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

B-PON ONT management and control interface (OMCI) support for Digital Subscriber Line interfaces

ITU-T Recommendation G.983.10

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B-PON ONT management and control interface (OMCI) support for Digital Subscriber Line interfaces

Summary

This Recommendation focuses on the OMCI specifications related to support for ONUs with ADSL and VDSL interfaces.

In the B-PON system defined in ITU-T Rec. G.983.1 [1], the ONTs are located at the customer site and the ONUs are generally located at the curb or cabinet. The B-PON element management system will only manage ONTs/ONUs as part of the B-PON system through the OLT using the ONT management and control interface (OMCI).

The OMCI specifications are based on ITU-T Rec. G.983.2 [2]. Some enhancements are needed for the support of ADSL and VDSL interfaces. This Recommendation covers configuration, fault and performance management enhancements to ITU-T Rec. G.983.2. Attributes are taken from the G.99x series of Recommendations which relate to DSL technology. This Recommendation uses the approach described in ITU-T Rec. G.983.8 which focuses on other interfaces.

FOREWORD

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ITU-T Recommendation G.983.10

B-PON ONT management and control interface (OMCI) support for Digital Subscriber Line interfaces

1 Scope

This Recommendation focuses on the OMCI specifications related to support for ONUs with ADSL and VDSL interfaces. Though the OMCI specifications are based on ITU-T Rec. G.983.2 [2] and ITU-T Rec. G.983.8 [3], some enhancements are needed. The scope of this Recommendation is limited to the enhancements only. An alternative management protocol for ONUs with ADSL and VDSL interfaces consists of carrying an SNMP MIB structure transparently over the PON. This alternative solution is not documented here.

This Recommendation includes additions to sections of ITU-T Rec. G.983.2 that pertain to these topics. As this Recommendation serves as an extension of ITU-T Rec. G.983.2, all sections of that Recommendation remain pertinent.

The ADSL managed entities specified in this Recommendation are modelled after ITU-T Rec. G.997.1 (and its Amendment 1). The VDSL managed entities specified in this Recommendation are modelled after the IETF RFC 3728.

2 References

The following ITU-T Recommendations and other references contain provisions which, through reference in this text, constitute provisions of this Recommendation. At the time of publication, the editions indicated were valid. All Recommendations and other references are subject to revision; users of this Recommendation are therefore encouraged to investigate the possibility of applying the most recent edition of the Recommendations and other references listed below. A list of the currently valid ITU-T Recommendations is regularly published. The reference to a document within this Recommendation does not give it, as a stand-alone document, the status of a Recommendation.

[1]   ITU-T Recommendation G.983.1 (1998), *Broadband optical access systems based on Passive Optical Networks (PON)*.

[2]   ITU-T Recommendation G.983.2 (2002), *ONT management and control interface specification for B-PON*.

[3]   ITU-T Recommendation G.983.8 (2003), *B-PON OMCI support for IP, ISDN, video, VLAN tagging, VC cross-connections and other select functions*.

[4]   ITU-T Recommendation G.997.1 (2003), *Physical layer management for digital subscriber line (DSL) transceivers*, plus Amendment 1 (2003).

[5]   IETF RFC 3728 (2004), *Definitions of Managed Objects for Very High Speed Digital Subscriber Lines (VDSL)*.

3 Abbreviations

This Recommendation uses the following abbreviations:

ADSL   Asymmetrical Digital Subscriber Line

ANI   Access Network Interface

ARC   Alarm Reporting Control

ATM   Asynchronous Transfer Mode

ATU-C	ADSL Transceiver Unit, Central office end
ATU-R	ADSL Transceiver Unit, Remote terminal end
BER	Bit Error Rate
B-PON	Broadband Passive Optical Network
DSL	Digital Subscriber Line
HEC	Header Error Control
MAC	Media Access Control
MCM	Multiple Carrier Modulation
ME	Managed Entity
MIB	Management Information Base
MMPDU	MAC Management Protocol Data Unit
MPDU	MAC Protocol Data Unit
MSDU	MAC Service Data Unit
NMS	Network Management System
NSCds	Number of Subcarrier – Downstream
NSCus	Number of Subcarrier – Upstream
OLT	Optical Line Terminal
OMCI	ONT Management and Control Interface
ONT	Optical Network Terminal
ONU	Optical Network Unit
PHY	Physical layer
PM	Performance Monitoring
PMS-TC	Physical Media Specific – Transmission Convergence
PSD	Power Spectral Density
RFI	Radio Frequency Interference
SCM	Single Carrier Modulation
SNR	Signal-to-Noise Ratio
UNI	User Network Interface
VDSL	Very High-Speed DSL
VTU-O	VDSL Transceiver Unit, ONU end (a.k.a. VTU-C)
VTU-R	VDSL Transceiver Unit, Remote terminal end

4   Reference model and terms

See clause 4/G.983.2.

5   Requirements of the management interface specification

See clause 5/G.983.2.

5.1 Configuration management

The following configuration management-related managed entities are added to the list given in 5.1/G.983.2.

j)   Configuration of ADSL and VDSL line profiles;

k)   Configuration of ADSL and VDSL channel profiles;

l)   Configuration of ADSL Subcarrier Mask profiles;

m)   Configuration of ADSL PSD Mask profiles;

n)   Configuration of ADSL RFI Bands profiles;

o)   Configuration of VDSL Band Plan profiles.

5.2 Fault management

The following fault management-related managed entities are added to the list given in 5.2/G.983.2.

k)   Physical Path Termination Point ADSL UNI;

j)   Physical Path Termination Point VDSL UNI.

5.3 Performance management

The following performance management-related managed entities are added to the list given in 5.3/G.983.2.

m)   ADSL ATU-C Performance Monitoring History Data;

n)   ADSL ATU-R Performance Monitoring History Data;

o)   ADSL ATU-C Channel Performance Monitoring History Data;

p)   ADSL ATU-R Channel Performance Monitoring History Data;

q)   TC Adaptor Performance Monitoring History Data ADSL;

r)   VDSL VTU-O Physical Interface Monitoring History Data;

s)   VDSL VTU-R Physical Interface Monitoring History Data;

t)   VDSL VTU-O Channel Performance Monitoring History Data;

u)   VDSL VTU-R Channel Performance Monitoring History Data.

5.4 Security management

See 5.4/G.983.2.

6 Protocol-independent MIB for the OMCI

See clause 6/G.983.2.

6.1 Managed entities associated with xDSL interfaces

The managed entities in Table 1 are defined in addition to the managed entities defined in ITU-T Rec. G.983.2.

Table 1/G.983.10 – Additional managed entities in the OMCI

Managed entity	Required/ Optional	Description	Clause
ADSL managed entities:			
ADSL ATU-C channel performance monitoring history data	O	Performance monitoring data for an ADSL ATU-C channel	8.1.17
ADSL ATU-C performance monitoring history data	O	Performance monitoring data for an ADSL ATU-C modem Path	8.1.15
ADSL ATU-R channel performance monitoring history data	O	Performance monitoring data for an ADSL ATU-R Channel	8.1.18
ADSL ATU-R performance monitoring history data	O	Performance monitoring data for an ADSL ATU-R modem path	8.1.16
ADSL channel configuration profile	CR	Contains configuration for a channel	8.1.10
ADSL channel downstream status data	CR	Contains status on the downstream channel	8.1.5
ADSL channel upstream status data	CR	Contains status on the upstream channel	8.1.6
ADSL downstream PSD mask profile	CR	Contains masking information for the downstream PSD	8.1.13
ADSL downstream RFI bands profile	CR	Contains information on the downstream RFI bands	8.1.14
ADSL line configuration profile Part 1	CR	Contains the line parameters for an ADSL line	8.1.7
ADSL line configuration profile Part 2	CR	Contains the line parameters for an ADSL line	8.1.8
ADSL line configuration profile Part 3	CR	Contains the line parameters for an ADSL line	8.1.9
ADSL line inventory and status data Part 1	CR	Contains the inventory and status information on the ADSL line	8.1.3
ADSL line inventory and status data Part 2	CR	Contains the inventory and status information on the ADSL line	8.1.4
ADSL subcarrier masking downstream profile	CR	Contains masking information for the downstream subcarriers	8.1.11
ADSL subcarrier masking upstream profile	CR	Contains masking information for the upstream subcarriers	8.1.12
Physical path termination point ADSL UNI Part 1	CR	Used for the physical path termination point at an ADSL CO modem	8.1.1
Physical path termination point ADSL UNI Part 2	CR	Used for the physical path termination point at an ADSL CO modem	8.1.2
TC adaptor performance monitoring history data ADSL	O	Performance monitoring data for the ADSL ATM data path	8.1.19

Table 1/G.983.10 – Additional managed entities in the OMCI

Managed entity	Required/ Optional	Description	Clause
VDSL managed entities:			
Physical path termination point VDSL UNI	CR	Used for the physical path termination point at a VDSL connection	8.2.1
VDSL band plan configuration profile	CR	Parameters used to configure a VDSL band plan configuration profile	8.2.7
VDSL channel configuration profile	CR	Parameters used to configure a VDSL channel configuration profile	8.2.6
VDSL channel data	CR	Contains the channel parameters for VDSL fast and slow channels	8.2.4
VDSL line configuration profile	CR	Parameters used to configure a VDSL Line Configuration Profile	8.2.5
VDSL VTU-O channel performance monitoring history data	O	Performance monitoring data for a VDSL VTU-O channel	8.2.10
VDSL VTU-O physical data	CR	Contains the physical layer parameters for a VTU-O	8.2.2
VDSL VTU-O physical interface monitoring history data	O	Monitoring data for a VDSL VTU-O physical interface	8.2.8
VDSL VTU-R channel performance monitoring history data	O	Performance monitoring data for a VDSL VTU-R channel	8.2.11
VDSL VTU-R physical data	CR	Contains the physical layer parameters for a VTU-R	8.2.3
VDSL VTU-R physical interface monitoring history data	O	Monitoring data for a VDSL VTU-R physical interface	8.2.9

6.2   Managed entity diagrams

The relationships between the required xDSL managed entities are given in Figures 1 and 2. Note that Figure 4/G.983.2 provides additional relationships for some of the managed entities described below.
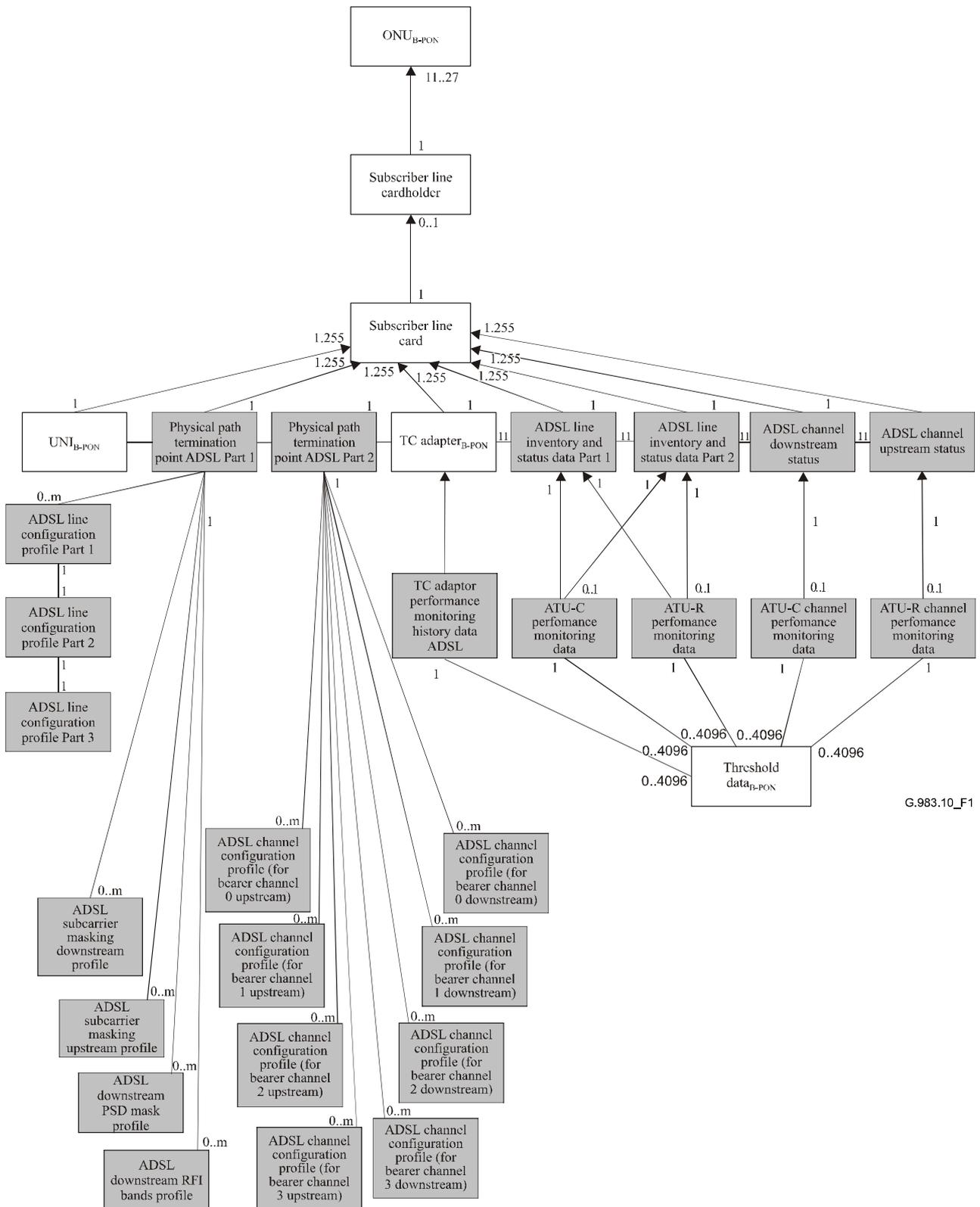
Figure 1/G.983.10 – Managed entity relation diagram for ADSL interfaces
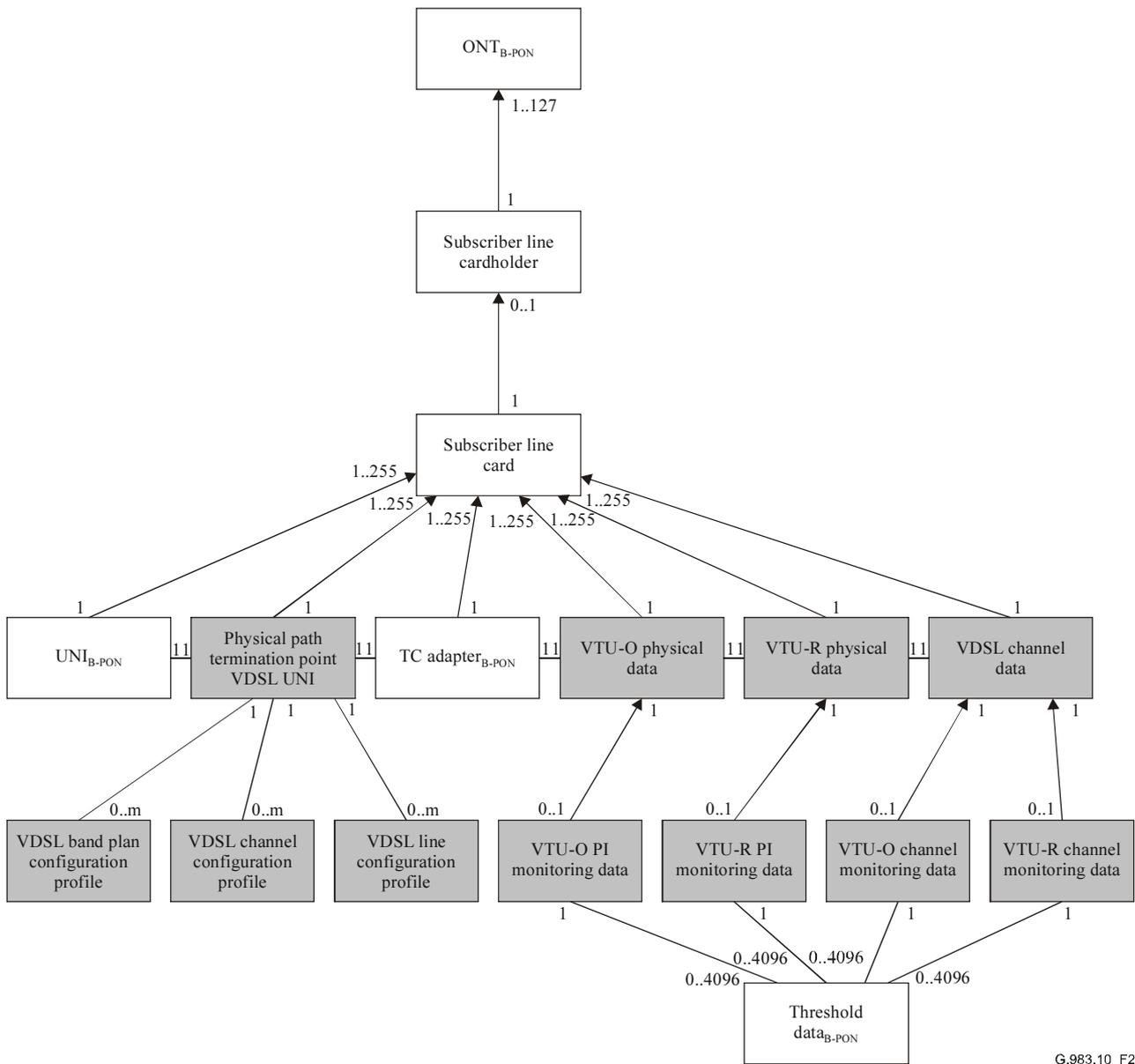
Figure 2/G.983.10 – Managed entity relation diagram for VDSL interfaces

7 Modified managed entities

7.1 Threshold data_{B-PON}

Under the Relationship section of threshold data_{B-PON} ME in ITU-T Rec. G.983.2, add the following managed entities to the existing list of PM managed entities:

- ADSL ATU-C channel performance monitoring history data;

- ADSL ATU-C performance monitoring history data;

- ADSL ATU-R channel performance monitoring history data;

- ADSL ATU-R performance monitoring history data;

- TC adaptor performance monitoring history data ADSL;

- VDSL VTU-O channel performance monitoring history data;

- VDSL VTU-O physical interface monitoring history data;

- VDSL VTU-R channel performance monitoring history data;
- VDSL VTU-R physical interface monitoring history data.

7.2 Traffic Management

To support the efficient control of congestion, the traffic descriptor managed entities described in ITU-T Rec. G.983.2 must be modified. Specifically, a 'FrameDiscard' attribute should be added at the end of the attribute lists to the following managed entity types:

- UBR traffic descriptor;
- SBR1/VBR1 traffic descriptor;
- SBR2/VBR2 traffic descriptor;
- SBR3/VBR3 traffic descriptor;
- ABR traffic descriptor;
- GFR traffic descriptor;
- ABT/DT/IT traffic descriptor;
- UBR+ traffic descriptor.

The attribute will have the following description:

> **FrameDiscard**: This Boolean attribute allows the indication of frame-aware handling. If set to 'false', no special handling is requested. If set to 'true', then the ONU is requested to treat data for this connection as frames (e.g., AAL5 CPCS_PDUs) rather than as individual cells. The treatment must be on a per-VC basis. While the precise implementation is equipment-specific, this treatment may, for example, involve discarding entire frames during congestion, rather than a few cells from many frames. (R, W, Set-by-create) (optional) (1 byte).

8 New managed entities for xDSL management

8.1 ADSL

8.1.1 Physical path termination point ADSL UNI Part 1

This managed entity represents the point at an ATM UNI in the ONU where physical paths terminate to an ADSL CO modem.

