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

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

B-PON OMCI support for IP, ISDN, video, VLAN tagging, VC cross-connections and other select functions

ITU-T Recommendation G.983.8

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ITU-T Recommendation G.983.8

B-PON OMCI support for IP, ISDN, video, VLAN tagging, VC cross-connections and other select functions

Summary

This Recommendation provides ONT Management and Control Interface (OMCI) support for the Broadband Passive Optical Network (B-PON) system defined in ITU-T Rec. G.983.1 [1] for select functions which were out of the scope of ITU-T Rec. G.983.2 [2]. OMCI support is specified for Internet Protocol (IP) Router functionality on Local Area Network (LAN) cards, Integrated Services Digital Network (ISDN) interfaces, additional Ethernet performance monitoring, video interfaces, virtual LAN (VLAN) tagging, extended Media Access Control (MAC) Bridge Filtering, local craft terminal interfaces, Virtual Channel (VC) cross-connections, and Optical Network Units (ONUs).

Source

ITU-T Recommendation G.983.8 was prepared by ITU-T Study Group 15 (2001-2004) and approved under the A.8 procedure on 16 March 2003.

FOREWORD

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

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

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

NOTE

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

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B-PON OMCI support for IP, ISDN, video, VLAN tagging, VC cross-connections and other select functions

1 Scope

This Recommendation focuses on the OMCI specifications related to support for IP Router functionality on LAN cards, ISDN, additional Ethernet performance monitoring, video interfaces, VLAN tagging, extended MAC Bridge Filtering, local craft terminal interfaces, VC cross-connections, and ONUs (detailed management for ONUs with xDSL interfaces is for future study). Though the OMCI specifications are based on ITU-T Rec. G.983.2 [2], some enhancements are needed. The scope of this Recommendation is limited to the enhancements only.

This Recommendation includes additions and editorial changes to sections of ITU-T Rec. G.983.2 [2] that pertain to these topics. As this Recommendation serves as an extension of ITU-T Rec. G.983.2 [2], all sections of that Recommendation remain pertinent.

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 G.983.1 (1998), *Broadband optical access systems based on Passive Optical Networks (PON)*.

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

[3] IETF RFC 2096 (1997), *IP Forwarding Table MIB*.

[4] IEEE Standard 802.1Q-1998, *Virtual Bridged Local Area Networks*.

[5] IEEE Standard 802.1D-1998, *Media Access Control (MAC) Bridges*.

3 Abbreviations

This Recommendation uses the following abbreviations:

ANI	Access Node Interface
APON	ATM over Passive Optical Network
ARP	Address Resolution Protocol
B-PON	Broadband Passive Optical Network
CFI	Canonical Format Indicator
CNR	Carrier-to-Noise Ratio
CSO	Composite Second Order
CTB	Composite Triple Beat
ICMP	Internet Control Message Protocol

IP Internet Protocol

ISDN Integrated Services Digital Network

LAN Local Area Network

ME Managed Entity

MIB Management Information Base

OLT Optical Line Terminal

OMCC ONT Management and Control Channel

OMCI ONT Management and Control Interface

ONT Optical Network Termination

PON Passive Optical Network

TCA Threshold Crossing Alert

TCI Tag Control Information

TPID Tag Protocol Identifier

UNI User Network Interface

VCC Virtual Channel Connection

VID VLAN Identifier

VLAN Virtual Local Area Network

VP Virtual Path

4 Reference model and terms

4.1 OMCI in this Recommendation

See 4.1/G.983.2.

4.2 ONT functions

See 4.2/G.983.2.

4.3 VP mux functionality in the ONT

See 4.3/G.983.2.

5 Requirements of the management interface specification

See 5/G.983.2.

5.1 Configuration management

Modify the text in 5.1/G.983.2 to allow either a VP or VC cross-connection to be used in the ONT.

Delete the following text.

"ATM VC management is not a part of this Recommendation (see [App. V-1] and ITU-T Rec. I.751 [9]). VC cross-connection capability is not necessary for the ONT, as VC cross-connection is handled by the OLT. Note that"

Change figure caption for Figure 2b/G.983.2 to "VP cross-connection termination model".

Add the following text and figure at the end of 5.1/G.983.2.

"For cases such as the support of ONUs with xDSL interfaces, it is necessary to implement VC cross-connections. VC cross-connection can be supported by the ONT/ONU, as indicated by the termination model shown in Figure 1/G.983.8.

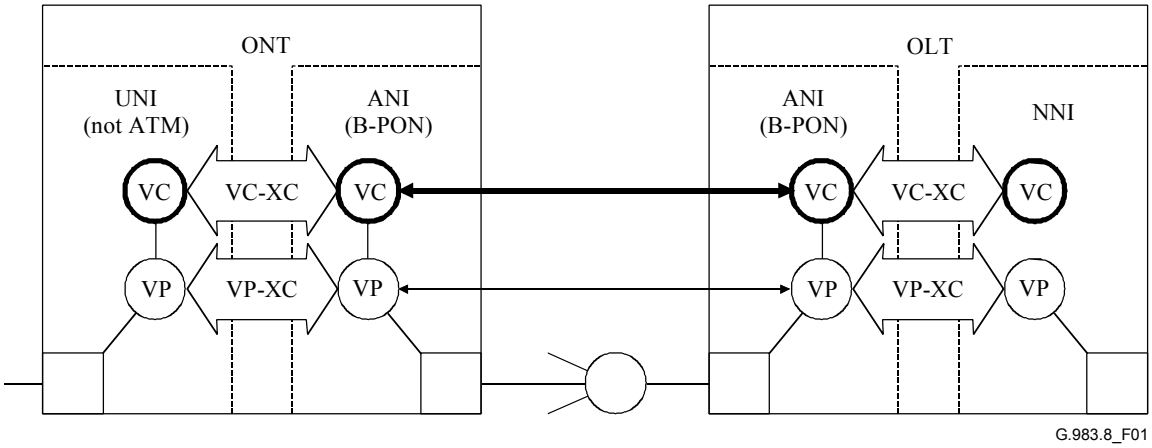

Figure 1/G.983.8 – VC cross-connection termination model

5.2 Fault management

See 5.2/G.983.2.

5.3 Performance management

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

m) IP Router PM History Data 1;

n) IP Router PM History Data 2;

o) ICMP PM History Data 1;

p) ICMP PM History Data 2;

q) VC PM History Data;

r) Ethernet Performance Monitoring History Data 2.

5.4 Security management

See 5.4/G.983.2.

6 Protocol-independent MIB for the OMCI

See 6/G.983.2.

6.1 Managed entities associated with IP router function on LAN card, ISDN, VLAN tagging, extended MAC bridge filtering, video card interfaces, local craft terminal interfaces, VC cross-connections, additional Ethernet performance monitoring, and ONUs

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

The definitions of the managed entities in Table 2 are modified from those given in ITU-T Rec. G.983.2.

Table 1/G.983.8 – Additional managed entities in the OMCI

Managed entity	Required/ Optional	Description
IP Port Configuration Data	CR	Used for IP Port supported by the ONT
IP Router Service Profile	CR	Used for IP Router supported by the ONT
IP Router Configuration Data	CR	Used for IP Router supported by the ONT
IP Router PM History Data 1	O	Used for IP Router performance monitoring
IP Router PM History Data 2	O	Used for IP Router performance monitoring
ICMP PM History Data 1	O	Used for ICMP performance monitoring
ICMP PM History Data 2	O	Used for ICMP performance monitoring
IP Route Table	CR	Used for IP Router supported by the ONT
IP Static Routes	CR	Used for IP Router supported by the ONT
ARP Service Profile	CR	Used for IP Port supported by the ONT
ARP Configuration Data	CR	Used for IP Port supported by the ONT
VLAN Tagging Operation Configuration Data	O	Used for VLAN tagging
MAC Bridge Port Filter Preassign Table	O	Used for Ethernet type filtering
Physical Path Termination Point ISDN UNI	O	Used for ISDN port supported by the ONT
Physical Path Termination Point Video UNI	O	Used for video port
Physical Path Termination Point Video ANI	O	Used for video input port
Physical Path Termination Point LCT UNI	O	Used for local craft terminal port
VLAN Tagging Filter Data	O	Used for VLAN tagging
$ONU_{B\text{-}PON}$	O	Used for ONU that supports xDSL interfaces
ATM VC Cross-Connection	O	Used for VC multiplexing with VCI translation in the ONU
VC Network $CTP_{B\text{-}PON}$	O	Used for VC link termination in the VC MUX
VC PM History Data	O	Used for VC performance monitoring
Ethernet Performance Monitoring History Data 2	O	Used for Ethernet performance monitoring

Table 2/G.983.8 – Modified managed entities in the OMCI

Managed entity	Required/ Optional	Description
$ONT_{B\text{-}PON}$	R	Used for ONT equipment management
ONT Data	R	Used for OMCI MIB management
Subscriber Line Card	CR (Note)	Used for the UNI line card plug-in
TC $Adapter_{B\text{-}PON}$	CR	Used for TC layer at the UNI side for the ATM UNI
Voice Service Profile AAL	CR	Used for Voice over AAL1/2 supported by the ONT
Voice CTP	CR	Used for Voice supported by the ONT
Voice PM History Data	O	Used for Voice performance monitoring
Interworking VCC Termination Point	CR	Used for non-ATM UNIs
UPC Disagreement Monitoring History $Data_{B\text{-}PON}$	CR	Used for the ONT that supports UPC
Threshold $Data_{B\text{-}PON}$	CR	Used for the set-up of threshold values
NOTE – The preferred solution is that the Subscriber Line Card and Subscriber Line Cardholder managed entities should always be modelled, regardless of whether or not the ONT has integrated interfaces; however, for reasons of backward compatibility, these managed entities remain as "CR".		

6.2 Managed entity relation diagrams

6.2.1 New managed entity relation diagrams

Figure 2 shows the managed entity relation diagram for IP Router service in an ONT that models VP cross-connection functionality.

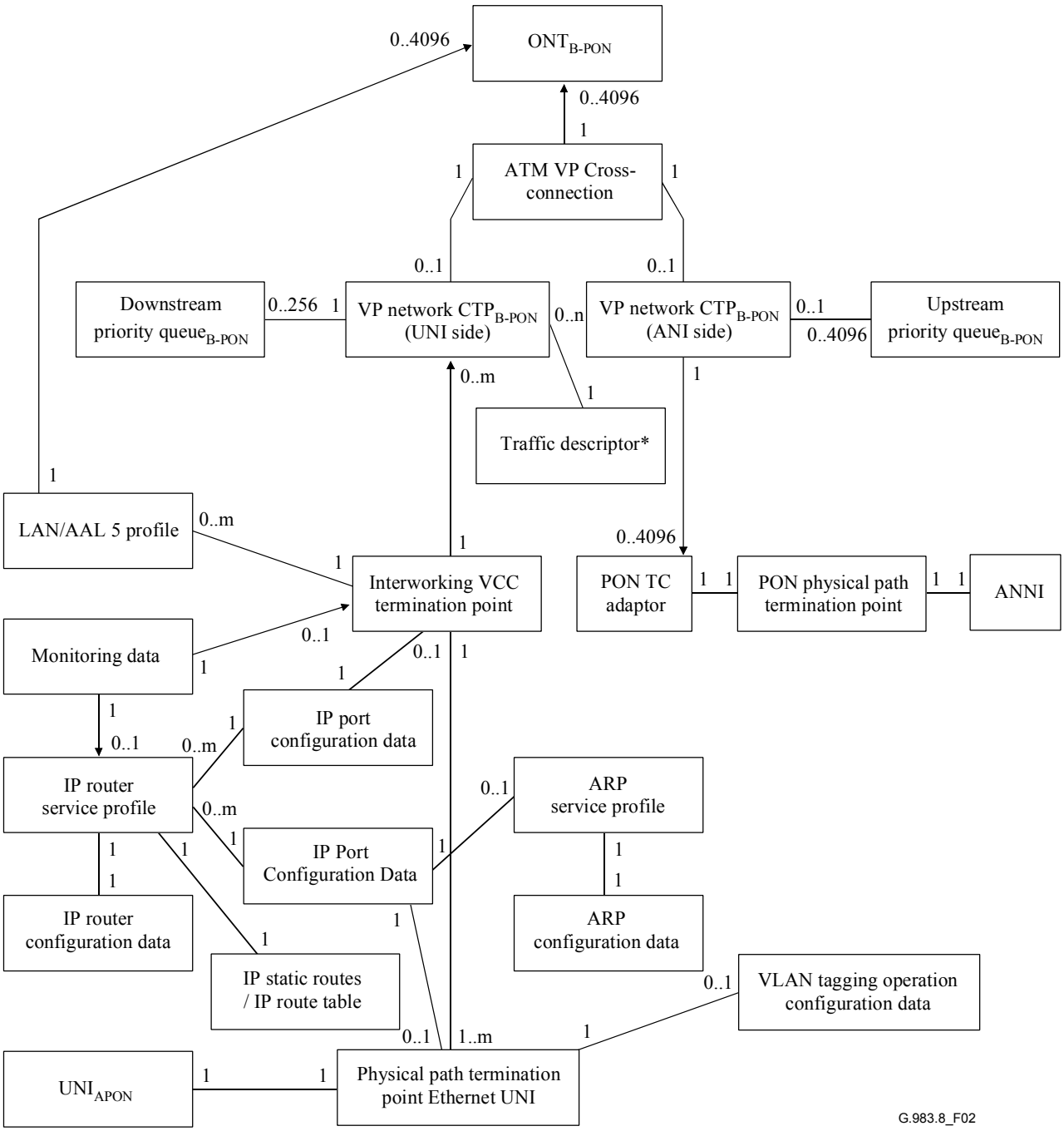

Figure 2/G.983.8 – Managed entity relation diagram, IP router service in an ONT that models VP cross-connect functionality

The "*" in Figure 2 indicates that the Traffic Descriptor can be one of the specific Traffic Descriptor managed entities defined in 7.5.2/G.983.2.

Figure 3 shows the managed entity relation diagram for an ONT that supports MAC bridge service with preassigned MAC addresses.

