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XGS-PON ONT Tests Library

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Release

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1 Introduction

1.1 Purpose

This document gives the ONT vendor the details of the test cases performed at Swisscom for the Swisscom XGS-PON ONT certification.

The Swisscom XGS-PON ONT certification is needed for each XGS-PON ONT. After a successful certification the XGS-PON ONT will be set to the BBCS Proved Equipment List [1] and registered in the NCE. Only registered XGS-PON ONTs will get connectivity on the XGS-PON network. ONTs must meet the requirements defined in chapter 2.8 of the xDSL, G.fast and fibre CPE WAN requirement library [1].

1.2 Scope

This document describes the tests in detail.

1.3 Target readership, requirements of the reader

The reader should understand the basics of XGS-PON and the rational of ONT handling at Swisscom.

1.4 Terms and abbreviations

ALM	Application Lifecycle Management
BBCS	Broadband Connectivity Services
BSP	Board Support Package
DS	Downstream
FEC	Forward Error Correction
GEM	GPON encapsulation method
IOP	Interoperability
NCE	Network Cloud Engine
NGFAN	Next-generation Fibre Access Node
OMCC	Optical network unit Management and Control Channel
OMCI	ONU Management and Control Interface
OLT	Optical Line Termination
ONT	Optical Network Termination
US	Upstream
XGS-PON	10G-symmetrical Passive Optical Network

1.5 Referenced documents

- 2 BBCS Proved Equipment List (https://www.swisscom.ch/dam/swisscom/en/ws/documents/E_BBCS-Documents/e_bbc_supporting-documentprovedequipment.pdf)
- 3 E_CPE_Requirements_Library_WAN_xDSL_G.fast_&_Fibre (https://www.swisscom.ch/dam/swisscom/en/ws/documents/E_BBCS-Documents/cpe-requirements-library-wan-xdsl-g-fast---fibre-v3-01.pdf)
- 4 XGS-PON_ONT_Required_Information_v1.0.xlsx

2 Test plan for the Swisscom tests

The test in Table 1 have to be performed in order to get the Swisscom certification for an XGS-PON ONT

Table 1: Test plan for a XGS-PON ONT

Test case	Remarks
IOP - ONT state	
IOP - ONT Inventory Information	
IOP - Validate the number of GEM ports	
IOP - Validate the number of Alloc-IDs	
IOP - Validate the number of US priority-queues	
IOP - Validate the ONT XGS-PON chipset information	
IOP - Validate the ONT XGS-PON information	
IOP - Validate the ONT XGS-PON SFP information	
IOP - ONT Dying Gasp	
IOP - ONT Forward Error Correction US and DS	
IOP - Isolate Rogue ONT	
IOP - Validate ONT Rogue Behaviour	
XGS-PON SFP+ - Validate Rogue Behaviour	



3 Detailed description of test cases

3.1 IOP - ONT state

Description: Validate the ONT state

Step	Description	Expected Result / Annotations
1	Prerequisite	The board has registered successfully, and the ONT is connected to a PON port. You have logged in to the system as an administrator.
2	Record and check the ONT state.	<u>Huawei MA5800-X7 (XGSPON)</u> (config)#interface gpon x/y (config-if-gpon-y/x)#display ont info { portid } { ontid } The ONT must be up and running <ul style="list-style-type: none"> Run state must be "online" Config state must be "normal"
3	Test assessment	Pass: Run state is "online" and Config state is "normal" Critical: Run state is "offline" and/or Config state is "failed"

3.2 IOP - ONT Inventory Information

Description: Validate the ONT format definition according to the standard

Step	Description	Expected Result / Annotations
1	Prerequisite	The board has registered successfully, and the ONT works in the normal state. You have logged in to the system as an administrator.
2	Enter global config mode and check ONT info	<u>Huawei MA5800-X7 (XGSPON)</u> (config)#interface gpon x/y (config-if-gpon-y/x)#display ont info { portid } { ontid }
3	Record and check the ONT Serial number.	Serial number: The serial number is unique for each ONT. It is defined in [ITU-T G.984.3] and [ITU-T G.987.3] and contains the vendor ID and version number. The first four bytes are an ASCII-encoded four-letter vendor ID. The second four bytes are a binary encoded serial number, under the control of the ONT vendor. (8 bytes)



