

# **TR-247/ATP-247**

## **Abstract Test Plan for GPON ONU Conformance**

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## Executive Summary

The Broadband Forum develops specifications and tools to help establish an interoperable, competitive environment for G-PON. Interoperability means faster time to market, decreasing costs and increasing market traction through standards based compliance. The Broadband Forum G-PON ONU Certification Program assures that G-PON equipment meets Service Provider requirements for efficient network operation and high quality broadband access options. This means faster procurement/deployment and an expedited time to market.

This Abstract Test Plan (TR-247/ATP-247) for GPON ONU Conformance describes a series of abstract test cases intended for study purposes only, helping vendors assess the scope of the certification program in order to better engage.

The abstract test cases are based on the detailed test cases defined in the Broadband Forum test specification (OD-247/IR-247), which are the measures used in the Broadband Forum Certification Program and available to Broadband Forum members only.

Note: For information about how to obtain a copy of the complete GPON ONU test specification (OD-247/IR-247) or more information on the Broadband Forum certification program visit <http://www.broadband-forum.org/technical/certification.php>

## 1. Purpose and Scope

### 1.1 Purpose

This Abstract Test Plan for GPON ONU Conformance describes a series of abstract test cases intended for study purposes only. These test cases are not intended or sufficient to develop compliant products or test product compliance.

### 1.2 Scope

The abstract test cases defined in this document are based on the detailed test cases defined in Broadband Forum test specification (OD-247/IR-247) which includes all the information required to verify conformance of GPON equipment functionality, and the implementation of the OMCI protocol by that equipment to Broadband Forum TR-156 Issue 2 [3], and the related recommendations from Appendix I and II of G.988 [2].

Note: For information about how to obtain a copy of the complete GPON ONU test specification (OD-247/IR-247) or the Broadband Forum certification program visit <http://www.broadband-forum.org/technical/certification.php>.

## 2. References and Terminology

### 2.1 Conventions

In this Technical Report, 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].

<b>MUST</b>	This word, or the term “REQUIRED”, means that the definition is an absolute requirement of the specification.
<b>MUST NOT</b>	This phrase means that the definition is an absolute prohibition of the specification.
<b>SHOULD</b>	This word, or the adjective “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.
<b>SHOULD NOT</b>	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.
<b>MAY</b>	This word, or the adjective “OPTIONAL”, means that this item is one of an allowed set of alternatives. An implementation that does not include this option <b>MUST</b> be prepared to inter-operate with another implementation that does include the option.

## 2.2 References

The following references are of relevance to this Technical Report. At the time of publication, the editions indicated were valid. All references are subject to revision; users of this Technical Report 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](http://www.broadband-forum.org).

Document	Title	Source	Year
[1] <a href="#">RFC 2119</a>	<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

## 2.3 Definitions

The following terminology is used throughout this Technical Report.

<b>Ethernet Traffic Generator</b>	A device that generates and captures well formed Ethernet frames as defined by test personnel.
<b>GEM Port</b>	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.
<b>GEM Port Id</b>	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.
<b>GPON Analyzer</b>	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
<b>GPON Network</b>	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.
<b>ODN</b>	Optical Distribution Network including the fibers, splitters and connectors.

<b>OLT</b>	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.
<b>OLT Emulator</b>	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 Technical Report.
<b>ONU</b>	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.
<b>T-CONT</b>	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.
<b>Traffic Classes</b>	(TC) - Traffic Classes are the set of upstream and downstream supported forwarding behaviours in the network element
<b>Traffic Flow</b>	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.
<b>U-interface</b>	U-interface is a short form of expressing one or more of the interfaces defined in this Technical Report or in TR-101 at the U reference point. It is also essentially equivalent to a subscriber-facing interface at the access node.
<b>V-interface</b>	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

## 2.4 Abbreviations

This Technical Report uses the following abbreviations:

AES	Advanced Encryption Standard
AN	Access Node
CPN	Customer Premises Network
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
FTTP	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]
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
OLT	Optical Line Termination – as defined in G.984.1
OMCI	ONU Management and Control Interface
ONT	Optical Network Termination – as defined in G.984.1
ONU	Optical Network Unit – as defined in G.984.1
RBN	Regional Broadband Network

RG	Residential Gateway
SFU	Single Family Unit – a type of residence
TLS	Transparent LAN Service – a common synonym for Business Ethernet Services
TR	Technical Report
VDSL	Very high speed Digital Subscriber Line
WG	Working Group
xDSL	Any variety of DSL

### **3. Technical Report Impact**

#### **3.1 Energy Efficiency**

TR-247/ATP-247 has no impact on Energy Efficiency.

#### **3.2 IPv6**

TR-247/ATP-247 has no impact on IPv6.

#### **3.3 Security**

TR-247/ATP-247 has no impact on Security.

#### **3.4 Privacy**

Any issues regarding privacy are not affected by TR-247/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 4.2.5. 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 Test Setup

#### 4.2.1 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 with G.984.3 [4] 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 to the GPON Transmission Convergence layer requirements, specified in ITU-T Recommendation G.984.3, 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.

#### 4.2.2 GPON Analyzer Requirements

The GPON 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] cannot be met.

#### 4.2.3 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 in G.984.2[5], 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.

#### 4.2.4 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 [2] compliant management interface.

#### 4.2.5 Selection of Random Values Used in Test Cases

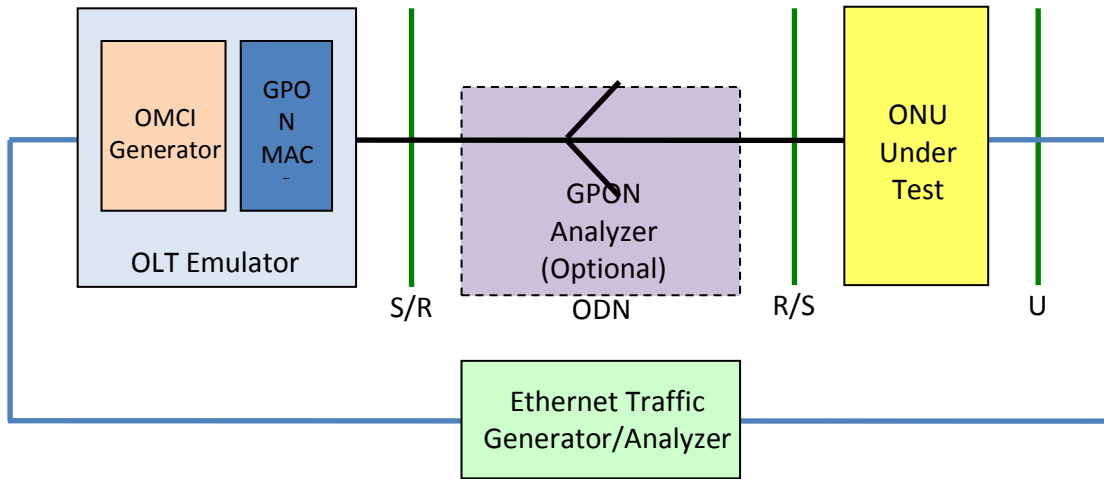
Many of the test cases defined in section 6 require the tester to select random values for attributes such as VID, p-bits, and GEM ports. To ensure a wide coverage of the possible value range of each attribute type, the tester must select the values in a way that provides for testing the entire value 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.

- **R8** The ONU and OLT **MUST** support all VID values from the range: 1-4094 as specified in IEEE 802.1Q, on all ports

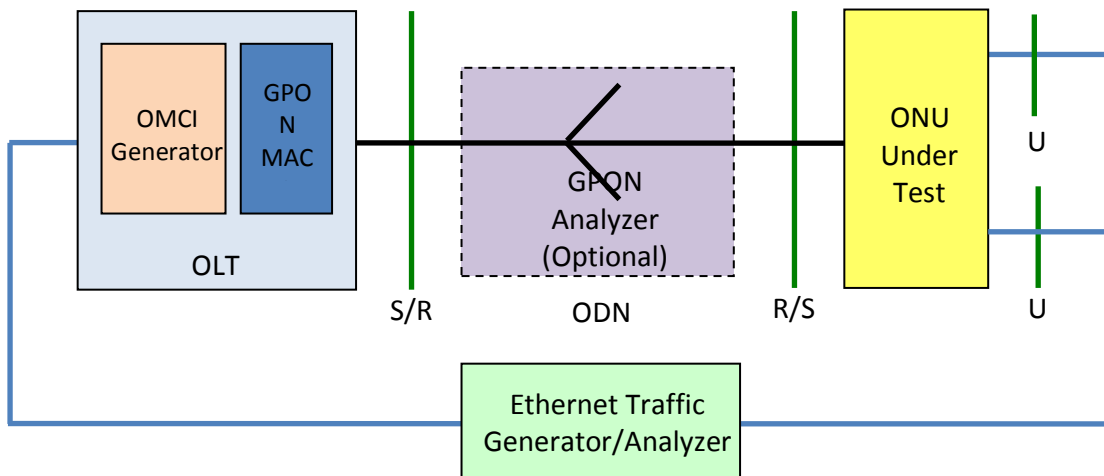
R-14 The selection of random values for attributes used in the test cases **MUST** be performed such that the values are distributed across the possible range for each attribute. This **MUST** include the minimum, maximum and median values for the attribute. This requirement applies to the entirety of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

**4.2.6 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 1 - Basic test setup for ONU conformance testing**



**Figure 2 – Basic test setup for multiple subscriber ONU**

## 5. Test Cases Summary

Test Case		Applicability	
		Single User ONU	Multiple User ONU
Classification and Tagging			
6.1.1	Single untagged U-interface	Mandatory	Mandatory
6.1.2	Single U-interface with symmetric VLAN tag translation	Mandatory	Mandatory
6.1.3	Deriving p-bits as a function of received P-bits (single user port)	Mandatory	Mandatory
6.1.4	Addition of an S-Tag in the Upstream Direction in a VBES Architecture	Mandatory	Mandatory
6.1.5	Validation of an S-Tag in the Upstream Direction in a VBES Architecture	Mandatory	Mandatory
6.1.6	Translation of an S-Tag in the Upstream Direction in a VBES Architecture	Mandatory	Mandatory
6.1.7	Removal of an S-Tag in the Downstream Direction in a VBES Architecture	Mandatory	Mandatory
6.1.8	Translation of an S-Tag in the Downstream Direction in a VBES Architecture	Mandatory	Mandatory
6.1.9	Test Case Reserved for Future Use	N/A	N/A
6.1.10	Deriving p-bits as a function of received VID (single user port)	Mandatory	Mandatory
6.1.11	Deriving p-bits as a function of received Ethertype (single user port)	Mandatory	Mandatory
6.1.12	Deriving p-bits as a function of received user port	N/A	Mandatory
6.1.13	VID Support for Untagged Frames. N:1 VLAN or 1:1 VLAN Single-Tagged at the V Interface	Mandatory	Mandatory
6.1.14	VID Support for Untagged Frames. 1:1 VLAN Double-Tagged at the V Interface	Mandatory	Mandatory
6.1.15	VID Support for Priority Tagged Frames with Priority Preservation. N:1 VLAN or 1:1 VLAN Single-Tagged at the V Interface	Mandatory	Mandatory
6.1.16	VID Support for Priority Tagged Frames without Priority Preservation. N:1 VLAN or 1:1 VLAN Single-Tagged at the V Interface	Mandatory	Mandatory

Test Case		Applicability	
		Single User ONU	Multiple User ONU
Classification and Tagging			
6.1.17	VID Support for Priority Tagged Frames with Priority Preservation. 1:1 VLAN Double-Tagged at the V Interface	Mandatory	Mandatory
6.1.18	VID Support for Priority Tagged Frames without Priority Preservation. 1:1 VLAN Double-Tagged at the V Interface	Mandatory	Mandatory
6.1.19	ONU addition and removal of C-Tag for 1:1 VLANs	Mandatory	Mandatory
6.1.20	ONU addition and removal of S-Tag for 1:1 VLANs	Mandatory	Mandatory
6.1.21	ONU translation between Q-Tag and C-Tag for 1:1 VLANs	Mandatory	Mandatory
6.1.22	ONU translation between Q-Tag and S-Tag for 1:1 VLANs	Mandatory	Mandatory
6.1.23	Test Case Reserved for Future Use	N/A	N/A
Frame Mapping and QoS			
6.2.1	Single U-interface with multiple downstream GEM ports	Mandatory	Mandatory
6.2.2	User Isolation on ONU Devices with Multiple U-interfaces	N/A	Mandatory
6.2.3	Mapping Traffic from GEM Ports to U Interface in the Downstream Direction in a VBES Architecture	Mandatory	Mandatory
6.2.4	Mapping traffic into GEM Ports based on P-bit values in the upstream direction (single user port)	Mandatory	Mandatory
6.2.5	Mapping traffic into GEM Ports based on VID values in the upstream direction (single user port)	Mandatory	Mandatory
6.2.6	Mapping traffic into GEM Ports based on VID & p-bit values in the upstream direction (single user port)	Mandatory	Mandatory
6.2.7	Mapping traffic into GEM Ports based on P-bit values in the upstream direction (multiple user port)	N/A	Mandatory
6.2.8	Mapping traffic into GEM Ports based on VID values in the upstream direction (multiple user port)	N/A	Mandatory
6.2.9	Mapping traffic into GEM Ports based on VID & p-bit values in the upstream direction (multiple user port)	N/A	Mandatory
6.2.10	Mapping multiple p-bit values to the same GEM port (single user port).	Mandatory	Mandatory

Test Case		Applicability	
		Single User ONU	Multiple User ONU
Frame Mapping and QoS			
6.2.11	Test Case Reserved for Future Use	N/A	N/A
6.2.12	Strict priority downstream scheduling among 4 queues on ONU	Mandatory	Mandatory
6.2.13	Indicating drop precedence using p-bits upstream	Mandatory	Mandatory
6.2.14	Indicating drop precedence using DEI bit upstream	Mandatory	Mandatory
6.2.15	Indicating drop precedence using p-bits downstream	Mandatory	Mandatory
6.2.16	Indicating drop precedence using DEI bit downstream	Mandatory	Mandatory
6.2.17	Test Case Reserved for Future Use	N/A	N/A
6.2.18	Test Case Reserved for Future Use	N/A	N/A
6.2.19	Mapping Traffic from GEM Ports to Multiple U Interfaces in the Downstream Direction (VBES)	N/A	Mandatory
6.2.20	Mapping Traffic from GEM Ports to U Interface in the Downstream Direction in a 1:1 VLAN Architecture	Mandatory	Mandatory
6.2.21	Mapping Traffic from GEM Ports to Multiple U Interfaces in the Downstream Direction (1:1 VLAN Architecture)	N/A	Mandatory
6.2.22	Test Case Reserved for Future Use	N/A	N/A
6.2.23	Test Case Reserved for Future Use	N/A	N/A
6.2.24	Test Case Reserved for Future Use	N/A	N/A
IGMP Controlled Multicast			
6.3.1	ONU passing of downstream IGMP messages	Mandatory	Mandatory
6.3.2	Test Case Reserved for Future Use	N/A	N/A

Test Case		Applicability	
		Single User ONU	Multiple User ONU
IGMP Controlled Multicast			
6.3.3	ONU silent discarding of IGMPv1 messages	Mandatory	Mandatory
6.3.4	Test Case Reserved for Future Use	N/A	N/A
6.3.5	Marking Upstream IGMP Messages with Ethernet P-Bits	Mandatory	Mandatory
6.3.6	IGMP controlled Multicast	Mandatory	Mandatory
6.3.7	Multicast White List	Mandatory	Mandatory
6.3.8	IGMP rate limit	Mandatory	Mandatory
6.3.9	IGMP immediate leave	Mandatory	Mandatory
6.3.10	Maximum number of multicast flows	Mandatory	Mandatory
6.3.11	IGMP transparent Snooping	Mandatory	Mandatory
6.3.12	Multicast VLAN membership based on user ports (Multiple User ports)	N/A	Mandatory
6.3.13	IGMP transparent Snooping (Multiple User ports)	N/A	Mandatory
Non-IGMP Controlled Multicast and Broadcast			
6.4.1	Downstream Broadcast Handling, Single U-interface	Mandatory	Mandatory
6.4.2	Downstream Broadcast Handling, Multiple U-interfaces	N/A	Mandatory
Filtering			
6.5.1	Test Case Reserved for Future Use	N/A	N/A
6.5.2	Test Case Reserved for Future Use	N/A	N/A



Test Case		Applicability	
		Single User ONU	Multiple User ONU
Filtering			
6.5.3	Test Case Reserved for Future Use	N/A	N/A
6.5.4	Test Case Reserved for Future Use	N/A	N/A
6.5.5	Test Case Reserved for Future Use	N/A	N/A
6.5.6	Test Case Reserved for Future Use	N/A	N/A
6.5.7	Test Case Reserved for Future Use	N/A	N/A
6.5.8	Test Case Reserved for Future Use	N/A	N/A
6.5.9	Test Case Reserved for Future Use	N/A	N/A
TR-156 Other			
6.6.1	2000-Byte Frames Supported by the ONU	Mandatory	Mandatory
6.6.2	Test Case Reserved for Future Use	N/A	N/A
Initial Provisionning of ONU			
6.7.1	Local setting of a registration ID at the ONU (ONU retains the Registration ID indefinitely)	Mandatory	Mandatory
ONU Bring-Up			
6.8.1	New ONU Bring-up method on new ONU	Mandatory	Mandatory
6.8.2	New ONU Bring-up method for old ONU	Mandatory	Mandatory
6.8.3	Old ONU Bring-up method for ONU	Mandatory	Mandatory
6.8.4	New ONU Bring-up method for new ONU with encrypted OMCC	Mandatory	Mandatory

Test Case		Applicability	
		Single User ONU	Multiple User ONU
MIB and Alarm Synchronization			
6.9.1	Alarm synchronization	Mandatory	Mandatory
6.9.2	MIB synchronization : Correct Data Sync	Mandatory	Mandatory
6.9.3	MIB synchronization : MIB Upload	Mandatory	Mandatory
Software Image Download			
6.10.1	Software Image Download, multiple window sizes, padded final window	Mandatory	Mandatory
6.10.2	Software Image Download, shortened final window	Mandatory	Mandatory
6.10.3	Failed Software Image Download, missing section	Mandatory	Mandatory
6.10.4	Failed Software Image Download, incorrect section CRC	Mandatory	Mandatory
6.10.5	Failed Software Image Download, incorrect software image CRC	Mandatory	Mandatory
6.10.6	Test Case Reserved for Future Use	N/A	N/A
6.10.7	Activate uncommitted software image	Mandatory	Mandatory
6.10.8	Commit software image	Mandatory	Mandatory
Circuit Packs			
6.11.1	Test Case Reserved for Future Use	N/A	N/A
6.11.2	Test Case Reserved for Future Use	N/A	N/A
6.11.3	Cardholder match or port mapping package for integrated ONU. Mandatory for an integrated ONU	Conditional Mandatory	Conditional Mandatory
6.11.4	Test Case Reserved for Future Use	N/A	N/A
6.11.5	Test Case Reserved for Future Use	N/A	N/A
6.11.6	Test Case Reserved for Future Use	N/A	N/A

## 6. ONU Conformance Tests

The following abstract test cases are intended for study purposes only. For the detailed test cases please refer to Broadband Forum OD-247/IR-247. Note: For information about how to obtain a copy of the complete GPON ONU test specification (OD-247/IR-247) or the Broadband Forum certification program visit <http://www.broadband-forum.org/technical/certification.php>.

Each of the following abstract test cases identifies the specific TR-156 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 abstract 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

### Test Case 6.1.1: Single Untagged U-Interface

Abstract Test Plan for GPON ONU Conformance	
Test Name	Single Untagged U-Interface
Test Definition ID	ONU.6.1.1
Reference Document	BBF TR-156i2 [3] ITU-T G.988 [2]
Test Type	Conformance
Test Status	Mandatory
Requirement(s) Description	<p><b>BBF TR-156i2</b></p> <p><b>R-10</b> The ONU <b>MUST</b> support adding an S-Tag to upstream untagged traffic received from the U-interface.</p> <p><b>R-11</b> The ONU <b>MUST</b> support removing an S-Tag from downstream traffic received from the OLT.</p> <p><b>R-19</b> The ONU <b>MUST</b> support mapping traffic from one or more GEM Ports to a U-interface in the downstream direction.</p> <p><b>R-82</b> The ONU and OLT <b>MUST</b> 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.</p>
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. Note that only the default behaviour described in the second half of R-82 is verified in this test.
Test Configuration	<ul style="list-style-type: none"> <li>The ONU is powered and connected to ODN.</li> <li>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.</li> <li>The OLT Emulator has instructed the ONU to reset its MIB to factory default values.</li> <li>The Ethernet Traffic Generator/Analyzer is configured to transmit Ethernet frames upstream with the following parameters: <ul style="list-style-type: none"> <li>Stream A: Untagged unicast</li> <li>Stream B: C-tagged unicast (any CVID)</li> <li>Stream C: S-tagged unicast (any SVID)</li> <li>Stream D: Untagged multicast</li> </ul> </li> <li>The OLT Emulator is configured to transmit Ethernet frames downstream with the following parameters: <ul style="list-style-type: none"> <li>Stream E: S-tagged unicast (SVID1)</li> </ul> </li> </ul> <p>Note: Only 1 user traffic is configured on the ONU requiring 1 GEM port (Alloc-ID, T-CONT, Port-ID).</p>
Test Procedure	<ul style="list-style-type: none"> <li>Select a random value for SVID1 between 1 and 4094 and select random values for the MAC addresses.</li> <li>Configure the OLT Emulator to provision the ONU to support: A single untagged U-interface, Addition/removal of the S-Tag in the upstream/downstream directions, respectively</li> <li>Cause the OLT Emulator to request the ONU to upload its current MIB.</li> <li>Enable any frame capture mechanisms on the OLT Emulator.</li> <li>Cause the Ethernet Traffic Generator to transmit upstream frame(s) described in Streams A, B, C, D. Stream D frames must contain IGMP join reports.</li> <li>Enable any frame capture mechanisms on the Ethernet Traffic Generator.</li> <li>Cause the OLT Emulator to transmit downstream frame(s) described in Streams E.</li> </ul>
Pass/Fail Criteria	<p>The test passes if the following are true, otherwise the test fails:</p> <ol style="list-style-type: none"> <li>Each OMCI response message shall indicate success for the associated create or set command.</li> <li>The uploaded ONU MIB shall be consistent with the MIB held in the OLT Emulator</li> <li>All upstream frame(s) from Stream A and D shall have been received as S-tagged frame(s) with the VID equal to SVID1 and TPID=0x88A8.</li> <li>All downstream frame(s) from Stream E shall have been received as untagged frame(s).</li> <li>No upstream frame(s) from Streams B and C shall have been received (e.g. the frames are silently discarded by the ONU).</li> </ol>
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.

**Test Case 6.1.2: Single U-Interface with Symmetric VLAN Tag Translation**

Abstract Test Plan for GPON ONU Conformance	
Test Name	Single U-Interface with Symmetric VLAN Tag Translation
Test Definition ID	ONU.6.1.2
Reference Document	BBF TR-156i2 [3] ITU-T G.988 [2]
Test Type	Conformance
Test Status	Mandatory
Requirement(s) Description	<p><b>BBF TR-156i2</b></p> <p><b>R-12</b> The ONU <b>MUST</b> support unique, symmetric translation of Q-Tag VIDs received from the U-interface into S-Tag VIDs.</p> <p><b>R-13</b> The ONU <b>MUST</b> 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.</p> <p><b>R-19</b> The ONU <b>MUST</b> support mapping traffic from one or more GEM Ports to a U-interface in the downstream direction.</p>
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	<ul style="list-style-type: none"> <li>• ONU is powered and connected to ODN.</li> <li>• 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.</li> <li>• The OLT Emulator has instructed the ONU to reset its MIB to factory default values.</li> <li>• The Ethernet Traffic Generator/Analyzer is configured to transmit Ethernet frames upstream with the following parameters: <ul style="list-style-type: none"> <li>Stream A: C-tagged unicast (CVID1, CPbits1)</li> <li>Stream B: C-tagged unicast (any CVID except CVID1)</li> <li>Stream C: S-tagged unicast (SVID1)</li> <li>Stream D: Untagged unicast</li> </ul> </li> <li>• The OLT Emulator is configured to transmit Ethernet frames downstream with the following parameters: <ul style="list-style-type: none"> <li>Stream E: S-tagged unicast (SVID2, SPbits1)</li> </ul> </li> </ul> <p>Note: Only 1 user traffic class is configured on the ONU, requiring 1 GEM port (Alloc-ID, T-CONT, Port-ID).</p>
Test Procedure	<ul style="list-style-type: none"> <li>• Select random values for CVID1 and SVID2 between 1 and 4094, which shall not be the same value and select random values for the MAC addresses.</li> <li>• Configure the OLT Emulator to provision the ONU to support: A single U-interface, with Q-Tag CVID1 and VLAN tag translation between CVID1 and SVID2.</li> <li>• Cause the OLT Emulator to request the ONU to upload its current MIB.</li> <li>• Enable any frame capture mechanisms on the OLT Emulator.</li> <li>• Cause the Ethernet Traffic Generator to transmit the upstream frame(s).</li> <li>• Enable any frame capture mechanisms on the Ethernet Traffic Generator.</li> <li>• Cause the OLT Emulator to transmit the downstream frame(s).</li> </ul>
Pass/Fail Criteria	<p>The test passes if the following are true, otherwise the test fails:</p> <ol style="list-style-type: none"> <li>1. Each OMCI response message shall indicate success for the associated create or set command.</li> <li>2. The uploaded ONU MIB shall be consistent with the MIB held in the OLT Emulator</li> <li>3. All upstream frame(s) from Stream-A received by the OLT Emulator shall be tagged with SVID2, with TPID = 0x88A8.</li> <li>4. All downstream frame(s) from Stream-E received by the Ethernet Traffic Generator shall be tagged with CVID1, with TPID=0x8100.</li> <li>5. Any p-bit value used shall not be changed between the S/R and U-interfaces.</li> <li>6. No upstream frame(s) from Streams B, C, and D shall have been received (e.g. the frames are silently discarded by the ONU).</li> </ol>
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.

