria

Omitted in Abstract Test Plan: Refer to http://www.broadband-forum.org/technical/test_cert_programs.php

Remarks

- None

6.8.4 New ONU Bring-up method for new ONU with encrypted OMCC**Test Name**

New ONU Bring-up method for new ONU with encrypted OMCC

Test Definition Number

ONU.6.8.4

Reference Document

ITU-T G.988 [2]

Test Type

Conformance

Test Requirement Type

Mandatory

Unit Under Test

ONU

Requirement Description

ITU-T G.988 section 7.2.2 Encryption

Test Objective

The purpose of the test is to verify that an ONU is able to complete the OMCI synchronisation with the OMCC channel encrypted.

Test Configuration

1. ONU has never been provisioned or if it has, it has been de-provisioned.
2. ONU successfully completed Test 6.8.1.
3. ONU is powered off and connected to the ODN.
4. OLT emulator is powered on, active and connected to the ODN.

The OLT emulator should be configured to send the sequence of PLOAM and OMCI messages required to fulfill the ONU activation process, the AES key exchange, the OMCC establishment, the OMCC configuration as an encrypted Port-ID, MIB synchronization and MIB upload processes.

Test Procedure

Omitted in Abstract Test Plan: Refer to http://www.broadband-forum.org/technical/test_cert_programs.php

OMCI Procedure Details

Refer to Annex B

Pass/Fail Criteria

Omitted in Abstract Test Plan: Refer to http://www.broadband-forum.org/technical/test_cert_programs.php

Remarks

- None

6.9 MIB and Alarm Synchronization

6.9.1 Alarm synchronization

Test Name

Alarm synchronization

Test Definition ID

ONU 6.9.1

Reference Document

ITU-T G.988 [2]:

Test Type

Conformance

Test Requirement Type

Mandatory

Unit Under Test

ONU

Requirement Description

ITU-T G.988 Appendix I

Test Objective

The purpose of this test is to verify that the ONU is able, first to upload its alarm table when the OLT detects an alarm mismatch value and second to increment its Alarm sequence number value.

Test Configuration

1. OLT Emulator and ONU under test are powered and connected to ODN
2. ONU under test has been activated by the OLT emulator, ranged, and a GEM port for OMCI has been created as a result of ONU-ID assignment.

3. Ethernet traffic generator is connected with the ONU under test and Ethernet port of the ONU under test is up. No need of Ethernet traffic

Test Procedure

Omitted in Abstract Test Plan: Refer to http://www.broadband-forum.org/technical/test_cert_programs.php

OMCI Procedure Details

Refer to Annex B

Pass/Fail Criteria

Omitted in Abstract Test Plan: Refer to http://www.broadband-forum.org/technical/test_cert_programs.php

Remarks

- None

6.9.2 MIB synchronization: Correct Data Sync

Test Name

MIB synchronization

Test Definition ID

ONU 6.9.2

Reference Document

ITU-T G.988 [2]

Test Type

Conformance

Test Requirement Type

Mandatory

Unit Under Test

ONU

Requirement Description

ITU-T G.988 Appendix I

Test Objective

The purpose of this test is to verify that the ONU is able to answer with the right MIB Data Sync value

Test Configuration

1. OLT Emulator and ONU under test are powered and connected to ODN
2. ONU under test has been activated by the OLT emulator, ranged, and a GEM port for OMCI has been created as a result of ONU-ID assignment.

Test Procedure

Omitted in Abstract Test Plan: Refer to http://www.broadband-forum.org/technical/test_cert_programs.php

OMCI Procedure Details

Refer to Annex B

Pass/Fail Criteria

Omitted in Abstract Test Plan: Refer to http://www.broadband-forum.org/technical/test_cert_programs.php

Remarks

- None

6.9.3 MIB synchronization : MIB Upload

Test Name

MIB synchronization

Test Definition ID

ONU.6.9.3

Reference Document

ITU-T G.988 [2]

Test Type

Conformance

Test Requirement Type

Mandatory

Unit Under Test

ONU

Requirement Description

ITU-T G.988 Appendix I

Test Objective

The purpose of this test is to verify that the ONU is able to upload its MIB on request of the OLT.

