annexe 4 - Prérequis à l'introduction d'un nouvel ONU

Offre FTTH Access

Orange requirement for G-PON ONU Gateway

Abstract:

This document presents the requirements of a G-PON ONU Gateway for Orange Wholesale services.

TABLE OF CONTENTS

1 INTRODUCTION

1.1 OBJECTIVES OF THIS DOCUMENT

This document presents the high level requirements of a ONU Gateway product from a G-PON perspective. This covers a big majority of the overall requirements and mechanisms to implement in the ONU Gateway product range to reach G-PON interoperability.

The overall objective is to rely heavily on Standard / Normalization / Forum specifications. The ONU Gateway specifications package is here to precise some options requested by Orange and to describe proprietary mechanisms when needed.

1.2 REFERENCE DOCUMENTS

Broadband Forum

#	Title	Reference	Version
R1.	TR-142i3 Framework for TR-069 enabled PON Devices	TR-142i3	Issue 3 (2017-09)
R2.	TR-155 G-PON ONU requirements for CPE	TR-155	Issue 1 (2011-05)
R3.	TR-156 Using G-PON Access in the context of TR-101	TR-156	Issue 4 (2017-11)
R4.	TP 247 G-PON & XG-PON & XGS-PON ONU Conformance Test Plan	TR-247	Issue 4, (2020-04)
R5.	TR-280 ITU-T PON in the context of TR-178	TR-280	Issue 1 (2016-10)
R6.	TR-280 amd1 ITU-T PON in the context of TR-178	TR-280	Issue1 amd1 (2020-04)

ITU-T documents

#	Title	Reference	Version
R7.	Gigabit-capable Passive Optical Networks (G-PON): General characteristics, 2008, with amendment 1 (2009) and 2 (2012)	ITU-T G.984.1	2012
R8.	G-PON: Physical Media Dependent (PMD) layer specification, 2003, with amendment 1 (2006) and 2 (2008)	ITU-T G.984.2	2008
R9.	G-PON: Transmission convergence layer specification, 2014	ITU-T G.984.3	2014
R10.	ONU management and control interface (OMCI) specification	ITU-T G.988	2012

R11.	Enhancement Band, 2007, with amendment 1 (2009) Coexistence with future WDM PON technology on the same medium.	ITU-T G.984.5	2009

1.3 GLOSSARY

Term	Definition
AES	Advanced Encryption Standard
ANI	Access Node Interface
BBF	Broadband Forum
BW	Bandwidth
DBA	Dynamic Bandwidth Assignment
DBRu	Dynamic Bandwidth Report upstream
FEC	Forward Error Correction
GEM	Gigabit-capable passive optical network Encapsulation Method
G-PON	Gigabit-capable Passive Optical Network
ITU	International Telecommunication Union
LAN	Local Area Network
LOS	Loss of Signal
MAC	Media Access Control
ME	Managed Entity
MIB	Management Information Base
NG-PON	Next Generation Passive Optical Network
OAM	Operations, Administration and Maintenance
OLT	Optical Line Termination
OMCI	Optical Network Unit Management and Control Interface
ONT	Optical Network Termination
ONU	Optical Network Unit
ONU-ID	Optical Network Unit Identifier
OTDR	Optical Time Domain Reflectometer
PHY	Physical Interface
PLOAM	Physical Layer Operations, Administration and Maintenance
PMD	Physical Media Dependent
PON	Passive Optical Network
Port-ID	Port Identifier
PQ	Priority Queue
QoS	Quality of Service

Reg-ID	Registration ID
SFP	Small Form-factor Pluggable
SN	Serial Number
T-CONT	Transmission Container
UNI	User-Network Interface
VLAN	Virtual LAN

2 OVERVIEW

2.1 INTEROPERABILITY

Orange plans to introduce interoperable ONU on its G-PON network as Interoperability means faster time to market, decreasing costs and increasing market traction through standards based compliance. Interoperability on Orange G-PON networks rely certification program (BBF.247) and on inforce standards (ITU-T Rec. G.98x series) and BBF TR-156 and TR-280.

2.1.1 Certification BBF.247

Certification BBF.247 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.

2.1.2 Standard BBF TR-156

Standard BBF TR.156 is intended to provide the architectural basis and technical requirements that are needed to successfully deploy G-PON access nodes within a TR-101 architecture.