**Test Case 6.1.3: Deriving P-bits as a Function of Received P-bits (Single User Port)**

Abstract Test Plan for GPON ONU Conformance	
Test Name	Deriving P-bits as a Function of Received P-bits (Single User Port).
Test Definition ID	ONU.6.1.3
Reference Document	BBF TR-156i2 [3] ITU-T G.988 [2]
Test Type	Conformance
Test Status	Mandatory
Requirement(s) Description	<b>BBF TR-156i2</b> <b>R-48</b> The ONU <b>MUST</b> 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	<ul style="list-style-type: none"> <li>• For this test, only a single user port is assumed.</li> <li>• 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 streams based on different p-bit values at the U-interface. Each stream will have an S-tag with a different p-bit value.</li> <li>• The Ethernet Traffic Generator/Analyzer is configured to transmit Ethernet frames at the U interface upstream with the following parameters: <ul style="list-style-type: none"> <li>Stream A: C-tagged unicast (CVID1, CPbits1)</li> <li>Stream B: C-tagged unicast (CVID1, CPbits3)</li> </ul> </li> <li>• The traffic corresponding to each stream will have a different p-bit marking at the S/R interface as follows: <ul style="list-style-type: none"> <li>Stream A: S-tagged unicast (SVID1, SPbits1)</li> <li>Stream B: S-tagged unicast (SVID1, SPbits2)</li> </ul> </li> </ul>
Test Procedure	<ul style="list-style-type: none"> <li>• Inject tagged traffic at the U interface with the specified p-bit values and verify that specified p-bit values are observed at the S/R-interface.</li> </ul>
Pass/Fail Criteria	The test passes if the following are true, otherwise the test fails: <ol style="list-style-type: none"> <li>1. All OMCI commands have Success responses</li> <li>2. A MIB upload and compare matches the MIB expected by the OLT</li> <li>3. The resulting p-bit values in each of the tests above is as specified.</li> </ol>
Remarks	None

**Test Case 6.1.4: Addition of an S-Tag in the Upstream Direction in a VBES Architecture**

Abstract Test Plan for GPON ONU Conformance	
Test Name	Addition of an S-Tag in the Upstream Direction in a VBES Architecture
Test Definition ID	ONU.6.1.4
Reference Document	BBF TR-156i2 [3] ITU-T G.988 [2]
Test Type	Conformance
Test Status	Mandatory
Requirement(s) Description	<b>BBF TR-156i2</b> <b>R-34</b> The ONU <b>MUST</b> 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	<ul style="list-style-type: none"> <li>OLT Emulator and ONU under test are powered and connected to ODN.</li> <li>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.</li> <li>The Ethernet Traffic Generator/Analyzer is configured to transmit Ethernet frames upstream with the following parameters: Stream A: C-tagged unicast (CVID1) Stream B: Priority-tagged unicast (CVID=0) Stream C: Untagged unicast</li> <li>The traffic corresponding to each stream will have the following parameters at the S/R interface: Stream A: Double-tagged unicast (CVID1, SVID1, SPbits1) Stream B: Double-tagged unicast (CVID=0, SVID1, SPbits2) Stream C: S-tagged unicast (SVID1, SPbits3)</li> </ul>
Test Procedure	<ul style="list-style-type: none"> <li>Select random values for CVID1, SVID1 and SPbits and select random values for the MAC addresses.</li> <li>Use the OLT Emulator to provision the ONU under test to support one VBES subscriber with SVID1 and SPbits1, SPbits2, SPbits3, each requiring a GEM port and T-CONT.</li> <li>Enable any frame monitoring/capture mechanisms on the OLT Emulator.</li> <li>Cause the Ethernet Traffic Generator/Analyzer to transmit upstream Ethernet frames with the characteristics described in the test configuration section.</li> </ul>
Pass/Fail Criteria	<p>The test passes if the following are true, otherwise the test fails:</p> <ol style="list-style-type: none"> <li>Each OMCI response message must indicate success for the associated create or set command.</li> <li>The uploaded ONU MIB must be consistent with the MIB held in the OLT Emulator</li> <li>All upstream C-tagged frames sent by the Ethernet tester must be received by the OLT Emulator at the S/R-interface. All frames must be error free and double-tagged with an S-tag with the VID equal to SVID1, S-Tag Pbits equal to SPbits1 and C-Tag with the VID equal to CVID1</li> <li>All upstream priority tagged frames sent by the Ethernet tester must be received by the OLT Emulator at the S/R-interface. All frames must be error free and double-tagged with an S-tag with the VID equal to SVID1, S-Tag Pbits equal to SPbits2 and C-Tag with the VID equal to 0</li> <li>All upstream untagged frames sent by the Ethernet tester must be received by the OLT Emulator at the S/R-interface. All frames must be error free and S-tagged with the VID equal to SVID1 and S-Tag Pbits equal to SPbits3</li> </ol>
Remarks	None

**Test Case 6.1.5: Validation of an S-Tag in the Upstream Direction in a VBES Architecture**

Abstract Test Plan for GPON ONU Conformance	
Test Name	Validation of an S-Tag in the Upstream Direction in a VBES Architecture
Test Definition ID	ONU.6.1.5
Reference Document	BBF TR-156i2 [3] ITU-T G.988 [2]
Test Type	Conformance
Test Status	Mandatory
Requirement(s) Description	<b>BBF TR-156i2 R-35</b> Part 1: The ONU <b>MUST</b> 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	<ul style="list-style-type: none"> <li>• OLT Emulator and ONU under test are powered and connected to ODN.</li> <li>• 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.</li> <li>• The Ethernet Traffic Generator/Analyzer is configured to transmit Ethernet frames upstream with the following parameters: Stream A: S-tagged unicast (SVID1, SPbits1) Stream B: Double-tagged unicast (CVID2, SVID2, SPbits2) Stream C: S-tagged unicast (SVID3, SPbits3)</li> <li>• The traffic corresponding to each stream will have the following parameters at the S/R interface: Stream A: S-tagged unicast (SVID1, SPbits1) Stream B: Double-tagged unicast (CVID2, SVID2, SPbits2)</li> </ul>
Test Procedure	<ul style="list-style-type: none"> <li>• Select random values for CVID2, SVID1, SVID2, SVID3, SPbits1, SPbits2 and SPbits3 and select random values for the MAC addresses.</li> <li>• Use the OLT Emulator to provision the ONU under test to support one VBES subscriber with two user traffic classes, requiring 2 GEM ports (Alloc-IDs, T-CONTs, Port-IDs). The ONU should be configured to validate/pass SVID1 and SVID2 only.</li> <li>• Enable any frame monitoring/capture mechanisms on the OLT Emulator.</li> <li>• Cause the Ethernet Traffic Generator/Analyzer to transmit upstream Ethernet frames with the characteristics described in the test configuration section.</li> </ul>
Pass/Fail Criteria	<p>The test passes if the following are true, otherwise the test fails:</p> <ol style="list-style-type: none"> <li>1. Each OMCI response message must indicate success for the associated create or set command.</li> <li>2. The uploaded ONU MIB must be consistent with the MIB held in the OLT Emulator</li> <li>3. Upstream frames tagged with SVID1 and SPbits1 sent by the Ethernet tester must be received error free by the OLT Emulator at the S/R-interface</li> <li>4. Upstream frames double-tagged with an S-Tag with the VID equal to SVID2, S-Tag Pbits equal to SPbits2 and C-Tag with VID equal to CVID2 sent by the Ethernet tester must be received error free by the OLT Emulator at the S/R-interface</li> <li>5. Upstream frames S-tagged with VID equal to SVID3 and S-Tag Pbits equal to SPbits3 sent by the Ethernet tester must not be received by the OLT Emulator at the S/R-interface. They must be silently discarded by the ONU</li> </ol>
Remarks	None



**Test Case 6.1.6: Translation of an S-Tag in the Upstream Direction in a VBES Architecture**

Abstract Test Plan for GPON ONU Conformance	
Test Name	Translation of an S-Tag in the Upstream Direction in a VBES Architecture
Test Definition ID	ONU.6.1.6
Reference Document	BBF TR-156i2 [3] ITU-T G.988 [2]
Test Type	Conformance
Test Status	Mandatory
Requirement(s) Description	<b>BBF TR-156i2</b> <b>R-35</b> Part 2: The ONU <b>MUST</b> support translating an S-Tag in the upstream direction for S-tagged frames. <b>R-42</b> The ONU <b>MUST</b> 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	<ul style="list-style-type: none"> <li>• OLT Emulator and ONU under test are powered and connected to ODN.</li> <li>• 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.</li> <li>• The Ethernet Traffic Generator/Analyzer is configured to transmit Ethernet frames upstream with the following parameters: Stream A: S-tagged unicast (SVID1, SPbits1) Stream B: Double-tagged unicast (CVID2, SVID2, SPbits2) Stream C: S-tagged unicast (SVID3, SPbits3)</li> <li>• The traffic corresponding to each stream will have the following parameters at the S/R interface: Stream A: S-tagged unicast (SVID10, SPbits1) Stream B: Double-tagged unicast (CVID2, SVID20, SPbits2)</li> </ul> <p>Note: SVID3 and SPbits3 must not be configured as part of the VBES Service.</p>
Test Procedure	<ul style="list-style-type: none"> <li>• Select random values for CVID2, SVID1, SVID2, SVID3, SVID10, SVID20, SPbits1, SPbits2 and SPbits3 and select random values for the MAC addresses.</li> <li>• Use the OLT Emulator to provision the ONU under test to support one VBES subscriber with two user traffic classes, requiring 2 GEM ports (Alloc-IDs, T-CONTs, Port-IDs).</li> <li>• Use the OLT Emulator to provision the ONU under test to translate SVID1 and SPbits1 to SVID10 and SPbits1 and to translate SVID2 and SPbits2 to SVID20 and SPbits2</li> <li>• Enable any frame monitoring/capture mechanisms on the OLT Emulator.</li> <li>• Cause the Ethernet Traffic Generator/Analyzer to transmit upstream Ethernet frames with the characteristics described in the test configuration section.</li> </ul>
Pass/Fail Criteria	<p>The test passes if the following are true, otherwise the test fails:</p> <ol style="list-style-type: none"> <li>1. Each OMCI response message must indicate success for the associated create or set command.</li> <li>2. The uploaded ONU MIB must be consistent with the MIB held in the OLT Emulator</li> <li>3. Upstream frames S-tagged with the VID equal to SVID1 and S-Tag Pbits equal to SPbits1 sent by the Ethernet tester must be received error free, S-Tagged with SVID10 and SPbits1 by the OLT Emulator at the S/R-interface</li> <li>4. Upstream frames double-tagged with the VID equal to SVID2, S-Tag Pbits equal to SPbits2 and C-Tag equal to CVID2 sent by the Ethernet tester must be received error free, S-Tagged with SVID20, S-Tag Pbits equal to SPbits2 and C-Tag equal to CVID2 by the OLT Emulator at the S/R-interface</li> <li>5. Upstream frames S-tagged with the VID equal to SVID3 and S-Tag Pbits equal to SPbits3 sent by the Ethernet tester must not be received by the OLT Emulator at the S/R-interface. They must be silently discarded by the ONU</li> </ol>
Remarks	None

**Test Case 6.1.7: Removal of an S-Tag in the Downstream Direction in a VBES Architecture**

Abstract Test Plan for GPON ONU Conformance	
Test Name	Removal of an S-Tag in the Downstream Direction in a VBES Architecture
Test Definition ID	ONU.6.1.7
Reference Document	BBF TR-156i2 [3] ITU-T G.988 [2]
Test Type	Conformance
Test Status	Mandatory
Requirement(s) Description	<b>BBF TR-156i2</b> <b>R-36</b> The ONU <b>MUST</b> 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	<ul style="list-style-type: none"> <li>• OLT Emulator and ONU under test are powered and connected to ODN.</li> <li>• 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.</li> <li>• The OLT Emulator is configured to transmit Ethernet frames downstream with the following parameters: <ul style="list-style-type: none"> <li>Stream A: Double-tagged unicast (CVID1, SVID1, SPbits1)</li> <li>Stream B: Double-tagged unicast (CVID=0, SVID1, SPbits2)</li> <li>Stream C: S-tagged unicast (SVID1, SPbits3)</li> </ul> </li> <li>• The traffic corresponding to each stream will have the following parameters at the U interface: <ul style="list-style-type: none"> <li>Stream A: C-tagged unicast (CVID1)</li> <li>Stream B: Priority-tagged unicast (CVID=0)</li> <li>Stream C: Untagged</li> </ul> </li> </ul>
Test Procedure	<ul style="list-style-type: none"> <li>• Select random values for CVID1, SVID1, SPbits1, SPbits2, and SPbits3 and select random values for the MAC addresses.</li> <li>• Use the OLT Emulator to provision the ONU under test to support one VBES subscriber with three user traffic classes, requiring 3 GEM ports (Alloc-IDs, T-CONTs, Port-IDs).</li> <li>• Enable any frame monitoring/capture mechanisms on the Ethernet Traffic Generator/Analyzer.</li> <li>• Cause the OLT Emulator to transmit downstream traffic with the characteristics described in the test configuration section.</li> </ul>
Pass/Fail Criteria	<p>The test passes if the following are true, otherwise the test fails:</p> <ol style="list-style-type: none"> <li>1. Each OMCI response message must indicate success for the associated create or set command.</li> <li>2. The uploaded ONU MIB must be consistent with the MIB held in the OLT Emulator</li> <li>3. All downstream double-tagged frames sent by the OLT Emulator with an S-Tag with a VID equal to SVID1, S-Tag Pbits equal to SPbits1 and C-Tag equal to CVID1 must be received C-tagged only with a VID value equal to CVID1 by the Ethernet Traffic Emulator/Generator at the U-interface</li> <li>4. All downstream double-tagged frames sent by the OLT Emulator with an S-Tag with a VID equal to SVID1, S-Tag Pbits equal to SPbits2 and C-Tag (priority tagged) must be received Priority-tagged only with a VID value equal to 0 by the Ethernet Traffic Emulator/Generator at the U-interface</li> <li>5. All downstream S-tagged frames sent by the OLT Emulator with an S-Tag with a VID equal to SVID1 and S-Tag Pbits equal to SPbits3 must be received untagged by the Ethernet Traffic Emulator/Generator at the U-interface</li> </ol>
Remarks	None

**Test Case 6.1.8: Translation of an S-Tag in the Downstream Direction in a VBES Architecture**

Abstract Test Plan for GPON ONU Conformance	
Test Name	Translation of an S-Tag in the Downstream Direction in a VBES Architecture
Test Definition ID	ONU.6.1.8
Reference Document	BBF TR-156i2 [3] ITU-T G.988 [2]
Test Type	Conformance
Test Status	Mandatory
Requirement(s) Description	<b>BBF TR-156i2</b> <b>R-43</b> The ONU <b>MUST</b> 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	<ul style="list-style-type: none"> <li>• OLT Emulator and ONU under test are powered and connected to ODN.</li> <li>• 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.</li> <li>• The OLT Emulator is configured to transmit Ethernet frames downstream with the following parameters: Stream A: Double-tagged unicast (CVID1, SVID10, SPbits1) Stream B: Double-tagged unicast (CVID2, SVID20, SPbits2)</li> <li>• The traffic corresponding to each stream will have the following parameters at the U interface: Stream A: Double-tagged unicast (CVID1, SVID1, SPbits1) Stream B: Double-tagged unicast (CVID2, SVID2, SPbits2)</li> </ul>
Test Procedure	<ul style="list-style-type: none"> <li>• Select random values for CVID1, CVID2, SVID1, SVID2, SVID10, SVID20, SPbits1, and SPbits2 and select random values for the MAC addresses.</li> <li>• Use the OLT Emulator to provision the ONU under test to support one VBES subscriber with two user traffic classes, requiring 2 GEM ports (Alloc-IDs, T-CONTs, Port-IDs).</li> <li>• Use the OLT Emulator to provision the ONU under test to translate SVID1 and SPbits1 to SVID10 and SPbits1 and to translate SVID2 and SPbits2 to SVID20 and SPbits2</li> <li>• Enable any frame monitoring/capture mechanisms on the Ethernet Traffic Generator/Analyzer.</li> <li>• Cause the OLT Emulator to transmit downstream Ethernet frames with the characteristics described in the test configuration section.</li> </ul>
Pass/Fail Criteria	<p>The test passes if the following are true, otherwise the test fails:</p> <ol style="list-style-type: none"> <li>1. Each OMCI response message must indicate success for the associated create or set command.</li> <li>2. The uploaded ONU MIB must be consistent with the MIB held in the OLT Emulator</li> <li>3. Downstream double-tagged frames must appear at the U-interface with S-Tags translated to match the stated U-interface configuration.</li> </ol>
Remarks	None

**Test Case 6.1.9: Test Case Reserved For Future Use**

**Test Case 6.1.10: Deriving P-bits as a Function of Received VID (Single User Port)**

Abstract Test Plan for GPON ONU Conformance	
Test Name	Deriving P-bits as a Function of Received VID (Single User Port).
Test Definition ID	ONU.6.1.10
Reference Document	BBF TR-156i2 [3] ITU-T G.988 [2]
Test Type	Conformance
Test Status	Mandatory
Requirement(s) Description	<b>BBF TR-156i2</b> <b>R-48</b> The ONU <b>MUST</b> 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	<p>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 streams based on 2 different VID values at the U-interface. Each stream will have an S-tag added with a specified p-bit value.</p> <ul style="list-style-type: none"> <li>• OLT Emulator and ONU under test are powered and connected to ODN.</li> <li>• 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.</li> <li>• The Ethernet Traffic Generator/Analyzer is configured to transmit Ethernet frames upstream with the following parameters: Stream A: C-tagged unicast (CVID1) Stream B: C-tagged unicast (CVID2)</li> <li>• The traffic corresponding to each stream will have the following parameters at the S/R interface: Stream A: Double-tagged unicast (SVID1, SPbits1, CVID1) Stream B: Double-tagged unicast (SVID1, SPbits2, CVID2)</li> </ul> <p>Traffic corresponding to each stream will produce a different p-bit marking.</p>
Test Procedure	<ul style="list-style-type: none"> <li>• Inject at the U-interface tagged traffic with the specified VID values. Verify that specified p-bit values are observed at the S/R-interface.</li> </ul>
Pass/Fail Criteria	<p>The test passes if the following are true, otherwise the test fails:</p> <ol style="list-style-type: none"> <li>1. All OMCI commands have Success responses</li> <li>2. A MIB upload and compare matches the MIB expected by the OLT</li> <li>3. The resulting p-bit values in each of the tests above is as specified.</li> </ol>
Remarks	None

**Test Case 6.1.11: Deriving P-bits as a Function of Received Ethertype (Single User Port)**

Abstract Test Plan for GPON ONU Conformance	
Test Name	Deriving P-bits as a Function of Received Ethertype (Single User Port).
Test Definition ID	ONU.6.1.11
Reference Document	BBF TR-156i2 [3] ITU-T G.988 [2]
Test Type	Conformance
Test Status	Mandatory
Requirement(s) Description	<b>BBF TR-156i2</b> <b>R-48</b> The ONU <b>MUST</b> 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	<p>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 streams based on different Ethertype values at the U-interface. (Ethertype=0x8863 is PPPoE; Ethertype=0x0800 is IPoE) Each stream will have an S-tag added with p-bit value different from the other stream.</p> <ul style="list-style-type: none"> <li>The Ethernet Traffic Generator/Analyzer is configured to transmit Ethernet frames upstream with the following parameters: <ul style="list-style-type: none"> <li>Stream A: C-tagged unicast (CVID1, CPbits1, Ethertype 0x8863)</li> <li>Stream B: C-tagged unicast (CVID1, CPbits1, Ethertype 0x0800)</li> </ul> </li> <li>The traffic corresponding to each stream will have the following parameters at the S/R interface: <ul style="list-style-type: none"> <li>Stream A: Double-tagged unicast (SVID1, SPbits1, CVID1, CPbits1, Ethertype 0x8863)</li> <li>Stream B: Double-tagged unicast (SVID1, SPbits2, CVID1, CPbits1, Ethertype 0x0800)</li> </ul> </li> </ul> <p>Traffic corresponding to each stream will produce a different p-bit marking.</p>
Test Procedure	<ul style="list-style-type: none"> <li>Inject at the U-interface tagged traffic with the specified Ethertype values. Verify that specified p-bit values are observed at the S/R-interface</li> </ul>
Pass/Fail Criteria	<p>The test passes if the following are true, otherwise the test fails:</p> <ol style="list-style-type: none"> <li>All OMCI commands have Success responses</li> <li>A MIB upload and compare matches the MIB expected by the OLT</li> <li>The resulting p-bit values in each of the tests above is as specified.</li> </ol>
Remarks	None

**Test Case 6.1.12: Deriving P-bits as a Function of Received User Port (Multiple User Ports)**

Abstract Test Plan for GPON ONU Conformance	
Test Name	Deriving P-bits as a Function of Received User Port (Multiple User Ports)
Test Definition ID	ONU.6.1.12
Reference Document	BBF TR-156i2 [3] ITU-T G.988 [2]
Test Type	Conformance
Test Status	Conditionally Mandatory (if ONU has multiple user ports)
Requirement(s) Description	<b>BBF TR-156i2</b> <b>R-48</b> The ONU <b>MUST</b> 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	<p>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 ports) with two upstream queues and two associated T-CONTs. The intent of the test is to define two streams based on different user ports. Each stream will have an S-tag added with p-bit value different from the other stream.</p> <ul style="list-style-type: none"> <li>• OLT Emulator and ONU under test are powered and connected to ODN.</li> <li>• 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.</li> <li>• The Ethernet Traffic Generator/Analyzer is configured to transmit Ethernet frames upstream with the following parameters: <ul style="list-style-type: none"> <li>Stream A (User port 1): C-tagged unicast (CVID1, CPbits1)</li> <li>Stream B (User port 2): C-tagged unicast (CVID1, CPbits1)</li> <li>Stream C (User port 1): Untagged unicast</li> <li>Stream D (User port 2): Untagged unicast</li> </ul> </li> <li>• The traffic corresponding to each stream will have the following parameters at the S/R interface: <ul style="list-style-type: none"> <li>Stream A (User port 1): Double-tagged unicast (SVID1, SPbits1, CVID1, CPbits1)</li> <li>Stream B (User port 2): Double-tagged unicast (SVID1, SPbits2, CVID1, CPbits1)</li> <li>Stream C (User port 1): S-tagged unicast (SVID1, SPbits1)</li> <li>Stream D (User port 2): S-tagged unicast (SVID1, SPbits2)</li> </ul> </li> </ul> <p>Traffic corresponding to each stream will produce a different p-bit marking.</p>
Test Procedure	<ol style="list-style-type: none"> <li>1. Select random values for CVID1, SVID1, CPbits1, SPbits1, SPbits2 and select random values for the MAC addresses.</li> <li>2. Configure L2 OCM for the test sequence number 1</li> <li>3. Inject stream A to D at the U-Interface</li> <li>4. Use the GPON analyser or OLT Emulator, verify that pbits are correctly deriving as a function of received user port</li> </ol>
Pass/Fail Criteria	<p>The test passes if the following are true, otherwise the test fails:</p> <ol style="list-style-type: none"> <li>1. All OMCI commands have Success responses</li> <li>2. A MIB upload and compare matches the MIB expected by the OLT</li> <li>3. The resulting p-bit values in each of the tests above is as specified.(at step 4)</li> </ol>
Remarks	None

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

Abstract Test Plan for GPON ONU Conformance	
Test Name	VID Support for Untagged Frames (N:1 VLAN or 1:1 VLAN Single-Tagged at the V Interface)
Test Definition ID	ONU.6.1.13
Reference Document	BBF TR-156i2 [3] ITU-T G.988 [2]
Test Type	Conformance
Test Status	Mandatory
Requirement(s) Description	<b>BBF TR-156i2</b> <b>R-9</b> The ONU <b>MUST</b> 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	<ul style="list-style-type: none"> <li>• OLT Emulator and ONU under test are powered and connected to ODN.</li> <li>• 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.</li> <li>• The Ethernet Traffic Generator/Analyzer is configured to transmit Ethernet frames upstream with the following parameters: <ul style="list-style-type: none"> <li>Stream A: Untagged unicast (Ethertype 0x0800)</li> <li>Stream B: Untagged unicast (Ethertype 0x8863)</li> <li>Stream C: Untagged unicast (Ethertype 0x8864)</li> <li>Stream D: Untagged unicast (Ethertype 0x0806)</li> </ul> </li> <li>• The traffic corresponding to each stream will have the following parameters at the S/R interface: <ul style="list-style-type: none"> <li>Stream A: S-tagged unicast (SVID1, SPbits1, Ethertype 0x0800)</li> <li>Stream B: S-tagged unicast (SVID2, SPbits2, Ethertype 0x8863)</li> <li>Stream C: S-tagged unicast (SVID2, SPbits2, Ethertype 0x8864)</li> <li>Stream D: S-tagged unicast (SVID1, SPbits1, Ethertype 0x0806)</li> </ul> </li> </ul>
Test Procedure	<ul style="list-style-type: none"> <li>• Select random values for SVID1, SVID2, SPbits1, and SPbits2 and select random values for the MAC addresses.</li> <li>• Use the OLT Emulator to provision the ONU under test to support one N:1 VLAN or one 1:1 VLAN (single-tagged at the V-interface) subscriber with one user traffic class, requiring 1 GEM port (Alloc-ID, T-CONT, Port-ID).</li> <li>• Enable any frame monitoring/capture mechanisms on the OLT Emulator.</li> <li>• Cause the Ethernet Traffic Generator/Analyzer to transmit upstream Ethernet frames with the characteristics described in the test configuration section.</li> </ul>
Pass/Fail Criteria	The test passes if the following are true, otherwise the test fails: <ol style="list-style-type: none"> <li>1. Each OMCI response message must indicate success for the associated create or set command.</li> <li>2. The uploaded ONU MIB must be consistent with the MIB held in the OLT Emulator</li> <li>3. All upstream frames (from streams A and D) received by the OLT Emulator at the S/R-interface must be error free, with an S-Tag with a VID equal to SVID1 and S-Tag Pbits equal to SPbits1</li> <li>4. All upstream frames (from streams B and C) received by the OLT Emulator at the S/R-interface must be error free, with an S-Tag with a VID equal to SVID2 and S-Tag Pbits equal to SPbits2</li> </ol>
Remarks	For more details see R-26/TR-101 and R-27/TR-101.



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

Abstract Test Plan for GPON ONU Conformance	
Test Name	VID Support for Untagged Frames (1:1 VLAN Double-Tagged at the V Interface)
Test Definition ID	ONU.6.1.14
Reference Document	BBF TR-156i2 [3] ITU-T G.988 [2]
Test Type	Conformance
Test Status	Mandatory
Requirement(s) Description	<b>BBF TR-156i2</b> <b>R-9</b> The ONU <b>MUST</b> 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	<ul style="list-style-type: none"> <li>• OLT Emulator and ONU under test are powered and connected to ODN.</li> <li>• 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.</li> <li>• The Ethernet Traffic Generator/Analyzer is configured to transmit Ethernet frames upstream with the following parameters: Stream A: Untagged unicast (EtherType 0x0800) Stream B: Untagged unicast (EtherType 0x8863) Stream C: Untagged unicast (EtherType 0x8864) Stream D: Untagged unicast (EtherType 0x0806)</li> <li>• The traffic corresponding to each stream will have the following parameters at the S/R interface: Stream A: C-tagged unicast (CVID1, CPbits1, EtherType 0x0800) Stream B: C-tagged unicast (CVID2, CPbits2, EtherType 0x8863) Stream C: C-tagged unicast (CVID2, CPbits2, EtherType 0x8864) Stream D: C-tagged unicast (CVID1, CPbits1, EtherType 0x0806)</li> </ul>
Test Procedure	<ul style="list-style-type: none"> <li>• Select random values for CVID1, CVID2, CPbits1 and CPbits2 and select random values for the MAC addresses.</li> <li>• Use the OLT Emulator to provision the ONU under test to support one 1:1 VLAN (double-tagged at the V-interface) subscriber with one user traffic class, requiring 1 GEM port (Alloc-ID, T-CONT, Port-ID).</li> <li>• Enable any frame monitoring/capture mechanisms on the OLT Emulator.</li> <li>• Cause the Ethernet Traffic Generator/Analyzer to transmit upstream Ethernet frames with the characteristics described in the test configuration section.</li> </ul>
Pass/Fail Criteria	The test passes if the following are true, otherwise the test fails: <ol style="list-style-type: none"> <li>1. Each OMCI response message must indicate success for the associated create or set command.</li> <li>2. The uploaded ONU MIB must be consistent with the MIB held in the OLT Emulator</li> <li>3. All upstream frames (from streams A and D) received by the OLT Emulator at the S/R-interface must be error free, with a C-Tag with a VID equal to CVID1 and C-Tag Pbits equal to CPbits1</li> <li>4. All upstream frames (from streams B and C) received by the OLT Emulator at the S/R-interface must be error free, with a C-Tag with a VID equal to CVID2 and C-Tag Pbits equal to CPbits2</li> </ol>
Remarks	For more details see R-26/TR-101 and R-27/TR-101.

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

Abstract Test Plan for GPON ONU Conformance	
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 ID	ONU.6.1.15
Reference Document	BBF TR-156i2 [3] ITU-T G.988 [2]
Test Type	Conformance
Test Status	Mandatory
Requirement(s) Description	<p><b>BBF TR-156i2</b>  <b>R-9</b> The ONU <b>MUST</b> support setting VID for untagged and priority-tagged frames in the upstream direction based on EtherType, except on VLANs used for Business Ethernet Services.</p> <p><b>BBF TR-101</b>  For each port configured as 'untagged or priority-tagged' or 'admit all', the Access Node <b>MUST</b> 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</p>
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	<ul style="list-style-type: none"> <li>OLT Emulator and ONU under test are powered and connected to ODN.</li> <li>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.</li> <li>The Ethernet Traffic Generator/Analyzer is configured to transmit Ethernet frames upstream with the following parameters: <ul style="list-style-type: none"> <li>Stream A: Priority-tagged unicast (CVID=0, CPbits1, Ethertype 0x0800)</li> <li>Stream B: Priority-tagged unicast (CVID=0, CPbits2, Ethertype 0x8863)</li> <li>Stream C: Priority-tagged unicast (CVID=0, CPbits2, Ethertype 0x8864)</li> <li>Stream D: Priority-tagged unicast (CVID=0, CPbits4, Ethertype 0x0806)</li> </ul> </li> <li>The traffic corresponding to each stream will have the following parameters at the S/R interface: <ul style="list-style-type: none"> <li>Stream A: S-tagged unicast (SVID1, SPbits1, Ethertype 0x0800)</li> <li>Stream B: S-tagged unicast (SVID2, SPbits2, Ethertype 0x8863)</li> <li>Stream C: S-tagged unicast (SVID2, SPbits2, Ethertype 0x8864)</li> <li>Stream D: S-tagged unicast (SVID1, SPbits4, Ethertype 0x0806)</li> </ul> </li> </ul>
Test Procedure	<ul style="list-style-type: none"> <li>Select random values for CPbits1, CPbits2, CPbits4, SVID1 and SVID2 (SPbitsn must be equal to CPbitsn) and select random values for the MAC addresses.</li> <li>Use the OLT Emulator to provision the ONU under test to support one N:1 VLAN or one 1:1 VLAN (single-tagged at the V-interface) subscriber with one user traffic class, requiring 1 GEM port (Alloc-ID, T-CONT, Port-ID).</li> <li>Enable any frame monitoring/capture mechanisms on the OLT Emulator.</li> <li>Cause the Ethernet Traffic Generator/Analyzer to transmit upstream Ethernet frames with the characteristics described in the test configuration section.</li> </ul>
Pass/Fail Criteria	<p>The test passes if the following are true, otherwise the test fails:</p> <ol style="list-style-type: none"> <li>Each OMCI response message must indicate success for the associated create or set command.</li> <li>The uploaded ONU MIB must be consistent with the MIB held in the OLT Emulator</li> <li>All upstream frames received by the OLT Emulator at the S/R-interface must be error free, with an S-Tag with a VID equal to SVID1 or SVID2 and SPbits values equal to the CPbits values.</li> <li>SVID2 tagged frames must contain PPPoE Ethertypes.</li> </ol>
Remarks	For more details see R-26/TR-101 and R-27/TR-101.