Test Configuration

1. OLT Emulator and ONU under test are powered and connected to ODN
2. ONU under test has been activated by the OLT emulator, ranged, and a GEM port for OMCI has been created as a result of ONU-ID assignment.

Test Procedure

Omitted in Abstract Test Plan: Refer to http://www.broadband-forum.org/technical/test_cert_programs.php

OMCI Procedure Details

Refer to Annex B

Pass/Fail Criteria

Omitted in Abstract Test Plan: Refer to http://www.broadband-forum.org/technical/test_cert_programs.php

Remarks

- None

6.10 Software Image Download

6.10.1 Software Image Download, multiple window sizes, padded final window

Test Name

Software Image Download, multiple window sizes, padded final window

Test Definition Number

ONU.6.10.1

Reference Document

ITU-T G.988 [2]

Test Type

Conformance

Test Requirement Type

Mandatory

Unit Under Test

ONU

Requirement Description

ITU-T G.988 Appendix I

Test Objective

Verify the ONU is able to perform the software image download procedure under the following conditions:

- i. Multiple window sizes proposed by the OLT
- ii. OLT inserts padding final sections (if software image is not evenly divisible by the window size)

Test Configuration

1. ONU is powered and connected to ODN

2. ONU has been activated by the OLT Emulator, has been ranged, and a GEM port for OMCI has been created as a result of ONU-ID assignment.
3. The OLT Emulator has instructed the ONU to reset its MIB to factory default values.
4. ONU vendor has provided valid software image to use in testing.

Test Procedure

Omitted in Abstract Test Plan: Refer to http://www.broadband-forum.org/technical/test_cert_programs.php

OMCI Procedure Details

Refer to Annex B

Pass/Fail Criteria

Omitted in Abstract Test Plan: Refer to http://www.broadband-forum.org/technical/test_cert_programs.php

Remarks

Measured/calculated values used in testing:

- Software image size (bytes):
- OLT Window Size (integer): 32
 1. ONU chosen window size (integer):
 2. Number of sections per software image (integer):
 3. Number of windows per software image (integer):
- OLT Window Size (integer): 16
 1. ONU chosen window size (integer):
 2. Number of sections per software image (integer):
 3. Number of windows per software image (integer):
- OLT Window Size (integer): 64
 1. ONU chosen window size (integer):
 2. Number of sections per software image (integer):
 3. Number of windows per software image (integer):

6.10.2 Software Image Download, shortened final window

Test Name

Software Image Download, shortened final window

Test Definition Number

ONU.6.10.2

Reference Document

ITU-T G.988 [2]

Test Type

Conformance

Test Requirement Type

Mandatory

Unit Under Test

ONU

Requirement Description

ITU-T G.988 Appendix I

Test Objective

Verify the ONU is able to perform the software image download procedure under the following conditions:

- i. OLT shortens the final window (if software image is not evenly divisible by the window size) by setting the AR bit in the Download_Section_cmd for the final section of the software image.

Test Configuration

1. ONU is powered and connected to ODN
2. ONU has been activated by the OLT Emulator, has been ranged, and a GEM port for OMCI has been created as a result of ONU-ID assignment.
3. The OLT Emulator has instructed the ONU to reset its MIB to factory default values.

4. ONU vendor has provided valid software image to use in testing.

Test Procedure

Omitted in Abstract Test Plan: Refer to http://www.broadband-forum.org/technical/test_cert_programs.php

OMCI Procedure Details

Pass/Fail Criteria

Omitted in Abstract Test Plan: Refer to http://www.broadband-forum.org/technical/test_cert_programs.php

Remarks

Measured/calculated values used in testing:

1. OLT Window Size (integer): 32
2. Software image size (bytes):
3. ONU chosen window size (integer):
4. Number of sections per software image (integer):
5. Number of windows per software image (integer):

6.10.3 Failed Software Image Download, missing section

Test Name

Failed Software Image Download, missing section

Test Definition Number

ONU.6.10.3

Reference Document

ITU-T G.988 [2]

Test Type

Conformance

Test Requirement Type

Mandatory

Unit Under Test

ONU

Requirement Description

ITU-T G.988 Appendix I

Test Objective

Verify the ONU is able to detect a gap in the section number within the Download_Section_cmd, and report the error to the OLT.