2.1.3 Standard BBF TR-280

Standard BBF TR-280 is intended to provide the architectural basis and technical requirements that are needed to successfully deploy G-PON access nodes within a TR-178 architecture.

3 REQUIREMENTS LIST

Chapter	Requirement
4.	Optical Layer
4.1.1.	ITU-T standard
4.1.2	ITU-T options
4.1.3.	C+ Class
4.1.4	ITU-T PLOAM
4.2	Bi-directional Optical Sub Assembly (BOSA)
4.3	Connector
5	Interoperability
5.1.1	G.988
5.1.2	TR-156
5.1.3	TR-280
5.2.1	ME BBF.247 certification
5.2.2	BBF.247 certification as Residential Gateway ONU
5.2.3	BBF.247 Issues for Residential Gateway ONU (Mandatory)
5.2.4	BBF.247 Issues for Residential Gateway ONU (Optional)
5.2.5	ME ONU2-G
6	Functional
6.1.1	DBA
6.1.2	AES
6.1.3	GEM Ports minimum
6.2.1	Priority Queue / GEM Ports
6.2.2	Priority Queue ID

6.2.3	Priority Queue null
6.2.4	Priority Queue unknown
6.3.1	ME ITU-T G.988
6.3.2	ME Cardholder for ONU Provisionning
6.3.3	ME Priority Queue
7	OAM
7.1.1	Alarms
7.1.2	Alarm & Performance monitoring ME exchange
7.1.3	Performance Monitoring ME
7.1.4	Accuracy
7.1.5	Specific Alarms
7.2.1	Configuration Rejection
7.2.2	Software Status
7.2.3	ONU reset
7.3.1	Optical Line Data
7.3.2	Optical Line Data 1
7.3.3	Optical Line Data 2
7.3.4	Fiber Measurement
7.3.5	Optical Level High
7.3.6	Optical Level Low
7.3.7	Managed Entities section 9.3.30
7.3.8	Managed Entities section 9.3.31
7.3.9	Managed Entities section 9.5.2
7.3.10	Managed Entities section 9.5.3
7.3.11	Managed Entities section 9.5.4

7.3.12	Managed Entities section 9.3.9
7.3.13	Managed Entities section 9.2.9
7.3.14	Managed Entities section 9.2.13
7.3.15	Managed Entities section 9.2.8
7.3.16	Managed Entities section 9.3.32
7.3.17	Managed Entities section 9.3.34
7.3.18	Number of supported Performance Monitoring ME
8	Provisioning and management
8.1.1	OMCI Provisioning
8.1.2	Data transmission authorization
8.1.3	Rogue behavior
8.1.4	Restart time
8.1.5	Response time test request
8.1.6	Response time data retrieval
8.1.7	Recommended response time
8.1.8	MIB reset response time
8.2.1	Authentication methods
8.2.2	Reg-ID compliancy
8.2.3	Reg-ID persistency
8.3.1	Dying Gasp
9	Managed Entities Parameters
9.1.1	Vendor Id
9.1.2	Vendor Id Format
9.1.3	Vendor Id Permanency
9.2.1	ONU-G Version

9.2.2	ONU-G Version Value
9.2.3	ONU-G Version Format
9.2.4	ONU-G Version Length
9.2.5	ONU-G Version Start 1
9.2.6	ONU-G Version Start 2
9.2.7	ONU-G Version Permanency
9.3.1	Software image Version
9.3.2	Software Image Version Format
9.3.3	Software upgrade
9.4.1	Equipment Id
9.4.2	Equipment Id / ONU Type
9.4.3	Equipment Id Format
9.4.4	Equipment Id Start
9.4.5	Equipment Id Permanency

4 OPTICAL LAYER

4.1 STANDARDS

4.1.1 ITU-T standard

The ONU Data rate MUST comply with ITU-T G.984

4.1.2 ITU-T options

The ONU transmission MUST comply with ITU-T G.984 series with the following options:

- PMD performances compliant with class B+ (ITU-T G.984.2 amd1)
- Upstream FEC so that the ONU enables optional activation to achieve class C+ performance according to the OLT requirements (ITU-T G.984.2 amd2)

4.1.3 C+ Class

The ONU transmission MUST comply with ITU-T G.984 series with the following options