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

Abstract Test Plan for GPON ONU Conformance	
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 ID	ONU.6.1.16
Reference Document	BBF TR-156i2 [3] ITU-T G.988 [2]
Test Type	Conformance
Test Status	Mandatory
Requirement(s) Description	<p><b>BBF TR-156i2</b>  <b>R-9</b> The ONU <b>MUST</b> support setting VID for untagged and priority-tagged frames in the upstream direction based on EtherType, except on VLANs used for Business Ethernet Services.</p> <p><b>BBF TR-101</b>  For each port configured as 'untagged or priority-tagged' or 'admit all', the Access Node <b>MUST</b> 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</p>
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	<ul style="list-style-type: none"> <li>• OLT Emulator and ONU under test are powered and connected to ODN.</li> <li>• 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.</li> <li>• The Ethernet Traffic Generator/Analyzer is configured to transmit Ethernet frames upstream with the following parameters: <ul style="list-style-type: none"> <li>Stream A: Priority-tagged unicast (CVID=0, CPbits1, Ethertype 0x0800)</li> <li>Stream B: Priority-tagged unicast (CVID=0, CPbits2, Ethertype 0x8863)</li> <li>Stream C: Priority-tagged unicast (CVID=0, CPbits3, Ethertype 0x8864)</li> <li>Stream D: Priority-tagged unicast (CVID=0, CPbits4, Ethertype 0x0806)</li> </ul> </li> <li>• The traffic corresponding to each stream will have the following parameters at the S/R interface: <ul style="list-style-type: none"> <li>Stream A: S-tagged unicast (SVID1, SPbits1, Ethertype 0x0800)</li> <li>Stream B: S-tagged unicast (SVID2, SPbits1, Ethertype 0x8863)</li> <li>Stream C: S-tagged unicast (SVID2, SPbits1, Ethertype 0x8864)</li> <li>Stream D: S-tagged unicast (SVID1, SPbits1, Ethertype 0x0806)</li> </ul> </li> </ul>
Test Procedure	<ul style="list-style-type: none"> <li>• Select random values for CPbits1, CPbits2, CPbits3, CPbits4, SVID1, SVID2 and SPbits1 and select random values for the MAC addresses.</li> <li>• Use the OLT Emulator to provision the ONU under test to support one N:1 VLAN or one 1:1 VLAN (single-tagged at the V-interface) subscriber with one user traffic class, requiring 1 GEM port (Alloc-ID, T-CONT, Port-ID).</li> <li>• Enable any frame monitoring/capture mechanisms on the OLT Emulator.</li> <li>• Cause the Ethernet Traffic Generator/Analyzer to transmit upstream Ethernet frames with the characteristics described in the test configuration section.</li> </ul>
Pass/Fail Criteria	<p>The test passes if the following are true, otherwise the test fails:</p> <ol style="list-style-type: none"> <li>1. Each OMCI response message must indicate success for the associated create or set command.</li> <li>2. The uploaded ONU MIB must be consistent with the MIB held in the OLT Emulator</li> <li>3. All upstream frames received by the OLT Emulator at the S/R-interface must be error free, with an S-Tag with a VID equal to SVID1 or SVID2 and S-Tag Pbits equal to SPbits1</li> <li>4. SVID2 tagged frames must contain PPPoE Ethertypes.</li> </ol>
Remarks	For more details see R-26/TR-101 and R-27/TR-101.

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

Abstract Test Plan for GPON ONU Conformance	
Test Name	VID Support for Priority Tagged Frames with Priority Preservation (1:1 VLAN Double-Tagged at the V Interface)
Test Definition ID	ONU.6.1.17
Reference Document	BBF TR-156i2 [3] ITU-T G.988 [2]
Test Type	Conformance
Test Status	Mandatory
Requirement(s) Description	<p><b>BBF TR-156i2</b>  <b>R-9</b> The ONU <b>MUST</b> support setting VID for untagged and priority-tagged frames in the upstream direction based on EtherType, except on VLANs used for Business Ethernet Services.</p> <p><b>BBF TR-101</b>  For each port configured as 'untagged or priority-tagged' or 'admit all', the Access Node <b>MUST</b> 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</p>
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	<ul style="list-style-type: none"> <li>• OLT Emulator and ONU under test are powered and connected to ODN.</li> <li>• 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.</li> <li>• The Ethernet Traffic Generator/Analyzer is configured to transmit Ethernet frames upstream with the following parameters: <ul style="list-style-type: none"> <li>Stream A: Priority-tagged unicast (CVID=0, CPbits1, Ethertype 0x0800)</li> <li>Stream B: Priority-tagged unicast (CVID=0, CPbits2, Ethertype 0x8863)</li> <li>Stream C: Priority-tagged unicast (CVID=0, CPbits2, Ethertype 0x8864)</li> <li>Stream D: Priority-tagged unicast (CVID=0, CPbits4, Ethertype 0x0806)</li> </ul> </li> <li>• The traffic corresponding to each stream will have the following parameters at the S/R interface: <ul style="list-style-type: none"> <li>Stream A: C-tagged unicast (CVID1, CPbits1, Ethertype 0x0800)</li> <li>Stream B: C-tagged unicast (CVID2, CPbits2, Ethertype 0x8863)</li> <li>Stream C: C-tagged unicast (CVID2, CPbits2, Ethertype 0x8864)</li> <li>Stream D: C-tagged unicast (CVID1, CPbits4, Ethertype 0x0806)</li> </ul> </li> </ul>
Test Procedure	<ul style="list-style-type: none"> <li>• Select random values for CVID1, CVID2 and CPbits1, CPbits2, CPbits4 and select random values for the MAC addresses.</li> <li>• Use the OLT Emulator to provision the ONU under test to support one 1:1 VLAN (double-tagged at the V-interface) subscriber with one user traffic class, requiring 1 GEM port (Alloc-ID, T-CONT, Port-ID).</li> <li>• Enable any frame monitoring/capture mechanisms on the OLT Emulator.</li> <li>• Cause the Ethernet Traffic Generator/Analyzer to transmit upstream Ethernet frames with the characteristics described in the test configuration section.</li> </ul>
Pass/Fail Criteria	<p>The test passes if the following are true, otherwise the test fails:</p> <ol style="list-style-type: none"> <li>1. Each OMCI response message must indicate success for the associated create or set command.</li> <li>2. The uploaded ONU MIB must be consistent with the MIB held in the OLT Emulator</li> <li>3. All upstream frames received by the OLT Emulator at the S/R-interface must be error free, with a C-Tag with a VID equal to CVID1 or CVID2 and C-Tag Pbits equal to CPbits1, CPbits2, or CPbits4</li> <li>4. CVID2 tagged frames must contain PPPoE Ethertypes.</li> </ol>
Remarks	For more details see R-26/TR-101 and R-27/TR-101.

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

Abstract Test Plan for GPON ONU Conformance	
Test Name	VID Support for Priority Tagged Frames without Priority Preservation (1:1 VLAN Double-Tagged at the V Interface)
Test Definition ID	ONU6.1.18
Reference Document	BBF TR-156i2 [3] ITU-T G.988 [2]
Test Type	Conformance
Test Status	Mandatory
Requirement(s) Description	<p><b>BBF TR-156i2</b>  <b>R-9</b> The ONU <b>MUST</b> support setting VID for untagged and priority-tagged frames in the upstream direction based on EtherType, except on VLANs used for Business Ethernet Services.</p> <p><b>BBF TR-101</b>  For each port configured as 'untagged or priority-tagged' or 'admit all', the Access Node <b>MUST</b> 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</p>
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	<ul style="list-style-type: none"> <li>• OLT Emulator and ONU under test are powered and connected to ODN.</li> <li>• 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.</li> <li>• The Ethernet Traffic Generator/Analyzer is configured to transmit Ethernet frames upstream with the following parameters: <ul style="list-style-type: none"> <li>Stream A: Priority-tagged unicast (CVID=0, CPbits1, EtherType 0x0800)</li> <li>Stream B: Priority-tagged unicast (CVID=0, CPbits2, EtherType 0x8863)</li> <li>Stream C: Priority-tagged unicast (CVID=0, CPbits3, EtherType 0x8864)</li> <li>Stream D: Priority-tagged unicast (CVID=0, CPbits4, EtherType 0x0806)</li> </ul> </li> <li>• The traffic corresponding to each stream will have the following parameters at the S/R interface: <ul style="list-style-type: none"> <li>Stream A: C-tagged unicast (CVID1, CPbits2, EtherType 0x0800)</li> <li>Stream B: C-tagged unicast (CVID2, CPbits2, EtherType 0x8863)</li> <li>Stream C: C-tagged unicast (CVID2, CPbits2, EtherType 0x8864)</li> <li>Stream D: C-tagged unicast (CVID1, CPbits2, EtherType 0x0806)</li> </ul> </li> </ul>
Test Procedure	<ul style="list-style-type: none"> <li>• Select random values for CVID1, CVID2 CPbits1, CPbits2, CPbits3, and CPbits4 and select random values for the MAC addresses.</li> <li>• Use the OLT Emulator to provision the ONU under test to support one 1:1 VLAN (double-tagged at the V-interface) subscriber with one user traffic class, requiring 1 GEM port (Alloc-ID, T-CONT, Port-ID).</li> <li>• Enable any frame monitoring/capture mechanisms on the OLT Emulator.</li> <li>• Cause the Ethernet Traffic Generator/Analyzer to transmit upstream Ethernet frames with the characteristics described in the test configuration section.</li> </ul>
Pass/Fail Criteria	<p>The test passes if the following are true, otherwise the test fails:</p> <ol style="list-style-type: none"> <li>1. Each OMCI response message must indicate success for the associated create or set command.</li> <li>2. The uploaded ONU MIB must be consistent with the MIB held in the OLT Emulator</li> <li>3. All upstream frames received by the OLT Emulator at the S/R-interface must be error free, with a C-Tag with a VID equal to CVID1 or CVID2 and C-Tag Pbits equal to the CPbits2.</li> <li>4. CVID2 tagged frames must contain PPPoE Ethertypes.</li> </ol>
Remarks	For more details see R-26/TR-101 and R-27/TR-101.

**Test Case 6.1.19: ONU Addition and Removal of C-Tag for 1:1 VLAN**

Abstract Test Plan for GPON ONU Conformance	
Test Name	ONU Addition and Removal of C-Tag for 1:1 VLAN
Test Definition ID	ONU.6.1.19
Reference Document	BBF TR-156i2 [3] ITU-T G.988 [2]
Test Type	Conformance
Test Status	Mandatory
Requirement(s) Description	<b>BBF TR-156i2</b> <b>R-20</b> The ONU <b>MUST</b> support adding a C-Tag or S-Tag to upstream untagged traffic. <b>R-21</b> The ONU <b>MUST</b> 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	<ul style="list-style-type: none"> <li>OLT emulator and ONU under test are connected to the ODN and powered on.</li> <li>ONU activation and OMCC establishment processes have been successfully completed.</li> <li>The OLT Emulator has instructed the ONU to reset its MIB to factory default values</li> <li>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 C-Tag from downstream packets and addition of C-Tag to upstream packets). One unicast GEM port</li> <li>The Ethernet Traffic Generator/Analyzer is configured to transmit Ethernet frames upstream with the following parameters: Stream A: Untagged unicast Stream B: C-tagged unicast (CVID1, CPbits1) Stream C: S-tagged unicast (SVID1, SPbits1)</li> <li>The traffic corresponding to each stream will have the following parameters at the S/R interface: Stream A: C-tagged unicast (CVID1, CPbits1)</li> <li>The OLT Emulator is configured to transmit Ethernet frames downstream with the following parameters: Stream D: C-tagged unicast (CVID1, CPbits1)</li> <li>The traffic corresponding to Stream D will have the following parameters at the U interface: Stream D: Untagged unicast</li> </ul>
Test Procedure	<ul style="list-style-type: none"> <li>Select random value for CVID1, SVID1, CPbits1, and SPbits1 and select random values for the MAC addresses.</li> <li>Cause the OLT emulator to send the configured OMCI message sequence to provision the ONU for 1:1 VLANs.</li> <li>Enable any frame capture mechanism on the OLT Emulator and the Ethernet traffic generator.</li> <li>Cause the OLT emulator and Ethernet traffic generator to transmit the frames defined above.</li> </ul>
Pass/Fail Criteria	The test passes if the following are true, otherwise the test fails: <ol style="list-style-type: none"> <li>Upstream frames from Stream A are received by the OLT Emulator as C-Tagged frames with VID = CVID1 and TPID = 0x8100.</li> <li>Upstream frames from Streams B and C are silently discarded (not received by the OLT Emulator).</li> <li>Downstream frames from Stream D are received by the Ethernet traffic generator as untagged Ethernet frames.</li> </ol>
Remarks	None

**Test Case 6.1.20: ONU Addition and Removal of S-Tag for 1:1 VLAN**

Abstract Test Plan for GPON ONU Conformance	
Test Name	ONU Addition and Removal of S-Tag for 1:1 VLANs
Test Definition ID	ONU..6.1.20
Reference Document	BBF TR-156i2 [3] ITU-T G.988 [2]
Test Type	Conformance
Test Status	Mandatory
Requirement(s) Description	<b>BBF TR-156i2</b> <b>R-20</b> The ONU <b>MUST</b> support adding a C-Tag or S-Tag to upstream untagged traffic. <b>R-21</b> The ONU <b>MUST</b> 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	<ul style="list-style-type: none"> <li>OLT emulator and ONU under test are connected to the ODN and powered on.</li> <li>ONU activation and OMCC establishment processes have been successfully completed.</li> <li>The OLT Emulator has instructed the ONU to reset its MIB to factory default values</li> <li>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</li> <li>The Ethernet Traffic Generator/Analyzer is configured to transmit Ethernet frames upstream with the following parameters: Stream A: Untagged unicast Stream B: C-tagged unicast (CVID1, CPbits1) Stream C: S-tagged unicast (SVID1, SPbits1)</li> <li>The traffic corresponding to each stream will have the following parameters at the S/R interface: Stream A: S-tagged unicast (SVID1, SPbits1)</li> <li>The OLT Emulator is configured to transmit Ethernet frames downstream with the following parameters: Stream D: S-tagged unicast (SVID1, SPbits1)</li> <li>The traffic corresponding to Stream D will have the following parameters at the U interface: Stream D: Untagged unicast</li> </ul>
Test Procedure	<ul style="list-style-type: none"> <li>Select random value for CVID1, SVID1, CPbits1, and SPbits1 between 1 and 4094 and select random values for the MAC addresses.</li> <li>Cause the OLT emulator to send the configured OMCI message sequence to provision the ONU for 1:1 VLANs.</li> <li>Enable any frame capture mechanism on the OLT Emulator and the Ethernet traffic generator.</li> <li>Cause the OLT emulator and Ethernet traffic generator to transmit the frames defined above.</li> </ul>
Pass/Fail Criteria	The test passes if the following are true, otherwise the test fails: <ol style="list-style-type: none"> <li>Upstream frames from Stream A are received by the OLT Emulator as S-Tagged frames with VID = SVID1 and TPID = 0x88A8.</li> <li>Upstream frames from Streams B and C are silently discarded (not received by the OLT Emulator).</li> <li>Downstream frames from Stream D are received by the Ethernet traffic generator as untagged Ethernet frames.</li> </ol>
Remarks	None

**Test Case 6.1.21: ONU Translation Between Q-Tag and C-Tag for 1:1 VLAN**

Abstract Test Plan for GPON ONU Conformance	
Test Name	ONU Translation Between Q-Tag and C-Tag for 1:1 VLANs
Test Definition ID	ONU.6.1.21
Reference Document	BBF TR-156i2 [3] ITU-T G.988 [2]
Test Type	Conformance
Test Status	Mandatory
Requirement(s) Description	<b>BBF TR-156i2</b> <b>R-22</b> The ONU <b>MUST</b> support VID translation of the Q-Tag received from the U-interface into the CTag or S-Tag for upstream-tagged traffic. <b>R-23</b> The ONU <b>MUST</b> 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	<ul style="list-style-type: none"> <li>• OLT emulator and ONU under test are connected to the ODN and powered on.</li> <li>• ONU activation and OMCC establishment processes have been successfully completed.</li> <li>• The OLT Emulator has instructed the ONU to reset its MIB to factory default values</li> <li>• 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</li> <li>• The Ethernet Traffic Generator/Analyzer is configured to transmit Ethernet frames upstream with the following parameters: Stream A: Q-tagged unicast (QVID1) Stream B: Q-tagged unicast (QVID2) Stream C: S-tagged unicast (SVID2) Stream D: Untagged unicast</li> <li>• The traffic corresponding to each stream will have the following parameters at the S/R interface: Stream A: C-tagged unicast (CVID2)</li> <li>• The OLT Emulator is configured to transmit Ethernet frames downstream with the following parameters: Stream E: C-tagged unicast (CVID2)</li> <li>• The traffic corresponding to Stream D will have the following parameters at the U interface: Stream E: Q-tagged unicast (QVID1)</li> </ul>
Test Procedure	<ul style="list-style-type: none"> <li>• Select random value for QVID1, QVID2, CVID2 and SVID2 between 1 and 4094 and select random values for the MAC addresses.</li> <li>• Cause the OLT emulator to send the configured OMCI message sequence to provision the ONU for 1:1 VLANs.</li> <li>• Enable any frame capture mechanism on the OLT Emulator and the Ethernet traffic generator.</li> <li>• Cause the OLT emulator and Ethernet traffic generator to transmit the frames defined above.</li> </ul>
Pass/Fail Criteria	The test passes if the following are true, otherwise the test fails: <ol style="list-style-type: none"> <li>1. Upstream frames from Stream A are received by the OLT Emulator as C-Tagged frames with VID = CVID2 and TPID = 0x8100.</li> <li>2. Upstream frames from Streams B through D are silently discarded (not received by the OLT Emulator).</li> <li>3. Downstream frames from Stream E are received by the Ethernet traffic generator as Q-Tagged Ethernet frames with VID = QVID1 and TPID = 0x8100.</li> </ol>
Remarks	None



**Test Case 6.1.22: ONU Translation Between Q-Tag and S-Tag for 1:1 VLAN**

Abstract Test Plan for GPON ONU Conformance	
Test Name	ONU Translation Between Q-Tag and S-Tag for 1:1 VLANs
Test Definition ID	ONU.6.1.22
Reference Document	BBF TR-156i2 [3] ITU-T G.988 [2]
Test Type	Conformance
Test Status	Mandatory
Requirement(s) Description	<b>BBF TR-156i2</b> <b>R-22</b> The ONU <b>MUST</b> support VID translation of the Q-Tag received from the U-interface into the CTag or S-Tag for upstream-tagged traffic. <b>R-23</b> The ONU <b>MUST</b> 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	<ul style="list-style-type: none"> <li>• OLT emulator and ONU under test are connected to the ODN and powered on.</li> <li>• ONU activation and OMCC establishment processes have been successfully completed.</li> <li>• The OLT Emulator has instructed the ONU to reset its MIB to factory default values</li> <li>• 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</li> <li>• The Ethernet Traffic Generator/Analyzer is configured to transmit Ethernet frames upstream with the following parameters: Stream A: Q-tagged unicast (QVID1) Stream B: Q-tagged unicast (QVID2) Stream C: S-tagged unicast (SVID2) Stream D: Untagged unicast</li> <li>• The traffic corresponding to each stream will have the following parameters at the S/R interface: Stream A: C-tagged unicast (SVID2)</li> <li>• The OLT Emulator is configured to transmit Ethernet frames downstream with the following parameters: Stream E: S-tagged unicast (SVID2)</li> <li>• The traffic corresponding to Stream D will have the following parameters at the U interface: Stream E: Q-tagged unicast (QVID1)</li> </ul>
Test Procedure	<ul style="list-style-type: none"> <li>• Select random value for QVID1, QVID2, and SVID2 and select random values for the MAC addresses.</li> <li>• Cause the OLT emulator to send the configured OMCI message sequence to provision the ONU for 1:1 VLANs based on the test configuration above.</li> <li>• Enable any frame capture mechanism on the OLT Emulator and the Ethernet traffic generator.</li> <li>• Cause the OLT emulator and Ethernet traffic generator to transmit the frames defined above.</li> </ul>
Pass/Fail Criteria	The test passes if the following are true, otherwise the test fails: <ol style="list-style-type: none"> <li>1. Upstream frames from Stream A are received by the OLT Emulator as S-Tagged frames with VID = SVID2, and TPID = 0x88A8.</li> <li>2. Upstream frames from Streams B through D are silently discarded (not received by the OLT Emulator).</li> <li>3. Downstream frames from Stream E are received by the Ethernet traffic generator as Q-Tagged Ethernet frames with VID = QVID1 and TPID = 0x8100.</li> </ol>
Remarks	None

**Test Case 6.1.23: Test Case Reserved For Future Use**

## 6.2 Frame Mapping and QoS

### Test Case 6.2.1: Single U-Interface with Multiple Downstream GEM Ports

Abstract Test Plan for GPON ONU Conformance	
Test Name	Single U-Interface with Multiple Downstream GEM Ports
Test Definition ID	ONU.6.2.1
Reference Document	BBF TR-156i2 [3] ITU-T G.988 [2]
Test Type	Conformance
Test Status	Mandatory
Requirement(s) Description	<b>BBF TR-156i2 R-19</b> The ONU <b>MUST</b> 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 streams 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	<ul style="list-style-type: none"> <li>• ONU is powered and connected to ODN.</li> <li>• 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.</li> <li>• 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: Stream A: MAC DA: 10:22:33:44:55:aa, MAC SA: 10:22:33:44:55:66, GEM Port 1 Stream B: MAC DA: 10:22:33:44:55:bb, MAC SA: 10:22:33:44:55:cc, GEM Port 2</li> </ul>
Test Procedure	<ul style="list-style-type: none"> <li>• Select random value for GEM Port 1, which shall not be a value typically reserved for special purposes.</li> <li>• Select random value for GEM Port 2, which shall not be a value typically reserved for special purposes.</li> <li>• Configure the OLT Emulator to provision the ONU to support: A single tagged U-interface, with no translation of VID values. Two GEM ports (1 &amp; 2), each associated with the above U-interface.</li> <li>• Cause the OLT Emulator to request the ONU upload its current MIB.</li> <li>• Enable any frame capture mechanisms on the Ethernet Traffic Generator.</li> <li>• Cause the OLT Emulator to transmit the downstream frames (both streams), where the Ethernet frames of stream A are carried in GEM frames addressed to first GEM port and the Ethernet frames of stream B are carried in GEM frames addressed to the second GEM port.</li> </ul>
Pass/Fail Criteria	The test passes if the following are true, otherwise the test fails: <ol style="list-style-type: none"> <li>1. Each OMCI response message should indicate success for the associated create or set command.</li> <li>2. The uploaded ONU MIB should be consistent with the MIB held in the OLT Emulator.</li> <li>3. All downstream frames should have been received error free for both streams.</li> </ol>
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.

**Test Case 6.2.2: User Isolation on ONU Devices with Multiple U-Interfaces**

Abstract Test Plan for GPON ONU Conformance	
Test Name	User Isolation on ONU Devices with Multiple U-interfaces
Test Definition ID	ONU.6.2.2
Reference Document	BBF TR-156i2 [3] ITU-T G.988 [2]
Test Type	Conformance
Test Status	Mandatory for ONU devices supporting multiple U-interfaces
Requirement(s) Description	<p><b>BBF TR-101</b>  <b>R-40</b> The Access Node <b>MUST</b> be able to prevent forwarding traffic between user ports (user isolation). This behavior <b>MUST</b> be configurable per S-VID.</p> <p><b>BBF TR-156i2</b>  <b>R-3</b> The OLT <b>MUST</b> support user isolation as defined in TR-101<sup>1</sup></p> <p><sup>1</sup>User isolation at the ONU is an inherent feature of the WT-156 Issue 2 architecture.</p>
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-156i2 [3], does not forward traffic between the U-interfaces when the GPON has been configured to support user isolation.
Test Configuration	<ul style="list-style-type: none"> <li>• ONU is powered and connected to ODN</li> <li>• 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.</li> <li>• The OLT Emulator has instructed the ONU to reset its MIB to factory default values.</li> <li>• The Ethernet Traffic Generator/Analyzer is configured to transmit Ethernet frames upstream with the following parameters:  Stream A (U-Interface 1): Untagged unicast MAC DA1, unicast MAC SA2  Stream B (U-Interface 2): Untagged unicast MAC DA2, unicast MAC SA1</li> <li>• Only 1 user traffic class should be configured on the ONU, requiring 1 GEM port (Alloc-ID, T-CONT, Port-ID).</li> </ul>
Test Procedure	<ul style="list-style-type: none"> <li>• Configure the OLT Emulator to provision the ONU to support: Two untagged U-interfaces on the same VLAN. User isolation on the above VLAN.</li> <li>• Select unicast values for MAC1 through MAC2, which are not already in use by the ONU or other connected devices.</li> <li>• Cause the OLT Emulator to request the ONU upload its current MIB.</li> <li>• Enable any frame capture mechanisms on the Ethernet Traffic Generator and on the OLT Emulator.</li> <li>• Cause the Ethernet Traffic Generator to transmit upstream frame(s) to each U-interface as described above.</li> </ul>
Pass/Fail Criteria	<p>The test passes if the following are true, otherwise the test fails:</p> <ol style="list-style-type: none"> <li>1. Each OMCI response message shall indicate success for the associated create or set command.</li> <li>2. The uploaded ONU MIB shall be consistent with the MIB held in the OLT Emulator.</li> <li>3. All frames must be received at the OLT emulator.</li> <li>4. No downstream frames may be received at the U-Interfaces.</li> </ol>
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.