Test Configuration

1. ONU is powered and connected to ODN.
2. ONU has been activated by the OLT Emulator, has been ranged, and a GEM port for OMCI has been created as a result of ONU-ID assignment.
3. The OLT Emulator has instructed the ONU to reset its MIB to factory default values.
4. ONU vendor has provided valid software image to use in testing.

Test Procedure

Omitted in Abstract Test Plan: Refer to http://www.broadband-forum.org/technical/test_cert_programs.php

OMCI Procedure Details

Refer to Annex B

Pass/Fail Criteria

Omitted in Abstract Test Plan: Refer to http://www.broadband-forum.org/technical/test_cert_programs.php

Remarks

Measured/calculated values used in testing:

- OLT Window Size (integer): 32
- Software image size (bytes):
- ONU chosen window size (integer):
- Number of sections per software image (integer):
- Number of windows per software image (integer):

6.10.4 Failed Software Image Download, incorrect section CRC

Test Name

Failed Software Image Download, incorrect section CRC

Test Definition Number

ONU.6.10.4

Reference Document

ITU-T G.988 [2]

Test Type

Conformance

Test Requirement Type

Mandatory

Unit Under Test

ONU

Requirement Description

ITU-T G.988 Appendix I

Test Objective

Verify the ONU is able to detect and report an incorrect CRC for an OMCI message transporting a Download_Section_cmd.

Test Configuration

1. ONU is powered and connected to ODN.
2. ONU has been activated by the OLT Emulator, has been ranged, and a GEM port for OMCI has been created as a result of ONU-ID assignment.
3. The OLT Emulator has instructed the ONU to reset its MIB to factory default values.
4. ONU vendor has provided valid software image to use in testing.

Test Procedure

Omitted in Abstract Test Plan: Refer to http://www.broadband-forum.org/technical/test_cert_programs.php

OMCI Procedure Details

Refer to Annex B

Pass/Fail Criteria

Omitted in Abstract Test Plan: Refer to http://www.broadband-forum.org/technical/test_cert_programs.php

Remarks

Measured/calculated values used in testing:

- OLT Window Size (integer): 32
- Software image size (bytes):
- ONU chosen window size (integer):
- Number of sections per software image (integer):
- Number of windows per software image (integer):

6.10.5 Failed Software Image Download, incorrect software image CRC

Test Name

Failed Software Image Download, incorrect software image CRC

Test Definition Number

ONU.6.10.5

Reference Document

ITU-T G.988 [2]

Test Type

Conformance

Test Requirement Type

Mandatory

Unit Under Test

ONU

Requirement Description

ITU-T G.988 Appendix I

Test Objective

Verify the ONU is able to detect and report an incorrect CRC for the complete software image after the OLT issues the End_Software_Download_command. It is assumed the software image was transferred to the ONU without error.

Test Configuration

1. ONU is powered and connected to ODN.
2. ONU has been activated by the OLT Emulator, has been ranged, and a GEM port for OMCI has been created as a result of ONU-ID assignment.

3. The OLT Emulator has instructed the ONU to reset its MIB to factory default values.
4. ONU vendor has provided valid software image to use in testing.
5. ONU must have passed tests ONU-6.10.1 and ONU-6.10.2.

Test Procedure

Omitted in Abstract Test Plan: Refer to http://www.broadband-forum.org/technical/test_cert_programs.php

OMCI Procedure Details**Pass/Fail Criteria**

Omitted in Abstract Test Plan: Refer to http://www.broadband-forum.org/technical/test_cert_programs.php

Remarks

Measured/calculated values used in testing:

- OLT Window Size (integer): 32
- Software image size (bytes):
- ONU chosen window size (integer):
- Number of sections per software image (integer):
- Number of windows per software image (integer):

6.10.6 Test Case Reserved For Future Use

6.10.7 Activate uncommitted software image

Test Name

Activate uncommitted software image

Test Definition Number

ONU.6.10.7

Reference Document

ITU-T G.988 [2]

Test Type

Conformance

Test Requirement Type

Mandatory

Unit Under Test

ONU

Requirement Description

ITU-T G.988 Appendix I

Test Objective

This test verifies the ONU is able to activate an uncommitted, valid software image, which may have been newly downloaded to the ONU (outside the scope of this test). Once the uncommitted software image is running, the ONU is power cycled to ensure it falls back to the committed software image.

