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Amendment 2

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SERIES G: TRANSMISSION SYSTEMS AND MEDIA, DIGITAL SYSTEMS AND NETWORKS

Digital sections and digital line system – Optical line systems for local and access networks

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ONT management and control interface specification for B-PON

Amendment 2

ITU-T Recommendation G.983.2 (2005) – Amendment 2

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ITU-T Recommendation G.983.2

ONT management and control interface specification for B-PON

Amendment 2

Summary

This amendment includes various enhancements to the OMCI, as defined in ITU-T Rec. G.983.2. The major topic areas include IGMP tests, equipment alarms, SIP alarms, power shedding alarms, VLAN tagging operation, VLAN filtering, and VDSL2 management. Additionally, various editorial corrections are included.

Source

Amendment 2 to ITU-T Recommendation G.983.2 (2005) was approved on 13 January 2007 by ITU-T Study Group 15 (2005-2008) under the ITU-T Recommendation A.8 procedure.

FOREWORD

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The World Telecommunication Standardization Assembly (WTSA), which meets every four years, establishes the topics for study by the ITU-T study groups which, in turn, produce Recommendations on these topics.

The approval of ITU-T Recommendations is covered by the procedure laid down in WTSA Resolution 1.

In some areas of information technology which fall within ITU-T's purview, the necessary standards are prepared on a collaborative basis with ISO and IEC.

NOTE

In this Recommendation, the expression "Administration" is used for conciseness to indicate both a telecommunication administration and a recognized operating agency.

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Introduction

The OMCI as defined in ITU-T Rec. G.983.2 continues to play an important role in PON systems, both G.983 and G.984 base systems. Various new services are being introduced on these systems, such as VDSL2 and the set introduced in G.983.2 Amendment 1 (03/2006). Many modifications and additions need to be made to support and improve these services, and this is the reason for this amendment.

ITU-T Recommendation G.983.2

ONT management and control interface specification for B-PON

Amendment 2

1) Modifications to existing clauses of G.983.2

1.1) Modify clause 2, References

Modify the following reference:

"ITU-T Recommendation G.997.1 (2006), *Physical layer management for digital subscriber line (DSL) transceivers*."

1.2) Modify clause 4, Abbreviations

a) Modify the following 2 items:

ADSL Asymmetric Digital Subscriber Line

NOTE 1 – The xDSL MEs include the G.992 family as well as G.993.2 VDSL2, but not G.993.1 VDSL.

VDSL Very High Speed DSL

NOTE 2 – G.993.2 VDSL2 is managed under the xDSL family of MEs.

b) Add the following items in alphabetic sequence:

SBC Set-by-Create

xTU-C xDSL transceiver unit at the central office end (in the case of PON, the ONT/ONU), used as a generic term referring to both the ATU-C of the G.992.x series of ITU-T Recommendations and the VTU-O of ITU-T Rec. G.993.2.

xTU-R xDSL transceiver unit at the remote end (subscriber premises), used as a generic term referring to both the ATU-R of the G.992.x series of ITU-T Recommendations and the VTU-R of ITU-T Rec. G.993.2.

1.3) Modify clause 5.2, Fault management

a) Replace item k) with the following:

k) Physical Path Termination Point xDSL UNI;

b) At the end of clause 5.2, add the following text:

To avoid erratic floods of alarm messages, it is common to filter, or soak, defects such as facility impairments before declaring them as alarms, and to soak defect clearing before retiring the alarm. The declaration soak time is typically 2.5 ± 0.5 seconds, while the retirement soak time is typically 10.5 ± 0.5 seconds. Which alarms are to be soaked, and what the soak intervals should be, are regarded as vendor-specific choices. Interoperability considerations, however, require that alarms be soaked at exactly one of the OLT or ONT, and this Recommendation specifies that they be soaked at the ONT.

1.4) Modify clause 5.3, Performance management

Replace items t) through x) with the following:

t) xDSL xTU-C Performance Monitoring History Data;

u) xDSL xTU-R Performance Monitoring History Data;

v) xDSL xTU-C Channel Performance Monitoring History Data;

w) xDSL xTU-R Channel Performance Monitoring History Data;

x) TC Adaptor Performance Monitoring History Data xDSL;

1.5) Modify clause 6.1, Managed entities

a) Replace the ADSL entries in Table 1 as shown. Reorder the table alphabetically:

Managed entity	Required/ Optional	Description	Defined in clause
xDSL xTU-C Channel Performance Monitoring History Data	O	Performance monitoring data for an xDSL xTU-C channel (formerly ADSL ATU-C Channel Performance Monitoring History Data)	7.3.79
xDSL xTU-C Performance Monitoring History Data	O	Performance monitoring data for an xDSL xTU-C modem path (formerly ADSL ATU-C Performance Monitoring History Data)	7.3.77
xDSL xTU-R Channel Performance Monitoring History Data	O	Performance monitoring data for an xDSL xTU-R channel (formerly ADSL ATU-R Channel Performance Monitoring History Data)	7.3.80
xDSL xTU-R Performance Monitoring History Data	O	Performance monitoring data for an xDSL xTU-R modem path (formerly ADSL ATU-R Performance Monitoring History Data)	7.3.78
xDSL Channel Configuration Profile	CR	Contains configuration for a channel (formerly ADSL Channel Configuration Profile)	7.3.72
xDSL Channel Downstream Status Data	CR	Contains status on the downstream channel (formerly ADSL Channel Downstream Status Data)	7.3.67
xDSL Channel Upstream Status Data	CR	Contains status on the upstream channel (formerly ADSL Channel Upstream Status Data)	7.3.68
xDSL PSD Mask Profile	CR	Contains PSD masking information (formerly ADSL Downstream PSD Mask Profile)	7.3.75
xDSL Downstream RFI Bands Profile	CR	Contains information on the downstream RFI bands (formerly ADSL Downstream RFI Bands Profile)	7.3.76
xDSL Line Configuration Profile Part 1	CR	Contains the line parameters for an xDSL line (formerly ADSL Line Configuration Profile Part 1)	7.3.69
xDSL Line Configuration Profile Part 2	CR	Contains the line parameters for an xDSL line (formerly ADSL Line Configuration Profile Part 2)	7.3.70
xDSL Line Configuration Profile Part 3	CR	Contains the line parameters for an xDSL line (formerly ADSL Line Configuration Profile Part 3)	7.3.71
xDSL Line Inventory and Status Data Part 1	CR	Contains the inventory and status information on the xDSL line (formerly ADSL Line Inventory and Status Data Part 1)	7.3.65

Managed entity	Required/ Optional	Description	Defined in clause
xDSL Line Inventory and Status Data Part 2	CR	Contains the inventory and status information on the xDSL line (formerly ADSL Line Inventory and Status Data Part 2)	7.3.66
xDSL Subcarrier Masking Downstream Profile	CR	Contains masking information for the downstream subcarriers (formerly ADSL Subcarrier Masking Downstream Profile)	7.3.73
xDSL Subcarrier Masking Upstream Profile	CR	Contains masking information for the upstream subcarriers (formerly ADSL Subcarrier Masking Upstream Profile)	7.3.74
Physical Path Termination Point xDSL UNI Part 1	CR	Used for the physical path termination point at an xDSL CO modem (formerly Physical Path Termination Point ADSL UNI Part 1)	7.3.63
Physical Path Termination Point xDSL UNI Part 2	CR	Used for the physical path termination point at an xDSL CO modem (formerly Physical Path Termination Point ADSL UNI Part 2)	7.3.64
TC Adaptor Performance Monitoring History Data xDSL	O	Performance monitoring data for the xDSL ATM data path (formerly TC Adaptor Performance Monitoring History Data ADSL)	7.3.81

b) Add the following new entries to Table 1 in alphabetic sequence:

VDSL2 line configuration extensions	CR	Contains xDSL attributes unique to VDSL2 (G.993.2)	7.3.122
xDSL line inventory and status data Part 3	CR	Contains additional test and status attributes for xDSL lines.	7.3.123
xDSL line inventory and status data Part 4	CR	Contains additional test and status attributes for xDSL lines.	7.3.124
VDSL2 line inventory and status data Part 1	CR	Contains additional test and status attributes for xDSL lines, specifically, extensions for VDSL2.	7.3.125
VDSL2 line inventory and status data Part 2	CR	Contains additional test and status attributes for xDSL lines, specifically, extensions for VDSL2.	7.3.126
VDSL2 line inventory and status data Part 3	CR	Contains additional test and status attributes for xDSL lines, specifically, extensions for VDSL2.	7.3.127
Extended VLAN Tagging Operation Configuration Data	CR	Contains configurations parameters for enhanced VLAN operations, including adding, removing, and changing multiple tags	7.3.128

1.6) Modify clause 6.2, Managed entity relation diagrams

Modify Figure 27 and its caption with references to xDSL instead of ADSL. Extend figure to show the new MEs defined in this amendment.

1.7) Modifications throughout clause 7

a) Ensure that all table attributes have the word 'table' *in their name, to indicate to the reader that the table access method should be used.*

b) Create a uniform treatment of the "Actions" section, locating all generally applicable text in one location, and making the actions section in each ME brief.

c) Ensure that all ME IDs for OLT created MEs are marked (R, Set-by-create).

d) *Ensure that all ME IDs for ONT created MEs are marked (R).*

e) *Ensure the proper use of* "dB" *for increments and relative measurements, and* "dBm" *and similar for absolute measurements.*

1.8) Modify clause 7.1.1, $ONT_{B\text{-}PON}$

Modify the following attributes to improve readability, as follows:

Total T-CONT buffer number: This attribute provides the total number of T-CONT buffers that are not associated with the PON interface. Upon autonomous instantiation, this attribute is set to zero.

(R) (mandatory if DBA supported) (1 byte)

Total Priority Queue number: This attribute provides the total number of priority queues that are not associated with the PON interface. Upon autonomous instantiation, this attribute is set to zero.

(R) (mandatory if DBA supported) (1 byte)

Total Traffic Scheduler number: This attribute provides the total number of Traffic Schedulers that are not associated with the PON interface. The ONT supports NULL function, HOL (Head Of the Line) scheduling and WRR (Weighted Round Robin) from the priority control and guarantee of minimum rate control points of view, respectively. If the ONT does not have any Traffic Scheduler, this attribute should be 0. Upon autonomous instantiation, this attribute is set to zero.

(R) (mandatory if DBA supported) (1 byte)

1.9) Modify clause 7.1.3, Cardholder

a) *Change Note 2 (already introduced in Amd.1) in the* "ME ID" *attribute to read as follows*:

"NOTE 2 – Some xDSL managed entities use the two most significant bits of the first byte (slot address) for other purposes. An ONT that supports these services may have slot limitations or restrictions."

b) *Replace the following lines of Table 3 with text as follows*:

Coding	Contents	Description
35	xDSL	xDSL IF
36	SHDSL	SHDSL IF
37	VDSL	VDSL IF (G.993.1)
41	xDSL/POTS	Combination xDSL and POTS interfaces
42	VDSL/POTS	Combination VDSL (G.993.1) and POTS interfaces

1.10) Modify clause 7.1.4, Circuit pack

a) *Revise the* "Alarm:" *subclause to read as follows*:

"This notification is used to notify the management system when a failure has been detected or cleared. Both ONT and OLT should know the alarm list used by this entity. The alarm list for this entity is given in Table 5b.

NOTE 3 – For ONTs with integrated interfaces on the UNI side, alarms are not applicable except perhaps for video support.

Use of alarms for video support is considered optional and is for future study. An ONT vendor may choose to indicate impending failure to the subscriber, for example via LED, such that a failing subscriber premises ONT could be replaced before it fails."

b) *Modify Table 5b, "***Alarms list for circuit pack**,*" to read as follows*:

Table 5b/G.983.2 – Alarms list for circuit pack

Number	Event	Description
0	EquipmentAlarm	A failure on an internal interface or failed self test
1	PoweringAlarm	LIM fuse failure or failure of LIM DC/DC converter
2	SelfTestFailure	Failure of circuit pack autonomous self test
3	Laser end of life	Failure of transmit laser imminent
4-223	Reserved	
224-239	Vendor specific alarms	Not to be standardized

1.11) Modify clause 7.1.10, Equipment extension package

a) *Change the* "Environmental sense" *and* "Contact closure" *attributes to*: (R, W).

b) *In the table* "Alarm list for equipment extension package", *add the following row at the top of the list of alarms*:

0	Reserved	

1.12) Modify clause 7.1.12, ONT power shedding

a) *Replace the ADSL lines of the introductory table as follows*:

Shedding Class	PPTP Type	Coding	Contents
Dsl	xDSL PPTP	35	xDSL
	Unspecified	36	SHDSL
	VDSL PPTP	37	G.993.1 VDSL
Voice (Dsl may also apply)	xDSL + POTS	41	xDSL/POTS
	VDSL + POTS	42	G.993.1 VDSL/POTS

b) *Add the following attribute to the list*:

Shedding Status:	Attribute provides Boolean indication of power shedding status for each shedding class. Two-byte field formatted ABCD EFGH IJKL MNOP, where: A = Data class B = Voice class C = Video overlay class D = Video return class E = DSL class F = ATM class G = CES class H = Frame class I = SONET class J through P = reserved and set to zero. The bit is set when shedding turns on, and cleared when power is restored. Upon autonomous instantiation, this attribute is set to 0x00. (R) (optional) (2 bytes)

c) Change the "Notifications" section to read:

Notifications

Attribute value change: This notification is used to report autonomous changes of attributes of this managed entity. The notification shall identify its new value. The AVC list is given in Table 5e.

Table 5e/G.983.2 – AVC list for ONT power shedding

Number	Attribute value change	Description
1-10	N/A	
11	Shedding status	State of the shedding function for all classes
12-16	Reserved	Reserved for AVCs of vendor-specific attributes

1.13) Modify clause 7.3.6, TC Adapter$_{B\text{-}PON}$

Modify Table 10b, "**Alarm list for TC Adapter$_{B\text{-}PON}$**"*, to read as follows*:

Table 10b/G.983.2 – Alarm list for TC Adapter$_{B\text{-}PON}$

Number	Alarm	Description
0	LCD	Loss of cell delineation, near end
1	NCD	No cell delineation, near end
2	LCD-FE	Loss of cell delineation, far end
3	NCD-FE	No cell delineation, far end
4-223	Reserved	
224-239	Vendor specific alarms	Not to be standardized

1.14) Modify clause 7.3.17, Threshold Data$_{B\text{-}PON}$

In the "Related Managed Entities" *subsection, replace the 5 list entries that refer to ADSL PM objects with their new xDSL names, as follows*:

- xDSL xTU-C Channel Performance Monitoring History Data;
- xDSL xTU-C Performance Monitoring History Data;
- xDSL xTU-R Channel Performance Monitoring History Data;
- xDSL xTU-R Performance Monitoring History Data;
- TC Adaptor Performance Monitoring History Data xDSL.

1.15) Modify clause 7.3.26, Physical path termination point POTS UNI

Add the following attribute description:

POTS holdover time: This attribute determines the time during which POTS loop voltage is held up when the ONT is not ranged on the PON. After the specified time elapses, the ONT drops POTS loop voltage, and may thereby cause premises intrusion alarm circuits to go active. When the ONT ranges successfully on the PON, it restores POTS loop voltage immediately and resets the timer to zero. The attribute is expressed in seconds. The default value 0 selects the vendor's factory policy.

(R, W) (optional) (2 bytes)

1.16) Modify clause 7.3.29, MAC bridge service profile

a) *In the* "*Relationships*" *section, replace* "Physical Path Termination Point Ethernet UNI managed entity" *with* "MAC bridge Port Configuration Data managed entity".

b) *In the* "**Managed entity ID**" *attribute, change* (R) *to* (R, SBC).

1.17) Modify clause 7.3.31, MAC bridge port configuration data

a) *Revise the following attribute descriptions to read as shown*:

TPType: This attribute identifies the type of the termination point associated with this MAC bridge port.

TPType	Managed entity type
1	Physical Path Termination Point Ethernet UNI
2	Interworking VCC Termination Point
3	802.1p mapper service profile
4	IP Host Config Data
5	Reserved for definition in G.984.4
6	Reserved for definition in G.984.4
7	Physical Path Termination Point xDSL UNI part 1
8	Physical Path Termination Point VDSL UNI
9	Reserved for definition in G.984.4

(R, Set-by-create) (mandatory) (1 byte)

TPPointer: This attribute points to the termination point associated with this MAC bridge port. The TPType attribute indicates the type of termination point, while TPPointer selects an instance of this type.