**Test Case 6.2.3: Mapping Traffic from GEM Ports to U-Interface in the Downstream Direction in a VBES Architecture**

Abstract Test Plan for GPON ONU Conformance	
Test Name	Mapping Traffic from GEM Ports to U-Interface in the Downstream Direction in a VBES Architecture
Test Definition ID	ONU.6.2.3
Reference Document	BBF TR-156i2 [3] ITU-T G.988 [2]
Test Type	Conformance
Test Status	Mandatory
Requirement(s) Description	<b>BBF TR-156i2</b> <b>R-41</b> The ONU <b>MUST</b> 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	<ul style="list-style-type: none"> <li>• OLT Emulator and ONU under test are powered and connected to ODN.</li> <li>• 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.</li> <li>• The OLT Emulator is configured to transmit Ethernet frames downstream with the following parameters: Stream A: Double-tagged unicast (CVID1, SVID1, SPbits1, GEM1) Stream B: Double-tagged unicast (CVID2, SVID2, SPbits1, GEM2)</li> <li>• The traffic corresponding to Stream A and Stream B will have the following parameters at the U interface: Stream A: C-tagged unicast (CVID1) Stream B: C-tagged unicast (CVID2)</li> </ul>
Test Procedure	<ul style="list-style-type: none"> <li>• Select random values for CVID1, CVID2, SVID1, SVID2, and SPbits1 and select random values for the MAC addresses.</li> <li>• Use the OLT Emulator to provision the ONU under test to support one VBES subscriber with two user traffic classes, requiring 2 GEM ports (Alloc-IDs, T-CONTs, Port-IDs).</li> <li>• Enable any frame monitoring/capture mechanisms on the Ethernet Traffic Generator/Analyzer.</li> <li>• Cause the OLT Emulator to transmit downstream traffic with the characteristics described in the test configuration section.</li> </ul>
Pass/Fail Criteria	<p>The test passes if the following are true, otherwise the test fails:</p> <ol style="list-style-type: none"> <li>1. Each OMCI response message must indicate success for the associated create or set command.</li> <li>2. The uploaded ONU MIB must be consistent with the MIB held in the OLT Emulator</li> <li>3. All downstream frames sent by the OLT Emulator must be received by the Ethernet Traffic Emulator/Generator at the U-interface</li> </ol>
Remarks	None

**Test Case 6.2.4: Mapping Traffic into GEM Ports Based on P-bit Values in the Upstream Direction (Single User Port)**

Abstract Test Plan for GPON ONU Conformance	
Test Name	Mapping Traffic into GEM Ports Based on P-bit Values in the Upstream Direction (Single User Port)
Test Definition ID	ONU.6.2.4
Reference Document	BBF TR-156i2 [3] ITU-T G.988 [2]
Test Type	Conformance
Test Status	Mandatory
Requirement(s) Description	<p><b>BBF TR-156i2</b></p> <p><b>R-51</b> The ONU <b>MUST</b> support mapping traffic into GEM Ports based on arbitrary combination of user port, VID and P-bit values in the upstream direction.</p> <p><b>R-52</b> The ONU <b>MUST NOT</b> prevent multiple P-bit values being used in the same VLAN.</p> <p><b>R-53</b> The ONU <b>MUST NOT</b> prevent multiple VLANs from using the same P-bits.</p> <p>Also, R-6, 7.</p>
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	<ul style="list-style-type: none"> <li>For this test, only a single user port is assumed.</li> <li>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 streams based on different combinations of received VIDs and p-bits at the U-interface. Each stream will map to the specified GEM port and T-CONT; tags will not be modified. The streams and their corresponding tags, GEM ports and T-CONTs are given below.</li> <li>The Ethernet Traffic Generator/Analyzer is configured to transmit Ethernet frames upstream with the following parameters: <ul style="list-style-type: none"> <li>Stream A: C-tagged unicast (CVID1, CPbits1)</li> <li>Stream B: C-tagged unicast (CVID1, CPbits2)</li> <li>Stream C: C-tagged unicast (CVID2, CPbits1)</li> <li>Stream D: C-tagged unicast (CVID2, CPbits2)</li> </ul> </li> <li>The traffic corresponding to each stream will have the following parameters at the S/R interface: <ul style="list-style-type: none"> <li>Stream A: C-tagged unicast (CVID1, CPbits1, GEM1, TCONT1)</li> <li>Stream B: C-tagged unicast (CVID1, CPbits2, GEM2, TCONT2)</li> <li>Stream C: C-tagged unicast (CVID2, CPbits1, GEM1, TCONT1)</li> <li>Stream D: C-tagged unicast (CVID2, CPbits2, GEM2, TCONT2)</li> </ul> </li> </ul>
Test Procedure	<ul style="list-style-type: none"> <li>Inject C-tagged traffic at the U-interface with the specified VID and p-bit values. Verify that this traffic is mapped to the specified GEM port and TCONT and that a C-tag is present with the specified VID and p-bit values.</li> </ul>
Pass/Fail Criteria	<p>The test passes if the following are true, otherwise the test fails:</p> <ol style="list-style-type: none"> <li>All OMCI commands have Success responses</li> <li>A MIB upload and compare matches the MIB expected by the OLT</li> <li>The resulting GEM port, TCONT, and C-tag (VID and p-bit) in each of the streams above are as specified.</li> </ol>
Remarks	None

**Test Case 6.2.5: Mapping Traffic into GEM Ports Based on VID Values in the Upstream Direction (Single User Port)**

Abstract Test Plan for GPON ONU Conformance	
Test Name	Mapping Traffic into GEM Ports Based on VID Values in the Upstream Direction (Single User Port)
Test Definition ID	ONU.6.2.5
Reference Document	BBF TR-156i2 [3] ITU-T G.988 [2]
Test Type	Conformance
Test Status	Mandatory
Requirement(s) Description	<p><b>BBF TR-156i2</b></p> <p><b>R-51</b> The ONU <b>MUST</b> support mapping traffic into GEM Ports based on arbitrary combination of user port, VID and P-bit values in the upstream direction.</p> <p><b>R-52</b> The ONU <b>MUST NOT</b> prevent multiple P-bit values being used in the same VLAN.</p> <p><b>R-53</b> The ONU <b>MUST NOT</b> prevent multiple VLANs from using the same P-bits.</p> <p>Also, R-6, 7.</p>
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	<ul style="list-style-type: none"> <li>For this test, only a single user port is assumed.</li> <li>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 streams based on different combinations of received VIDs and p-bits at the U-interface. Each stream will map to the specified GEM port and T-CONT; tags will not be modified. The streams and their corresponding tags, GEM ports and T-CONTs are given below.</li> <li>The Ethernet Traffic Generator/Analyzer is configured to transmit Ethernet frames upstream with the following parameters: <ul style="list-style-type: none"> <li>Stream A: C-tagged unicast (CVID1, CPbits1)</li> <li>Stream B: C-tagged unicast (CVID1, CPbits2)</li> <li>Stream C: C-tagged unicast (CVID2, CPbits1)</li> <li>Stream D: C-tagged unicast (CVID2, CPbits2)</li> </ul> </li> <li>The traffic corresponding to each stream will have the following parameters at the S/R interface: <ul style="list-style-type: none"> <li>Stream A: C-tagged unicast (CVID1, CPbits1, GEM1, TCONT1)</li> <li>Stream B: C-tagged unicast (CVID1, CPbits2, GEM1, TCONT1)</li> <li>Stream C: C-tagged unicast (CVID2, CPbits1, GEM2, TCONT2)</li> <li>Stream D: C-tagged unicast (CVID2, CPbits2, GEM2, TCONT2)</li> </ul> </li> </ul>
Test Procedure	<ul style="list-style-type: none"> <li>Inject C-tagged traffic at the U-interface with the specified VID and p-bit values. Verify that this traffic is mapped to the specified GEM port and TCONT and that a C-tag is present with the specified VID and p-bit values.</li> </ul>
Pass/Fail Criteria	<p>The test passes if the following are true, otherwise the test fails:</p> <ol style="list-style-type: none"> <li>All OMCI commands have Success responses</li> <li>A MIB upload and compare matches the MIB expected by the OLT</li> <li>The resulting GEM port, TCONT, and C-tag (VID and p-bit) in each of the streams above are as specified.</li> </ol>
Remarks	None

**Test Case 6.2.6: Mapping Traffic into GEM Ports based on VID & P-bit Values in the Upstream Direction (Single User Port)**

Abstract Test Plan for GPON ONU Conformance	
Test Name	Mapping Traffic into GEM Ports Based on VID & P-bit Values in the Upstream Direction (Single User Port)
Test Definition ID	ONU.6.2.6
Reference Document	BBF TR-156i2 [3] ITU-T G.988 [2]
Test Type	Conformance
Test Status	Mandatory
Requirement(s) Description	<p><b>BBF TR-156i2</b></p> <p><b>R-51</b> The ONU <b>MUST</b> support mapping traffic into GEM Ports based on arbitrary combination of user port, VID and P-bit values in the upstream direction.</p> <p><b>R-52</b> The ONU <b>MUST NOT</b> prevent multiple P-bit values being used in the same VLAN.</p> <p><b>R-53</b> The ONU <b>MUST NOT</b> prevent multiple VLANs from using the same P-bits.</p> <p>Also, R-6, 7, 46, 57, 67.</p>
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	<ul style="list-style-type: none"> <li>For this test, only a single user port is assumed.</li> <li>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 streams based on different combinations of received VIDs and p-bits at the U-interface. Each stream will map to the specified GEM port and T-CONT; tags will not be modified. The streams and their corresponding tags, GEM ports and T-CONTs are given below.</li> <li>The Ethernet Traffic Generator/Analyzer is configured to transmit Ethernet frames upstream with the following parameters: <ul style="list-style-type: none"> <li>Stream A: C-tagged unicast (CVID1, CPbits1)</li> <li>Stream B: C-tagged unicast (CVID1, CPbits2)</li> <li>Stream C: C-tagged unicast (CVID2, CPbits1)</li> <li>Stream D: C-tagged unicast (CVID2, CPbits2)</li> </ul> </li> <li>The traffic corresponding to each stream will have the following parameters at the S/R interface: <ul style="list-style-type: none"> <li>Stream A: C-tagged unicast (CVID1, CPbits1, GEM1, TCONT1)</li> <li>Stream B: C-tagged unicast (CVID1, CPbits2, GEM2, TCONT2)</li> <li>Stream C: C-tagged unicast (CVID2, CPbits1, GEM3, TCONT3)</li> <li>Stream D: C-tagged unicast (CVID2, CPbits2, GEM4, TCONT4)</li> </ul> </li> </ul>
Test Procedure	<ul style="list-style-type: none"> <li>Inject C-tagged traffic at the U-interface with the specified VID and p-bit values. Verify that this traffic is mapped to the specified GEM port and TCONT and that a C-tag is present with the specified VID and p-bit values.</li> </ul>
Pass/Fail Criteria	<p>The test passes if the following are true, otherwise the test fails:</p> <ol style="list-style-type: none"> <li>All OMCI commands have Success responses</li> <li>A MIB upload and compare matches the MIB expected by the OLT</li> <li>The resulting GEM port, TCONT, and C-tag (VID and p-bit) in each of the streams above are as specified.</li> </ol>
Remarks	None



**Test Case 6.2.7: Mapping Traffic into GEM Ports Based on P-bit Values in the Upstream Direction (Multiple User Port)**

Abstract Test Plan for GPON ONU Conformance	
Test Name	Mapping Traffic into GEM Ports Based on P-bit Values in the Upstream Direction (Multiple User Port)
Test Definition ID	ONU.6.2.7
Reference Document	BBF TR-156i2 [3] ITU-T G.988 [2]
Test Type	Conformance
Test Status	Conditionally Mandatory for ONUs supporting multiple U-interface
Requirement(s) Description	<b>BBF TR-156i2</b> <b>R-51</b> The ONU <b>MUST</b> support mapping traffic into GEM Ports based on arbitrary combination of user port, VID and P-bit values in the upstream direction. <b>R-52</b> The ONU <b>MUST NOT</b> prevent multiple P-bit values being used in the same VLAN. <b>R-53</b> The ONU <b>MUST NOT</b> 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	<ul style="list-style-type: none"> <li>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 streams based on different combinations of received VIDs and p-bits and user port. Each stream will map to the specified GEM port and T-CONT; tags will not be modified. The streams and their corresponding tags, GEM ports and T-CONTs are given below.</li> <li>The Ethernet Traffic Generator/Analyzer is configured to transmit Ethernet frames upstream with the following parameters: <ul style="list-style-type: none"> <li>Stream A (User port 1): C-tagged unicast (CVID1, CPbits1)</li> <li>Stream B (User port 1): C-tagged unicast (CVID1, CPbits2)</li> <li>Stream C (User port 1): C-tagged unicast (CVID2, CPbits1)</li> <li>Stream D (User port 1): C-tagged unicast (CVID2, CPbits2)</li> <li>Stream E (User port 2): C-tagged unicast (CVID1, CPbits1)</li> <li>Stream F (User port 2): C-tagged unicast (CVID1, CPbits2)</li> <li>Stream G (User port 2): C-tagged unicast (CVID2, CPbits1)</li> <li>Stream H (User port 2): C-tagged unicast (CVID2, CPbits2)</li> </ul> </li> <li>The traffic corresponding to each stream will have the following parameters at the S/R interface: <ul style="list-style-type: none"> <li>Stream A: C-tagged unicast (CVID1, CPbits1, GEM1, TCONT1)</li> <li>Stream B: C-tagged unicast (CVID1, CPbits2, GEM2, TCONT2)</li> <li>Stream C: C-tagged unicast (CVID2, CPbits1, GEM1, TCONT1)</li> <li>Stream D: C-tagged unicast (CVID2, CPbits2, GEM2, TCONT2)</li> <li>Stream E: C-tagged unicast (CVID1, CPbits1, GEM3, TCONT1)</li> <li>Stream F: C-tagged unicast (CVID1, CPbits2, GEM4, TCONT2)</li> <li>Stream G: C-tagged unicast (CVID2, CPbits1, GEM3, TCONT1)</li> <li>Stream H: C-tagged unicast (CVID2, CPbits2, GEM4, TCONT2)</li> </ul> </li> </ul>
Test Procedure	<ul style="list-style-type: none"> <li>Inject C-tagged traffic at the specified U-interface with the specified VID and p-bit values. Verify that this traffic is mapped to the specified GEM port and TCONT and that a C-tag is present with the specified VID and p-bit values.</li> </ul>
Pass/Fail Criteria	The test passes if the following are true, otherwise the test fails: <ol style="list-style-type: none"> <li>All OMCI commands have Success responses</li> <li>A MIB upload and compare matches the MIB expected by the OLT</li> <li>The resulting GEM port, TCONT, and C-tag (VID and p-bit) in each of the streams above are as specified.</li> </ol>
Remarks	None

**Test Case 6.2.8: Mapping Traffic into GEM Ports Based on VID Values in the Upstream Direction (Multiple User Port)**

Abstract Test Plan for GPON ONU Conformance	
Test Name	Mapping Traffic into GEM Ports Based on VID Values in the Upstream Direction (Multiple User Port)
Test Definition ID	ONU.6.2.8
Reference Document	BBF TR-156i2 [3] ITU-T G.988 [2]
Test Type	Conformance
Test Status	Conditionally Mandatory
Requirement(s) Description	<p><b>BBF TR-156i2</b></p> <p><b>R-51</b> The ONU <b>MUST</b> support mapping traffic into GEM Ports based on arbitrary combination of user port, VID and P-bit values in the upstream direction.</p> <p><b>R-52</b> The ONU <b>MUST NOT</b> prevent multiple P-bit values being used in the same VLAN.</p> <p><b>R-53</b> The ONU <b>MUST NOT</b> prevent multiple VLANs from using the same P-bits.</p> <p>Also, R-6, 7.</p>
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	<ul style="list-style-type: none"> <li>• 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 streams based on different combinations of received VIDs and p-bits and user port. Each stream will map to the specified GEM port and T-CONT; tags will not be modified. The streams and their corresponding tags, GEM ports and T-CONTs are given below.</li> <li>• The Ethernet Traffic Generator/Analyzer is configured to transmit Ethernet frames upstream with the following parameters: <ul style="list-style-type: none"> <li>Stream A (User port 1): C-tagged unicast (CVID1, CPbits1)</li> <li>Stream B (User port 1): C-tagged unicast (CVID1, CPbits2)</li> <li>Stream C (User port 1): C-tagged unicast (CVID2, CPbits1)</li> <li>Stream D (User port 1): C-tagged unicast (CVID2, CPbits2)</li> <li>Stream E (User port 2): C-tagged unicast (CVID1, CPbits1)</li> <li>Stream F (User port 2): C-tagged unicast (CVID1, CPbits2)</li> <li>Stream G (User port 2): C-tagged unicast (CVID2, CPbits1)</li> <li>Stream H (User port 2): C-tagged unicast (CVID2, CPbits2)</li> </ul> </li> <li>• The traffic corresponding to each stream will have the following parameters at the S/R interface: <ul style="list-style-type: none"> <li>Stream A: C-tagged unicast (CVID1, CPbits1, GEM1, TCONT1)</li> <li>Stream B: C-tagged unicast (CVID1, CPbits2, GEM1, TCONT1)</li> <li>Stream C: C-tagged unicast (CVID2, CPbits1, GEM2, TCONT2)</li> <li>Stream D: C-tagged unicast (CVID2, CPbits2, GEM2, TCONT2)</li> <li>Stream E: C-tagged unicast (CVID1, CPbits1, GEM3, TCONT1)</li> <li>Stream F: C-tagged unicast (CVID1, CPbits2, GEM3, TCONT1)</li> <li>Stream G: C-tagged unicast (CVID2, CPbits1, GEM4, TCONT2)</li> <li>Stream H: C-tagged unicast (CVID2, CPbits2, GEM4, TCONT2)</li> </ul> </li> </ul>
Test Procedure	<ul style="list-style-type: none"> <li>• Inject C-tagged traffic at the specified U-interface with the specified VID and p-bit values. Verify that this traffic is mapped to the specified GEM port and TCONT and that a C-tag is present with the specified VID and p-bit values.</li> </ul>
Pass/Fail Criteria	<p>The test passes if the following are true, otherwise the test fails:</p> <ol style="list-style-type: none"> <li>1. All OMCI commands have Success responses</li> <li>2. A MIB upload and compare matches the MIB expected by the OLT</li> <li>3. The resulting GEM port, TCONT, and C-tag (VID and p-bit) in each of the streams above are as specified.</li> </ol>
Remarks	None

**Test Case 6.2.9: Mapping Traffic into GEM Ports Based on VID & P-bit Values in the Upstream Direction (Multiple User Port)**

Abstract Test Plan for GPON ONU Conformance	
Test Name	Mapping Traffic into GEM Ports Based on VID & P-bit Values in the Upstream Direction (Multiple User Port)
Test Definition ID	ONU.6.2.9
Reference Document	BBF TR-156i2 [3] ITU-T G.988 [2]
Test Type	Conformance
Test Status	Mandatory
Requirement(s) Description	<p><b>BBF TR-156i2</b></p> <p><b>R-51</b> The ONU <b>MUST</b> support mapping traffic into GEM Ports based on arbitrary combination of user port, VID and P-bit values in the upstream direction.</p> <p><b>R-52</b> The ONU <b>MUST NOT</b> prevent multiple P-bit values being used in the same VLAN.</p> <p><b>R-53</b> The ONU <b>MUST NOT</b> prevent multiple VLANs from using the same P-bits.</p> <p>Also, R-6, 7, 46, 57, 67.</p>
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	<ul style="list-style-type: none"> <li>• 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 streams based on different combinations of received VIDs and p-bits and user port. Each stream will map to the specified GEM port and T-CONT; tags will not be modified. The streams and their corresponding tags, GEM ports and T-CONTs are given below.</li> <li>• The Ethernet Traffic Generator/Analyzer is configured to transmit Ethernet frames upstream with the following parameters: <ul style="list-style-type: none"> <li>Stream A (User port 1): C-tagged unicast (CVID1, CPbits1)</li> <li>Stream B (User port 1): C-tagged unicast (CVID1, CPbits2)</li> <li>Stream C (User port 1): C-tagged unicast (CVID2, CPbits1)</li> <li>Stream D (User port 1): C-tagged unicast (CVID2, CPbits2)</li> <li>Stream E (User port 2): C-tagged unicast (CVID1, CPbits1)</li> <li>Stream F (User port 2): C-tagged unicast (CVID1, CPbits2)</li> <li>Stream G (User port 2): C-tagged unicast (CVID2, CPbits1)</li> <li>Stream H (User port 2): C-tagged unicast (CVID2, CPbits2)</li> </ul> </li> <li>• The traffic corresponding to each stream will have the following parameters at the S/R interface: <ul style="list-style-type: none"> <li>Stream A: C-tagged unicast (CVID1, CPbits1, GEM1, TCONT1)</li> <li>Stream B: C-tagged unicast (CVID1, CPbits2, GEM2, TCONT2)</li> <li>Stream C: C-tagged unicast (CVID2, CPbits1, GEM3, TCONT3)</li> <li>Stream D: C-tagged unicast (CVID2, CPbits2, GEM4, TCONT4)</li> <li>Stream E: C-tagged unicast (CVID1, CPbits1, GEM5, TCONT1)</li> <li>Stream F: C-tagged unicast (CVID1, CPbits2, GEM6, TCONT2)</li> <li>Stream G: C-tagged unicast (CVID2, CPbits1, GEM7, TCONT3)</li> <li>Stream H: C-tagged unicast (CVID2, CPbits2, GEM8, TCONT4)</li> </ul> </li> </ul>
Test Procedure	<ul style="list-style-type: none"> <li>• Inject -tagged traffic at the specified U-interface with the specified VID and p-bit values. Verify that this traffic is mapped to the specified GEM port and TCONT and that a C-tag is present with the specified VID and p-bit values.</li> </ul>
Pass/Fail Criteria	<p>The test passes if the following are true, otherwise the test fails:</p> <ol style="list-style-type: none"> <li>1. All OMCI commands have Success responses</li> <li>2. A MIB upload and compare matches the MIB expected by the OLT</li> <li>3. The resulting GEM port, TCONT, and C-tag (VID and p-bit) in each of the streams above are as specified.</li> </ol>
Remarks	None

**Test Case 6.2.10: Mapping Multiple P-bit Values to the Same GEM Port (Single User Port)**

Abstract Test Plan for GPON ONU Conformance	
Test Name	Mapping Multiple P-bit Values to the Same GEM Port (Single User Port)
Test Definition ID	ONU.6.2.10
Reference Document	BBF TR-156i2 [3] ITU-T G.988 [2]
Test Type	Conformance
Test Status	Mandatory
Requirement(s) Description	<b>BBF TR-156i2</b> <b>R-51</b> The ONU <b>MUST</b> 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	<ul style="list-style-type: none"> <li>• OLT Emulator and ONU under test are powered and connected to ODN</li> <li>• 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.</li> <li>• A single user port is assumed</li> <li>• ONU must be set-up with the standard L2 OMCI Common Model (single user) with two upstream queues and TCONTs.</li> <li>• 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 streams 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.</li> <li>• The Ethernet Traffic Generator/Analyzer is configured to transmit Ethernet frames upstream with the following parameters: <ul style="list-style-type: none"> <li>Stream A: C-tagged unicast (CVID1, CPbits1)</li> <li>Stream B: C-tagged unicast (CVID1, CPbits2)</li> <li>Stream C: C-tagged unicast (CVID1, CPbits3)</li> <li>Stream D: C-tagged unicast (CVID1, CPbits4)</li> </ul> </li> <li>• The traffic corresponding to each stream will have the following parameters at the S/R interface: <ul style="list-style-type: none"> <li>Stream A: C-tagged unicast (CVID1, CPbits1, GEM1, TCONT1)</li> <li>Stream B: C-tagged unicast (CVID1, CPbits2, GEM1, TCONT1)</li> <li>Stream C: C-tagged unicast (CVID1, CPbits3, GEM2, TCONT2)</li> <li>Stream D: C-tagged unicast (CVID1, CPbits4, GEM2, TCONT2)</li> </ul> </li> </ul>
Test Procedure	<ul style="list-style-type: none"> <li>• Inject tagged traffic at the U-interface with the specified p-bit values and random VID values</li> <li>• Verify that p-bit values are correctly mapping into the right GEM ports and T-CONTs at the S/R-interface.</li> </ul>
Pass/Fail Criteria	The test passes if the following are true, otherwise the test fails: <ol style="list-style-type: none"> <li>1. All OMCI commands have Success responses</li> <li>2. For each stream, the resulting GEM port matches the specifications detailed in the test configuration section</li> </ol>
Remarks	None

**Test Case 6.2.11: Test Case Reserved For Future Use**

**Test Case 6.2.12: Strict Priority Downstream Scheduling Among 4 Queues on ONU**

Abstract Test Plan for GPON ONU Conformance	
Test Name	Strict Priority Downstream Scheduling Among 4 Queues on ONU
Test Definition ID	ONU.6.2.12
Reference Document	BBF TR-156i2 [3] and ITU-T G.988 [2]
Test Type	Conformance
Test Status	Mandatory
Requirement(s) Description	<p><b>BBF TR-156i2</b></p> <p><b>R-56</b> In the downstream direction, the ONU <b>MUST</b> support at least 4 queues per user port, one per traffic class</p> <p><b>R-63</b> The OLT and ONU <b>MUST</b> support scheduling of downstream queues according to strict priority among at least 4 TCs.</p> <p><b>R-64</b> The OLT and ONU <b>MUST</b> support assigning an individual TC to a downstream queue.</p> <p>Also <b>R-46</b> The OLT and ONU <b>MUST</b> support at least 4 traffic classes for Ethernet frames.</p>
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	<ul style="list-style-type: none"> <li>• OLT emulator and ONU under test are connected to the ODN and powered on.</li> <li>• ONU activation and OMCC establishment processes have been successfully completed.</li> <li>• 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</li> <li>• The OLT emulator will be configured to transmit four interleaved streams of 802.1ad tagged Ethernet frames downstream with the following parameters. Traffic class 1 will have the highest priority and traffic class 4 the lowest. <ul style="list-style-type: none"> <li>Stream A (Class 1): C-tagged unicast (CVID1, CPbits1, GEM1)</li> <li>Stream B (Class 2): C-tagged unicast (CVID1, CPbits2, GEM2)</li> <li>Stream C (Class 3): C-tagged unicast (CVID1, CPbits3, GEM3)</li> <li>Stream D (Class 4): C-tagged unicast (CVID1, CPbits4, GEM4)</li> </ul> </li> <li>• The traffic corresponding to each stream will have the following parameters at the U interface: <ul style="list-style-type: none"> <li>Stream A: C-tagged unicast (CVID1, CPbits1)</li> <li>Stream B: C-tagged unicast (CVID1, CPbits2)</li> <li>Stream C: C-tagged unicast (CVID1, CPbits3)</li> <li>Stream D: C-tagged unicast (CVID1, CPbits4)</li> </ul> </li> </ul>
Test Procedure	<ol style="list-style-type: none"> <li>1. Select random value for CVID1 between 1 and 4094.</li> <li>2. Select different random values for CPbits1 through CPbits4 between 0 and 7. Note.- Traffic class 1 will have the highest priority and traffic class 4 the lowest.</li> <li>3. Select random values for unicast MAC addresses.</li> <li>4. Cause the OLT emulator to send the configured OMCI message sequence to provision the ONU.</li> <li>5. Enable any frame capture mechanism on the Ethernet traffic generator.</li> <li>6. Cause the OLT emulator to send the configured traffic streams. Initially, the four streams will be sent at the same bit rate and the total bit rate will be below the maximum bandwidth available at the U-interface.</li> <li>7. Gradually increase the bit rate of traffic stream A until no frames from traffic stream D are received on the Ethernet traffic generator.</li> <li>8. Gradually increase the bit rate of traffic stream A until no frames from traffic stream C are received on the Ethernet traffic generator.</li> <li>9. Gradually increase the bit rate of traffic stream A until no frames from traffic stream B are received on the Ethernet traffic generator.</li> </ol>
Pass/Fail Criteria	<p>The test passes if the following are true, otherwise the test fails:</p> <ol style="list-style-type: none"> <li>1. During ONU provisioning, each OMCI response message indicates success for the associated create or set command.</li> <li>2. At step 6 of the test procedure, all downstream frames of streams from A to D are received error free at the Ethernet traffic generator</li> <li>3. At step 7 of the test procedure, at the Ethernet traffic generator: All frames from traffic streams A and B are received error free, at least some of the frames from traffic stream C are received, all of them error free and no frames from traffic stream D are received.</li> <li>4. At step 8 of the test procedure, at the Ethernet traffic generator: All frames from stream A are received error free, at least some of the frames from traffic stream B are received, all of them error free, and no frames from traffic streams D and C are received.</li> <li>5. At step 9 of the test procedure, at the Ethernet traffic generator: At least some of the frames from traffic stream A are received, all of them error free and no frames from traffic streams D, C and B are received.</li> </ol>
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.