Test Configuration

1. ONU is powered and connected to ODN
2. ONU has been activated by the OLT Emulator, has been ranged, and a GEM port for OMCI has been created as a result of ONU-ID assignment.
3. The OLT Emulator has instructed the ONU to reset its MIB to factory default values.

4. ONU has two valid software images loaded, one must be committed and active, the other must be uncommitted, and inactive.
(This may require the OLT Emulator to download a new, valid software image to the ONU).

Test Procedure

Omitted in Abstract Test Plan: Refer to http://www.broadband-forum.org/technical/test_cert_programs.php

OMCI Procedure Details

Refer to Annex B

Pass/Fail Criteria

Omitted in Abstract Test Plan: Refer to http://www.broadband-forum.org/technical/test_cert_programs.php

Remarks

- None

6.10.8 Commit software image**Test Name**

Commit software image

Test Definition Number

ONU.6.10.8

Reference Document

ITU-T G.988 [2]

Test Type

Conformance

Test Requirement Type

Mandatory

Unit Under Test

ONU

Requirement Description

ITU-T G.988 Appendix I

Test Objective

This test verifies the ONU is able to commit a valid software image.

Test Configuration

1. ONU is powered and connected to ODN
2. ONU has been activated by the OLT Emulator, has been ranged, and a GEM port for OMCI has been created as a result of ONU-ID assignment.
3. The OLT Emulator has instructed the ONU to reset its MIB to factory default values.
4. ONU has two valid software images loaded, one must be committed and active, the other must be uncommitted, and inactive.

Note: This may require the OLT Emulator to download a new, valid software image to the ONU.

5. ONU has passed test ONU-6.10.7.

Test Procedure

Omitted in Abstract Test Plan: Refer to http://www.broadband-forum.org/technical/test_cert_programs.php

OMCI Procedure Details

Refer to Annex B

Pass/Fail Criteria

Omitted in Abstract Test Plan: Refer to http://www.broadband-forum.org/technical/test_cert_programs.php

Remarks

- None

6.11 Circuit Packs

6.11.1 Test Case Reserved For Future Use

6.11.2 Test Case Reserved For Future Use

6.11.3 Cardholder or port mapping package for integrated ONU

Test Name

Cardholder match or port mapping package for integrated ONU

Test Definition Number

ONU.6.11.3

Reference Document

ITU-T G.988 [2]

Test Type

Conformance

Test Requirement Type

Conditionally Mandatory (integrated ONU devices)

Unit Under Test

ONU

Requirement Description

ITU-T G.988 Appendix I

Test Objective

To verify that the ONU is able to instantiate the cardholder or port mapping package without any configuration coming from the OLT

Test Configuration

1. OLT emulator and ONU under test are connected to the ODN.
2. ONU under test is power off
3. ONU activation and OMCC establishment processes have been successfully completed.

Test Procedure

Omitted in Abstract Test Plan: Refer to http://www.broadband-forum.org/technical/test_cert_programs.php

OMCI Procedure Details

Refer to Annex B

Pass/Fail Criteria

Omitted in Abstract Test Plan: Refer to http://www.broadband-forum.org/technical/test_cert_programs.php

Remarks

- None

6.11.4 Test Case Reserved For Future Use

6.11.5 Test Case Reserved For Future Use

6.11.6 Test Case Reserved For Future Use

Annex A: Test Case Template

Test Name

Descriptive name of test.

Test Definition Number

Test Definition Number = *ABC-x.y* where:

ABC Code identifying test type, as defined in the Test Plan:

- **ONU** for ONU Conformance Tests

x Subsection number from ID-247 within which this test is defined.

y Number of the test case.

Reference Document

BBF TR-156

ITU-T G.988,

Etc.

Test Type

Conformance

Test Requirement Type

Indicate if the test case is Mandatory or Optional. In general, test cases that verify mandatory (MUST) requirements would be defined as mandatory and test cases that verify optional (SHOULD/MAY) requirements will be defined as optional. However, the ultimate decision resides with the developers of this test plan.