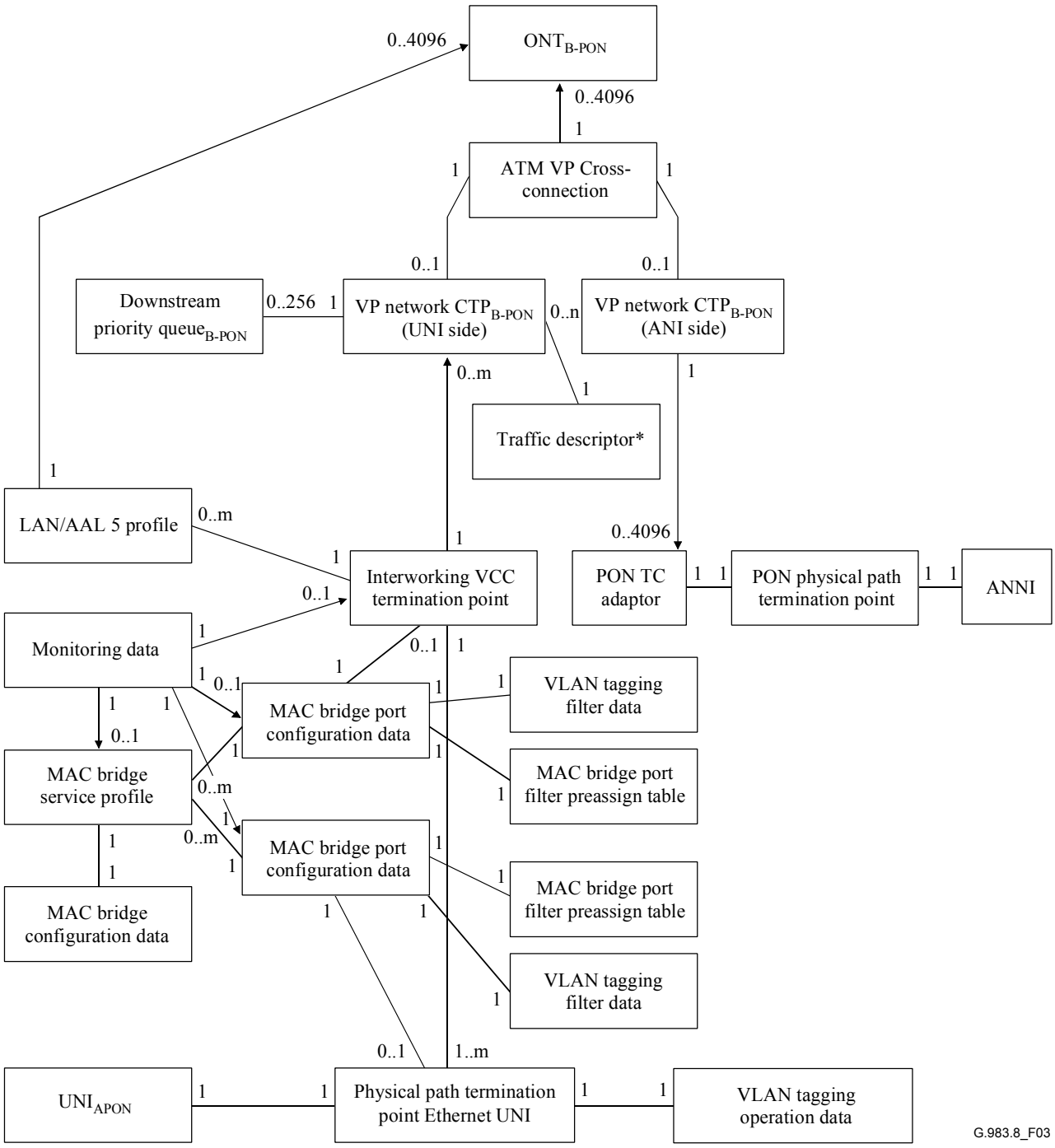

Figure 3/G.983.8 – Managed entity relation diagram, MAC bridge service including VLAN services in an ONT that models VP cross-connect functionality

The "*" in Figure 3 indicates that the Traffic Descriptor can be one of the specific Traffic Descriptor managed entities defined in 7.5.2/G.983.2.

In addition, the managed entity relation diagrams for ONTs that support VC cross-connections can be derived from Figures 4, 5, 7, 9a, 9b, and 9c/G.983.2 by replacing "VP Network $CTP_{B\text{-}PON}$" with "VC Network $CTP_{B\text{-}PON}$" and "ATM VP Cross-Connection" with "ATM VC Cross-Connection".

6.2.2 Revised managed entity relation diagrams

Replace Figure 9b/G.983.2 with Figure 4. Modifications from Figure 9b/G.983.2 are indicated by underlined text.

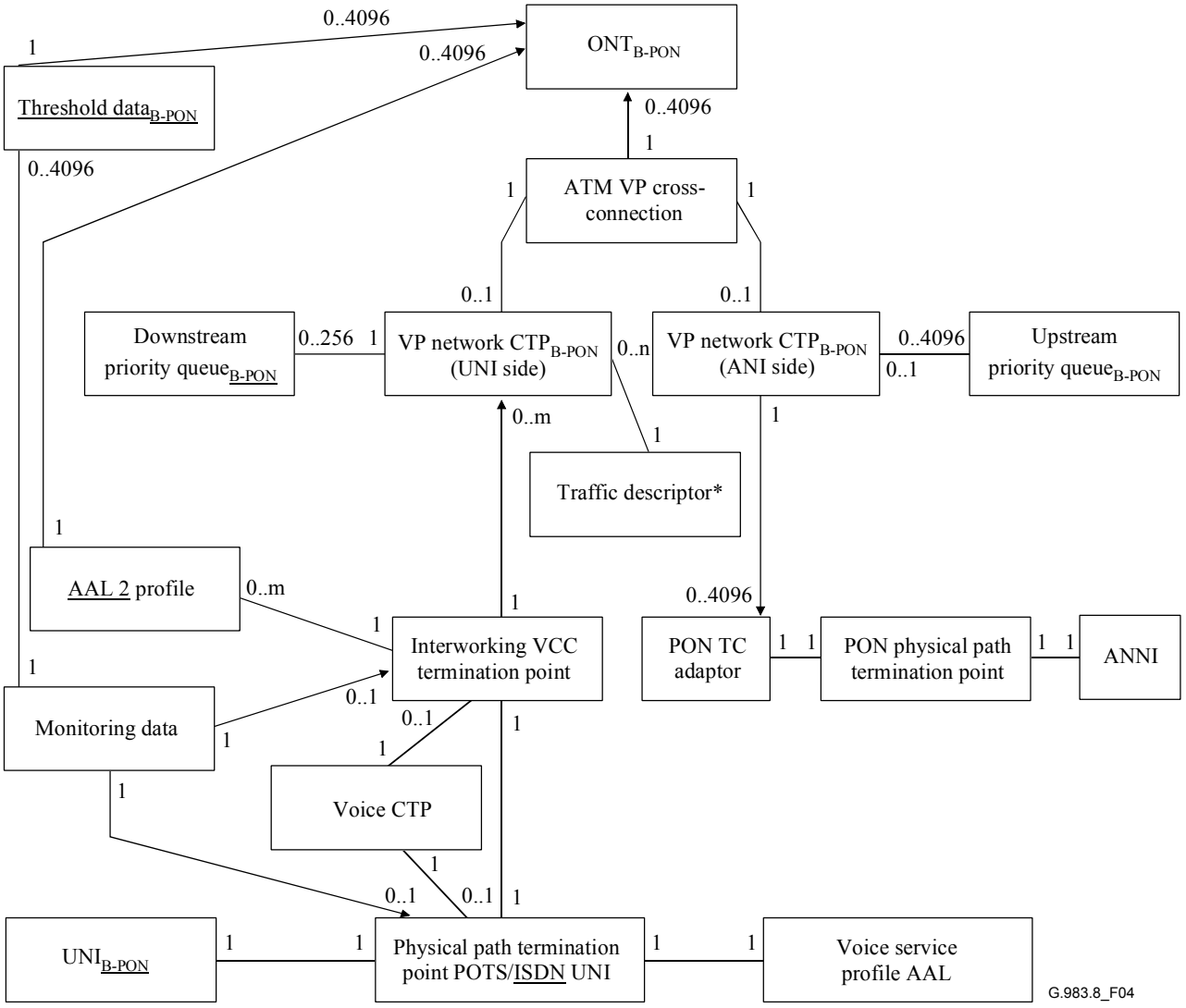

Figure 4/G.983.8 – Managed entity relation diagram, voice over AAL 2 service in an ONT that models VP cross-connect function

7 MIB description

Providing OMCI support for IP Router function, ISDN, additional Ethernet performance monitoring, video interfaces, VLAN tagging, extended MAC Bridge Filtering, local craft terminal interfaces, VC cross-connections, and ONUs causes the modification of existing managed entities and creation of new managed entities. In this clause, only modified or new managed entities are described. All other managed entities in ITU-T Rec. G.983.2 [2] remain unchanged.

7.1 Modified managed entities

Where appropriate, modifications from the managed entity descriptions in ITU-T Rec. G.983.2 [2] are indicated by underlined or crossed-out text.

7.1.1 $ONT_{B\text{-}PON}$

Modify the "VP cross-connection function option" in 7.1.1/G.983.2 as indicated below to allow support of VC cross-connections.

VP/VC cross-connection function option: This attribute identifies the support of ATM VP or VC cross-connection management functions for the interworking connections to non-ATM UNIs. The value is set to 0x00 if ATM VP or VC cross-connection management functions are not modelled. The value is set to 0x01 if the ATM VP cross-connection management functions are modelled. The value is set to 0x02 if ATM VC cross-connection management functions are modelled. The default value of this attribute is 0x01. (R) (mandatory) (1 byte).

7.1.2 ONT Data

To support ONUs, all references to ONT should be replaced by ONT/ONU in 7.1.2/G.983.2.

7.1.3 Subscriber line cardholder

Add the following entry to the list of line card types given in Table 3/G.983.2.

Coding	Contents	Description
39	LCT	Local craft terminal interface

7.1.4 Subscriber line card

Add the following attribute to the end of the list of attributes given in 7.1.4/G.983.2:

CardConfiguration: This attribute is used to select the appropriate configuration on configurable line cards (e.g., T1/E1). Table 3/G.983.2 specifies 3 configurable card types: A45/34 (code 9), C-DS1/E1 (code 16), and C-DS1/E1/J1 (code 17). Values are indicated below for the allowed card types and configurations.

Card type	Configuration	Value
A45/34	ATM 44.736 Mbit/s	0x00
	ATM 34.368 Mbit/s	0x01
C-DS1/E1	DS1	0x00
	E1	0x01
C-DS1/E1/J1	DS1	0x00
	E1	0x01
	J1	0x02

(R, W, Set-by-create (if applicable)) (mandatory for configurable line cards) (1 byte).

7.1.5 Physical path termination point Ethernet UNI

Add the attribute shown below to the end of the attribute list for the Physical Path Termination Point Ethernet UNI in 7.3.2/G.983.2. This attributes allow the port to be configured to discard any packets that are not PPPoE packets. This will allow more efficient use of the PON bandwidth for carriers that offer a service that uses PPPoE.

PPPoE Filter: This attribute may be used to control filtering of PPPoE packets on this Ethernet port. The value 0x00 is used to disable filtering. The value 0x01 is used to enable filtering. When filtering is enabled, all packets other than PPPoE packets will be discarded. Default value is 0x00. (R,W) (optional) (1 byte).

7.1.6 Interworking VCC termination point

7.1.6.1 Interworking termination point pointer attribute

Modify the Interworking Termination Point pointer attribute in 7.3.7/G.983.2 as indicated below to allow ISDN support.

Interworking termination point pointer: This attribute provides a pointer either to the associated instance(s) of the following managed entities (depending on the service provided):

- Physical Path Termination Point Ethernet UNI;
- Physical Path Termination Point POTS UNI;
- Physical Path Termination Point CES UNI;
- Logical N × 64 kbit/s subport Connection Termination Point;
- Physical Path Termination Point ISDN UNI.

NOTE – For the case utilizing the multiplexing function of AAL 2, this attribute is assigned a special value:

- 0x00XX will be used for pseudo slotIDs,
- 0xXX00 will be used for pseudo portIDs.

Therefore, 0x0000 will be used only for the case that the integrated interfaces (integrated type of ONT) support AAL 2 multiple function. (R, Set-by-create) (mandatory) (2 bytes).

7.1.6.2 VPNetworkCTP connectivity pointer attribute

Update to allow for either VP or VC Network CTPs to be used. Replace VPNetworkCTP connectivity pointer attribute in 7.3.7/G.983.2 with the updated attribute given below.

VP/VCNetworkCTP connectivity pointer: This attribute provides an instance identifier of the VP Network CTP or VC Network CTP that is associated with this Interworking VCC Termination Point. (R, Set-by-create) (mandatory) (2 bytes).

7.1.7 Threshold data$_{\text{B-PON}}$

The following managed entities are added to the list of thresholded managed entities given in Relationships section of 7.3.17/G.983.2.

- IP Router PM History Data 1;
- IP Router PM History Data 2;
- ICMP PM History Data 1;
- ICMP PM History Data 2;
- VC PM History Data;
- Ethernet Performance Monitoring History Data 2.

7.1.8 Voice service profile AAL

Modify the definition for the Managed entity id attribute in 7.3.24/G.983.2 as indicated below.

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 id of the Physical Path Termination Point POTS UNI or Physical Path Termination Point ISDN UNI. (R, Set-by-create) (mandatory) (2 bytes).

7.1.9 Voice CTP

Modify 7.3.27/G.983.2 to allow ISDN support.

7.1.9.1 Relationships

Modify the Relationships section in 7.3.27/G.983.2 as indicated below.

Relationships

Zero or more instances of this managed entity shall be contained in an instance of the $ONT_{B\text{-}PON}$ or Subscriber Line Card managed entity classified as a POTS or ISDN type.

7.1.9.2 InterworkingPPTPPtr attribute

Modify the definition for the InterworkingPPTPPtr attribute in 7.3.27/G.983.2 as indicated below.

InterworkingPPTPPtr: This attribute provides a pointer to the associated instance of the Termination Point managed entity for the case of POTS or ISDN services. When this Voice CTP is associated with a Subscriber Line Card managed entity classified as a POTS type, this attribute points to the instance of the Physical Path Termination Point POTS UNI. When this Voice CTP is associated with a Subscriber Line Card managed entity classified as ISDN type, this attribute points to the instance of the Physical Path Termination Point ISDN UNI. (R, Set-by-create) (mandatory) (2 bytes).

7.1.10 Voice PM history data

Replace the existing managed entity in 7.3.28/G.983.2 with the modified one given below.

7.3.28 Voice PM history data

This managed entity contains the last completed 15-minute interval performance monitoring data collected as a result of monitoring a voice port on an ONT. The statistic data value is only updated at the end of each period. Instances of this managed entity are created/deleted by the OLT after an instance of a Physical Path Termination Point POTS UNI or Physical Path Termination Point ISDN UNI managed entity is created/deleted.

Relationships

One instance of this managed entity can exist for each instance of a Physical Path Termination Point POTS UNI or Physical Path Termination Point ISDN 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 id of a Physical Path Termination Point POTS UNI or Physical Path Termination Point ISDN UNI. (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. 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).

VoicePortBufferOverflows: This attribute provides the total number of payload octets dropped due to buffer overflow at this port.

NOTE – This number does not include octets that are dropped because they arrived late had already been substituted by a filler octet). If the actual counter saturates, it remains on its maximum value.

(R) (mandatory) (4 bytes).

VoicePortBufferUnderflows: This attribute provides the total number of filler octets injected into the active media stream on this port due to playout buffer underflow. If the actual counter saturates, it remains on its maximum value. (R) (mandatory) (4 bytes).

ActiveSeconds: This attribute provides the total length of time, in seconds, that the AAL 2 channel associated with this port has been active. If the counter saturates, it remains on its maximum value. (R) (mandatory) (4 bytes).