One or more instances of this managed entity shall be automatically created/deleted by the ONU upon the creation/deletion of a subscriber line card of ADSL type.

Establishment of a "Physical Path Termination Point ADSL UNI"

The physical path termination point ADSL UNI is automatically created when the subscriber line card of type ADSL is created. On auto creation, the 5 profile pointers within the managed entity are set to their default values of 0x00. However, the PPTP ADSL UNI Part 1 must refer to 5 valid profiles before it can be operational.

Relationships

> One or more instances of this managed entity shall be contained in an instance of a subscriber line card managed entity classified as ADSL type.

Managed Entity ID: This attribute provides a unique number for each instance of this managed entity. This 2-byte number is directly associated with the physical position of the UNI. The first byte is the slot ID (defined in 7.1.3/G.983.2). The second byte is the port ID with a value range from 0x01 to 0xFF (1 to 255): 0x01 is used for the leftmost/lowest port on a subscriber line card, 0x02 is used for the next right/upper port, and so forth. (R) (mandatory) (2 bytes).

Loopback Configuration: This attribute represents the loopback configuration of this physical interface. Value 0x00: no loopback; value 0x01: loopback2 ("Loopback2") refers to a loopback at the ONU to the OLT. The OLT can execute a physical level loopback test after loopback2 is set. Upon autonomous instantiation, the value 0x00 is used. (R, W) (mandatory) (1 byte).

Administrative State: This attribute is used to activate (unlock: value 0x00) and deactivate (lock: value 0x01) the functions performed by instances of this managed entity. Selection of a default value for this attribute is outside the scope of this Recommendation as it is normally handled through supplier-operator negotiations. (R, W) (mandatory) (1 byte).

Operational State: This attribute indicates whether or not this managed entity is capable of performing its task. The operational state reflects the perceived ability to receive or to generate a valid signal. Valid values are enabled (0x00) and disabled (0x01). (R) (optional) (1 byte).

ADSL Line Configuration Profile: This attribute contains the managed entity ID of the ADSL line configuration profiles (part 1, 2, and 3) managed entities that contains the data necessary for initializing an ADSL modem. The value 0x00 is used to indicate that this ME does not point to an ADSL line configuration profile. The value 0x00 is the default value, which is set when this ME is auto created. (R, W) (mandatory) (2 bytes).

ADSL Subcarrier Masking Downstream Profile: This attribute provides a pointer to an instance of the ADSL subcarrier masking downstream profile managed entity that contains the data necessary for initializing an ADSL modem. The value 0x00 is used to indicate that this ME does not point to an ADSL subcarrier masking downstream profile. The value 0x00 is the default value, which is set when this ME is auto created. (R, W) (mandatory) (2 bytes).

ADSL Subcarrier Masking Upstream Profile: This attribute provides a pointer to an instance of the ADSL subcarrier masking upstream profile managed entity that contains the data necessary for initializing an ADSL modem. The value 0x00 is used to indicate that this ME does not point to an ADSL subcarrier masking upstream profile. The value 0x00 is the default value, which is set when this ME is auto created. (R, W) (mandatory) (2 bytes).

ADSL Downstream PSD Mask Profile: This attribute provides a pointer to an instance of the ADSL downstream PSD mask profile managed entity that contains the data necessary for initializing an ADSL modem. The value 0x00 is used to indicate that this ME does not point to an ADSL downstream PSD mask profile. The value 0x00 is the default value, which is set when this ME is auto created. (R, W) (mandatory) (2 bytes).

ADSL Downstream RFI Bands Profile: This attribute provides a pointer to an instance of the ADSL downstream RFI bands profile managed entity that contains the data necessary for initializing an ADSL modem. The value 0x00 is used to indicate that this ME does not point to an ADSL downstream RFI bands profile. The value 0x00 is the default value, which is set when this ME is auto created. (R, W) (mandatory) (2 bytes).

ARC: This attribute is used to control alarm reporting from this managed entity. Valid values are "off" (alarm reporting allowed immediately) and "on" (alarm reporting inhibited). Upon initial installation and provisioning of the ONU, this attribute may be set to "on" or "off" for the time interval specified by "ARCInterval". Similarly, this attribute may be set to "off". If the attribute is set to "on", then alarm reporting is inhibited until this managed entity detects a valid signal for the time interval specified by "ARCInterval". The default value is ON. (R, W) (optional) (1 byte).

ARCInterval: This attribute provides a provisionable length of time. Units are given in minutes. The default value is 2. (R, W) (optional) (1 byte).

Actions

Get: Get one or more attributes.

Set: Set one or more attributes.

Notifications

Attribute value change: This notification is used to report autonomous changes of attributes of this managed entity. The notification shall identify the attribute and its new value. The AVCs for this managed entity are given in Table 2.

Table 2/G.983.10 – AVC list for physical path termination point ADSL UNI

Number	AVC	Description
1-2	N/A	
3	OpState	Operational state
4-10	N/A	
11-16	Reserved	

Alarm: This notification is used to notify the management system when a failure has been detected or cleared. Both ONU and OLT should know the alarm list used by this entity. The alarms for this entity are given in Table 3.

**Table 3/G.983.10 – Alarm list for physical path
termination point ADSL UNI**

Number	Event	Description
	Alarm	
0	NE_LOF	Near end loss of frame
1	NE_LOS	Near end loss of signal
2	NE_LOL	Near end loss of link
3	NE_LPR	Near end loss of power
4	CARD_ALM	Card in alarm
5	FE_LOF	Far end loss of frame
6	FE_LOS	Far end loss of signal
7	FE_LOL	Far end loss of link
8	FE_LPR	Far end loss of power
9	DRT_UP	Data rate threshold up-shift alarm
10	DRT_DOWN	Data rate threshold down-shift alarm

8.1.2 Physical path termination point ADSL UNI part 2

This managed entity represents the point at an ATM UNI in the ONU where physical paths terminate to an ADSL CO modem.

One or more instances of this managed entity shall be automatically created/deleted by the ONU upon the creation/deletion of a subscriber line card of ADSL type.

Establishment of a "Physical Path Termination Point ADSL UNI"

The physical path termination point ADSL UNI is automatically created when the subscriber line card of type ADSL is created. On auto creation, the 8 profile pointers within the managed entity are set to their default values of 0x00. However, the PPTP ADSL UNI Part 2 must refer to at least 2 valid profiles before it can be operational.

Relationships

> One or more instances of this managed entity shall be contained in an instance of a subscriber line card managed entity classified as ADSL type.

Attributes

> **Managed Entity ID**: This attribute provides a unique number for each instance of this managed entity. This 2-byte number is directly associated with the physical position of the UNI. The first byte is the slot ID (defined in 7.1.3/G.983.2). The second byte is the port ID with a value range from 0x01 to 0xFF (1 to 255): 0x01 is used for the leftmost/lowest port on a subscriber line card, 0x02 is used for the next right/upper port, and so forth. (R) (mandatory) (2 bytes).

> **ADSL Channel Configuration Profile (For Bearer Channel 0 Downstream)**: This attribute provides a pointer to an instance of the ADSL channel configuration profile managed entity for bearer channel 0 downstream that contains the data necessary for initializing an ADSL modem. The value 0x00 is used to indicate that this ME does not point to an ADSL channel configuration profile. The value 0x00 is the default value, which is set when this ME is auto created. (R, W) (optional) (2 bytes).

> **ADSL Channel Configuration Profile (For Bearer Channel 1 Downstream)**: This attribute provides a pointer to an instance of the ADSL channel configuration profile managed entity for bearer channel 1 downstream that contains the data necessary for initializing an ADSL modem. The value 0x00 is used to indicate that this ME does not point to an ADSL channel configuration profile. The value 0x00 is the default value, which is set when this ME is auto created. (R, W) (optional) (2 bytes).

> **ADSL Channel Configuration Profile (For Bearer Channel 2 Downstream)**: This attribute provides a pointer to an instance of the ADSL channel configuration profile managed entity for bearer channel 2 downstream that contains the data necessary for initializing an ADSL modem. The value 0x00 is used to indicate that this ME does not point to an ADSL channel configuration profile. The value 0x00 is the default value, which is set when this ME is auto created. (R, W) (optional) (2 bytes).

> **ADSL Channel Configuration Profile (For Bearer Channel 3 Downstream)**: This attribute provides a pointer to an instance of the ADSL channel configuration profile managed entity for bearer channel 3 downstream that contains the data necessary for initializing an ADSL modem. The value 0x00 is used to indicate that this ME does not point to an ADSL channel configuration profile. The value 0x00 is the default value, which is set when this ME is auto created. (R, W) (optional) (2 bytes).

ADSL Channel Configuration Profile (For Bearer Channel 0 Upstream): This attribute provides a pointer to an instance of the ADSL channel configuration profile managed entity for bearer channel 0 upstream that contains the data necessary for initializing an ADSL modem. The value 0x00 is used to indicate that this ME does not point to an ADSL channel configuration profile. The value 0x00 is the default value, which is set when this ME is auto created. (R, W) (optional) (2 bytes).

ADSL Channel Configuration Profile (For Bearer Channel 1 Upstream): This attribute provides a pointer to an instance of the ADSL channel configuration profile managed entity for bearer channel 1 upstream that contains the data necessary for initializing an ADSL modem. The value 0x00 is used to indicate that this ME does not point to an ADSL channel configuration profile. The value 0x00 is the default value, which is set when this ME is auto created. (R, W) (optional) (2 bytes).

ADSL Channel Configuration Profile (For Bearer Channel 2 Upstream): This attribute provides a pointer to an instance of the ADSL channel configuration profile managed entity for bearer channel 2 upstream that contains the data necessary for initializing an ADSL modem. The value 0x00 is used to indicate that this ME does not point to an ADSL channel configuration profile. The value 0x00 is the default value, which is set when this ME is auto created. (R, W) (optional) (2 bytes).

ADSL Channel Configuration Profile (For Bearer Channel 3 Upstream): This attribute provides a pointer to an instance of the ADSL channel configuration profile managed entity for bearer channel 3 upstream that contains the data necessary for initializing an ADSL modem. The value 0x00 is used to indicate that this ME does not point to an ADSL channel configuration profile. The value 0x00 is the default value, which is set when this ME is auto created. (R, W) (optional) (2 bytes).

Actions

Get: Get one or more attributes.

Set: Set one or more attributes.

Actions

None.

8.1.3 ADSL line inventory and status data Part 1

This managed entity contains Part 1 of the line inventory and status data for an ADSL line. One or more instances of this managed entity shall be automatically created/deleted by the ONU upon the creation/deletion of a subscriber line card of ADSL type.

Relationships

One or more instances of this managed entity shall be contained in an instance of a subscriber line card managed entity classified as ADSL type. All attributes other than managed entity ID will default to zero.

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 physical path termination point ADSL UNI with which this ADSL line inventory data is associated. (R) (mandatory) (2 bytes).

ATU-C G.994.1 Vendor ID: The ATU-C G.994.1 vendor ID is the vendor ID as inserted by the ATU-C in the G.994.1 CL message. It consists of 8 binary octets, including a country code followed by a (regionally allocated) provider code, as defined in ITU-T Rec. T.35. (R) (mandatory) (8 bytes).

ATU-R G.994.1 Vendor ID: The ATU-R G.994.1 vendor ID is the vendor ID as inserted by the ATU-R in the G.994.1 CLR message. It consists of 8 binary octets, with same format as the ATU-C G.994.1 vendor ID (R) (mandatory) (8 bytes).

ATU-C System Vendor ID: The ATU-C system vendor ID is the vendor ID as inserted by the ATU-C in the overhead messages (G.992.3 and G.992.4). It consists of 8 binary octets, with same format as the ATU-C G.994.1 vendor ID. (R) (mandatory) (8 bytes).

ATU-R System Vendor ID: The ATU-R system vendor ID is the vendor ID as inserted by the ATU-R in the embedded operations channel (G.992.1 and G.992.2) and the overhead messages (G.992.3 and G.992.4). It consists of 8 binary octets, with same format as the ATU-C G.994.1 vendor ID (R) (mandatory) (8 bytes).

ATU-C Version Number: The ATU-C version number is the version number as inserted by the ATU-C in the overhead messages (G.992.3 and G.992.4). It is for version control and is vendor-specific information. It consists of up to 16 binary octets (R) (mandatory) (16 bytes).

ATU-R Version Number: The ATU-R version number is the version number as inserted by the ATU-R in the embedded operations channel (G.992.1 and G.992.2) or Overhead Messages (G.992.3 and G.992.4). It is for version control and is vendor-specific information. It consists of up to 16 binary octets. (R) (mandatory) (16 bytes).

ATU-C Serial Number Part 1: The ATU-C serial number is the serial number as inserted by the ATU-C in the overhead messages (G.992.3 and G.992.4). It is vendor-specific information. It consists of up to 32 ASCII characters. This attribute contains the first 16 characters. (R) (mandatory) (16 bytes).

ATU-C Serial Number Part 2: The ATU-C serial number is the serial number as inserted by the ATU-C in the overhead messages (G.992.3 and G.992.4). It is vendor-specific information. It consists of up to 32 ASCII characters. This attribute contains the second 16 characters. (R) (mandatory) (16 bytes).

ATU-R Serial Number Part 1: The ATU-R version number is the version number as inserted by the ATU-R in the embedded operations channel (G.992.1 and G.992.2) or overhead messages (G.992.3 and G.992.4). It is vendor-specific information. It consists of up to 32 ASCII characters. This attribute contains the first 16 characters. (R) (mandatory) (16 bytes).

ATU-R Serial Number Part 2: The ATU-R version number is the version number as inserted by the ATU-R in the embedded operations channel (G.992.1 and G.992.2) or overhead messages (G.992.3 and G.992.4). It is vendor-specific information. It consists of up to 32 ASCII characters. This attribute contains the second 16 characters. (R) (mandatory) (16 bytes).

ATU-C Self Test Results: This parameter defines the ATU-C self-test result. It is coded as a 32-bit integer. The most significant octet of the self-test result is 00hex if the self-test passed, and 01hex if the self-test failed. The interpretation of the other octets is vendor-discretionary and can be interpreted in combination with G.994.1 and system vendor IDs. (R) (mandatory) (4 bytes).

ATU-R Self Test Results: This parameter defines the ATU-R self-test result. It is coded as a 32-bit integer. The most significant octet of the self-test result is 00hex if the self-test passed, and 01hex if the self-test failed. The interpretation of the other octets is vendor-discretionary and can be interpreted in combination with G.994.1 and system vendor IDs. (R) (mandatory) (4 bytes).

ATU-C Transmission System Capability: This parameter defines the ATU-C transmission system capability list of the different coding types. It is coded in a bit-map representation with the bits defined in Table 4. (R) (mandatory) (7 bytes).

ATU-R Transmission System Capability: This parameter defines the ATU-R transmission system capability list of the different coding types. It is coded in a bit-map representation with the bits defined in Table 4. (R) (mandatory) (7 bytes).

Initialization – Success/Failure Cause: This parameter represents the success or failure cause of the last full initialization performed on the line. It is coded as an integer in the 0 to 5 range, coded as follows:

0   Successful

1   Configuration error

This error occurs with inconsistencies in configuration parameters. For example, when the line is initialized in an ADSL transmission system where an ATU does not support the configured maximum delay or the configured minimum or maximum data rate for one or more bearer channels.

2   Configuration not feasible on the line

This error occurs if the minimum data rate cannot be reached on the line with the minimum noise margin, maximum PSD level, maximum delay and maximum bit error ratio for one or more bearer channels.

3   Communication problem

This error occurs e.g., due to corrupted messages or bad syntax messages, or if no common mode can be selected in the G.994.1 handshaking procedure, or due to a timeout.

4   No peer ATU detected

This error occurs if the peer ATU is not powered or not connected, or if the line is too long to allow detection of a peer ATU.

5   Any other or unknown initialization failure cause. (R) (mandatory) (1 byte).

Actions

Get: Get one or more attributes.

Notifications

None.

Table 4/G.983.10 – ATU transmission system table

The following is an explanation of the ATU transmission system capability attributes in the ADSL managed entity. It is coded in a bit-map representation (0 if not allowed, 1 if allowed) with the following definition:

Bit	Representation
Octet 1	
1	ANSI T1.413
2	Annex C of TS 101 388 v1.3.1
3	G.992.1 operation over POTS non-overlapped spectrum (Annex A/G.992.1)
4	G.992.1 operation over POTS overlapped spectrum (Annex A/G.992.1)

Bit	Representation
5	G.992.1 operation over ISDN non-overlapped spectrum (Annex B/G.992.1)
6	G.992.1 operation over ISDN overlapped spectrum (Annex B/G.992.1)
7	G.992.1 operation in conjunction with TCM-ISDN non-overlapped spectrum (Annex C/G.992.1)
8	G.992.1 operation in conjunction with TCM-ISDN overlapped spectrum (Annex C/G.992.1)
Octet 2	
9	G.992.2 operation over POTS non-overlapped spectrum (Annex A/G.992.2)
10	G.992.2 operation over POTS overlapped spectrum (Annex B/G.992.2)
11	G.992.2 operation in conjunction with TCM-ISDN non-overlapped spectrum (Annex C/G.992.2)
12	G.992.2 operation in conjunction with TCM-ISDN overlapped spectrum (Annex C/G.992.2)
13	Reserved
14	Reserved
15	Reserved
16	Reserved
Octet 3	
17	Reserved
18	Reserved
19	G.992.3 operation over POTS non-overlapped spectrum (Annex A/G.992.3)
20	G.992.3 operation over POTS overlapped spectrum (Annex A/G.992.3)
21	G.992.3 operation over ISDN non-overlapped spectrum (Annex B/G.992.3)
22	G.992.3 operation over ISDN overlapped spectrum (Annex B/G.992.3)
23	Reserved
24	Reserved
Octet 4	
25	G.992.4 operation over POTS non-overlapped spectrum (Annex A/G.992.4)
26	G.992.4 operation over POTS overlapped spectrum (Annex A/G.992.4)
27	Reserved
28	Reserved
29	G.992.3 All digital mode operation with non-overlapped spectrum (Annex I/G.992.3)
30	G.992.3 All digital mode operation with overlapped spectrum (Annex I/G.992.3)
31	G.992.3 All digital mode operation with non-overlapped spectrum (Annex J/G.992.3)
32	G.992.3 All digital mode operation with overlapped spectrum (Annex J/G.992.3)
Octet 5	
33	G.992.4 All digital mode operation with non-overlapped spectrum (Annex I/G.992.4)
34	G.992.4 All digital mode operation with overlapped spectrum (Annex I/G.992.4)
35	G.992.3 Reach extended operation over POTS, mode 1 (non-overlapped, wide upstream) (Annex L/G.992.3)

Bit	Representation
36	G.992.3 Reach extended operation over POTS, mode 2 (non-overlapped, narrow upstream) (Annex L/G.992.3)
37	G.992.3 Reach extended operation over POTS, mode 3 (overlapped, wide upstream) (Annex L/G.992.3)
38	G.992.3 Reach extended operation over POTS, mode 4 (overlapped, narrow upstream) (Annex L/G.992.3)
39	G.992.3 Extended upstream operation over POTS non-overlapped spectrum (Annex M/G.992.3)
40	G.992.3 Extended upstream operation over POTS overlapped spectrum (Annex M/G.992.3)
Octet 6	
41	G.992.5 operation over POTS non-overlapped spectrum (Annex A/G.992.5)
42	G.992.5 operation over POTS overlapped spectrum (Annex A/G.992.5)
43	G.992.5 operation over ISDN non-overlapped spectrum (Annex B/G.992.5)
44	G.992.5 operation over ISDN overlapped spectrum (Annex B/G.992.5)
45	Reserved
46	Reserved
47	G.992.5 All digital mode operation with non-overlapped spectrum (Annex I/G.992.5)
48	G.992.5 All digital mode operation with overlapped spectrum (Annex I/G.992.5)
Octet 7	
49	G.992.5 All digital mode operation with non-overlapped spectrum (Annex J/G.992.5)
50	G.992.5 All digital mode operation with overlapped spectrum (Annex J/G.992.5)
51	G.992.5 Extended upstream operation over POTS non-overlapped spectrum (Annex M/G.992.5)
52	G.992.5 Extended upstream operation over POTS overlapped spectrum (Annex M/G.992.5)
53	Reserved
54	Reserved
55	Reserved
56	Reserved

8.1.4   ADSL line inventory and status data Part 2

This managed entity contains Part 2 of the line inventory and status data for an ADSL line. One or more instances of this managed entity shall be automatically created/deleted by the ONU upon the creation/deletion of a subscriber line card of ADSL type.