(R, Set-by-create) (mandatory) (2 bytes)

b) *Add the following two attributes at the end of the attribute list*:

Reserved 1: This attribute reserves space for an attribute used in G.984.4.

(R, W) (optional) (2 bytes)

Reserved 2: This attribute reserves space for an attribute used in G.984.4.

(R, W) (optional) (2 bytes)

1.17a) Modify clause 7.3.49, VLAN tagging operation configuration data

a) *Modify the "Relationships" section to read as follows*:

Zero or one instance of this managed entity may exist for an instance of a MAC bridge port, an 802.1p mapper service profile, an IP host, or any physical path termination point that supports Ethernet service; in short, any managed entity that can terminate or modify an Ethernet stream.

b) *Modify the description of the "***ME ID***" to read as follow*s:

Managed Entity id: This attribute provides a unique number for each instance of this managed entity. The assigned number is the same as the id of the managed entity with which this VLAN Tagging Operation Configuration Data instance is associated.

(R, Set-by-create) (mandatory) (2 bytes)

c) *Add the following additional attribute at the end of the list of attributes*:

Association type: This attribute identifies the type of ME that is associated with this VLAN tagging operation configuration data ME. Values are assigned in accordance with the following list.

(R, W, Set-by-create) (optional) (1 byte)

0 Physical path termination point Ethernet UNI (default)

1 IP host config data

2 802.1p mapper service profile

3 MAC bridge port configuration data

4 Physical path termination point xDSL UNI

5 GEM interworking termination point

6 Multicast GEM interworking termination point

7 Physical path termination point MoCA UNI

8 Physical path termination point 802.11 UNI

9 Ethernet flow termination point

1.18) Modify clause 7.3.50, VLAN tagging filter data

a) *Modify lettered list items a) and f) to read as follows*:

a) **Basic MAC bridge operation**: As shown in Figure 38, if the DA (Destination MAC Address) in the received frame is listed in the MAC Bridge Port Bridge Table Data for one or more ports, this frame is forwarded to the indicated ports. Otherwise, it is broadcast to all ports except the receiving port.

f) **Positive filtering by TCI**: If some or all of the fields in the TCI of the received frame are included in VLAN Tag Filter Data, it is forwarded according to action a) to the indicated ports as shown in Figure 39. Otherwise, its TCI is ignored and it is controlled by action a).

b) *Modify Figure 40 to correct the routing arrows*:

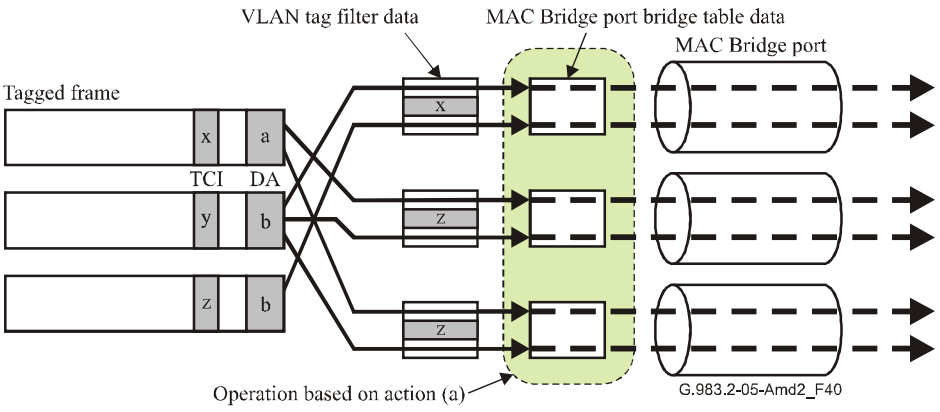

Figure 40/G.983.2 – Negative filtering by TCI operation

c) *Add the following item to the lettered list in the* "supplementary explanation" *subsection*:

"h) **Positive filtering by TCI and Dropping for no match**: If some or all of the fields in the TCI of the received frame are included in VLAN Tag Filter Data, it is forwarded according to action a) to the indicated ports as shown in Figure 40a. Otherwise, it is dropped.

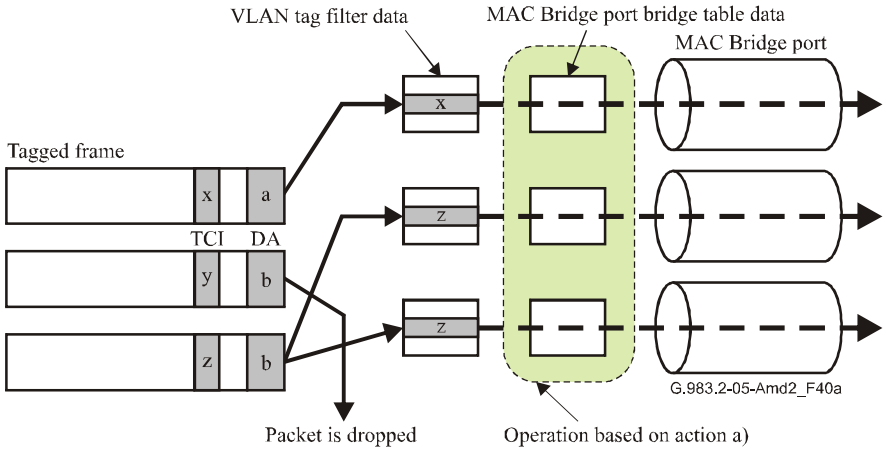

Figure 40a/G.983.2 – Positive filtering by TCI operation and Dropping for no match"

d) Add the following rows to the "Forwarding Operation" *table*:

0x0F	Action h) (VID investigation)	Action a)
0x10	Action h) (VID investigation)	Action e)
0x11	Action h) (user priority investigation)	Action a)
0x12	Action h) (user priority investigation)	Action e)
0x13	Action h) (TCI investigation)	Action a)
0x14	Action h) (TCI investigation)	Action e)

1.19) Modify clause 7.3.53, Physical path termination point video ANI

In the description of "Video Upper Optical Threshold", *change the* "–12 dB" *to* "–12 dBm", *and change* "0.1 dBm" *to* "0.1 dB".

1.20) Modify clauses 7.3.63 through 7.3.81 and clause 7.3.88

a) As well as the specific changes noted in the following amendment clauses, change ADSL *to* xDSL, *and change* ATU *to* xTU (usually -C or -R) *throughout the otherwise unaltered text and headings in these clauses. Finally, change the title of Table 21 from* "**ATU transmission system table**" *to* "**xTU transmission system enabling**".

b) In all clauses describing an ME whose name is changed, add a Note of the form similar to that given in clause 1.21, modifications to 7.3.63.

c) Ensure that all OLT created MEs have the "**Create**" *and* "**Delete**" *actions.*

d) Ensure that all ONU created MEs do not have "**Create**" *and* "**Delete**" *actions.*

1.21) Modify clause 7.3.63, Physical path termination point xDSL UNI part 1

a) Replace the first paragraph with the following two paragraphs:

"NOTE 1 – This managed entity was previously called Physical path termination point ADSL UNI part 1.

This managed entity represents the point in the ONU where physical paths terminate on an xDSL CO modem (xTU-C). The xDSL managed entity family is used for ADSL and VDSL2 services. (The existing VDSL family of managed entities remains valid for G.993.1 VDSL1.)"

b) Modify the description of the "**ADSL downstream PSD Mask Profile**" *attribute to read as follows*:

xDSL Downstream PSD Mask Profile: This attribute provides a pointer to an instance of the xDSL PSD mask profile managed entity that contains data necessary for initializing an xDSL modem. The default value 0, set when this ME is auto-created, indicates that this ME does not point to an xDSL PSD mask profile.

(R, W) (mandatory) (2 bytes)

c) Add the following attributes at the end of the present list (after ARCInterval):

Modem type: This attribute indicates the modem type. If the hardware cannot support the requested modem type, the ONT must deny the provisioning command. For backward compatibility, the attribute is optional, with a default of ATM.

0 – undefined

1 – ATM (default)

2 – PTM (Ethernet)

(R, W) (optional) (1 byte)

Upstream PSD mask profile: This attribute points to an instance of the xDSL PSD mask profile. The default value 0, set when this ME is auto-created, indicates that this ME does not point to an xDSL PSD mask profile.

(R, W) (optional) (2 bytes)

d) Amend Table 20 as follows:

Table 20/G.983.2 – Alarm list for physical path termination point xDSL UNI

...		
11	LINIT	Line initialization failure
~~11~~12-223	reserved	
...		

e) Add the following Note after the alarms table:

"NOTE 2 – The data rate upshift and downshift notifications are triggered by the individual channels. However, the alarms do not contain information about which channel shifted its rate. For further information, refer to the data rate threshold attribute descriptions in the xDSL channel configuration profile managed entity."

1.22) Modify clause 7.3.64, Physical path termination point xDSL UNI part 2

a) Replace the first paragraph with the following two paragraphs:

"NOTE – This managed entity was previously called Physical path termination point ADSL UNI part 2.

This managed entity represents the point in the ONU where physical paths terminate on an xDSL CO modem (xTU-C). Standards and chip sets support several forms of DSL, including VDSL2, and the xDSL managed entity family is used for all of them, with specific extensions for technology variations. (The existing VDSL family of managed entities remains valid for G.993.1 VDSL1.)"

b) Modify the description of the "**Managed entity ID**" *attribute to read*:

Managed Entity ID: This attribute acts as an implicit pointer. Its value is identical to that of its associated physical path termination point xDSL UNI part 1.

(R) (mandatory) (2 bytes)

1.23) Modify clause 7.3.65, xDSL line inventory and status data part 1

a) Revise the introductory paragraphs to read as follows:

"NOTE 1 – This managed entity was previously called ADSL line inventory and status data part 1.

This managed entity contains part 1 of the line inventory and status data for an xDSL line. An instance of this managed entity shall be automatically created/deleted by the ONU upon the creation/deletion of a Physical Path Termination Point xDSL UNI Part 1.

Relationships

An instance of this managed entity shall be contained in an instance of a Physical Path Termination Point xDSL UNI Part 1."

b) Amend the transmission system capability attribute descriptions as follows:

xTU-C Transmission System Capability: This attribute lists xTU-C transmission system capabilities. It is coded in a bit-map representation according to Table 21.

NOTE 2 – An additional byte identifying VDSL2 capabilities is defined in the VDSL2 line inventory and status data part 1 managed entity.

(R) (mandatory) (7 bytes)

xTU-R Transmission System Capability: This attribute lists xTU-R transmission system capabilities. It is coded in a bit-map representation according to Table 21.

NOTE 3 – An additional byte identifying VDSL2 capabilities is defined in the VDSL2 line inventory and status data part 2 managed entity.

(R) (mandatory) (7 bytes)

c) Append octet 8 to Table 21 as follows:

Octet 8	
57	G.993.2 region A (North America) (Annex A/G.993.2)
58	G.993.2 region B (Europe) (Annex B/G.993.2)
59	G.993.2 region C (Japan) (Annex C/G.993.2)
60	Reserved
61	Reserved
62	Reserved
63	Reserved
64	Reserved

1.24) Modify clause 7.3.66, xDSL line inventory and status data part 2

a) Revise the introductory paragraphs to read as follows:

"NOTE 1 – This managed entity was previously called ADSL line inventory and status data part 2.

This managed entity contains part 2 of the line inventory and status data for an xDSL line. An instance of this managed entity shall be automatically created/deleted by the ONU upon the creation/deletion of a Physical Path Termination Point xDSL UNI Part 1.

NOTE 2 – ITU-T Rec. G.997.1 (2006) specifies that bit rate attributes have granularity of 1000 bit/s. If G.997.1 compliance is required, the ONT should only report values with this granularity.

Relationships

An instance of this managed entity shall be contained in an instance of a Physical Path Termination Point xDSL UNI Part 1."

b) Amend the description of the following attributes to read:

xDSL Transmission System: This attribute defines the transmission system capabilities in use. It is coded in bitmap representation according to Table 21.

NOTE 3 – An additional byte identifying VDSL2 capabilities is defined in the VDSL2 line inventory and status data part 1 managed entity.

(R) (mandatory) (7 bytes)

Downstream Line Attenuation: The LATNds attribute is the measured difference in the total power transmitted by the xTU-C and the total power received by the xTU-R over all subcarriers during diagnostics mode and initialization. Downstream line attenuation ranges from 0 (0) to +127 (1270) dB in 0.1 dB steps. The special value 0xFFFF indicates the line attenuation is out of range to be represented.

NOTE 4 – VDSL2 (G.993.2) specifies a per-band array to represent this attribute. The array is defined in the VDSL2 line inventory and status data part 3 managed entity. In a G.993.2 context, the attribute should be set to 0 in this managed entity, and populated in the VDSL2 line inventory and status data part 3 ME instead.

(R) (mandatory) (2 bytes)

Upstream Line Attenuation: The LATNus attribute is the measured difference in dB in the total power transmitted by the xTU-R and the total power received by the xTU-C over all subcarriers during diagnostics mode and initialization. Upstream line attenuation ranges from 0 (0) to +127 (1270) dB in 0.1 dB steps. The special value 0xFFFF indicates the line attenuation is out of range to be represented.

NOTE 5 – VDSL2 (G.993.2) specifies a per-band array to represent this attribute. The array is defined in the VDSL2 line inventory and status data part 3 managed entity. In a G.993.2 context, the attribute should be set to 0 in this managed entity, and populated in the VDSL2 line inventory and status data part 3 ME instead.

(R) (mandatory) (2 bytes)

Downstream Signal Attenuation: The SATNds attribute is the measured difference in the total power transmitted by the xTU-C and the total power received by the xTU-R over all subcarriers during showtime. Downstream signal attenuation ranges from 0 (0) to +127 (1270) dB in 0.1 dB steps. The special value 0xFFFF indicates the signal attenuation is out of range to be represented.

NOTE 6 – VDSL2 (G.993.2) specifies a per-band array to represent this attribute. The array is defined in the VDSL2 line inventory and status data part 3 managed entity. In a G.993.2 context, the attribute should be set to 0 in this managed entity, and populated in the VDSL2 line inventory and status data part 3 ME instead.

(R) (mandatory) (2 bytes)

Upstream Signal Attenuation: The SATNus attribute is the measured difference in dB in the total power transmitted by the xTU-R and the total power received by the xTU-C over all subcarriers during showtime. Upstream signal attenuation ranges from 0 (0) to +127 (1270) dB in 0.1 dB steps. The special value 0xFFFF indicates the signal attenuation is out of range to be represented.

NOTE 7 – VDSL2 (G.993.2) specifies a per-band array to represent this attribute. The array is defined in the VDSL2 line inventory and status data part 3 managed entity. In a G.993.2 context, the attribute should be set to 0 in this managed entity, and populated in the VDSL2 line inventory and status data part 3 ME instead.

(R) (mandatory) (2 bytes)

Downstream Signal-to-Noise Ratio Margin: The downstream signal-to-noise ratio margin SNRMds is the maximum increase in dB of the noise power received at the xTU-R, such that the BER requirements are met for all downstream bearer channels. The downstream SNR margin ranges from –64 (0) dB to +63 (1270) dB in 0.1 dB steps. The special value 0xFFFF indicates the attribute is out of range to be represented.

(R) (mandatory) (2 bytes)

Upstream Signal-to-Noise Ratio Margin: The upstream signal-to-noise ratio margin SNRMus is the maximum increase in dB of the noise power received at the xTU-C, such that the BER requirements are met for all upstream bearer channels. Upstream SNR margin ranges from –64 (0) dB to +63 (1270) dB in 0.1 dB steps. The special value 0xFFFF indicates the attribute is out of range to be represented.

(R) (mandatory) (2 bytes)

Upstream Actual Power Spectrum Density: The ACTPSDus attribute is the average upstream transmit power spectrum density over the used subcarriers (subcarriers to which upstream user data are allocated) delivered by the xTU-R at the U-R reference point, at the instant of measurement. The power spectrum density level ranges from –90 (0) dBm/Hz to 0 (900) dBm/Hz in 0.1 dB steps. The special value 0xFFFF indicates the attribute is out of range to be represented.