DchannelBufferOverflows: This attribute provides the total number of payload octets for the D channel that are dropped due to buffer overflow at this port.

NOTE – This number does not include octets that are dropped because they arrived late had already been substituted by a filler octet). If the actual counter saturates, it remains on its maximum value.

(R) (mandatory, if this voice port carries ISDN traffic) (4 bytes).

B1ChannelBufferOverflows: This attribute provides the total number of payload octets for the B1 channel that are dropped due to buffer overflow at this port.

NOTE – This number does not include octets that are dropped because they arrived late had already been substituted by a filler octet). If the actual counter saturates, it remains on its maximum value.

(R) (mandatory, if this voice port carries ISDN traffic) (4 bytes).

B2ChannelBufferOverflows: This attribute provides the total number of payload octets for the B2 channel that are dropped due to buffer overflow at this port.

NOTE – This number does not include octets that are dropped because they arrived late and had already been substituted by a filler octet). If the actual counter saturates, it remains on its maximum value.

(R) (mandatory, if this voice port carries ISDN traffic) (4 bytes).

DchannelBufferUnderflows: This attribute provides the total number of filler octets injected into the D channel of the active media stream on this port due to playout buffer underflow. If the actual counter saturates, it remains on its maximum value. (R) (mandatory, if this voice port carries ISDN traffic) (4 bytes).

B1ChannelBufferOverflows: This attribute provides the total number of filler octets injected into the B1 channel of the active media stream on this port due to playout buffer underflow. If the actual counter saturates, it remains on its maximum value. (R) (mandatory, if this voice port carries ISDN traffic) (4 bytes).

B2ChannelBufferOverflows: This attribute provides the total number of filler octets injected into the B2 channel of the active media stream on this port due to playout buffer underflow. If the actual counter saturates, it remains on its maximum value. (R) (mandatory, if this voice port carries ISDN traffic) (4 bytes).

DchannelActiveSeconds: This attribute provides the total length of time, in seconds, that the D channel associated with this port has been active. If the counter saturates, it remains on its maximum value. (R) (mandatory, if this voice port carries ISDN traffic) (4 bytes).

B1ChannelActiveSeconds: This attribute provides the total length of time, in seconds, that the B1 channel associated with this port has been active. If the counter saturates, it remains on its maximum value. (R) (mandatory, if this voice port carries ISDN traffic) (4 bytes).

B2ChannelActiveSeconds: This attribute provides the total length of time, in seconds, that the B2 channel associated with this port has been active. If the counter saturates, it remains on its maximum value. (R) (mandatory, if this voice port carries ISDN traffic) (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.

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. The event list for this entity is given in Table 3. Table 3 replaces Table 15e/G.983.2. Modifications from Table 15e/G.983.2 are indicated by underlined text.

Table 3/G.983.8 – Alarm list for voice PM history data

Number	Event	Description
	Threshold Crossing Alert	
0	Reserved	
1	Reserved	
2	VoicePortBufferOverflows	Exceeds threshold
3	VoicePortBufferUnderflows	Exceeds threshold
4	B1ChannelBufferOverflows	Exceeds threshold
5	B2ChannelBufferOverflows	Exceeds threshold
6	DchannelBufferUnderflows	Exceeds threshold
7	B1ChannelBufferOverflows	Exceeds threshold
8	B2ChannelBufferOverflows	Exceeds threshold
9-255	Reserved	

7.1.11 UPC disagreement monitoring history data

To support VC cross-connections, replace "VP Network $CTP_{B\text{-}PON}$" in 7.5.4/G.983.2 with "VP Network $CTP_{B\text{-}PON}$ or VC Network $CTP_{B\text{-}PON}$".

7.2 IP router function management

7.2.1 IP port configuration data

This managed entity is used to organize data that is associated with IP address and IP port provisioning. Instances of this managed entity are created and deleted by request of the OLT.

Relationships

Zero or one instances of this managed entity may exist for each instance of the Interworking VCC Termination Point managed entity and a Subscriber Line Card managed entity classified as a native LAN type (e.g. Ethernet).

Attributes

Managed entity id: This attribute provides a unique number for each instance of this managed entity. (R, Set-by-create) (mandatory) (2 bytes).

PortNum: This attribute identifies the port at which IP provisioning takes place. (R, Set-by-create) (mandatory) (1 byte).

TPType: This attribute identifies the type of the termination point associated with this IP port. The value is set to 0x01 if this IP port is associated with the LAN side's TP. The value is set to 0x02 if this IP port is associated with the ATM side's TP. (R, Set-by-create) (mandatory) (1 byte).

TPPointer: This attribute points to the instance of the TP associated with this port. When this IP port is associated with the LAN side's TP, this attribute points to the instance of the PPTP Ethernet UNI. When this IP port is associated with the ATM side's TP, this attribute points to the instance of the Interworking VCC Termination Point. (R, Set-by-create) (mandatory) (2 bytes).

PortAddress: This attribute identifies the provisioned IP address. When an IP address is not assigned, this attribute consists of all 0x00. (R, Set-by-create) (mandatory) (4 bytes).

PortMask: This attribute identifies the address mask associated with the provisioned IP address. When an IP address mask is not assigned, this attribute consists of all 0x00. (R, Set-by-create) (mandatory) (4 bytes).

Unnumbered: This boolean attribute indicates whether or not this IP port has an IP address. The value TRUE means unnumbered. (For future use by IP router function.) (R, Set-by-create) (mandatory) (1 byte).

AdministrativeState: This boolean attribute is used to activate (unlock, value 0x00) and deactivate (lock, value 0x01) the functions performed by instances of this managed entity. (R, W, Set-by-create) (1 byte).

PortState: This boolean attribute provides status information on the port. Valid values include "up" (value 0x00) and "down" (value 0x01). (R, Set-by-create) (mandatory) (1 byte).

AllowRemoteAccess: This boolean attribute indicates whether or not this IP port may be accessed remotely. The value TRUE means remote access is enabled. (R, Set-by-create) (mandatory) (1 byte).

Router id pointer: This attribute identifies the IP router controlling the port, if it exists. This attribute points to the instance of the IP Router Service Profile. If no IP router controls the port, this attribute consists of a null pointer. (R, Set-by-create) (mandatory) (2 bytes).

ARP pointer: This attribute identifies the instance of ARP Service Profile associated with the IP port. (R, Set-by-create) (mandatory) (2 bytes).

EncapsulationMethod: This attribute identifies the frame encapsulation method that is used. Value 0x00: identification by ATM VC; value 0x01: LLC encapsulation. Upon autonomous instantiation, the value 0x00 is used. (R, W) (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.

7.2.2 IP router service profile

This managed entity is used to organize data that affects all ports on an IP router on a routed LAN UNI interface on the ONT. Instances of this managed entity are created and deleted by request of the OLT.

Relationships

Zero or more instances of this managed entity shall be contained in an instance of a Subscriber Line Card managed entity classified as a native LAN type (e.g., Ethernet).

Attributes

Managed entity id: This attribute provides a unique number for each instance of this managed entity. The first byte is the slot id (defined in 7.1.3/G.983.2). If the UNI is integrated, this value is 0x00. The second byte is the router group id. (R, Set-by-create) (mandatory) (2 bytes).

ForwardingInd: This boolean attribute indicates whether or not forwarding of IP packets as a whole is enabled. The value TRUE means enabled. The initial value is enabled. (R, W, Set-by-create) (mandatory) (1 byte).

ProxyARPInd: This boolean attribute indicates whether or not proxy ARP is enabled. The value TRUE means enabled. The initial value is enabled. (R, W, Set-by-create) (mandatory) (1 byte).

DirectedBroadcastInd: This boolean attribute indicates whether or not relaying of directed broadcast packets is enabled. The value TRUE means enabled. The initial value is disabled. (R, W, Set-by-create) (mandatory) (1 byte).

UpstreamMulticastFiltering: This attribute indicates whether upstream IP multicast packets are forwarded (value 0x00) or filtered (value 0x01). The initial value is 0x01. (R,W, Set-by-create) (mandatory) (1 byte).

DownstreamMulticastFiltering: This attribute indicates whether downstream IP multicast packets are forwarded (value 0x00) or filtered (value 0x01). The initial value is 0x01. (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.

7.2.3 IP router configuration data

This managed entity is used to record data that is associated with IP router configurations. An instance of this managed entity shall be automatically created/deleted by the ONT upon creation/deletion of the associated instance of IP Router Service Profile.

Relationships

An instance of this managed entity is associated with one instance of IP Router Service Profile.

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 IP Router Service Profile with which this IP Router Configuration Data is associated. (R) (mandatory) (2 bytes).

IpReasmTimeout: This attribute indicates the maximum number of seconds that received fragments are held while they are awaiting reassembly at this router. (R) (mandatory) (4 bytes).

Actions

Get: Get one or more attributes.

Notifications

None.

7.2.4 IP router PM history data 1

This managed entity contains some IP-related past performance monitoring data collected at IP router function. Instances of this managed entity are created/deleted by the OLT after/before an instance of IP Router Service Profile is created/deleted.

Relationships

An instance of this managed entity is associated with one instance of IP Router Service Profile.

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 IP Router Service Profile with which this IP Router PM History Data1 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. 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).

IpInReceivesCounter: This attribute provides a count of packets received from interfaces, including those with errors. If the actual counter saturates, it remains on its maximum value. Default value is 0x00. (R) (mandatory) (4 bytes).

IpInHdrErrorsCounter: This attribute provides a count of packets discarded due to errors in their IP headers, including bad checksums, version number mismatch, other format errors, time-to-live exceeded, errors discovered in processing their IP options, etc. If the actual counter saturates, it remains on its maximum value. Default value is 0x00. (R) (mandatory) (4 bytes).

IpInAddrErrorsCounter: This attribute provides a count of packets discarded because the IP address in their IP header's destination field was not a valid address to be received at this router. This counter includes invalid addresses (e.g., 0.0.0.0) and addresses of unsupported Classes (e.g., Class E). If the actual counter saturates, it remains on its maximum value. Default value is 0x00. (R) (mandatory) (4 bytes).

IpForwPacketsCounter: This attribute provides a count of packets for which this router was not their final IP destination, as a result of which an attempt was made to find a route to forward them to that final destination. If the actual counter saturates, it remains on its maximum value. Default value is 0x00. (R) (mandatory) (4 bytes).

IpInUnknownProtosCounter: This attribute provides a count of packets which were locally-addressed and received successfully but discarded because of an unknown or unsupported protocol. If the actual counter saturates, it remains on its maximum value. Default value is 0x00. (R) (mandatory) (4 bytes).

IpInDiscardsCounter: This attribute provides a count of input packets for which no problems were encountered to prevent their continued processing, but which were discarded (e.g., for lack of buffer space). Note that this counter does not include any packets discarded while awaiting re-assembly. If the actual counter saturates, it remains on its maximum value. Default value is 0x00. (R) (mandatory) (4 bytes).

IpInDeliversCounter: This attribute provides a count of input packets successfully delivered to IP user-protocols (including ICMP). If the actual counter saturates, it remains on its maximum value. Default value is 0x00. (R) (mandatory) (4 bytes).

IpOutRequestsCounter: This attribute provides a count of packets that local IP user-protocols (including ICMP) supplied to IP in requests for transmission. Note that this counter does not include any packets counted in ipForwPacketsCounter. If the actual counter saturates, it remains on its maximum value. Default value is 0x00. (R) (mandatory) (4 bytes).

IpOutDiscardsCounter: This attribute provides a count of output packets for which no problem was encountered to prevent their transmission to their destination, but which were discarded (e.g., for lack of buffer space). Note that this counter would include packets counted in ipForwPacketsCounter if any such packets met this (discretionary) discard criterion. If the actual counter saturates, it remains on its maximum value. Default value is 0x00. (R) (mandatory) (4 bytes).

IpOutNoRoutesCounter: This attribute provides a count of packets discarded because no route could be found to transmit them to their destination. Note that this counter includes any packets counted in ipForwPacketsCounter which meet this 'no-route' criterion. Note that this includes any packets that a host cannot route because all of its default gateways are

down. If the actual counter saturates, it remains on its maximum value. Default value is 0x00. (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.

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 4.

Table 4/G.983.8 – Alarm list for IP router PM history data 1

Number	Event	Description
	Threshold crossing alert	
0	IpInReceives	Exceeds threshold
1	IpInHdr	Exceeds threshold
2	IpInAddr	Exceeds threshold
3	IpForwPackets	Exceeds threshold
4	IpInUnknownProtos	Exceeds threshold
5	IpInDiscards	Exceeds threshold
6	IpInDelivers	Exceeds threshold
7	IpOutRequests	Exceeds threshold
8	IpOutDiscards	Exceeds threshold
9	IpOutNoRoutes	Exceeds threshold
10-255	Reserved	

7.2.5 IP router PM history data 2

This managed entity contains other IP-related past performance monitoring data collected at IP router function. Instances of this managed entity are created/deleted by the OLT after/before an instance of IP Router Service Profile is created/deleted.

Relationships

An instance of this managed entity is associated with one instance of IP Router Service Profile.

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 IP Router Service Profile with which this IP Router PM History Data 2 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. 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).

IpReasmReqdsCounter: This attribute provides a count of received packets that needed to be reassembled at this entity. Default value is 0x00. (R) (mandatory) (4 bytes).

IpReasmOKsCounter: This attribute provides a count of packets successfully re-assembled. Default value is 0x00. (R) (mandatory) (4 bytes).

IpReasmFailsCounter: This attribute provides a count of failures detected by the IP re-assembly algorithm (for whatever reason: timed out, errors, etc). Note that this is not necessarily a count of discarded IP fragments since some algorithms (notably the algorithm in RFC 815) can lose track of the number of fragments by combining them as they are received. Default value is 0x00. (R) (mandatory) (4 bytes).

IpFragOKsCounter: This attribute provides a count of packets that have been successfully fragmented at this entity. Default value is 0x00. (R) (mandatory) (4 bytes).

IpFragFailsCounter: This attribute provides a count of packets that have been discarded because they needed to be fragmented at this router but could not be, e.g., because their Don't Fragment flag was set. Default value is 0x00. (R) (mandatory) (4 bytes).

IpFragCreatesCounter: This attribute provides a count of IP fragments that have been generated as a result of fragmentation at this entity. Default value is 0x00. (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.

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.983.8 – Alarm list for IP router PM history data2

Number	Event	Description
	Threshold crossing alert	
0	IpReasmReqds	Exceeds threshold
1	IpReasmOKs	Exceeds threshold
2	IpReasmFails	Exceeds threshold
3	IpFragOKs	Exceeds threshold
4	IpFragFails	Exceeds threshold
5	IpFragCreates	Exceeds threshold
6-255	Reserved	

7.2.6 ICMP PM history data 1

This managed entity contains some ICMP-related past performance monitoring data collected at IP router function. Instances of this managed entity are created/deleted by the OLT after/before an instance of IP Router Service Profile is created/deleted.

Relationships

An instance of this managed entity is associated with one instance of IP Router Service Profile.

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 IP Router Service Profile with which this ICMP PM History Data1 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. 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).