- PMD performances compliant with class C+ (ITU-T G.984.2 amd1)

4.1.4 ITU-T PLOAM

The Full G-PON stack processing MUST include full PLOAM handling and framing as standardized in ITU-T G.984.3

4.2 BI-DIRECTIONAL OPTICAL SUB ASSEMBLY (BOSA)

The optical filters enabling overlay capability with RF Video, optical monitoring and NG-PON generations MUST be supported :

- The transmitter wavelength MUST be compliant with ITU-T G.984.5 2014: 1300-1320nm
- The ONU MUST include a wavelength blocking filter according to ITU-T G.984.5 to protect its diplex transmission against RF Video, monitoring via 1650nm OTDR and NG-PON systems

4.3 CONNECTOR

The ONU MUST be compatible with a SC/APC optical connector as PON interface as describe in CEI 61754-4, CEI 61755-2-2 and CEI 61755-3-2

5 INTEROPERABILITY

5.1 STANDARDS

5.1.1 G.988

The ONU MUST comply with ITU-T standards G.988 and associated documents like amendments / appendices

5.1.2 TR-156

The ONU MUST comply with the following Broadband Forum standards

• TR-156 issue 4 : All Mandatory requirements and the following optional requirements have to be supported (R-49, R-95, R-114 to R-119, R-123)

5.1.3 TR-280

The ONU MUST comply with all mandatory the TR-280 Broadband Forum standard (except R-2 to R-10) and amd1

5.2 MANAGED ENTITIES

5.2.1 ME BBF.247 certification

The ONU MUST comply with all MEs used in BBF.247 certification issue 4

5.2.2 BBF.247 certification as Residential Gateway ONU

The G-PON ONU MUST be BBF.247 issue 4 certified with the product type Residential Gateway ONU

5.2.3 BBF.247 Issues for Residential Gateway ONU (Mandatory)

The G-PON ONU MUST be BBF.247 issue 4 certified with the following profiles:

- Profile A – N:1 VLAN Architecture
- Profile B – 1:1 VLAN Architecture
- Profile C – VBES VLAN Architecture
- Profile E – Enhanced Operations
- Profile G – Capacity Test cases
- All Residential Gateway ONU devices under certification must support the Baseline Profile requirements only

5.2.4 BBF.247 Issues for Residential Gateway ONU (Optional)

The G-PON ONU SHOULD be BBF.247 issue 4 certified with the following profiles:

- Profile A – N:1 VLAN Architecture
- Profile B – 1:1 VLAN Architecture
- Profile C – VBES VLAN Architecture
- Profile D – Multicast Operations
- Profile E – Enhanced Operations
- Profile F – Enhanced Multicast Operations
- Profile G – Capacity Test cases
- Profile H – Monitoring Test Cases
- All Residential Gateway ONU devices under certification must support the Baseline Profile requirements only

5.2.5 ME ONU2-G

The G-PON ONU MUST use the baseline OMCI messages and configure the attribute Optical network unit management and control channel (OMCC) version of the ONU2-G 0xAx with x depending of the OMCI version.

6 FUNCTIONAL

6.1 ACHITECTURE

6.1.1 DBA

The ONU MUST support Status Reporting DBA

6.1.2 AES

The ONU MUST support downstream AES for OMCI and unicast user GEMport

6.1.3 GEM Ports minimum

The ONU MUST support at least 8 user GEMPort + 1 OMCI GEMport

6.2 PRIORITY QUEUE

6.2.1 Priority Queue / GEM Ports

Each PQ (upstream and downstream) MUST support the association with many GEMports

6.2.2 Priority Queue ID

In downstream direction, the range of attribute "Manage entity id" for the ME "Priority queue" **MUST NOT** be between 0x0000 to 0x0007 for ONU with 8PQ in the downstream. (see Annex)

- Strict priority is applied between priority queue

6.2.3 Priority Queue null

In downstream direction, the ONU MUST support strict priority based on pbit value at the U interface (pbit 7 has the highest priority and pbit 0 the lowest) if the attribute "Priority queue pointer for downstream" of ME GEMport network CTP has a null value (0)

(i.e. the attribute point to the priority queue with the Manage entity id value 0x0000) (see Annex and [ITU-T G.988 2012] section 9.2.3 and 9.2.10)