Tests that address a subset of device types, should be noted within this field. For example, tests that are mandatory only for multi-subscriber ONUs are classified as “Mandatory for multiple user port devices”.

Unit Under Test

ONU

Requirement Description

List of requirements from the appropriate specification(s) that are applicable for this test. Note: A test case should test as small a set of requirements as is practical.

Test Objective

Succinct description of the test purpose

Test Configuration

Preconditions description if needed

Succinct description of the test configuration like GEM port/TCONT usage, VIDs, P-bit, etc. A test configuration schematic may also be used to add clarity to the test configuration description.

Test Procedure

Description of the test procedure considering that OMCI verification is part of the test procedure but described in a dedicated section

OMCI Procedure Details

Pointer to a specific annex with OMCI Implementation description (List of impacted ME and messages exchanges) Not required for interoperability tests.

Pass/Fail Criteria

A detailed description of the criteria upon which to base a pass/fail determination.

Remarks

Description of any particular observations that might affect the test result

Annex B: OMCI Procedure Details

The OMCI message sequences used in implementing the test cases described in this document are available in ID-284 [8]
The schema used by those message sequences is available in ID-283 [7].

Annex C: OMCI Scrambler Principle of Operation

The OMCI scrambler operation used by the OLT emulator for ONU conformance testing shall operate with respect to the following common principles and rules:

Omitted in Abstract Test Plan: Refer to http://www.broadband-forum.org/technical/test_cert_programs.php

Annex D: OMCI Scrambler Example Implementation

```
import java.io.*;
import java.util.Scanner;

class OMCIcommand {
    public String comment;
    public String source;
    public String type;
    public String cmd;
    public String MEID;
    public String[] attr;
    public String[] attrName;
    public String[] attrValue;
    public int order;
}

public class OMCI_Scrambler {

    public static void main(String[] args) throws IOException {
        Scanner s = null;
        FileWriter w = null;
        FileWriter log = null;
        String Line = null;
        String Temp = null;
        String[] TableAttr = null;
        int MaxCmdCnt = 1024;
        OMCIcommand[] Commands = new OMCIcommand[MaxCmdCnt];
        String LogStr = new String();
        String commandTemp = new String();
        int row = 0;
        int n = 0;
    }
}
```



```
int i = 0;
int j = 0;
int cand;
int position = 1;
int loopcnt = 0;

String Attrboundary = ",";
String ErrLogName = "errLog.txt";

if(0 == args.length)
{
    System.out.println("pls input the sorce file name with .txt");
    return;
}

try {
    s = new Scanner(new BufferedReader(new FileReader(args[0].toString())));
    // s.useDelimiter("\\\\(\\n|\\f|\\r|\\t)*");
    s.useDelimiter(",");
    while (s.hasNext()) {
        row++;
        Line = s.next().trim();
        if (Line.contains("//"))
        {
            commandTemp = Line.split("//")[1].trim();
        }

        Line = Line.split("//")[0];
        if (!Line.isEmpty()) {

            /* Line has no '(' or '>'; skip and log err */
            if ((!Line.contains("(") || (!Line.contains(")")))) {
                try {
```

```

        log = new FileWriter(ErrLogName, true);
        // log error and return;
        LogStr = row + "  Attrs Not Find '(' or ')' \n\r";
        System.out.println(LogStr);
        log.append(LogStr);

    } finally {
        if (log != null) {
            log.close();
        }
    }

    continue;
}

/* TableAttr input format check */
if (Line.contains("[") {
    /*
     * if tableAttr different counters of '[' and ']',skip
     * and log err
     */
    boolean flag = false;
    if (Line.split("\\[").length != Line.split("\\]").length) {
        try {

            log = new FileWriter(ErrLogName, true);
            // log error and return;
            LogStr = row
                + "  TableAttr counter of '[' different form ']' \n\r";
            System.out.println(LogStr);
            log.append(LogStr);
        } finally {
            if (log != null) {