IcmpInMsgsCounter: This attribute provides a count of received ICMP messages. Note that this counter includes all those counted by IcmpInErrorsCounter. Default value is 0x00. (R) (mandatory) (4 bytes).

IcmpInErrorsCounter: This attribute provides a count of ICMP messages that were received but determined as having ICMP-specific errors (bad ICMP checksums, bad length, etc.). Default value is 0x00. (R) (mandatory) (4 bytes).

IcmpInDestUnreachsCounter: This attribute provides a count of received ICMP Destination Unreachable messages. Default value is 0x00. (R) (mandatory) (4 bytes).

IcmpInTimeExcdsCounter: This attribute provides a count of received ICMP Time Exceeded messages. Default value is 0x00. (R) (mandatory) (4 bytes).

IcmpInParmProbsCounter: This attribute provides a count of received ICMP Parameter Problem messages. Default value is 0x00. (R) (mandatory) (4 bytes).

IcmpInSrcQuenchsCounter: This attribute provides a count of received ICMP Source Quench messages. Default value is 0x00. (R) (mandatory) (4 bytes).

IcmpInRedirectsCounter: This attribute provides a count of received ICMP Redirect messages. Default value is 0x00. (R) (mandatory) (4 bytes).

IcmpInEchosCounter: This attribute provides a count of received ICMP Echo (request) messages. Default value is 0x00. (R) (mandatory) (4 bytes).

IcmpInEchoRepsCounter: This attribute provides a count of received ICMP Echo Reply messages. Default value is 0x00. (R) (mandatory) (4 bytes).

IcmpInTimestampsCounter: This attribute provides a count of received ICMP Timestamp (request) messages. Default value is 0x00. (R) (mandatory) (4 bytes).

IcmpInTimestampRepsCounter: This attribute provides a count of received ICMP Timestamp Reply messages. Default value is 0x00. (R) (mandatory) (4 bytes).

IcmpInAddrMasksCounter: This attribute provides a count of received ICMP Address Mask (request) messages. Default value is 0x00. (R) (mandatory) (4 bytes).

IcmpInAddrMaskRepsCounter: This attribute provides a count of received ICMP Address Mask Reply messages. Default value is 0x00. (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.

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.983.8 – Alarm list for ICMP PM history data 1

Number	Event	Description
	Threshold crossing alert	
0	IcmpInMsgs	Exceeds threshold
1	IcmpInErrors	Exceeds threshold
2	IcmpInDestUnreachs	Exceeds threshold
3	IcmpInTimeExcds	Exceeds threshold
4	IcmpInParmProbs	Exceeds threshold
5	IcmpInSrcQuenchs	Exceeds threshold
6	IcmpInRedirects	Exceeds threshold
7	IcmpInEchos	Exceeds threshold
8	IcmpInTimestamps	Exceeds threshold
9	IcmpInTimestampReps	Exceeds threshold
10	IcmpInAddrMasks	Exceeds threshold
11	IcmpInAddrMaskReps	Exceeds threshold
12-255	Reserved	

7.2.7 ICMP PM history data 2

This managed entity contains other ICMP-related past performance monitoring data collected at IP router function. Instances of this managed entity are created/deleted by the OLT after/before an instance of IP Router Service Profile is created/deleted.

Relationships

An instance of this managed entity is associated with one instance of IP Router Service Profile.

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 IP Router Service Profile with which this ICMP PM History Data 2 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. 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).

IcmpOutMsgsCounter: This attribute provides a count of ICMP messages that this router attempted to send. Note that this counter includes all those counted by IcmpOutErrorsCounter. Default value is 0x00. (R) (mandatory) (4 bytes).

IcmpOutErrorsCounter: This attribute provides a count of ICMP messages that this router did not send due to problems discovered within ICMP such as a lack of buffers. This value should not include errors discovered outside the ICMP layer such as the inability of IP to route the resultant packet. In some implementations, there may be no types of error that contribute to this counter's value. Default value is 0x00. (R) (mandatory) (4 bytes).

IcmpOutDestUnreachsCounter: This attribute provides a count of sent ICMP Destination Unreachable messages. Default value is 0x00. (R) (mandatory) (4 bytes).

IcmpOutTimeExcdsCounter: This attribute provides a count of sent ICMP Time Exceeded messages. Default value is 0x00. (R) (mandatory) (4 bytes).

IcmpOutParmProbsCounter: This attribute provides a count of sent ICMP Parameter Problem messages. Default value is 0x00. (R) (mandatory) (4 bytes).

IcmpOutSrcQuenchsCounter: This attribute provides a count of sent ICMP Source Quench messages. Default value is 0x00. (R) (mandatory) (4 bytes).

IcmpOutRedirectsCounter: This attribute provides a count of sent ICMP Redirect messages. Default value is 0x00. (R) (mandatory) (4 bytes).

IcmpOutEchosCounter: This attribute provides a count of sent ICMP Echo (request) messages. Default value is 0x00. (R) (mandatory) (4 bytes).

IcmpOutEchoRepsCounter: This attribute provides a count of sent ICMP Echo Reply messages. Default value is 0x00. (R) (mandatory) (4 bytes).

IcmpOutTimestampsCounter: This attribute provides a count of sent ICMP Timestamp (request) messages. Default value is 0x00. (R) (mandatory) (4 bytes).

IcmpOutTimestampRepsCounter: This attribute provides a count of sent ICMP Timestamp Reply messages. Default value is 0x00. (R) (mandatory) (4 bytes).

IcmpOutAddrMasksCounter: This attribute provides a count of sent ICMP Address Mask (request) messages. Default value is 0x00. (R) (mandatory) (4 bytes).

IcmpOutAddrMaskRepsCounter: This attribute provides a count of sent ICMP Address Mask Reply messages. Default value is 0x00. (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.

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.983.8 – Alarm list for ICMP PM history data 2

Number	Event	Description	Threshold data counter # (Note)
	Threshold crossing alert		
0	IcmpOutMsgs	Exceeds threshold	1
1	IcmpOutErrors	Exceeds threshold	2
2	IcmpOutDestUnreachs	Exceeds threshold	3
3	IcmpOutTimeExcds	Exceeds threshold	4
4	IcmpOutParmProbs	Exceeds threshold	5
5	IcmpOutSrcQuenchs	Exceeds threshold	6
6	IcmpOutRedirects	Exceeds threshold	7
7	IcmpOutEchos	Exceeds threshold	8
8	IcmpOutTimestamps	Exceeds threshold	9
9	IcmpOutTimestampReps	Exceeds threshold	10
10	IcmpOutAddrMasks	Exceeds threshold	11
11	IcmpOutAddrMaskReps	Exceeds threshold	12
12-255	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.			

7.2.8 IP route table

This managed entity is used to record data that is associated with IP routes. Some of the data is volatile. Instances of this managed entity shall be automatically created/deleted by the ONT upon creation/deletion of the associated instances of IP Router Service Profile.

Relationships

An instance of this managed entity is associated with one instance of IP Router Service Profile.

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 IP Router Service Profile with which this IP Route Table is associated. (R) (mandatory) (2 bytes).

IpRouteNumber: This attribute indicates the number of current routes in the route table. Default value is 0x00. (R) (mandatory) (2 bytes).

IpRouteTableMaxSize: This attribute indicates the maximum number of routes that can be stored in the route table. (R) (mandatory) (2 bytes).

IpRouteTable: This attribute lists current routes in the route table. A route consists of route-id, destination-address, destination-address-mask, tos, next-hop, output-port, route-type, route-protocol, route-age, and metric, which are further described below. (R) (mandatory) ($N \times 30$ bytes. N is the number of routes.):

route-id: a unique identifier of a route within the route table (2 bytes);

destination-address: the destination IP address of this route (4 bytes);

destination-address-mask: the address mask associated with the destination address (4 bytes);

tos: TOS value defined in RFC 2096 [3] (ipCidrRouteTos) for use with policy routing; otherwise, 0 (1 byte);

next-hop: the address of the next router on remote routes (4 bytes);

output-port: the port number of the IP port through which the next hop of this route should be reached (1 byte);

route-type: the type of route as defined in RFC 2096 [3] (ipCidrRouteType) (1 byte);

route-protocol: the routing mechanism via which this route was learned, as defined in RFC 2096 [3] (ipCidrRouteProto). For example, static route is 3 (1 byte);

route-age: the number of seconds since this route was last updated or otherwise determined to be correct. Static routes can return the maximum value (4 bytes);

metric: the primary and secondary routing metrics for this route. The semantics of this metric are determined by the routing-protocol specified in the route's route-protocol value. If part of this metric is not used, its value should be set to –1 (2×4 bytes).

Actions

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

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

Notifications

None.

7.2.9 IP static routes

This managed entity is used to set or delete IP static routes. Instances of this managed entity shall be automatically created/deleted by the ONT upon creation/deletion of the associated instances of IP Router Service Profile.

Relationships

An instance of this managed entity is associated with one instance of IP Router Service Profile.

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 IP Router Service Profile with which this IP Static Routes is associated. (R) (mandatory) (2 bytes).

IpStaticRouteTableMaxSize: This attribute indicates the maximum number of routes that can be set as static routes. (R) (mandatory) (2 bytes).

IpStaticRouteTable: This attribute is used to set or delete static routes in the route table. A route consists of route-id, action, destination-address, destination-address-mask, next-hop, output-port, iVCCTPointer and metric, which are further described below. (The same scenario is used for the MAC filter table attribute of the MAC Bridge Port Filter Table Data managed entity. See I.1.3 and I.1.4.) When this attribute is used to set a static route through the parameter action:add(1), the route table is searched for the route-id parameter associated with the static route that is to be added. If the same route-id is found, the route is overwritten. (R, W) (mandatory) ($N \times 21$ bytes. N is the number of routes.):

- route-id: a unique identifier of a route within the static route table (1 byte);
- action: remove (0) or add (1) this route. When a static route is being removed, only static-route-id field is used to identify the route (1 byte);

- destination-address: the destination IP address of this route. This field may be set at the default route address (0.0.0.0) (4 bytes);
- destination-address-mask: the address mask associated with the destination address (4 bytes);
- next-hop: the address of the next router on remote routes. This field is not used when the next-hop is reached through an unnumbered link (4 bytes, 0xFFFFFFFF when not used);
- output-port: the port number of the IP port through which the next hop of this route should be reached. This field is used when the next-hop is reached through an unnumbered link and when a static route is set to support a fully meshed network over ATM (1 byte, 0xFF when not used);
- iVCCTPointer: the pointer to the instance of Interworking VCC Termination Point which identifies one of the ATM links of the fully meshed network which is being set by this attribute (optional, 2 bytes);
- metric: the routing metric for this route (4 bytes).

Actions

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

Set: Set one or more attributes.

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

Notifications

None.

7.2.10 ARP service profile

This managed entity is used to organize data that is associated with the ARP function used by an IP router function that contains an IP port of native LAN type. Instances of this managed entity are created/deleted by the OLT after/before an instance of IPPortConfigurationData is created/deleted.

Relationships

An instance of this managed entity is associated with one instance of IP Port Configuration Data of native LAN type.

Attributes

Managed entity id: This attribute provides a unique number for each instance of this managed entity. The first byte is the slot id (defined in 7.1.3/G.983.2). If the UNI is integrated, this value is 0x00. The second byte is the ARP group id. (R, Set-by-create) (mandatory) (2 bytes).

ARP timer: This attribute indicates the maximum number of seconds that IP packets are held while they are awaiting address resolution by ARP at this router. (R) (mandatory) (4 bytes).

ARP cache clear: This boolean attribute is used by the management system to initialize the ARP cache associated with an instance of this entity. This attribute is used only to trigger the "Cache Clear" action. The value TRUE means clear, and the value FALSE has no significance. As the value of this attribute has no physical meaning, the action "Get" will always return the value FALSE for this attribute. (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.

7.2.11 ARP configuration data

This managed entity is used to organize data that is associated with the ARP function related to an IP router that contains an IP port of native LAN type. Some of the data is volatile. Instances of this managed entity shall be automatically created/deleted by the ONT upon creation/deletion of the associated instance of ARP Service Profile.

Relationships

An instance of this managed entity is associated with one instance of ARP Service Profile.

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 ARP Service Profile with which this ARP Configuration Data is associated. (R) (mandatory) (2 bytes).

ARPTableMaxSize: This attribute indicates the maximum number of ARP entries that can be set in the ARP table. (R) (mandatory) (2 bytes).

ARP table: This attribute lists current entries in the ARP cache. An ARP cache entry consists of port, IP-address, MAC-address, and type, which are further described below. (R) (mandatory) ($N \times 12$ bytes. N is the number of entries.):

- port: the port number of the IP port associated with the entry (1 byte);
- IP-address: an IP address (4 bytes);
- MAC-address: an equivalent MAC-address resolved by the ARP procedure (6 bytes);
- type: the entry type such as dynamic (3) or static (4) (1 byte).

Actions

Get: Get one or more attributes. Latch a snapshot (i.e. copy) of the current ARP Table and respond with the size of data (4 bytes) that should be obtained using the Get next command.

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

Notifications

None.

7.3 ISDN management

7.3.1 Physical path termination point ISDN UNI

This managed entity represents the point at the ISDN UNI in the ONT where physical paths terminate and physical path level functions (e.g. analog telephony, facsimile function) are performed. An instance of this managed entity shall be automatically created/deleted by the ONT upon the creation/deletion of a Subscriber Line Card with ISDN type.

Relationships

One or more instances of this managed entity shall be contained in an instance of the $ONT_{B\text{-}PON}$ or a Subscriber Line Card managed entity classified as ISDN 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). If the UNI is integrated, this value is 0x00. The second byte is the port id with 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).

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).

Interworking VCCpointer: This attribute provides a pointer to the instance of the Interworking VCC Termination Point managed entity to which this instance is connected. (R, W) (optional) (2 bytes).

DchannelID: This attribute provides the channel identifier of the AAL 2 connection transporting the D channel associated with this ISDN BRI port. (R, set-by-create) (mandatory) (1 byte).

B1ChannelID: This attribute provides the channel identifier of the AAL 2 connection transporting the B1 channel associated with this ISDN BRI port. (R, set-by-create) (mandatory) (1 byte).

B2ChannelID: This attribute provides the channel identifier of the AAL 2 connection transporting the B2 channel associated with this ISDN BRI port. (R, set-by-create) (mandatory) (1 byte).

ARC: This attribute is used to control alarm reporting from this managed entity. Valid values are "off" (alarm reporting allowed immediately, value 0x00) and "on" (alarm reporting inhibited, value 0x01). Upon initial installation and provisioning of the ONT, 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." (R, W) (optional) (1 byte).

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

ISDN loopback configuration: This attribute represents the loopback configuration of this physical interface. Value 0x00: no loopback; value 0x01: simultaneous loopback of all channels; value 0x01: loopback of D channel only; value 0x02: loopback of B1 channel only; value 0x03: loopback of B2 channel only. Upon autonomous instantiation, the value 0x00 is used. (R, W) (mandatory) (1 byte).

Actions

Get: Get one or more attributes.

Set: Set one or more attributes.