6.2.4 Priority Queue unknown

In downstream direction, the ONU MUST support strict priority based on pbit value at the U interface (pbit 7 has the highest priority and pbit 0 the lowest) if the attribute "Priority queue pointer for downstream" of ME GEM port network CTP has an unknown priority queue Manage Entity ID for the ONU but sent by the OLT (see Annex)

6.3 MANAGED ENTITIES

6.3.1 ME ITU-T G.988

The ONU MUST support all G.988 ME which are described in BBF.247

6.3.2 ME Cardholder for ONU Provisionning

The G-PON ONU MUST provision the Cardholder ME for ethernet interface with the following parameters for the attribute "Managed entity id" its value MUST be 0x0101 for the 'plug in type"; the value is 47 or 24 and 34 see table 9.1.5-1 [ITU-T G.988 (2012)] (47 is the recommended value for the PPTP Ethernet UNI interface). This ME MUST support only 1 ETH port that MUST work like VEIP ME (R-68 TR-280)

6.3.3 ME Priority Queue

In downstream direction, The ONU MUST support 8 ME "Priority Queue" (see Annex)

7 OAM

7.1 ALARMS AND PERFORMANCE MONITORING

7.1.1 Alarms

The ONU must be compliant with all alarms and all notifications signals which are described in chapter 11 Alarms and performance monitoring [ITU-T G.984.3 Jan 2014]

7.1.2 Alarm & Performance monitoring ME exchange

The ONU MUST support the exchanges of the alarms & PM ME between ONU & OLT with the rules defined in the recommendations ITU-T G.988, including appendix 1 & 2

7.1.3 Performance Monitoring ME

The ONU MUST respect strictly the clause 9 and I.4 [ITU-T G.988 Oct 2012] for the Performance Monitoring

7.1.4 Accuracy

The ONU counters MUST be accurate within ± 1 frame

7.1.5 Specific Alarms

If the ONU can send vendor-specific alarms, the ONU vendor MUST indicate in its release note the Vendor-specfic alarms that the ONU can report.

7.2 ONU REPORT

7.2.1 Configuration Rejection

The ONT must report on OMCI message to the OLT when it rejects the configuration requested by the OLT, in accordance with section A3 of ITU-T G.988 ver. 2012.

The ONU rejects if the current configuration is beyond the actual capabilities of the ONT or if the software of ONT is abnormal.

7.2.2 Software Status

The ONU MUST report software status in accordance with ITU-T G.988 version 2012, its appendix I.3 and the message format as specified in section A.3.

- Software download is achieved with success or fail
- Activation of the new ONU Software is achieved with success or fail
- Commit of the new ONU Software is achieved with success or fail

7.2.3 ONU reset

The ONU MUST accept any request for performing one remote ONU reset (i.e. OMCI reboot command)

7.3 OPTICAL LINE

7.3.1 Optical Line Data

The Optical line data at ONU level MUST be in accordance with the following performance items which are described in Table IV.1 [ITU-T G.984.2 Amd.2 (03/2008)]

- ONU transmitted power
- ONU received power

All the above parameters should be monitored continuously in real time.

7.3.2 Optical Line Data 1

The ONU MUST support the optical power parameter monitoring enhanced accuracy as defined below:

- ONU Transmit Power accuracy : +/- 3 dB
- ONU receive power accuracy : +/- 3 dB
- ONU receive power repeatability : +/- 0,5 dB

7.3.3 Optical Line Data 2

The Optical line data at ONU level MUST be in accordance with the following performance items which are described in Table IV.1 [ITU-T G.984.2 Amd.2 (03/2008)]

- ONT Transceiver temperature
- ONT Transceiver voltage
- ONT Laser bias current

All the above parameters should be monitored continuously in real time.

7.3.4 Fiber Measurement

The ONU MUST permit to the OLT to deliver the PON fibre distance measurement from the OLT to a ONU. The estimate should be approximately ±1% accurate as it is mentioned in clause 10.3.6 [ITU-T G.984.3 Jan 2014]

7.3.5 Optical Level High

The internal policy of the ONU for Upper optical threshold of the ANI-G ME MUST be configured at -8dBm and the ONU MUST send the OMCI alarm (High received optical power) when the threshold is reached.