Step	Description	Expected Result / Annotations
4	Record and check the ONT Vendor-ID Huawei MA5800-X7 (XGSPON) (config)#interface gpon x/y (config-if-gpon-y/x)#display ont version { portid } { ontid }	Vendor-ID: This attribute identifies the vendor of the ONT. It is the same as the four most significant bytes of the ONU serial number as specified in [ITU-T G.984.3] and [ITU-T G.987.3]. (4 bytes)
5	Record and check the ONT Version	ONT Version: This attribute identifies the version of the ONT as defined by the vendor. (14 bytes) Remark: The character value 0 indicates that version information is not available or applicable and is generally not accepted by Swisscom.
6	Record and check the ONT Equipment-ID	Equipment-ID: This attribute may be used to identify the vendor's specific type of circuit pack. In some environments, this attribute may include the CLEI code. Upon ME instantiation, the ONT sets this attribute to all spaces or to the equipment ID of the circuit pack that is physically present. (20 bytes)
7	Record and check the ONT Software version	Software Version: This string attribute identifies the version of the software. (14 bytes)
8	Test assessment	Pass: The correct information for the following 6 items must be contained: <ul style="list-style-type: none"> • ONT vendor • ONT model • ONT HW version • ONT FW version • ONT Chipset FW version • ONT SFP model Critical: The information of one or several of the following 4 items is missing or incorrect: <ul style="list-style-type: none"> • ONT vendor • ONT model • ONT HW version • ONT FW version Major: The information of one or both of the following 2 items is missing or incorrect: <ul style="list-style-type: none"> • ONT Chipset FW version • ONT SFP model

3.3 IOP - Validate the number of GEM ports

Description: Validate the GEM port requirement based on the ONT's vendor information

Step	Description	Expected Result / Annotations
1	Prerequisite	The ONT vendor shall have delivered the detailed information of the ONT in advance that contains at least the number of the GEM ports
2	Check the reported number of GEM ports of the ONT	The number of GEM ports must be ≥ 16
3	Test assessment	Pass: The number of GEM ports is ≥ 16 Major The number of GEM ports is < 16

3.4 IOP - Validate the number of Alloc-IDs

Description: Validate the Alloc-ID requirement based on the ONT's vendor information

Step	Description	Expected Result / Annotations
1	Prerequisite	The ONT vendor shall have delivered the detailed information of the ONT in advance that contains at least the number of the Alloc-IDs
2	Check the reported number of Alloc-IDs of the ONT	The number of Alloc-IDs must be ≥ 8
3	Test assessment	Pass: The number of Alloc-IDs is ≥ 8 Major The number of Alloc-IDs is < 8

3.5 IOP - Validate the number of US priority-queues

Description: Validate the US priority-queues requirement based on the ONT's vendor information

Step	Description	Expected Result / Annotations
1	Prerequisite	The ONT vendor shall have delivered the detailed information of the ONT in advance that contains at least the number of the US priority-queues
2	Check the reported number of US priority-queues of the ONT	The number of US priority-queues must be ≥ 4
3	Test assessment	Pass: The number of US priority-queues is ≥ 4 Critical: The number of US priority-queues is < 4



3.6 IOP - Validate the ONT XGS-PON chipset information

Description: Validate the type and FW of XGS-PON chipset requirement based on the ONT's vendor information

Step	Description	Expected Result / Annotations
1	Prerequisite	The ONT vendor shall have delivered the detailed XGS-PON chipset-related information of the ONT in advance [4], i.e. information on ONT Chipset Vendor, ONT Chipset model and ONT Chipset firmware version
2	Check the reported information of XGS-PON chipset of the ONT	
3	Test assessment	Pass: The following 3 XGS-PON chipset related informations are delivered: <ul style="list-style-type: none">• ONT Chipset Vendor• ONT Chipset model• ONT Chipset firmware version Critical: any of the 3 informations are not delivered