```

```
        log.close();
    }
}
continue;
}

Temp = Line.substring(Line.indexOf('[', Line
    .lastIndexOf(']') + 1);
TableAttr = new String[Temp.split("\\]").length];
TableAttr = Temp.split("\\]");
for (i = 0; i < TableAttr.length; i++) {
    if (TableAttr[i].contains(",")) {
        try {
            log = new FileWriter(ErrLogName, true);
            // log error and return;
            LogStr = row
                + "    TableAttr Find ',\n\r";
            System.out.println(LogStr);
            log.append(LogStr);
            flag = true;
            break;
        } finally {
            if (log != null) {
                log.close();
            }
        }
    }
}

if (flag) {
```

```
                continue;
            }
        }

        if (n >= MaxCmdCnt) {
            System.out.println("too many cmds to process !!");
            return;
        }

        Commands[n] = new OMCIcommand();

        if(!commandTemp.isEmpty())
        {
            Commands[n].comment = "/" + commandTemp.trim();
            commandTemp = "";
        }
        else
        {
            Commands[n].comment = "";
        }

        Commands[n].order = 0;
        Commands[n].source = Line;

        Commands[n].type = Line.split("\\(")[0].trim();

        Line = Line.split("\\(")[1];
        Line = Line.split("\\)")[0].trim();

        Commands[n].cmd = Line.split(Attrboundary, 3)[0].trim();
        Commands[n].MEID = Line.split(Attrboundary, 3)[1].trim();
        if (Line.split(Attrboundary, 3).length == 2) {
```

```
        Commands[n].attr = new String[0];
    } else {
        Line = Line.split(Attrboundary, 3)[2];
        Commands[n].attr = Line.split(Attrboundary);
    }
    int L = Commands[n].attr.length;
    Commands[n].attrName = new String[L];
    Commands[n].attrValue = new String[L];
    for (j = 0; j < L; j++) {
        Commands[n].attrName[j] = Commands[n].attr[j]
            .split("=")[0].trim();
        Commands[n].attrValue[j] = Commands[n].attr[j]
            .split("=")[1].trim();
    }
    n++;
}
else
{

}

}
} finally {
    if (s != null) {
        s.close();
    }
}

/* check if exists create cmd */
```

```
boolean errExist = false;
for (i = 0; i < n; i++) {
    if (Commands[i].cmd.compareToIgnoreCase("Set") == 0
        && (!Commands[i].MEID.contains("!"))) {
        for (j = 0; j < n; j++) {
            if ((Commands[j].cmd.compareToIgnoreCase("Create") == 0)
                && (Commands[j].MEID.compareTo(Commands[i].MEID) == 0)) {
                break;
            }
        }
        if (j >= n) {
            errExist = true;

            /* err log */
            try {
                log = new FileWriter(ErrLogName, true);
                // log error and return;
                LogStr = row + "  Entity " + Commands[i].type
                    + " MeID " + Commands[i].MEID
                    + " has no create msg\n\r";
                System.out.println(LogStr);
                log.append(LogStr);

            } finally {
                if (log != null) {
                    log.close();
                }
            }
        }
    }
}
```

```
    }  
    if (errExist) {  
        return;  
    }  
    try {  
        String FormatFileName = "FormattedOriginal.txt";  
        w = new FileWriter(FormatFileName);  
        for (i = 0; i < n; i++) {  
            String Reconst = new String();  
            if (Commands[i].comment.contains("//"))  
            {  
                Reconst = Commands[i].comment + "\r\n";  
                w.write(Reconst);  
            }  
            Reconst = Commands[i].type + "(" + Commands[i].cmd  
                + Attrboundary + Commands[i].MEID;  
            for (j = 0; j < Commands[i].attr.length; j++) {  
                Reconst = Reconst + ", " + Commands[i].attrName[j] + "="  
                    + Commands[i].attrValue[j];  
            }  
            Reconst = Reconst + "); \r\n";  
            w.write(Reconst);  
        }  
    } finally {  
        if (w != null) {  
            w.close();  
        }  
    }  
}
```

```
    }

    position = 1;
    loopcnt = 0;
    do {
        int count = (int) (Math.random() * (n - position + 1));
        j = -1;
        cand = -1;
        do {
            j++;
            if (Commands[j].order == 0) {
                cand++;
            }
        } while (count != cand);
        cand = j;
        loopcnt++;
        if (loopcnt > 1000) {
            System.out.println("err happen, excessive looping !!");
            try {
                log = new FileWriter(ErrLogName, true);
                // log error and return;
                LogStr = " err!! check the errlog \n\r";
                log.append(LogStr);

            } finally {
                if (log != null) {
                    log.close();
                }
            }
        }

        return;
    }
    if (Commands[cand].order == 0) {
```



```

boolean valid = false;
/* This loop is the test that a SET comes after the corresponding CREATE */
if ((Commands[cand].cmd.compareToIgnoreCase("Set") == 0)
    && (!Commands[cand].MEID.contains("!"))) {
    for (i = 0; i < n; i++) {
        if ((Commands[i].order > 0)
            && (Commands[i].cmd
                .compareToIgnoreCase("Create") == 0)
            && Commands[i].MEID
                .compareTo(Commands[cand].MEID) == 0) {
                valid = true;
                break;
            }
    }
} else {
    valid = true;
}

if (valid) { /*This loop is the test that pointer Attr happen after the corresp. CREATE */
    for (j = 0; j < Commands[cand].attr.length; j++) {
        if (!Commands[cand].attrValue[j].contains("!")) {
            for (i = 0; i < n; i++) {
                if ((Commands[cand].attrValue[j]
                    .compareTo(Commands[i].MEID) == 0)
                    && (Commands[i].cmd
                        .compareToIgnoreCase("Create") == 0)
                    && (Commands[i].order == 0)) {
                        valid = false;
                        break;
                    }
            }
        }
    }

    if (valid == false) {