Relationships

> One or more instances of this managed entity shall be contained in an instance of a subscriber line card managed entity classified as ADSL type.

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 physical path termination point ADSL UNI with which this ATU-R physical data is associated. (R) (mandatory) (2 bytes).

ADSL Transmission System: This parameter defines the transmission system in use. It is coded in bitmap representation with the bits defined in Table 4. (R) (mandatory) (7 bytes).

Line Power Management State: The line has four possible power management states, numbered 0 to 3 and corresponding respectively to:

0 = L0 – Synchronized – This line state (L0) is when the line has full transmission (i.e., showtime).

1 = L1 – Power down data transmission – This line state (L1) is when there is transmission on the line but the net data rate is reduced (e.g., only for OAM and higher layer connection and session control). This state applies to ITU-T Rec. G.992.2 only.

2 = L2 – Power down data transmission – This line state (L2) is when there is transmission on the line but the net data rate is reduced (e.g., only for OAM and higher layer connection and session control). This state applies to ITU-T Recs G.992.3 and G.992.4 only.

3 = L3 – No-power – This line state (L3) is when there is no power transmitted on the line at all. (R) (mandatory) (1 byte).

Downstream Line Attenuation: This parameter is the measured difference in the total power transmitted by the ATU-C and the total power received by the ATU-R over all subcarriers during diagnostics mode and initialization. The downstream line attenuation ranges from 0 (0) to +127 (1270) dB with 0.1 dB steps. A special value (0xFFFF) indicates the line attenuation is out of range to be represented. (R) (mandatory) (2 bytes).

Upstream Line Attenuation: This parameter is the measured difference in dB in the total power transmitted by the ATU-R and the total power received by the ATU-C over all subcarriers during diagnostics mode and initialization. The upstream line attenuation ranges from 0 (0) to +127 (1270) dB with 0.1 dB steps. A special value (0xFFFF) indicates the line attenuation is out of range to be represented. (R) (mandatory) (2 bytes).

Downstream Signal Attenuation: This parameter is the measured difference in the total power transmitted by the ATU-C and the total power received by the ATU-R over all subcarriers during showtime. The downstream line attenuation ranges from 0 (0) to +127 (1270) dB with 0.1 dB steps. A special value (0xFFFF) indicates the line attenuation is out of range to be represented. (R) (mandatory) (2 bytes).

Upstream Signal Attenuation: This parameter is the measured difference in dB in the total power transmitted by the ATU-R and the total power received by the ATU-C over all subcarriers during showtime. The upstream line attenuation ranges from 0 (0) to +127 (1270) dB with 0.1 dB steps. A special value (0xFFFF) indicates the line attenuation is out of range to be represented. (R) (mandatory) (2 bytes).

Downstream Signal-to-Noise Ratio Margin: The downstream signal-to-noise ratio margin is the maximum increase in dB of the noise power received at the ATU-R, such that the BER requirements are met for all downstream bearer channels. The downstream SNR margin ranges from –64 (0) dB to +63 (1280) dB with 0.1 dB steps. A special value (0xFFFF) indicates the parameter is out of range to be represented (R) (mandatory) (2 bytes).

Upstream Signal-to-Noise Ratio Margin: The upstream signal-to-noise ratio margin is the maximum increase in dB of the noise power received at the ATU-C, such that the BER requirements are met for all upstream bearer channels. The upstream SNR margin ranges from –64 (0) dB to +63 (1280) dB with 0.1 dB steps. A special value (0xFFFF) indicates the parameter is out of range to be represented. (R) (mandatory) (2 bytes).

Downstream Maximum Attainable Data Rate: This parameter indicates the maximum downstream net data rate currently attainable by the ATU-C transmitter and the ATU-R receiver. The rate is coded in bit/s. (R) (mandatory) (4 bytes).

Upstream Maximum Attainable Data Rate: This parameter indicates the maximum upstream net data rate currently attainable by the ATU-R transmitter and the ATU-C receiver. The rate is coded in bit/s. (R) (mandatory) (4 bytes).

Downstream Actual Power Spectrum Density: This parameter is the average downstream transmit power spectrum density over the used subcarriers (subcarriers to which downstream user data are allocated) delivered by the ATU-C at the U-C reference point, at the instant of measurement. The power spectrum density level ranges from –90 (0) dBm/Hz to 0 (900) dBm/Hz with 0.1 dB steps. A special value (0xFFFF) indicates the parameter is out of range to be represented. (R) (mandatory) (2 bytes).

Upstream Actual Power Spectrum Density: This parameter is the average upstream transmit power spectrum density over the used subcarriers (subcarriers to which upstream user data are allocated) delivered by the ATU-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 with 0.1 dB steps. A special value (0xFFFF) indicates the parameter is out of range to be represented. (R) (mandatory) (2 bytes).

Downstream Actual Aggregate Transmit Power: This parameter is the total amount of transmit power delivered by the ATU-C at the U-C reference point, at the instant of measurement. The total output power level ranges from –31 (0) dBm to +31 (620) dBm with 0.1 dB steps. A special value (0xFFFF) indicates the parameter is out of range to be represented.

NOTE – The downstream nominal aggregate transmit power may be taken as a best estimate of the parameter. (R) (mandatory) (2 bytes).

Upstream Actual Aggregate Transmit Power: This parameter is the total amount of transmit power delivered by the ATU-R at the U-R reference point, at the instant of measurement. The total output power level ranges from –31 (0) dBm to +31 (620) dBm with 0.1 dB steps. A special value (0xFFFF) indicates the parameter is out of range to be represented.

NOTE – The upstream nominal aggregate transmit power may be taken as a best estimate of the parameter. (R) (mandatory) (2 bytes)

Initialization – Last State Transmitted Downstream: This parameter represents the last successful transmitted initialization state in the downstream direction in the last full initialization performed on the line. Initialization states are defined in the individual ADSL Recommendations and are counted from 0 (if ITU-T Rec. G.994.1 is used) or 1 (if ITU-T Rec. G.994.1 is not used) up to showtime. This parameter must be interpreted along with the ADSL transmission system.

This parameter is available only when, after a failed full initialization, the line diagnostics procedures are activated on the line. Line diagnostics procedures can be activated by the operator of the system (through the line state forced line configuration parameter) or autonomously by the ATU-C or ATU-R. (R) (mandatory) (1 byte).

Initialization – Last State Transmitted Upstream: This parameter represents the last successful transmitted initialization state in the upstream direction in the last full initialization performed on the line. Initialization states are defined in the individual ADSL Recommendations and are counted from 0 (if ITU-T Rec. G.994.1 is used) or 1 (if ITU-T Rec. G.994.1 is not used) up to showtime. This parameter must be interpreted along with the ADSL transmission system.

This parameter is available only when, after a failed full initialization, the line diagnostics procedures are activated on the line. Line diagnostics procedures can be activated by the operator of the system (through the line state forced line configuration parameter) or autonomously by the ATU-C or ATU-R. (R) (mandatory) (1 byte).

Actions

> **Get**: Get one or more attributes.

Notifications

> None.

8.1.5 ADSL channel downstream status data

This managed entity contains the ADSL channel downstream status data. One or more instances of this managed entity shall be automatically created/deleted by the ONU upon the creation/deletion of a subscriber line card of ADSL type.

Relationships

> One or more instances of this managed entity shall be contained in an instance of a subscriber line card managed entity classified as ADSL type.

Attributes

> **Managed Entity ID**: This attribute provides a unique number for each instance of this managed entity. This 2-byte number is directly associated with the physical position of the UNI. The two most significant bits of the first byte are the bearer channel ID. The six least significant bits of the first byte are the slot ID (defined in 7.1.3/G.983.2). The second byte is the port ID with a value range from 0x01 to 0xFF (1 to 255): 0x01 is used for the leftmost/lowest port on a subscriber line card, 0x02 is used for the next right/upper port, and so forth. (R) (mandatory) (2 bytes).

> **Actual Interleaving Delay**: This parameter 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 states. In L1 and L2 states, the parameter contains the interleaving delay in the previous L0 state. This parameter is derived from the S and D parameters as $\lceil S*D \rceil /4$ ms, where "S" is the symbols per codeword, and "D" is the "interleaving depth" and $\lceil x \rceil$ denotes rounding to the higher integer. The actual interleaving delay is coded in ms rounded to the nearest ms. 0-255 ms. (R) (mandatory) (1 byte).

> **Actual Data Rate**: This parameter reports the actual net data rate the bearer channel is operating at excluding rate in L1 and L2 states. In L1 or L2 state, the parameter contains the net data rate in the previous L0 state. The data rate is coded in bit/s. (R) (mandatory) (4 bytes).

> **Previous Data Rate**: This parameter reports the previous net data rate the bearer channel was operating at just before the latest rate change event occurred excluding all transitions between L0 state and L1 or L2 state. A rate change can occur at a power management state transition, e.g., at full or short initialization, fast retrain, or power down or at a dynamic rate adaptation. The rate is coded in bit/s (R) (mandatory) (4 bytes).

Actions

> **Get**: Get one or more attributes.

Notifications

> None.

8.1.6 ADSL channel upstream status data

This managed entity contains the ADSL channel upstream status data.

One or more instances of this managed entity shall be automatically created/deleted by the ONU upon the creation/deletion of a subscriber line card of ADSL type.

Relationships

> One or more instances of this managed entity shall be contained in an instance of a subscriber line card managed entity classified as ADSL type.

Attributes

> **Managed Entity ID**: This attribute provides a unique number for each instance of this managed entity. This 2-byte number is directly associated with the physical position of the UNI. The two most significant bits of the first byte are the bearer channel ID. The six least significant bits of the first byte are the slot ID (defined in 7.1.3/G.983.2). The second byte is the port ID with a value range from 0x01 to 0xFF (1 to 255): 0x01 is used for the leftmost/lowest port on a subscriber line card, 0x02 is used for the next right/upper port, and so forth. (R) (mandatory) (2 bytes).

> **Actual Interleaving Delay**: This parameter 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 states. In L1 and L2 states, the parameter contains the interleaving delay in the previous L0 state. This parameter is derived from the S and D parameters as $\lceil S*D \rceil /4$ ms, where "S" is the symbols per codeword, and "D" is the "interleaving depth" and $\lceil x \rceil$ denotes rounding to the higher integer. The actual interleaving delay is coded in ms (rounded to the nearest ms). (R) (mandatory) (1 byte).

> **Actual Data Rate**: This parameter reports the actual net data rate the bearer channel is operating at excluding rate in L1 and L2 states. In L1 or L2 state, the parameter contains the net data rate in the previous L0 state. The data rate is coded in bit/s. (R) (mandatory) (4 bytes).

> **Previous Data Rate**: This parameter reports the previous net data rate the bearer channel was operating at just before the latest rate change event occurred excluding all transitions between L0 state and L1 or L2 state. A rate change can occur at a power management state transition, e.g., at full or short initialization, fast retrain, or power down or at a dynamic rate adaptation. The rate is coded in bit/s. (R) (mandatory) (4 bytes).

Actions

> **Get**: Get one or more attributes.

Notifications

> None.

8.1.7 ADSL line configuration profile Part 1

This managed entity contains part 1 of the line configuration profile for an ADSL line. An instance of this managed entity is created/deleted on request of the OLT.

Relationships

> Zero or more instances of this managed entity shall exist and may be associated with zero or more instances of the physical path termination point ADSL UNI.

Attributes

> **Managed Entity ID**: This attribute provides a unique number for each instance of this managed entity. The value 0x00 is reserved. (R, Set-by-create) (mandatory) (2 bytes).

ATU Transmission System Enabling: This configuration parameter defines the transmission system coding types to be allowed by the near-end ATU on this line. This parameter only applies to the Q-interface. It is coded in a bit-map representation with the bits defined in Table 4. (R, W, set-by-create) (mandatory) (7 bytes).

Power Management State Forced: This configuration parameter defines the line states to be forced by the near-end ATU on this line. It is coded as an integer value with following definition:

0   Force the line to transition from the L3 idle state to the L0 full-on state. This transition requires the (short) initialization procedures. After reaching the L0 state, the line may transition into or exit from the L2 low power state (if L2 state is enabled). If the L0 state is not reached (after a vendor discretionary number of retries and/or within a vendor discretionary timeout), then an initialization failure occurs. Whenever the line is in the L3 state, attempts shall be made to transition to the L0 state until it is forced into another state through this configuration parameter.

2   Force the line to transition from L0 full on to L2 low power state. This transition requires the entry into L2 mode. This is an out-of-service test value for triggering the L2 mode.

3   Force the line to transition from the L0 full-on or L2 low power state to the L3 idle state. This transition requires the (orderly) shutdown procedure. After reaching the L3 state, the line shall remain in the L3 idle state until it is forced into another state through this configuration parameter. (R, W, set-by-create) (mandatory) (1 byte).

Power Management State Enabling: This configuration parameter defines the line states the ATU-C or ATU-R may autonomously transition to on this line. It is coded in a bit-map representation (0 if not allowed, 1 if allowed) with following definition:

Bit 0:   L3 state (idle state);

Bit 1:   L1/L2 state (low power state);

(R, W, set-by-create) (mandatory) (1 byte).

Downstream Target Noise Margin: This is the noise margin the ATU-R receiver shall achieve, relative to the BER requirement for each of the downstream bearer channels, or better, to successfully complete initialization. The target noise margin ranges from 0 (0) to 31 (310) dB with 0.1 dB steps. (R, W, set-by-create) (mandatory) (2 bytes).

Upstream Target Noise Margin: This is the noise margin the ATU-C receiver shall achieve, relative to the BER requirement for each of the upstream bearer channels, or better, to successfully complete initialization. The target noise margin ranges from 0 (0) to 31 (310) dB with 0.1 dB steps. (R, W, set-by-create) (mandatory) (2 bytes).

Downstream Maximum Noise Margin: This is the maximum noise margin the ATU-R receiver shall try to sustain. If the noise margin is above this level, the ATU-R shall request the ATU-C to reduce the ATU-C transmit power to get a noise margin below this limit (if this functionality is supported). The maximum noise margin ranges from 0 (0) to 31 (310) dB with 0.1 dB steps. A special value of 0xFFFF is used to indicate that no maximum noise margin limit is to be applied. (R, W, Set-by-create) (mandatory) (2 bytes).

Upstream Maximum Noise Margin: This is the maximum noise margin the ATU-C receiver shall try to sustain. If the noise margin is above this level, the ATU-C shall request the ATU-R to reduce the ATU-R transmit power to get a noise margin that is below this limit (if this functionality is supported). The maximum noise margin ranges from 0 (0) to 31 (310) dB with 0.1 dB steps. A special value of 0xFFFF is used to indicate that no maximum noise margin limit is to be applied. (R, W, Set-by-create) (mandatory) (2 bytes).

Downstream Minimum Noise Margin: This is the minimum noise margin the ATU-R receiver shall tolerate. If the noise margin falls below this level, the ATU-R shall request the ATU-C to increase the ATU-C transmit power. If an increase of ATU-C transmit power is not possible, a loss-of-margin (LOM) defect occurs, the ATU-R shall fail and attempt to re-initialize and the NMS shall be notified. The minimum noise margin ranges from 0 (0) to 31 (310) dB with 0.1 dB steps. (R, W, set-by-create) (mandatory) (2 bytes).

Upstream Minimum Noise Margin: This is the minimum noise margin the ATU-C receiver shall tolerate. If the noise margin falls below this level, the ATU-C shall request the ATU-R to increase the ATU-R transmit power. If an increase of ATU-R transmit power is not possible, a loss-of-margin (LOM) defect occurs, the ATU-C shall fail and attempt to re-initialize and the NMS shall be notified. The minimum noise margin ranges from 0 (0) to 31 (310) dB with 0.1 dB steps (R, W, set-by-create) (mandatory) (2 bytes).

Downstream Rate Adaptation Mode: This parameter specifies the mode of operation of a rate-adaptive ATU-C in the transmit direction. The parameter can take three values.

1 = Mode **1**: MANUAL – Rate changed manually.

At startup:

The downstream minimum data rate parameter specifies the data rate the ATU-C transmitter shall operate at for each of the bearer channels, with a downstream noise margin which is at least as large as the specified downstream target noise margin, relative to the required BER for each of the downstream bearer channels, or better. If the ATU-C fails to achieve the downstream minimum data rate for one of the bearer channels, the ATU-C will fail to initialize, and the NMS will be notified. Although the ATU-C and the line might be able to support a higher data rate, the ATU-C shall not transmit a higher data rate than what is requested for each of the bearer channels.

At showtime:

The ATU-C transmitter shall maintain the specified downstream minimum data rate for each of the bearer channels.

2 = Mode **2**: AT_INIT– Rate automatically selected at startup only and does not change after that.

At startup:

The downstream minimum data rate parameter specifies the minimum data rate the ATU-C transmitter shall operate at for each of the bearer channels, with a downstream noise margin which is at least as large as the specified downstream target noise margin, relative to the required BER for each of the bearer channels, or better. If the ATU-C fails to achieve the downstream minimum data rate for one of the bearer channels, the ATU-C will fail to initialize, and the NMS will be notified. If the ATU-C transmitter is able to support a higher downstream data rate at initialization, the excess data rate will be distributed amongst the downstream bearer channels according to the ratio (0 to 100%) specified by the rate adaptation ratio parameter for each bearer channel (adding up to 100% over all bearer channels). When the downstream maximum data Rate is achieved in one of the bearer channels, then the remaining excess bit rate is assigned to the other bearer channels, still according to their relative rate adaptation ratio parameters. As long as the downstream data rate is below the downstream maximum data rate for one of the bearer channels, data rate increase shall take priority over transmit power reduction.

At showtime:

During showtime, no downstream data rate adaptation is allowed. The downstream data rate, which has been settled during initialization for each of the bearer channels, shall be maintained.

3 = Mode **3**: DYNAMIC – Data rate is automatically selected at initialization and is continuously adapted during operation (showtime). The DYNAMIC rate adaptation mode is optional. All related configuration parameters are also optional.

At startup:

In Mode 3, the ATU-C shall start up as in Mode 2.

At showtime:

During showtime, rate adaptation is allowed with respect to the rate adaptation ratio for distributing the excess data rate amongst the bearer channels (see Mode 2), and assuring that the downstream minimum data rate remains available at the required BER for each of the bearer channels, or better. The downstream data rate can vary between the downstream minimum data rate and the downstream maximum data rate. Downstream rate adaptation is performed when the conditions specified for downstream upshift noise margin and downstream upshift interval – or for downstream downshift noise margin and downstream downshift interval – are satisfied. This means:

- For an upshift action: Allowed when the downstream noise margin is above the downstream upshift noise margin during downstream minimum time interval for upshift rate adaptation (i.e., upon RAU anomaly).