3.7 IOP - Validate the ONT XGS-PON information

Description: Validate the XGS-PON ONT related information of the ONT's vendor

Step	Description	Expected Result / Annotations
1	Prerequisite	The ONT vendor shall have delivered the detailed XGS-PON information of the ONT in advance [4], i.e. information on ONT Full Vendor Name, ONT Vendor ID, ONT Software Version, ONT PON Serial Number format/encoding, ONT PON Serial number labelling and ONT Type
2	Check the reported information of XGS-PON ONT	
3	Test assessment	Pass: The following 6 XGS-PON ONT-related informations are delivered: <ul style="list-style-type: none">• ONT Full Vendor Name• ONT Vendor ID• ONT Software Version• ONT PON Serial Number format/encoding• ONT PON Serial number labelling• ONT Type Critical: any of the 6 informations are not delivered

3.8 IOP - Validate the ONT XGS-PON SFP information

Description: Validate the XGS-PON SFP information based on the ONT's vendor

Step	Description	Expected Result / Annotations
1	Prerequisite	The ONT vendor shall have delivered the detailed XGS-PON information of the SFP in advance [4], i.e. information on SFP Vendor and SFP Model
2	Check the reported information of XGS-PON SFP of the ONT	
3	Test assessment	Pass: The following 2 XGS-PON SFP-related informations are delivered: <ul style="list-style-type: none"> • SFP Vendor • SFP Model Critical: any of the 2 informations are not delivered

3.9 IOP - ONT Dying Gasp

Description: Validate that the ONT sends a Dying Gasp when going offline with loss of power

Step	Description	Expected Result / Annotations
1	Prerequisite	The OLT port is correctly configured The ONT has registered successfully and works in the normal state. The optical connection OLT - optical splitter - ONT exists
2	Power off the ONT	The ONT is switched off via the device power ON/OFF button.
3	Verify that Dying Gasp was sent	<u>Huawei MA5800-X7 (XGSPON)</u> <i>MA5800-X7 (diagnose)%display ont info (frameid) (slotid) (portid) (ontid)</i> → Last down cause : dying-gasp
4	Power on the ONT	The ONT is switched on via the device power ON/OFF button.
5	Verify that ONT is online again	<u>Huawei MA5800-X7 (XGSPON)</u> <i>MA5800-X7 (diagnose)%display ont info (frameid) (slotid) (portid) (ontid)</i>
6	Remove the AC plug of the ONT power supply from the power outlet	The AC plug of the ONT power supply is removed from the socket



Step	Description	Expected Result / Annotations
7	Verify that Dying Gasp was sent	<u>Huawei MA5800-X7 (XGSPON)</u> <i>MA5800-X7 (diagnose)%%display ont info (frameid) (slotid) (portid) (ontid)</i> ➔ Last down cause : dying-gasp
8	Connect the AC plug of the ONT power supply to the power outlet	The AC plug of the ONT power supply is connected to the socket again
9	Verify that ONT is online again	<u>Huawei MA5800-X7 (XGSPON)</u> <i>MA5800-X7 (diagnose)%%display ont info (frameid) (slotid) (portid) (ontid)</i>
10	Repeat steps 2-9 three times	A total of 8 Dying Gasps should be sent
11	Test assessment	Pass: ONT sends 8 (of 8) Dying Gasps Major: ONT sends 5-7 (of 8) Dying Gasps Critical: ONT less than 5 (of 8) Dying Gasps

3.10 IOP - ONT Forward Error Correction US and DS

Description: Validate FEC reporting in Up- und Downstream with increasing attenuation

Step	Description	Expected Result / Annotations
1	Prerequisite	The OLT port is correctly configured The ONT has registered successfully and works in the normal state. The optical connection OLT - optical splitter - ONT exists
2	Build the test setup with 5km fiber plus a variable attenuation (set initially to 8 dB attenuation) between splitter and ONT	The setup is constructed and the ONT works normally <u>Huawei MA5800-X7 (XGSPON)</u> <i>MA5800-X7#(config-if-gpon-(frameid))/(slotid)#display ont optical-info (portid) (ontid)</i> The values are recorded