```

```

        break;
    }
}

}

}

if (valid) { /*This loop is the test that VLAN table set happens after the corresp. VLAN SET's*/
    if ( (Commands[cand].type.compareTo("Ext_VLAN_Tagging_Opr_Config_Data") == 0)
        && (Commands[cand].attrName[0].contains("RcvFrameVLANTagOperTbl")) ) {
        for (i = 0; i < n; i++) {
            if ( (Commands[i].order == 0) &&

(Commands[i].type.compareTo("Ext_VLAN_Tagging_Opr_Config_Data") == 0) ) {
                for (j = 0; j < Commands[i].attr.length; j++) {
                    if ((Commands[i].attrName[j].contains("InputTPID")) ||
                        (Commands[i].attrName[j].contains("OutputTPID"))) {
                        valid = false;
                        break;
                    }
                }
            }
            if (valid == false) {
                break;
            }
        }
    }
}

}

if (valid) {
    Commands[cand].order = position;
    position++;
    loopcnt = 0;
}

```

```

        }
    }
} while (position <= n);

try {
    String ScrambledFileName = "ScrambledOriginal.txt";
    w = new FileWriter(ScrambledFileName);
    for (position = 1; position <= n; position++) {
        for (i = 0; i < n; i++) {
            if (Commands[i].order == position) {

                String Reconst = new String();
                Reconst = Commands[i].type + "(" + Commands[i].cmd
                    + ", " + Commands[i].MEID;
                for (j = 0; j < Commands[i].attr.length; j++) {
                    Reconst = Reconst + ", " + Commands[i].attrName[j]
                        + "=" + Commands[i].attrValue[j];
                }
                Reconst = Reconst + "); \r\n";
                w.write(Reconst);
            }
        }
    }
} finally {
    if (w != null) {
        w.close();
    }
}

/* create --> create + set */
/* set --> set + set */
/*{
    int currentN = n;