- For a downshift action: Allowed when the downstream noise margin is below the downstream downshift noise margin during downstream minimum time interval for downshift rate adaptation (i.e., upon RAD anomaly).

As long as the downstream data rate is below the downstream maximum data rate for one of the bearer channels, data rate increase shall take priority over transmit power reduction. (R, W, set-by-create) (mandatory) (1 byte).

Upstream Rate Adaptation Mode: This parameter specifies the mode of operation of a rate-adaptive ATU-R in the transmit direction. The parameter is used only if the rate-adaptive functionality is supported and can take three values:

1 = MANUAL

2 = AT_INIT

3 = DYNAMIC

The definition of each of the values is identical to their definition in the downstream rate adaptation mode (with replacing of ATU-C with ATU-R and downstream with upstream). (R, W, set-by-create) (mandatory) (1 byte).

Downstream Up-shift Noise Margin: If the downstream noise margin is above the downstream upshift noise margin and stays above that for more than the time specified by the downstream minimum upshift rate adaptation interval, the ATU-R shall attempt to increase the downstream net data rate. The downstream up-shift noise margin ranges from 0 (0) to 31 (310) dB with 0.1 dB steps. (R, W, set-by-create) (optional) (2 bytes).

Upstream Up-shift Noise Margin: If the upstream noise margin is above the upstream up-shift noise margin, and stays above that for more than the time specified by the upstream minimum upshift rate adaptation interval, the ATU-C shall attempt to increase the upstream net data rate. The upstream up-shift noise margin ranges from 0 (0) to 31 (310) dB with 0.1 dB steps. (R, W, set-by-create) (optional) (2 bytes).

Upstream PSD Mask Selection: This configuration parameter defines which upstream PSD mask is enabled. This parameter is used only for Annexes J and M of G.992.3/5. As only one selection parameter is defined in the MIB, the same selection value applies to all relevant modes enabled in the ATSE line configuration parameter. It ranges from 1 to 9 and selects the mask with the following definition.

Selected mask		
Upstream PSD mask selection value	Annex J of G.992.3/5	Annex M of G.992.3/5
1	ADLU-32	EU-32
2	ADLU-36	EU-36
3	ADLU-40	EU-40
4	ADLU-44	EU-44
5	ADLU-48	EU-48
6	ADLU-52	EU-52
7	ADLU-56	EU-56
8	ADLU-60	EU-60
9	ADLU-64	EU-64

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

Minimum Overhead Rate Upstream: This attribute defines the minimum rate of the message-based overhead that shall be maintained by the ATU in upstream direction. MSGMINus is expressed in bits per second and ranges from 4000 to 64 000 bit/s. This attribute is only valid for ITU-T Recs G.992.3, G.992.4 and G.992.5. (R, W, set-by-create) (optional) (2 bytes).

Minimum Overhead Rate Downstream: This attribute defines the minimum rate of the message-based overhead that shall be maintained by the ATU in downstream direction. MSGMINds is expressed in bits per second and ranges from 4000 to 64 000 bit/s. This attribute is only valid for ITU-T Recs G.992.3, G.992.4 and G.992.5. (R, W, set-by-create) (optional) (2 bytes).

Actions

Create: Create an instance of this managed entity.

Delete: Delete an instance of this managed entity.

Get: Get one or more attributes.

Set: Set one or more attributes.

Notifications

None.

8.1.8   ADSL line configuration profile Part 2

This managed entity contains part 2 of the line configuration profile for an ADSL line. An instance of this managed entity is created/deleted on request of the OLT.

Relationships

Zero or more instances of this managed entity shall exist and may be associated with zero or more instances of the physical path termination point ADSL UNI.

Attributes

Managed Entity ID: This attribute provides a unique number for each instance of this managed entity. The value 0x00 is reserved. (R, Set-by-create) (mandatory) (2 bytes).

Downstream Minimum Time Interval for Up-shift Rate Adaptation: This parameter defines the interval of time the downstream noise margin should stay above the downstream

up-shift noise margin before the ATU-R shall attempt to increase the downstream net data rate. The time interval ranges from 0 to 16 383 s. (R, W, set-by-create) (optional) (2 bytes).

Upstream Minimum Time Interval for Up-shift Rate Adaptation: This parameter defines the interval of time the upstream noise margin should stay above the upstream up-shift noise margin before the ATU-C shall attempt to increase the upstream net data rate. The time interval ranges from 0 to 16 383 s. (R, W, set-by-create) (optional) (2 bytes).

Downstream Down-shift Noise Margin: If the downstream noise margin is below the downstream down-shift noise margin, and stays below that for more than the time specified by the downstream minimum downshift rate adaptation interval, the ATU-R shall attempt to decrease the downstream net data rate. The downstream down-shift noise margin ranges from 0 (0) to 31 (310) dB with 0.1 dB steps. (R, W, set-by-create) (optional) (2 bytes).

Upstream Down-shift Noise Margin: If the upstream noise margin is below the upstream down-shift noise margin and stays below that for more than the time specified by the upstream minimum downshift rate adaptation interval, the ATU-C shall attempt to decrease the upstream net data rate. The upstream down-shift noise margin ranges from 0 (0) to 31 (310) dB with 0.1 dB steps. (R, W, set-by-create) (optional) (2 bytes).

Downstream Minimum Time Interval for Downshift Rate Adaptation: This parameter defines the interval of time the downstream noise margin should stay below the downstream down-shift noise margin before the ATU-R shall attempt to decrease the downstream net data rate. The time interval ranges from 0 to 16 383 s. (R, W, set-by-create) (optional) (2 bytes).

Upstream Minimum Time Interval for Downshift Rate Adaptation: This parameter defines the interval of time the upstream noise margin should stay below the upstream downshift noise margin before the ATU-C shall attempt to decrease the upstream net data rate. The time interval ranges from 0 to 16 383 s. (R, W, set-by-create) (optional) (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. It is only valid for ITU-T Recs G.992.3 (Annex A), G.992.4 (Annex A) and G.992.5 (Annex A). 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) (mandatory) (1 byte).

L0-TIME: This parameter represents the minimum time (in seconds) between an exit from the L2 state and the next entry into the L2 state. It is only valid for ITU-T Recs G.992.3, G.992.4 and G.992.5. It ranges from 0 to 255 s. (R, W, set-by-create) (mandatory) (1 byte).

L2-TIME: This parameter represents the minimum time (in seconds) between an entry into the L2 state and the first power trim in the L2 state and between two consecutive power trims in the L2 State. It is only valid for ITU-T Recs G.992.3, G.992.4 and G.992.5. It ranges from 0 to 255 s. (R, W, set-by-create) (mandatory) (1 byte).

Downstream Maximum Nominal Power Spectral Density: This parameter represents the maximum nominal transmit PSD in the downstream direction during initialization and showtime (in dBm/Hz). A single MAXNOMPSDds parameter is defined per mode enabled in the ATSE line configuration parameter. It is only valid for ITU-T Recs G.992.3, G.992.4 and G.992.5. It ranges from –60 (0) to –30 (900) dBm/Hz, with 0.1 dB steps. (R, W, set-by-create) (mandatory) (2 bytes).

Upstream Maximum Nominal Power Spectral Density: This parameter represents the maximum nominal transmit PSD in the upstream direction during initialization and showtime (in dBm/Hz). A single MAXNOMPSDus parameter is defined per mode enabled in the ATSE line configuration parameter. It is only valid for ITU-T Recs G.992.3, G.992.4 and G.992.5. It ranges from –60 (0) to –30 (900) dBm/Hz, with 0.1 dB steps. (R, W, set-by-create) (mandatory) (2 bytes).

Downstream Maximum Nominal Aggregate Transmit Power: This parameter represents the maximum nominal aggregate transmit power in the downstream direction during initialization and showtime (in dBm). It is only valid for ITU-T Recs G.992.3, G.992.4 and G.992.5. It ranges from 0 (0) to 25.5 (255) dBm, with 0.1 dB steps. (R, W, set-by-create) (mandatory) (1 byte).

Upstream Maximum Nominal Aggregate Transmit Power: This parameter represents the maximum nominal aggregate transmit power in the upstream direction during initialization and showtime (in dBm). It is only valid for ITU-T Recs G.992.3, G.992.4 and G.992.5. It ranges from 0 (0) to 25.5 (255) dBm, with 0.1 dB steps. (R, W, set-by-create) (mandatory) (1 byte).

Upstream Maximum Aggregate Receive Power: This parameter represents the maximum upstream aggregate receive power over a set of subcarriers (in dBm) as specified in the relevant Recommendation. The ATU-C shall request an upstream power cutback such that the upstream aggregate receive power over that set of subcarriers is at or below the configured maximum value. It is only valid for ITU-T Recs G.992.3, G.992.4 and G.992.5. It ranges from –25.5 (0) to 25.5 (510) dBm, with 0.1 dB steps. A special value of 0xFFFF is used to indicate that no upstream maximum aggregate receive power limit is to be applied. (R, W, set-by-create) (mandatory) (2 bytes).

Actions

Create: Create an instance of this managed entity.

Delete: Delete an instance of this managed entity.

Get: Get one or more attributes.

Set: Set one or more attributes.

Notifications

None.

8.1.9   ADSL line configuration profile Part 3

This managed entity contains part 3 of the line configuration profile for an ADSL line. An instance of this managed entity is created/deleted on request of the OLT.

Relationships

Zero or more instances of this managed entity shall exist and may be associated with zero or more instances of the physical path termination point ADSL UNI.

Attributes

Managed Entity ID: This attribute provides a unique number for each instance of this managed entity. The value 0x00 is reserved. (R, set-by-create) (mandatory) (2 bytes).

Loop Diagnostics Mode Forced: This configuration parameter defines whether the line should be forced into the loop diagnostics mode by the near-end ATU on this line. It is only valid for ITU-T Recs G.992.3, G.992.4 and G.992.5. It is coded as an integer value with following definition:

0   Inhibits the near-end ATU from performing loop diagnostics mode procedures on the line. Loop diagnostic mode procedures may still be initiated by the far-end ATU.

1   Forces the near-end ATU to perform the loop diagnostics procedures.

The line needs to be forced to the L3 state before it can be forced to the loop diagnostics mode. Only while the line power management state is in the L3 state, the line can be forced into the loop diagnostics mode procedures. When the loop diagnostics mode procedures are completed successfully, the access node shall reset the LDSF MIB element to 0 and the line shall return to remain in the L3 idle state. The loop diagnostics data shall be available at least until the line is forced to the L0 state. If the loop diagnostics procedures cannot be completed successfully, (after a vendor-discretionary number of retries and/or within a vendor-discretionary timeout), then an initialization failure occurs. As long as loop diagnostics procedures are not completed successfully, attempts shall be made to do so until the loop diagnostics mode is no longer forced on the line through this configuration parameter. (R, W, set-by-create) (mandatory) (1 byte).

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

Automode is defined as the case where multiple operation-modes are enabled in the MIB in the G.997.1 "ATU Transmission System Enabling (ATSE)" table and where the selection of the operation-mode to be used for transmission does not only depend on the common capabilities of both ATUs (as exchanged in G.994.1), but depends also on achievable data rates under given loop conditions. (R, W, Set-by-create) (mandatory) (1 byte).

L2-ATPR: This parameter represents the maximum aggregate transmit power reduction (in dB) that can be performed in the L2 request (i.e., at transition of L0 to L2 state) or through a single power trim in the L2 state. It is only valid for ITU-T Recs G.992.3, G.992.4 and G.992.5. It ranges from 0 (0) dB to 31 (31) dB (R, W, Set-by-create) (mandatory) (1 byte).

L2-ATPRT: This parameter represents the total maximum aggregate transmit power reduction (in dB) that can be performed in an L2 state. This is the sum of all reductions of L2 request (i.e., at transition of L0 to L2 state) and power trims. It ranges from 0 (0) dB to 31 (31) dB. (R, W, set-by-create) (mandatory) (1 byte).

Actions

Create: Create an instance of this managed entity.

Delete: Delete an instance of this managed entity.

Get: Get one or more attributes.

Set: Set one or more attributes.

Notifications

None.

8.1.10 ADSL channel configuration profile

This managed entity contains the channel configuration profile for an ADSL line. An instance of this managed entity is created/deleted on request of the OLT.

Relationships

Zero or more instances of this managed entity shall exist and may be associated with zero

or more instances of the physical path termination point ADSL UNI.

Attributes

Managed Entity ID: This attribute provides a unique number for each instance of this managed entity. The value 0x00 is reserved. (R, set-by-create) (mandatory) (2 bytes).

Minimum Data Rate: This parameter specifies the minimum net data rate for the bearer channel as desired by the operator of the system. The rate is coded in bit/s. (R, set-by-create) (mandatory) (4 bytes).

Maximum Data Rate: This parameter specifies the maximum net data rate for the bearer channel as desired by the operator of the system. The data rate is coded in bit/s. (R, set-by-create) (mandatory) (4 bytes).

Rate Adaptation Ratio: This parameter (expressed in %) specifies the ratio that should be taken into account for the bearer channel when performing rate adaptation in the direction of the bearer channel. The ratio is defined as a percentage in the 0 to 100 range. A ratio of 20% means that 20% of the available data rate (in excess of the minimum data rate summed over all bearer channels) will be assigned to this bearer channel and 80% to the other bearer channels.

The sum of rate adaptation ratios over all bearers in one direction shall be equal to 100%. (R, set-by-create) (optional) (1 byte).

Maximum Interleaving Delay: This parameter 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 ADSL Recommendations as $\lceil S*D \rceil /4$ ms, where "S" is the S-factor and "D" is the "Interleaving Depth" and $\lceil x \rceil$ denotes rounding to the higher integer.

The ATUs shall 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, with the value 0 and 1 special values. The value 0 indicates no delay bound is being imposed. The value 1 indicates the fast latency path shall be used in the G.992.1 operating mode and S and D shall be selected such that $S \leq 1$ and $D = 1$ in G.992.2, G.992.3 and G.992.4 operating modes. Value range: 2-255. (R, set-by-create) (mandatory) (1 byte).

Data Rate Threshold Up-shift: This parameter is a threshold on the net data rate up-shift achieved over one or more bearer channel data rate adaptations. An up-shift 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) (4 bytes).

Data Rate Threshold Down-shift: This parameter is a threshold on the net data rate down-shift achieved over one or more bearer channel data rate adaptations. A down-shift 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) (4 bytes).

Minimum Reserved Data Rate: This parameter specifies the minimum reserved net data rate for the bearer channel as desired by the operator of the system. The rate is coded in bit/s. (R, set-by-create) (mandatory) (4 bytes).

Minimum Data Rate in low power state: This parameter specifies the minimum net data rate for the bearer channel as desired by the operator of the system during the low power state (L1/L2). The power management low power states L1 and L2 are defined in ITU-T Recs G.992.2 and G.992.3 respectively. The data rate is coded in bit/s. (R, set-by-create) (mandatory) (4 bytes).

Minimum Impulse Noise Protection: This parameter specifies the minimum impulse noise protection for the bearer channel. It is only valid for ITU-T Recs G.992.3, G.992.4 and G.992.5. The impulse noise protection is expressed in symbols and can take the following integer values:

1 = 0 symbol;

2 = ½ symbol;

3 = 1 symbol;

4 = 2 symbols;

(R, set-by-create) (mandatory) (1 byte).

Maximum Bit Error Ratio: This parameter specifies the maximum bit error ratio for the bearer channel as desired by the operator of the system. It is only valid for ITU-T Recs G.992.3, G.992.4 and G.992.5. The bit error ratio can take the following integer values:

1 = 1E-3;

2 = 1E-5;

3 = 1E-7;

(R, set-by-create) (mandatory) (1 byte).

Actions

Create: Create an instance of this managed entity.

Delete: Delete an instance of this managed entity.

Get: Get one or more attributes.

Set: Set one or more attributes.

Notifications

None.

8.1.11 ADSL subcarrier masking downstream profile

This managed entity contains the subcarrier masking downstream profile for an ADSL line. An instance of this managed entity is created/deleted on request of the OLT.

Relationships

Zero or more instances of this managed entity shall exist and may be associated with zero or more instances of the physical path termination point ADSL UNI.

Attributes

Managed Entity ID: This attribute provides a unique number for each instance of this managed entity. The value 0x00 is reserved. (R, set-by-create) (mandatory) (2 bytes).

Downstream Subcarrier Mask1: This configuration parameter is a bitmap representing the downstream mask values for subcarriers 1 to 128. The MSB of the first byte corresponds to subcarrier 1, and the LSB of the last byte corresponds to subcarrier 128.

Each bit position defines whether the corresponding subcarrier is masked on this line in the downstream direction. It is coded as 1 if masked and 0 if not masked (default).

Subcarrier number 1 is the lowest, and subcarrier number NSCds is the highest subcarrier that can be transmitted in the downstream direction.

NOTE – For G.992.3 and G.992.4, the number of subcarrier downstream (NSCds) is defined in the corresponding Recommendations. For ITU-T Rec. G.992.1, NSCds = 256, for ITU-T Rec. G.992.2, NSCds = 128, and for ITU-T Rec. G.992.5, NSCds = 512.

(R, W, set-by-create) (mandatory) (16 bytes).

Downstream Subcarrier Mask2: This configuration parameter is a bitmap representing the downstream mask values for subcarriers 129 to 256. The MSB of the first byte corresponds to subcarrier 129, and the LSB of the last byte corresponds to entry 256.

Each bit position defines whether the corresponding subcarrier is masked on this line in the downstream direction. It is coded as 1 if masked and 0 if not masked (default).

Subcarrier number 1 is the lowest, and subcarrier number NSCds is the highest subcarrier that can be transmitted in the downstream direction.

NOTE – For G.992.3 and G.992.4, the number of subcarrier downstream (NSCds) is defined in the corresponding Recommendations. For ITU-T Rec. G.992.1, NSCds = 256, for ITU-T Rec. G.992.2, NSCds = 128, and for ITU-T Rec. G.992.5, NSCds = 512.

(R, W) (mandatory for modems that support NSCds > 128) (16 bytes).

Downstream Subcarrier Mask3: This configuration parameter is a bitmap representing the downstream mask values for subcarriers 257 to 384. The MSB of the first byte corresponds to subcarrier 257, and the LSB of the last byte corresponds to entry subcarrier 384.

Each bit position defines whether the corresponding subcarrier is masked on this line in the downstream direction. It is coded as 1 if masked and 0 if not masked (default).

Subcarrier number 1 is the lowest, and subcarrier number NSCds is the highest subcarrier that can be transmitted in the downstream direction.

NOTE – For G.992.3 and G.992.4, the number of subcarrier downstream (NSCds) is defined in the corresponding Recommendations. For ITU-T Rec. G.992.1, NSCds = 256, for ITU-T Rec. G.992.2, NSCds = 128, and for ITU-T Rec. G.992.5, NSCds = 512.

(R, W) (mandatory for modems that support NSCds > 256) (16 bytes).

Downstream Subcarrier Mask4: This configuration parameter is a bitmap representing the downstream mask values for subcarriers 385 to 512. The MSB of the first byte corresponds to subcarrier 385, and the LSB of the last byte corresponds to entry subcarrier 512.

Each bit position defines whether the corresponding subcarrier is masked on this line in the downstream direction. It is coded as 1 if masked and 0 if not masked (default).

Subcarrier number 1 is the lowest, and subcarrier number NSCds is the highest subcarrier that can be transmitted in the downstream direction.

NOTE – For G.992.3 and G.992.4, the number of subcarrier downstream (NSCds) is defined in the corresponding Recommendations. For ITU-T Rec. G.992.1, NSCds = 256, for ITU-T Rec. G.992.2, NSCds = 128, and for ITU-T Rec. G.992.5, NSCds = 512.