7.3.6 Optical Level Low

The Managed Entities and all associated attributes described in ITU-T G.988 Section 9.1.1 ONU-G MUST be implemented

7.3.7 Managed Entities section 9.3.30

The Managed Entities and all associated attributes described in ITU-T G.988 Section 9.3.30: Ethernet frame performance monitoring history data upstream MUST be implemented

7.3.8 Managed Entities section 9.3.31

The Managed Entities and all associated attributes described in ITU-T G.988 Section 9.3.31: Ethernet frame performance monitoring history data downstream MUST be implemented

7.3.9 Managed Entities section 9.5.2

The Managed Entities and all associated attributes described in ITU-T G.988 Section 9.5.2: Ethernet performance monitoring history data MUST be implemented

7.3.10 Managed Entities section 9.5.3

The Managed Entities and all associated attributes described in ITU-T G.988 Section 9.5.3: Ethernet performance monitoring history data 2 MUST be implemented

7.3.11 Managed Entities section 9.5.4

The Managed Entities and all associated attributes described in ITU-T G.988 Section 9.5.4: Ethernet performance monitoring history data 3 MUST be implemented

7.3.12 Managed Entities section 9.3.9

The Managed Entities and all associated attributes described in ITU-T G.988 Section 9.3.9: MAC bridge port PM history data MUST be implemented

7.3.13 Managed Entities section 9.2.9

The Managed Entities and all associated attributes described in ITU-T G.988 Section 9.2.9: FEC performance monitoring history data MUST be implemented

7.3.14 Managed Entities section 9.2.13

The Managed Entities and all associated attributes described in ITU-T G.988 Section 9.2.13: GEM port network CTP performance monitoring history data MUST be implemented

7.3.15 Managed Entities section 9.2.8

The Managed Entities and all associated attributes described in ITU-T G.988 Section 9.2.8: GAL Ethernet performance monitoring history data MUST be implemented

7.3.16 Managed Entities section 9.3.32

The following Managed Entities and all associated attributes described in ITU-T G.988 Section 9.3.32 Ethernet frame extended PM (32bits) MUST be implemented

- (11) Physical path termination point Ethernet UNI in upstream for UNI interface (1 ME instance for all frames)
- (11) Physical path termination point Ethernet UNI in downstream for UNI interface (1 ME instance for all frames)
- (11) Physical path termination point Ethernet UNI in upstream for all Pbits (1 ME instance for each pbit of tagged Orange FTTH Bitstream wholesale services)
- (11) Physical path termination point Ethernet UNI in downstream for all Pbits (1 ME instance for each pbit of tagged Orange FTTH Bitstream wholesale services)
- (266) GEM interworking termination point up in upstream for all GEMport (1 ME instance per GEMport for all frames)
- (266) GEM interworking termination point up in downstream for all GEMport (1 ME instance per GEMport for all frames)
- (266) GEM interworking termination point up in upstream for all GEMport (1 ME instance for each pbit of tagged Orange FTTH Bitstream wholesale services)
- (266) GEM interworking termination point up in downstream for all GEMport (1 ME instance for each pbit of tagged Orange FTTH Bitstream wholesale services)

7.3.17 Managed Entities section 9.3.34

The following Managed Entities and all associated attributes described in ITU-T G.988 Section 9.3.34 Ethernet frame extended PM 64-Bit [ITU-T G.988 amd1 2014] MUST be implemented

- (11) Physical path termination point Ethernet UNI in upstream for UNI interface(1 ME instance for frames)
- (11) Physical path termination point Ethernet UNI in downstream for UNI interface (1 ME instance for all frames)
- (11) Physical path termination point Ethernet UNI in upstream (1 ME instance for each pbit of tagged Orange FTTH Bitstream wholesale services)
- (11) Physical path termination point Ethernet UNI in downstream (1 ME instance for each pbit of tagged wholesale offer)
- (266) GEM interworking termination point up in upstream for all GEMport (1 ME instance per GEMport for all frames)
- (266) GEM interworking termination point up in downstream for all GEMport (1 ME instance per GEMport for all frames)
- (266) GEM interworking termination point up in upstream for all GEMport (1 ME instance for each pbit of tagged Orange FTTH Bitstream wholesale services)
- (266) GEM interworking termination point up in downstream for all GEMport (1 ME instance for each pbit of tagged Orange FTTH Bitstream wholesale services)