**Test Case 6.2.13: Indicating Drop Precedence Using P-bits Upstream**

Abstract Test Plan for GPON ONU Conformance	
Test Name	Indicating Drop Precedence Using P-bits Upstream
Test Definition ID	ONU.6.2.13
Reference Document	BBF TR-156i2 [3] ITU-T G.988 [2]
Test Type	Conformance
Test Status	Mandatory
Requirement(s) Description	<b>BBF TR-156i2</b> <b>R-54</b> The OLT and ONU <b>MUST</b> support drop precedence within at least 2 traffic classes and <b>MUST</b> 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	<ul style="list-style-type: none"> <li>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 streams, two per traffic class. For each traffic class, one of the streams is marked with drop precedence. Each T-CONT should to be serviced at a fixed rate, E. Each stream rate is set to <math>R=0.7E</math>.</li> <li>The Ethernet Traffic Generator/Analyzer is configured to transmit Ethernet frames upstream with the following parameters: <ul style="list-style-type: none"> <li>Stream A* (Test 1): S-tagged unicast (SVID1, SPbits2)</li> <li>Stream B (Test 1) : S-tagged unicast (SVID1, SPbits3)</li> <li>Stream C* (Test 2): S-tagged unicast (SVID1, SPbits4)</li> <li>Stream D (Test 2) : S-tagged unicast (SVID1, SPbits5)</li> </ul> </li> <li>The traffic corresponding to each stream will have the following parameters at the S/R interface: <ul style="list-style-type: none"> <li>Stream A: S-tagged unicast (SVID1, SPbits2, GEM1, TCONT1)</li> <li>Stream B: S-tagged unicast (SVID1, SPbits3, GEM1, TCONT1)</li> <li>Stream C: S-tagged unicast (SVID1, SPbits4, GEM2, TCONT2)</li> <li>Stream D: S-tagged unicast (SVID1, SPbits5, GEM2, TCONT2)</li> </ul> </li> </ul> <p>Note: * Drop Precedence Stream</p>
Test Procedure	<ul style="list-style-type: none"> <li>For each traffic stream pair (A&amp;B, C&amp;D), inject streams at the U-interface, each of rate R, tagged as shown in the test configuration section above. The stream rate shall be set to <math>R=0.7E</math>. Verify at the S/R-interface that the only packets dropped are from streams marked with drop precedence.</li> </ul>
Pass/Fail Criteria	The test passes if the following are true, otherwise the test fails: <ol style="list-style-type: none"> <li>All OMCI commands have Success responses</li> <li>A MIB upload and compare matches the MIB expected by the OLT</li> <li>Verify at the S/R-interface that the only packets dropped are from streams marked with drop precedence.</li> </ol>
Remarks	None

**Test Case 6.2.14: Indicating Drop Precedence Using DEI Bit Upstream**

Abstract Test Plan for GPON ONU Conformance	
Test Name	Indicating Drop Precedence Using DEI Bit Upstream
Test Definition ID	ONU.6.2.14
Reference Document	BBF TR-156i2 [3] ITU-T G.988 [2]
Test Type	Conformance
Test Status	Mandatory
Requirement(s) Description	<b>BBF TR-156i2</b> <b>R-55</b> The OLT and ONU <b>MUST</b> 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	<ul style="list-style-type: none"> <li>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 streams, two per traffic class. For each traffic class, one of the streams is marked with drop precedence. Each T-CONT should be serviced at a fixed rate, E. Each stream is set to rate R=0.7E.</li> <li>The Ethernet Traffic Generator/Analyzer is configured to transmit Ethernet frames upstream with the following parameters: <ul style="list-style-type: none"> <li>Stream A* (Test 1): S-tagged unicast (SVID1, SPbits1, DEI=1)</li> <li>Stream B (Test 1) : S-tagged unicast (SVID1, SPbits1, DEI=0)</li> <li>Stream C* (Test 2): S-tagged unicast (SVID1, SPbits2, DEI=1)</li> <li>Stream D (Test 2) : S-tagged unicast (SVID1, SPbits2, DEI=0)</li> <li>Stream E* (Test 3): S-tagged unicast (SVID1, SPbits3, DEI=1)</li> <li>Stream F (Test 3) : S-tagged unicast (SVID1, SPbits3, DEI=0)</li> <li>Stream G* (Test 4): S-tagged unicast (SVID1, SPbits4, DEI=1)</li> <li>Stream H (Test 4) : S-tagged unicast (SVID1, SPbits4, DEI=0)</li> </ul> </li> <li>The traffic corresponding to each stream will have the following parameters at the S/R interface: <ul style="list-style-type: none"> <li>Stream A: S-tagged unicast (SVID1, SPbits1, DEI=1, GEM1, TCONT1)</li> <li>Stream B: S-tagged unicast (SVID1, SPbits1, DEI=0, GEM1, TCONT1)</li> <li>Stream C: S-tagged unicast (SVID1, SPbits2, DEI=1, GEM2, TCONT2)</li> <li>Stream D: S-tagged unicast (SVID1, SPbits2, DEI=0, GEM2, TCONT2)</li> <li>Stream E: S-tagged unicast (SVID1, SPbits3, DEI=1, GEM3, TCONT3)</li> <li>Stream F: S-tagged unicast (SVID1, SPbits3, DEI=0, GEM3, TCONT3)</li> <li>Stream G: S-tagged unicast (SVID1, SPbits4, DEI=1, GEM4, TCONT4)</li> <li>Stream H: S-tagged unicast (SVID1, SPbits4, DEI=0, GEM4, TCONT4)</li> </ul> </li> </ul> <p>Note: * Drop Precedence Stream</p>
Test Procedure	<ul style="list-style-type: none"> <li>For each traffic stream pair (A&amp;B, C&amp;D, E&amp;F, G&amp;H), inject streams at the U-interface, each of rate R, tagged as shown in the test configuration section above. The stream rate shall be set to R=0.7E. Verify at the S/R-interface that the only packets dropped are from streams marked with drop precedence.</li> </ul>
Pass/Fail Criteria	The test passes if the following are true, otherwise the test fails: <ol style="list-style-type: none"> <li>All OMCI commands have Success responses</li> <li>A MIB upload and compare matches the MIB expected by the OLT</li> <li>Verify at the S/R-interface that the only packets dropped are from streams marked with drop precedence.</li> </ol>
Remarks	None



**Test Case 6.2.15: Indicating Drop Precedence Using P-bits Downstream**

Abstract Test Plan for GPON ONU Conformance	
Test Name	Indicating Drop Precedence Using P-bits Downstream
Test Definition ID	ONU.6.2.15
Reference Document	BBF TR-156i2 [3] ITU-T G.988 [2]
Test Type	Conformance
Test Status	Mandatory
Requirement(s) Description	<b>BBF TR-156i2</b> <b>R-54</b> The OLT and ONU <b>MUST</b> support drop precedence within at least 2 traffic classes and <b>MUST</b> 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	<ul style="list-style-type: none"> <li>• 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 streams, two per traffic class. For each traffic class, one of the streams is marked with drop precedence. For a user port egress rate of E, each stream rate is set to <math>R=0.7E</math>.</li> <li>• The OLT Emulator is configured to transmit Ethernet frames downstream with the following parameters: <ul style="list-style-type: none"> <li>Stream A* (Test 1): S-tagged unicast (SVID1, SPbits2, GEM1)</li> <li>Stream B (Test 1) : S-tagged unicast (SVID1, SPbits3, GEM1)</li> <li>Stream C* (Test 2): S-tagged unicast (SVID1, SPbits4, GEM2)</li> <li>Stream D (Test 2) : S-tagged unicast (SVID1, SPbits5, GEM2)</li> </ul> </li> <li>• The traffic corresponding to each stream will have the following parameters at the U interface: <ul style="list-style-type: none"> <li>Stream A: S-tagged unicast (SVID1, SPbits2)</li> <li>Stream B: S-tagged unicast (SVID1, SPbits3)</li> <li>Stream C: S-tagged unicast (SVID1, SPbits4)</li> <li>Stream D: S-tagged unicast (SVID1, SPbits5)</li> </ul> </li> </ul> <p>Note: * Drop Precedence Stream</p>
Test Procedure	<ul style="list-style-type: none"> <li>• For each traffic stream pair (A&amp;B, C&amp;D) inject streams at the S/R-interface, each of rate R, tagged as shown in the test configuration section above. The stream rate shall be set to <math>R=0.7E</math>, where E is the user port egress rate. Verify at the U-interface that the only packets dropped are from streams marked with drop precedence.</li> </ul>
Pass/Fail Criteria	<p>The test passes if the following are true, otherwise the test fails:</p> <ol style="list-style-type: none"> <li>1. All OMCI commands have Success responses</li> <li>2. A MIB upload and compare matches the MIB expected by the OLT</li> <li>3. Verify at the U-interface that the only packets dropped are from streams marked with drop precedence.</li> </ol>
Remarks	None

**Test Case 6.2.16: Indicating Drop Precedence Using DEI Bit Downstream**

Abstract Test Plan for GPON ONU Conformance	
Test Name	Indicating Drop Precedence Using DEI Bit Downstream
Test Definition ID	ONU.6.2.16
Reference Document	BBF TR-156i2 [3] ITU-T G.988 [2]
Test Type	Conformance
Test Status	Mandatory
Requirement(s) Description	<b>BBF TR-156i2</b> <b>R-55</b> The OLT and ONU <b>MUST</b> 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	<ul style="list-style-type: none"> <li>• OLT Emulator and ONU under test are powered and connected to ODN.</li> <li>• 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.</li> <li>• 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 streams, two per traffic class. For each traffic class, one of the streams is marked with drop precedence*. For a user port egress rate of E, each stream rate is set to <math>R=0.7E</math>.</li> <li>• The OLT Emulator is configured to transmit Ethernet frames downstream with the following parameters: <ul style="list-style-type: none"> <li>Stream A* (Test 1): S-tagged unicast (SVID1, SPbits1, DEI=1, GEM1)</li> <li>Stream B (Test 1) : S-tagged unicast (SVID1, SPbits1, DEI=0, GEM1)</li> <li>Stream C* (Test 2): S-tagged unicast (SVID1, SPbits2, DEI=1, GEM2)</li> <li>Stream D (Test 2) : S-tagged unicast (SVID1, SPbits2, DEI=0, GEM2)</li> <li>Stream E* (Test 3): S-tagged unicast (SVID1, SPbits3, DEI=1, GEM3)</li> <li>Stream F (Test 3) : S-tagged unicast (SVID1, SPbits3, DEI=0, GEM3)</li> <li>Stream G* (Test 4): S-tagged unicast (SVID1, SPbits4, DEI=1, GEM4)</li> <li>Stream H (Test 4) : S-tagged unicast (SVID1, SPbits4, DEI=0, GEM4)</li> </ul> </li> <li>• The traffic corresponding to each stream will have the following parameters at the U interface: <ul style="list-style-type: none"> <li>Stream A: S-tagged unicast (SVID1, SPbits1, DEI=1)</li> <li>Stream B: S-tagged unicast (SVID1, SPbits1, DEI=0)</li> <li>Stream C: S-tagged unicast (SVID1, SPbits2, DEI=1)</li> <li>Stream D: S-tagged unicast (SVID1, SPbits2, DEI=0)</li> <li>Stream E: S-tagged unicast (SVID1, SPbits3, DEI=1)</li> <li>Stream F: S-tagged unicast (SVID1, SPbits3, DEI=0)</li> <li>Stream G: S-tagged unicast (SVID1, SPbits4, DEI=1)</li> <li>Stream H: S-tagged unicast (SVID1, SPbits4, DEI=0)</li> </ul> </li> </ul>
Test Procedure	<ul style="list-style-type: none"> <li>• For each traffic stream pair (A&amp;B, C&amp;D, E&amp;F, G&amp;H), inject streams at the S/R-interface, each of rate R, tagged as shown in the test configuration section above. The stream rate shall be set to <math>R=0.7E</math>, where E is the user port egress rate. Verify at the U-interface that the only packets dropped are from streams marked with drop precedence.</li> </ul>
Pass/Fail Criteria	The test passes if the following are true, otherwise the test fails: <ol style="list-style-type: none"> <li>1. All OMCI commands have Success responses</li> <li>2. A MIB upload and compare matches the MIB expected by the OLT</li> <li>3. Verify at the U-interface that the only packets dropped are from streams marked with drop precedence.</li> </ol>
Remarks	None

**Test Case 6.2.17: Test Case Reserved For Future Use**

**Test Case 6.2.18: Test Case Reserved For Future Use**

**Test Case 6.2.19: Mapping Traffic from GEM Ports to Multiple U-Interfaces in the Downstream Direction (VBES)**

Abstract Test Plan for GPON ONU Conformance	
Test Name	Mapping Traffic from GEM Ports to Multiple U-Interfaces in the Downstream Direction (VBES)
Test Definition ID	ONU.6.2.19
Reference Document	BBF TR-156i2 [3] ITU-T G.988 [2]
Test Type	Conformance
Test Status	Conditionally mandatory if Multiple U Interfaces are supported by the ONU
Requirement(s) Description	<b>BBF TR-156i2</b> <b>R-41</b> The ONU <b>MUST</b> 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	<ul style="list-style-type: none"> <li>• OLT Emulator and ONU under test are powered and connected to ODN.</li> <li>• 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.</li> <li>• The OLT Emulator is configured to transmit Ethernet frames downstream with the following parameters: Stream A: Double-tagged unicast (SVID1, SPbits1, CVID1, GEM1) Stream B: Double-tagged unicast (SVID1, SPbits1, CVID1, GEM2)</li> <li>• The traffic corresponding to each stream will have the following parameters at the U interface: Stream A (User Port 1): Double-tagged unicast (SVID1, SPbits1, CVID1) Stream B (User Port 2): Double-tagged unicast (SVID1, SPbits1, CVID1)</li> </ul>
Test Procedure	<ul style="list-style-type: none"> <li>• Select random values for CVID1, SVID1 and SPbits1 and select random values for the MAC addresses.</li> <li>• Use the OLT Emulator to provision the ONU under test to support two VBES subscribers with one user traffic class, requiring 2 GEM ports (Alloc-IDs, T-CONTs, Port-IDs).</li> <li>• Enable any frame monitoring/capture mechanisms on the Ethernet Traffic Generator/Analyzer.</li> <li>• Cause the OLT Emulator to transmit downstream traffic with the characteristics described in the test configuration section.</li> </ul>
Pass/Fail Criteria	<p>The test passes if the following are true, otherwise the test fails:</p> <ol style="list-style-type: none"> <li>1. Each OMCI response message must indicate success for the associated create or set command.</li> <li>2. The uploaded ONU MIB must be consistent with the MIB held in the OLT Emulator</li> <li>3. All downstream frames sent by the OLT Emulator on GEM1 must be received by the Ethernet Traffic Generator/Analyzer at the U-interface 1 but not at U-interface 2.</li> <li>4. All downstream frames sent by the OLT Emulator on GEM2 must be received by the Ethernet Traffic Generator/Analyzer at the U-interface 2 but not at U-interface 1.</li> </ol>
Remarks	None

**Test Case 6.2.20: Mapping Traffic from GEM Ports to U-Interface in the Downstream Direction in a 1:1 VLAN Architecture**

Abstract Test Plan for GPON ONU Conformance	
Test Name	Mapping Traffic from GEM Ports to U-Interface in the Downstream Direction in a 1:1 VLAN Architecture
Test Definition ID	ONU.6.2.20
Reference Document	BBF TR-156i2 [3] ITU-T G.988 [2]
Test Type	Conformance
Test Status	Mandatory
Requirement(s) Description	<b>BBF TR-156i2</b> <b>R-31</b> The ONU <b>MUST</b> 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	<ul style="list-style-type: none"> <li>• OLT Emulator and ONU under test are powered and connected to ODN.</li> <li>• 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.</li> <li>• The OLT Emulator is configured to transmit Ethernet frames downstream with the following parameters: Stream A: C-tagged unicast (CVID1, CPbits1, GEM1) Stream B: C-tagged unicast (CVID1, CPbits2, GEM2)</li> <li>• The traffic corresponding to each stream will have the following parameters at the U interface: Stream A (User Port 1): C-tagged unicast (CVID1, CPbits1) Stream B (User Port 1): C-tagged unicast (CVID1, CPbits2)</li> </ul> <p>* In the upstream direction, mapping to traffic classes is done using C-Tag Pbits</p>
Test Procedure	<ul style="list-style-type: none"> <li>• Select random values for CVID1, CPbits1 and CPbits2 and select random values for the MAC addresses.</li> <li>• Use the OLT Emulator to provision the ONU under test to support one 1:1 subscriber with two user traffic classes, requiring 2 GEM ports (Alloc-IDs, T-CONTs, Port-IDs).</li> <li>• Enable any frame monitoring/capture mechanisms on the Ethernet Traffic Generator/Analyzer.</li> <li>• Cause the OLT Emulator to transmit downstream traffic with the characteristics described in the test configuration section.</li> </ul>
Pass/Fail Criteria	The test passes if the following are true, otherwise the test fails: <ol style="list-style-type: none"> <li>1. Each OMCI response message must indicate success for the associated create or set command.</li> <li>2. The uploaded ONU MIB must be consistent with the MIB held in the OLT Emulator</li> <li>3. All downstream frames sent by the OLT Emulator must be received error free by the Ethernet Traffic Generator/Analyzer at the U-interface</li> </ol>
Remarks	None

**Test Case 6.2.21: Mapping Traffic from GEM Ports to Multiple U-Interfaces in the Downstream Direction (1:1 VLAN Architecture)**

Abstract Test Plan for GPON ONU Conformance	
Test Name	Mapping Traffic from GEM Ports to Multiple U-Interfaces in the Downstream Direction (1:1 VLAN Architecture)
Test Definition ID	ONU.6.2.21
Reference Document	BBF TR-156i2 [3] ITU-T G.988 [2]
Test Type	Conformance
Test Status	Mandatory if Multiple U Interfaces are supported by the ONU
Requirement(s) Description	<b>BBF TR-156i2</b> <b>R-31</b> The ONU <b>MUST</b> support mapping traffic from one or more GEM Ports to a U-interface in the downstream direction <b>R-33</b> The Access Node <b>MUST</b> configure 1:1 VLANs so that the C-Tags are assigned to be unique across the U-interfaces and across the entries in the 1:1 VLAN membership list
Test Objective	Verify that the ONU supports mapping traffic from GEM Ports to multiple U-interfaces in the downstream direction
Test Configuration	<ul style="list-style-type: none"> <li>• OLT Emulator and ONU under test are powered and connected to ODN.</li> <li>• 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.</li> <li>• The OLT Emulator is configured to transmit Ethernet frames downstream with the following parameters:                             <ul style="list-style-type: none"> <li>Stream A: C-tagged unicast (CVID1, CPbits1, GEM1)</li> <li>Stream B: C-tagged unicast (CVID1, CPbits2, GEM2)</li> <li>Stream C: C-tagged unicast (CVID2, CPbits1, GEM3)</li> </ul> </li> <li>• The traffic corresponding to each stream will have the following parameters at the U interface:                             <ul style="list-style-type: none"> <li>Stream A (User Port 1): C-tagged unicast (CVID1, CPbits1)</li> <li>Stream B (User Port 1): S-tagged unicast (CVID1, CPbits2)</li> <li>Stream C (User Port 2): S-tagged unicast (CVID2, CPbits1)</li> </ul> </li> </ul> <p>* In the upstream direction, mapping to traffic classes is done using C-Tag Pbits</p>
Test Procedure	<ul style="list-style-type: none"> <li>• Select random values for CVID1, CVID2, CPbits1 and CPbits2 and select random values for the MAC addresses.</li> <li>• Use the OLT Emulator to provision the ONU under test to support two 1:1 subscribers with two user traffic classes, requiring 3 GEM ports (Alloc-IDs, T-CONTs, Port-IDs).</li> <li>• Enable any frame monitoring/capture mechanisms on the Ethernet Traffic Generator/Analyzer.</li> <li>• Cause the OLT Emulator to transmit downstream traffic with the characteristics described in the test configuration section.</li> </ul>
Pass/Fail Criteria	The test passes if the following are true, otherwise the test fails: <ol style="list-style-type: none"> <li>1. Each OMCI response message must indicate success for the associated create or set command.</li> <li>2. The uploaded ONU MIB must be consistent with the MIB held in the OLT Emulator</li> <li>3. All downstream frames sent by the OLT Emulator on GEM1 must be received error free by the Ethernet Traffic Generator/Analyzer at the U-interface 1</li> <li>4. All downstream frames sent by the OLT Emulator on GEM2 must be received error free by the Ethernet Traffic Generator/Analyzer at the U-interface 1</li> <li>5. All downstream frames sent by the OLT Emulator on GEM3 must be received error free by the Ethernet Traffic Generator/Analyzer at the U-interface 2</li> </ol>
Remarks	None

**Test Case 6.2.22: Test Case Reserved For Future Use**

**Test Case 6.2.23: Test Case Reserved For Future Use**

**Test Case 6.2.24: Test Case Reserved For Future Use**

### 6.3 IGMP Controlled Multicast

#### Test Case 6.3.1: ONU Passing of Downstream IGMP Messages

Abstract Test Plan for GPON ONU Conformance	
Test Name	ONU Passing of Downstream IGMP Messages
Test Definition ID	ONU.6.3.1
Reference Document	BBF TR-156i2 [3] ITU-T G.988 [2]
Test Type	Conformance
Test Status	Mandatory
Requirement(s) Description	<b>BBF TR-156i2</b> <b>R-81</b> The ONU <b>MUST</b> 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	<ol style="list-style-type: none"> <li>1. OLT emulator and ONU under test are connected to the ODN and powered on.</li> <li>2. ONU activation and OMCC establishment processes have been successfully completed.</li> <li>3. The OLT Emulator has instructed the ONU to reset its MIB to factory default values</li> <li>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</li> <li>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.</li> <li>6. The Ethernet traffic generator will be configured to report/capture the receipt of the IGMP messages</li> </ol>
Test Procedure	<ol style="list-style-type: none"> <li>1. Select random value for VID1 between 1 and 4094. The VID shall be used as the VID of the S-Tag noted in the above configuration.</li> <li>2. Cause the OLT emulator to send the configured OMCI message sequence to provision the ONU.</li> <li>3. Enable any frame capture mechanism on the Ethernet traffic generator.</li> <li>4. Cause the OLT emulator to send an IGMP global/general query message to the unicast GEM port. The IGMP message shall be encapsulated within a S-Tagged Ethernet frame. The group address and number of sources fields within the IGMP message should both be all zeros.</li> <li>5. Verify the Ethernet traffic generator received the IGMP query message.</li> <li>6. Cause the OLT emulator to send an IGMP global/general query message to the multicast GEM port. The IGMP message shall be encapsulated within a S-Tagged Ethernet frame. The group address and number of sources fields within the IGMP message should both be all zeros.</li> <li>7. Verify the Ethernet traffic generator received the IGMP query message.</li> </ol>
Pass/Fail Criteria	<p>The test passes if the following are true, otherwise the test fails:</p> <ol style="list-style-type: none"> <li>1. During ONU provisioning, each OMCI response message indicates success for the associated create or set command.</li> <li>2. The uploaded ONU MIB must be consistent with the MIB held in the OLT Emulator</li> <li>3. The IGMP global/general query message transmitted to the unicast GEM port was received by the Ethernet traffic generator and was contained within an untagged Ethernet frame.</li> <li>4. The IGMP global/general query message transmitted to the multicast GEM port was received by the Ethernet traffic generator and was contained within an untagged Ethernet frame.</li> </ol>
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).



**Test Case 6.3.2: Test Case Reserved For Future Use**

**Test Case 6.3.3: ONU Silent Discarding of IGMPv1 Messages**

Abstract Test Plan for GPON ONU Conformance	
Test Name	ONU Silent Discarding of IGMPv1 Messages
Test Definition ID	ONU.6.3.3
Reference Document	BBF TR-156i2 [3] ITU-T G.988 [2]
Test Type	Conformance
Test Status	Mandatory
Requirement(s) Description	<b>BBF TR-156i2</b> <b>R-98</b> The ONU <b>MUST</b> silently discard IGMP v1 messages.
Test Objective	To verify that the ONU implementation supports silently discarding of IGMPv1 messages.
Test Configuration	<ol style="list-style-type: none"> <li>1. OLT emulator and ONU under test are connected to the ODN and powered on.</li> <li>2. ONU activation and OMCC establishment processes have been successfully completed.</li> <li>3. The OLT Emulator has instructed the ONU to reset its MIB to factory default values</li> <li>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</li> <li>5. The OLT emulator will be used to report/capture any upstream packets.</li> <li>6. The Ethernet traffic generator will be configured to generate and transmit an upstream IGMPv1 membership report/group join message into the U-interface</li> </ol>
Test Procedure	<ol style="list-style-type: none"> <li>1. Select random value for SVID1 between 1 and 4094. The VID shall be used as the VID of the S-Tag noted in the above configuration.</li> <li>2. Cause the OLT emulator to send the configured OMCI message sequence to provision the ONU.</li> <li>3. Enable any frame capture mechanism on the OLT Emulator.</li> <li>4. Cause the Ethernet traffic generator to transmit the upstream IGMPv1 membership report message into the ONU U-interface.</li> <li>5. Verify the OLT Emulator does not receive the IGMPv1 upstream message.</li> </ol>
Pass/Fail Criteria	<p>The test passes if the following are true, otherwise the test fails:</p> <ol style="list-style-type: none"> <li>1. During ONU provisioning, each OMCI response message indicates success for the associated create or set command.</li> <li>2. The uploaded ONU MIB must be consistent with the MIB held in the OLT Emulator</li> <li>3. The upstream IGMPv1 message is not received by the OLT Emulator (it is silently discarded by the ONU).</li> </ol>
Remarks	None

**Test Case 6.3.4: Test Case Reserved For Future Use**

**Test Case 6.3.5: Marking Upstream IGMP Messages with Ethernet P-Bits**

Abstract Test Plan for GPON ONU Conformance													
Test Name	Marking Upstream IGMP Messages with Ethernet P-Bits												
Test Definition ID	ONU.6.3.5												
Reference Document	BBF TR-156i2 [3] ITU-T G.988 [2]												
Test Type	Conformance												
Test Status	Mandatory												
Requirement(s) Description	<b>BBF TR-156i2 R-94</b> The ONU <b>MUST</b> 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	<ol style="list-style-type: none"> <li>OLT Emulator and ONU under test are powered and connected to ODN</li> <li>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.</li> <li>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). <table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td>IPTV Channel (Group)</td> <td>1</td> </tr> <tr> <td>IP Multicast Group</td> <td>IP_G1</td> </tr> <tr> <td>MAC Multicast Group</td> <td>MAC_G1</td> </tr> </table> <table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td>Multicast Server (Source)</td> <td>1</td> </tr> <tr> <td>Multicast Server IP Address</td> <td>IP_S1</td> </tr> <tr> <td>Multicast Server MAC Address</td> <td>MAC_S1</td> </tr> </table> </li> <li>The ONU under test is configured to add an S-Tag to upstream untagged traffic</li> </ol>	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
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												
Test Procedure	<ol style="list-style-type: none"> <li>Select random values for the multicast address MAC1 and unicast addresses MAC2</li> <li>Select random values for the multicast address IP_G1 and unicast address IP_S1</li> <li>Use the OLT Emulator to provision the ONU under test to support one N:1 VLAN with one user traffic class, requiring 1 bidirectional unicast GEM port (Alloc-ID, T-CONT, Port-ID).</li> <li>Enable any frame monitoring/capture mechanisms on the OLT Emulator.</li> <li>Use the Ethernet Traffic Generator/Analyzer at the U-interface to send IGMP messages to join channel 1</li> <li>Use the Ethernet Traffic Generator/Analyzer at the U-interface to send IGMP Leave messages for channel 1</li> </ol>												
Pass/Fail Criteria	<p>The test passes if the following are true, otherwise the test fails:</p> <ol style="list-style-type: none"> <li>Each OMCI response message must indicate success for the associated create or set command.</li> <li>The uploaded ONU MIB must be consistent with the MIB held in the OLT Emulator</li> <li>Use the OLT Emulator to verify that all the IGMP Join and Leave messages received at the S/R-interface are S-tagged with a VID equal to SVID1 and S-Tag Pbits equal to SPbit1</li> </ol>												
Remarks	None												

**Test Case 6.3.6: IGMP Controlled Multicast**

Abstract Test Plan for GPON ONU Conformance																																																																									
Test Name	IGMP Controlled Multicast																																																																								
Test Definition ID	ONU.6.3.6																																																																								
Reference Document	BBF TR-156i2 [3] ITU-T G.988 [2]																																																																								
Test Type	Conformance																																																																								
Test Status	Mandatory																																																																								
Requirement(s) Description	<b>BBF TR-156i2</b> <b>R-74</b> The GPON network <b>MUST</b> be able to forward all multicast VLAN using a single downstream multicast GEM port <b>R-79</b> The GPON network <b>MUST</b> 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	<ol style="list-style-type: none"> <li>ONU under test and OLT emulator are powered and connected to ODN</li> <li>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.</li> <li>A single U-interface is used</li> <li>The Ethernet traffic generator connected to the OLT Emulator generates multicast Ethernet frames. <table border="1"> <thead> <tr> <th>Multicast stream</th> <th>Multicast IP SA</th> <th>Multicast group IP DA</th> <th>Multicast MAC group address</th> <th>VID</th> <th>p bit</th> </tr> </thead> <tbody> <tr> <td>Ch1</td> <td>IP-S1</td> <td>IP-G1</td> <td>MAC-G1</td> <td>VID1</td> <td>Pbit1</td> </tr> <tr> <td>Ch2</td> <td>IP-S2</td> <td>IP-G2</td> <td>MAC-G2</td> <td>VID2</td> <td>Pbit1</td> </tr> </tbody> </table> </li> <li>The Ethernet traffic generator connected to the OLT Emulator generates unicast Ethernet frames <table border="1"> <thead> <tr> <th>Unicast MAC DA</th> <th>Unicast MAC SA</th> <th>VID</th> <th>Pbit</th> </tr> </thead> <tbody> <tr> <td>MAC-U1</td> <td>MAC-V1</td> <td>VID3</td> <td>Pbit1</td> </tr> </tbody> </table> </li> <li>The Ethernet Traffic Generator connected to the U-interface generates unicast Ethernet frames <table border="1"> <thead> <tr> <th>Unicast MAC DA</th> <th>Unicast MAC SA</th> <th>VID</th> <th>Pbit</th> </tr> </thead> <tbody> <tr> <td>MAC-V1</td> <td>MAC-U1</td> <td>VID3</td> <td>Pbit1</td> </tr> </tbody> </table> </li> <li>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 <table border="1"> <thead> <tr> <th>Source IP address</th> <th>Source MAC address</th> <th>Multicast IP group address</th> <th>VID</th> <th>P bit</th> </tr> </thead> <tbody> <tr> <td>IP-U2</td> <td>MAC-U2</td> <td>IP-G1</td> <td>VID1</td> <td>Pbit1</td> </tr> </tbody> </table> </li> <li>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 <table border="1"> <thead> <tr> <th>Source IP address</th> <th>Source MAC address</th> <th>Multicast IP group address</th> <th>Multicast source IP address</th> <th>VID</th> <th>p bit</th> </tr> </thead> <tbody> <tr> <td>0.0.0.0</td> <td>MAC-U3</td> <td>IP-G2</td> <td>IP-S2</td> <td>VID2</td> <td>Pbit1</td> </tr> </tbody> </table> </li> <li>This table shows the bidirectionnal GEM port mapping (unicast stream, and IGMP messages) <table border="1"> <thead> <tr> <th colspan="3">U-interface</th> <th rowspan="2">GEM Port</th> <th rowspan="2">T-CONT</th> <th>S/R-interface</th> </tr> <tr> <th>User Port</th> <th>TPID</th> <th>p-bit value</th> <th>p-bit</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>0x8100</td> <td>Pbit1</td> <td>GEM1</td> <td>TCONT1</td> <td>Pbit1</td> </tr> </tbody> </table> </li> <li>All the previous streams have the same Traffic Class</li> </ol>	Multicast stream	Multicast IP SA	Multicast group IP DA	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	Unicast MAC DA	Unicast MAC SA	VID	Pbit	MAC-U1	MAC-V1	VID3	Pbit1	Unicast MAC DA	Unicast MAC SA	VID	Pbit	MAC-V1	MAC-U1	VID3	Pbit1	Source IP address	Source MAC address	Multicast IP group address	VID	P bit	IP-U2	MAC-U2	IP-G1	VID1	Pbit1	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	U-interface			GEM Port	T-CONT	S/R-interface	User Port	TPID	p-bit value	p-bit	1	0x8100	Pbit1	GEM1	TCONT1	Pbit1
Multicast stream	Multicast IP SA	Multicast group IP DA	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																																																																				
Unicast MAC DA	Unicast MAC SA	VID	Pbit																																																																						
MAC-U1	MAC-V1	VID3	Pbit1																																																																						
Unicast MAC DA	Unicast MAC SA	VID	Pbit																																																																						
MAC-V1	MAC-U1	VID3	Pbit1																																																																						
Source IP address	Source MAC address	Multicast IP group address	VID	P bit																																																																					
IP-U2	MAC-U2	IP-G1	VID1	Pbit1																																																																					
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																																																																				
U-interface			GEM Port	T-CONT	S/R-interface																																																																				
User Port	TPID	p-bit value			p-bit																																																																				
1	0x8100	Pbit1	GEM1	TCONT1	Pbit1																																																																				