(R, W) (mandatory for modems that support NSCds > 384) (16 bytes).

TableValid: This Boolean attribute controls and reports the operational status of this downstream subcarrier mask attributes.

If this attribute is true (coded as 0x01), then the downstream subcarrier mask represented in this ME has been impressed on the DSL equipment.

If this attribute is false (coded as 0x00), then the downstream subcarrier mask represented in this ME has not been impressed on the DSL equipment. Default value is false.

The value of this attribute can be modified by the ONU and OLT, as follows:

If the OLT changes any of the four mask attributes or sets TableValid to false, then TableValid is set to false.

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

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

Actions

> **Get**: Get one or more attributes.
>
> **Set**: Set one or more attributes. Note that setting the mask attributes does not directly change the DSL equipment operating mode, because of the TableValid attribute.

Notifications

> None.

8.1.12 ADSL subcarrier masking upstream profile

This managed entity contains the subcarrier masking upstream profile for an ADSL line. An instance of this managed entity is created/deleted on request of the OLT.

Relationships

> Zero or more instances of this managed entity shall exist and may be associated with zero or more instances of the physical path termination point ADSL UNI.

Attributes

> **Managed Entity ID**: This attribute provides a unique number for each instance of this managed entity. The value 0x00 is reserved. (R, set-by-create) (mandatory) (2 bytes).
>
> **Upstream Subcarrier Mask**: This configuration parameter is a bitmap representing the upstream mask values for subcarriers 1 to 64. The MSB of the first byte corresponds to subcarrier 1, and the LSB of the last byte corresponds to subcarrier 64.
>
> Each bit position defines whether the corresponding subcarrier is masked on this line in the upstream direction. It is coded as 1 if masked and 0 if not masked (default).
>
> Subcarrier number 1 is the lowest, and subcarrier number NSCus is the highest subcarrier that can be transmitted in the upstream direction.
>
> NOTE – For G.992.3 and G.992.4, the number of subcarrier upstream (NSCus) is defined in the corresponding Recommendations. For Annex A/G.992.1 and ITU-T Rec. G.992.2, NSCus = 32, for Annex B/G.992.1, NSCus = 64, and for ITU-T Rec. G.992.5, NSCus = 64.
>
> (R, W, set-by-create) (mandatory) (8 bytes).

Actions

> **Get**: Get one or more attributes.
>
> **Set**: Set one or more attributes. Note that in this case, setting this attribute will result in the mask information being impressed on the DSL equipment immediately.

Notifications

> None.

8.1.13 ADSL downstream PSD mask profile

This managed entity contains the downstream PSD mask profile for an ADSL line. An instance of this managed entity is created/deleted on request of the OLT.

Zero or more instances of this managed entity shall exist and may be associated with zero or more instances of the physical path termination point ADSL UNI.

Attributes

Managed Entity ID: This attribute provides a unique number for each instance of this managed entity. The value 0x00 is reserved. (R, set-by-create) (mandatory) (2 bytes).

Downstream PSD Mask: This configuration parameter is a table where each entry consists of an entry number (1 byte, first entry numbered 1) field, subcarrier index (2 bytes) field, and a MIB PSD mask level (1 byte) field. This table defines the downstream PSD mask applicable at the U-C2 reference point. This MIB PSD mask may impose PSD restrictions in addition to the limit PSD mask defined in the relevant Recommendation (e.g., ITU-T Rec. G.992.5).

The downstream PSD mask in the CO-MIB shall be specified through a set of breakpoints. Each breakpoint shall consist of a subcarrier index i (using the same definition of 'i' as given in 8.1.10) and a MIB PSD mask level (expressed in dBm/Hz) at that subcarrier. The set of breakpoints can then be represented as [(i1, PSD-1), (i2, PSD-2), ... , (iN, PSD-N)]. The MIB PSD mask level field shall be coded as an unsigned integer representing the MIB PSD mask levels 0 (0) dBm/Hz to –95 (190) dBm/Hz, in steps of 0.5 dBm/Hz. The maximum number of breakpoints is 32.

This attribute is only valid for ITU-T Rec. G.992.5.

The requirements for a valid set of breakpoints are defined in the relevant Recommendations (e.g., ITU-T Rec. G.992.5). The entries will have default value of 0x00 for subcarrier index and 0x0 for MIB PSD mask level (i.e., no breakpoints). Table entries for this attribute are added or modified using the set action. Setting an entry with a non-zero subcarrier index and MIB PSD mask level implies insertion into the table. Setting an entry's subcarrier index and MIB PSD mask level to 0 implies deletion from the table, if present.

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

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

If this attribute is true (coded as 0x01), then the downstream PSD mask represented in this ME has been impressed on the DSL equipment.

If this attribute is false (coded as 0x00), then the downstream PSD mask represented in this ME has not been impressed on the DSL equipment. Default value is false.

The value of this attribute can be modified by the ONU and OLT, 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 the TableValid is false and OLT sets TableValid to true, then the ONU will impress the downstream PSD mask data to the DSL equipment.

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

Actions

Get: Get one or more attributes. Latch a snapshot (i.e., copy) of the current downstream PSD mask and use 4 bytes to respond with the size of data which should be obtained using the "Get next" command.

Get next: Get the 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 downstream PSD mask attribute, the set action either adds, modifies, or deletes table entries in downstream PSD mask. A maximum of 7 table entries can be added/modified/deleted by a single set action.

Notifications

None.

8.1.14 ADSL downstream RFI bands profile

This managed entity contains the downstream RFI bands profile for an ADSL line. An instance of this managed entity is created/deleted on request of the OLT.

Relationships

Zero or more instances of this managed entity shall exist and may be associated with zero or more instances of the physical path termination point ADSL UNI.

Attributes

Managed Entity ID: This attribute provides a unique number for each instance of this managed entity. The value 0x00 is reserved. (R, set-by-create) (mandatory) (2 bytes).

Downstream RFI Bands: This configuration parameter is a table where each entry consists of an entry number (1 byte, first entry numbered 1) field, subcarrier index1 (2 bytes) field, and subcarrier index2 (2 bytes) field. The subcarrier indices are defined in 8.1.10. This table defines the subset of downstream RFI bands breakpoints, as specified in downstream PSD mask ME, that shall be used to notch an RFI band. This subset consists of couples of consecutive subcarrier indices belonging to breakpoints [i1;i2], corresponding to the low level of the notch. The maximum number of RFI bands is 32. This attribute is only valid for ITU-T Rec. G.992.5.

The specific interpolation around these points is defined in the relevant Recommendations (e.g., ITU-T Rec. G.992.5). The CO-MIB shall define the RFI notches using breakpoints in the downstream PSD mask ME as specified in the relevant Recommendations (e.g., ITU-T Rec. G.992.5).

The entries will have default value of 0x00 for 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. Setting an entry's subcarrier index1 and subcarrier index2 to 0 implies deletion from the table, if present.

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

TableValid: This Boolean attribute controls and reports the operational status of this downstream RFI bands attribute.

If this attribute is true (coded as 0x01), then the downstream RFI bands represented in this ME have been impressed on the DSL equipment.

If this attribute is false (coded as 0x00), then the downstream RFI bands represented in this ME have not been impressed on the DSL equipment. Default value is false.

The value of this attribute can be modified by the ONU and OLT, as follows:

If the OLT changes any of the RFI bands table entries, or sets TableValid to false, then TableValid is set to false.

If the TableValid is false and OLT sets TableValid to true, then the ONU will impress the downstream RFI bands data to the DSL equipment.

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

Actions

Get: Get one or more attributes. Latch a snapshot (i.e., copy) of the current downstream RFI bands and use 4 bytes to respond with the size of data which should be obtained using the "Get next" command.

Get next: Get the 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 downstream RFI bands attribute, the set action either adds, modifies, or deletes table entries in downstream RFI bands. A maximum of 6 table entries can be added/modified/deleted by a single set action.

Notifications

None.

8.1.15 ADSL ATU-C performance monitoring history data

This managed entity represents the last completed 15-minute interval collected performance monitoring of the ATU-C – ATU-R ADSL modem path as seen from the ATU-C.

Instances of this managed entity are created/deleted by the OLT after an instance of the corresponding physical path termination point ADSL UNI managed entity is created/deleted.

Relationships

One instance of this managed entity can exist for each instance of a physical path termination point ADSL UNI.

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 physical path termination point ADSL UNI with which this ATU-C performance monitoring history data is associated. (R, W, set-by-create) (mandatory) (2 bytes).

Interval End Time: This attribute identifies the most recently finished 15-minute interval. It is a cyclic counter (modulo 0xFF (256)) that is incremented each time a new interval is finished and the attribute counters are updated. The value of this attribute is 0x00 during the first 15-minute interval that starts with the reception of the "synchronize time" action. The value is 0x01 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).

Threshold Data$_{B-PON}$ ID: This attribute provides a pointer to an instance of the Threshold Data$_{B-PON}$ managed entity that contains the threshold values for the performance monitoring data collected by this managed entity. (R, W, set-by-create) (mandatory) (2 bytes).

Loss of Frame Seconds: This attribute is the count of seconds in the previous 15-minute interval when there was loss of framing. (R) (mandatory) (2 bytes).

Loss of Signal Seconds: This attribute is the count of seconds in the previous 15-minute interval when there was loss of signal. (R) (mandatory) (2 bytes).

Loss of Link Seconds: This attribute is the count of seconds in the previous 15-minute interval when there was loss of link. (R) (mandatory) (2 bytes).

Loss of Power Seconds: This attribute is the count of seconds in the previous 15-minute interval when there was loss of power. (R) (mandatory) (2 bytes).

Errored Seconds: This attribute is the count of errored seconds in the previous 15-minute interval. (R) (mandatory) (2 bytes).

Severely Errored Seconds: This attribute is the count of severely errored seconds in the previous 15-minute interval. (R) (mandatory) (2 bytes).

Line Initializations: This attribute is the count of line initializations in the previous 15-minute interval. (R) (mandatory) (2 bytes).

Failed Line Initializations: This attribute is a count of the total number of failed full initializations in the previous 15-minute interval. (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) in the previous 15-minute interval. (R) (optional) (2 bytes).

Failed Short Initializations: This attribute is a count of the total number of failed fast retrains or short initializations in the previous 15-minute interval. (R) (optional) (2 bytes).

FEC Seconds: This attribute is the count of seconds in the previous 15-minute interval when there was a forward error correction anomaly. (R) (mandatory) (2 bytes).

Unavailable Seconds: This attribute is the count of seconds in the previous 15-minute interval the ATU-C was unavailable. (R) (mandatory) (2 bytes).

Actions

Create: Create an instance of this managed entity.

Delete: Delete an instance of this managed entity.

Get: Get one or more attributes.

Get Current Data: Get the current value of one or more attributes.

Set: Set one or more attributes.

Notifications

Threshold Crossing Alert: This notification is used to notify the management system when a Threshold Crossing Alert (TCA) has been detected or cleared. The TCA change notification "on" will be sent at the crossing of the threshold by the actual counter; the TCA change notification "off" will be sent at the end of the 15-min period since that is when the actual counters are reset to 0x00. The event list for this entity is given in Table 5.

Table 5/G.983.10 – ADSL performance monitoring history data

Number	Event	Description	Threshold data counter number (Note)
	Threshold Crossing Alert		
0	Loss of Frame Seconds	Loss of frame seconds threshold crossing	1
1	Loss of Signal Seconds	Loss of signal seconds threshold crossing	2
2	Loss of Link Seconds	Loss of link seconds threshold crossing	3
3	Loss of Power Seconds	Loss of power seconds threshold crossing	4
4	Errored Seconds	Errored seconds threshold crossing	5
5	Severely Errored Seconds	Severely errored seconds threshold crossing	6
6	Line Initializations	Line initializations threshold crossing	7
7	Failed Line Initializations	Failed line initializations threshold crossing	8
8	Short Initializations	Short initializations threshold crossing	9
9	Failed Short Initializations	Failed short initializations threshold crossing	10
10	FEC Seconds	FEC seconds threshold crossing	11
11	Unavailable Seconds	Unavailable seconds threshold crossing	12
12-255	Reserved		
NOTE – This numbering is used with the associated Threshold Data$_{B\text{-}PON}$ managed entity. Threshold data counter 1 indicates the 1st thresholded counter, etc.			

8.1.16 ADSL ATU-R performance monitoring history data

This managed entity represents the last completed 15-minute interval collected performance monitoring of the ATU-C – ATU-R ADSL modem path as seen from the ATU-R.

Instances of this managed entity are created/deleted by the OLT after an instance of the corresponding physical path termination point ADSL UNI managed entity is created/deleted.

Relationships

> One instance of this managed entity can exist for each instance of a physical path termination point ADSL UNI.

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 physical path termination point ADSL UNI with which this ATU-R performance monitoring history data is associated. (R, set-by-create) (mandatory) (2 bytes).

Interval End Time: This attribute identifies the most recently finished 15-minute interval. It is a cyclic counter (modulo 0xFF (256)) that is incremented each time a new interval is finished and the attribute counters are updated. The value of this attribute is 0x00 during the first 15-minute interval that starts with the reception of the "synchronize time" action. The value is 0x01 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).

Threshold Data$_{B-PON}$ ID: This attribute provides a pointer to an instance of the Threshold Data$_{B-PON}$ managed entity that contains the threshold values for the performance monitoring data collected by this managed entity. (R, W, set-by-create) (mandatory) (2 bytes).

Loss of Frame Seconds: This attribute is the count of seconds in the previous 15-minute interval when there was loss of framing. (R) (mandatory) (2 bytes).

Loss of Signal Seconds: This attribute is the count of seconds in the previous 15-minute interval when there was loss of signal. (R) (mandatory) (2 bytes).

Loss of Power Seconds: This attribute is the count of seconds in the previous 15-minute interval when there was loss of power. (R) (mandatory) (2 bytes).

Errored Seconds: This attribute is the count of errored seconds in the previous 15-minute interval. (R) (mandatory) (2 bytes).

Severely Errored Seconds: This attribute is the count of severely errored seconds in the previous 15-minute interval. (R) (mandatory) (2 bytes).

FEC Seconds: This attribute is the count of seconds in the previous 15-minute interval when there was a forward error correction anomaly. (R) (mandatory) (2 bytes).

Unavailable Seconds: This attribute is the count of seconds in the previous 15-minute interval the ATU-R was unavailable. (R) (mandatory) (2 bytes).

Actions

Create: Create an instance of this managed entity.

Delete: Delete an instance of this managed entity.

Get: Get one or more attributes.

Get Current Data: Get the current value of one or more attributes.

Set: Set one or more attributes.

Notifications

Threshold Crossing Alert: This notification is used to notify the management system when a Threshold Crossing Alert (TCA) has been detected or cleared. The TCA change notification "on" will be sent at the crossing of the threshold by the actual counter; the TCA change notification "off" will be sent at the end of the 15-min period since that is when the actual counters are reset to 0x00. The event list for this entity is given in Table 6.

Table 6/G.983.10 – ATU-R performance monitoring history data

Number	Event	Description	Threshold data counter number (Note)
	Threshold Crossing Alert		
0	Loss of Frame Seconds	Loss of frame seconds threshold crossing	1
1	Loss of Signal Seconds	Loss of signal seconds threshold crossing	2
2	Loss of Power Seconds	Loss of power seconds threshold crossing	3
3	Errored Seconds	Errored seconds threshold crossing	4
4	Severely Errored Seconds	Severely errored seconds threshold crossing	5
5	FEC Seconds	FEC seconds threshold crossing	6
6	Unavailable Seconds	Unavailable seconds threshold crossing	7
7-255	Reserved		
NOTE – This numbering is used with the associated Threshold Data$_{B-PON}$ managed entity. Threshold data counter 1 indicates the 1st thresholded counter, etc.			

8.1.17 ADSL ATU-C channel performance monitoring history data

This managed entity represents the last completed 15-minute interval collected performance monitoring of the ATU-C – ATU-R ADSL channel as seen from the ATU-C.

Instances of this managed entity are created/deleted by the OLT after an instance of the corresponding physical path termination point ADSL UNI managed entity is created/deleted.

Relationships

> One instance of this managed entity can exist for each instance of a physical path termination point ADSL UNI.

Attributes

> **Managed Entity ID**: This attribute provides a unique number for each instance of this managed entity. This 2-byte number is directly associated with the physical position of the UNI. The two most significant bits of the first byte are the bearer channel ID. The six least significant bits of the first byte are the slot ID (defined in 7.1.3/G.983.2). The second byte is the port ID with a value range from 0x01 to 0xFF (1 to 255): 0x01 is used for the leftmost/lowest port on a subscriber line card, 0x02 is used for the next right/upper port, and so forth. (R) (mandatory) (2 bytes).

> **Interval End Time**: This attribute identifies the most recently finished 15-minute interval. It is a cyclic counter (modulo 0xFF (256)) that is incremented each time a new interval is finished and the attribute counters are updated. The value of this attribute is 0x00 during the first 15-minute interval that starts with the reception of the "synchronize time" action. The value is 0x01 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).

Threshold Data$_{B-PON}$ ID: This attribute provides a pointer to an instance of the Threshold Data$_{B-PON}$ managed entity that contains the threshold values for the performance monitoring data collected by this managed entity. (R, W, set-by-create) (mandatory) (2 bytes).

Corrected blocks: This attribute is the count of all blocks received with errors that were corrected on this channel within the previous 15-minute interval. (R) (mandatory) (4 bytes).

Uncorrected Blocks: This attribute is the count of all blocks received with uncorrectable errors on this channel within the previous 15-minute interval. (R) (mandatory) (4 bytes).

Transmitted Blocks: This attribute is the count of all encoded blocks transmitted on this channel within the previous 15-minute interval. (R) (mandatory) (4 bytes).

Received Blocks: This attribute is the count of all encoded blocks received on this channel within the previous 15-minute interval. (R) (mandatory) (4 bytes).

Code Violations: This attribute is the count of CRC-8 anomalies in the bearer channel in the previous 15-minute interval. (R) (mandatory) (2 bytes).

Forward Error Corrections: This attribute is the count of FEC anomalies in the bearer channel in the previous 15-minute interval. (R) (mandatory) (2 bytes).

Actions

Create: Create an instance of this managed entity.

Delete: Delete an instance of this managed entity.

Get: Get one or more attributes.

Get Current Data: Get the current value of one or more attributes.

Set: Set one or more attributes.

Notifications

Threshold Crossing Alert: This notification is used to notify the management system when a Threshold Crossing Alert (TCA) has been detected or cleared. The TCA change notification "on" will be sent at the crossing of the threshold by the actual counter; the TCA change notification "off" will be sent at the end of the 15-min period since that is when the actual counters are reset to 0x00. The event list for this entity is given in Table 7.

Table 7/G.983.10 – ATU-C channel performance monitoring history data

Number	Event	Description	Threshold data counter number (Note)
	Threshold Crossing Alert		
0	Corrected Blocks	Corrected blocks threshold crossing	1
1	Uncorrected Blocks	Uncorrected blocks threshold crossing	2
2	Code Violations	Code violation threshold crossing	3
3	Forward Error Corrections	FEC threshold crossing	4
4-255	Reserved		
NOTE – This numbering is used with the associated Threshold Data$_{B-PON}$ managed entity. Threshold data counter 1 indicates the 1st thresholded counter, etc.			

8.1.18 ADSL ATU-R channel performance monitoring history data

This managed entity represents the last completed 15-minute interval collected performance monitoring of the ATU-C – ATU-R ADSL channel as seen from the ATU-R.

Instances of this managed entity are created/deleted by the OLT after an instance of the corresponding physical path termination point ADSL UNI managed entity is created/deleted.

Relationships

> One instance of this managed entity can exist for each instance of a physical path termination point ADSL UNI.