7.3.18 Number of supported Performance Monitoring ME

The ONU MUST simultaneously support at least 16 instances for the following Managed Entities:

- Ethernet frame extended PM (32bits)
- Ethernet frame extended PM (64bits)

8 PROVISIONING AND MANAGEMENT

8.1 PROVISIONING

8.1.1 OMCI Provisioning

The ONU MUST fully support the provisioning using OMCI through the network

8.1.2 Data transmission authorization

The ONU MUST not transmit data in GEM port and T-CONT before all PLOAM and OMCI configuration have been completed and grant allocated

8.1.3 Rogue behavior

The ONU MUST never have a rogue behavior (during activation, reboot, MIB synchro, LOS, reboot after software download)

8.1.4 Restart time

The ONU MUST boot/reboot and the services be back up in less than 120 seconds, upon :

- Electrical power off/on
- Electrical cable reconnection
- Software reboot (via OMCI)

8.1.5 Response time test request

The maximum G-PON ONU response time to OLT test requests for the optical power parameters and optical line data parameters MUST NOT exceed 500 milliseconds.

8.1.6 Response time data retrieval

The maximum G-PON ONU response time to OLT data retrieval request for the performance monitoring parameters MUST NOT exceed 500 milliseconds.

8.1.7 Recommended response time

The recommended G-PON ONU response time to OLT requests (Create/Get/Set) not exceed 10ms.

8.1.8 MIB reset response time

The recommended G-PON ONU response time to OLT requests (MIB reset) not exceed 8s.

8.2 AUTHENTICATION

8.2.1 Authentication methods

The ONU MUST support authentication through Reg-Id methods according to TR-156

8.2.2 Reg-ID compliancy

The Reg-ID MUST comply with ITU-T Rec. G.984.3

8.2.3 Reg-ID persistency

The G-PON password and/or Reg-ID MUST remain after a restore default settings.

8.3 DYING GASP

8.3.1 Dying Gasp

The ONU MUST support the Dying Gasp, including when all functions in the box are enabled.

9 MANAGED ENTITIES PARAMETERS

9.1 VENDOR ID ATTRIBUTE

9.1.1 Vendor Id

The G-PON ONU MUST store the attribute "Vendor Id" of the ME ONU-G of the ITU-T G.988 recommendations.

This attribute "ONU-G::Vendor Id" attribute MUST uniquely and unambiguously identify the vendor of the ONU.

9.1.2 Vendor Id Format

The ONU-G::Vendor Id attribute (defined in ITU-T Rec. G.988) MUST consist of four letters or digits (A..Z, a..z, 0..9).

9.1.3 Vendor Id Permanency

The ONU-G::Vendor Id attribute MUST be the same during all the life of the ONU (e.g. Software upgrade or downgrade MUST NOT change it).

9.2 ONU-G : ATTRIBUTE

9.2.1 ONU-G Version

The G-PON ONU MUST store the attribute "ONU-G::Version" of the ME ONU-G of the ITU-T G.988 recommendations.

This attribute "ONU-G::Version" MUST uniquely and unambiguously identify the hardware version of the ONU.

9.2.2 ONU-G Version Value

The ONU-G::Version attribute value (defined in ITU-T Rec. G.988) MUST NOT be 0.

9.2.3 ONU-G Version Format

The ONU-G::Version MUST consist of the minimum 5 non-null ASCII characters, which can only be letters or numbers.

9.2.4 ONU-G Version Length

If the ONU-G::Version consists of less than fourteen non-null characters, they have to be followed by all NULL characters.

9.2.5 ONU-G Version Start 1

The ONU-G::Version attribute MUST NOT start with 46|45 ("FE").

9.2.6 ONU-G Version Start 2

The ONU-G::Version attribute MUST NOT start with 33|46|45 ("3FE").

9.2.7 ONU-G Version Permanency

The ONU-G::Version MUST be the same during all the life of the ONU (e.g. Software upgrade or downgrade MUST NOT change it).

9.3 SOFTWARE IMAGE : ATTRIBUTE

9.3.1 Software image Version

The G-PON ONU MUST store the attribute "Version" of the ME Software Image of the ITU-T G.988 recommendations.

The "Software Image::Version" attribute MUST uniquely and unambiguously identify the given software image of the G-PON-ONU.