Step	Description	Expected Result / Annotations
3	<p>Verify and record the following FEC parameters of the ONT (2 times ca. 10 seconds apart):</p> <p>Downstream frame FEC corrected bytes Downstream frame FEC corrected code words Downstream frame FEC uncorrectable code words Downstream frame total receive code words</p> <p>Upstream frame FEC corrected bytes Upstream frame FEC corrected code words Upstream frame FEC uncorrected code words Upstream frame total receive code words</p>	<p>Total receive code words in downstream and upstream should increase if the following commands are executed multiple times:</p> <p><u>Huawei MA5800-X7 (XGSPON)</u></p> <p><i>MA5800-X7#(config-if-gpon-(frameid))/(slotid)#display statistics ont-performance (portid) (ontid) current-15minutes</i></p> <p><i>MA5800-X7#(config-if-gpon-(frameid))/(slotid)#display statistics ont-line-quality (portid) (ontid)</i></p>
4	<p>Increase the attenuation of the Optical Attenuator in 2.0 dB steps and wait 30 seconds and then record the Rx power on ONT and OLT side</p>	<p><u>Huawei MA5800-X7 (XGSPON)</u></p> <p><i>MA5800-X7#(config-if-gpon-(frameid))/(slotid)#display ont optical-info (portid) (ontid)</i></p> <p>The values are recorded</p>
5	<p>After each attenuation increase check the FEC values of the ONT 2 times ca. 10 seconds apart:</p> <p>Downstream frame FEC corrected bytes Downstream frame FEC corrected code words Downstream frame FEC uncorrectable code words Downstream frame total receive code words</p> <p>Upstream frame FEC corrected bytes Upstream frame FEC corrected code words Upstream frame FEC uncorrected code words Upstream frame total receive code words</p>	<p><u>Huawei MA5800-X7 (XGSPON)</u></p> <p><i>MA5800-X7#(config-if-gpon-(frameid))/(slotid)#display statistics ont-performance (portid) (ontid) current-15minutes</i></p> <p><i>MA5800-X7#(config-if-gpon-(frameid))/(slotid)#display statistics ont-line-quality (portid) (ontid)</i></p> <p>The values are recorded</p>
6	<p>Continue with step 4 until the ONT goes offline</p>	
7	<p>Test assessment</p>	<p>Pass: Total receive code words in downstream and upstream should increase if the FEC query commands are executed multiple times. Reasonable (e.g. not 4294967295 = 0xFFFFFFFF) FEC information is reported.</p> <p>Major: Total receive code words don't increase or unreasonable FEC information is reported</p>

3.11 IOP - Isolate Rogue ONT

Description: It is to verify a rouge ONT to isolate with CLI command.

Step	Description	Expected Result / Annotations
1	Prerequisite	The OLT port is correctly configured The ONT has registered successfully and works in the normal state. The optical connection OLT - optical splitter - ONT exists
2	Verify the list of isolated ONT on the corresponding OLT port on which the ONT is registered	<u>Huawei MA5800-X7 (XGSPON)</u> <i>MA5800-X7 diagnose%%display rogueont (portid) all</i> The list should be empty
3	Activate the diagnosis mode and isolate the specific rogue ONT	<u>Huawei MA5800-X7 (XGSPON)</u> <i>MA5800-X7(diagnose)%anti-rogueont isolate (frameid)/(slotid)/(portid) (ontid)</i>
4	Verify the list of isolated ONT again	<u>Huawei MA5800-X7 (XGSPON)</u> <i>MA5800-X7(diagnose)%display rogueont (portid) all</i> The isolated ONT should be reported in the list
5	Verify the run state of isolated ONT	<u>Huawei MA5800-X7 (XGSPON)</u> <i>MA5800-X7(config-if-gpon-(frameid)/(slotid) #display ont info (portid) (ontid)</i> The run state of the ONT should be offline
6	Switch the corresponding ONT OFF/ON	The ONT has been switched OFF/ON and has executed a restart
7	Verify the list of isolated ONT and the run state of the ONT again	<u>Huawei MA5800-X7 (XGSPON)</u> <i>MA5800-X7#display rogueont (portid) all</i> <i>MA5800-X7(config-if-gpon-(frameid)/(slotid) #display ont info (portid) (ontid)</i> The OLT should still be listed as isolated and the run state should be offline
8	Undo the isolation status of the ONT	<u>Huawei MA5800-X7 (XGSPON)</u> <i>MA5800-X7(diagnose)%undo anti-rogueont isolate (frameid)/(slotid)/(portid) (ontid)</i>