Test: Request that the ONT perform one or more MLT tests. See "Test" and "Test result" message layouts in II.2.27/G.983.2 and II.2.45/G.983.2.

Notifications

Alarm: This notification is used to notify the management system when a failure has been detected or cleared. Both ONT and OLT should know the alarm list used by this entity. The alarm list for this entity is given in Table 8.

Table 8/G.983.8 – Alarm list for physical path termination point ISDN UNI

Number	Alarm	Description
0	AIS	Alarm indication signal
1	RDI	Remote defect indication
2-255	Reserved	

7.4 VLAN tagging management

7.4.1 VLAN tagging operation configuration data

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

Relationships

Zero or one instance of this managed entity may exist for each instance of Physical Path Termination Point Ethernet 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 Ethernet UNI with which this VLAN Tagging Operation Configuration Data instance is associated. (R, Set-by-create) (mandatory) (2 bytes).

Upstream VLAN tagging operation mode: This attribute selects whether or not upstream VLAN tagging is sent. Valid values are 0x00 (upstream frame is sent "as is," regardless of whether or not the received frame is tagged) and 0x01 (The upstream frame is sent as tagged whether or not the received frame is tagged. TCI, consisting of VID, CFI and user priority, is attached or overwritten by using the Upstream VLAN Tag TCI Value.). (R, W, Set-by-create) (mandatory) (1 byte).

Upstream VLAN tag TCI value: This attribute indicates the TCI value for upstream VLAN tagging. It is used when the Upstream VLAN Tagging Operation Mode is 0x01. Any 2-byte value is acceptable. (R, W, Set-by-create) (mandatory) (2 bytes).

Downstream VLAN tagging operation mode: This attribute selects whether or not downstream VLAN tagging is sent. Valid values are 0x00 (downstream frame is sent "as is," regardless of whether or not the received frame is tagged) and 0x01 (The downstream frame is sent as untagged whether or not the received frame is tagged). (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.

7.4.2 VLAN tagging filter data

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

Relationships

Zero or one instance of this managed entity may exist for each instance of MAC Bridge Port Configuration Data which is associated with Interworking VCC Termination Point (PON side) or Physical Path Termination Point Ethernet 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 MACBridgePortConfigurationData with which this VLAN Tagging Filter Data instance is associated. (R, Set-by-create) (mandatory) (2 bytes).

VLAN filter table: This attribute lists TCI values which are provisioned at a bridging port. Since a TCI value (consisting of user priority, CFI and VID) is represented by 16 bits, 2 bytes are reserved for this attribute per VLAN. (R, W, Set-by-create) (mandatory) (2 bytes × number of supported VLANs).

Forward operation: When a frame is received, the frame is processed according to the following Forward Operations. The operations are invoked based on the value of VID, user priority, or the entire TCI or whether or not the TCI field exists. This attribute indicates the received frame is treated as indicated below. (R,W, set-by-create) (mandatory) (1 byte).

	Type of received frame	
	Tagged	**Untagged**
0x00	Depends on MAC Bridge Port Bridge Table Data	Depends on MAC Bridge Port Bridge Table Data
0x01	Discard	Depends on MAC Bridge Port Bridge Table Data
0x02	Depends on MAC Bridge Port Bridge Table Data	Discard
0x03	Depends on MAC Bridge Port Bridge Table Data when the received VID is included in this table.	Depends on MAC Bridge Port Bridge Table Data
0x04	Discarded when the received VID is not included in this table.	Discard
0x05	Discarded when the received VID is included in this table.	Depends on MAC Bridge Port Bridge Table Data
0x06	Depends on MAC Bridge Port Bridge Table Data when the received VID is not included in this table.	Discard
0x07	Depends on MAC Bridge Port Bridge Table Data when the received user priority is included in this table.	Depends on MAC Bridge Port Bridge Table Data
0x08	Discarded when the received user priority is not included in this table.	Discard
0x09	Discarded when the received user priority is included in this table.	Depends on MAC Bridge Port Bridge Table Data
0x0A	Depends on MAC Bridge Port Bridge Table Data when the received user priority is not included in this table.	Discard
0x0B	Depends on MAC Bridge Port Bridge Table Data when the received TCI is included in this table.	Depending on MAC Bridge Port Bridge Table Data
0x0C	Discarded when the entire received TCI is not included in this table.	Discard
0x0D	Discarded when the entire received TCI is included in this table.	Depends on MAC Bridge Port Bridge Table Data
0x0E	Depends on MAC Bridge Port Bridge Table Data when the entire received TCI is not included in this table.	Discard

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.

Supplementary explanation

1) *Ethernet frame and fields format for VLAN services*

The detailed format of Ethernet frame for VLAN services is described in IEEE 802.1Q [4] and is depicted in Figure 5.

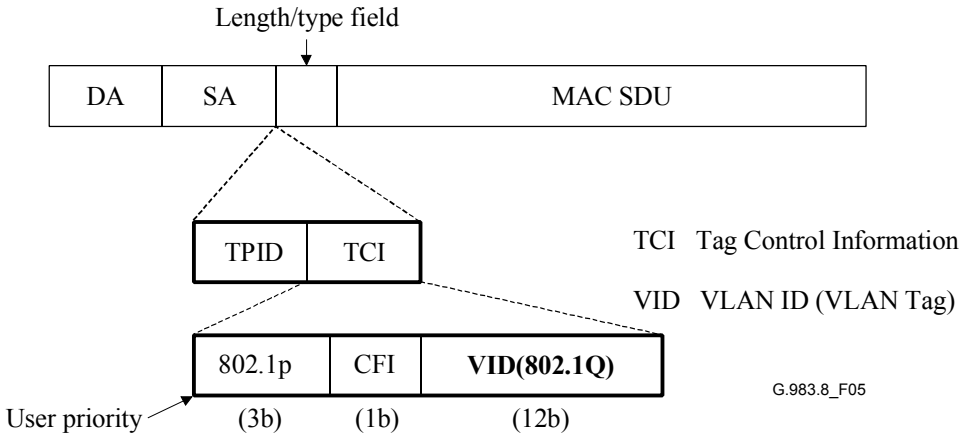

Figure 5/G.983.8 – Detailed format for Ethernet frame with VLAN tag

2) *Operations*

Operations specified in the attribute "Forward Operation" are explained. Forward Operations are specified by a combination of the basic actions mentioned.

a) Basic MAC bridge operation: As shown in Figure 6, if Destination MAC Address (DA) in the received frame is listed in one or more ports with MAC Bridge Port Bridge Table Data, this frame is forwarded to the indicated ports. Otherwise, it is broadcasted to all of the ports excepting for its receiving port.

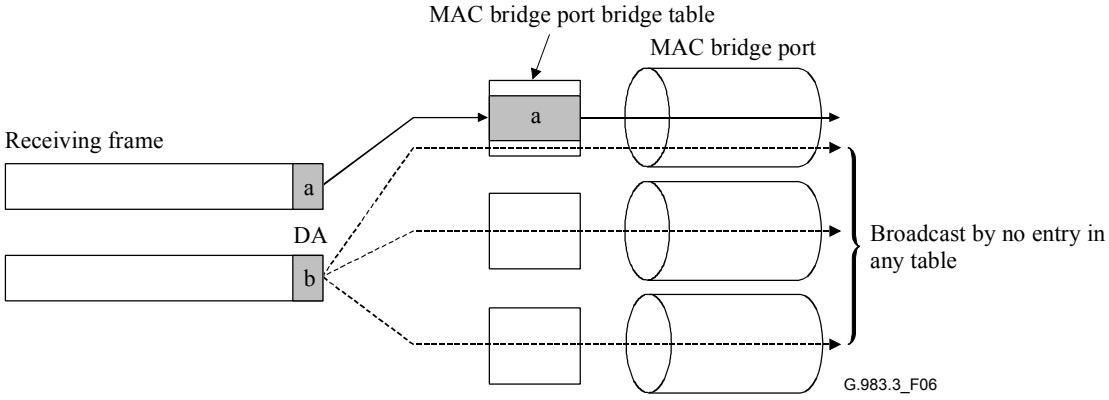

Figure 6/G.983.8 – Basic MAC bridge operation

b) Unconditional forwarding for tagged frame: If a tagged frame is received, it is forwarded without investigation of TCI.

c) Unconditional discarding for tagged frame: If a tagged frame is received, it is discarded without investigation of TCI.

d) **Unconditional forwarding for untagged frame**: If an untagged frame is received, it is forwarded without investigation of TCI.

e) **Unconditional discarding for untagged frame**: If an untagged frame is received, it is discarded without investigation of TCI.

f) **Positive filtering by TCI**: If a part or all of the fields in the TCI of the received frame are included in VLAN Tag Filter Data, it is forwarded, according to Action a to the indicted ports as shown in Figure 7. Otherwise, its TCI is ignored and it is controlled by Action a.

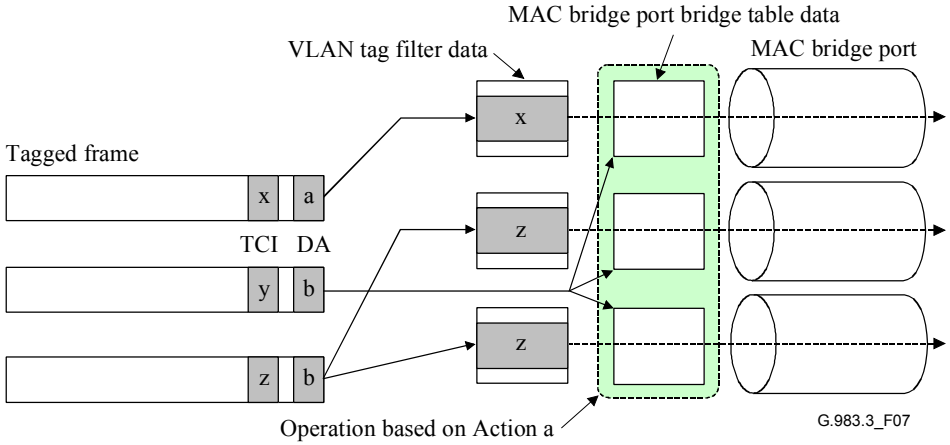

Figure 7/G.983.8 – Positive filtering by TCI operation

g) **Negative filtering by TCI**: If a part or all of the fields in the TCI of the received frame are included in VLAN Tag Filter Data, it is discarded. Otherwise, it is forwarded according to Action a as shown in Figure 8.

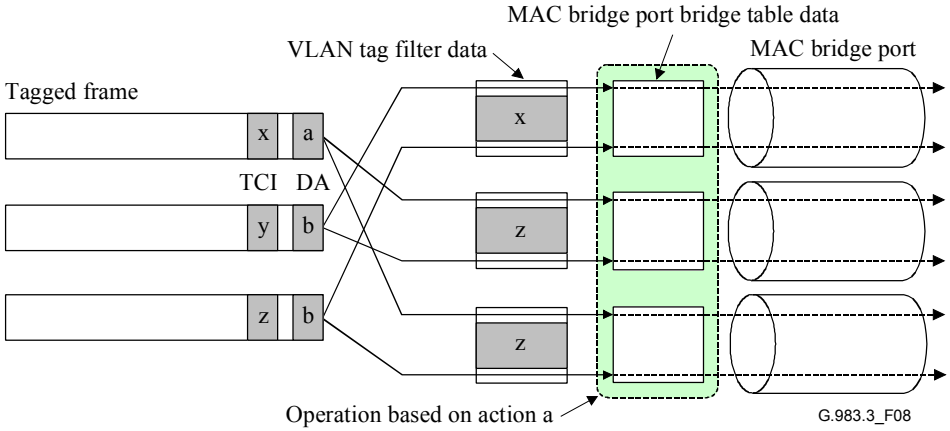

Figure 8/G.983.8 – Negative filtering by TCI operation

The Forwarding Operation is specified by combination of these actions.

	The type of received frame	
	Tagged	**Untagged**
0x00	Action a	Action a
0x01	Action c	Action a
0x02	Action a	Action e
0x03	Action f (VID investigation)	Action a
0x04	Action f (VID investigation)	Action e
0x05	Action g (VID investigation)	Action a
0x06	Action g (VID investigation)	Action e
0x07	Action f (user priority investigation)	Action a
0x08	Action f (user priority investigation)	Action e
0x09	Action g (user priority investigation)	Action a
0x0A	Action g (user priority investigation)	Action e
0x0B	Action f (TCI investigation)	Action a
0x0C	Action f (TCI priority investigation)	Action e
0x0D	Action g (TCI investigation)	Action a
0x0E	Action g (TCI investigation)	Action e

7.5 Extended MAC bridge filtering scheme

7.5.1 MAC bridge port filter preassign table

This managed entity provides an alternate approach to address filtering other than that supported in ITU-T Rec. G.983.2 [2] through MACBridgePortFilterTableData. This alternate approach is useful when all the groups of addresses are stored beforehand in the line card, and this managed entity is used to designate which groups are valid or invalid for filtering. The MAC addresses and Ethernet types for various protocols are provided in Appendix III. Instances of this managed entity are created/deleted autonomously after creation/deletion of a Subscriber Line Card ME of Ethernet type in which all groups of addresses are preassigned and stored in the card.

Relationships

This managed entity is associated with one instance of a MACBridgePortConfigurationData managed entity.

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 MACBridgePortConfigurationData with which this MAC Bridge Port Filter Preassign Table instance is associated. (R) (mandatory) (2 bytes).

IPv4MulticastFiltering: This attribute indicates whether IPv4Multicast Ethernet types are forwarded (value 0x00) or filtered (value 0x01). Initial value is 0x00. (R,W) (mandatory) (1 byte).

IPv6MulticastFiltering: This attribute indicates whether Ipv6Multicast Ethernet types are forwarded (value 0x00) or filtered (value 0x01). Initial value is 0x00. (R,W) (mandatory) (1 byte).

IPv4BroadcastFiltering: This attribute indicates whether IPv4Broadcast Ethernet types are forwarded (value 0x00) or filtered (value 0x01). Initial value is 0x00. (R,W) (mandatory) (1 byte).

RARPFiltering: This attribute indicates whether RARP Ethernet types are forwarded (value 0x00) or filtered (value 0x01). Initial value is 0x00. (R,W) (mandatory) (1 byte).

IPXFiltering: This attribute indicates whether IPX Ethernet types are forwarded (value 0x00) or filtered (value 0x01). Initial value is 0x00. (R,W) (mandatory) (1 byte).

NetBEUIFiltering: This attribute indicates whether NetBEUI Ethernet types are forwarded (value 0x00) or filtered (value 0x01). Initial value is 0x00. (R,W) (mandatory) (1 byte).

AppleTalkFiltering: This attribute indicates whether AppleTalk Ethernet types are forwarded (value 0x00) or filtered (value 0x01). Initial value is 0x00. (R,W) (mandatory) (1 byte).

BridgeManagementInformationFiltering: This attribute indicates whether BridgeManagementInformation Ethernet types are forwarded (value 0x00) or filtered (value 0x01). Initial value is 0x00. (R,W) (mandatory) (1 byte).