9.3.2 Software Image Version Format

The Software Image::Version attribute (defined in ITU-T Rec. G.988) MUST follow the following format:

- Is 13 non-null ASCII characters, which are only letters or numbers.
- the last 14th byte is always a NULL character
- if the attribute value starts with less than 13 non-null characters, the following bytes must all be NULL characters.

- The example invalid attribute values are:
  - 33|46|45|42|42|31|32|00|00|00|00|00|00|00 ("3FEBB12") - the attribute starts with "3FE"
  - 56| 45|4E|44|31|4F|4E|55|31|53|57|30|30|31 ("VEND1ONU1SW001") - the last character is not NULL

9.3.3 Software upgrade

The ONU is not under Orange responsibility for the upgrade, all upgrade via non OMCI management MUST NOT change the ONU software image version name.

9.4 ONU-2G : EQUIPMENT-ID ATTRIBUTE

9.4.1 Equipment Id

The G-PON ONU MUST support the attribute "Equipment Id" of the ME ONU2-G of the ITU-T G.988 recommendations.

9.4.2 Equipment Id / ONU Type

The attribute "ONU2-G::Equipment Id" MUST uniquely and unambiguously identify the specific type of ONU.

9.4.3 Equipment Id Format

The ONU2-G::Equipment Id MUST consists of minimum 5 and maximum 20 non-null ASCII characters, which can be only letters and digits (A..Z, a..z, 0..9).

9.4.4 Equipment Id Start

If the ONU2-G::Equipment Id attribute value starts with less than 20 non-null characters, the following bytes must all be NULL characters.

9.4.5 Equipment Id Permanency

The ONU2-G::Equipment Id MUST be the same during all the life of the ONU (e.g. Software upgrade or downgrade MUST NOT change it).

10 ANNEX

Recommendation on OMCI implementation

PRIORITY QUEUE BEHAVIOR

PRIORITY QUEUE ME

The standard says :

> **Managed entity id**: This attribute uniquely identifies each instance of this managed entity. The most significant bit represents the direction (1: upstream, 0: downstream). The 15 least significant bits represent a queue id. The queue id is numbered in ascending order by the ONU itself. It is strongly encouraged that the queue id be formulated to simplify finding related queues. One way to do this is to number the queues such that the related port attributes are in ascending order (for the downstream and upstream queues separately). The range of downstream queue ids is 0 to 0x7FFF and the range of upstream queue ids is 0x8000 to 0xFFFF. (R) (mandatory) (2 bytes)

Which means that in the downstream direction the range of Managed entity Id is 0x0000 to 0x7FFF, The ONU MUST support 8 Priority Queue ME in the downstream direction. The range of Managed entity id MUST not be between 0x0000 to 0x0007.

The ONU MUST have strict priority between queues in the downstream direction

GEM PORT NETWORK CTP

This managed Entity give the link between the GEMport and the priority queue. Here focus is done in the downstream direction.

The standard says :

Priority queue pointer for downstream: This attribute points to the instance of the priority queue used for this GEM port network CTP in the downstream direction. It is the responsibility of the OLT to provision the downstream pointer in a way that is consistent with the bridge and mapper connectivity. If the pointer is null, downstream queueing is determined by other mechanisms in the ONU. (R, W, Set-by-create) (mandatory) (2 bytes)

NOTE 2 – If the GEM port network CTP is associated with more than one UNI (downstream multicast), the downstream priority queue pointer defines a pattern (e.g., queue number 3 for a given UNI) to be replicated (i.e.,to queue number 3) at the other affected UNIs.

Mandatory

1. **If the priority queue pointer for downstream has the value 0x0000 that means that it's the ONU which decide how to perform the priority mechanisms. For Orange, the ONU MUST performs strict priority between Pbit, and pbit with the value 0 have the lowest priority and pbit with the value 7 the highest.**

2. **If the priority queue pointer for downstream has a known value that means that the ONU performed priority between priorities queues based on strict priority.**

3. **if the priority queue pointer for downstream have the value which is unknown by the ONU that means that it's the ONU which decide how to perform the priority mechanisms. For Orange Network, the ONU MUST performs strict priority between Pbit, and pbit with the value 0 have the lowest priority and pbit with the value 7 the highest.**