Test Procedure	<ol style="list-style-type: none"> <li>1. Select random values for multicast IP group addresses: IP-G1 and IP-G2</li> <li>2. Use associate multicast MAC addresses: MAC-G1 and MAC-G2.</li> <li>3. Select random values for IP addresses : IP-S1, IP-S2 and IP-U2</li> <li>4. Select random values for MAC addresses: MAC-U1, MAC-V1, MAC-U2 and MAC-U3</li> <li>5. Select a random value for VID1, VID2 and VID3 between 1 and 4094 VID1≠VID2≠VID3.</li> <li>6. Select a random value for Pbit1</li> <li>7. Via the OLT emulator, create a bidirectional GEM port between the OLT emulator and the ONU under test U-interface, for IGMP messages and unicast streams</li> <li>8. Create a multicast GEM port between the OLT emulator and the ONU under test for multicast Ethernet frames</li> <li>9. Configure the OLT emulator to forward all multicast-VLAN traffic using a single downstream multicast GEM port</li> <li>10. Configure the OLT emulator to forward all multicast traffic to the multicast GEM Port permanently</li> <li>11. Via the OLT emulator configure the ONU under test to allow all channels</li> <li>12. Generate downstream multicast traffic defined in test configuration step 4.</li> <li>13. At the U-interface send IGMP messages to join channel Ch1</li> <li>14. At the U-interface send IGMP message to leave Channel Ch1 and send IGMP messages to join channel Ch2</li> <li>15. At the V and U-interface generate unicast Ethernet streams</li> </ol>
Pass/Fail Criteria	<p>The test passes if the following are true, otherwise the test fails:</p> <ol style="list-style-type: none"> <li>1. Each OMCI response message must indicate success for the associated create or set command.</li> <li>2. The uploaded ONU MIB must be consistent with the MIB held in the OLT Emulator</li> <li>3. The ONU is able to receive all multicast-VLAN traffic using a single downstream multicast GEM port</li> <li>4. The ONU uses bidirectional GEM port to send and receive IGMP messages</li> <li>5. The ONU can share bidirectional GEM port used for IGMP messages to transmit other VLANs with the same traffic class</li> </ol>
Remarks	None

**Test Case 6.3.7: Multicast White List**

Abstract Test Plan for GPON ONU Conformance																																											
Test Name	Multicast White List																																										
Test Definition ID	ONU.6.3.7																																										
Reference Document	BBF TR-156i2 [3] ITU-T G.988 [2]																																										
Test Type	Conformance																																										
Test Status	Mandatory																																										
Requirement(s) Description	<p><b>BBF TR-156i2</b></p> <p><b>R-76</b> The ONU <b>MUST</b> allow the configuration of the IP multicast groups that are acceptable per user port based on:</p> <ul style="list-style-type: none"> <li>• Source address matching</li> <li>• Group address matching</li> <li>• VLAN membership</li> </ul> <p><b>R-84</b> The ONU <b>MUST</b> 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 <b>MUST</b> be silently discarded. When there is a match, the IGMP message <b>SHOULD</b> be forwarded within a multicast-VLAN, and enter the IGMP snooping function.</p>																																										
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	<ol style="list-style-type: none"> <li>1. ONU under test and OLT emulator are powered and connected to ODN</li> <li>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.</li> <li>3. ONU and OLT <b>MUST</b> support IGMP V3</li> <li>4. A single U-interface is used</li> <li>5. A bidirectional GEM port between the ONU under test U-interface and the OLT emulator has been created by OMCI, for IGMP messages</li> <li>6. A downstream multicast GEM port between the ONU under test and the OLT emulator has been created by OMCI, for multicast Ethernet frames.</li> <li>7. The OLT Emulator generates multicast Ethernet frames as follows</li> </ol> <table border="1" style="margin-left: 40px;"> <thead> <tr> <th>Multicast stream</th> <th>Multicast source IP address</th> <th>Multicast IP group address</th> <th>Multicast MAC group address</th> <th>VID</th> <th>p bit</th> </tr> </thead> <tbody> <tr> <td>Ch1</td> <td>IP-S1</td> <td>IP-G1</td> <td>MAC-G1</td> <td>CVID1</td> <td>CPbit1</td> </tr> <tr> <td>Ch2</td> <td>IP-S2</td> <td>IP-G2</td> <td>MAC-G2</td> <td>CVID1</td> <td>CPbit1</td> </tr> <tr> <td>Ch3</td> <td>IP-S3</td> <td>IP-G3</td> <td>MAC-G3</td> <td>CVID1</td> <td>CPbit1</td> </tr> <tr> <td>Ch4</td> <td>IP-S3</td> <td>IP-G4</td> <td>MAC-G4</td> <td>CVID1</td> <td>CPbit1</td> </tr> <tr> <td>Ch5</td> <td>IP-S4</td> <td>IP-G5</td> <td>MAC-G5</td> <td>CVID2</td> <td>CPbit1</td> </tr> <tr> <td>Ch6</td> <td>IP-S5</td> <td>IP-G5</td> <td>MAC-G5</td> <td>CVID3</td> <td>CPbit1</td> </tr> </tbody> </table>	Multicast stream	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
Multicast stream	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																																						

<p>Test Procedure</p>	<ol style="list-style-type: none"> <li>1. Select random values for multicast IP group addresses: IP-G1, IP-G2, IP-G3, IP-G4 and IP-G5</li> <li>2. Select random values for IP addresses : IP-S1, IP-S2, IP-S3, IP-S4, and IP-S5</li> <li>3. Select random values for CVID1, CVID2, and CVID3.</li> <li>4. Select a random value for CPbit1</li> <li>5. Configure the OLT emulator to forward all multicast traffic to the multicast GEM Port.</li> <li>6. Via the OLT emulator, configure the dynamic access list control table of the ONU (table index IND1)</li> </ol> <table border="1" data-bbox="560 422 1230 638"> <thead> <tr> <th>Table Index</th> <th>VLAN ID</th> <th>Multicast source IP address</th> <th>Multicast IP group address</th> </tr> </thead> <tbody> <tr> <td>IND1</td> <td>CVID1</td> <td>IP-S1</td> <td>IP-G1</td> </tr> <tr> <td>IND3</td> <td>CVID1</td> <td>IP-S3</td> <td>IP-G3</td> </tr> <tr> <td>IND5</td> <td>CVID2</td> <td>IP-S4</td> <td>IP-G5</td> </tr> </tbody> </table> <p>NB: 0.0.0.0 = no IP filtering according to ITU-T G.988[2]</p> <ol style="list-style-type: none"> <li>7. Generate multicast traffic defined in test step 3 at the OLT Emulator</li> <li>8. At the U-interface send IGMP messages to join channel Ch1</li> <li>9. At the U-interface send IGMP message to leave Channel Ch1</li> <li>10. At the U-interface send IGMP messages to join channel Ch2</li> <li>11. At the U-interface send IGMP message to leave Channel Ch2</li> <li>12. At the U-interface send IGMP messages to join channel Ch3</li> <li>13. At the U-interface send IGMP message to leave Channel Ch3</li> <li>14. At the U-interface send IGMP messages to join channel Ch4</li> <li>15. At the U-interface send IGMP message to leave Channel Ch4</li> <li>16. At the U-interface send IGMP messages to join channel Ch5</li> <li>17. At the U-interface send IGMP message to leave Channel Ch5</li> <li>18. At the U-interface send IGMP messages to join channel Ch6</li> <li>19. At the U-interface send IGMP message to leave Channel Ch6</li> </ol>	Table Index	VLAN ID	Multicast source IP address	Multicast IP group address	IND1	CVID1	IP-S1	IP-G1	IND3	CVID1	IP-S3	IP-G3	IND5	CVID2	IP-S4	IP-G5
Table Index	VLAN ID	Multicast source IP address	Multicast IP group address														
IND1	CVID1	IP-S1	IP-G1														
IND3	CVID1	IP-S3	IP-G3														
IND5	CVID2	IP-S4	IP-G5														
<p>Pass/Fail Criteria</p>	<ol style="list-style-type: none"> <li>1. Each OMCI response message must indicate success for the associated create or set command.</li> <li>2. The uploaded ONU MIB must be consistent with the MIB held in the OLT Emulator</li> <li>3. The ONU allows the configuration of the IP multicast groups that are acceptable per user port based on group address matching (step 7)</li> <li>4. The U-interface receives the multicast stream channel Ch1 (step 8)</li> <li>5. At the R/S-interface, the IGMP join message is not sent for the multicast stream channel Ch2 (step 10)</li> <li>6. The U-interface does not receive the multicast stream channel Ch2 (step 10)</li> <li>7. The U-interface receives the multicast stream channel Ch3 (step 12)</li> <li>8. At the R/S-interface, the IGMP join message is not sent for the multicast stream channel Ch4 (step 14)</li> <li>9. The U-interface does not receive the multicast stream channel Ch4 (step 14)</li> <li>10. The U-interface receives the multicast stream channel Ch5 (step 16)</li> <li>11. At the R/S-interface, the IGMP join message is not sent for the multicast stream channel Ch6 (step 18)</li> <li>12. The U-interface does not receive the multicast stream channel Ch6 (step 18)</li> </ol>																
<p>Remarks</p>	<p>None</p>																



**Test Case 6.3.8: IGMP Rate Limit**

Abstract Test Plan for GPON ONU Conformance																		
Test Name	IGMP Rate Limit																	
Test Definition ID	ONU.6.3.8																	
Reference Document	BBF TR-156i2 [3] ITU-T G.988 [2]																	
Test Type	Conformance																	
Test Status	Mandatory																	
Requirement(s) Description	<b>BBF TR-156i2 R-87</b> The ONU <b>MUST</b> 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	<ol style="list-style-type: none"> <li>ONU under test and OLT emulator are powered and connected to ODN</li> <li>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.</li> <li>A single U-interface is used</li> <li>A bidirectional GEM port between the ONU under test U-interface and the OLT emulator has been created by OMCI, for IGMP messages</li> <li>A multicast GEM port between the ONU under test and the OLT emulator has been created by OMCI, for multicast Ethernet frames.</li> <li>The Ethernet Traffic Generator connected to the U-interface is configured to use the following IP and MAC addresses for sending IGMP messages</li> </ol> <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>Source IP address</th> <th>Source MAC address</th> <th>Multicast IP group address</th> <th>Multicast MAC group address</th> <th>VID</th> <th>Pbit</th> </tr> </thead> <tbody> <tr> <td>IP-U1</td> <td>MAC-U1</td> <td>IP-G1</td> <td>MAC-G1</td> <td>VID1</td> <td>pbit1</td> </tr> </tbody> </table>						Source IP address	Source MAC address	Multicast IP group address	Multicast MAC group address	VID	Pbit	IP-U1	MAC-U1	IP-G1	MAC-G1	VID1	pbit1
Source IP address	Source MAC address	Multicast IP group address	Multicast MAC group address	VID	Pbit													
IP-U1	MAC-U1	IP-G1	MAC-G1	VID1	pbit1													
Test Procedure	<ol style="list-style-type: none"> <li>Select random value for IP address: IP-U1</li> <li>Select random value for MAC address: MAC-U1</li> <li>Select random value for multicast IP group address: IP-G1</li> <li>Use associate multicast MAC group address: MAC-G1</li> <li>Select a random value for VID1 between 1 and 4094.</li> <li>Select a random value for pbit1</li> <li>Via the OLT emulator, configure the Upstream IGMP rate (IGMP message/second), select a random value (Value1) Value 1 must be between 10 and 100.</li> <li>Generate upstream IGMP traffic defines in test condition 2 at the U-interface, with a IGMP rate below Value1</li> <li>Generate upstream IGMP traffic defines in test condition 2 at the U-interface, with a IGMP rate above Value1</li> <li>Via the GPON analyser, verify that IGMP messages are rate-limited at the ONU</li> </ol>																	
Pass/Fail Criteria	The test passes if the following are true, otherwise the test fails: <ol style="list-style-type: none"> <li>Each OMCI response message must indicate success for the associated create or set command.</li> <li>The uploaded ONU MIB must be consistent with the MIB held in the OLT Emulator</li> <li>The upstream IGMP messages are rate-limited at the ONU</li> <li>The upstream IGMP traffic in excess of this limit is silently discarded so that IGMP messages are forwarded at the rate define by value1</li> </ol>																	
Remarks	None																	

**Test Case 6.3.9: IGMP Immediate Leave**

Abstract Test Plan for GPON ONU Conformance													
Test Name	IGMP Immediate Leave												
Test Definition ID	ONU.6.3.9												
Reference Document	BBF TR-156i2 [3] ITU-T G.988 [2]												
Test Type	Conformance												
Test Status	Mandatory												
Requirement(s) Description	<b>BBF TR-156i2</b> <b>R-91</b> The ONU <b>MUST</b> 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	<ol style="list-style-type: none"> <li>ONU under test and OLT emulator are powered and connected to ODN</li> <li>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.</li> <li>A single U-interface is used</li> <li>A bidirectional GEM port between the ONU under test U-interface and the OLT emulator has been created by OMCI, for IGMP messages</li> <li>A multicast GEM port between the ONU under test and the OLT emulator has been created by OMCI, for multicast Ethernet frames.</li> <li>The OLT Emulator generates downstream multicast Ethernet frames: <table border="1" style="margin-left: 20px;"> <thead> <tr> <th>Channel</th> <th>Multicast source IP address</th> <th>Multicast IP group address</th> <th>Multicast MAC group address</th> <th>VID</th> <th>p bit</th> </tr> </thead> <tbody> <tr> <td>Ch1</td> <td>IP-S1</td> <td>IP-G1</td> <td>MAC-G1</td> <td>VID1</td> <td>Pbit1</td> </tr> </tbody> </table> </li> <li>The Ethernet frames analyser is connected between ONU and the Ethernet traffic Generator</li> </ol>	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
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								
Test Procedure	<ol style="list-style-type: none"> <li>Select random values for multicast IP group addresses: IP-G1</li> <li>Use associate multicast MAC address: MAC-G1</li> <li>Select random value for IP addresses: IP-S1</li> <li>Select random value for MAC addresses: MAC-S1</li> <li>Select a random value for VID1 between 1 and 4094</li> <li>Select a random value for pbit1</li> <li>Configure the OLT emulator to forward all multicast traffic to the multicast GEM Port permanently</li> <li>Via the OLT emulator, configure the dynamic access list control table at the ONU (table index IND1) <table border="1" style="margin-left: 20px;"> <thead> <tr> <th>Table Index</th> <th>VLAN ID</th> <th>Multicast Source IP address</th> <th>Multicast IP group address</th> </tr> </thead> <tbody> <tr> <td>IND1</td> <td>VID1</td> <td>0.0.0.0</td> <td>IP-G1</td> </tr> </tbody> </table> </li> <li>Via the OLT emulator, configure the Immediate leave function at the ONU</li> <li>Generate multicast traffic defines in test condition 3 at the V-interface</li> <li>At the U-interface send IGMP messages to join channel Ch1</li> <li>At the U-interface send IGMP message to leave Channel Ch1</li> <li>Via Ethernet frames analyser, verify that Ch1 is immediately stopped when the ONU receives a leave IGMP message</li> </ol>	Table Index	VLAN ID	Multicast Source IP address	Multicast IP group address	IND1	VID1	0.0.0.0	IP-G1				
Table Index	VLAN ID	Multicast Source IP address	Multicast IP group address										
IND1	VID1	0.0.0.0	IP-G1										
Pass/Fail Criteria	<p>The test passes if the following are true, otherwise the test fails:</p> <ol style="list-style-type: none"> <li>Each OMCI response message must indicate success for the associated create or set command.</li> <li>The uploaded ONU MIB must be consistent with the MIB held in the OLT Emulator</li> <li>The ONU support IGMP immediate leave as part of the IGMP transparent snooping (step 9)</li> <li>The U-interface receives the multicast stream with IP address IP-G1 (step 11)</li> <li>Ch1 is immediately stopped when the ONU receives a leave IGMP message (no wait for expiry of any IGMP Query timer) (step 12)</li> </ol>												
Remarks	None												

**Test Case 6.3.10: Maximum Number of Multicast Flows**

Abstract Test Plan for GPON ONU Conformance																													
Test Name	Maximum Number of Multicast Flows																												
Test Definition ID	ONU.6.3.10																												
Reference Document	BBF TR-156i2 [3] ITU-T G.988 [2]																												
Test Type	Conformance																												
Test Status	Mandatory																												
Requirement(s) Description	<b>BBF TR-156i2</b> <b>R-97</b> The ONU <b>MUST</b> 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	<ol style="list-style-type: none"> <li>ONU under test and OLT emulator are powered and connected to ODN</li> <li>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.</li> <li>A single U-interface is used</li> <li>A bidirectional GEM port between the ONU under test U-interface and the OLT emulator has been created by OMCI, for IGMP messages</li> <li>A multicast GEM port between the ONU under test and the OLT emulator has been created by OMCI, for multicast Ethernet frames.</li> <li>The OLT Emulator generates downstream multicast Ethernet frames</li> </ol>																												
	<table border="1"> <thead> <tr> <th>Channel</th> <th>Multicast source IP address</th> <th>Multicast IP group address</th> <th>Multicast MAC group address</th> <th>VID</th> <th>p bit</th> </tr> </thead> <tbody> <tr> <td>Ch1</td> <td>IP-S1</td> <td>IP-G1</td> <td>MAC-G1</td> <td>VID1</td> <td>Pbit1</td> </tr> <tr> <td>Ch2</td> <td>IP-S1</td> <td>IP-G2</td> <td>MAC-G2</td> <td>VID1</td> <td>Pbit1</td> </tr> <tr> <td>Ch3</td> <td>IP-S1</td> <td>IP-G3</td> <td>MAC-G3</td> <td>VID1</td> <td>Pbit1</td> </tr> </tbody> </table>					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
	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																								
<ol style="list-style-type: none"> <li>Select random values for multicast IP group addresses: IP-G1, IP-G2 and IP-G3</li> <li>Use associate multicast MAC addresses: MAC-G1, MAC-G2 and MAC-G3</li> <li>Select a random value for VID1 between 1 and 4094</li> <li>Select a random value for pbit1</li> <li>Configure the OLT emulator to forward all multicast traffic to the multicast GEM Port permanently</li> <li>Via the OLT emulator, configure the dynamic access list control table at the ONU (table index IND1)</li> </ol>																													
Test Procedure	<table border="1"> <thead> <tr> <th>Table Index</th> <th>VLAN ID</th> <th>Multicast source IP address</th> <th>Multicast IP group address</th> </tr> </thead> <tbody> <tr> <td>IND1</td> <td>VID1</td> <td>0.0.0.0</td> <td>IP-G1</td> </tr> <tr> <td>IND2</td> <td>VID1</td> <td>0.0.0.0</td> <td>IP-G2</td> </tr> <tr> <td>IND3</td> <td>VID1</td> <td>0.0.0.0</td> <td>IP-G3</td> </tr> </tbody> </table>					Table Index	VLAN ID	Multicast source IP address	Multicast IP group address	IND1	VID1	0.0.0.0	IP-G1	IND2	VID1	0.0.0.0	IP-G2	IND3	VID1	0.0.0.0	IP-G3								
	Table Index	VLAN ID	Multicast source IP address	Multicast IP group address																									
IND1	VID1	0.0.0.0	IP-G1																										
IND2	VID1	0.0.0.0	IP-G2																										
IND3	VID1	0.0.0.0	IP-G3																										
<ol style="list-style-type: none"> <li>Via the OLT emulator, configure the max simultaneous groups (value=2) at the ONU</li> <li>Generate multicast traffic defines in test condition 3 at the V-interface</li> <li>At the U-interface send IGMP messages to join channel Ch1</li> <li>At the U-interface send IGMP messages to join channel Ch2</li> <li>At the U-interface send IGMP messages to join channel Ch3</li> <li>At the U-interface send IGMP messages to leave channel Ch2.</li> <li>At the U-interface send IGMP messages to join channel Ch3 again.</li> </ol>																													
Pass/Fail Criteria	<p>The test passes if the following are true, otherwise the test fails:</p> <ol style="list-style-type: none"> <li>Each OMCI response message must indicate success for the associated create or set command.</li> <li>The uploaded ONU MIB must be consistent with the MIB held in the OLT Emulator</li> <li>The ONU is able to configure per U-interface the maximum number of simultaneous multicast groups allowed (step 7)</li> <li>The U-interface receives simultaneously two multicast streams (step 9 and 10)</li> <li>The U-interface does not receive the third multicast stream (step 11)</li> <li>The U-interface receives simultaneously only one multicast streams, only Ch1 (step 12).</li> <li>The U-interface receives simultaneously two multicast streams, Ch1 and Ch3. (step13).</li> </ol>																												
Remarks	None																												

**Test Case 6.3.11: IGMP Transparent Snooping**

Abstract Test Plan for GPON ONU Conformance																																																					
Test Name	IGMP Transparent Snooping																																																				
Test Definition ID	ONU.6.3.11																																																				
Reference Document	BBF TR-156i2 [3] ITU-T G.988 [2]																																																				
Test Type	Conformance																																																				
Test Status	Mandatory																																																				
Requirement(s) Description	<p><b>BBF TR-156i2</b></p> <p><b>R-88</b> The ONU and OLT <b>MUST</b> support an IGMP v3 (as per RFC 3376) transparent snooping function.</p> <p><b>R-89</b> The ONU and OLT IGMP v3 transparent snooping function <b>MUST</b> 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.</p> <p><b>R-90</b> The ONU and OLT IGMP v3 transparent snooping function <b>MUST</b> 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.</p>																																																				
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	<ol style="list-style-type: none"> <li>ONU is powered and connected to ODN</li> <li>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.</li> <li>The OLT Emulator has instructed the ONU to reset its MIB to factory default values.</li> <li>ONU has successfully completed test cases in section 6.1.</li> <li>The OLT Emulator should configure the ONU to support the following configuration: <ul style="list-style-type: none"> <li>One multicast VLANs, VID1</li> <li>Enable IGMP transparent snooping on VLAN VID1</li> <li>One bi-directional GEM port</li> <li>One multicast GEM port</li> <li>Singled-tagged U-interface, with no translation of VID values between the R/S and U-interfaces.</li> <li>No restrictions for IGMP dynamic access (all streams are allowed)</li> </ul> </li> <li>The OLT Emulator will be configured to generate the following downstream, multicast streams. All streams should use the same multicast GEM port. <table border="1" data-bbox="360 1373 1430 1608"> <thead> <tr> <th>Stream</th> <th>MAC DA</th> <th>MAC SA</th> <th>IP DA</th> <th>IP SA</th> <th>VID</th> <th>TPID</th> <th>Pbits</th> </tr> </thead> <tbody> <tr> <td>A</td> <td>MAC-G1</td> <td>MAC-S1</td> <td>IP-G1</td> <td>IP-S1</td> <td>SVID1</td> <td>0x88A8</td> <td>Any</td> </tr> <tr> <td>B</td> <td>MAC-G2</td> <td>MAC-S2</td> <td>IP-G2</td> <td>IP-S2</td> <td>SVID1</td> <td>0x88A8</td> <td>Any</td> </tr> <tr> <td>C</td> <td>MAC-G3</td> <td>MAC-S3</td> <td>IP-G3</td> <td>IP-S3</td> <td>SVID1</td> <td>0x88A8</td> <td>Any</td> </tr> <tr> <td>D</td> <td>MAC-G4</td> <td>MAC-S4</td> <td>IP-G4</td> <td>IP-S4</td> <td>SVID1</td> <td>0x88A8</td> <td>Any</td> </tr> </tbody> </table> </li> <li>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: <table border="1" data-bbox="529 1734 1261 1814"> <thead> <tr> <th>Stream</th> <th>MAC SA</th> <th>IP SA</th> <th>VID</th> <th>TPID</th> <th>Pbits</th> </tr> </thead> <tbody> <tr> <td>E</td> <td>MAC-S7</td> <td>IP-S7</td> <td>SVID1</td> <td>0x88A8</td> <td>Any</td> </tr> </tbody> </table> </li> </ol>	Stream	MAC DA	MAC SA	IP DA	IP SA	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-G4	MAC-S4	IP-G4	IP-S4	SVID1	0x88A8	Any	Stream	MAC SA	IP SA	VID	TPID	Pbits	E	MAC-S7	IP-S7	SVID1	0x88A8	Any
Stream	MAC DA	MAC SA	IP DA	IP SA	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-G4	MAC-S4	IP-G4	IP-S4	SVID1	0x88A8	Any																																														
Stream	MAC SA	IP SA	VID	TPID	Pbits																																																
E	MAC-S7	IP-S7	SVID1	0x88A8	Any																																																

Test Procedure	<ol style="list-style-type: none"> <li>1. Select random values for SVID1 between 1 and 4094.</li> <li>2. Select random values for MAC-S1 through MAC-S7, which are unicast MAC addresses</li> <li>3. Select random values for IP addresses IP-S1 through IP-S4 that are unicast IP addresses.</li> <li>4. Select random values for IP-G1 through IP-G4 that are multicast addresses and are not in the 224.0.0.0/24 range and generate the corresponding MAC destination addresses.</li> <li>5. Configure the OLT emulator to use OMCI to provision the ONU to support the configuration described above.</li> <li>6. Enable any frame capture mechanisms on the Ethernet traffic generator.</li> <li>7. Cause the OLT Emulator to continuously transmit the downstream, multicast streams described above.</li> <li>8. Cause the Ethernet Traffic Generator at the U-interface to send an IGMP join request for stream A.</li> <li>9. Cause the Ethernet Traffic at the U-interface Generator to send an IGMP join request for stream B.</li> <li>10. Cause the Ethernet Traffic at the U-interface Generator to send an IGMP join request for stream C.</li> </ol>
Pass/Fail Criteria	<p>The test passes if the following are true, otherwise the test fails:</p> <ol style="list-style-type: none"> <li>1. Each OMCI response message must indicate success for the associated create or set command.</li> <li>2. The uploaded ONU MIB must be consistent with the MIB held in the OLT Emulator</li> <li>3. After step 7, the Ethernet Traffic Generator must not receive any Ethernet frames from multicast streams A through D.</li> <li>4. After step 8, the Ethernet Traffic Generator must receive downstream, multicast stream A, as S-tagged Ethernet frames, with VID1.</li> <li>5. After step 9, the Ethernet Traffic Generator must receive downstream, multicast stream B, as S-tagged Ethernet frames, with VID1.</li> <li>6. After step 10, the Ethernet Traffic Generator must receive downstream, multicast stream C, as S-tagged Ethernet frames, with VID1.</li> <li>7. After step 10, the Ethernet Traffic Generator not must receive any Ethernet frames from multicast stream D.</li> </ol>
Remarks	None

**Test Case 6.3.12: Multicast VLAN Membership Based on User Ports (Multiple User ports)**

Abstract Test Plan for GPON ONU Conformance																																													
Test Name	Multicast VLAN Membership Based on User Ports (Multiple User ports)																																												
Test Definition ID	ONU.6.3.12																																												
Reference Document	BBF TR-156i2 [3] ITU-T G.988 [2]																																												
Test Type	Conformance																																												
Test Status	Conditional Mandatory (ONU with multiple user ports)																																												
Requirement(s) Description	<b>BBF TR-156i2</b> <b>R-96</b> The ONU <b>MUST</b> 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	<ol style="list-style-type: none"> <li>ONU under test and OLT emulator are powered and connected to ODN</li> <li>ONU under test has been activated by the OLT emulator, has been ranged, and a GEM port for OMCI has been created by PLOAM.</li> <li>Multiple U interfaces are used</li> <li>The Ethernet Traffic Generator connected to the OLT Emulator generates multicast Ethernet frames.</li> </ol> <table border="1" style="margin-left: 40px;"> <thead> <tr> <th>Multicast stream</th> <th>Multicast IP source address</th> <th>Multicast group IP destination address</th> <th>Multicast MAC group address</th> <th>VID</th> <th>p bit</th> </tr> </thead> <tbody> <tr> <td>Ch1</td> <td>IP-S1</td> <td>IP-G1</td> <td>MAC-G1</td> <td>VID1</td> <td>Pbit1</td> </tr> <tr> <td>Ch2</td> <td>IP-S2</td> <td>IP-G2</td> <td>MAC-G2</td> <td>VID2</td> <td>Pbit2</td> </tr> </tbody> </table> <ol style="list-style-type: none"> <li>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                     <table border="1" style="margin-left: 40px;"> <thead> <tr> <th>Source IP address</th> <th>Source MAC address</th> <th>Multicast IP group address</th> <th>VID</th> <th>p bit</th> </tr> </thead> <tbody> <tr> <td>IP-U1</td> <td>MAC-U1</td> <td>IP-G1</td> <td>VID1</td> <td>Pbit1</td> </tr> </tbody> </table> </li> <li>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                     <table border="1" style="margin-left: 40px;"> <thead> <tr> <th>Source IP address</th> <th>Source MAC address</th> <th>Multicast IP group address</th> <th>VID</th> <th>p bit</th> </tr> </thead> <tbody> <tr> <td>IP-U2</td> <td>MAC-U2</td> <td>IP-G2</td> <td>VID2</td> <td>Pbit2</td> </tr> </tbody> </table> </li> <li>User port Multicast VLAN association at the ONU                     <table border="1" style="margin-left: 40px;"> <thead> <tr> <th>User port</th> <th>Multicast VLAN members</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>VID1</td> </tr> <tr> <td>2</td> <td>VID2</td> </tr> </tbody> </table> </li> </ol>	Multicast stream	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	Source IP address	Source MAC address	Multicast IP group address	VID	p bit	IP-U1	MAC-U1	IP-G1	VID1	Pbit1	Source IP address	Source MAC address	Multicast IP group address	VID	p bit	IP-U2	MAC-U2	IP-G2	VID2	Pbit2	User port	Multicast VLAN members	1	VID1	2	VID2
	Multicast stream	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																																							
	Source IP address	Source MAC address	Multicast IP group address	VID	p bit																																								
	IP-U1	MAC-U1	IP-G1	VID1	Pbit1																																								
	Source IP address	Source MAC address	Multicast IP group address	VID	p bit																																								
IP-U2	MAC-U2	IP-G2	VID2	Pbit2																																									
User port	Multicast VLAN members																																												
1	VID1																																												
2	VID2																																												