Step	Description	Expected Result / Annotations
9	Verify the list of isolated ONT and the run state of the ONT again	<p><u>Huawei MA5800-X7 (XGSPON)</u> <i>MA5800-X7#display rogueont (portid) all</i></p> <p><i>MA5800-X7(config-if-gpon-(frameid))/(slotid) #display ont info (portid) (ontid)</i></p> <p>The OLT should disappear from the list and the run state should be online</p>
10	Test assessment	<p>Pass: The behavior is conformant with the expected result</p> <p>Major: The ONT is not isolated after the isolate command (step 3/4)</p> <p>Minor: The ONT does not stay isolated after ONT power off/on (step 6/7)</p>

3.12 IOP - Validate ONT Rogue Behaviour

Description: Validate the rogue behaviour of new ONT with each white list XGS-PON SFP+

Step	Description	Expected Result / Annotations
1	Prerequisite	<p>The OLT port is correctly configured</p> <p>The ONT has registered successfully and works in the normal state. The optical connection OLT - optical splitter - ONT exists</p>
2	Check the versions information of the ONT incl. home XGS-PON-SFP+	<p><u>Huawei MA5800-X7 (XGSPON)</u> <i>MA5800-X7#(config-if-gpon-(frameid))/(slotid)#display ont version (portid) (ontid)</i></p>
3	<p>Switch off the ONT and replace the XGS-PON SFP+ with an SFP+ from the ONT/SFP+ matrix</p> <p>Turn on the ONT and wait a few minutes</p> <p>Check if the ONT with a 3rd party SFP+ generates a 'rogue' signal or not.</p>	<p><u>Huawei MA5800-X7 (XGSPON)</u> <i>MA5800-X7(diagnose)%display board maintenance-info (frameid)/(slotid)/(portid)</i></p>
4	Check if the ONT with the 3 rd party SFP+ is online	<p><u>Huawei MA5800-X7 (XGSPON)</u> <i>MA5800-X7#(config-if-gpon-(frameid))/(slotid)#display ont info (portid) (ontid)</i></p>
5	Repeat step 3 and 4 with each SFP+ from the matrix	The ONT's rogue behaviour is validated with each 3 rd SFP+ from the matrix and the matrix is completed with the results



Step	Description	Expected Result / Annotations
6	Test assessment	Pass: No rogue signal is detected Minor: the ONT is online with the 3 rd party SFP+ Major: A rogue signal is detected with RSSI > -28 dBm and < -18 dBm Critical: A rogue signal is detected with RSSI > -18 dBm

3.13 XGS-PON SFP+ - Validate Rogue Behaviour

Description: Validate the rogue behaviour of new XGS-PON SFP+ in a non-XGS-PON device

Step	Description	Expected Result / Annotations
1	Prerequisite	The OLT port is correctly configured
2	Insert the new XGS-PON SFP+ into an Ubiquiti UniFi Dream Machine Pro (or another non XGS-PON capable device e.g. a media convertor with 10G SFP+ slot) and connect it to the NGFAN port Turn on the Ubiquiti UniFi Dream Machine Pro and wait a few minutes Check if the XGS-PON SFP+ generates a 'rogue' signal or not.	<u>Huawei MA5800-X7 (XGSPON)</u> <code>MA5800-X7(diagnose)%display board maintenance-info (frameid)/(slotid)/(portid)</code>
3	Test assessment	Pass: No rogue signal is detected Major: A rogue signal is detected with RSSI > -28 dBm and < -18 dBm Critical: A rogue signal is detected with RSSI > -18 dBm



4 Annex A: Information of NGFAN

The following information (status at releasing date of the document) on the NGFAN may be of interest:

- Chassis: MA5800-X7
- LT Card (XGS-PON): FLHF & XSHF
- SFP Type: XGS-PON N1 & N2