Note that some MAC addresses should not be handled, considering the following rules of IEEE 802.1D [5]:

1) Addresses from 0x0180C2000000 to 0x0180C200000F are reserved;
2) Addresses from 0x0180C2000020 to 0x0180C20002F are used for GARP Application Address.

ARPFiltering: This attribute indicates whether ARP Ethernet types are forwarded (value 0x00) or filtered (value 0x01). Initial value is 0x00. (R,W) (mandatory) (1 byte).

PPPoEFiltering: This attribute indicates whether PPPoE Ethernet types are forwarded (value 0x00) or filtered (value 0x01). Initial value is 0x00. (R,W) (mandatory) (1 byte).

Actions

Set: Set one or more attributes.

Notifications

None.

7.6 Management support for video interface

7.6.1 Physical path termination point video UNI

This managed entity represents the point at the video UNI in the ONT where physical paths terminate and physical path level functions are performed.

An instance of this managed entity shall be automatically created/deleted by the ONT upon creation/deletion of a Subscriber Line Card of Video 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 Video 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). If the UNI is integrated, this value is 0x00. The second byte is the port id with 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).

Administrative state: This attribute is used to activate (unlock: value 0x00) and deactivate (lock: value 0x01) 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).

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 ONT, 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". (R, W) (optional) (1 byte).

ARCInterval: This attribute provides a provisionable length of time. Units are given in minutes. (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 its new value. The AVC list is given in Table 9.

Alarm: This notification is used to notify the management system when a failure has been detected or cleared. Both ONT and OLT should know the alarm list used by this entity. The alarm list for this entity is given in Table 10.

Table 9/G.983.8 – AVC list for physical path termination point video UNI

Number	Attribute value change	Description
1	N/A	
2	OpState	Operational state of video UNI
3-16	Reserved	Reserved for AVCs of vendor-specific attributes

Table 10/G.983.8 – Alarms list for physical path termination point video UNI

Number	Event	Description
0	Video-LOS	No signal at the video UNI
1-255	Reserved	Reserved for vendor-specific alarms

7.6.2 Physical path termination point video ANI

This managed entity represents the point at the video ANI in the ONT where physical paths terminate and physical path level functions are performed.

An instance of this managed entity shall be automatically created/deleted by the ONT upon creation/deletion of a Subscriber Line Card of Video 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 Video type.

Attributes

Managed entity id: This attribute provides a unique number for each instance of this managed entity. There is only one instance, and it has the number 0x0000. (R) (mandatory) (2 bytes).

Administrative state: This attribute is used to activate (unlock: value 0x00) and deactivate (lock: value 0x01) 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).

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 ONT, 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". (R, W) (optional) (1 byte).

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

FrequencyRangeLow: This attribute indicates the lower of the possibly two frequency ranges supported. Different frequency ranges are indicated by code points, as given below:

- 0 indicates no low band is supported;
- 1 indicates 50-550 MHz is supported;
- 2 indicates 50-750 MHz is supported;
- 3 indicates 50-870 MHz is supported;
- 4..255 are reserved for future use.

(R) (mandatory) (1 byte).

FrequencyRangeHigh: This attribute indicates the higher of the two frequency ranges supported. Different frequency ranges are indicated by code points, as given below:

- 0 indicates no high band is supported;
- 1 indicates 550-750 MHz is supported;
- 2 indicates 550-870 MHz is supported;
- 3 indicates 950-2050 MHz is supported;
- 4 indicates 2150-3250 MHz is supported;
- 5 indicates 950-3250 MHz is supported;
- 6..255 are reserved for future use.

(R) (mandatory) (1 byte).

SignalCapability: This attribute indicates the capability of the ONT to measure the video signal level. Different capabilities are indicated by code points, as given below:

- 0 indicates no signal level capability is supported;
- 1 indicates total optical power level is supported;
- 2 indicates fixed frequency pilot tone power level is supported;
- 3 indicates total optical power level and fixed frequency pilot tone power level are supported;
- 4 indicates variable frequency pilot tone power level is supported;
- 5 indicates total optical power level and variable frequency pilot tone power level are supported;
- 6..255 are reserved for future use.

(R) (mandatory) (1 byte).

OpticalSignalLevel: This attribute indicates the current measurement of the total optical signal level. The unit of this attribute is dBµW optical.

If SignalCapability = 0, 2, or 4 then this attribute is undefined.

If SignalCapability = 1, 3, or 5, then this attribute describes the total optical power that is generating photocurrent on the receiver.

(R) (optional) (1 byte).

PilotSignalLevel: This attribute indicates the current measurement of the pilot signal level. The unit of this attribute is dBµV at the RF video service port.

If SignalCapability = 0 or 1, then this attribute is undefined.

If SignalCapability = 2, 3, 4, or 5, then this attribute describes the pilot signal level at the output of the video UNI.

(R) (optional) (1 bytes).

SignalLevelMin: This attribute indicates the minimum optical RF power per channel that will result in a CNR of 47 dBc for a channel of 4.5 MHz in bandwidth. The unit of this attribute is dBµW optical.

(R) (mandatory) (1 byte).

SignalLevelMax: This attribute indicates the maximum optical RF power per channel that will result in a CTB of –57 dBc for an 80-channel ensemble of carriers. The units of the attributes are in dBµW optical.

(R) (mandatory) (1 byte).

PilotFrequency: This attribute indicates the frequency of the pilot channel receiver. This unit of this attribute is Hz.

If SignalCapability = 0 or 1, this attribute is undefined;

If SignalCapability = 2 or 3, this attribute is functionally read only;

If SignalCapability = 4 or 5, this attribute is read-write.

(R, W) (optional) (4 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 its new value. The AVC list is given in Table 11.

Alarm: This notification is used to notify the management system when a failure has been detected or cleared. Both ONT and OLT should know the alarm list used by this entity. The alarm list for this entity is given in Table 12.

Table 11/G.983.8 – AVC list for physical path termination point video UNI

Number	Attribute Value Change	Description
1	N/A	
2	OpState	Operational state of video ANI
3-16	Reserved	Reserved for AVCs of vendor-specific attributes

Table 12/G.983.8 – Alarms list for physical path termination point video UNI

Number	Event	Description
0	Video-LOS	No signal at the video ANI
1-255	Reserved	Reserved for vendor-specific alarms

7.7 Management support for local craft terminal interface

7.7.1 Physical path termination point LCT UNI

This managed entity represents the point at the local craft terminal UNI in the ONT where physical paths terminate and physical path level functions are performed.

An instance of this managed entity shall be automatically created/deleted by the ONT upon creation/deletion of a Subscriber Line Card of LCT type. However, this instance will not be reported during a MIB upload.

Relationships

One or more instances of this managed entity shall be contained in an instance of a Subscriber Line Card managed entity classified as LCT 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). If the UNI is integrated, this value is 0x00. The second byte is the port id with 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).

Administrative state: This attribute is used to activate (unlock: value 0x00) and deactivate (lock: value 0x01) 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).

Actions

Get: Get one or more attributes.

Set: Set one or more attributes.

Notifications

None.

7.8 Management support for ONUs

7.8.1 ONT/ONU terminology

Throughout ITU-T Rec. G.983.2 [2], with the exception of the $ONT_{B\text{-}PON}$ Data managed entity description, the term ONT should generally be read as implying either ONT or ONU, whichever is appropriate for the particular instance.

7.8.2 $ONU_{B\text{-}PON}$

This managed entity represents the ONU as equipment.

An instance of this managed entity is automatically created by the ONU after initialization. After the creation of this managed entity, the associated attributes are updated according to the data within the ONU itself.

Relationships

All other managed entities in this Recommendation are related directly or indirectly to the $ONU_{B\text{-}PON}$ (or $ONT_{B\text{-}PON}$) entity.

Attributes

Managed entity id: This attribute provides a unique number for each instance of this managed entity. There is only one instance and it has the number 0x0000. (R) (mandatory) (2 bytes).

Vendor id: This attribute identifies the vendor of the ONU. Upon autonomous instantiation, this attribute consists of all spaces. (R) (mandatory) (4 bytes).

Version: This attribute identifies the version of the ONU as defined by the vendor. The printable value of "0" shall be used when version information is not available or applicable to the ONT being represented. Upon autonomous instantiation, this attribute consists of all spaces. (R) (mandatory) (14 bytes).

Serial number: The serial number is unique for each ONU. Note that the serial number of the ONU is already defined in ITU-T Rec. G.983.1 [1] and contains the vendor id and/or the version number. Upon autonomous instantiation, this attribute consists of all spaces. (R) (mandatory) (8 bytes).

Traffic management option: This attribute identifies the upstream traffic management function implemented in the ONU. There are two options:

1) "Priority controlled upstream traffic" (0x00): the upstream traffic coming from the user is given a priority.
2) "Cell rate controlled upstream traffic" (0x01): the maximum upstream traffic of each individual connection is guaranteed.

Note that the Traffic management option will not apply to downstream traffic. In other words, there is no need for a traffic descriptor for the downstream direction and downstream priority queues can be used. Upon autonomous instantiation, this attribute is set to 0x00. (R) (mandatory) (1 byte).

VP/VC cross-connection function option: This attribute identifies the support of ATM VP or VC cross-connection management functions for the interworking connections to non-ATM UNIs. The value is set to 0x00 if ATM VP or VC cross-connection management functions are not modelled. The value is set to 0x01 if the ATM VP cross-connection management functions are modelled. The value is set to 0x02 if ATM VC cross-connection management functions are modelled. The default value of this attribute is 0x01. (R) (mandatory) (1 byte).

Battery backup: This attribute provides a Boolean indication of whether or not the ONU supports battery backup. False will indicate that no battery is provisioned; true indicates that a battery is provisioned. Upon autonomous instantiation, this attribute is set to false. (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 a managed entity is capable of performing its task. Valid values are enabled (0x00) and disabled (0x01). (R) (optional) (1 byte).

Equipment id: This attribute may be used to identify the specific type of ONU. In North America, this may be used for the equipment CLEI code. (R) (optional) (20 bytes).

OMCC version: This attribute is used to identify the specific version of the OMCC protocol being used by the ONU. This is used to allow the OLT to manage a network with ONUs that support different OMCC versions. Valid values include 0x00 (2000 version) and 0x01 (2002 revised version). Future versions will be added sequentially. Default value is 0x00. (R) (optional) (1 byte).

Vendor product code: This attribute is used to provide a vendor-specific product code for the ONT. (R) (optional) (2 bytes).

SecurityCapability: This attribute is used to advertise the advanced security modes of the ONT. The following code points are defined:

- 0: No extra security features are supported;
- 1: AES encryption of the downstream payload is supported;
- 2..255: Reserved for future use.

(R) (optional) (1 byte).

SecurityMode: This attribute is used to select the advanced security mode for the ONT. Note that all secure VPs in an ONT must use the same security mode at any time. The following code points are defined:

- 0: Churning algorithm will be used;
- 1: AES algorithm will be used;
- 2..255: Reserved for future use.

The default value for this attribute is 0. (R, W) (optional) (1 byte).

Actions

Get: Get one or more attributes.

Set: Set one or more attributes.

Reboot: Reboot the ONU.

Test: This action is used to initiate an ONU self test. Test outcome is "Pass" or "Fail".

Synchronize time: This action is used to synchronize the start time of all Monitoring managed entities of the ONU with the reference time of the OLT and to reset the registers of the Monitoring managed entities. The effect of this action is that all counters of all Monitoring managed entities are set to 0x00 and restart counting. Also, the value of the Interval End Time attribute of the Monitoring managed entities is set to 0x00 and restarts counting.

Note that no other OMCI action has the same effect: synchronization of the start time is not guaranteed at start-up or after a MIB reset command (optional).

Notifications

Attribute value change: This notification is used to report autonomous changes to the attributes of this managed entity. The attribute value change notification shall identify the attribute changed and its new value. The list of AVCs for this managed entity is given in Table 13.

Alarm: This notification is used to notify the managed system when a failure has been detected or cleared. Both ONT and OLT should know the alarm list used by this entity. The alarm list for this entity is given in Table 14.

Test result: For the "Test result" event, notification is sent to the OLT via an alarm ONLY if the ME fails the autonomous self test.

Table 13/G.983.8 – AVC list for $ONU_{B\text{-}PON}$

Number	Attribute value change	Description
1-7	N/A	
8	OpState	Operational state of $ONT_{B\text{-}PON}$
9-16	Reserved	

Table 14/G.983.8 – Alarm list for $ONU_{B\text{-}PON}$

Number	Event	Description
	Alarm	
0	EquipmentAlarm	A functional failure on an internal interface
1	PoweringAlarm	Loss of external power
2	BatteryMissing	Battery is provisioned but missing
3	BatteryFailure	Battery is provisioned and present but cannot recharge
4	BatteryLow	Battery is provisioned and present but its voltage is too low
5	PhysicalIntrusionAlarm	Applies if the ONT is supported with detection such as door or box open
	Test result	
6	ONUSelfTestFailure	ONU has failed autonomous self test
7-255	Reserved	

7.9 Management support for VC cross-connections

7.9.1 VC network $CTP_{B\text{-}PON}$

This managed entity is used to represent the termination of VC links on an ONT. An instance of the ATM VC Cross-Connection (i.e., VC MUX in ONT) managed entity may be used to relate two instances of the VC Network $CTP_{B\text{-}PON}$ managed entity for point-to-point cross-connection (multipoint cross-connection is for further study).

Instances of the VC Network $CTP_{B\text{-}PON}$ managed entity will be created on demand of the OLT:

- as a consequence of action "create" on the VC Network $CTP_{B\text{-}PON}$ managed entity, or
- as a consequence of action "create complete connection" on the ATM VC Cross-Connection managed entity.

Instances of the VC Network $CTP_{B\text{-}PON}$ managed entity will be deleted on demand of the OLT:

- as a consequence of action "delete" on the VC Network $CTP_{B\text{-}PON}$ managed entity, or
- as a consequence of action "delete complete connection" on the ATM VC Cross-Connection managed entity.

Notice that a VC Network $CTP_{B\text{-}PON}$ can be deleted only when no ATM VC Cross-Connection or Interworking VCC Termination Point is associated with it. It is the responsibility of the OLT to make sure that the VC Network $CTP_{B\text{-}PON}$ meets this condition at the time when the OLT requests to delete it.

Note that this managed entity aggregates connectivity functionality from the network view and alarms from the network element view as well as artefacts from trails.

Relationships

Zero or more instances of the VC Network $CTP_{B\text{-}PON}$ managed entity shall exist for each instance of the TC $Adapter_{B\text{-}PON}$, PON TC Adapter or Interworking VCC Termination Point managed entity.

Relationship to Priority $Queue_{B\text{-}PON}$ /Traffic Descriptor Profile Pointer: see attribute definition.

Relationship to UPC Disagreement Monitoring History $Data_{B\text{-}PON}$: one or zero implied in the managed entity id of UPC Disagreement Monitoring History $Data_{B\text{-}PON}$.

This managed entity is related to the ATM VC Cross-Connection managed entity through the Termination Point ANI/UNI side attributes of the ATM VC Cross-Connection managed entity.