<p>Test Procedure</p>	<ol style="list-style-type: none"> <li>1. Select random values for multicast IP group addresses: IP-G1 and IP-G2</li> <li>2. Use associate multicast MAC addresses: MAC-G1 and MAC-G2.</li> <li>3. Select random values for IP addresses : IP-S1, IP-S2, IP-U1 and IP-U2</li> <li>4. Select random values for MAC addresses: MAC-U1, MAC-U2</li> <li>5. Select a random value for VID1, VID2 between 1 and 4094 VID1≠VID2.</li> <li>6. Select a random value for pbit1 and pbit2</li> <li>7. Via the OLT emulator, create a bidirectional GEM port per U interface between the OLT emulator and the ONU under test. This GEM ports will be used for IGMP messages</li> <li>8. Create a multicast GEM port between the OLT emulator and the ONU under test for multicast Ethernet frames</li> <li>9. Configure the OLT emulator to forward all multicast-VLAN traffic (VID1 and VID2) using a single downstream multicast GEM port</li> <li>10. Via the OLT emulator configure the ONU under test to allow multicast stream             <ol style="list-style-type: none"> <li>a. For user port 1                 <table border="1" data-bbox="483 638 1312 732"> <thead> <tr> <th>Table Index</th> <th>VLAN ID</th> <th>Multicast source IP address</th> <th>Multicast IP group address</th> </tr> </thead> <tbody> <tr> <td>IND1</td> <td>VID1</td> <td>IP-S1</td> <td>IP-G1</td> </tr> </tbody> </table> </li> <li>b. For user port 2                 <table border="1" data-bbox="477 827 1317 921"> <thead> <tr> <th>Table Index</th> <th>VLAN ID</th> <th>Multicast source IP address</th> <th>Multicast IP group address</th> </tr> </thead> <tbody> <tr> <td>IND1</td> <td>VID2</td> <td>IP-S2</td> <td>IP-G2</td> </tr> </tbody> </table> </li> </ol> </li> <li>11. Generate multicast traffic defines in test configuration 4 at the OLT Emulator</li> <li>12. At the U interface (user port 1) send IGMP messages to join channel Ch1</li> <li>13. At the U interface (user port 1) send IGMP messages to join channel Ch2</li> <li>14. At the U interface (user port 2) send IGMP message to join Channel Ch1</li> <li>15. At the U interface (user port 2) send IGMP message to join Channel Ch2</li> </ol>	Table Index	VLAN ID	Multicast source IP address	Multicast IP group address	IND1	VID1	IP-S1	IP-G1	Table Index	VLAN ID	Multicast source IP address	Multicast IP group address	IND1	VID2	IP-S2	IP-G2
Table Index	VLAN ID	Multicast source IP address	Multicast IP group address														
IND1	VID1	IP-S1	IP-G1														
Table Index	VLAN ID	Multicast source IP address	Multicast IP group address														
IND1	VID2	IP-S2	IP-G2														
<p>Pass/Fail Criteria</p>	<p>The test passes if the following are true, otherwise the test fails:</p> <ol style="list-style-type: none"> <li>1. Each OMCI response message must indicate success for the associated create or set command.</li> <li>2. The uploaded ONU MIB must be consistent with the MIB held in the OLT Emulator</li> <li>3. The ONU is able to configure multicast members by user port (at step 11)</li> <li>4. At step 12 User port 1 receives only Ch 1 and user port 2 doesn't receive any channel</li> <li>5. At step 13 User port 1 receives only Ch 1 and user port 2 doesn't receive any channel</li> <li>6. At step 14 User port 1 receives only Ch 1 and user port 2 doesn't receive any channel</li> <li>7. At step 15, User port 1 receives only Ch 1 and user port 2 only Ch2</li> </ol>																
<p>Remarks</p>	<p>None</p>																

**Test Case 6.3.13: IGMP Transparent Snooping (Multiple User ports)**

Abstract Test Plan for GPON ONU Conformance																																																																							
Test Name	IGMP Transparent Snooping (Multiple User ports)																																																																						
Test Definition ID	ONU.6.3.13																																																																						
Reference Document	BBF TR-156i2 [3]																																																																						
Test Type	Conformance																																																																						
Test Status	Conditional Mandatory																																																																						
Requirement(s) Description	<p><b>BBF TR-156i2</b></p> <p><b>R-88</b> The ONU and OLT <b>MUST</b> support an IGMP v3 (as per RFC 3376) transparent snooping function.</p> <p><b>R-89</b> The ONU and OLT IGMP v3 transparent snooping function <b>MUST</b> 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.</p> <p><b>R-90</b> The ONU and OLT IGMP v3 transparent snooping function <b>MUST</b> 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.</p>																																																																						
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	<ol style="list-style-type: none"> <li>ONU is powered and connected to ODN</li> <li>ONU has been activated by the OLT Emulator, has been ranged, and a GEM port for OMCI has been created by PLOAM.</li> <li>The OLT Emulator has instructed the ONU to reset its MIB to factory default values.</li> <li>The OLT Emulator should configure the ONU to support the following configuration: <ul style="list-style-type: none"> <li>One multicast VLAN, VID1</li> <li>Enable IGMP transparent snooping on VLAN VID1</li> <li>One bi-directional GEM port per U-interface</li> <li>One multicast GEM port</li> <li>Symmetric user port tagging rules</li> </ul> <table border="1" style="margin-left: 40px;"> <thead> <tr> <th>User port</th> <th>U interface Q-Tag</th> <th>R/S interface S-Tag</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>none</td> <td>SVID1</td> </tr> <tr> <td>2</td> <td>none</td> <td>SVID1</td> </tr> </tbody> </table> <ul style="list-style-type: none"> <li>All U-interfaces are member of VID1</li> <li>No restrictions for IGMP dynamic access (all streams are allowed)</li> </ul> </li> <li>The OLT Emulator will be configured to generate the following downstream, multicast streams. All streams should use the same multicast GEM port. <table border="1" style="margin-left: 40px;"> <thead> <tr> <th>Stream</th> <th>MAC DA</th> <th>MAC SA</th> <th>IP DA</th> <th>IP SA</th> <th>VID</th> <th>TPID</th> <th>Pbits</th> </tr> </thead> <tbody> <tr> <td>A</td> <td>MAC-G1</td> <td>MAC-S1</td> <td>IP-G1</td> <td>IP-S1</td> <td>SVID1</td> <td>0x88a8</td> <td>Any</td> </tr> <tr> <td>B</td> <td>MAC-G2</td> <td>MAC-S2</td> <td>IP-G2</td> <td>IP-S2</td> <td>SVID1</td> <td>0x88a8</td> <td>Any</td> </tr> <tr> <td>C</td> <td>MAC-G3</td> <td>MAC-S3</td> <td>IP-G3</td> <td>IP-S3</td> <td>SVID1</td> <td>0x88a8</td> <td>Any</td> </tr> <tr> <td>D</td> <td>MAC-G3</td> <td>MAC-S4</td> <td>IP-G4</td> <td>IP-S4</td> <td>SVID1</td> <td>0x88a8</td> <td>Any</td> </tr> </tbody> </table> </li> <li>The Ethernet Traffic Generator should be configure to transmit the following upstream IGMP join/leave messages for each of the above multicast groups using the following parameters: <table border="1" style="margin-left: 40px;"> <thead> <tr> <th>Stream</th> <th>User port</th> <th>MAC SA</th> <th>IP SA</th> <th>VID</th> <th>TPID</th> <th>Pbits</th> </tr> </thead> <tbody> <tr> <td>E</td> <td>1</td> <td>MAC-U1</td> <td>IP-U1</td> <td>None</td> <td>None</td> <td>None</td> </tr> <tr> <td>F</td> <td>2</td> <td>MAC-U2</td> <td>IP-U2</td> <td>None</td> <td>None</td> <td>None</td> </tr> </tbody> </table> </li> </ol>	User port	U interface Q-Tag	R/S interface S-Tag	1	none	SVID1	2	none	SVID1	Stream	MAC DA	MAC SA	IP DA	IP SA	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	Stream	User port	MAC SA	IP SA	VID	TPID	Pbits	E	1	MAC-U1	IP-U1	None	None	None	F	2	MAC-U2	IP-U2	None	None	None
User port	U interface Q-Tag	R/S interface S-Tag																																																																					
1	none	SVID1																																																																					
2	none	SVID1																																																																					
Stream	MAC DA	MAC SA	IP DA	IP SA	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																																																																
Stream	User port	MAC SA	IP SA	VID	TPID	Pbits																																																																	
E	1	MAC-U1	IP-U1	None	None	None																																																																	
F	2	MAC-U2	IP-U2	None	None	None																																																																	



Test Procedure	<ol style="list-style-type: none"> <li>1. Select random values for VID1 between 1 and 4094.</li> <li>2. Select random values for MAC-S1, MAC-S2, MAC-S3, MAC-S4, MAC-U1 and MAC-U2, which are unicast MAC addresses</li> <li>3. Select random values for IP addresses IP-S1 IP-S2, IP-S3, IP-S4, IP-U1 and IP-U2 that are unicast IP addresses.</li> <li>4. Select random values for IP-G1 through IP-G4 that are multicast addresses and are not in the 224.0.0.0/24 range and generate the corresponding MAC destination addresses.</li> <li>5. Configure the OLT emulator to provision the ONU to support the configuration described above.</li> <li>6. Enable any frame capture mechanisms on the Ethernet traffic generator.</li> <li>7. Cause the OLT Emulator to continuously transmit the downstream, multicast streams described above.</li> <li>8. Cause the Ethernet Traffic Generator to send an IGMP join request for stream A via user port 1.</li> <li>9. Cause the Ethernet Traffic Generator to send an IGMP join request for stream B via user port 2</li> <li>10. Cause the Ethernet Traffic Generator to send an IGMP join request for stream C via user port 1.</li> </ol>
Pass/Fail Criteria	<p>The test passes if the following are true, otherwise the test fails:</p> <ol style="list-style-type: none"> <li>1. Each OMCI response message must indicate success for the associated create or set command.</li> <li>2. The uploaded ONU MIB must be consistent with the MIB held in the OLT Emulator</li> <li>3. After step 7, User port 1 and User port 2 must not receive any Ethernet frames from multicast streams A through D.</li> <li>4. After step 8, User port 1 must only receive downstream multicast stream A, as untagged frames. User port 2 must not receive any multicast streams.</li> <li>5. After step 9, User port 1 must only receive downstream multicast stream A, as untagged frames. User port 2 must only receive downstream multicast stream B untagged frames.</li> <li>6. After step 10, User port 1 must only receive downstream multicast stream A and C, as untagged frames. User port 2 must only receive downstream multicast stream B as untagged frames.</li> </ol>
Remarks	None

## 6.4 Non-IGMP Controlled Multicast and Broadcast

### Test Case 6.4.1: Downstream Broadcast Handling, Single U-Interface

Abstract Test Plan for GPON ONU Conformance	
Test Name	Downstream Broadcast Handling, Single U-Interface
Test Definition ID	ONU.6.4.1
Reference Document	BBF TR-156i2 [3] ITU-T G.988 [2]
Test Type	Conformance
Test Status	Mandatory
Requirement(s) Description	<b>BBF TR-156i2</b> <b>R-113</b> If the ONU receives a tagged frame on a downstream GEM Port, it <b>MUST</b> 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	<ul style="list-style-type: none"> <li>• OLT Emulator and ONU under test are powered and connected to ODN.</li> <li>• 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. The OLT Emulator has instructed the ONU to reset its MIB to factory default values.</li> <li>• ONU has successfully completed test cases in section 6.1.</li> <li>• The OLT Emulator is configured to transmit Ethernet frames downstream with the following parameters: Stream A: S-tagged broadcast (SVID1) Stream B: S-tagged broadcast (SVID2)</li> <li>• The traffic corresponding to each stream will have the following parameters at the U interface: Stream A (User Port 1): Untagged broadcast</li> </ul>
Test Procedure	<ul style="list-style-type: none"> <li>• Select a random values for SVID1 and SVID2 between 1 and 4094.</li> <li>• Configure the OLT emulator to provision the ONU to support: <ul style="list-style-type: none"> <li>• A single untagged U-interface, member only of SVID1</li> <li>• Additional/removal of the S-tag in the upstream/downstream directions, respective (making the U-interface a member of the VLAN).</li> </ul> </li> <li>• Enable capture on the Ethernet traffic generator.</li> <li>• Cause the OLT Emulator to transmit the downstream frame(s) described above in Stream A and Stream B.</li> </ul>
Pass/Fail Criteria	<p>The test passes if the following are true, otherwise the test fails:</p> <ol style="list-style-type: none"> <li>1. Each OMCI response message must indicate success for the associated create or set command.</li> <li>2. The uploaded ONU MIB must be consistent with the MIB held in the OLT Emulator</li> <li>3. The downstream frames in Stream A must be received as untagged Ethernet frames.</li> <li>4. The downstream frames in Stream B must not be received by the Ethernet Traffic Generator.</li> </ol>
Remarks	None

**Test Case 6.4.2: Downstream Broadcast Handling, Multiple U-Interfaces**

Abstract Test Plan for GPON ONU Conformance	
Test Name	Downstream Broadcast Handling, Multiple U-Interfaces
Test Definition ID	ONU.6.4.2
Reference Document	BBF TR-156i2 [3] ITU-T G.988 [2]
Test Type	Conformance
Test Status	Conditional Mandatory, ONU must have multiple U-interfaces
Requirement(s) Description	<b>BBF TR-156i2</b> <b>R-113</b> If the ONU receives a tagged frame on a downstream GEM Port, it <b>MUST</b> 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	<ul style="list-style-type: none"> <li>• OLT Emulator and ONU under test are powered and connected to ODN.</li> <li>• 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. The OLT Emulator has instructed the ONU to reset its MIB to factory default values.</li> <li>• ONU has successfully completed test cases in section 6.1.</li> <li>• The OLT Emulator is configured to transmit Ethernet frames downstream with the following parameters: Stream A: S-tagged broadcast (SVID1) Stream B: S-tagged broadcast (SVID2)</li> <li>• The traffic corresponding to each stream will have the following parameters at the U interfaces: Stream A (User Port 1 and 2): Untagged broadcast</li> </ul>
Test Procedure	<ul style="list-style-type: none"> <li>• Select a random values for SVID1 and SVID2 between 1 and 4094.</li> <li>• Configure the OLT emulator to provision the ONU to support: <ul style="list-style-type: none"> <li>• A two untagged U-interfaces, both members of only SVID1</li> <li>• Additional/removal of the S-tag in the upstream/downstream directions, respective (making the U-interface a member of the VLAN).</li> </ul> </li> <li>• Enable capture on the Ethernet traffic generator.</li> <li>• Cause the OLT Emulator to transmit the downstream frame(s) described above in Stream A and Stream B.</li> </ul>
Pass/Fail Criteria	The test passes if the following are true, otherwise the test fails: <ol style="list-style-type: none"> <li>1. Each OMCI response message must indicate success for the associated create or set command.</li> <li>2. The uploaded ONU MIB must be consistent with the MIB held in the OLT Emulator</li> <li>3. The downstream frames in Stream A must be received as untagged Ethernet frames from both U-interfaces.</li> <li>4. The downstream frames in Stream B must not be received by the Ethernet Traffic Generator from either of the U-interfaces.</li> </ol>
Remarks	None

## **6.5 Filtering**

**Test Case 6.5.1: Test Case Reserved For Future Use**

**Test Case 6.5.2: Test Case Reserved For Future Use**

**Test Case 6.5.3: Test Case Reserved For Future Use**

**Test Case 6.5.4: Test Case Reserved For Future Use**

**Test Case 6.5.5: Test Case Reserved For Future Use**

**Test Case 6.5.6: Test Case Reserved For Future Use**

**Test Case 6.5.7: Test Case Reserved For Future Use**

**Test Case 6.5.8: Test Case Reserved For Future Use**

**Test Case 6.5.9: Test Case Reserved For Future Use**

## 6.6 TR-156 Other

### Test Case 6.6.1: 2000-Byte Frames Supported by the ONU

Abstract Test Plan for GPON ONU Conformance	
Test Name	2000-Byte Frames Supported by the ONU
Test Definition ID	ONU.6.6.1
Reference Document	BBF TR-156i2 [3] ITU-T G.988 [2]
Test Type	Conformance
Test Status	Mandatory
Requirement(s) Description	<b>BBF TR-156i2</b> <b>R-4</b> The ONU/ONT <b>MUST</b> 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	<ul style="list-style-type: none"> <li>OLT Emulator and ONU under test are powered and connected to ODN</li> <li>ONU under test has been activated by the OLT Emulator, has been ranged, and a GEM port for OMCI has been created by PLOAM.</li> <li>The Ethernet Traffic Generator/Analyzer is configured to transmit 2000 bytes Ethernet frames upstream with the following parameters: <ul style="list-style-type: none"> <li>Stream A: S-tagged unicast (SVID1, SPbits1)</li> </ul> </li> <li>The traffic corresponding to Stream A will have the following parameters at the S/R interface: <ul style="list-style-type: none"> <li>Stream A: S-tagged unicast (SVID1, SPbits1)</li> </ul> </li> <li>The OLT Emulator is configured to transmit 2000 bytes Ethernet frames downstream with the following parameters: <ul style="list-style-type: none"> <li>Stream B: S-tagged unicast (SVID1, SPbits1)</li> </ul> </li> <li>The traffic corresponding to Stream B will have the following parameters at the U interfaces: <ul style="list-style-type: none"> <li>Stream B: S-tagged unicast (SVID1, SPbits1)</li> </ul> </li> </ul>
Test Procedure	<ul style="list-style-type: none"> <li>Select random values for SVID1 and SPbits1</li> <li>Use the OLT Emulator to provision the ONU under test to support one subscriber with user traffic class, requiring 1 GEM port (Alloc-ID, T-CONT, Port-ID).</li> <li>Enable any frame monitoring/capture mechanisms on the OLT Emulator.</li> <li>Cause the Ethernet Traffic Generator/Analyzer to transmit upstream Ethernet frames with the characteristics described in the test configuration section.</li> <li>Enable any frame monitoring/capture mechanisms on the Ethernet Traffic Generator/Analyzer.</li> <li>Cause the OLT Emulator to transmit downstream Ethernet frames with the characteristics described in the test configuration section.</li> </ul>
Pass/Fail Criteria	<p>The test passes if the following are true, otherwise the test fails:</p> <ol style="list-style-type: none"> <li>Each OMCI response message must indicate success for the associated create or set command.</li> <li>The uploaded ONU MIB must be consistent with the MIB held in the OLT Emulator</li> <li>All upstream 2000-byte frames sent by the Ethernet Traffic Generator/Analyzer must be received error free by the OLT Emulator at the S/R interface</li> <li>All downstream 2000-byte frames sent by the OLT Emulator must be received error free by the Ethernet Traffic Generator/Analyzer at the U interface</li> </ol>
Remarks	None

**Test Case 6.6.2: Test Case Reserved For Future Use**

## 6.7 Initial Provisioning of ONU

### Test Case 6.7.1: Local Setting of a Registration ID at the ONU (ONU Retains the Registration ID Indefinitely)

Abstract Test Plan for GPON ONU Conformance	
Test Name	Local Setting of a Registration ID at the ONU (ONU Retains the Registration ID Indefinitely)
Test Definition ID	ONU.6.7.1
Reference Document	BBF TR-156i2 [3] ITU-T G.988 [2]
Test Type	Conformance
Test Status	Mandatory
Requirement(s) Description	<b>BBF TR-156i2</b> <b>R-152</b> ONU that support the registration ID approach <b>MUST</b> support the local setting of a registration ID <b>R-153</b> ONU that support the registration ID approach <b>MUST</b> retain the registration ID indefinitely
Test Objective	To verify that the ONU retains indefinitely the Registration ID
Test Configuration	<ol style="list-style-type: none"> <li>1. The OLT emulator and ONU under test are connected to the same ODN</li> <li>2. The ONU under test is power off.</li> <li>3. Deactivate ONU autodiscover mode if this functionality is available at the OLT emulator</li> </ol>
Test Procedure	<ol style="list-style-type: none"> <li>1. Use a local management interface to enter the registration ID at the ONU</li> <li>2. Set the Registration ID of the ONU and provision it in the OLT emulator</li> <li>3. Through the GPON Analyser or OLT emulator, verify that the ONU ranges using the Registration ID</li> <li>4. Power off the ONU</li> <li>5. Power on the ONU</li> <li>6. Through the GPON Analyser or OLT emulator, verify that the ONU ranges using the Registration ID set at as step 1</li> </ol>
Pass/Fail Criteria	The test passes if the following are true, otherwise the test fails: The test is passed if the Registration ID entered at step 1 above is sent on the PON by the ONU for ranging after step 3 and step 5
Remarks	None

## 6.8 ONU Bring-Up

### Test Case 6.8.1: New ONU Bring-up Method on New ONU

Abstract Test Plan for GPON ONU Conformance	
Test Name	New ONU Bring-up Method on New ONU
Test Definition ID	ONU.6.8.1
Reference Document	ITU-T G.988 [2]
Test Type	Conformance
Test Status	Mandatory
Requirement(s) Description	<b>ITU-T G.988</b> 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	<ol style="list-style-type: none"> <li>1. ONU has never been provisioned or if it has, it has been de-provisioned.</li> <li>2. ONU is powered off and connected to the ODN.</li> <li>3. OLT emulator is powered on, active and connected to the ODN.</li> <li>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 download processes.</li> </ol>
Test Procedure	<ol style="list-style-type: none"> <li>1. Power the ONU on.</li> <li>2. Cause the OLT emulator to execute the ONU activation process as specified in section A.6 of ITU-T G.984.3[4].</li> <li>3. Cause the OLT emulator to establish the OMCI channel, that is, to activate a GEM port for OMCI, as specified in section 7.2.1 of ITU-T G.988[2].</li> <li>4. Cause the OLT emulator to send the OMCI message sequence specified in the OMCI Procedure Details for MIB synchronization and MIB download.</li> <li>5. Cause the OLT emulator to upload the current ONU's MIB and get the current ONU's MIB data sync attribute.</li> </ol>
Pass/Fail Criteria	<p>The test passes if the following are true, otherwise the test fails:</p> <ol style="list-style-type: none"> <li>1. After ONU activation and OMCC establishment, the ONU answers to all the OMCI messages sent by the OLT emulator.</li> <li>2. All the OMCI response messages are syntactically correct and the responses associated to MIB reset, Set, Create and/or Delete commands indicate "command successfully processed".</li> <li>3. The uploaded ONU's MIB and MIB data sync value in step 5 of the Test Procedure must match the value + 1 set by in the OLT emulator as part of the bring up procedure.</li> </ol>
Remarks	Old and new ONU as defined in G.988[2] Appendix I.



**Test Case 6.8.2: New ONU Bring-up Method for Old ONU**

Abstract Test Plan for GPON ONU Conformance	
Test Name	New ONU Bring-up Method for Old ONU
Test Definition ID	ONU.6.8.2
Reference Document	ITU-T G.988 [2]
Test Type	Conformance
Test Status	Mandatory
Requirement(s) Description	<b>ITU-T G.988</b> 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	<ol style="list-style-type: none"> <li>ONU has previously been provisioned. For example, it has successfully passed test ONU-6.8.1.</li> <li>OLT emulator is powered on, active and connected to the ODN.</li> <li>ONU is powered on and has successfully achieved MIB synchronization.</li> <li>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 download processes.</li> </ol>
Test Procedure	<ol style="list-style-type: none"> <li>Disconnect the ONU from the ODN.</li> <li>Re-connect the ONU to the ODN.</li> <li>Cause the OLT emulator to execute the ONU activation process as specified in section A.6 of ITU-T G.984.3[4].</li> <li>Cause the OLT emulator to establish the OMCI channel, that is, to activate a GEM port for OMCI, as specified in section 7.2.1 of ITU-T G.988[2].</li> <li>Cause the OLT emulator to send the OMCI message sequence specified in the OMCI Procedure Details for MIB synchronization and MIB download.</li> <li>Cause the OLT emulator to upload the current ONU's MIB and get the current ONU's MIB data sync attribute.</li> </ol>
Pass/Fail Criteria	<p>The test passes if the following are true, otherwise the test fails:</p> <ol style="list-style-type: none"> <li>After ONU activation and OMCC establishment, the ONU answers to all the OMCI messages sent by the OLT emulator.</li> <li>All the OMCI response messages are syntactically correct and the responses associated with MIB reset, Set, Create and/or Delete commands indicate "command successfully processed".</li> <li>The uploaded ONU's MIB and MIB data sync value in step 5 of the Test Procedure must match the value + 1 set by in the OLT emulator as part of the bring up procedure.</li> </ol>
Remarks	None

**Test Case 6.8.3: Old ONU Bring-up Method for ONU**

Abstract Test Plan for GPON ONU Conformance	
Test Name	Old ONU Bring-up Method for ONU
Test Definition ID	ONU.6.8.3
Reference Document	ITU-T G.988 [2]
Test Type	Conformance
Test Status	Mandatory
Requirement(s) Description	<b>ITU-T G.988</b> 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 Figure 8.3 of ITU-T G.988 [2]. Note1: method described in Figure 8.2 of ITU-T G.988 [2] can be considered a special case of Figure 8.3 from the ONU point of view.
Test Configuration	<ol style="list-style-type: none"> <li>ONU has previously been provisioned. For example, it has successfully passed test ONU-6.8.1.</li> <li>OLT emulator is powered on, active and connected to the ODN.</li> <li>ONU is powered on and has successfully achieved MIB synchronization.</li> <li>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 download processes.</li> </ol>
Test Procedure	<ol style="list-style-type: none"> <li>Disconnect the ONU from the ODN.</li> <li>Re-connect the ONU to the ODN.</li> <li>Cause the OLT emulator to execute the ONU activation process as specified in section A.6 of ITU-T G.984.3[4].</li> <li>Cause the OLT emulator to establish the OMCI channel, that is, to activate a GEM port for OMCI, as specified in section 7.2.1 of ITU-T G.988[2].</li> <li>Cause the OLT emulator to send the OMCI message sequence specified in the OMCI Procedure Details for MIB synchronization and MIB download.</li> <li>Cause the OLT emulator to upload the current ONU's MIB and get the current ONU's MIB data sync attribute.</li> </ol>
Pass/Fail Criteria	The test passes if the following are true, otherwise the test fails: <ol style="list-style-type: none"> <li>After ONU activation and OMCC establishment, the ONU answers to all the OMCI messages sent by the OLT emulator.</li> <li>All the OMCI response messages are syntactically correct and the responses associated with Set, Create and/or Delete commands indicate "command successfully processed".</li> <li>The uploaded ONU's MIB and MIB data sync value in step 5 of the Test Procedure must match the value + 1 set by in the OLT emulator as part of the bring up procedure.</li> </ol>
Remarks	None