Attributes

> **Managed Entity ID**: This attribute provides a unique number for each instance of this managed entity. This 2-byte number is directly associated with the physical position of the UNI. The two most significant bits of the first byte are the bearer channel ID. The six least significant bits of the first byte are the slot ID (defined in 7.1.3/G.983.2). The second byte is the port ID with a value range from 0x01 to 0xFF (1 to 255): 0x01 is used for the leftmost/lowest port on a subscriber line card, 0x02 is used for the next right/upper port, and so forth. (R) (mandatory) (2 bytes).

> **Interval End Time**: This attribute identifies the most recently finished 15-minute interval. It is a cyclic counter (modulo 0xFF (256)) that is incremented each time a new interval is finished and the attribute counters are updated. The value of this attribute is 0x00 during the first 15-minute interval that starts with the reception of the "synchronize time" action. The value is 0x01 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).

> **Threshold Data$_{B-PON}$ ID**: This attribute provides a pointer to an instance of the Threshold Data$_{B-PON}$ managed entity that contains the threshold values for the performance monitoring data collected by this managed entity. (R, W, Set-by-create) (mandatory) (2 bytes).

> **Corrected blocks**: This attribute is the count of all blocks received with errors that were corrected on this channel within the previous 15-minute interval. (R) (mandatory) (4 bytes).

> **Uncorrected Blocks**: This attribute is the count of all blocks received with uncorrectable errors on this channel within the previous 15-minute interval. (R) (mandatory) (4 bytes).

> **Transmitted Blocks**: This attribute is the count of all encoded blocks transmitted on this channel within the previous 15-minute interval. (R) (mandatory) (4 bytes).

> **Received Blocks**: This attribute is the count of all encoded blocks received on this channel within the previous 15-minute interval. (R) (mandatory) (4 bytes).

> **Code Violations**: This attribute is the count of CRC-8 anomalies in the bearer channel in the previous 15-minute interval. (R) (mandatory) (2 bytes).

> **Forward Error Corrections**: This attribute is the count of FEC anomalies in the bearer channel in the previous 15-minute interval. (R) (mandatory) (2 bytes).

Actions

> **Create**: Create an instance of this managed entity.

> **Delete**: Delete an instance of this managed entity.

> **Get**: Get one or more attributes.

Get Current Data: Get the current value of one or more attributes.

Set: Set one or more attributes.

Notifications

Threshold Crossing Alert: This notification is used to notify the management system when a Threshold Crossing Alert (TCA) has been detected or cleared. The TCA change notification "on" will be sent at the crossing of the threshold by the actual counter; the TCA change notification "off" will be sent at the end of the 15-min period since that is when the actual counters are reset to 0x00. The event list for this entity is given in Table 8.

Table 8/G.983.10 – ATU-R channel performance monitoring history data

Number	Event	Description	Threshold data counter number (Note)
	Threshold Crossing Alert		
0	Corrected Blocks	Corrected blocks threshold crossing	1
1	Uncorrected Blocks	Uncorrected blocks threshold crossing	2
2	Code Violations	Code violation threshold crossing	3
3	Forward Error Corrections	FEC threshold crossing	4
4-255	Reserved		
NOTE – This numbering is used with the associated Threshold Data$_{B-PON}$ managed entity. Threshold data counter 1 indicates the 1st thresholded counter, etc.			

8.1.19 TC Adaptor performance monitoring history data ADSL

This managed entity represents the last completed 15-minute interval collected performance monitoring of the ATU-C – ATU-R ATM data path.

Instances of this managed entity are created/deleted by the OLT after an instance of the corresponding Physical Path Termination Point ADSL UNI managed entity is created/deleted.

Relationships

One instance of this managed entity can exist for each instance of a physical path termination point ADSL UNI.

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 physical path termination point ADSL UNI with which this TC adaptor performance monitoring history data is associated. (R, set-by-create) (mandatory) (2 bytes).

Interval End Time: This attribute identifies the most recently finished 15-minute interval. It is a cyclic counter (modulo 0xFF (256)) that is incremented each time a new interval is finished and the attribute counters are updated. The value of this attribute is 0x00 during the first 15-minute interval that starts with the reception of the "synchronize time" action. The value is 0x01 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).

Threshold Data$_{\text{B-PON}}$ ID: This attribute provides a pointer to an instance of the Threshold Data$_{\text{B-PON}}$ managed entity that contains the threshold values for the performance monitoring data collected by this managed entity. (R, W, set-by-create) (mandatory) (2 bytes).

Near-end HEC violation count: The near-end HEC_violation_count performance parameter is a count of the number of occurrences of a near-end HEC anomaly in the ATM data path. (R) (mandatory) (2 bytes).

Near-end delineated total cell count (CD-P): The near-end delineated_total_cell_count performance parameter is a count of the total number of cells passed through the cell delineation and HEC function process operating on the ATM data path while in the SYNC state. (R) (mandatory) (4 bytes).

Near-end User total cell count: The near-end User_total_cell_count performance parameter is a count of the total number of cells in the ATM data path delivered at the V-C (for ATU-C) or T-R (for ATU-R) interface. (R) (mandatory) (4 bytes).

Near-end Idle Cell Bit Error Count: The near-end idle_bit_error_count performance parameter in a count of the number of bit errors in the idle cell payload received in the ATM data path at the near-end. (R) (mandatory) (2 bytes).

Far-end HEC violation count: The far-end HEC_violation_count performance parameter is a count of the number of occurrences of a far-end HEC anomaly in the ATM data path. (R) (mandatory) (2 bytes).

Far-end delineated total cell count: The far-end delineated_total_cell_count performance parameter is a count of the total number of cells passed through the cell delineation process and HEC function operating on the ATM data path while in the SYNC state. (R) (mandatory) (4 bytes).

Far-end User total cell count: The far-end User_total_cell_count performance parameter is a count of the total number of cells in the ATM data path delivered at the V-C (for ATU-C) or T-R (for ATU-R) interface. (R) (mandatory) (4 bytes).

Far-end Idle Cell Bit Error Count: The far-end idle_bit_error_count performance parameter is a count of the number of bit errors in the idle cell payload received in the ATM data path at the far-end. (R) (mandatory) (2 bytes).

Actions

Create: Create an instance of this managed entity.

Delete: Delete an instance of this managed entity.

Get: Get one or more attributes.

Get Current Data: Get the current value of one or more attributes.

Set: Set one or more attributes.

Notifications

Threshold Crossing Alert: This notification is used to notify the management system when a Threshold Crossing Alert (TCA) has been detected or cleared. The TCA change notification "on" will be sent at the crossing of the threshold by the actual counter; the TCA change notification "off" will be sent at the end of the 15-min period since that is when the actual counters are reset to 0x00. The event list for this entity is given in Table 9.

Table 9/G.983.10 – TC adaptor performance monitoring history data ADSL

Number	Event	Description	Threshold data counter number (Note)
	Threshold Crossing Alert		
0	Near-end HEC violation	Near-end HEC violation count threshold crossing	1
1	Near-end Idle Cell Bit Error Count	Near-end idle cell bit error count threshold crossing	2
2	Far-end HEC violation count	Far-end HEC violation count threshold crossing	3
3	Far-end Idle Cell Bit Error Count	Far-end idle cell bit error count threshold crossing	4
4-255	Reserved		
NOTE – This numbering is used with the associated Threshold Data$_{B-PON}$ managed entity. Threshold data counter 1 indicates the 1st thresholded counter, etc.			

8.2 VDSL

8.2.1 Physical path termination point VDSL UNI

This managed entity represents the point at a VDSL connection in the ONU where physical paths terminate and physical path level functions (e.g., path overhead functions) are performed.

Instances of this managed entity shall be automatically created/deleted by the ONU upon the creation/deletion of a subscriber line card of VDSL type.

If the subscriber line card of VDSL type is a plug-in unit, the number of managed entities automatically created is the maximum number supportable by the subscriber line card slot. This allows the creation of these managed entities before the unit is plugged-in.

Establishment of a "Physical Path Termination Point VDSL UNI"

The physical path termination point VDSL UNI is automatically created when the subscriber line card of type VDSL is created. On auto creation, the three profile pointers within the managed entity are set to their default values of 0x00. However, the PPTP VDSL UNI must refer to three valid profiles before it can be operational.

Relationships

One or more instances of this managed entity shall be contained in an instance of a subscriber line card managed entity classified as VDSL type.

Extensions for VDSL using Single Carrier Modulation (SCM) and Multiple Carrier Modulation (MCM) are for further study.

Attributes

Managed Entity ID: This attribute provides a unique number for each instance of this managed entity. This 2-byte number is directly associated with the physical position of the UNI. The first byte is the slot ID (defined in 7.1.3/G.983.2). The second byte is the port ID with a value range from 0x01 to 0xFF (1 to 255): 0x01 is used for the leftmost/lowest port on a subscriber line card, 0x02 is used for the next right/upper port, and so forth. (R) (mandatory) (2 bytes).

Loopback Configuration: This attribute represents the loopback configuration of this physical interface. Value 0x00: no loopback; value 0x01: loopback2 ("Loopback2" refers to

a loopback at the local VDSL modem). The OLT can execute a physical level loopback test after loopback is set. Upon autonomous instantiation, the value 0x00 is used. (R, W) (mandatory) (1 byte).

Administrative State: This attribute is used to activate (unlock: value 0x00) and deactivate (lock: value 0x01) the functions performed by instances of this managed entity. Selection of a default value for this attribute is outside the scope of this Recommendation as it is normally handled through supplier-operator negotiations. (R, W) (mandatory) (1 byte).

Operational State: This attribute indicates whether or not this managed entity is capable of performing its task. The operational state reflects the perceived ability to receive or to generate a valid signal. Valid values are enabled (0x00) and disabled (0x01). (R) (optional) (1 byte).

Availability State: This attribute indicates whether the hardware to support this UNI is available on the plugged in line card. Valid values are available(0), notAvailable(1), unknown(2). (R) (optional) (1 byte).

VDSL Line Coding Type: This data type is used as the syntax for the VDSL Line Code. Attributes with this syntax identify the line coding used. The three values are: other(1) – none of the following, mcm(2) – multiple carrier modulation, scm(3) – single carrier modulation. (R) (mandatory) (1 byte).

VDSL Line Type: Defines the type of VDSL physical line entity that exists, by defining whether and how the line is channelized. If the line is channelized, the value will be other than noChannel(1). This object defines which channel type(s) are supported. Defined values are noChannel(1) – no channels exist, fastOnly(2) – only fast channel exists, slowOnly(3) – only slow channel exists, fastOrSlow(4) – either fast or slow channels exist, but only one at a time, fastAndSlow(5) – both fast and slow channels exist. (R) (mandatory) (1 byte).

ARC: This attribute is used to control alarm reporting from this managed entity. Valid values are "off" (alarm reporting allowed immediately) and "on" (alarm reporting inhibited). Upon initial installation and provisioning of the ONU, this attribute may be set to "on" or "off" for the time interval specified by "ARCInterval". Similarly, this attribute may be set to "off". If the attribute is set to "on", then alarm reporting is inhibited until this managed entity detects a valid signal for the time interval specified by "ARCInterval". The default value is ON. (R, W) (optional) (1 byte).

ARCInterval: This attribute provides a provisionable length of time. Units are given in minutes. The default value is 2. (R, W) (optional) (1 byte).

VDSL Line Configuration Profile ID: This attribute provides a pointer to an instance of the VDSL line configuration profile managed entity that contains the data necessary for initializing a VDSL modem. The value 0x00 is used to indicate that this ME does not point to a line configuration profile. The default value 0x00 is used when this ME is auto created. (R, W) (mandatory) (2 bytes).

VDSL Channel Configuration Profile ID: This attribute provides a pointer to an instance of the VDSL channel configuration profile managed entity that contains the data necessary for channelizing a VDSL connection. The value 0x00 is used to indicate that this ME does not point to a channel configuration profile. The default value 0x00 is used when this ME is auto created. (R, W) (mandatory) (2 bytes).

VDSL Band Plan Configuration Profile ID: This attribute provides a pointer to an instance of the VDSL band plan configuration profile managed entity that contains the data necessary to set up a VDSL connection. The value 0x00 is used to indicate that this ME does not point to band plan configuration profile. The default value 0x00 is used when this ME is auto created. (R, W) (mandatory) (2 bytes).

Actions

Get: Get one or more attributes.

Set: Set one or more attributes.

Notifications

Attribute value change: This notification is used to report autonomous changes of attributes of this managed entity. The notification shall identify the attribute and its new value. The AVCs for this managed entity are given in Table 10.

Table 10/G.983.10 – AVC list for physical path termination point VDSL UNI

Number	Attribute value change	Description
1-2	N/A	
3	OpState	Operational state
4-11	N/A	
12-16	Reserved	

Alarm: This notification is used to notify the management system when a failure has been detected or cleared. Both ONU and OLT should know the alarm list used by this entity. The alarms for this entity are given in Table 11.

Table 11/G.983.10 – Alarm list for physical path termination point VDSL UNI

Number	Alarm	Description
0	NE_LOF	Near End (VTU-O) Loss of Framing
1	NE_LOS	Near End (VTU-O) Loss of Signal
2	NE_LOP	Near End (VTU-O) Loss of Power
3	NE_LOSQ	Near End (VTU-O) Loss of Signal Quality
4	NE_LOL	Near End (VTU-O) Loss of Link
5	FE_LOF	Far End (VTU-R) Loss of Framing
6	FE_LOS	Far End (VTU-R) Loss of Signal
7	FE_LOP	Far End (VTU-R) Loss of Power
8	FE_LOSQ	Far End (VTU-R) Loss of Signal Quality

8.2.2 VDSL VTU-O physical data

This managed entity represents the physical status of the VDSL Termination Unit (ONU) (VTU-O) in a VDSL connection in the ONU.

An instance of this managed entity shall be automatically created/deleted by the ONU upon the creation/deletion of a subscriber line card of VDSL type.

Relationships

One or more instances of this managed entity shall be contained in an instance of a subscriber line card managed entity classified as VDSL type.

Managed Entity ID: This attribute provides a unique number for each instance of this managed entity. This 2-byte number is directly associated with the physical position of the UNI. The first byte is the slot ID. The second byte is the port ID with a value range from 0x01 to 0xFF (1 to 255). (R) (mandatory) (2 bytes).

Line Transmit Rate: Indicates the current VTU-O line transmit rate in kbit/s. This value will be less than or equal to the current attainable rate.

NOTE – 1 kbit/s = 1000 bit/s.

(R) (mandatory) (4 bytes).

Serial Number Part 1: The vendor-specific string that identifies the vendor equipment. It consists of up to 32 ASCII characters. This attribute contains the first 16 characters. (R) (mandatory) (16 bytes).

Serial Number Part 2: The vendor-specific string that identifies the vendor equipment. It consists of up to 32 ASCII characters. This attribute contains the second 16 characters. (R) (mandatory) (16 bytes).

Vendor ID: The vendor ID code is a copy of the binary vendor identification field expressed as readable characters in hexadecimal notation. (R) (mandatory) (16 bytes).

Version Number: The vendor-specific version number sent by this VTU as part of the initialization messages. It is a copy of the binary version number field expressed as readable characters in hexadecimal notation. (R) (mandatory) (16 bytes).

Current Status: Indicates current state of the VTU-O. This is a bit-map of possible conditions. The various bit positions are:

0 – noDefect – There are no defects on the line.

1 – lossOfFraming – VTU-O failure due to not receiving a valid frame.

2 – lossOfSignal – VTU-O failure due to not receiving signal.

3 – lossOfPower – VTU-O failure due to loss of power.

4 – lossOfSignalQuality – Loss of signal quality is declared when the noise margin falls below the minimum noise margin, or the bit-error-rate exceeds 10^{-7}.

5 – lossOfLink – VTU-O failure due to inability to link with peer VTU. Set whenever the transceiver is in the 'Warm Start' state.

6 – dataInitFailure – VTU-O failure during initialization due to bit errors corrupting startup exchange data.

7 – configInitFailure – VTU-O failure during initialization due to peer VTU not able to support requested configuration.

8 – protocolInitFailure – VTU-O failure during initialization due to incompatible protocol used by the peer VTU.

9 – noPeerVtuPresent – VTU-O failure during initialization due to no activation sequence detected from peer VTU.

(R) (mandatory) (2 bytes).

Current Output Power: Measured total output power transmitted by this VTU in steps of 0.1 dBm. This is the measurement that was reported during the last activation sequence. The effective range is 0 (0) to +16 (160) dBm. (R) (mandatory) (1 byte).

Current SNR Margin: Noise margin as seen by this VTU with respect to its received signal in steps of 0.25 dB. The effective range is –31.75 (–127) to +31.75 (127) dB. (R) (mandatory) (1 byte).

Current Attenuation: Measured difference in the total power transmitted by the peer VTU and the total power received by this VTU. The effective range is 0 (0) to +63.75 (255) dB. (R) (mandatory) (1 byte).

Current Attainable Rate: Indicates the maximum currently attainable line transmit rate by the VTU-O in kbit/s. This value will be equal to or greater than the current line rate.

NOTE – 1 kbit/s = 1000 bit/s.

(R) (mandatory) (4 bytes).

Current Loop Length Estimate: Estimated loop length in feet assuming a 26 AWG (0.4 mm) loop. (R) (mandatory) (2 bytes).

Actions

Get: Get one or more attributes.

Notifications

None.

8.2.3 VDSL VTU-R physical data

This managed entity represents the physical status of the VDSL termination unit (Remote) (VTU-R) in a VDSL connection in the ONU.

An instance of this managed entity shall be automatically created/deleted by the ONU upon the creation/deletion of a subscriber line card of VDSL type.

Relationships

One or more instances of this managed entity shall be contained in an instance of a subscriber line card managed entity classified as VDSL type.

Attributes

Managed Entity ID: This attribute provides a unique number for each instance of this managed entity. This 2-byte number is directly associated with the physical position of the UNI. The first byte is the slot ID. The second byte is the port ID with a value range from 0x01 to 0xFF (1 to 255). (R) (mandatory) (2 bytes).

Line Transmit Rate: Indicates the current VTU-R line transmit rate in kbit/s. This value will be less than or equal to the current attainable rate.

NOTE – 1 kbit/s = 1000 bit/s.

(R) (mandatory) (4 bytes).

Serial Number Part 1: The vendor-specific string that identifies the vendor equipment. This attribute contains the first 16 characters. (R) (mandatory) (16 bytes).

Serial Number Part 2: The vendor-specific string that identifies the vendor equipment. It consists of up to 32 ASCII characters. This attribute contains the second 16 characters. (R) (mandatory) (16 bytes).

Vendor ID: The vendor ID code is a copy of the binary vendor identification field expressed as readable characters in hexadecimal notation. (R) (mandatory) (16 bytes).

Version Number: The vendor-specific version number sent by this VTU as part of the initialization messages. It is a copy of the binary version number field expressed as readable characters in hexadecimal notation. (R) (mandatory) (16 bytes).

Current Status: Indicates current state of the VTU line. This is a bit-map of possible conditions. The various bit positions are:

0 – noDefect – There are no defects on the line.

1 – lossOfFraming – VTU failure due to not receiving a valid frame.

2 – lossOfSignal – VTU failure due to not receiving signal.

3 – lossOfPower – VTU failure due to loss of power.

4 – lossOfSignalQuality – Loss of signal quality is declared when the noise margin falls below the minimum noise margin, or the bit-error-rate exceeds 10^{-7}.

(R) (mandatory) (1 byte).

Current Output Power: Measured total output power transmitted by this VTU in steps of 0.1 dBm. This is the measurement that was reported during the last activation sequence. The effective range is 0 (0) to +16 (160) dBm. (R) (mandatory) (1 byte).