Attributes

Managed entity id: This attribute provides a unique number for each instance of this managed entity. (R, Set-by-create) (mandatory) (2 bytes).

VPI value: This attribute identifies the VPI value associated with the VC link being terminated. (R, Set-by-create) (mandatory) (2 bytes).

VCI value: This attribute identifies the VCI value associated with the VC link being terminated. (R, Set-by-create) (mandatory) (2 bytes).

UNI/ANI pointer: This attribute associates the VC Network $CTP_{B\text{-}PON}$ with the ANI (i.e. PON interface) or a UNI. It points to the connected ANI/UNI instance id.

NOTE – For the case using the multiplexing function of AAL 2 (i.e. multiple instances of UNI are associated with a VC Network $CTP_{B\text{-}PON}$ instance), this attribute is assigned a special value:

– 0x00XX will be used for pseudo slotIDs,

– 0xXX00 will be used for pseudo portIDs.

Therefore, 0x0000 will be used only for integrated interfaces (integrated type of ONT) that support multiple AAL 2 functions.

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

Direction: This attribute specifies whether the VC link is used for UNI-to-ANI (value 0x01), ANI-to-UNI (value 0x02), or bi-directional (value 0x03) connection. (R, W, Set-by-create) (mandatory) (1 byte).

Priority queue pointer for downstream: This attribute points to the instance of the Priority $Queue_{B\text{-}PON}$ used for this VC Network $CTP_{B\text{-}PON}$ in the downstream direction. Note that the value of this pointer is null when the VC Network $CTP_{B\text{-}PON}$ is at the ANI side. (R, Set-by-create) (mandatory) (2 bytes).

Priority queue pointer for upstream: This attribute points to the instance of the Priority $Queue_{B\text{-}PON}$ used for this VC Network $CTP_{B\text{-}PON}$ in the upstream direction. It is used when the UNI/ANI pointer indicates an ANI instance id and the **Traffic Management Option** attribute in $ONT_{B\text{-}PON}$ is 0x00; this pointer is null otherwise. (R, Set-by-create) (mandatory) (2 bytes).

Traffic descriptor profile pointer: This attribute serves as a pointer to the instance of the Traffic Descriptor Profile managed entity that contains the traffic parameters used for this VC Network $CTP_{B\text{-}PON}$. This attribute is used when the **Traffic Management Option** attribute in $ONT_{B\text{-}PON}$ is 0x01. It applies to the UNI side VC Network $CTP_{B\text{-}PON}$ if UPC is used. In this case, this pointer points to a Traffic Descriptor managed entity.

When traffic shaping is used, it applies to the ANI side VC Network $CTP_{B\text{-}PON}$. In this case, this pointer points to a Traffic Descriptor Profile managed entity and the **Priority queue pointer for the upstream** attribute is null. (R, Set-by-create) (optional) (2 bytes).

See also Appendix IV/G.983.2.

Actions

Create: Create an instance of this managed entity.

Delete: Delete an instance of this managed entity.

Get: Get one or more attributes of this managed entity.

Set: Set one or more attributes of this managed entity.

Notifications

Alarm: This notification is used to notify the management system for the ATM Layer Management Indication (LMI) when an alarm has been detected or cleared. The OLT should know the alarm list used by this entity. The alarm list for this entity is given in Table 15. See also Appendix III/G.983.2.

Table 15/G.983.8 – Alarm list for VC network $CTP_{B\text{-}PON}$

Number	Alarm	Description
0	VC-AIS-LMIR	VC-AIS receiving indication (optional)
1	VC-RDI-LMIR	VC-RDI receiving indication (optional)
2	VC-AIS-LMIG	VC-AIS generation indication (optional)
3	VC-RDI-LMIG	VC-RDI generation indication (optional)
4	Segment Loss of Continuity	Loss of continuity is detected when the VC Network $CTP_{B\text{-}PON}$ is a segment end point (optional)
5	End-to-End Loss of Continuity	Loss of continuity is detected when the VC Network $CTP_{B\text{-}PON}$ supports an Interworking VCC Termination Point (optional)
6-255	Reserved	

7.9.2 ATM VC cross-connection

For point-to-point ATM VC Cross-Connections, this managed entity is used to represent the cross-connect relationship between two VC Network $CTP_{B\text{-}PON}$s. For multipoint ATM VC Cross-Connections, which are optional, the use of this managed entity is for further study.

Instances of this managed entity shall be created and deleted by the OLT based on ATM connection set up.

Relationships

Zero or more instances of the ATM VC Cross-Connection managed entity shall exist for each instance of the $ONT_{B\text{-}PON}$ managed entity.

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 instance identifier of the VC Network $CTP_{B\text{-}PON}$ at the ANI side of this ATM VC cross-connect. (R, Set-by-create) (mandatory) (2 bytes).

Termination point ANI side: This attribute identifies the instance of the VC Network $CTP_{B\text{-}PON}$ managed entity that represents the cross-connected VC Network $CTP_{B\text{-}PON}$s on the ANI side. (R, Set-by-create) (mandatory) (2 bytes).

Termination point UNI side: This attribute identifies the instance of the VC Network $CTP_{B\text{-}PON}$ managed entity that represents the cross-connected VC Network $CTP_{B\text{-}PON}$s on the UNI side. (R, Set-by-create) (mandatory) (2 bytes).

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).

Administrative state: This attribute is used to "unlock" (value 0x00) and "lock" (value 0x01) the functions performed by instances of this managed entity. (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.

Create complete connection: Create two instances of the VC Network $CTP_{B\text{-}PON}$ managed entity (ANI-side and UNI-side) and one instance of the ATM VC Cross-Connection managed entity.

Delete complete connection: Delete two instances of the VC Network $CTP_{B\text{-}PON}$ managed entity (ANI-side and UNI-side) and one instance of the ATM VC Cross-Connection managed entity.

Get: Get attributes of this managed entity.

Get complete connection: Get all attributes of a connection; this holds the attributes of two instances of the VC Network $CTP_{B\text{-}PON}$ managed entity (ANI-side and UNI-side) and the attributes of the corresponding ATM VC Cross-Connection managed entity.

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 its new value. The list of AVCs for this managed entity is given in Table 16.

Table 16/G.983.8 –AVC list for ATM VC cross-connection

Number	AVC	Description
1	N/A	
2	N/A	
3	OpState	Operational state
4	N/A	
5-16	Reserved	

7.9.3 VC PM history data

This managed entity is used to collect and report performance monitoring data associated with a VCC for the last completed 15-minute interval. The instances of this managed entity are created and deleted on request of the OLT.

Relationships

Zero or more instances of this managed entity may exist for each instance of the VC Network $CTP_{B\text{-}PON}$ managed entity.

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 Managed Entity id of the corresponding VC Network $CTP_{B\text{-}PON}$. (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 actual 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$_{B\text{-}PON}$ 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).

Lost C=0+1 cells: This attribute measures background cell loss. It cannot distinguish between cells lost because of header bit errors, ATM-level header errors, cell policing, or buffer overflows. It records only loss of information independent of the priority of the cell. If the actual counter saturates, it remains on its maximum value. (R) (mandatory) (2 bytes).

Lost C=0 cells: This attribute measures background cell loss. It cannot distinguish between cells lost because of header bit errors, ATM-level header errors, cell policing, or buffer overflows. It records only loss of high priority cells. If the actual counter saturates, it remains on its maximum value. (R) (mandatory) (2 bytes).

Misinserted cells: This attribute is used to measure occurrences of when a cell is misrouted to an active VC that is being monitored. If the actual counter saturates, it remains on its maximum value. (R) (mandatory) (2 bytes).

Transmitted C=0+1 cells: This attribute provides a count of all cells that are originated at a monitored connection by the transmitting end point (i.e., backward reporting is assumed). (R) (mandatory) (5 bytes).

Transmitted C=0 cells: This attribute provides a count of all high priority cells that are originated at a monitored connection by the transmitting end point (i.e., backward reporting is assumed). (R) (mandatory) (5 bytes).

Impaired block: This severely errored cell block counter will be incremented whenever one of the following events takes place: the number of misinserted cells exceeds $M_{misinserted}$, the number of bipolar violations exceeds $M_{errored}$, or the number of lost cells exceeds M_{lost}. The values for $M_{misinserted}$, $M_{errored}$, and M_{lost} are set based on vendor-operator negotiation. (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.

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; the TCA change notification "off" will be sent at the end of the 15 min period since that is when the counters are reset to 0x00. Both ONT and OLT should know the event list used by this entity, given in Table 17.

Table 17/G.983.8 – Alarm list for VC PM history data

Number	Event	Description	Threshold Data counter # (Note)
	Threshold crossing alert		
0	Lost CLP=0+1 Cells	Exceeds threshold	1
1	Lost CLP=0 Cells	Exceeds threshold	2
2	Misinserted Cells	Exceeds threshold	3
3	Impaired Blocks	Exceeds threshold	4
4-255	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.			

7.10 Management support for additional Ethernet performance monitoring

7.10.1 Ethernet performance monitoring history data 2

This managed entity contains the last completed 15-minute interval collected statistic data for an Ethernet interface. The statistic data value is only updated at the end of each period.

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

Relationships

One instance of this Ethernet Performance Monitoring History Data 2 managed entity can exist for each instance of the Physical Path Termination Point Ethernet 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 id of the Physical Path Termination Point Ethernet UNI. (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 statistic data values 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 statistic data value is 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 $_{\text{APON}}$ 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).

PPPoEFilteredFrameCounter: This attribute provides a count of the number of frames that have been discarded due to PPPoE filtering. Default value is 0x00. (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: This action returns the current value of one or more actual counters associated with performance monitoring attributes and the value of the Interval End Time attribute representing the interval in which the request is made. The values in the specific counters would be reset at the end of the interval.

NOTE – "Get" returns the statistical data stored in the attribute values; "Get current data" returns the real-time value of the actual counters associated with those attributes.

Support of this action is optional.

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. The event list for this entity is given in Table 18.

Table 18/G.983.8 – Alarm list for Ethernet performance monitoring history data 2

Number	Event	Description	Threshold Data counter # (Note)
	Threshold Crossing Alert		
0	PPPoEFilteredFrameCounter	Exceeds threshold	1
1-255	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 ONT Management and Control Channel (OMCC)

See clause 8/G.983.2.

9 ONT Management and Control Protocol

See clause 9/G.983.2. Modifications to this clause are provided in the clauses below.

9.1 Message types

To support VC cross-connections, message types 5 and 7 in Table 20/G.983.2 must be modified. Table 19 gives the modified message types.

Table 19/G.983.8 – OMCI message types

MT	Type	Purpose	AK	Inc MIB data sync.
5	Create complete connection	Create an ATM VP Cross-Connection and two associated VP Network $CTP_{B\text{-}PON}$s or create an ATM VC Cross-Connection and two associated VC Network $CTP_{B\text{-}PON}$s	Yes	Yes
7	Delete complete connection	Delete an ATM VP Cross-Connection and two associated VP Network $CTP_{B\text{-}PON}$s or delete an ATM VC Cross-Connection and two associated VC Network $CTP_{B\text{-}PON}$s	Yes	Yes

9.2 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 20 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 20/G.983.8 – Managed entity identifiers

Managed entity class value	Managed entity
67	IP Port Configuration Data
68	IP Router Service Profile
69	IP Router Configuration Data
70	IP Router PM History Data 1
71	IP Router PM History Data 2
72	ICMP PM History Data1
73	ICMP PM History Data 2
74	IP Route Table
75	IP Static Routes
76	ARP Service Profile
77	ARP Configuration Data
78	VLAN Tagging Operation Configuration Data
79	MAC Bridge Port Filter Preassign Table
80	Physical Path Termination Point ISDN UNI
81	(Reserved for Physical Path Termination Point HPNA UNI)
82	Physical Path Termination Point Video UNI
83	Physical Path Termination Point LCT UNI
84	VLAN Tagging Filter Data
85	$ONU_{B\text{-}PON}$
86	ATM VC Cross-Connection
87	VC Network $CTP_{B\text{-}PON}$
88	VC PM History Data
89	Ethernet Performance Monitoring History Data 2
90	Physical Path Termination Point Video ANI
91..255	Reserved

For other specifications, refer to clause 9/G.983.2.

Appendix I

OMCI common mechanisms and services

This appendix describes the common mechanizms and services of the OMCI that are related to IP Router function and VC cross-connections. For all other common mechanisms and services, refer to Appendix I/G.983.2.

I.1 Common mechanisms

The following common mechanisms shall be added to the list given in clause I.1/G.983.2.

h) IP Router service connection set-up;

i) IP Router service connection tear-down;

j) Addition of entities to IP Static Routes; and

k) Removal of entities from IP Static Routes.

These common mechanisms will be explained by the use of scenario diagrams.

I.1.1 IP router service connection set-up

Figure I.1 shows the scenario for IP Router service connection set-up for an ONT with cross-connect functionality. For the case that an ONT does not model cross-connect function, the Interworking VCC Termination Point is directly associated to the VP Network $CTP_{B\text{-}PON}$ on the ANI side.

Note that the AAL 5 profile can be shared among multiple Interworking VCC Termination Points. No creation of profiles is needed if the Interworking VCCTP points to an existing profile. Moreover, the IP Router Service Profile and ARP Service Profile can be shared among multiple IP Port Configuration Data managed entities, so no creation of profiles is needed if the IP Port Configuration Data points to an existing profile.

The OLT also may want to create corresponding History Data managed entities for the connection.