(R) (mandatory) (2 bytes)

1.25) Modify clause 7.3.67, xDSL channel downstream status data

a) Revise the introductory paragraphs to read as follows:

"NOTE 1 – This managed entity was previously called ADSL channel downstream status data.

This managed entity contains the xDSL channel downstream status data for an xDSL line. One or more instances of this managed entity shall be automatically created/deleted by the ONU upon the creation/deletion of a Physical Path Termination Point xDSL UNI Part 1.

NOTE 2 – ITU-T Rec. G.997.1 (2006) specifies that bit rate attributes have granularity of 1000 bit/s. If G.997.1 compliance is required, the ONT should only report values with this granularity.

Relationships

One or more instances of this managed entity shall be contained in an instance of a Physical Path Termination Point xDSL UNI Part 1."

b) Amend the following attribute descriptions to read:

Managed Entity ID: This attribute provides a unique number for each instance of this managed entity. The two most significant bits of the first byte are the bearer channel ID. Excluding the first two bits of the first byte, the remaining part of the managed entity ID is identical to that of this ME's parent Physical Path Termination Point xDSL UNI part 1.

(R) (mandatory) (2 bytes)

Actual Interleaving Delay: This attribute is the actual one-way interleaving delay introduced by the PMS-TC between the alpha and beta reference points excluding delay in L1 and L2 state. In L1 and L2 state, the attribute contains the interleaving delay in the previous L0 state. For ADSL, this attribute is derived from the S and D attributes as cap(S × D)/4 ms, where S is the number of symbols per codeword, D is the interleaving depth and cap() denotes rounding to the next higher integer. For G.993.2, this attribute is computed according to the formula in 9.7/G.993.2. The actual interleaving delay is coded in ms (rounded to the nearest ms).

(R) (mandatory) (1 byte)

c) Add the following attributes:

Actual impulse noise protection: The ACTINP attribute reports the actual impulse noise protection (INP) on the bearer channel in the L0 state. In the L1 or L2 state, the attribute contains the INP in the previous L0 state.

For ADSL, this value is computed according to the formula specified in the relevant Recommendation based on the actual framing attributes. G.993.2 VDSL2 specifies no means to retrieve the impulse noise protection estimated by the far-end VTU receiver. Therefore, the far-end ACTINP is computed according to the INP_no_erasure formula.

The value of this attribute is a number of DMT symbols, with a granularity of 0.1 symbols. Its range is from 0 (coded as 0) to 25.4 (coded as 254). The special value 255 indicates an ACTINP higher than 25.4.

(R) (mandatory) (1 byte)

Actual size of Reed-Solomon codeword: The NFEC attribute reports the actual Reed-Solomon codeword size used in the latency path in which the bearer channel is transported. The value is coded in bytes. It ranges from 0 to 255.

(R) (mandatory for G.993.2 VDSL2) (1 byte)

Actual number of Reed-Solomon redundancy bytes: The RFEC attribute reports the actual number of Reed-Solomon redundancy bytes per codeword used in the latency path in which the bearer channel is transported. The value is coded in bytes. It ranges from 0 to 16. The value 0 indicates no Reed-Solomon coding.

(R) (mandatory for G.993.2 VDSL2) (1 byte)

Actual number of bits per symbol: The LSYMB attribute reports the actual number of bits per symbol assigned to the latency path in which the bearer channel is transported. This value does not include trellis overhead. The value is coded in bits. It ranges from 0 to 65535.

(R) (mandatory for G.993.2 VDSL2) (2 bytes)

Actual interleaving depth: The INTLVDEPTH attribute reports the actual depth of the interleaver used in the latency path in which the bearer channel is transported. The value ranges from 1 to 4096 in steps of 1. The value 1 indicates no interleaving.

(R) (mandatory for G.993.2 VDSL2) (2 bytes)

Actual interleaving block length: The INTLVBLOCK attribute reports the actual block length of the interleaver used in the latency path in which the bearer channel is transported. The value ranges from 4 to 255 in steps of 1.

(R) (mandatory for G.993.2 VDSL2) (1 byte)

Actual latency path: The LPATH attribute reports the index of the actual latency path in which the bearer channel is transported. Valid values are 0 and 1.

(R) (mandatory for G.993.2 VDSL2) (1 byte)

1.26) Modify clause 7.3.68, xDSL channel upstream status data

a) Revise the introductory paragraphs to read as follows:

"NOTE – This managed entity was previously called ADSL channel upstream status data.

This managed entity contains the xDSL channel upstream status data for an xDSL line. One or more instances of this managed entity shall be automatically created/deleted by the ONU upon the creation/deletion of a Physical Path Termination Point xDSL UNI Part 1.

Relationships

One or more instances of this managed entity shall be contained in an instance of a Physical Path Termination Point xDSL UNI Part 1.

b) Amend the following attribute descriptions to read:

Managed Entity ID: This attribute provides a unique number for each instance of this managed entity. The two most significant bits of the first byte are the bearer channel ID. Excluding the first two bits of the first byte, the remaining part of the managed entity ID is identical to that of this ME's parent Physical Path Termination Point xDSL UNI part 1.

(R) (mandatory) (2 bytes)

Actual Interleaving Delay: This attribute is the actual one-way interleaving delay introduced by the PMS-TC between the alpha and beta reference points excluding delay in L1 and L2 state. In L1 and L2 state, the attribute contains the interleaving delay in the previous L0 state. For ADSL, this attribute is derived from the S and D attributes as cap(S × D)/4 ms, where S is the number of symbols per codeword, D is the interleaving depth and cap() denotes rounding to the next higher integer. For G.993.2, this attribute is computed according to the formula in 9.7/G.993.2. The actual interleaving delay is coded in ms (rounded to the nearest ms).

(R) (mandatory) (1 byte)

c) Add the following attributes:

Actual impulse noise protection: The ACTINP attribute reports the actual impulse noise protection (INP) on the bearer channel in the L0 state. In the L1 or L2 state, the attribute contains the INP in the previous L0 state. For ADSL, this value is computed according to the formula specified in the relevant Recommendation based on the actual framing attributes. For G.993.2, the method to report this value is according to the INPREPORT attribute. The value is coded in fractions of DMT symbols with a granularity of 0.1 symbols. The range is from 0 (coded as 0) to 25.4 (coded as 254). The special value 255 indicates an ACTINP higher than 25.4.

(R) (mandatory) (1 byte)

Impulse noise protection reporting mode: The INPREPORT attribute reports the method used to compute the ACTINP. If set to 0, the ACTINP is computed according to the INP_no_erasure formula (clause 9.6/G.993.2). If set to 1, the ACTINP is the value estimated by the xTU receiver.

(R) (mandatory for G.993.2 VDSL2) (1 byte)

Actual size of Reed-Solomon codeword: The NFEC attribute reports the actual Reed-Solomon codeword size used in the latency path in which the bearer channel is transported. The value is coded in bytes. It ranges from 0 to 255.

(R) (mandatory for G.993.2 VDSL2) (1 byte)

Actual number of Reed-Solomon redundancy bytes: The RFEC attribute reports the actual number of Reed-Solomon redundancy bytes per codeword used in the latency path in which the bearer channel is transported. The value is coded in bytes. It ranges from 0 to 16. The value 0 indicates no Reed-Solomon coding.

(R) (mandatory for G.993.2 VDSL2) (1 byte)

Actual number of bits per symbol: The LSYMB attribute reports the actual number of bits per symbol assigned to the latency path in which the bearer channel is transported. This value does not include trellis overhead. The value is coded in bits. It ranges from 0 to 65535.

(R) (mandatory for G.993.2 VDSL2) (2 bytes)

Actual interleaving depth: The INTLVDEPTH attribute reports the actual depth of the interleaver used in the latency path in which the bearer channel is transported. The value ranges from 1 to 4096 in steps of 1. The value 1 indicates no interleaving.

(R) (mandatory for G.993.2 VDSL2) (2 bytes)

Actual interleaving block length: The INTLVBLOCK attribute reports the actual block length of the interleaver used in the latency path in which the bearer channel is transported. The value ranges from 4 to 255 in steps of 1.

(R) (mandatory for G.993.2 VDSL2) (1 byte)

Actual latency path: The LPATH attribute reports the index of the actual latency path in which the bearer channel is transported. Valid values are 0 and 1.

(R) (mandatory for G.993.2 VDSL2) (1 byte)

1.27) Modify clause 7.3.69, xDSL line configuration profile part 1

a) Modify the "Relationships" section to read as follows:

"An instance of this managed entity may be associated with zero or more instances of the Physical Path Termination Point xDSL UNI part 1. The overall xDSL line configuration profile is modelled in several parts, all of which are associated together through a common managed entity ID. (The client Physical Path Termination Point xDSL UNI part 1 has a single pointer, which refers to the entire set of line configuration profile parts.)"

b) Amend the following attribute descriptions to read:

Managed Entity ID: This attribute provides a unique number for each instance of this managed entity. All xDSL and VDSL2 line configuration profiles that pertain to a given physical path termination point xDSL must have the same managed entity ID. The value 0x00 is reserved.

(R, Set-by-create) (mandatory) (2 bytes)

xTU Transmission System Enabling: The xTSE configuration attribute defines the transmission system coding types to be allowed by the near-end xTU. It is coded in a bit-map representation according to Table 21.

NOTE 1 – An additional byte enabling VDSL2 capabilities is defined in the xDSL line configuration profile part 2 managed entity.

(R, W, Set-by-create) (mandatory) (7 bytes)

Minimum Overhead Rate Upstream: This attribute defines the minimum rate of the message-based overhead to be maintained by the xTU in the upstream direction. MSGMINus ranges from 4000 to 248 000 bit/s. This attribute is only valid for G.992.3, G.992.4, G.992.5 and G.993.2.

NOTE 2 – For compatibility with previous versions of G.983.2, values between 4 000 and 65 535 are interpreted as bits per second. To align with ITU-T Rec. G.997.1 (2006), values between 4 and 248 are interpreted as kilobits per second. For maximum flexibility, the ONT should support both conventions.

(R, W, Set-by-create) (optional) (2 bytes)

Minimum Overhead Rate Downstream: This attribute defines the minimum rate of the message-based overhead to be maintained by the xTU in the downstream direction. MSGMINds ranges from 4000 to 248 000 bit/s. This attribute is only valid for G.992.3, G.992.4, G.992.5 and G.993.2.

NOTE 3 – For compatibility with previous versions of G.983.2, values between 4 000 and 65 535 are interpreted as bits per second. To align with ITU-T Rec. G.997.1 (2006), values between 4 and 248 are interpreted as kilobits per second. For maximum flexibility, the ONT should support both conventions.

(R, W, Set-by-create) (optional) (2 bytes)

c) In the "**Upstream PSD Mask Selection**"*, change* "**ATSE**" *to* "**xTSE**".

1.28) Modify clause 7.3.70, xDSL line configuration profile part 2

a) Modify the "Relationships" section to read as follows:

An instance of this managed entity may be associated with zero or more instances of the Physical Path Termination Point xDSL UNI part 1. The overall xDSL line configuration profile is modelled in several parts, all of which are associated together through a common managed entity ID. (The client Physical Path Termination Point xDSL UNI part 1 has a single pointer, which refers to the entire set of line configuration profile parts.)

b) Amend the following attribute descriptions to read:

Managed Entity ID: This attribute provides a unique number for each instance of this managed entity. All xDSL and VDSL2 line configuration profiles that pertain to a given physical path termination point xDSL must have the same managed entity ID. The value 0x00 is reserved.

(R, Set-by-create) (mandatory) (2 bytes)

ATU Impedance State forced: This configuration parameter defines the impedance state to be forced on the near-end ATU. It applies only to the T/S-interface, and is deprecated in OMCI, which stands proxy for the Q interface. It is only valid for Annex A/G.992.3, Annex A/G.992.4 and Annex A/G.992.5. It is coded as an integer value with following definition:

1 Force the near-end ATU to the disabled state.

2 Force the near-end ATU to the inactive state.

3 Force the near-end ATU to the active state.

(R, W, Set-by-create) (optional) (1 byte)

Downstream Maximum Nominal Power Spectral Density: This attribute represents the maximum nominal transmit PSD in the downstream direction during initialization and showtime (in dBm/Hz). A single MAXNOMPSDds attribute is defined per mode enabled in the xTSE line configuration attribute. It is only valid for G.992.3, G.992.4 and G.992.5. It ranges from –60 (0) to –30 (300) dBm/Hz in 0.1 dB steps.

(R, W, Set-by-create) (mandatory) (2 bytes)

Upstream Maximum Nominal Power Spectral Density: This attribute represents the maximum nominal transmit PSD in the upstream direction during initialization and showtime (in dBm/Hz). A single MAXNOMPSDus attribute is defined per mode enabled in the xTSE line configuration attribute. It is only valid for G.992.3, G.992.4 and G.993.2. It ranges from –60 (0) to –30 (300) dBm/Hz in 0.1 dB steps.

(R, W, Set-by-create) (mandatory) (2 bytes)

Downstream Maximum Nominal Aggregate Transmit Power: This attribute represents the maximum nominal aggregate transmit power in the downstream direction during initialization and showtime (in dBm). It is only valid for G.992.3, G.992.4, G.992.5 and G.993.2. It ranges from 0 (0) to 25.5 (255) dBm in 0.1 dB steps.

(R, W, Set-by-create) (mandatory) (1 byte)

c) At the end, after "Upstream Maximum Aggregate Receive Power", *add the following attribute*:

VDSL2 transmission system enabling: This configuration attribute extends the transmission system coding types to be allowed by the xTU-C. It is coded in a bit-map representation as octet 8 (bits 57-64) of the eight octets defined in Table 21.

(R, W, Set-by-create) (optional) (1 byte)

1.29) Modify clause 7.3.71, xDSL line configuration profile part 3

a) Modify the "Relationships" section to read as follows:

"An instance of this managed entity may be associated with zero or more instances of the Physical Path Termination Point xDSL UNI part 1. The overall xDSL line configuration profile is modelled in several parts, all of which are associated together through a common managed entity ID. (The client Physical Path Termination Point xDSL UNI part 1 has a single pointer, which refers to the entire set of line configuration profile parts.)"

b) In the "Loop Diagnostics Mode Forced" *attribute, add* "G.993.2" *to the list of supported standards.*

c) Amend the following attribute descriptions to read:

Managed Entity ID: This attribute provides a unique number for each instance of this managed entity. All xDSL and VDSL2 line configuration profiles that pertain to a given physical path termination point xDSL must have the same managed entity ID. The value 0x00 is reserved.

(R, Set-by-create) (mandatory) (2 bytes)

Automode Cold Start Forced: This attribute is defined in order to improve testing of the performance of xTUs supporting automode when it is enabled in the MIB. Valid values are 0 and 1. A change in value of this attribute indicates a change in loop conditions applied to the devices under test. The xTUs reset any historical information used for automode, for shortening G.994.1 handshake, or for shortening the initialization procedure.

Automode is defined as the case where multiple operation modes are enabled in Table 21 and where the selection of the operation mode to be used for transmission does not only depend on the common capabilities of both xTUs (as exchanged in G.994.1), but depends also on achievable data rates under given loop conditions.

(R, W, Set-by-create) (mandatory if automode supported) (1 byte)

d) Add the following attributes:

Force INP downstream: When set to 1, this attribute forces the framer settings of all downstream bearer channels to be selected such that the impulse noise protection computed according to the formula specified in the relevant Recommendation is greater than or equal to the minimal impulse noise protection requirement.

The default value 0 disables this function.

(R, W) (mandatory for G.993.2) (1 byte)

Force INP upstream: When set to 1, this attribute forces the framer settings of all upstream bearer channels to be selected such that the impulse noise protection computed according to the formula specified in the relevant Recommendation is greater than or equal to the minimal impulse noise protection requirement.

The default value 0 disables this function.

(R, W) (mandatory for G.993.2) (1 byte)

1.30) Modify clause 7.3.72, xDSL channel configuration profile

a) Add the following Note to the introductory section:

"NOTE – If G.997.1 (2006) compatibility is required, bit rates should only be set to integer multiples of 1000 bit/s. The ONT may reject attempts to set other values for bit rate attributes."

b) Amend the following attribute descriptions to read:

Maximum interleaving delay: This attribute is the maximum one-way interleaving delay introduced by the PMS-TC between the alpha and the beta reference points, in the direction of the bearer channel. The one-way interleaving delay is defined in individual xDSL Recommendations as cap(S × D)/4 ms, where S is the S-factor, D is the interleaving depth, and cap() denotes rounding to the next higher integer.

xTUs choose the S and D values such that the actual one-way interleaving delay is less than or equal to the configured maximum interleaving delay. The delay is coded in ms, varying from 2 to 63, with special meaning assigned to values 0, 1 and 255. The value 0 indicates no delay bound is imposed. The value 1 indicates the fast latency path is to be used in the G.992.1 operating mode and S and D are to be selected such that S ≤ 1 and D = 1 in G.992.2, G.992.3, G.992.4, G.992.5 and G.993.2 operating modes. The value 255 indicates a delay bound of 1 ms in G.993.2 operation.