Current SNR margin: Noise margin as seen by this VTU with respect to its received signal in steps of 0.25 dB. The effective range is −31.75 (−127) to +31.75 (127) dB.

(R) (mandatory) (1 byte).

Current Attenuation: Measured difference in the total power transmitted by the peer VTU and the total power received by this VTU. The effective range is 0 (0) to +63.75 (255) dB. (R) (mandatory) (1 byte).

Current Attainable Rate: Indicates the maximum currently attainable line transmit rate by the VTU-R in kbit/s. This value will be equal to or greater than the current line rate.

NOTE – 1 kbit/s = 1000 bit/s.

(R) (mandatory) (4 bytes).

Actions

Get: Get one or more attributes.

Notifications

None.

8.2.4 VDSL channel data

This managed entity represents the physical status of the VDSL fast and slow channels in a VDSL connection in the ONU.

An instance of this managed entity shall be automatically created/deleted by the ONU upon the creation/deletion of a subscriber line card of VDSL type.

Relationships

One or more instances of this managed entity shall be contained in an instance of a subscriber line card managed entity classified as VDSL type.

Attributes

Managed Entity ID: This attribute provides a unique number for each instance of this managed entity. This 2-byte number is directly associated with the physical position of the UNI. The first byte is the slot ID. The second byte is the port ID with a value range from 0x01 to 0xFF (1 to 255). (R) (mandatory) (2 bytes).

Current Interleave Delay Down: Downstream interleave delay for this channel in milliseconds. Interleave delay defines the mapping (relative spacing) between subsequent input bytes at the interleaver input and their placement in the bit stream at the interleaver

output. Larger numbers provide greater separation between consecutive input bytes in the output bit stream allowing for improved impulse noise immunity at the expense of payload latency. (R) (mandatory) (1 byte).

Current Fast Payload Rate Down: Actual fast channel downstream data rate, in kbit/s.

NOTE – 1 kbit/s = 1000 bit/s.

(R) (mandatory) (4 bytes).

Current Slow Payload Rate Down: Actual slow channel downstream data rate, in kbit/s.

NOTE – 1 kbit/s = 1000 bit/s.

(R) (mandatory) (4 bytes).

Current Fast CRC Block Length Down: Indicates the length of the downstream fast channel data-block, in bytes, on which the CRC operates. (R) (mandatory) (2 bytes).

Current Slow CRC Block Length Down: Indicates the length of the downstream slow channel data-block, in bytes, on which the CRC operates. (R) (mandatory) (2 bytes).

Current Slow Burst Protect Down: Actual level of downstream impulse noise (burst) protection, in microseconds, for the slow channel. (R) (mandatory) (2 bytes).

Current Fast FEC Down: Actual downstream Forward Error Correction (FEC) redundancy, in per cent, related overhead for the fast channel. (R) (mandatory) (1 byte).

Current Interleave Delay Up: Upstream interleave delay for this channel in milliseconds. Interleave delay applies only to the interleave (slow) channel and defines the mapping (relative spacing) between subsequent input bytes at the interleaver input and their placement in the bit stream at the interleaver output. Larger numbers provide greater separation between consecutive input bytes in the output bit stream allowing for improved impulse noise immunity at the expense of payload latency.

In the case where the interface type is fast, return a value of zero. (R) (mandatory) (1 byte).

Current Fast Payload Rate Up: Actual fast channel upstream data rate, in kbit/s.

NOTE – 1 kbit/s = 1000 bit/s.

(R) (mandatory) (4 bytes).

Current Slow Payload Rate Up: Actual slow channel upstream data rate, in kbit/s.

NOTE – 1 kbit/s = 1000 bit/s.

(R) (mandatory) (4 bytes).

Current Fast CRC Block Length Up: Indicates the length of the upstream fast channel data-block, in bytes, on which the CRC operates. (R) (mandatory) (2 bytes).

Current Slow CRC Block Length Up: Indicates the length of the upstream slow channel data-block, in bytes, on which the CRC operates. (R) (mandatory) (2 bytes).

Current Slow Burst Protect Up: Actual level of upstream impulse noise (burst) protection, in microseconds, for the slow channel. (R) (mandatory) (2 bytes).

Current Fast FEC Up: Actual upstream Forward Error Correction (FEC) redundancy, in per cent, related overhead for the fast channel. (R) (mandatory) (1 byte).

Actions

Get: Get one or more attributes.

Notifications

None.

8.2.5 VDSL line configuration profile

An instance of this managed entity represents a VDSL line configuration profile supported on the ONU. Zero or more VDSL physical path termination points can reference an instance of a VDSL line configuration profile managed entity.

Instances of this managed entity are created and deleted by the ONU on request of the OLT.

Relationships

> Zero or more instances of this managed entity shall be contained in an ONU. One or more instances of this managed entity shall be contained in an ONU containing instances of physical path termination point VDSL UNI.

Attributes

> **Managed Entity ID**: This attribute provides a unique number for each instance of this managed entity. The value 0x00 is reserved. (R, W, set-by-create) (mandatory) (2 bytes).

> **Down Rate Mode**: Specifies the rate selection behaviour for the line in the downstream direction. manual(1) forces the rate to the configured rate, adaptAtInit(2) adapts the line based upon line quality. (R, W, set-by-create) (mandatory) (1 byte).

> **Up Rate Mode**: Specifies the rate selection behaviour for the line in the upstream direction. manual(1) forces the rate to the configured rate, adaptAtInit(2) adapts the line based upon line quality. (R, W, set-by-create) (mandatory) (1 byte).

> **Down Max Power**: Specifies the maximum aggregate downstream power level in the range 0 (0) to 14.5 dBm (58) in 0.25 dBm intervals. (R, W, set-by-create) (mandatory) (1 byte).

> **Up Max Power**: Specifies the maximum aggregate upstream power level in the range 0 (0) to 14.5 dBm (58) in 0.25 dBm intervals. (R, W, set-by-create) (mandatory) (1 byte).

> **Down Max SNR Margin**: Specifies the maximum downstream signal/noise ratio margin in units of 0.25 dB, for a range of 0 (0) to 31.75 dB (127). (R, W, set-by-create) (mandatory) (1 byte).

> **Down Min SNR Margin**: Specifies the minimum downstream signal/noise ratio margin in units of 0.25 dB, for a range of 0 (0) to 31.75 dB (127). (R, W, set-by-create) (mandatory) (1 byte).

> **Down Target SNR Margin**: Specifies the target downstream signal/noise ratio margin in units of 0.25 dB, for a range of 0 (0) to 31.75 dB (127). This is the noise margin the transceivers must achieve with a BER of 10^{-7} or better to successfully complete initialization. (R, W, set-by-create) (mandatory) (1 byte).

> **Up Max SNR Margin**: Specifies the maximum upstream signal/noise ratio margin in units of 0.25 dB, for a range of 0 (0) to 31.75 dB (127). (R, W, set-by-create) (mandatory) (1 byte).

> **Up Min SNR Margin**: Specifies the minimum upstream signal/noise ratio margin in units of 0.25 dB, for a range of 0 (0) to 31.75 dB (127). (R, W, set-by-create) (mandatory) (1 byte).

> **Up Target SNR Margin**: Specifies the target upstream signal/noise ratio margin in units of 0.25 dB, for a range of 0 (0) to 31.75 dB (127). This is the noise margin the transceivers must achieve with a BER of 10^{-7} or better to successfully complete initialization. (R, W, set-by-create) (mandatory) (1 byte).

> **Down PBO Control**: Downstream power backoff (PBO) control for this line. For transceivers which do not support downstream PBO control, this object MUST be fixed at disabled(1). If auto(2) is selected, the transceiver will automatically adjust the power

backoff. If manual(3) is selected, then the transceiver will use the down PBO level. (R, W, set-by-create) (mandatory) (1 byte).

Up PBO Control: Upstream power backoff (PBO) control for this line. For transceivers which do not support upstream PBO control, this object MUST be fixed at disabled(1). If auto(2) is selected, the transceiver will automatically adjust the power backoff. If manual(3) is selected, then the transceiver will use the up PBO level. (R, W, set-by-create) (mandatory) (1 byte).

Down PBO Level: Specifies the downstream backoff level to be used when down PBO control = manual(3). Valid range is 0 dB (0) to 40 dB (160) in 0.25 dB intervals. (R, W, set-by-create) (mandatory) (1 byte).

Up PBO Level: Specifies the upstream backoff level to be used when up PBO control = manual(3). Valid range is 0 dB (0) to 40 dB (160) in 0.25 dB intervals. (R, W, set-by-create) (mandatory) (1 byte).

Line Type: This parameter provisions the VDSL physical entity at start-up by defining whether and how the line will be channelized, i.e., which channel type(s) are supported. If the line is to be channelized, the value will be other than noChannel(1).

Defined values are noChannel(1) – no channels exist, fastOnly(2) – only the fast channel exists, slowOnly(3) – only the slow channel exists, fastOrSlow(4) – either the fast or the slow channel exists, but only one at a time, fastAndSlow(5) – both fast and slow channels exist. (R, W, set-by-create) (mandatory) (1 byte).

Actions

Create: Create an instance of this managed entity.

Delete: Delete an instance of this managed entity.

Get: Get one or more attributes.

Set: Set one or more attributes.

Notifications

None.

8.2.6   VDSL channel configuration profile

An instance of this managed entity represents a VDSL channel configuration profile supported on the ONU. Zero or more VDSL physical path termination points can reference an instance of a VDSL channel configuration profile managed entity.

Instances of this managed entity are created and deleted by the ONU on request of the OLT.

Relationships

Zero or more instances of this managed entity shall be contained in an ONU. One or more instances of this managed entity shall be contained in an ONU containing instances of physical path termination point VDSL UNI.

Attributes

Managed Entity ID: This attribute provides a unique number for each instance of this managed entity. The value 0x00 is reserved. (R, set-by-create) (mandatory) (2 bytes).

Down Rate Ratio: This attribute is the configured allocation ratio of excess downstream transmit bandwidth between fast and slow channels. Only applies when two channel mode and adaptAtInit are supported. Distribute bandwidth on each channel in excess of the corresponding minimum transmit bit rate so that:

$$\text{Rate Change Ratio} = [\text{Fast} / (\text{Fast} + \text{Slow})] \times 100$$

In other words this value is the fast channel percentage. Valid range is 0 to 100. (R, W, set-by-create) (optional) (1 byte).

Up Rate Ratio: This attribute is the configured allocation ratio of excess upstream transmit bandwidth between fast and slow channels. Only applies when two channel mode and adaptAtInit are supported. Distribute bandwidth on each channel in excess of the corresponding minimum transmit bit rate so that:

$$\text{Rate Change Ratio} = [\text{Fast} / (\text{Fast} + \text{Slow})] \times 100$$

In other words, this value is the fast channel percentage. Valid range is 0 to 100. (R, W, set-by-create) (optional) (1 byte).

Down Slow Max Data Rate: Specifies the maximum downstream slow channel data rate in steps of 64 kbits. The maximum aggregate downstream transmit speed of the line can be derived from the sum of maximum downstream fast and slow channel data rates. (R, W, set-by-create) (mandatory) (2 bytes).

Down Slow Min Data Rate: Specifies the minimum downstream slow channel data rate in steps of 64 kbits. The minimum aggregate downstream transmit speed of the line can be derived from the sum of minimum downstream fast and slow channel data rates. (R, W, set-by-create) (mandatory) (2 bytes).

Up Slow Max Data Rate: Specifies the maximum upstream slow channel data rate in steps of 64 kbits. The maximum aggregate upstream transmit speed of the line can be derived from the sum of maximum upstream fast and slow channel data rates. (R, W, set-by-create) (mandatory) (2 bytes).

Up Slow Min Data Rate: Specifies the minimum upstream slow channel data rate in steps of 64 kbits. The minimum aggregate upstream transmit speed of the line can be derived from the sum of minimum upstream fast and slow channel data rates. (R, W, set-by-create) (mandatory) (2 bytes).

Down Max Interleave Delay: Specifies the maximum interleave delay, in milliseconds, for the downstream slow channel. Valid range is 0 to 255 ms. (R, W, set-by-create) (mandatory) (1 byte).

Up Max Interleave Delay: Specifies the maximum interleave delay, in milliseconds, for the upstream slow channel. Valid range is 0 to 255 ms. (R, W, set-by-create) (mandatory) (1 byte).

Down Target Slow Burst: Specifies the target level of impulse noise (burst) protection, in microseconds, for the downstream slow channel. Valid range is 0 to 1275 µs. (R, W, set-by-create) (mandatory) (2 bytes).

Up Target Slow Burst: Specifies the target level of impulse noise (burst) protection, in microseconds, for the upstream slow channel. Valid range is 0 to 1275 µs. (R, W, set-by-create) (mandatory) (2 bytes).

Down Fast Max Data Rate: Specifies the maximum downstream fast channel data rate in steps of 64 kbits. (R, W, set-by-create) (mandatory) (2 bytes).

Down Fast Min Data Rate: Specifies the minimum downstream fast channel data rate in steps of 64 kbits. (R, W, set-by-create) (mandatory) (2 bytes).

Up Fast Max Data Rate: Specifies the maximum upstream fast channel data rate in steps of 64 kbits. (R, W, set-by-create) (mandatory) (2 bytes).

Up Fast Min Data Rate: Specifies the minimum upstream fast channel data rate in steps of 64 kbits. (R, W, set-by-create) (mandatory) (2 bytes).

Down Max Fast FEC: This parameter provisions the maximum level of Forward Error Correction (FEC) redundancy related overhead to be maintained, as a percentage, for the downstream fast channel. Valid range is 0 to 50 per cent. (R, W, set-by-create) (optional) (1 byte).

Up Max Fast FEC: This parameter provisions the maximum level of Forward Error Correction (FEC) redundancy related overhead to be maintained, as a percentage, for the upstream fast channel. Valid range is 0 to 50 per cent. (R, W, set-by-create) (optional) (1 byte).

Actions

Create: Create an instance of this managed entity.

Delete: Delete an instance of this managed entity.

Get: Get one or more attributes.

Set: Set one or more attributes.

Notifications

None.

8.2.7 VDSL band plan configuration profile

An instance of this managed entity represents a VDSL band plan configuration profile supported on the ONU. Zero or more VDSL physical path termination points can reference an instance of a VDSL band plan configuration profile managed entity.

Instances of this managed entity are created and deleted by the ONU on request of the OLT.

Relationships

Zero or more instances of this managed entity shall be contained in an ONU. One or more instances of this managed entity shall be contained in an ONU containing instances of physical path termination point VDSL UNI.

Attributes

Managed Entity ID: This attribute provides a unique number for each instance of this managed entity. The value 0x00 is reserved. (R, set-by-create) (mandatory) (2 bytes).

Band Plan: The VDSL band plan to be used for the line. bandPlan997(1) is to be used for ITU-T Rec. G.993.1 Bandplan-B, ETSI bandplan, ANSI Plan 997. bandPlan998(2) is to be used for ITU-T Rec. G.993.1 Bandplan-A, ANSI Plan 998. bandPlanFx(3) is to be used for ITU-T Rec. G.993.1 Bandplan-C. other(4) is to be used for non-standard band plans. If this object is set to bandPlanFx(3), then band plan FX MUST also be set. (R, W, set-by-create) (mandatory) (1 byte).

Band Plan FX: The frequency limit, in kHz, between bands D2 and U2 when the band plan is set to bandPlanFx(3). Valid range is 3750 to 12 000 kHz. (R, W, set-by-create) (optional) (2 bytes).

Band Opt Usage: Defines the VDSL link use of the optional frequency range [25 – 138 kHz] (Opt). unused(1) indicates Opt is unused, upstream(2) indicates Opt usage

is for upstream, downstream(3) indicates Opt usage is for downstream. (R, W, set-by-create) (mandatory) (1 byte).

Up PSD Template: The upstream PSD template to be used for the line. Here, templateMask1(1) refers to a notched mask that limits the transmitted PSD within the internationally standardized Handheld Amateur (HAM) radio bands, while templateMask2(2) refers to an unnotched mask. The masks themselves depend upon the applicable standard being used (Applicable Standard). (R, W, set-by-create) (mandatory) (1 byte).

Down PSD Template: The downstream PSD template to be used for the line. Here, templateMask1(1) refers to a notched mask that limits the transmitted PSD within the internationally standardized Handheld Amateur (HAM) radio bands, while templateMask2(2) refers to an unnotched mask. The masks themselves depend upon the applicable standard being used (Applicable Standard). (R, W, set-by-create) (mandatory) (1 byte).

HAM Band Mask: The transmit power spectral density mask code, used to avoid interference with HAM radio bands by introducing power control (notching) in one or more of these bands. Amateur radio band notching is defined in the VDSL spectrum as follows:

Band	Start Frequency	Stop Frequency
30 m	1810 kHz	2000 kHz
40 m	3500 kHz	3800 kHz (ETSI); 4000 kHz (ANSI)
80 m	7000 kHz	7100 kHz (ETSI); 7300 kHz (ANSI)
160 m	10 100 kHz	10 150 kHz

Notching for each standard band can be enabled or disabled via this bit mask. Two custom notches may be specified. If customNotch1 is enabled, then both **Custom Notch 1 Start** and **Custom Notch 1 Stop** MUST be specified. If customNotch2 is enabled, then both **Custom Notch 2 Start** and **Custom Notch 2 Stop** MUST be specified. Valid bit values are defined as follows, all combinations are allowed:

customNotch1(0) – custom (region-specific) notch;

customNotch2(1) – custom (region-specific) notch;

amateurBand30m(2) – amateur radio band notch;

amateurBand40m(3) – amateur radio band notch;

amateurBand80m(4) – amateur radio band notch;

amateurBand160m(5) – amateur radio band notch;

(R, W, set-by-create) (mandatory) (1 byte).

Custom Notch 1 Start: Specifies the start frequency, in kHz, of custom Handheld Amateur Radio (HAM) notch 1. This field MUST be less than or equal to **Custom Notch 1 Stop**. Valid range is 0 to 65 535 kHz. (R, W, set-by-create) (optional) (2 bytes).

Custom Notch 1 Stop: Specifies the stop frequency, in kHz, of custom Handheld Amateur Radio (HAM) notch 1. This field MUST be greater than or equal to **Custom Notch 1 Start**. Valid range is 0 to 65 535 kHz. (R, W, set-by-create) (optional) (2 bytes).

Custom Notch 2 Start: Specifies the start frequency, in kHz, of custom Handheld Amateur Radio (HAM) notch 2. This field MUST be less than or equal to **Custom Notch 2 Stop**. Valid range is 0 to 65 535 kHz. (R, W, set-by-create) (optional) (2 bytes).

Custom Notch 2 Stop: Specifies the stop frequency, in kHz, of custom Handheld Amateur Radio (HAM) notch 2. This field MUST be greater than or equal to **Custom Notch 2 Start**. Valid range is 0 to 65 535 kHz. (R, W, set-by-create) (optional) (2 bytes).

Deployment Scenario: The VDSL line deployment scenario. When using fttCab(1), the VTU-C is located in a street cabinet. When using fttEx(2), the VTU-C is located at the central office. Changes to this value will have no effect on the transceiver. (R, W, set-by-create) (mandatory) (1 byte).

ADSL Presence: Indicates presence of ADSL service in the associated cable bundle/binder. none(1) indicates no ADSL service in the bundle, adslOverPots(2) indicates ADSL service over POTS is present in the bundle, adslOverISDN(3) indicates ADSL service over ISDN is present in the bundle. (R, W, set-by-create) (mandatory) (1 byte).