```

```
for (i = 0; i < currentN; i++) {
    if ((Commands[i].cmd.compareToIgnoreCase("Create") == 0)
        || ((Commands[i].cmd.compareToIgnoreCase("Set") == 0) && (Commands[i].attr.length
> 1))) {
        for (j = 0; j < Commands[i].attr.length; j++) {

            if (n >= MaxCmdCnt) {
                System.out.println("too many cmds to process !!");
                continue;
            }

            Commands[n] = new OMCIcommand();
            Commands[n].comment = "";
            Commands[n].order = 0;
            Commands[n].source = null;

            Commands[n].type = Commands[i].type;
            Commands[n].cmd = "Set";
            Commands[n].MEID = Commands[i].MEID;
            Commands[n].attr = new String[1];

            Commands[n].attrName = new String[1];
            Commands[n].attrValue = new String[1];

            Commands[n].attrName[0] = Commands[i].attrName[j];
            Commands[n].attrValue[0] = Commands[i].attrValue[j];

            n++;
        }
    }
}
```

```
    }  
    try {  
        String FormatFileName = "FormattedSplitted.txt";  
        w = new FileWriter(FormatFileName);  
  
        for (i = 0; i < n; i++) {  
  
            if (Commands[i].comment.contains("//"))  
            {  
                w.write(Commands[i].comment + "\r\n");  
            }  
  
            String Reconst = new String();  
            Reconst = Commands[i].type + "(" + Commands[i].cmd  
                + Attrboundary + Commands[i].MEID;  
            for (j = 0; j < Commands[i].attr.length; j++) {  
                Reconst = Reconst + ", " + Commands[i].attrName[j] + "="  
                    + Commands[i].attrValue[j];  
            }  
            Reconst = Reconst + "); \r\n";  
            w.write(Reconst);  
        }  
    } finally {  
        if (w != null) {  
            w.close();  
        }  
    }  
  
    for(i = 0; i < n; i++)  
    {  
        Commands[i].order = 0;
```

```
    }

    position = 1;
    loopcnt = 0;
    do {
        int count = (int) (Math.random() * (n - position + 1));
        j = -1;
        cand = -1;
        do {
            j++;
            if (Commands[j].order == 0) {
                cand++;
            }
        } while (count != cand);
        cand = j;
        loopcnt++;
        if (loopcnt > 100) {
            System.out.println("err happen, can't halase !!");
            try {
                log = new FileWriter(ErrLogName, true);
                // log error and return;
                LogStr = " err!! check the errlog \n\r";
                log.append(LogStr);

            } finally {
                if (log != null) {
                    log.close();
                }
            }
        }

        return;
    }
```

```
}
if (Commands[cand].order == 0) {
    boolean valid = false;
    if ((Commands[cand].cmd.compareToIgnoreCase("Set") == 0)
        && (!Commands[cand].MEID.contains("!"))) {
        for (i = 0; i < n; i++) {
            if ((Commands[i].order > 0)
                && (Commands[i].cmd
                    .compareToIgnoreCase("Create") == 0)
                && Commands[i].MEID
                    .compareTo(Commands[cand].MEID) == 0) {
                valid = true;
                break;
            }
        }
    } else {
        valid = true;
    }
}

if (valid) {
    for (j = 0; j < Commands[cand].attr.length; j++) {
        if (!Commands[cand].attrValue[j].contains("!")) {
            for (i = 0; i < n; i++) {
                if ((Commands[cand].attrValue[j]
                    .compareTo(Commands[i].MEID) == 0)
                    && (Commands[i].cmd
                        .compareToIgnoreCase("Create") == 0)
                    && (Commands[i].order == 0)) {
                    valid = false;
                    break;
                }
            }
        }
    }
}
```

```

                if (valid == false) {
                    break;
                }
            }
        }
    }

    if (valid) {
        Commands[cand].order = position;
        position++;
        loopcnt = 0;
    }
}
} while (position <= n);

try {
    String ScrambledFileName = "ScrambledSplitted.txt";
    w = new FileWriter(ScrambledFileName);
    for (position = 1; position <= n; position++) {
        for (i = 0; i < n; i++) {

            if (Commands[i].order == position) {
                String Reconst = new String();
                Reconst = Commands[i].type + "(" + Commands[i].cmd
                    + ", " + Commands[i].MEID;
                for (j = 0; j < Commands[i].attr.length; j++) {
                    Reconst = Reconst + ", " + Commands[i].attrName[j]
                        + "=" + Commands[i].attrValue[j];
                }
                Reconst = Reconst + "); \r\n";
                w.write(Reconst);
            }
        }
    }
}

```



```
        }  
    }  
} finally {  
    if (w != null) {  
        w.close();  
    }  
}*/  
}  
}
```

End of Broadband Forum Abstract Test Plan ATP-247