(R, Set-by-create) (mandatory) (1 byte)

Data rate threshold upshift: This attribute is a threshold on the net data rate upshift achieved over one or more bearer channel data rate adaptations. An upshift rate change alarm (event) is triggered when the actual data rate exceeds the data rate at the last entry into showtime by more than the threshold. The data rate threshold is coded in bit/s.

(R, Set-by-create) (mandatory for xDSL standards that use this attribute) (4 bytes)

Data rate threshold downshift: This attribute is a threshold on the net data rate downshift achieved over one or more bearer channel data rate adaptations. A downshift rate change alarm (event) is triggered when the actual data rate is below the data rate at the last entry into showtime by more than the threshold. The data rate threshold is coded in bit/s.

(R, Set-by-create) (mandatory for xDSL standards that use this attribute) (4 bytes)

Minimum reserved data rate: This attribute specifies the desired minimum reserved net data rate for the bearer channel. The rate is coded in bit/s. This attribute is optional. It is used only if the rate adaptation mode is set to dynamic in the xDSL line configuration profile part 1.

(R, Set-by-create) (optional) (4 bytes)

Minimum impulse noise protection: The INP_{min} attribute specifies the minimum impulse noise protection for the bearer channel if it is transported over DMT symbols with a subcarrier spacing of 4.3125 kHz. Impulse noise protection is expressed in DMT symbols with a subcarrier spacing of 4.3125 kHz. It can be ½ symbol or any integer number of symbols from 0 to 16, inclusive.

If the xTU does not support the configured INP_{min} value, it uses the nearest supported impulse noise protection value greater than INP_{min}.

Value	**INP_{min}**
1	0 symbols
2	½ symbol
3	1 symbol
4	2 symbols
N	(N – 2) symbols, 3 ≤ N ≤ 18

(R, Set-by-create) (mandatory for xDSL standards that use this attribute) (1 byte)

Maximum bit error ratio: This attribute specifies the desired maximum bit error ratio for the bearer channel. It is only valid for G.992.3, G.992.4 and G.992.5. The bit error ratio is specified via the following integer values:

$1 = 10^{-3}$

$2 = 10^{-5}$

$3 = 10^{-7}$

(R, Set-by-create) (mandatory for standards that use this attribute) (1 byte)

c) Add the following attribute:

Minimum impulse noise protection 8 kHz: The INP_{min8} attribute specifies the minimum impulse noise protection for the bearer channel if it is transported over DMT symbols with a subcarrier spacing of 8.625 kHz. It is only valid for G.993.2. Impulse noise protection is expressed in DMT symbols with a subcarrier spacing of 8.625 kHz. It can take any integer value from 0 (default) to 16 inclusive.

(R, W) (mandatory for G.993.2) (1 byte)

1.31) Modify clause 7.3.73, xDSL subcarrier masking downstream profile

No additional changes required.

1.32) Modify clause 7.3.74, xDSL subcarrier masking upstream profile

No additional changes required.

1.33) Modify clause 7.3.75, xDSL PSD mask profile

a) Add the following Note:

"NOTE 1 – This managed entity was previously known as ADSL downstream PSD mask profile. The name has been changed so that the same managed entity may be used for both upstream and downstream."

b) Keep the "ME ID" *description as is, but replace the other attribute descriptions with the following*:

PSD mask: This attribute is a table where each entry consists of an entry number field (1 byte, first entry numbered 1), subcarrier index field (2 bytes), and a PSD mask level field (1 byte).

The table defines the PSD mask applicable at the U-C2 reference point (downstream) or the U-R2 reference point (upstream). This mask may impose PSD restrictions in addition to the limit PSD mask defined in the relevant Recommendations (G.992.5, G.993.2).

The PSD mask is specified through a set of breakpoints. Each breakpoint comprises a 2-byte subcarrier index t, with a subcarrier spacing of 4.3125 kHz, and a 1-byte PSD mask level (expressed in dBm/Hz) at that subcarrier. The set of breakpoints can then be represented as [(t_1, PSD_1), (t_2, PSD_2), … , (t_N, PSD_N)]. The subcarrier index is coded as an unsigned integer. The PSD mask level is coded as an unsigned integer representing 0 (coded as 0) to –95 (coded as 190) dBm/Hz, in steps of 0.5 dB.

The maximum number of downstream breakpoints is 32. In the upstream direction, the maximum number of breakpoints is 4 for G.992.3 and 16 for G.993.2. The requirements for a valid set of breakpoints are defined in the relevant Recommendations (G.992.3, G.992.5, G.993.2).

NOTE 2 – In ITU-T Rec. G.997.1, this attribute is called PSDMASKds (downstream) and PSDMASKus (upstream). In G.993.2, this attribute is called MIBMASKds (downstream) and MIBMASKus (upstream). The G.993.2 MIBMASKus does not include breakpoints to shape US0.

By default, the PSD mask table is empty. Entries are added or modified using the set action, which permits from one to as many as seven breakpoints to be addressed in a single message. Setting a subcarrier entry with a non-zero PSD mask level implies insertion into the table or replacement of an existing entry. Setting an entry's PSD mask level to 0xFFFF implies deletion from the table, if present.

(R, W) (mandatory) (4N bytes where N is the number of breakpoints)

TableValid: This boolean attribute controls and reports the operational status of this PSD mask attribute.

As a status report, the value false (coded as 0), indicates that the PSD mask represented in this ME has not been impressed on the DSL equipment. The value true (coded as 1), indicates that the PSD mask represented in this ME has been impressed on the DSL equipment.

This attribute behaves as follows:

– If the OLT changes any of the PSD mask table entries or sets TableValid to false, then TableValid is set to false.

– If TableValid is false and OLT sets TableValid to true, then the ONU will impress the PSD mask data on the DSL equipment.

(R, W) (mandatory) (1 byte)

c) Replace the "Actions" section with the following:

Create: Create an instance of this managed entity.

Delete: Delete an instance of this managed entity.

Get: Get one or more attributes. Latch a snapshot of the current PSD mask and use four bytes to respond with the size of data that should be obtained using the "Get-next" command.

Get-next: Get the next latched attribute values of the managed entity within the current snapshot.

Set: Generally, this action is used to set one or more entire attribute values. When used on the PSD mask attribute, the Set action either adds, modifies or deletes table entries in the PSD mask table. A maximum of seven table entries can be added/modified/deleted by a single Set action.

1.34) Modify clause 7.3.76, xDSL downstream RFI bands profile

Replace the "**Downstream RFI Bands**" *attribute description with the following text*:

Downstream RFI Bands: The RFIBANDS attribute is a table where each entry consists of an entry number field (1 byte, first entry numbered 1), subcarrier index1 field (2 bytes), and subcarrier index2 field (2 bytes).

For G.992.5, this configuration attribute defines the subset of downstream PSD mask breakpoints, as specified in the downstream PSD mask, to be used to notch an RFI band. This subset consists of couples of consecutive subcarrier indices belonging to breakpoints: $[t_i; t_{i+1}]$, corresponding to the low level of the notch. The specific interpolation around these points is defined in the relevant Recommendations (e.g., G.992.5). The MIB defines the RFI notches using breakpoints in the downstream PSD mask as specified in the relevant Recommendations (e.g., G.992.5).

For G.993.2, this attribute defines the bands where the PSD is to be reduced as specified in 7.2.1.2/G.993.2. Each band is represented by start and stop subcarrier indices with a subcarrier spacing of 4.3125 kHz. Up to 16 bands may be specified. This attribute defines the RFI bands for both upstream and downstream directions.

Entries have default value 0 for both subcarrier index1 and subcarrier index2. Table entries for this attribute are added or modified using the Set action. Setting an entry with a non-zero subcarrier index1 and subcarrier index2 implies insertion into the table or replacement of an existing entry. Setting an entry's subcarrier index1 and subcarrier index2 to 0 implies deletion from the table, if present.

(R, W) (mandatory) (5N bytes where N is the number of RFI bands)

1.35) Modify clause 7.3.77, xDSL xTU-C performance monitoring history data

Amend the various attribute descriptions as follows:

Interval End Time: This attribute identifies the most recently finished 15-minute interval. It is a cyclic counter (modulo 256) that is incremented each time a new interval is finished and the attribute counters are updated. The value of this attribute is 0 during the first 15-minute interval that starts with the reception of the synchronize time action. The value is 1 during the first period after this, and so on. If this managed entity is created after the reception of the synchronize time action, the value of this attribute is set equal to the number of the last completed interval. The actual counters of this managed entity start counting directly.

(R) (mandatory) (1 byte)

Errored Seconds: This attribute is a count of 1-second intervals with one or more CRC-8 anomalies summed over all received bearer channels, or one or more LOS defects, or one or more SEF defects, or one or more LPR defects.

(R) (mandatory) (2 bytes)

Severely Errored Seconds: This attribute is a count of severely errored seconds (SES). An SES is declared if, during a 1-second interval, there are 18 or more CRC-8 anomalies in one or more of the received bearer channels, or one or more LOS defects, or one or more SEF defects, or one or more LPR defects.

If the relevant Recommendation (e.g., ITU-T Recs G.992.3, G.992.5, G.993.2) supports one-second normalized CRC-8 anomaly counter increment, the one-second counter used to declare SES increments with this value instead of one for each CRC-8 anomaly.

If a common CRC is applied over multiple bearer channels, then each related CRC-8 anomaly is counted only once for the whole set of bearer channels over which the CRC is applied.

(R) (mandatory) (2 bytes)

Line Initializations: This attribute is a count of the total number of full initializations attempted on the line (successful and failed) during the accumulation period.

(R) (mandatory) (2 bytes)

Failed Line Initializations: This performance attribute is a count of the total number of failed full initializations during the accumulation period. A failed full initialization occurs when showtime is not reached at the end of the full initialization procedure.

(R) (mandatory) (2 bytes)

Short Initializations: This attribute is a count of the total number of fast retrains or short initializations attempted on the line (successful and failed) during the accumulation period. Fast retrain is defined in ITU-T Rec. G.992.2. Short initialization is defined in ITU-T Recs G.992.3 and G.992.4.

(R) (optional) (2 bytes)

Failed Short Initializations: This performance attribute is a count of the total number of failed fast retrains or short initializations during the accumulation period, e.g., when:

- A CRC error is detected.
- A time-out occurs.
- A fast retrain profile is unknown.

(R) (optional) (2 bytes)

Unavailable Seconds: This attribute is a count of 1-second intervals for which the xDSL line is unavailable. The xDSL line becomes unavailable at the onset of 10 contiguous SES-Ls. The 10 SES-Ls are included in unavailable time. Once unavailable, the xDSL line becomes available at the onset of 10 contiguous seconds that are not severely errored. The 10 seconds with no SES-Ls are excluded from unavailable time. Some attribute counts are inhibited during unavailability – see 7.2.7.13/G.997.1.

(R) (mandatory) (2 bytes)

1.36) Modify clause 7.3.78, xDSL xTU-R performance monitoring history data

Amend the attribute descriptions as shown:

Interval End Time: This attribute identifies the most recently finished 15-minute interval. It is a cyclic counter (modulo 256) that is incremented each time a new interval is finished and the attribute counters are updated. The value of this attribute is 0 during the first 15-minute interval that starts with the reception of the synchronize time action. The value is 1 during the first period after this, and so on. If this managed entity is created after the reception of the synchronize time action, the value of this attribute is set equal to the number of the last completed interval. The actual counters of this managed entity start counting directly.

(R) (mandatory) (1 byte)

Errored Seconds: This attribute is a count of 1-second intervals with one or more FEBE anomalies summed over all transmitted bearer channels, or one or more LOS-FE defects, or one or more RDI defects, or one or more LPR-FE defects.

(R) (mandatory) (2 bytes)

Severely Errored Seconds: This attribute is a count of severely errored seconds (SES-LFE). An SES is declared if, during a 1-second interval, 18 or more FEBE anomalies are reported across one or more of the bearer channels, or there are one or more far-end LOS defects, or one or more RDI defects, or one or more LPR-FE defects.

If the relevant Recommendation (e.g., ITU-T Recs G.992.3, G.992.5 and G.993.2) supports a one-second normalized CRC-8 anomaly counter increment, the one-second counter used to declare SES increments with this value instead of one for each FEBE anomaly.

If a CRC is applied over multiple bearer channels, then each related FEBE anomaly is counted only once for the whole set of related bearer channels.

(R) (mandatory) (2 bytes)

Unavailable Seconds: This attribute is a count of 1-second intervals for which the far-end xDSL line is unavailable.

The far-end xDSL line becomes unavailable at the onset of 10 contiguous SES-LFEs. The 10 SES-LFEs are included in unavailable time. Once unavailable, the far-end xDSL line becomes available at the onset of 10 contiguous seconds with no SES-LFEs. The 10 seconds with no SES-LFEs are excluded from unavailable time. Some attribute counts are inhibited during unavailability – see 7.2.7.13/G.997.1.

(R) (mandatory) (2 bytes)

1.37) Modify clause 7.3.79, xDSL xTU-C channel performance monitoring history data

a) Amend the "Relationships" section to read:

"An instance of this managed entity may exist for each downstream bearer channel associated with a physical path termination point xDSL UNI part 1."

b) Amend the "**Managed Entity ID**" *description to read*:

Managed Entity ID: This attribute provides a unique number for each instance of this managed entity. The two most significant bits of the first byte are the bearer channel ID. Excluding the first two bits of the first byte, the remaining part of the managed entity ID is identical to that of this ME's parent Physical Path Termination Point xDSL UNI part 1.

(R) (mandatory) (2 bytes)

1.38) Modify clause 7.3.80, xDSL xTU-R channel performance monitoring history data

a) Amend the "Relationships" section to read:

"An instance of this managed entity may exist for each upstream bearer channel associated with a physical path termination point xDSL UNI part 1."

b) Amend the following attribute descriptions to read:

Managed Entity ID: This attribute provides a unique number for each instance of this managed entity. The two most significant bits of the first byte are the bearer channel ID. Excluding the first two bits of the first byte, the remaining part of the managed entity ID is identical to that of this ME's parent Physical Path Termination Point xDSL UNI part 1.

(R) (mandatory) (2 bytes)

Interval End Time: This attribute identifies the most recently finished 15-minute interval. It is a cyclic counter (modulo 256) that is incremented each time a new interval is finished and the attribute counters are updated. The value of this attribute is 0 during the first 15-minute interval that starts with the reception of the synchronize time action. The value is 1 during the first period after this, and so on. If this managed entity is created after the reception of the synchronize time action, the value of this attribute is set equal to the number of the last completed interval. The actual counters of this managed entity start counting directly.

(R) (mandatory) (1 byte)

Code Violations: This attribute is a count of FEBE anomalies reported in the downstream bearer channel. This attribute is subject to inhibiting during unavailable time.

If the CRC is applied over multiple bearer channels, then each related FEBE anomaly increments each of the counters related to the individual bearer channels.

(R) (mandatory) (2 bytes)

Forward Error Corrections: This attribute is a count of FFEC anomalies reported in the downstream bearer channel. This attribute is subject to inhibiting during unavailable time.

If FEC is applied over multiple bearer channels, then each related FFEC anomaly increments each of the counters related to the individual bearer channels.

(R) (mandatory) (2 bytes)

1.39) Modify clause 7.3.81, TC adaptor performance monitoring history data xDSL

Revise the "**Managed Entity ID**" *description to read*:

Managed Entity ID: This attribute acts as an implicit pointer. Its value is identical to that of the physical path termination point xDSL UNI part 1 with which it is associated.

(R) (mandatory) (2 bytes)

1.40) Modify clause 7.3.82, Physical path termination point VDSL UNI

Add the following Note to the end of the introductory section:

"NOTE – The VDSL series of managed entities pertains to G.993.1 service only. VDSL2 service, as defined in ITU-T Rec. G.993.2, is accommodated by the xDSL series of managed entities."