Applicable Standard: The VDSL standard to be used for the line. ansi(1) indicates ANSI standard, etsi(2) indicates ETSI standard, itu(3) indicates ITU standard, other(4) indicates a standard other than the above. (R, W, set-by-create) (mandatory) (1 byte).

Actions

Create: Create an instance of this managed entity.

Delete: Delete an instance of this managed entity.

Get: Get one or more attributes.

Set: Set one or more attributes.

Notifications

None.

8.2.8   VDSL VTU-O physical interface monitoring history data

This managed entity contains the last completed 15-minute interval collected statistic data for a VDSL physical interface.

Instances of this managed entity are created/deleted by the OLT after an instance of the physical path termination point VDSL UNI managed entity is created/deleted.

The performance management of the physical interfaces used by VDSL shall be supported. Failure/notifications should include threshold alerts for unacceptable performance (error) rates. Performance data should include transmission counts of Errored Seconds (ES), Severely Errored Seconds (SES) and Unavailable Seconds (UAS).

Relationships

One instance of this managed entity can exist for each instance of the physical path termination point VDSL UNI.

Attributes

Managed Entity ID: This attribute provides a unique number for each instance of this managed entity. This 2-byte number is directly associated with the physical position of the UNI. The first byte is the slot ID. The second byte is the port ID with a value range from 0x01 to 0xFF (1 to 255). (R, W, set-by-create) (mandatory) (2 bytes).

Interval End Time: This attribute identifies the most recently finished 15-minute interval. It is a cyclic counter (modulo 0xFF (256)) that is incremented each time a new interval is finished and the attribute counters are updated. The value of this attribute is 0x00 during the first 15-minute interval that starts with the reception of the "synchronize time" action. The value is 0x01 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. The attribute counters are updated at the end of the interval. (R) (mandatory) (1 byte).

Threshold Data$_{B-PON}$ ID: This attribute provides a pointer to an instance of the Threshold Data$_{B-PON}$ managed entity that contains the threshold values for the performance monitoring data collected by this managed entity. (R, W, set-by-create) (mandatory) (2 bytes).

Loss of Framing Seconds: Count of seconds during this interval when there was loss of framing. (R) (mandatory) (2 bytes).

Loss of Signal Seconds: Count of seconds during this interval when there was loss of signal. (R) (mandatory) (2 bytes).

Loss of Power Seconds: Count of seconds during this interval when there was loss of power. (R) (mandatory) (2 bytes).

Loss of Link Seconds: Count of seconds during this interval when there was loss of link. (R) (mandatory) (2 bytes).

Errored Seconds: Count of Errored Seconds during this interval. An errored second is a one-second interval containing one or more CRC anomalies, or one or more LOS or LOF defects. (R) (mandatory) (2 bytes).

Severely Errored Seconds: Count of severely errored seconds during this interval. (R) (mandatory) (2 bytes).

Unavailable Seconds: Count of unavailable seconds during this interval. (R) (mandatory) (2 bytes).

Line Initializations: Count of the line initialization attempts during this interval. This count includes both successful and failed attempts. (R) (mandatory) (2 bytes).

Actions

Create: Create an instance of this managed entity.

Delete: Delete an instance of this managed entity.

Get: Get one or more attributes.

Get Current Data: Get the current value of one or more attributes.

Set: Set one or more attributes.

Notifications

Threshold Crossing Alert: This notification is used to notify the management system when a threshold crossing alert (TCA) is detected or cleared. The TCA change notification "on" will be sent at the crossing of the threshold by the actual counter; the TCA change notification "off" will be sent at the end of the 15-min period since that is when the actual counters are reset to 0x00. Both ONU and OLT should know the event list used by this entity. The list of TCAs for this entity is given in Table 12.

**Table 12/G.983.10 – Alarm list for VDSL VTU-O physical
interface monitoring history data**

Number	Event	Description	Threshold data counter number (Note)
	Threshold Crossing Alert		
0	LOFS	Exceeds threshold	1
1	LOSS	Exceeds threshold	2
2	LOLS	Exceeds threshold	3
3	LOPS	Exceeds threshold	4
4	ES	Exceeds threshold	5
5	LI	Exceeds threshold	6
6	SES	Exceeds threshold	7
7	UAS	Exceeds threshold	8
8-255	Reserved		
NOTE – This numbering is used with the associated Threshold Data$_{B-PON}$ managed entity. Threshold data counter 1 indicates the 1st thresholded counter, etc.			

8.2.9 VDSL VTU-R physical interface monitoring history data

This managed entity contains the last completed 15-minute interval collected statistic data for a VDSL physical interface.

Instances of this managed entity are created/deleted by the OLT after an instance of the physical path termination point VDSL UNI managed entity is created/deleted.

The performance management of the physical interfaces used by VDSL shall be supported. Failure/notifications should include threshold alerts for unacceptable performance (error) rates. Performance data should include transmission counts of Errored Seconds (ES), Severely Errored Seconds (SES) and Unavailable Seconds (UAS).

Relationships

> One instance of this managed entity can exist for each instance of the physical path termination point VDSL UNI.

Attributes

> **Managed Entity ID**: This attribute provides a unique number for each instance of this managed entity. This 2-byte number is directly associated with the physical position of the UNI. The first byte is the slot ID. The second byte is the port ID with a value range from 0x01 to 0xFF (1 to 255). (R, W, set-by-create) (mandatory) (2 bytes).

> **Interval End Time**: This attribute identifies the most recently finished 15-minute interval. It is a cyclic counter (modulo 0xFF (256)) that is incremented each time a new interval is finished and the attribute counters are updated. The value of this attribute is 0x00 during the first 15-minute interval that starts with the reception of the "synchronize time" action. The value is 0x01 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. The attribute counters are updated at the end of the interval. (R) (mandatory) (1 byte).

Threshold Data$_{B\text{-}PON}$ ID: This attribute provides a pointer to an instance of the Threshold Data$_{B\text{-}PON}$ managed entity that contains the threshold values for the performance monitoring data collected by this managed entity. (R, W, set-by-create) (mandatory) (2 bytes).

Loss of Framing Seconds: Count of seconds during this interval when there was loss of framing. (R) (mandatory) (2 bytes).

Loss of Signal Seconds: Count of seconds during this interval when there was loss of signal. (R) (mandatory) (2 bytes).

Loss of Power Seconds: Count of seconds during this interval when there was loss of power. (R) (mandatory) (2 bytes).

Loss of Link Seconds: Count of seconds during this interval when there was loss of link. (R) (mandatory) (2 bytes).

Errored Seconds: Count of errored seconds during this interval. An errored second is a one-second interval containing one or more CRC anomalies, or one or more LOS or LOF defects. (R) (mandatory) (2 bytes).

Severely Errored Seconds: Count of severely errored seconds during this interval. (R) (mandatory) (2 bytes).

Unavailable Seconds: Count of unavailable seconds during this interval. (R) (mandatory) (2 bytes).

Actions

Create: Create an instance of this managed entity.

Delete: Delete an instance of this managed entity.

Get: Get one or more attributes.

Get Current Data: Get the current value of one or more attributes.

Set: Set one or more attributes.

Notifications

Threshold Crossing Alert: This notification is used to notify the management system when a threshold crossing alert (TCA) is detected or cleared. The TCA change notification "on" will be sent at the crossing of the threshold by the actual counter; the TCA change notification "off" will be sent at the end of the 15-min period since that is when the actual counters are reset to 0x00. Both ONU and OLT should know the event list used by this entity. The list of TCAs for this entity is given in Table 13.

**Table 13/G.983.10 – Alarm list for VDSL VTU-R physical
interface monitoring history data**

Number	Event	Description	Threshold data counter number (Note)
	Threshold Crossing Alert		
0	LOFS	Exceeds threshold	1
1	LOSS	Exceeds threshold	2
2	LOLS	Exceeds threshold	3
3	LOPS	Exceeds threshold	4
4	ES	Exceeds threshold	5
5	SES	Exceeds threshold	6
6	UAS	Exceeds threshold	7
7-255	Reserved		
NOTE – This numbering is used with the associated Threshold Data$_{\text{B-PON}}$ managed entity. Threshold Data counter 1 indicates the 1st thresholded counter, etc.			

8.2.10 VDSL VTU-O channel performance monitoring history data

This managed entity contains the last completed 15-minute interval collected statistic data for both fast and slow VDSL channels, as seen from the VTU-O.

Instances of this managed entity are created/deleted by the OLT after an instance of the physical path termination point VDSL UNI managed entity is created/deleted.

Relationships

> One instance of this managed entity can exist for each instance of the physical path termination point VDSL UNI.

Attributes

> **Managed Entity ID**: This attribute provides a unique number for each instance of this managed entity. This 2-byte number is directly associated with the physical position of the UNI. The first byte is the slot ID. The second byte is the port ID with a value range from 0x01 to 0xFF (1 to 255). (R, W, set-by-create) (mandatory) (2 bytes).

> **Interval End Time**: This attribute identifies the most recently finished 15-minute interval. It is a cyclic counter (modulo 0xFF (256)) that is incremented each time a new interval is finished and the attribute counters are updated. The value of this attribute is 0x00 during the first 15-minute interval that starts with the reception of the "synchronize time" action. The value is 0x01 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. The attribute counters are updated at the end of the interval. (R) (mandatory) (1 byte).

> **Threshold Data$_{\text{B-PON}}$ ID**: This attribute provides a pointer to an instance of the Threshold Data$_{\text{B-PON}}$ managed entity that contains the threshold values for the performance monitoring data collected by this managed entity. (R, W, set-by-create) (mandatory) (2 bytes).

> **Fast Channel Corrected Blocks**: This attribute is the count of all blocks received by the VTU-O with errors that were corrected on the fast channel within the previous 15-minute interval. (R) (mandatory) (4 bytes).

Fast Channel Bad Blocks: This attribute is the count of all blocks received by the VTU-O with uncorrectable errors on the fast channel within the previous 15-minute interval. (R) (mandatory) (4 bytes).

Fast Channel Transmitted Blocks: This attribute is the count of all blocks transmitted by the VTU-O on the fast channel within the previous 15-minute interval. (R) (mandatory) (4 bytes).

Fast Channel Received Blocks: This attribute is the count of all blocks received by the VTU-O on the fast channel within the previous 15-minute interval. (R) (mandatory) (4 bytes).

Slow Channel Corrected Blocks: This attribute is the count of all blocks received by the VTU-O with errors that were corrected on the slow channel within the previous 15-minute interval. (R) (mandatory) (4 bytes).

Slow Channel Bad Blocks: This attribute is the count of all blocks received by the VTU-O with uncorrectable errors on the slow channel within the previous 15-minute interval. (R) (mandatory) (4 bytes).

Slow Channel Transmitted Blocks: This attribute is the count of all blocks transmitted by the VTU-O on the slow channel within the previous 15-minute interval. (R) (mandatory) (4 bytes).

Slow Channel Received Blocks: This attribute is the count of all blocks received by the VTU-O on the slow channel within the previous 15-minute interval. (R) (mandatory) (4 bytes).

Actions

Create: Create an instance of this managed entity.

Delete: Delete an instance of this managed entity.

Get: Get one or more attributes.

Get Current Data: Get the current value of one or more attributes.

Set: Set one or more attributes.

Notifications

Threshold Crossing Alert: This notification is used to notify the management system when a threshold crossing alert (TCA) is detected or cleared. The TCA change notification "on" will be sent at the crossing of the threshold by the actual counter; the TCA change notification "off" will be sent at the end of the 15-min period since that is when the actual counters are reset to 0x00. Both ONU and OLT should know the event list used by this entity. The list of TCAs for this entity is given in Table 14.

**Table 14/G.983.10 – Alarm list for VDSL VTU-O channel
performance monitoring history data**

Number	Event	Description	Threshold data counter number (Note)
	Threshold Crossing Alert		
0	FCCB	Exceeds threshold	1
1	FCBB	Exceeds threshold	2
2	SCCB	Exceeds threshold	3
3	SCBB	Exceeds threshold	4
4-255	Reserved		
NOTE – This numbering is used with the associated Threshold Data$_{B-PON}$ managed entity. Threshold data counter 1 indicates the 1st thresholded counter, etc.			

8.2.11 VDSL VTU-R channel performance monitoring history data

This managed entity contains the last completed 15-minute interval collected statistic data for both fast and slow VDSL channels, as seen from the VTU-R.

Instances of this managed entity are created/deleted by the OLT after an instance of the physical path termination point VDSL UNI managed entity is created/deleted.

Relationships

> One instance of this managed entity can exist for each instance of the physical path termination point VDSL UNI.

Attributes

> **Managed Entity ID**: This attribute provides a unique number for each instance of this managed entity. This 2-byte number is directly associated with the physical position of the UNI. The first byte is the slot ID. The second byte is the port ID with a value range from 0x01 to 0xFF (1 to 255). (R, W, set-by-create) (mandatory) (2 bytes).

> **Interval End Time**: This attribute identifies the most recently finished 15-minute interval. It is a cyclic counter (modulo 0xFF (256)) that is incremented each time a new interval is finished and the attribute counters are updated. The value of this attribute is 0x00 during the first 15-minute interval that starts with the reception of the "synchronize time" action. The value is 0x01 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. The attribute counters are updated at the end of the interval. (R) (mandatory) (1 byte).

> **Threshold Data$_{B-PON}$ ID**: This attribute provides a pointer to an instance of the Threshold Data$_{B-PON}$ managed entity that contains the threshold values for the performance monitoring data collected by this managed entity. (R, W, set-by-create) (mandatory) (2 bytes).

> **Fast Channel Corrected Blocks**: This attribute is the count of all blocks received by the VTU-R with errors that were corrected on the fast channel within the previous 15-minute interval. (R) (mandatory) (4 bytes).

> **Fast Channel Bad Blocks**: This attribute is the count of all blocks received by the VTU-R with uncorrectable errors on the fast channel within the previous 15-minute interval. (R) (mandatory) (4 bytes).

Fast Channel Transmitted Blocks: This attribute is the count of all blocks transmitted by the VTU-R on the fast channel within the previous 15-minute interval. (R) (mandatory) (4 bytes).

Fast Channel Received Blocks: This attribute is the count of all blocks received by the VTU-R on the fast channel within the previous 15-minute interval. (R) (mandatory) (4 bytes).

Slow Channel Corrected Blocks: This attribute is the count of all blocks received by the VTU-R with errors that were corrected on the slow channel within the previous 15-minute interval. (R) (mandatory) (4 bytes).

Slow Channel Bad Blocks: This attribute is the count of all blocks received by the VTU-R with uncorrectable errors on the slow channel within the previous 15-minute interval. (R) (mandatory) (4 bytes).

Slow Channel Transmitted Blocks: This attribute is the count of all blocks transmitted by the VTU-R on the slow channel within the previous 15-minute interval. (R) (mandatory) (4 bytes).

Slow Channel Received Blocks: This attribute is the count of all blocks received by the VTU-R on the slow channel within the previous 15-minute interval. (R) (mandatory) (4 bytes).

Actions

Create: Create an instance of this managed entity.

Delete: Delete an instance of this managed entity.

Get: Get one or more attributes.

Get Current Data: Get the current value of one or more attributes.

Set: Set one or more attributes.

Notifications

Threshold Crossing Alert: This notification is used to notify the management system when a threshold crossing alert (TCA) is detected or cleared. The TCA change notification "on" will be sent at the crossing of the threshold by the actual counter; the TCA change notification "off" will be sent at the end of the 15-min period since that is when the actual counters are reset to 0x00. Both ONU and OLT should know the event list used by this entity. The list of TCAs for this entity is given in Table 15.

**Table 15/G.983.10 – Alarm list for VDSL VTU-R Channel
performance monitoring history data**

Number	Event	Description	Threshold data counter number (Note)
	Threshold Crossing Alert		
0	FCCB	Exceeds threshold	1
1	FCBB	Exceeds threshold	2
2	SCCB	Exceeds threshold	3
3	SCBB	Exceeds threshold	4
4-255	Reserved		
NOTE – This numbering is used with the associated Threshold Data$_{B-PON}$ managed entity. Threshold Data counter 1 indicates the 1st thresholded counter, etc.			

9 Managed entity identifiers

The ONT management and control protocol cell format is defined in ITU-T Rec. G.983.2. As new managed entities are introduced into the OMCI specifications, the managed entity identifier that is used in the message identifier field shall be defined. Table 16 gives the class values for the new managed entities. The class values for existing managed entities are found in Table 21/G.983.2.

Table 16/G.983.10 – Managed entity identifiers

Managed entity class value	Managed entity
98	Physical Path Termination Point ADSL UNI Part 1
99	Physical Path Termination Point ADSL UNI Part 2
100	ADSL Line Inventory and Status Data Part 1
101	ADSL Line Inventory and Status Data Part 2
102	ADSL Channel Downstream Status Data
103	ADSL Channel Upstream Status Data
104	ADSL Line Configuration Profile Part 1
105	ADSL Line Configuration Profile Part 2
106	ADSL Line Configuration Profile Part 3
107	ADSL Channel Configuration Profile
108	ADSL Subcarrier Masking Downstream Profile
109	ADSL Subcarrier Masking Upstream Profile
110	ADSL Downstream PSD Mask Profile
111	ADSL Downstream RFI Bands Profile
112	ADSL ATU-C Performance Monitoring History Data
113	ADSL ATU-R Performance Monitoring History Data
114	ADSL ATU-C Channel Performance Monitoring History Data
115	ADSL ATU-R Channel Performance Monitoring History Data
116	TC Adaptor Performance Monitoring History Data ADSL
117	Physical Path Termination Point VDSL UNI
118	VDSL VTU-O Physical Data
119	VDSL VTU-R Physical Data
120	VDSL Channel Data
121	VDSL Line Configuration Profile
122	VDSL Channel Configuration Profile
123	VDSL Band Plan Configuration Profile
124	VDSL VTU-O Physical Interface Monitoring History Data
125	VDSL VTU-R Physical Interface Monitoring History Data
126	VDSL VTU-O Channel Performance Monitoring History Data
127	VDSL VTU-R Channel Performance Monitoring History Data

BIBLIOGRAPHY

[B-1]   IETF RFC 2662 (1999), *Definition of Managed Objects for ADSL Lines*.

[B-2]   IETF RFC 3440 (2002), *Definitions of Extension Managed Objects for Asymmetric Digital Subscriber Lines*.

[B-3]   ITU-T Rec. G.992.1 (1999), *Asymmetric digital subscriber line (ADSL) transceivers*.

[B-4]   ITU-T Rec. G.992.2 (1999), *Splitterless asymmetric digital subscriber line (ADSL) transceivers*.

[B-5]   ITU-T Rec. G.992.3 (2002), *Asymmetric digital subscriber line transceivers 2 (ADSL2)*.

[B-6]   ITU-T Rec. G.992.4 (2002), *Splitterless asymmetric digital subscriber line transceivers 2 (splitterless ADSL2)*.

[B-7]   ITU-T Rec. G.992.5 (2003), *Asymmetric digital subscriber line (ADSL) transceivers – Extended bandwidth ADSL2 (ADSL2+)*.

[B-8]   ITU-T Rec. G.994.1 (2003), *Handshake procedure for digital subscriber line (DSL) transceivers*.

[B-9]   ITU-T Rec. T.35 (2000), *Procedure for the allocation of ITU-T defined codes for non-standard facilities*.

[B-10] IETF draft, *Definitions of Managed Object Extensions for Very High Speed Digital Subscriber Lines (VDSL) Using Single Carrier Modulation (SCM) Line Coding*.

[B-11] IETF draft, *Definitions of Managed Object Extensions for Very High Speed Digital Subscriber Lines (VDSL) Using Multiple Carrier Modulation (MCM) Line Coding*.

[B-12] DSL Forum TR-057 (February, 2003), *VDSL Network Element Management Requirement*.

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