**Test Case 6.8.4: New ONU Bring-up Method for New ONU with Encrypted OMCC**

Abstract Test Plan for GPON ONU Conformance	
Test Name	New ONU Bring-up Method for New ONU with Encrypted OMCC
Test Definition ID	ONU.6.8.4
Reference Document	ITU-T G.988 [2] ITU-T G.984.3 [4]
Test Type	Conformance
Test Status	Mandatory
Requirement(s) Description	<b>ITU-T G.988</b> Section 7.2.2 Encryption <b>ITU-T G.984.3</b> Section 12.2 Encryption system Section 12.3 Key exchange and switch-over
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	<ol style="list-style-type: none"> <li>1. ONU has never been provisioned or if it has, it has been de-provisioned.</li> <li>2. ONU successfully completed Test 6.8.1.</li> <li>3. ONU is powered off and connected to the ODN.</li> <li>4. OLT emulator is powered on, active and connected to the ODN.</li> </ol> <p>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 download processes.</p>
Test Procedure	<ol style="list-style-type: none"> <li>1. Power On the ONU.</li> <li>2. Cause the OLT Emulator to execute the ONU activation process as specified in section A.6 of ITU G.984.3[4].</li> <li>3. Cause the OLT Emulator to establish the OMCI channel, that is, to activate a GEM port for OMCI, as specified in section 7.2.1 of ITU-T G.988[2].</li> <li>4. Cause the OLT Emulator to Request a new AES key generation at the ONU side.</li> <li>5. Cause the OLT Emulator to send a Key Switching Time PLOAM message.</li> <li>6. Wait for Key Switching Time superframe counter instant.</li> <li>7. Cause the OLT Emulator to set the Encryption Status of the OMCC channel to Encrypted.</li> <li>8. Cause the OLT Emulator to send the OMCI message sequence specified in the OMCI Procedure details for MIB synchronization and MIB download.</li> <li>9. Cause the OLT emulator to upload the current ONU's MIB and get the current ONU's MIB data sync attribute.</li> </ol>
Pass/Fail Criteria	<p>The test passes if the following are true, otherwise the test fails:</p> <ol style="list-style-type: none"> <li>1. At step 4 of the Test Procedure, the ONU answers with the new AES Key sent 3 times.</li> <li>2. At steps 5 and 7 of the Test Procedure, the ONU acknowledges the commands from the OLT Emulator.</li> <li>3. After ONU activation and OMCC establishment, the ONU answers to all the OMCI messages sent by the OLT emulator.</li> <li>4. All the OMCI response messages are syntactically correct and the responses associated to MIB reset, Set, Create and/or Delete commands indicate "command successfully processed".</li> <li>5. The uploaded ONU's MIB and MIB data sync value in step 9 of the Test Procedure must match the value + 1 set by in the OLT emulator as part of the bring up procedure.</li> </ol>
Remarks	None

## 6.9 MIB and Alarm Synchronization

### Test Case 6.9.1: Alarm Synchronization

Abstract Test Plan for GPON ONU Conformance	
Test Name	Alarm Synchronization
Test Definition ID	ONU.6.9.1
Reference Document	ITU-T G.988 [2]
Test Type	Conformance
Test Status	Mandatory
Requirement(s) Description	<b>ITU-T G.988</b> 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	<ol style="list-style-type: none"> <li>1. OLT Emulator and ONU under test are powered and connected to ODN</li> <li>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.</li> <li>3. A bidirectional GEM port between the ONU under test and the OLT emulator has been created by OMCI.</li> <li>4. 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</li> </ol>
Test Procedure	<ol style="list-style-type: none"> <li>1. Cause an ONU OMCI alarm via an external stimulus (for example by disconnecting the Ethernet cable from an ONU's Ethernet UNI)</li> <li>2. The OLT emulator sends a Get All Alarms OMCI message</li> <li>3. Verify that the ONU uploads its alarm table</li> <li>4. Once alarm synchronisation process is finished, remove the cause of the alarm. Verify that the ONU sends an Alarm OMCI message and increment its Alarm sequence number value</li> </ol>
Pass/Fail Criteria	<p>The test passes if the following are true, otherwise the test fails:</p> <ol style="list-style-type: none"> <li>1. The ONU answers to all the OMCI messages send by the OLT emulator.</li> <li>2. The ONU follows OMCI messages exchanges described in OMCI procedure detailed in ITU-T G.988[2]</li> <li>3. The ONU is able to send an Alarm OMCI message notifying that the alarm previously created is cleared.</li> <li>4. The ONU is able to increment its Alarm sequence number value</li> </ol>
Remarks	None

**Test Case 6.9.2: MIB Synchronization : Correct Data Sync**

Abstract Test Plan for GPON ONU Conformance	
Test Name	MIB Synchronization: Correct Data Sync
Test Definition ID	ONU.6.9.2
Reference Document	ITU-T G.988 [2]
Test Type	Conformance
Test Status	Mandatory
Requirement(s) Description	<b>ITU-T G.988</b> Appendix I
Test Objective	The purpose of this test is to verify that the ONU is able to answer with the right Data MIB Sync value
Test Configuration	<ol style="list-style-type: none"> <li>1. OLT Emulator and ONU under test are powered and connected to ODN</li> <li>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.</li> <li>3. A bidirectional GEM port between the ONU under test and the OLT emulator has been created by OMCI.</li> </ol>
Test Procedure	<ol style="list-style-type: none"> <li>1. Using the OLT emulator, set the ONT Data MIB Sync value</li> <li>2. Using the OLT emulator, send a get ONT Data OMCI message</li> <li>3. Verify that the ONU answers with the previously set Data MIB Sync value incremented by 1</li> </ol>
Pass/Fail Criteria	<p>The test passes if the following are true, otherwise the test fails:</p> <ol style="list-style-type: none"> <li>1. The ONU answers to all the OMCI messages sent by the OLT emulator.</li> <li>2. The ONU under test answers with the Data MIB Sync value incremented.</li> <li>3. The ONU follows OMCI messages exchanges described in OMCI procedure detailed in ITU-T G.988[2]</li> </ol>
Remarks	None

**Test Case 6.9.3: MIB Synchronization: MIB Upload**

Abstract Test Plan for GPON ONU Conformance	
Test Name	MIB Synchronization: MIB Upload
Test Definition ID	ONU.6.9.3
Reference Document	ITU-T G.988 [2]
Test Type	Conformance
Test Status	Mandatory
Requirement(s) Description	<b>ITU-T G.988</b> 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	<ol style="list-style-type: none"> <li>1. OLT Emulator and ONU under test are powered and connected to ODN</li> <li>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.</li> <li>3. A bidirectional GEM port between the ONU under test and the OLT emulator has been created by OMCI.</li> </ol>
Test Procedure	<ol style="list-style-type: none"> <li>1. Using the OLT emulator send a MIB Upload ONT Data</li> <li>2. Verify that the ONU uploads its MIB</li> </ol>
Pass/Fail Criteria	<p>The test passes if the following are true, otherwise the test fails:</p> <ol style="list-style-type: none"> <li>1. The ONU answers to all the OMCI messages sent by the OLT emulator.</li> <li>2. The ONU under test uploads its MIB</li> <li>3. The ONU follows OMCI messages exchanges described in OMCI procedure detailed in ITU-T G.988[2]</li> </ol>
Remarks	None

## 6.10 Software Image Download

### Test Case 6.10.1: Software Image Download, Multiple Window Sizes, Padded Final Window

Abstract Test Plan for GPON ONU Conformance	
Test Name	Software Image Download, Multiple Window Sizes, Padded Final Window
Test Definition ID	ONU.6.10.1
Reference Document	ITU-T G.988 [2]
Test Type	Conformance
Test Status	Mandatory
Requirement(s) Description	<b>ITU-T G.988</b> Appendix I
Test Objective	Verify the ONU is able to perform the software image download procedure under the following conditions: <ul style="list-style-type: none"> <li>Multiple window sizes proposed by the OLT</li> <li>OLT inserts padding final sections (if software image is not evenly divisible by the window size)</li> </ul>
Test Configuration	<ol style="list-style-type: none"> <li>ONU is powered and connected to ODN</li> <li>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.</li> <li>The OLT Emulator has instructed the ONU to reset its MIB to factory default values.</li> <li>ONU vendor has provided valid software image to use in testing.</li> </ol>
Test Procedure	<ol style="list-style-type: none"> <li>Note the software image size, in bytes, and record this value below.</li> <li>Cause the OLT Emulator to perform a <i>Get</i> operation on both software image MEs. Note which software image is reported as active.</li> <li>Cause the OLT Emulator to send the <code>Start_Software_Download_cmd</code> with the following attributes: Software Instance: Opposite of image reported as active in step 2 Window Size: 32 Software Image Size: As noted above in step 1</li> <li>Record the value of the ONU's chosen window size in the <code>Start_Software_Download_resp</code> message as "ONU chosen window size" below.</li> <li>Divide the provided software image into sections of 31 bytes (The last section may be a partial section, and should be padded with zeros). Record the number of sections below.</li> <li>Group the software image sections into N windows, each made up of "ONU chosen window size 1" sections. If there are "empty sections" in the last window, these sections must be padded with zeros. Record the number of windows below.</li> <li>Cause the OLT Emulator to send the first window of sections to the ONU, with the AR bit being set only for the last section, using the <code>Download_Section_cmd</code>.</li> <li>Verify the ONU responses to the final <code>Download_Section_cmd</code> (indicated by the AR bit being set) with the <code>Download_Section_resp</code>. The response should indicate success.</li> <li>Repeat steps 7 and 8 for each of the N windows.</li> <li>Calculate the CRC-32 for the software image, according to ITU-T I.363.5.</li> <li>Cause the OLT Emulator to send the <code>End_Software_Download_cmd</code>, with the CRC-32 calculated above.</li> <li>Verify the ONU responds with the <code>End_Software_Download_resp</code>. The response should indicate success. If the ONU responds with "Device Busy," wait 5 seconds and repeat steps 11 and 12. Repeat this delay no more than 23 times (120 seconds of total waiting time).</li> <li>Cause the OLT Emulator to perform a <i>Get</i> operation on the software image instance that was the download target.</li> <li>Verify the ONU reports the software image as Valid, Inactive, and Uncommitted.</li> <li>Repeat steps 3 through 14 using an OLT window size of 16.</li> <li>Repeat steps 3 through 14 using an OLT window size of 64.</li> </ol>

<p>Pass/Fail Criteria</p>	<p>The test passes if the following are true, otherwise the test fails:</p> <ol style="list-style-type: none"> <li>1. The ONU must indicate success in the response to the Start_Software_Download_cmd (procedure step 4).</li> <li>2. The ONU must indicate success for each downloaded window (procedure step 8).</li> <li>3. The ONU must indicate success in the final End_Software_Download_resp (procedure step 12). [The number of times the ONU responds with “Device Busy” does not impact this result, provided the 120 second timeout is not reached.]</li> <li>4. The ONU must report the software image for the instance that was the download target as Valid, Inactive, and Uncommitted.</li> </ol>
<p>Remarks</p>	<p>Measured/calculated values used in testing:</p> <ul style="list-style-type: none"> <li>• Software image size (bytes):</li> <li>• OLT Window Size (integer): 32             <ul style="list-style-type: none"> <li>ONU chosen window size (integer):</li> <li>Number of sections per software image (integer):</li> <li>Number of windows per software image (integer):</li> </ul> </li> <li>• OLT Window Size (integer): 16             <ul style="list-style-type: none"> <li>ONU chosen window size (integer):</li> <li>Number of sections per software image (integer):</li> <li>Number of windows per software image (integer):</li> </ul> </li> <li>• OLT Window Size (integer): 64             <ul style="list-style-type: none"> <li>ONU chosen window size (integer):</li> <li>Number of sections per software image (integer):</li> <li>Number of windows per software image (integer):</li> </ul> </li> </ul>



**Test Case 6.10.2: Software Image Download, Shortened Final Window**

Abstract Test Plan for GPON ONU Conformance	
Test Name	Software Image Download, Shortened Final Window
Test Definition ID	ONU.6.10.2
Reference Document	ITU-T G.988 [2]
Test Type	Conformance
Test Status	Mandatory
Requirement(s) Description	<b>ITU-T G.988</b> Appendix I
Test Objective	Verify the ONU is able to perform the software image download procedure under the following conditions: <ul style="list-style-type: none"> <li>• 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.</li> </ul>
Test Configuration	<ol style="list-style-type: none"> <li>1. ONU is powered and connected to ODN</li> <li>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.</li> <li>3. The OLT Emulator has instructed the ONU to reset its MIB to factory default values.</li> <li>4. ONU vendor has provided valid software image to use in testing.</li> </ol>
Test Procedure	<ol style="list-style-type: none"> <li>1. Note the software image size, in bytes, and record this value below.</li> <li>2. Cause the OLT Emulator to perform a <i>Get</i> operation on both software image MEs. Note which software image is reported as active.</li> <li>3. Cause the OLT Emulator to send the Start_Software_Download_cmd with the following attributes: Software Instance: Opposite of image reported as active in step 2 Window Size: 32 Software Image Size: As noted above in step 1</li> <li>4. Record the value of the ONU's chosen window size in the Start_Software_Download_resp message as "ONU chosen window size 1" below.</li> <li>5. Divide the provided software image into sections of 31 bytes (The last section may be a partial section, and should be padded with zeros).</li> <li>6. Group the software image sections into N windows, each made up of "ONU chosen window size 1" sections. The last window is likely to have fewer sections than "full window," this window will be shortened by setting the AR bit in Download_Section_cmd for the final section of the software image.</li> <li>7. Cause the OLT Emulator to send the first window of sections to the ONU, with the AR bit being set only for the last section, using the Download_Section_cmd.</li> <li>8. Verify the ONU responses to the final Download_Section_cmd (indicated by the AR bit being set) with the Download_Section_resp. The response should indicate success.</li> <li>9. Repeat steps 7 and 8 for each of the N windows.</li> <li>10. Calculate the CRC-32 for the software image, according to ITU-T I.363.5.</li> <li>11. Cause the OLT Emulator to send the End_Software_Download_cmd, with the CRC-32 calculated above.</li> <li>12. Verify the ONU responds with the End_Software_Download_resp. The response should indicate success. If the ONU responds with "Device Busy," wait 5 seconds and repeat steps 11 and 12. Repeat this delay no more than 23 times (120 seconds of total waiting time).</li> <li>13. Cause the OLT Emulator to perform a <i>Get</i> operation on the software image instance that was the download target.</li> </ol>

	<p>14. Verify the ONU reports the software image as Valid, Inactive, and Uncommitted.</p>
<p>Pass/Fail Criteria</p>	<p>The test passes if the following are true, otherwise the test fails:</p> <ol style="list-style-type: none"> <li>1. The ONU must indicate success in the response to the Start_Software_Download_cmd (procedure step 4).</li> <li>2. The ONU must indicate success for each downloaded window (procedure step 8).</li> <li>3. The ONU must indicate success in the final End_Software_Download_resp (procedure step 12). [The number of times the ONU responds with “Device Busy” does not impact this result, provided the 120 seconds timeout is not reached.]</li> <li>4. The ONU must report the software image for the instance that was the download target as Valid, Inactive, and Uncommitted.</li> </ol>
<p>Remarks</p>	<p>Measured/calculated values used in testing:</p> <ol style="list-style-type: none"> <li>1. OLT Window Size (integer): 32</li> <li>2. Software image size (bytes):</li> <li>3. ONU chosen window size (integer):</li> <li>4. Number of sections per software image (integer):</li> <li>5. Number of windows per software image (integer):</li> </ol>

**Test Case 6.10.3: Failed Software Image Download, Missing Section**

Abstract Test Plan for GPON ONU Conformance	
Test Name	Failed Software Image Download, Missing Section
Test Definition ID	ONU.6.10.3
Reference Document	ITU-T G.988 [2]
Test Type	Conformance
Test Status	Mandatory
Requirement(s) Description	<b>ITU-T G.988</b> 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	<ol style="list-style-type: none"> <li>ONU is powered and connected to ODN.</li> <li>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.</li> <li>The OLT Emulator has instructed the ONU to reset its MIB to factory default values.</li> <li>ONU vendor has provided valid software image to use in testing.</li> </ol>
Test Procedure	<ol style="list-style-type: none"> <li>Note the software image size, in bytes, and record this value below.</li> <li>Cause the OLT Emulator to perform a <i>Get</i> operation on both software image MEs. Note which software image is reported as active.</li> <li>Cause the OLT Emulator to send the Start_Software_Download_cmd with the following attributes: Software Instance: Opposite of image reported as active in step 2 Window Size: 32 Software Image Size: As noted above in step 1</li> <li>Record the value of the ONU's chosen window size in the Start_Software_Download_resp message as "ONU chosen window size" below.</li> <li>Divide the provided software image into sections of 31 bytes (The last section may be a partial section, and should be padded with zeros).</li> <li>Group the software image sections into N windows, each made up of "ONU chosen window size 1" sections. Only the first window will be used in this test.</li> <li>Cause the OLT Emulator to download the first section of the first window, setting the "Download Section Number" to 0, using the Download_Section_cmd.</li> <li>Cause the OLT Emulator to download the third section of the first window, setting the "Download Section Number" to 2 (this is skipping the second section of the window), using the Download_Section_cmd.</li> <li>Cause the OLT Emulator to download the remaining sections of the window, setting the AR bit for the last section of the window.</li> <li>Verify the ONU responds with the Download_Section_resp, indicating a failure for the window.</li> <li>Cause the OLT Emulator to cancel the software image download by sending the End_Software_Download_cmd. The value of the CRC-32 is not important, as the download is being terminated in a failure mode.</li> <li>Verify responds with the End_Software_Download_resp, indicating a failure.</li> </ol>
Pass/Fail Criteria	<p>The test passes if the following are true, otherwise the test fails:</p> <ol style="list-style-type: none"> <li>The ONU must indicate success in the response to the Start_Software_Download_cmd (procedure step 4).</li> <li>The ONU must indicate a failure for the first downloaded window (procedure step 8).</li> <li>The ONU must indicate a failure in the final End_Software_Download_resp (procedure step 12).</li> </ol>
Remarks	<p>Measured/calculated values used in testing:</p> <ol style="list-style-type: none"> <li>OLT Window Size (integer): 32</li> <li>Software image size (bytes):</li> <li>ONU chosen window size (integer):</li> <li>Number of sections per software image (integer):</li> <li>Number of windows per software image (integer):</li> </ol>

**Test Case 6.10.4: Failed Software Image Download, Incorrect Section CRC**

Abstract Test Plan for GPON ONU Conformance	
Test Name	Failed Software Image Download, Incorrect Section CRC
Test Definition ID	ONU.6.10.4
Reference Document	ITU-T G.988 [2]
Test Type	Conformance
Test Status	Mandatory
Requirement(s) Description	<b>ITU-T G.988</b> 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	<ol style="list-style-type: none"> <li>ONU is powered and connected to ODN.</li> <li>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.</li> <li>The OLT Emulator has instructed the ONU to reset its MIB to factory default values.</li> <li>ONU vendor has provided valid software image to use in testing.</li> </ol>
Test Procedure	<ol style="list-style-type: none"> <li>Note the software image size, in bytes, and record this value below.</li> <li>Cause the OLT Emulator to perform a <i>Get</i> operation on both software image MEs. Note which software image is reported as active.</li> <li>Cause the OLT Emulator to send the Start_Software_Download_cmd with the following attributes:</li> <li>Software Instance: Opposite of image reported as active in step 2</li> <li>Window Size: 32</li> <li>Software Image Size: As noted above in step 1</li> <li>Record the value of the ONU's chosen window size in the Start_Software_Download_resp message as "ONU chosen window size" below.</li> <li>Divide the provided software image into sections of 31 bytes (The last section may be a partial section, and should be padded with zeros).</li> <li>Group the software image sections into N windows, each made up of "ONU chosen window size 1" sections. Only the first window will be used in this test.</li> <li>Cause the OLT Emulator to download the first section of the first window, using the Download_Section_cmd.</li> <li>Cause the OLT Emulator to download the second section of the first window, using the Download_Section_cmd. Before transmitting the OMCI message, arbitrarily invert two of the bits in the OMCI message CRC field.</li> <li>Cause the OLT Emulator to download the remaining sections of the window, setting the AR bit for the last section of the window.</li> <li>Verify the ONU responds with the Download_Section_resp, indicating a failure for the window.</li> <li>Cause the OLT Emulator to cancel the software image download by sending the End_Software_Download_cmd. The value of the CRC-32 is not important, as the download is being terminated in a failure mode.</li> <li>Verify responds with the End_Software_Download_resp, indicating a failure.</li> </ol>
Pass/Fail Criteria	<p>The test passes if the following are true, otherwise the test fails:</p> <ol style="list-style-type: none"> <li>The ONU must indicate success in the response to the Start_Software_Download_cmd (procedure step 7).</li> <li>The ONU must indicate a failure for the first downloaded window (procedure step 13).</li> <li>The ONU must indicate a failure in the final End_Software_Download_resp (procedure step 15).</li> </ol>
Remarks	<p>Measured/calculated values used in testing:</p> <ol style="list-style-type: none"> <li>OLT Window Size (integer): 32</li> <li>Software image size (bytes):</li> <li>ONU chosen window size (integer):</li> <li>Number of sections per software image (integer):</li> <li>Number of windows per software image (integer):</li> </ol>

**Test Case 6.10.5: Failed Software Image Download, Incorrect Software Image CRC**

Abstract Test Plan for GPON ONU Conformance	
Test Name	Failed Software Image Download, Incorrect Software Image CRC
Test Definition ID	ONU.6.10.5
Reference Document	ITU-T G.988 [2]
Test Type	Conformance
Test Status	Mandatory
Requirement(s) Description	<b>ITU-T G.988</b> 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	<ol style="list-style-type: none"> <li>ONU is powered and connected to ODN.</li> <li>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.</li> <li>The OLT Emulator has instructed the ONU to reset its MIB to factory default values.</li> <li>ONU vendor has provided valid software image to use in testing.</li> <li>ONU must have passed tests ONU-6.10.1 and ONU-6.10.2.</li> </ol>
Test Procedure	<ol style="list-style-type: none"> <li>Note the software image size, in bytes, and record this value below.</li> <li>Cause the OLT Emulator to perform a <i>Get</i> operation on both software image MEs. Note which software image is reported as active.</li> <li>Cause the OLT Emulator to send the Start_Software_Download_cmd with the following attributes: Software Instance: Opposite of image reported as active in step 2 Window Size: 32 Software Image Size: As noted above in step 1</li> <li>Record the value of the ONU's chosen window size in the Start_Software_Download_resp message as "ONU chosen window size" below.</li> <li>Divide the provided software image into sections of 31 bytes (The last section may be a partial section, and should be padded with zeros).</li> <li>Group the software image sections into N windows, each made up of "ONU chosen window size 1" sections. Only the first window will be used in this test.</li> <li>Cause the OLT Emulator to download the each window, using the Download_Section_cmd.</li> <li>Verify the ONU responds with the Download_Section_resp, indicating success for each window. The last window may be padded or shortened as in tests ONU-6.10.1 or ONU-6.10.2.</li> <li>Cause the OLT Emulator to complete the software image download by sending the End_Software_Download_cmd. Ensure the CRC-32 value for the software image transmitted in the OMCI is incorrect.</li> <li>Verify responds with the End_Software_Download_resp, indicating a failure. If the ONU responds with "Device Busy," wait 5 seconds and repeat steps 7 and 8. Repeat this delay no more than 23 times (120 seconds of total waiting time).</li> <li>Cause the OLT Emulator to perform a Get operation on the software image instance that was the download target.</li> <li>Verify the ONU reports the software image as Invalid, Inactive, and Uncommitted.</li> </ol>
Pass/Fail Criteria	<p>The test passes if the following are true, otherwise the test fails:</p> <ol style="list-style-type: none"> <li>The ONU must indicate success in the response to the Start_Software_Download_command (procedure step 4).</li> <li>The ONU must indicate success for the each downloaded window section (procedure step 8).</li> <li>The ONU must indicate a failure in the final End_Software_Download_response (procedure step 10).</li> <li>The ONU must report the software image for the instance that was the download target as Invalid, Inactive, and Uncommitted.</li> </ol>
Remarks	<p>Measured/calculated values used in testing:</p> <ol style="list-style-type: none"> <li>OLT Window Size (integer): 32</li> <li>Software image size (bytes):</li> <li>ONU chosen window size (integer):</li> <li>Number of sections per software image (integer):</li> <li>Number of windows per software image (integer):</li> </ol>

**Test Case 6.10.6: Test Case Reserved For Future Use**

**Test Case 6.10.7: Activate Uncommitted Software Image**

Abstract Test Plan for GPON ONU Conformance	
Test Name	Activate Uncommitted Software Image
Test Definition ID	ONU.6.10.7
Reference Document	ITU-T G.988 [2]
Test Type	Conformance
Test Status	Mandatory
Requirement(s) Description	<b>ITU-T G.988</b> 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	<ol style="list-style-type: none"> <li>1. ONU is powered and connected to ODN</li> <li>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.</li> <li>3. The OLT Emulator has instructed the ONU to reset its MIB to factory default values.</li> <li>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).</li> </ol>
Test Procedure	<ol style="list-style-type: none"> <li>1. Cause the OLT Emulator to perform a <i>Get</i> operation on both software image MEs. Note which software images are reported as committed, active, and valid.</li> <li>2. Verify the inactive image is also listed as valid, uncommitted.</li> <li>3. Cause the OLT Emulator to send the <i>Activate_Image_cmd</i> for the image reported as valid, uncommitted, and inactive.</li> <li>4. Verify the ONU responds with <i>Activate_Image_resp</i>, indicating success.</li> <li>5. Wait for the ONU to load the new software image (this may cause the ONU to reboot).</li> <li>6. Cause the OLT Emulator to perform a <i>Get</i> operation on both software image MEs.</li> <li>7. Verify the newly activated image is reported as active and uncommitted.</li> <li>8. Power cycle the ONU (this must be a hard power cycle, intended to simulate a watchdog timer reboot).</li> <li>9. Wait for the ONU to complete booting and loading its software.</li> <li>10. Cause the OLT Emulator to perform a <i>Get</i> operation on both software image MEs.</li> <li>11. Verify the software image reported in step 1 is listed as active and committed.</li> <li>12. Verify the second software image is reported as valid, inactive, and uncommitted.</li> </ol>
Pass/Fail Criteria	<p>The test passes if the following are true, otherwise the test fails:</p> <ol style="list-style-type: none"> <li>1. The ONU must load the activated image after step 4.</li> <li>2. The ONU must report the active image as valid, active, and uncommitted in step 7.</li> <li>3. After the power cycle, the ONU must be running the original software image that was reported as committed and active in step 1.</li> </ol>
Remarks	None

**Test Case 6.10.8: Commit Software Image**

Abstract Test Plan for GPON ONU Conformance	
Test Name	Commit Software Image
Test Definition ID	ONU.6.10.8
Reference Document	ITU-T G.988 [2]
Test Type	Conformance
Test Status	Mandatory
Requirement(s) Description	<b>ITU-T G.988</b> Appendix I
Test Objective	This test verifies the ONU is able to commit a valid software image.
Test Configuration	<ol style="list-style-type: none"> <li>1. ONU is powered and connected to ODN</li> <li>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.</li> <li>3. The OLT Emulator has instructed the ONU to reset its MIB to factory default values.</li> <li>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.</li> <li>5. ONU has passed test ONU-6.10.7.</li> </ol>
Test Procedure	<ol style="list-style-type: none"> <li>1. Cause the OLT Emulator to perform a <i>Get</i> operation on both software image MEs. Note which software images are reported as committed, active, and valid.</li> <li>2. Verify the inactive image is also listed as valid, uncommitted.</li> <li>3. Cause the OLT Emulator to send the <i>Activate_Image_cmd</i> for the image reported as valid, uncommitted, and inactive.</li> <li>4. Verify the ONU responds with <i>Activate_Image_resp</i>, indicating success.</li> <li>5. Wait for the ONU to load the new software image (this may cause the ONU to reboot).</li> <li>6. Cause the OLT Emulator to perform a <i>Get</i> operation on both software image MEs.</li> <li>7. Verify the newly activated image is reported as active and uncommitted.</li> <li>8. Cause the OLT emulator to send the <i>Commit_Image_cmd</i> for the currently active software image.</li> <li>9. Verify the ONU responds with the <i>Commit_Image_resp</i>, indicating success.</li> <li>10. Cause the OLT Emulator to perform a <i>Get</i> operation on both software image MEs.</li> <li>11. Verify the activated image is reported as active and committed.</li> </ol>
Pass/Fail Criteria	<p>The test passes if the following are true, otherwise the test fails:</p> <ol style="list-style-type: none"> <li>1. The ONU must load the activated image after step 4.</li> <li>2. The ONU must report the active image as valid, active, and uncommitted in step 7.</li> <li>3. The ONU must report the active image as valid, active, and committed in step 11.</li> </ol>
Remarks	None



## **6.11 Circuit Packs**

**Test Case 6.11.1: Test Case Reserved For Future Use**

**Test Case 6.11.2: Test Case Reserved For Future Use**

**Test Case 6.11.3: Cardholder or Port Mapping Package for Integrated ONU**

Abstract Test Plan for GPON ONU Conformance	
Test Name	Cardholder or Port Mapping Package for Integrated ONU
Test Definition ID	ONU.6.11.3
Reference Document	ITU-T G.988 [2]
Test Type	Conformance
Test Status	Mandatory for an integrated ONU
Requirement(s) Description	<b>ITU-T G.988</b> Appendix I
Test Objective	To verify that the ONU is able to configure the cardholder or port mapping package without any configuration coming from the OLT
Test Configuration	<ol style="list-style-type: none"> <li>1. OLT emulator and ONU under test are connected to the ODN.</li> <li>2. ONU under test is power off</li> <li>3. ONU activation and OMCC establishment processes have been successfully completed.</li> </ol>
Test Procedure	<ol style="list-style-type: none"> <li>1. Power on the ONU</li> <li>2. Wait the end of the bring up process</li> <li>3. With the OLT emulator sends a "MIB Upload" message</li> </ol>
Pass/Fail Criteria	<p>The test passes if the following are true, otherwise the test fails:</p> <ol style="list-style-type: none"> <li>1. The ONU sends the cardholder or port mapping package information during the MIB upload, at step 3</li> </ol>
Remarks	None

**Test Case 6.11.4: Test Case Reserved For Future Use**

**Test Case 6.11.5: Test Case Reserved For Future Use**

**Test Case 6.11.6: Test Case Reserved For Future Use**

End of Broadband Forum Technical Report TR-247/ATP-247