1.41) Modify clause 7.3.88, VDSL band plan configuration profile

Amend the following attribute description to read:

Applicable Standard: The VDSL standard to be used for the line:

1 – ANSI standard

2 – ETSI standard

3 – ITU Rec. G.993.1

4 – a standard other than the above.

(R, W, Set-by-Create) (mandatory) (1 byte)

1.42) *Left blank on purpose*.

1.43) Modify clause 7.3.94, Video return path statistics

a) *Remove the* "(mandatory)" *from the* "Rx Current Power" *attribute*.

b) *Add the* "**Create**" *and* "**Delete**" *actions, as this is an OLT created object.*

1.44) Modify clause 7.3.95, 802.1p mapper service profile

a) *Rename the attribute* "**PPTP UNI Pointer**" *to be* "**TP Pointer**".

b) *In the description of the* "**TP Pointer**" *attribute, in the first sentence, replace* "PPTP UNI or IP Host Service" *with* "Termination point"; *and add the following sentence at the end:* "If TPType is set to 0x03, this attribute contains the ME ID of the Ethernet Flow TP ME."

c) *In the description of the* "**TPType**" *attribute, modify the last sentence to read:* "The value is set to 0x03 if the mapper is directly associated with an Ethernet Flow termination point."

d) *Add the following Note at the end of the "Attributes" section*:

"NOTE – Interworking TP pointers that are set to NULL (0xFFFF) imply that the correspondingly tagged frames should be discarded."

1.45) Modify clause 7.3.98, IP host config data

Add the following Action to the ME:

"**Test**: Invoke an ICMP message from this IP host. The test message can be configured to generate a ping or traceroute.

Appendix II defines the test, test response and test result messages. No change is required to the test response message."

1.46) Modify clause 7.3.103, SIP agent config data

a) Add the footnote reference "(Note)" to the last three alarms from the alarm table (items 4, 5, and 6).

b) Add the text immediately after the alarms table:

"NOTE – These alarms are deprecated, and retained for backward compatibility. It is recommended that the SIP agent config data NOT declare these alarms, but that they be declared by the SIP user data ME instead. In any event, only one ME should declare the alarm, not both."

1.47) Modify clause 7.3.106, SIP user data

Change the "Notifications" subsection of this ME to read as follows:

Notifications

Alarm: This notification is used to notify the management system when an alarm has been detected or cleared per line. The OLT should know the alarm list used by this entity. The alarm list for this entity is given in Table 36ja.

Table 36ja/G.983.2 – Alarm list for SIP user data

Number	Alarm	Description
0	SIPUA-REGISTER-AUTH	Cannot authenticate registration session (e.g., missing credentials)
1	SIPUA-REGISTER-TIMEOUT	Timeout waiting for response from registration server
2	SIPUA-REGISTER-FAIL	Failure response received from registration server
3-223	Reserved	
224-239	Vendor specific alarms	Not to be standardized

1.48) Modify clause 9.1.6, Message identifier

a) Change the following entries of Table 47 as shown:

Table 47/G.983.2 – Managed entity identifiers

Managed entity class value	Managed entity
98	Physical Path Termination Point xDSL UNI Part 1
99	Physical Path Termination Point xDSL UNI Part 2
100	xDSL Line Inventory and Status Data Part 1
101	xDSL Line Inventory and Status Data Part 2
102	xDSL Channel Downstream Status Data
103	xDSL Channel Upstream Status Data

Table 47/G.983.2 – Managed entity identifiers

Managed entity class value	Managed entity
104	xDSL Line Configuration Profile Part 1
105	xDSL Line Configuration Profile Part 2
106	xDSL Line Configuration Profile Part 3
107	xDSL Channel Configuration Profile
108	xDSL Subcarrier Masking Downstream Profile
109	xDSL Subcarrier Masking Upstream Profile
110	xDSL PSD Mask Profile
111	xDSL Downstream RFI Bands Profile
112	xDSL xTU-C Performance Monitoring History Data
113	xDSL xTU-R Performance Monitoring History Data
114	xDSL xTU-C Channel Performance Monitoring History Data
115	xDSL xTU-R Channel Performance Monitoring History Data
116	TC Adaptor Performance Monitoring History Data xDSL
172..239	Reserved for Future Standardization

b) Add the following entries to Table 47:

Managed entity class value	Managed entity
165	VDSL2 line configuration extensions
166	xDSL line inventory and status data part 3
167	xDSL line inventory and status data part 4
168	VDSL2 line inventory and status data part 1
169	VDSL2 line inventory and status data part 2
170	VDSL2 line inventory and status data part 3
171	Extended VLAN Tagging Operation Configuration Data

1.49) Modify clause I.1.2, MIB audit and resynchronization

Add the following paragraph to the end of the clause:

"It should be noted that certain MEs and attributes are not to be included in the MIB audit. This is for reasons of efficiency and protocol simplification. In particular, instances of all performance management MEs and the Managed Entity ME and the Attribute ME should not be included in the MIB audit. All Table attributes should not be included in the MIB audit, even though their parent ME is included. If the OLT requires this information, it will obtain it by directly reading it."

1.50) Modify clause I.1.6, Create an instance of a managed entity with an attribute that is larger than the OMCI message contents field

Delete this clause in its entirety, but leave an "intentionally left blank" *to preserve numbering.*

1.51) Modify clause I.1.8, Alarm reporting control

Add the following text to the end of the clause:

"Note that ARC suppresses the reporting of the alarms, and not the alarm conditions themselves. Therefore, if an alarm condition develops during an ARC interval, then the ONU should maintain the internal indication of the alarm, and if the OLT gets all the alarms, it should be reported."

1.52) Modify clause II.2.26, Attribute value change

Add the following Note at the end of the clause:

"NOTE – For table attributes, the AVC message will contain no attribute value, and a snapshot of the table will not be created. If the OLT wishes to obtain the new value, it will then do a 'get' operation, followed by the required number of 'get next' operations."

1.53) Modify clause II.2.1, Create

Change the "Comments" *text for byte 13 so that the corrected row reads as follows*:

Message contents	13								attribute value of first Set-by-create attribute, NOT the ME ID (size depending on the type of attribute)

1.54) Modify clause II.2.15, Get all alarms

Replace the last row of the message format with the following two rows:

Message contents	13	0	0	0	0	0	0	0	x	x = alarm retrieval mode 0 = Get all alarms regardless of ARC status 1 = Get all alarms not currently under ARC
	14-45	0	0	0	0	0	0	0	0	padding

1.55) Modify clause II.2.27, Test

a) Change the first occurrence of the word "two" *to* "three".

b) Add the following material to the end of the clause:

Format for IP host config data entity class

Field	Byte	8	7	6	5	4	3	2	1	Comments
Transaction identifier	6-7									
Message type	8	0	1	0						DB = 0, AR = 1, AK = 0 Bits 5-1: action = test
Device identifier type	9	0	0	0	0	1	0	1	0	OMCI = 0x0A
Message identifier	10									Entity class NOTE – This format applies to entity class IP host config data.
	11									MSB entity instance
	12									LSB entity instance

Field	Byte	8	7	6	5	4	3	2	1	Comments
	13	0	0	0	0	x	x	x	x	xxxx = select test 0001 – Ping 0010 – Traceroute 0010..0111 – Reserved 1000..1111 – Vendor specific use. The ICMP message is intended to be from the ONT upstream toward the network. See discussion related to the test result message.
	14-17									IP address of target
	18-45	0	0	0	0	0	0	0	0	Padding

1.56) Modify clause II.2.45, Test result

a) Change the second paragraph to read as follows:

Four formats are currently defined.

- The first reports the result of a self test (any ME that supports self test).
- The second reports the results of vendor specific tests using a generic structure.
- The third reports the results of a dial tone draw-break test (PPTP POTS UNI) or an MLT test (PPTP POTS UNI or PPTP ISDN UNI).
- The fourth reports the result of a ping or traceroute test initiated at the ONT (IP host config data ME).

If a new test for the presently supported entities is defined in the future, the corresponding test results can be reported by extending the test result message layout. If a new test for other managed entity classes is defined in the future, a new test result message layout may be defined.

b) Add the following material to the end of the clause:

Format for test action invoked against IP host config data entity class

Field	Byte	8	7	6	5	4	3	2	1	Comments
Transaction identifier	6-7									
Message type	8	0	0	0						DB = 0, AR = 0, AK =0 bits 5-1: action = test result
Device identifier type	9	0	0	0	0	1	0	1	0	OMCI = 0x0A
Message identifier	10									Entity class NOTE – This format applies to entity class IP host config data.
	11									MSB entity instance
	12									LSB entity instance

Field	Byte	8	7	6	5	4	3	2	1	Comments
Message contents	13	0	0	0	0	0	x	x	x	Test result: xxx = 000: timed out, no response xxx = 001: ICMP echo responses attached xxx = 010: ICMP time exceeded responses attached xxx = 011: Unexpected ICMP response xxx = 100-111: Reserved
	14	0	0	0	y	y	y	y	y	yyyyy: number of meaningful bytes in the remainder of the test result message

If xxx = 001 (echo response – ping), the remainder of the message contains the following content. How many echo requests are sent and the resolution of the delay measurement are specific to a vendor's implementation. The special value 0xFFFF indicates a lost response.

	15-16									16-bit measurement of response delay 1, expressed in ms.
	17-18									16-bit measurement of response delay 2, expressed in ms.
	…									Etc.
	…-45	0	0	0	0	0	0	0	0	Padding

If xxx = 010 (time exceeded – traceroute), the remainder of the message contains the following content. In PON applications, it is not expected that a route trace will exceed the available space in the message, but if it does, the more distant responses should be dropped.

	15-18									IP address of nearest neighbour
	19-22									IP address of second nearest neighbour
	…									Etc.
	…-45	0	0	0	0	0	0	0	0	Padding

If xxx = 011 (unexpected ICMP response), the remainder of the message contains the following content:

	15									Type
	16									Code
	17-18									Checksum
	19-22									Bytes 4-8 of ICMP message (meaning depends on type/code)
	23-45									Internet header + 64 bits of original datagram (truncated)

2) Addition of new clauses to G.983.2

2.1) Add the following clauses to the end of clause 7.3

Add the following clauses to define new managed entities for VDSL2 service.

7.3.122 VDSL2 line configuration extensions

This managed entity extends the xDSL line configuration MEs with attributes that are unique to VDSL2, as defined in ITU-T Rec. G.993.2. The attributes of this ME are further defined in ITU-T Rec. G.997.1. An instance of this managed entity is created/deleted on request of the OLT.

Relationships

An instance of this managed entity may be associated with zero or more instances of the Physical Path Termination Point xDSL UNI part 1. The overall xDSL line configuration profile is modelled in several parts, all of which are associated together through a common managed entity ID. (The client Physical Path Termination Point xDSL UNI part 1 has a single pointer, which refers to the entire set of line configuration parts.)

Attributes

Managed entity ID: This attribute provides a unique number for each instance of this managed entity. All xDSL and VDSL2 line configuration profiles that pertain to a given physical path termination point xDSL must have the same managed entity ID. The value 0x00 is reserved.

(R, Set-by-create) (mandatory) (2 bytes)

VDSL2 profiles enabling: This attribute (PROFILES) contains the G.993.2 profiles to be allowed by the xTU-C. It is coded in a bit map representation (0 if not allowed, 1 if allowed) with the following definition:

Bit	Representation
Octet 1	
1	G.993.2 Profile 8a.
2	G.993.2 Profile 8b.
3	G.993.2 Profile 8c.
4	G.993.2 Profile 8d.
5	G.993.2 Profile 12a.
6	G.993.2 Profile 12b.
7	G.993.2 Profile 17a.
8	G.993.2 Profile 30a.

(R, Set-by-create) (mandatory) (1 byte)

VDSL2 PSD mask class selection (CLASSMASK): To reduce the number of configuration possibilities, the limit PSD masks are grouped in the following PSD mask classes:

– Class 998 Annex A: D-32, D-64.
– Class 997-M1c Annex B: 997-M1c-A-7.
– Class 997-M1x Annex B: 997-M1x-M-8, 997-M1x-M.
– Class 997-M2x Annex B: 997-M2x-M-8, 997-M2x-A, 997-M2x-M.
– Class 998-M1x Annex B: 998-M1x-A, 998-M1x-B, 998-M1x-NUS0.
– Class 998-M2x Annex B: 998-M2x-A, 998-M2x-M, 998-M2x-B, 998-M2x-NUS0.

– Class 998 Annex C: POTS (C.2.1.1/G.993.2), TCM-ISDN (C.2.1.2/G.993.2).

Each class is designed such that the PSD levels of each limit PSD mask of a specific class are equal in their respective passbands above 276 kHz.

The CLASSMASK attribute is defined per annex enabled in the xTSE (see the xDSL line configuration profile 1 managed entity and the xTSE extension for G.993.2 in the xDSL line configuration profile 2 managed entity). It selects a single PSD mask class per annex that is activated at the VTU-O. The coding is as follows:

Attribute value	Annex A/G.993.2	Annex B/G.993.2	Annex C/G.993.2
1	998	997-M1c	998
2		997-M1x	
3		997-M2x	
4		998-M1x	
5		998-M2x	
NOTE – A single PSD mask class may be selected per G.993.2 Annex.			

(R, Set-by-create) (mandatory) (1 byte)

VDSL2 limit PSD masks: The LIMITMASK attribute contains the G.993.2 limit PSD masks of the selected PSD mask class, enabled by the near-end xTU for each class of profiles. One LIMITMASK parameter is defined per annex enabled in the xTSE.

The profiles are grouped in the following profile classes:

– Class 8: Profiles 8a, 8b, 8c, 8d

– Class 12: Profiles 12a, 12b

– Class 17: Profile 17a

– Class 30: Profile 30a

For each profile class, several limit PSD masks of the selected PSD mask class (CLASSMASK) may be enabled. The enabling attribute is coded in a bit map representation (0 if the associated mask is not allowed, 1 if it is allowed).

The attribute is defined in Table 36o.

(R, Set-by-create) (mandatory) (8 bytes)

VDSL2 US0 disabling: The US0DISABLE attribute indicates whether channel US0 is disabled for each limit PSD mask enabled in the LIMITMASK attribute.

For each limit PSD mask enabled in the LIMITMASK attribute, one bit indicates if US0 is disabled. The disabling attribute is coded as a bit map. The bit is set to 1 if US0 is disabled for the associated limit mask. The bit map has the same structure as the LIMITMASK attribute.

(R, Set-by-create) (mandatory) (8 bytes)

VDSL2 US0 PSD masks: The US0MASK attribute contains the US0 PSD masks to be allowed by the near-end xTU. This attribute is only defined for Annex A/G.993.2. It is represented as a bitmap (0 if not allowed and 1 if allowed) with the definitions of Table 36p.

(R, Set-by-create) (mandatory) (4 bytes)

VDSL2-CARMASK: This attribute defines restrictions, additional to the band plan, to determine the set of subcarriers allowed for transmission in both upstream and downstream directions.

The VDSL2-CARMASK describes the not masked subcarriers as one or more frequency bands. Each band is represented by start and stop subcarrier indices with a subcarrier spacing of 4.3125 kHz. The valid range of subcarrier indices specifying the VDSL2-CARMASK is from 0 to at least the index of the highest allowed subcarrier in both transmission directions among all profiles enabled by the VDSL2 profiles enabling (PROFILES) attribute. Up to 32 bands may be specified. Other subcarriers shall be masked.

For profiles using 8.625 kHz tone spacing, the odd subcarrier indices $i_{4.3125}$ in VDSL2-CARMASK can be transformed into actual subcarrier indices $i_{8.625}$ using the following rule:

– for the start frequency of each band: $i_{8.625} = (i_{4.3125} + 1)/2$

– for the stop frequency of each band: $i_{8.625} = (i_{4.3125} - 1)/2$.

The VDSL2-CARMASK attribute is represented as a table where each entry comprises an entry number field (1 byte, first entry numbered 1), subcarrier index field 1 (2 bytes), and subcarrier index field 2 (2 bytes). The maximum number of breakpoints is 32, so the maximum size of the table is 160 bytes.

By default, the table is empty. Entries are added or modified using the set action, which permits from one to as many as six breakpoints to be addressed in a single message. Setting a table entry with non-zero subcarrier references implies insertion into the table. Setting an entry's subcarrier references to zero implies deletion from the table, if present.

(R, W) (mandatory) (5N bytes, where N is the number of bands)

CARMASK valid: This attribute controls and reports the status of the VDSL2-CARMASK table. If CARMASK valid = 1, then the VDSL2-CARMASK has been effectuated on the xDSL equipment. If CARMASK valid = 0 (default), then the VDSL2-CARMASK table is under construction and has not been effectuated on the xDSL equipment.

This attribute behaves as follows:

– If the OLT changes any of the VDSL2-CARMASK table entries or sets CARMASK valid = 0, then CARMASK valid = 0.

– If CARMASK valid = 0 and the OLT sets CARMASK valid = 1, then the ONT updates the xDSL equipment with the content of the table.

(R, W) (mandatory) (1 byte)

UPBOSHAPED: Upstream power back-off (UPBO) is specified in ITU-T Rec. G.993.2 to provide spectral compatibility between loops of different lengths deployed in the same binder. The upstream transmit PSD mask, UPBOMASKus is defined in 7.2.1.3.2/G.993.2 using the formula:

$$UPBOMASK(kl_0, f) = UPBOPSD(f) + LOSS(kl_0, f) + 3.5 \quad \text{[dBm/Hz]}$$

where:

$$LOSS(kl_0, f) = kl_0\sqrt{f} \quad \text{[dB]}$$

$$UPBOPSD(f) = -a - b\sqrt{f}$$

The UPBO configuration attributes a and b are set by the NMS. The attribute kl_0 may be determined during initialization by the VTUs or also set by the NMS.

Further detail appears in ITU-T Rec. G.997.1. The attribute includes two parameters for each band. The parameters are a and b, in that order. Parameter a is coded as an unsigned 16-bit number from 40 dBm/Hz (coded as 4000) to 80.95 dBm/Hz (coded as 8095) in steps of 0.01 dB. Parameter b is coded as an unsigned 16-bit number from 0 (coded as 0) to 40.95 dBm/Hz (coded as 4095) in steps of 0.01 dB. The special values a = b = 0 disable UPBO in the respective upstream band.

The upstream electrical length parameter UPBOKL defines the electrical length expressed in dB at 1 MHz, kl_0, that may be configured by the NMS. The value ranges from 0 to 128 dB in steps of 0.1 dB.

The force electrical length parameter UPBOKLF is a flag that forces the VTU-R to use the electrical length from the MIB (UPBOKL) to compute UPBO. The value is forced if the flag is set to 1. Otherwise, the VTUs determine the electrical length themselves.

Upstream band 1	a	2 bytes
	b	2 bytes
Upstream band 2	a	2 bytes
	b	2 bytes
Upstream band 3	a	2 bytes
	b	2 bytes
Upstream band 4	a	2 bytes
	b	2 bytes
Upstream band 5	a	2 bytes
	b	2 bytes
UPBOKL		2 bytes
UPBOKLF		1 byte

(R, W) (mandatory) (23 bytes)

Cyclic extension: The CEFLAG attribute enables the use of the optional cyclic extension values. If it is set to 1, the optional cyclic extension values may be used. Otherwise, the cyclic extension is forced to the mandatory length (5N/32).

(R, W) (mandatory) (1 byte)

Downstream SNR mode: The SNRMODEds attribute enables transmitter referred virtual noise in the downstream direction. If set to 1, virtual noise is disabled. If set to 2, virtual noise is enabled.

(R, W) (mandatory) (1 byte)

Upstream SNR mode: The SNRMODEus attribute enables transmitter referred virtual noise in the upstream direction. If set to 1, virtual noise is disabled. If set to 2, virtual noise is enabled.

(R, W) (mandatory) (1 byte)

Transmitter referred virtual noise downstream: The TXREFVNds attribute defines the downstream transmitter referred virtual noise. TXREFVNds is specified through a set of breakpoints. Each breakpoint comprises a 2-byte subcarrier index t, with a subcarrier spacing of 4.3125 kHz, and a noise PSD level (expressed in dBm/Hz) at that subcarrier. The set of breakpoints can then be represented as $[(t_1, PSD_1), (t_2, PSD_2), \ldots, (t_N, PSD_N)]$. The subcarrier index is coded as an unsigned two-byte integer. The noise level is coded as an 8-bit unsigned integer representing the noise level –40 dBm/Hz (coded as 0) to –140 dBm/Hz (coded as 200), in steps of 0.5 dB. Values between 201 and 254 indicate a noise PSD level of 0 W/Hz. The maximum number of breakpoints is 32.

Table entries for this attribute have default value 254 for the noise PSD level. Entries are added or modified using the Set action. Setting an entry to a noise PSD level less than or equal to 254 implies insertion into the table. Setting an entry's noise PSD level to 255 implies deletion from the table, if present.

(R, W) (optional) (3N bytes, where N is the number of breakpoints)

Transmitter referred virtual noise upstream: The TXREFVNus attribute defines the upstream transmitter referred virtual noise. TXREFVNus is specified through a set of breakpoints. Each breakpoint comprises a 2-byte subcarrier index t, with a subcarrier spacing of 4.3125 kHz, and a noise PSD level (expressed in dBm/Hz) at that subcarrier. The set of breakpoints can then be represented as $[(t_1, PSD_1), (t_2, PSD_2), \ldots, (t_N, PSD_N)]$. The subcarrier index is coded as an unsigned two-byte integer. The noise level is coded as an 8-bit unsigned integer representing the noise level –40 dBm/Hz (coded as 0) to –140 dBm/Hz (coded as 200), in steps of 0.5 dB. Values between 201 and 254 indicate a noise PSD level of 0 W/Hz. The maximum number of breakpoints is 16.

Table entries for this attribute have default value 254 for the noise PSD level. Entries are added or modified using the Set action. Setting an entry to a noise PSD level less than or equal to 254 implies insertion into the table. Setting an entry's noise PSD level to 255 implies deletion from the table, if present.

(R, W) (optional) (3N bytes, where N is the number of breakpoints)

DPBOSHAPED: Downstream power back-off – shaped is described in ITU-T Rec. G.997.1 as a vector of parameters that modifies the downstream PSD mask.

DPBOEPSD – assumed exchange PSD mask. This component is a pointer to an xDSL downsteam PSD mask profile managed entity. It should contain not more than 16 break points. (2 bytes)

DPBOESEL – E-side electrical length. This component is the assumed loss at some reference frequency of the electrical cable from the xDSL equipment to a possible flexibility point. It ranges from 0 (coded as 0) to 255.5 dB (coded as 511) in steps of 0.5 dB. The value 0 has the special meaning that it disables the DPBOSHAPED feature. (2 bytes)

The following three parameters describe the cable model. Further detail appears in ITU-T Rec. G.997.1. Each is a scalar that represents the range –1 (coded as 0) to +1.5 (coded as 640) in steps of 1/256.

DPBOESCMA – (2 bytes)

DPBOESCMB – (2 bytes)

DPBOESCMC – (2 bytes)

DPBOMUS – assumed minimum usable receive PSD mask. This component ranges from 0 dBm/Hz (coded as 0) to –127.5 dBm/Hz (coded as 255) in steps of 0.5 dB. (1 byte)

DPBOFMIN – the lower frequency bound above which DPBO is applied. This component ranges from 0 kHz (coded as 0) to 8832 kHz (coded as 2048) in steps of 4.3125 kHz. (2 bytes)

DPBOFMAX – the upper frequency bound below which DPBO is applied. This component ranges from 138 kHz (coded as 32) to 29997.75 kHz (coded as 6956) in steps of 4.3125 kHz. (2 bytes)

(R, W) (optional) (15 bytes)

Table 36o/G.983.2 – VDSL2 limit mask definitions

		PSD mask classes						
		Annex A	**Annex B**					**Annex C**
Bit number	**Profile Class**	**998 Annex A**	**998-M1x Annex B**	**998-M2x Annex B**	**997-M1x Annex B**	**997-M1c Annex B**	**997-M2x Annex B**	**998 Annex C**
Octet 1								
1	8	D-32	M1x-A	M2x-A		M1c-A-7	M2x-A	POTS
2	8		M1x-B	M2x-B	M1x-M-8		M2x-M-8	TCM-ISDN
3	8			M2x-M	M1x-M		M2x-M	
4	8		M1x-NUS0	M2x-NUS0				
5	8							
6	8							
7	8							
8	8							
Octet 2								
1	8	D-64						
2	8							
3	8							
4	8							
5	8							
6	8							
7	8							
8	8							
Octet 3								
1	12	D-32	M1x-A	M2x-A			M2x-A	POTS
2	12		M1x-B	M2x-B				TCM-ISDN
3	12			M2x-M	M1x-M		M2x-M	
4	12		M1x-NUS0	M2x-NUS0				
5	12							
6	12							
7	12							
8	12							

Table 36o/G.983.2 – VDSL2 limit mask definitions

		PSD mask classes						
		Annex A	Annex B					Annex C
Bit number	Profile Class	998 Annex A	998-M1x Annex B	998-M2x Annex B	997-M1x Annex B	997-M1c Annex B	997-M2x Annex B	998 Annex C
Octet 4								
1	12	D-64						
2	12							
3	12							
4	12							
5	12							
6	12							
7	12							
8	12							
Octet 5								
1	17							POTS
2	17							TCM-ISDN
3	17							
4	17							
5	17							
6	17							
7	17							
8	17							
Octet 6								
1	17							
2	17							
3	17							
4	17							
5	17							
6	17							
7	17							
8	17							

Table 36o/G.983.2 – VDSL2 limit mask definitions

		PSD mask classes						
		Annex A	Annex B					Annex C
Bit number	Profile Class	998 Annex A	998-M1x Annex B	998-M2x Annex B	997-M1x Annex B	997-M1c Annex B	997-M2x Annex B	998 Annex C
Octet 7								
1	30							POTS
2	30							TCM-ISDN
3	30							
4	30							
5	30							
6	30							
7	30							
8	30							
Octet 8								
1	30							
2	30							
3	30							
4	30							
5	30							
6	30							
7	30							
8	30							
NOTE – All unassigned bits are reserved by ITU.								

Table 36p/G.983.2 – VDSL2 US0 PSD masks definition

Bit	G.993.2 Annex A US0MASK
Octet 1	
1	EU-32
2	EU-36
3	EU-40
4	EU-44
5	EU-48
6	EU-52
7	EU-56
8	EU-60

Table 36p/G.983.2 – VDSL2 US0 PSD masks definition

Bit	G.993.2 Annex A US0MASK
Octet 2	
1	EU-64
2	reserved by ITU
3	reserved by ITU
4	reserved by ITU
5	reserved by ITU
6	reserved by ITU
7	reserved by ITU
8	reserved by ITU
Octet 3	
1	ADLU-32
2	ADLU-36
3	ADLU-40
4	ADLU-44
5	ADLU-48
6	ADLU-52
7	ADLU-56
8	ADLU-60
Octet 4	
9	ADLU-64
10	reserved by ITU
11	reserved by ITU
12	reserved by ITU
13	reserved by ITU
14	reserved by ITU
15	reserved by ITU
16	reserved by ITU
NOTE 1 – Valid combinations of US0MASK and LIMITMASK are described in ITU-T Rec. G.993.2. NOTE 2 – More than one mask may be enabled simultaneously. If no US0 PSD masks are enabled, the line is configured without US0 support.	

Actions

Create: Create an instance of this managed entity.

Delete: Delete an instance of this managed entity.

Get: Get one or more attributes.

Get-next: Get the latched attribute values of this managed entity within the current snapshot.

Set: Set one or more attributes.

Notifications

None.

7.3.123 xDSL line inventory and status data part 3

This managed entity extends the attributes defined in the xDSL line inventory and status data parts 1 and 2. This ME contains downstream attributes.

Relationships

This is one of the status MEs pointed to by a Physical Path Termination Point xDSL managed entity. An instance of this managed entity is automatically created (deleted) by the ONT upon creation (deletion) of a physical path termination point xDSL that supports these attributes.

Attributes

Managed entity ID: The managed entity ID is an implicit pointer, with the same value as that of its parent Physical Path Termination Point xDSL managed entity.

(R) (mandatory) (2 bytes)

TSSpsds: This attribute contains the downstream transmit spectrum shaping attributes expressed as the set of breakpoints exchanged during G.994.1. Each breakpoint consists of a 2-byte subcarrier index and the associated shaping attribute. The shaping attribute is one byte, an integer value in the 0 to 126 range. It is represented as a multiple of –0.5 dB. The value 127 indicates the subcarrier is not transmitted. Because this attribute may be too large to get in a single operation, it is retrieved via the get-next action.

(R) (mandatory) (3N bytes, where N is the number of breakpoints)

HLINSCds: This attribute is the scale factor to be applied to the downstream Hlin(f) values. It is coded as a 16-bit unsigned integer. This attribute is only available after a loop diagnostic procedure.

(R) (mandatory) (2 bytes)

HLINpsds: This attribute is an array of complex coefficients {a, b} that represent the downstream transfer function Hlin(f) in linear form. Each array entry represents the Hlin(f) = i*HLINGds*Δf for a particular subcarrier group index i, ranging from 0 to min(NSds, 511). Hlin(f) may be reconstructed from the array as $((HLINSCds/2^{15})*((a(i) + j*b(i))/2^{15}))$, where a(i) and b(i) are 2s complement integers in the $(–2^{15} + 1)$ to $(+2^{15} – 1)$ range. The granularity of a and b depends on the scale factor.

The special value $a(i) = b(i) = –2^{15}$ indicates that no measurement could be done for this subcarrier group because it is out of the passband or that the attenuation is out of range to be represented. This attribute is only available after a loop diagnostic procedure. Because this array may be too large to get in a single operation, it is retrieved via the get-next action.

(R) (mandatory) (4N bytes, where N is the number of subcarrier groups)

HLOGMTds: After a loop diagnostic procedure, this attribute contains the number of symbols used to measure the downstream Hlog(f) values. It is a 16-bit unsigned value that corresponds to the value specified in the corresponding Recommendation (e.g., the number of symbols in a 1 s time interval for G.992.3).

(R) (mandatory) (2 bytes)

HLOGpsds: The HLOGpsds attribute contains an array of numbers m(i), where i is a particular subcarrier group index, ranging from 0 to min(NSds, 511), and m is a 10-bit unsigned integer in the 0 to 1022 range, with a granularity of 0.1 dB. The downstream transfer function Hlog(f) can be reconstructed by the OLT management client as (6 – m(i)/10) dBm/Hz, with a range from +6 to approximately –96 dBm/Hz.

The special value m = 1023 indicates that no measurement could be done for this subcarrier group because it is out of the passband or that the attenuation is out of range to be represented. Because this attribute may be too large to get in a single operation, it is retrieved via the get-next action.

(R) (mandatory) (2N bytes, where N is the number of subcarrier groups)

QLNMTds: After a loop diagnostic procedure, the quiet line noise PSD measurement time attribute contains the number of symbols used to measure the downstream QLN(f) values. It is represented as a 16-bit unsigned value, and corresponds to the value specified in the corresponding Recommendation (e.g., the number of symbols in a 1 s time interval for G.992.3).

(R) (mandatory) (2 bytes)

QLNpsds: The quiet line noise PSD attribute contains an array of numbers n(i), where i is a subcarrier group index, ranging from 0 to min(NSds, 511), and n is an 8-bit unsigned integer in the 0 to 254 range, with a granularity of 0.5 dB. The downstream quiet line noise function QLN(f) can be reconstructed by the OLT management client as (–23 – n(i)/2) dBm/Hz, with a range from –150 to –23 dBm/Hz.

The special value n = 255 indicates that no measurement could be done for this subcarrier group because it is out of the passband or that the noise PSD is out of range to be represented. Because this attribute may be too large to get in a single operation, it is retrieved via the get-next action.

(R) (mandatory) (N bytes, where N is the number of subcarrier groups)

SNRMTds: After a loop diagnostic procedure, the SNR measurement time attribute contains the number of symbols used to measure the downstream SNR(f) values. It is represented as a 16-bit unsigned value, and corresponds to the value specified in the corresponding Recommendation (e.g., the number of symbols in a 1 s time interval for G.992.3).

(R) (mandatory) (2 bytes)

SNRpsds: The SNRpsds attribute contains an array of numbers snr(i), where i is a subcarrier group index, ranging from 0 to min(NSds, 511), and snr is an 8-bit unsigned integer in the 0 to 254 range, with a granularity of 0.5 dB. The downstream SNR function SNR(f), can be reconstructed by the OLT management client as (–32 + snr(i)/2) dBm/Hz, with a range from –160 to –32 dBm/Hz.

The special value n = 255 indicates that no measurement could be done for this subcarrier group because it is out of the passband or that the noise PSD is out of range to be represented. Because this attribute may be too large to get in a single operation, it is retrieved via the get-next action.

(R) (mandatory) (N bytes, where N is the number of subcarrier groups)

BITSpsds: This attribute defines the downstream bits allocation table per subcarrier. It is an array of integer values in the 0 to 15 range for subcarriers 0 to NSds.

The reported bits of subcarriers out of the downstream MEDLEY set are set to 0. Because this attribute may be too large to get in a single operation, it is retrieved via the get-next action.

(R) (mandatory) (N bytes, where N is the number of subcarriers)

GAINSpsds: This attribute defines the downstream gains allocation table per subcarrier. It is an array of integer values in the 0 to 4093 range for subcarriers 0 to NSds. The gain value is represented as a multiple of 1/512 on a linear scale.

The reported gains of subcarriers out of the downstream MEDLEY set are set to 0. Because this attribute may be too large to get in a single operation, it is retrieved via the get-next action.

(R) (mandatory) (2N bytes, where N is the number of subcarriers)

Actions

Get: Get one or more attributes. Latch a snapshot of the current reply attribute and respond with the size of data (4 bytes) that should be obtained using the Get-next command.

Get-Next: Get the latched attribute values of the managed entity within the current snapshot.

Notifications

None.

7.3.124 xDSL line inventory and status data part 4

This managed entity extends the attributes defined in the xDSL line inventory and status data parts 1, 2 and 3. This ME contains upstream attributes.

Relationships

This is one of the status data MEs pointed to by a Physical Path Termination Point xDSL managed entity. An instance of this managed entity is automatically created (deleted) by the ONT upon creation (deletion) of a physical path termination point xDSL that supports these attributes.

Attributes

Managed entity ID: The managed entity ID is an implicit pointer, with the same value as that of its parent Physical Path Termination Point xDSL managed entity.

(R) (mandatory) (2 bytes)

TSSpsus: This attribute contains the upstream transmit spectrum shaping attributes expressed as the set of breakpoints exchanged during G.994.1. Each breakpoint consists of a two-byte subcarrier index and the associated shaping attribute. The shaping attribute is one byte, an integer value in the 0 to 126 range. It is represented as a multiple of –0.5 dB. The value 127 is a special value indicating the subcarrier is not transmitted. Because this attribute may be too large to get in a single operation, it is retrieved via the get-next action.

(R) (mandatory) (3N bytes, where N is the number of breakpoints)

HLINSCus: This attribute is the scale factor to be applied to the upstream Hlin(f) values. It is coded as a 16-bit unsigned integer. This attribute is only available after a loop diagnostic procedure.

(R) (mandatory) (2 bytes)

HLINpsus: This attribute is an array of complex upstream Hlin(f) values in linear scale. It is coded in the same way as the related downstream attribute HLINpsds (see xDSL line inventory and status data part 3). This attribute is only available after a loop diagnostic procedure. Because this attribute may be too large to get in a single operation, it is retrieved via the get-next action.

(R) (mandatory) (4N bytes, where N is the number of subcarrier groups)

HLOGMTus: After a loop diagnostic procedure, this attribute contains the number of symbols used to measure the upstream Hlog(f) values. It is a 16-bit unsigned value that corresponds to the value specified in the corresponding Recommendation (e.g., the number of symbols in a 1 s time interval for G.992.3).

(R) (mandatory) (2 bytes)

HLOGpsus: This attribute is an array of real upstream Hlog(f) values. It is coded in the same way as the related downstream attribute HLOGpsds (see xDSL line inventory and status data part 3). Because this attribute may be too large to get in a single operation, it is retrieved via the get-next action.

(R) (mandatory) (2N bytes, where N is the number of subcarrier groups)

QLNMTus: After a loop diagnostic procedure, the quiet line noise PSD measurement attribute contains the number of symbols used to measure the upstream QLN(f) values. It is represented as a 16-bit unsigned value, and corresponds to the value specified in the corresponding Recommendation (e.g., the number of symbols in a 1 s time interval for G.992.3).

(R) (mandatory) (2 bytes)

QLNpsus: The quiet line noise attribute represents an array of real upstream QLN(f) values. It is coded in the same way as the related downstream attribute QLNpsds (see xDSL line inventory and status data part 3). Because this attribute may be too large to get in a single operation, it is retrieved via the get-next action.

(R) (mandatory) (N bytes, where N is the number of subcarrier groups)

SNRMTus: After a loop diagnostic procedure, the SNR measurement time attribute contains the number of symbols used to measure the upstream SNR(f) values. It is a 16-bit unsigned value, and corresponds to the value specified in the corresponding Recommendation (e.g., the number of symbols in a 1 s time interval for G.992.3).

(R) (mandatory) (2 bytes)

SNRpsus: This attribute represents an array of real upstream SNR(f) values. It is coded in the same way as the related downstream attribute SNRpsds (see xDSL line inventory and status data part 3). Because this attribute may be too large to get in a single operation, it is retrieved via the get-next action.

(R) (mandatory) (N bytes, where N is the number of subcarrier groups)

BITSpsus: This attribute defines the upstream bits allocation table per subcarrier. It is an array of integer values in the 0 to 15 range for subcarriers 0 to NSus.

The reported bits of subcarriers out of the upstream MEDLEY set are set to 0. Because this attribute may be too large to get in a single operation, it is retrieved via the get-next action.

(R) (mandatory) (N bytes, where N is the number of subcarriers)

GAINSpsus: This attribute defines the upstream gains allocation table per subcarrier. It is an array of integer values in the 0 to 4093 range for subcarriers 0 to NSus. The gain value is represented as a multiple of 1/512 on a linear scale.

The reported gains of subcarriers out of the upstream MEDLEY set are set to 0. Because this attribute may be too large to get in a single operation, it is retrieved via the get-next action.

(R) (mandatory) (2N bytes, where N is the number of subcarriers)

Actions

Get: Get one or more attributes. Latch a snapshot of the current reply attribute and respond with the size of data (4 bytes) that should be obtained using the Get-next command.

Get-Next: Get the latched attribute values of the managed entity within the current snapshot.

Notifications

None.

7.3.125 VDSL2 line inventory and status data part 1

This managed entity extends the other xDSL line inventory and status data MEs with attributes specific to VDSL2. This ME contains general and downstream attributes.

Relationships

This is one of the status data MEs pointed to by a Physical Path Termination Point xDSL managed entity. It is required only if VDSL2 is supported by the PPTP. An instance of this managed entity is automatically created (deleted) by the ONT upon creation (deletion) of a physical path termination point xDSL that supports these attributes.

Attributes

Managed entity ID: The managed entity ID is an implicit pointer, with the same value as that of its parent Physical Path Termination Point xDSL managed entity.

(R) (mandatory) (2 bytes)

VDSL2 Transmission System Capability xTU-C: This attribute extends the list of the xDSL line configuration profile part 1 xTSE attribute to include xTU-C VDSL2 capabilities. It is coded in bit-map representation as bits 57-64 defined in Table 21.

(R) (mandatory) (1 byte)

VDSL2 Transmission System: This attribute reports the transmission system in use. It extends the xDSL transmission system attribute of the xDSL line inventory and status data part 2 managed entity with a byte that includes VDSL2 capabilities. It is coded in bit-map representation as bits 57-64 defined in Table 21.

(R) (mandatory) (1 byte)

VDSL2 profile: This attribute defines the profile in use. It is coded in a bit map representation (0 if not allowed, 1 if allowed) with the following definition:

Bit	**Representation**
Octet 1	
1	G.993.2 Profile 8a.
2	G.993.2 Profile 8b.
3	G.993.2 Profile 8c.
4	G.993.2 Profile 8d.
5	G.993.2 Profile 12a.
6	G.993.2 Profile 12b.
7	G.993.2 Profile 17a.
8	G.993.2 Profile 30a.

(R) (mandatory) (1 byte)

VDSL2 limit PSD mask and bandplan: This attribute defines the limit PSD mask and bandplan in use. It is coded in a bit-map representation with the bits defined in Table 36o.

(R) (mandatory) (8 bytes)

VDSL2 US0 PSD mask: This attribute defines the US0 PSD mask in use. It is coded in a bit-map representation with the bits defined Table 36p.

(R) (mandatory) (4 bytes)

ACTSNRMODEds: This attribute indicates if transmitter referred virtual noise is active on the line in the downstream direction.

1 – virtual noise is inactive.

2 – virtual noise is active.

(R) (mandatory) (1 byte)

HLINGds: This attribute is the number of subcarriers per group used to report HLINpsds. Valid values are 1, 2, 4, 8. For ADSL, this attribute is equal to one, and therefore need not be specified. For VDSL2, it is equal to the size of the subcarrier group used to compute these attributes (see 11.4.1/G.993.2).

(R) (mandatory) (1 byte)

HLOGGds: This attribute is the number of subcarriers per group used to report HLOGpsds. Valid values are 1, 2, 4, 8. For ADSL, this attribute is equal to one, and therefore need not be specified. For VDSL2, it is equal to the size of the subcarrier group used to compute these attributes (see 11.4.1/G.993.2).

(R) (mandatory) (1 byte)

QLNGds: This attribute is the number of subcarriers per group used to report QLNpsds. Valid values are 1, 2, 4, 8. For ADSL, this attribute is equal to one, and therefore need not be specified. For VDSL2, it is equal to the size of the subcarrier group used to compute these attributes (see 11.4.1/G.993.2).

(R) (mandatory) (1 byte)

SNRGds: This attribute is the number of subcarriers per group used to report SNRpsds. Valid values are 1, 2, 4, 8. For ADSL, this attribute is equal to one, and therefore need not be specified. For VDSL2, it is equal to the size of the subcarrier group used to compute these attributes (see 11.4.1/G.993.2).

(R) (mandatory) (1 byte)

MREFPSDds: The downstream MEDLEY reference PSD attribute contains the set of breakpoints exchanged in the MREFPSDds fields of the O-PRM message of ITU-T Rec. G.993.2. The format is similar to that specified for the PSD descriptor in ITU-T Rec. G.993.2.

In ITU-T Rec. G.993.2, the first byte gives the size of the table, each entry of which is three bytes. In OMCI, the first byte is omitted, because the size of the table is known from the response to the get command.

(R) (mandatory) (3N bytes, where N is the number of breakpoints)

TRELLISds: This attribute reports whether trellis coding is in use in the downstream direction.

0 – trellis is not used.

1 – trellis is used.

(R) (mandatory) (1 byte)

Actions

Get: Get one or more attributes. Latch a snapshot of the current reply attribute and respond with the size of data (4 bytes) that should be obtained using the Get-next command.

Get-Next: Get the latched attribute values of the managed entity within the current snapshot.

Notifications

None.

7.3.126 VDSL2 line inventory and status data part 2

This managed entity extends the other xDSL line inventory and status data MEs with attributes specific to VDSL2. This ME contains upstream attributes.

Relationships

This is one of the status data MEs pointed to by a Physical Path Termination Point xDSL managed entity. It is required only if VDSL2 is supported by the PPTP. An instance of this managed entity is automatically created (deleted) by the ONT upon creation (deletion) of a physical path termination point xDSL that supports these attributes.

Attributes

Managed entity ID: The managed entity ID is an implicit pointer, with the same value as that of its parent Physical Path Termination Point xDSL managed entity.

(R) (mandatory) (2 bytes)

VDSL2 Transmission System Capability xTU-R: This attribute extends the list of the xDSL line configuration profile part 1 xTSE attribute to include xTU-R VDSL2 capabilities. It is coded in bit-map representation as bits 57-64 defined in Table 21.

(R) (mandatory) (1 byte)

ACTSNRMODEus: This attribute indicates if transmitter referred virtual noise is active on the line in the upstream direction.

1 – virtual noise is inactive.

2 – virtual noise is active.

(R) (mandatory) (1 byte)

UPBOKLE: This attribute contains the estimated electrical length expressed in dB at 1 MHz, kl_0 (see O-UPDATE in 12.3.3.2.1.2/G.993.2). This is the final electrical length that would be sent from the VTU-O to the VTU-R if the electrical length is not forced by the NMS. The value is an unsigned 16-bit number in the range 0 (coded as 0) to 128 dB (coded as 1280) in steps of 0.1 dB.

(R) (mandatory) (2 bytes)

HLINGus: This attribute is the number of subcarriers per group used to report HLINpsus. Valid values are 1, 2, 4, 8. For ADSL, this attribute is equal to one, and therefore need not be specified. For VDSL2, it is equal to the size of the subcarrier group used to compute these attributes (see 11.4.1/G.993.2).

(R) (mandatory) (1 byte)

HLOGGus: This attribute is the number of subcarriers per group used to report HLOGpsus. Valid values are 1, 2, 4, 8. For ADSL, this attribute is equal to one, and therefore need not be specified. For VDSL2, it is the size of the subcarrier group used to compute these attributes (see 11.4.1/G.993.2).

(R) (mandatory) (1 byte)

QLNGus: This attribute is the number of subcarriers per group used to report QLNpsus. Valid values are 1, 2, 4, 8. For ADSL, this attribute is equal to one, and therefore need not be specified. For VDSL2, it is the size of the subcarrier group used to compute these attributes (see 11.4.1/G.993.2).

(R) (mandatory) (1 byte)

SNRGus: This attribute is the number of subcarriers per group used to report SNRpsus. Valid values are 1, 2, 4, 8. For ADSL, this attribute is equal to one, and therefore need not

be specified. For VDSL2, it is the size of the subcarrier group used to compute these attributes (see 11.4.1/G.993.2).

(R) (mandatory) (1 byte)

MREFPSDus: The upstream MEDLEY reference PSD attribute contains the set of breakpoints exchanged in the MREFPSDus fields of the R-PRM message of ITU-T Rec. G.993.2. The format is similar to that specified for the PSD descriptor in ITU-T Rec. G.993.2.

In ITU-T Rec. G.993.2, the first byte gives the size of the table, each entry of which is three bytes. In OMCI, the first byte is omitted, because the size of the table is known from the response to the get command.

(R) (mandatory) (3N bytes, where N is the number of breakpoints)

TRELLISus: This attribute reports whether trellis coding is in use in the upstream direction.

0 – trellis is not used.

1 – trellis is used.

(R) (mandatory) (1 byte)

ACTUALCE: This attribute reports the cyclic extension used on the line. It is coded as an unsigned integer from 2 to 16 in units of *N*/32 samples, where *2N* is the IDFT size.

(R) (mandatory) (1 byte)

Actions

Get: Get one or more attributes. Latch a snapshot of the current reply attribute and respond with the size of data (4 bytes) that should be obtained using the Get-next command.

Get-Next: Get the latched attribute values of the managed entity within the current snapshot.

Notifications

None.

7.3.127 VDSL2 line inventory and status data part 3

This managed entity extends the other xDSL line inventory and status data MEs with attributes specific to VDSL2. This ME contains per-band attributes for both directions. These same attributes are defined in the xDSL line inventory and status data part 2 managed entity, but only for a single band. VDSL2 can have as many as four bands upstream and as many as three bands downstream.

Relationships

This is one of the status data MEs pointed to by a Physical Path Termination Point xDSL managed entity. It is required only if VDSL2 is supported by the PPTP. An instance of this managed entity is automatically created (deleted) by the ONT upon creation (deletion) of a physical path termination point xDSL that supports these attributes.

Attributes

Managed entity ID: The managed entity ID is an implicit pointer, with the same value as that of its parent Physical Path Termination Point xDSL managed entity.

(R) (mandatory) (2 bytes)

Upstream bands count: This attribute records the number of upstream bands. It can be used to filter the upstream attributes. All of the upstream attributes are arrays of four entries, of which the first upstream bands count are populated. The content of the arrays for unused frequency bands is unspecified.

(R) (mandatory) (1 byte)

Downstream bands count: This attribute records the number of downstream bands. It can be used to filter the downstream attributes. All of the downstream attributes are arrays of three entries, of which the first downstream bands count are populated. The content of the arrays for unused frequency bands is unspecified.

(R) (mandatory) (1 byte)

Downstream line attenuation per band: The LATNds attribute is defined per usable band. It is the measured difference in the total power transmitted in this band by the xTU-C and the total power received in this band by the xTU-R over all subcarriers of this band during loop diagnostic mode and initialization. The downstream line attenuation ranges per band from 0 to +127 dB with 0.1 dB steps. The special value 0xFFFF indicates the line attenuation per band is out of range to be represented.

(R) (mandatory) (3 bands × 2 bytes = 6 bytes)

Upstream line attenuation per band: The LATNus attribute is defined per usable band. It is the measured difference in dB in the total power transmitted in this band by the xTU-R and the total power received in this band by the xTU-C over all subcarriers of this band during loop diagnostic mode and initialization. The upstream line attenuation ranges per band from 0 to +127 dB with 0.1 dB steps. The special value 0xFFFF indicates the line attenuation per band is out of range to be represented.

(R) (mandatory) (4 bands × 2 bytes = 8 bytes)

Downstream signal attenuation per band: The SATNds attribute is defined per usable band. It is the measured difference in the total power transmitted in this band by the xTU-C and the total power received in this band by the xTU-R over all subcarriers of this band during showtime. The downstream signal attenuation per band ranges from 0 to +127 dB with 0.1 dB steps. The special value 0xFFFF indicates the signal attenuation per band is out of range to be represented.

NOTE 1 – During showtime, only a subset of the subcarriers may be transmitted by the xTU-C, as compared to loop diagnostic mode and initialization. Therefore, the downstream signal attenuation may be significantly lower than the downstream line attenuation.

(R) (mandatory) (3 bands × 2 bytes = 6 bytes)

Upstream signal attenuation per band: The SATNus attribute is defined per usable band. It is the measured difference in dB in the total power transmitted in this band by the xTU-R and the total power received in this band by the xTU-C over all subcarriers of this band during showtime. The upstream signal attenuation per band ranges from 0 to +127 dB with 0.1 dB steps. The special value 0xFFFF indicates the signal attenuation per band is out of range to be represented.

NOTE 2 – During showtime, only a subset of the subcarriers may be transmitted by the xTU-R, as compared to loop diagnostic mode and initialization. Therefore, the upstream signal attenuation may be significantly lower than the upstream line attenuation.

(R) (mandatory) (4 bands × 2 bytes = 8 bytes)

Downstream signal-to-noise ratio margin per band: The SNRMpbds attribute is defined per usable band. The downstream signal-to-noise ratio margin per band is the maximum increase in dB of the noise power received at the xTU-R, such that the BER requirements are met for all downstream bearer channels. The downstream SNR margin per band ranges

from –64 dB (coded as 0) to +63 dB (coded as 1270) with 0.1 dB steps. The special value 0xFFFF indicates the attribute is out of range to be represented.

(R) (mandatory) (3 bands × 2 bytes = 6 bytes)

Upstream signal-to-noise ratio margin per band: The SNRMpbus attribute is defined per usable band. The upstream signal-to-noise ratio margin per band is the maximum increase in dB of the noise power received at the xTU-C, such that the BER requirements are met for all upstream bearer channels. The upstream SNR margin per band ranges from –64 dB (coded as 0) to +63 dB (coded as 1270) with 0.1 dB steps. The special value 0xFFFF indicates the attribute is out of range to be represented.

(R) (mandatory) (4 bands × 2 bytes = 8 bytes)

Actions

Get: Get one or more attributes.

Notifications

None.

2.2) Add the following clause to the end of clause 7.3

Add the following clauses to define new managed entities for extended VLAN tagging operations:

7.3.128 Extended VLAN Tagging Operation Configuration Data

This managed entity is used to organize data associated with VLAN tagging. Instances of this managed entity are created/deleted at the request of the OLT.

Relationships

Zero or one instance of this managed entity may exist for an instance of a MAC bridge port, an 802.1p mapper service profile, an IP host, or any Physical Path Termination Point that supports Ethernet service; in short, any managed entity that can terminate or modify an Ethernet stream.

In either case, the tagging operations described refer to the upstream direction.

Attributes

Managed Entity id: This attribute provides a unique number for each instance of this managed entity. The assigned number is the same as the id of the managed entity with which this Extended VLAN Tagging Operation Configuration Data instance is associated. (R, Set-by-create) (mandatory) (2 bytes)

AssociationType: This attribute identifies the type of the ME that is associated with this Extended VLAN tagging ME. Values are assigned in accordance with the following list. (R, Set-by-create) (mandatory) (1 byte)

0 MAC bridge port configuration data

1 802.1p mapper service profile

2 Physical path termination point Ethernet UNI

3 IP host config data

4 Physical path termination point xDSL UNI

5 GEM interworking termination point

6 Multicast GEM interworking termination point

7 Physical path termination point MoCA UNI

8 Physical path termination point 802.11 UNI

9 Ethernet flow termination point

Received frame VLAN tagging operation table max size: This attribute indicates the maximum number of VLAN Tagging operation entry that can be set in VLAN Tagging Operation Table.

(R) (mandatory) (2 bytes)

InputTPID: This attribute gives the special TPID value for operations on the input (filtering) side of the table. Typical values include 0x8a88 and 0x9100.

(R, W) (mandatory) (2 bytes)

OutputTPID: This attribute gives the special TPID value for operations on the output (tagging) side of the table. Typical values include 0x8a88 and 0x9100.

(R, W) (mandatory) (2 bytes)

Downstream mode: This attribute gives the mode for the downstream mapping, as specified below:

0: The operation performed in the downstream direction is the inverse of that performed in the upstream direction. For one-to-one VLAN mappings, the inverse is trivially defined. Multi-to-one mappings are possible; however, and these are treated as follows. If the multi-to-one mapping results from multiple operation rules producing the same ANI-side tag configuration, then the first rule in the list will be used to define the inverse operation. If the multi-to-one mapping results from "Don't care" fields in the filter being replaced with provisioned fields in the ANI-side tags, then the inverse is defined to set the corresponding fields on the ANI-side with their lowest value.

1: No operation is performed in the downstream direction.

All other values are reserved.

(R,W) (mandatory) (1 byte)

Received frame VLAN Tagging Operation Table: This attribute is used to set or delete entries in the VLAN Tagging Operation Table for the upstream direction (regardless of MAC bridge port attachment). Each entry consists of fourteen fields. They are Filter Outer Priority, Filter Outer VID, Filter Outer TPID/DE, Filter Inner Priority, Filter Inner VID, Filter Inner TPID/DE, Filter Ethertype, Treatment Tags to remove, Treatment Outer Priority, Treatment Outer VID, Treatment Outer TPID/DE, Treatment Inner Priority, Treatment Inner VID, and Treatment Inner TPID/DE, which are further described and illustrated in Figure 40b below:

Each entry represents a tagging rule, consisting of a filtering part (the first 9 fields) and a treatment part (the last 9 fields). Each incoming packet should be matched against each rule, in list order. The first rule that matches the packet is selected as the active rule, and the packet is then treated according to that rule.

There are three categories of rules: zero tag, 1 tag, and 2 tag rules. Logically, these categories are separate, and apply to their respective incoming frame types. In other words, a single tag rule should not apply to a double tagged frame, even though the single tag rule matches the outer tag of the double-tagged frame. All single-tag rules have a filter outer priority field = 15, and the no-tag rule have both filter priority fields = 15. 11 bytes are reserved for each entry.

(R, W) (mandatory) (N * 16 bytes, N is the number of VLAN tagging operation item)

NOTE 1 – First 8 bytes of table entry are guaranteed to be the unique index of the table.

Filter outer priority: (4 bits) the outer priority value on which to filter the received frames and some special functions, as listed below:

0~7: the value is used as the given outer priority to filter the received frames.

8: indicates not to filter on outer priority.

14: indicates the default filter when no other two-tag rule in this table applies.

15: indicates that this entry is not a double-tag rule, and all other outer tag filter fields should be ignored.

Other values: reserved.

Filter outer VID: (13 bits) the outer VID value on which to filter the received frames and some special functions, as listed below:

000~4094: the value is used as the given outer VID value to filter the received frames.

4096: indicates not to filter on the outer VID.

Other values: reserved.

Filter outer TPID/DE: (3 bits) the outer TPID value on which to filter the received frames and some special functions, as listed below:

000: Don't filter on outer TPID field.

100: outer TPID = 8100

101: outer TPID = InputTPID, don't care about DE bit

110: outer TPID = InputTPID, DE = 0

111: outer TPID = InputTPID, DE = 1

Padding: (12 bits).

Filter inner priority: (4 bits) the inner priority value on which to filter the received frames and some special functions, as listed below:

0~7: the value is used as the given inner priority value to filter the received frames.

8: indicates not to filter on inner priority.

14: indicates the default filter when no other one-tag rule in this table applies.

15: indicates that this entry is the no-tag rule.

Other values: reserved.

Filter inner VID: (13 bits) the inner VID value on which to filter the received frames and some special functions, as listed below:

000~4094: the value is used as the given inner VID value to filter the received frames.

4096: indicates not to filter on the inner VID.

Other values: reserved.

Filter inner TPID/DE: (3 bits) the inner TPID value on which to filter the received frames and some special functions, as listed below:

000: Don't filter on inner TPID field.

100: inner TPID = 8100

101: inner TPID = InputTPID, don't care about DE bit

110: inner TPID = InputTPID, DE = 0

111: inner TPID = InputTPID, DE = 1

Padding: (8 bits).

Filter Ethertype: (4 bits) select the Ethertype value on which to filter the received frames, as listed below:

NOTE 2 – This filter is recommended for use on untagged frames or frames with priority only.

0000: Don't filter on Ethertype.

0001: Ethertype = 0x0800 (filter IPoE frames)

0010: Ethertype = 0x8863 or 0x8864 (filter PPPoE frames)

0011: Ethertype = 0x0806 (filter ARP frames)

Other values: Reserved

Treatment tags to remove: (2 bits) Used to indicate initial treatment of the received frames.

00~10: indicates that 0, 1, or 2 tags, respectively, are to be removed. If one tag is specified, then it is the outer tag that should be removed.

11: Reserved

Padding: (10 bits).

Treatment outer priority: (4 bits) the priority value for use in the outer VLAN tag or some special functions, as listed below:

0~7: the value is used as the given priority to insert in the outer VLAN tag.

8: the outer priority is to be copied from the inner priority of the received frame.

9: the outer priority is to be copied from the outer priority of the received frame.

15: Do not add an outer tag.

Other values: reserved.

Treatment outer VID: (13 bits) the VID to use in the outer VLAN tag or some special functions, as listed below:

000~4094: the value is the VID to use in the outer VLAN tag.

4096: the outer VID is to be copied from the inner VID of the received frame.

4097: the outer VID is to be coped from the outer VID of the received frame.

Other values: reserved.

Treatment outer TPID/DE: (3 bits) the TPID value to use in the outer VLAN tag or some special functions, as listed below:

000: TPID (and DE, if present) copied from inner tag of received frame

001: TPID (and DE, if present) copied from outer tag of received frame

010: TPID = OutputTPID, and DE copied from inner tag of received frame

011: TPID = OutputTPID, and DE copied from outer tag of received frame

100: TPID = 0x8100

101: Reserved.

110: TPID = OutputTPID, DE = 0

111: TPID = OutputTPID, DE = 1

Padding: (12 bits).

Treatment inner priority: (4 bits) the priority value to use in the inner VLAN tag or some special functions, as listed below:

0~7: the value used as the given priority to insert in the inner VLAN tag.

8: the inner priority is to be copied from the inner priority of the received frame.

9: the inner priority is to be copied from the outer priority of the received frame.

15: Do not add an inner tag.

Other values: reserved.

Treatment inner VID: (13 bits) the VID value to use in the inner VLAN tag or some special functions, as listed below:

000~4094: the value is the VID to use in the inner VLAN tag.

4096: the inner VID is to be copied from the inner VID of the received frame.

4097: the inner VID is to be coped from the outer VID of the received frame.

Other values: reserved.

Treatment inner TPID/DE: (3 bits) the TPID value to use in the inner VLAN tag or some special functions, as listed below:

000: TPID (and DE, if present) copied from inner tag of received frame

001: TPID (and DE, if present) copied from outer tag of received frame

010: TPID = OutputTPID, and DE copied from inner tag of received frame

011: TPID = OutputTPID, and DE copied from outer tag of received frame

100: TPID = 0x8100

101: Reserved.

110: TPID = OutputTPID, DE = 0

111: TPID = OutputTPID, DE = 1

When created, table should have 3 entries defined that list the default treatment (of normal forwarding) for untagged, single tagged, and double tagged frames. As an exception to the rule on ordered processing, these default rules are always considered as a last resort for frames that do not match any other applicable rule. Best practice dictates that these entries should not be deleted; however, they can be modified to produce the desired default behaviour.

15, x, x, 15, x, x, x, (0, 15, x, x, 15, x, x)

15, x, x, 14, x, x, x, (0, 15, x, x, 15, x, x)

14, x, x, 14, x, x, x, (0, 15, x, x, 15, x, x)

NOTE 3 – 'x' is don't care values, should be set to zero.

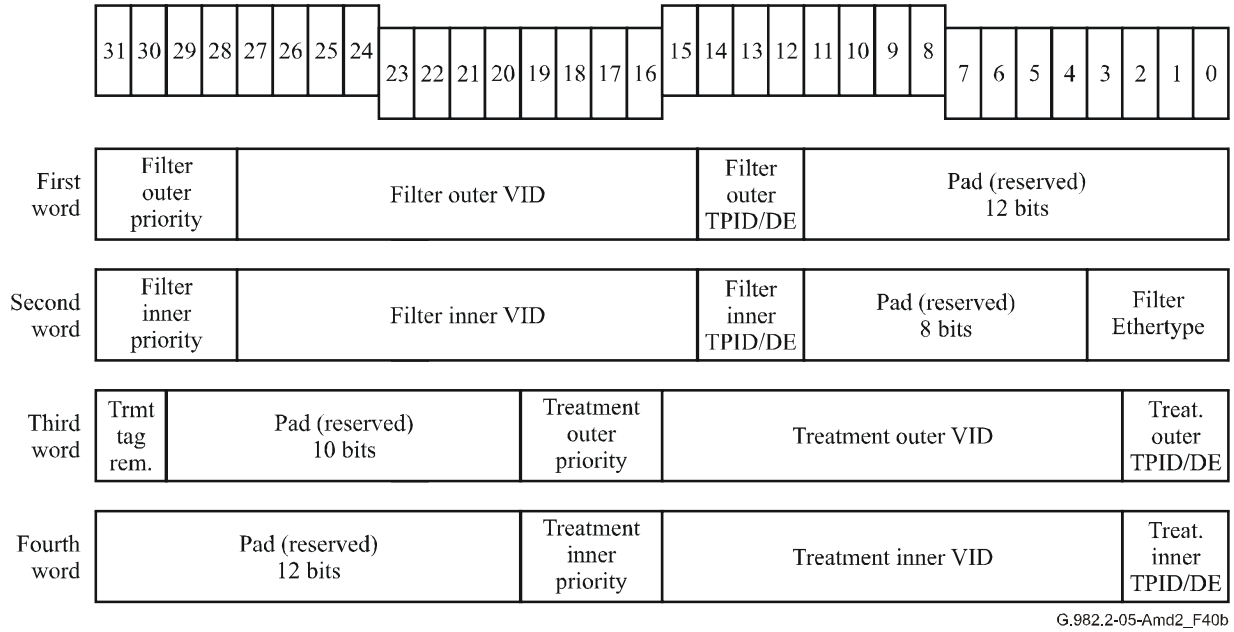

Figure 40b/G.983.2 – Received VLAN tagging operation table entry

Actions

Create: Create an instance of this managed entity.

Delete: Delete an instance of this managed entity.

Get: Get one or more attributes. For table attributes, latch a snapshot (i.e., copy) of the current Received frame VLAN Tagging Operation Table and respond with the size of data (4 bytes) that should be obtained using the Get-next command.

Set: This action is used to add or delete table entries from "VLAN Tagging Operation Table". Only one entry can be added/deleted by a single "Set" action.

NOTE 4 – An entry is added by writing to the new entry (a unique value for the first 44 bits). An entry is deleted by writing to the entry with the last 5 bytes being all 1s.

Get-next: Get the latched attribute values of the managed entity within the current snapshot.

Notifications

None.

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