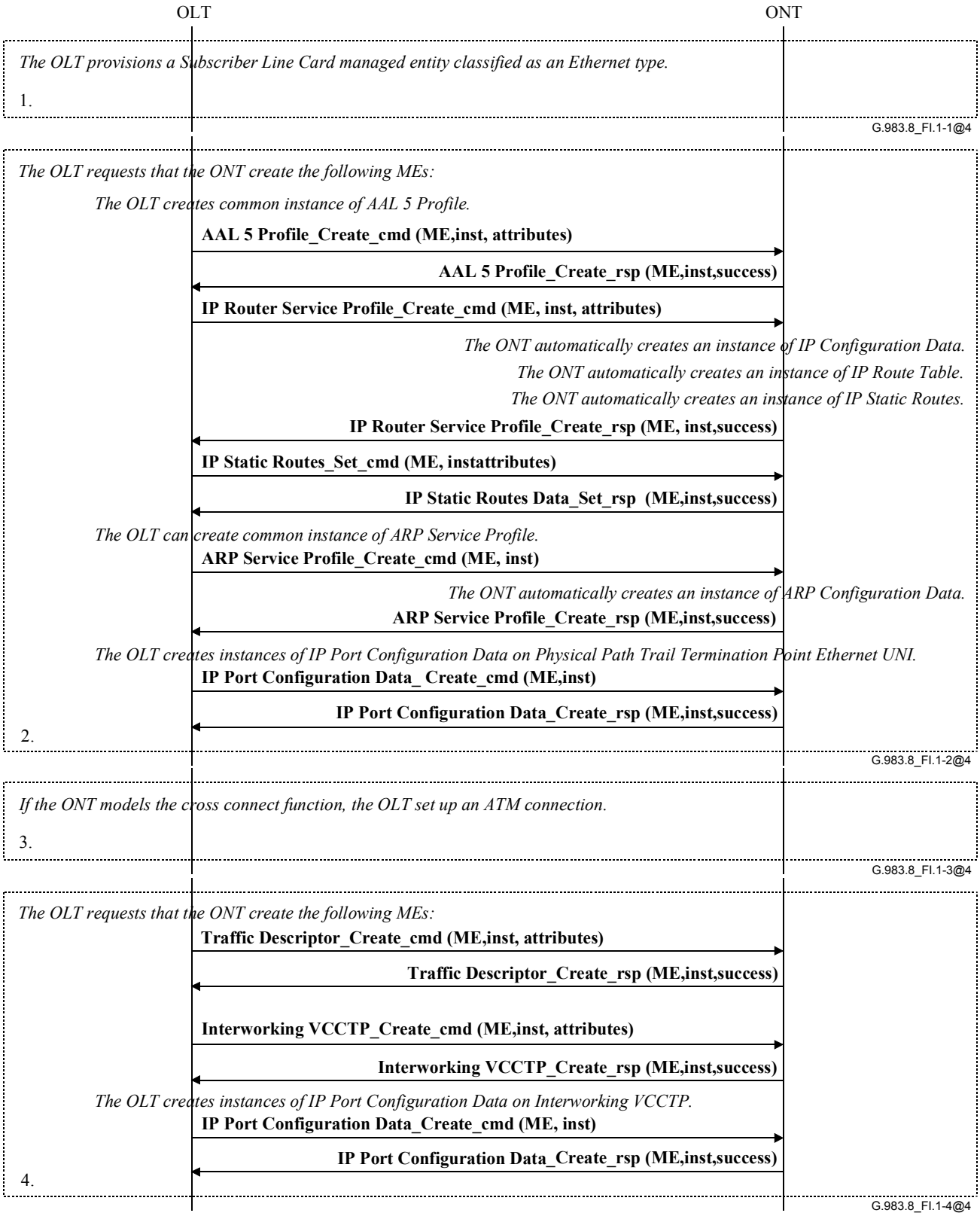

Figure I.1/G.983.8 – Connection set-up for IP router service connection

I.1.2 IP router service connection tear-down

The following scenario, Figure I.2, depicts IP Router service connection tear-down for an ONT with cross-connect functionality. For the case that an ONT does not model cross-connect function, the Interworking VCC Termination Point is directly associated to the VP Network $CTP_{B\text{-}PON}$ on the ANI side.

Note that the AAL 5 profile can be shared among multiple Interworking VCC Termination Points. If there are more Interworking VCC Termination Points associated with this profile managed entity, the OLT may not request to delete it. This holds also for the ATM connection used: if more Interworking VCC Termination Points are associated to this connection (i.e. VP Network $CTP_{B\text{-}PON}$), the ATM connection cannot be deleted. Moreover, the IP Router Service Profile and ARP Service Profile can be shared among multiple IP Port Configuration Data managed entities. If there are more IP Port Configuration Data managed entities associated with these profile managed entities, the OLT may not request to delete them.

If applicable, the OLT can delete the corresponding History Data managed entities as well.

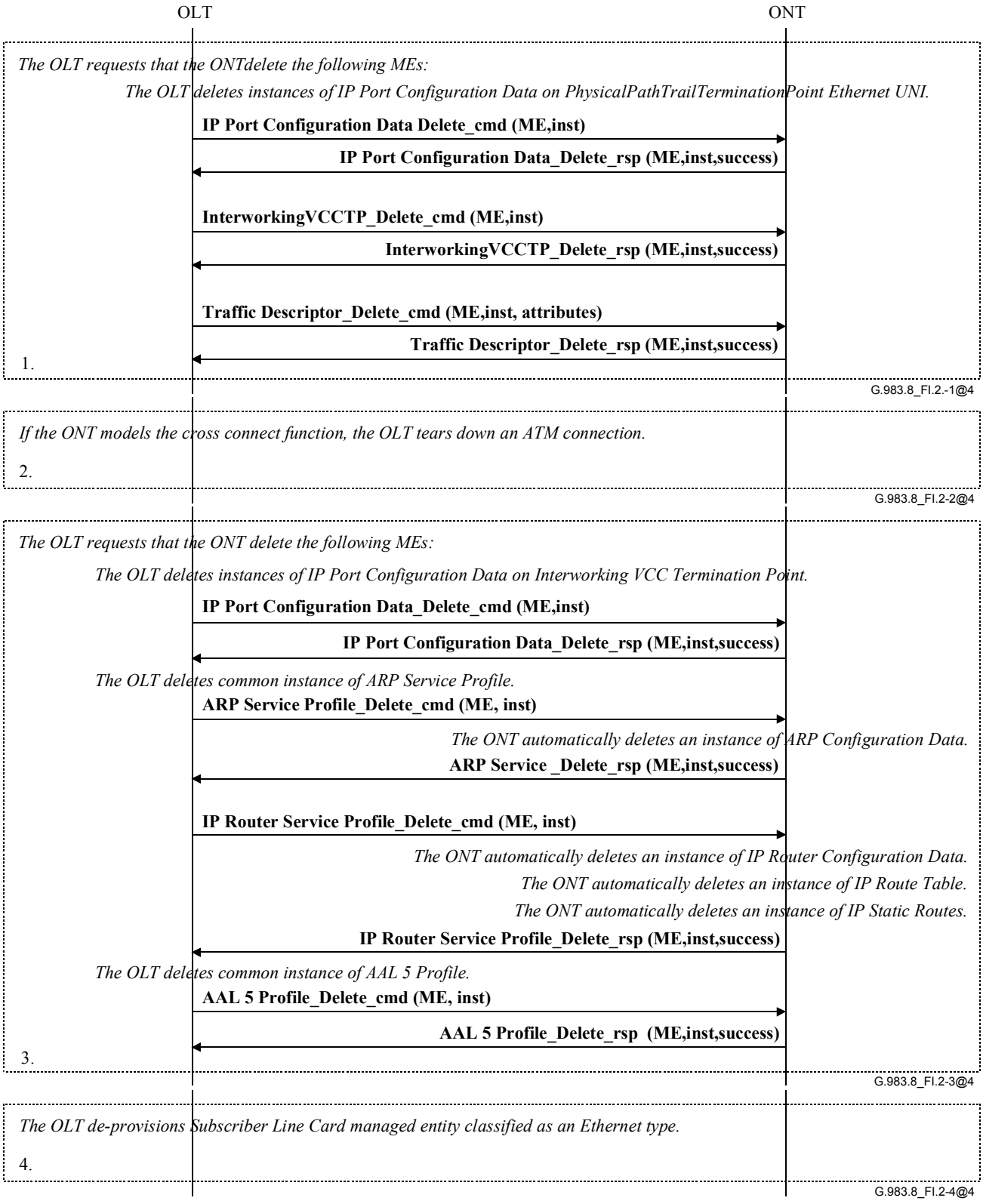

Figure I.2/G.983.8 – Connection tear-down for IP router service connection

I.1.3 Addition of entries to IP static routes

The following scenario, Figure I.3, depicts addition of entities to the IP Static Routes managed entity for an ONT.

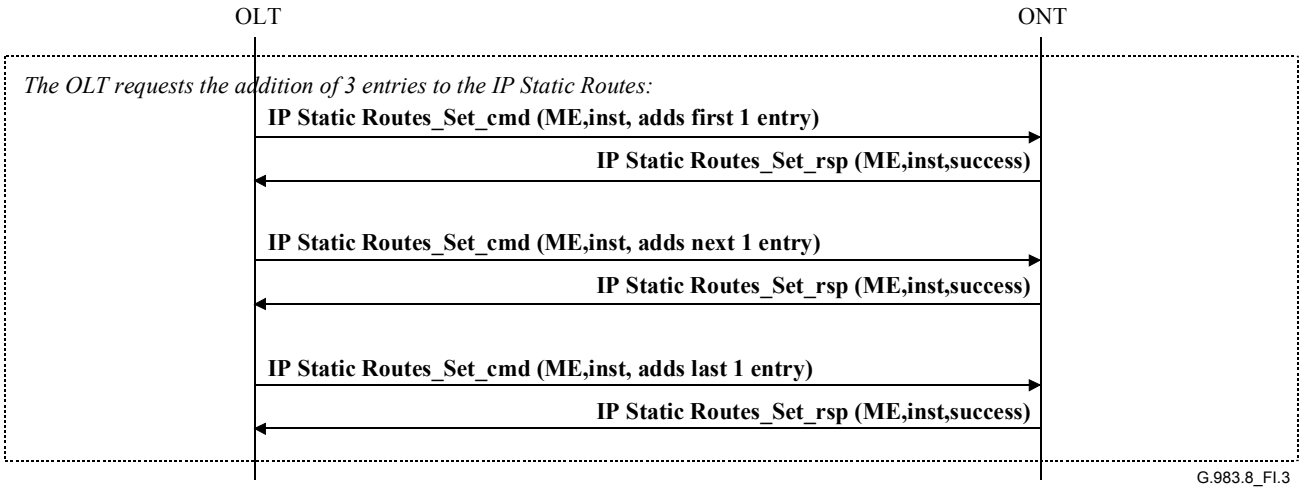

Figure I.3/G.983.8 – Addition of entities to the IP static routes

I.1.4 Removal of entries from IP static routes

The following scenario, Figure I.4, depicts the removal of entries from the IP Static Routes managed entity for an ONT.

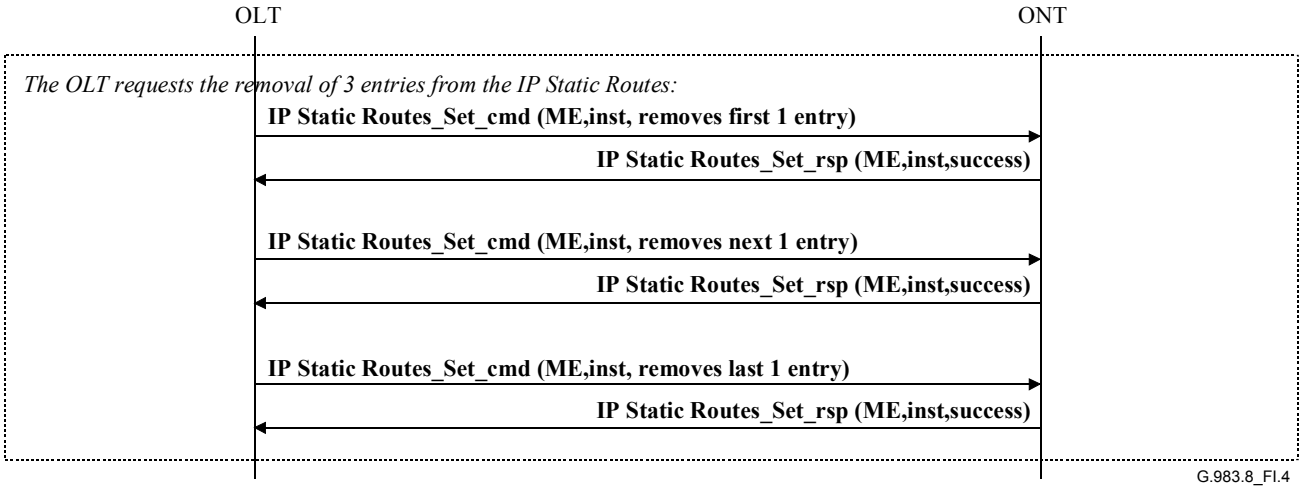

Figure I.4/G.983.8 – Removal of entries from IP static routes

I.2 Common services

I.2.1 Update common services table

Common services f) and g) in clause I.2/G.983.2 need to be updated as shown below to support VC cross-connections.

f) ATM VP Cross-Connection or ATM VC Cross-Connection setup;

g) ATM VP Cross-Connection or ATM VC Cross-Connection breakdown.

I.2.2 Update ATM service set-up and take-down

Clauses I.2.7 and I.2.8/G.983.2 provide descriptions for ATM service set-up and take-down using VP cross-connections. These descriptions can be extended for use with VC cross-connections as well. For ATM service set-up and take-down using VC cross-connections, replace "VP Network $CTP_{B\text{-}PON}$s" with "VC Network $CTP_{B\text{-}PON}$s" and "ATM VP Cross-Connection" with "ATM VC Cross-Connection".

I.2.3 Update common mechanism scenarios

Clauses I.2.9 to I.2.12/G.983.2 provide common mechanism scenarios involving VP cross-connections. These scenarios can be extended for use with VC cross-connections as well. To do so, replace the term "VP Network $CTP_{B\text{-}PON}$" with "VP Network $CTP_{B\text{-}PON}$ or VC Network $CTP_{B\text{-}PON}$".

Appendix II

OMCI message set

II.1 Create complete connection

Bytes 13-16 of II.2.3/G.983.2 must be modified as indicated below to provide support for VC cross-connections.

Field	Byte	8	7	6	5	4	3	2	1	Comments
Message contents	13									msb ani VP Network $CTP_{B\text{-}PON}$ or VC Network $CTP_{B\text{-}PON}$ instance
	14									lsb ani VP Network $CTP_{B\text{-}PON}$ or VC Network $CTP_{B\text{-}PON}$ instance
	15									msb uni VP Network $CTP_{B\text{-}PON}$ or VC Network $CTP_{B\text{-}PON}$ instance
	16									lsb uni VP Network $CTP_{B\text{-}PON}$ or VC Network $CTP_{B\text{-}PON}$ instance

II.2 Get complete connection response

Bytes 14-17 of II.2.14/G.983.2 must be modified as indicated below to provide support for VC cross-connections.

Field	Byte	8	7	6	5	4	3	2	1	Comments
Message contents	14									msb ani VP Network $CTP_{B\text{-}PON}$ or VC Network $CTP_{B\text{-}PON}$ instance
	15									lsb ani VP Network $CTP_{B\text{-}PON}$ or VC Network $CTP_{B\text{-}PON}$ instance
	16									msb uni VP Network $CTP_{B\text{-}PON}$ or VC Network $CTP_{B\text{-}PON}$ instance
	17									lsb uni VP Network $CTP_{B\text{-}PON}$ or VC Network $CTP_{B\text{-}PON}$ instance

Appendix III

MAC addresses and Ethernet types

Table III.1/G.983.8 –MAC address and Ethernet type for various protocols

#	Protocol	MAC address	Ethernet type	Standard
1	IPv4 Multicast	0x01005E000000 ~ 0x01005E7FFFFF	–	RFC 1700 [App IV-3]
2	IPv6 Multicast	0x333300000000 ~ 0x3333FFFFFFFF	–	RFC 2464 [App IV-4]
3	IPv4 Broadcast	0xFFFFFFFFFFFF	0x0800	RFC 1700 [App IV-3]
4	RARP	0xFFFFFFFFFFFF	0x8035	RFC 1700 [App IV-3]
5	IPX	0xFFFFFFFFFFFF	0x8137	RFC 1700 [App IV-3]
		0x09001BFFFFFF, 0x09004E000002	–	
6	NetBEUI	0x030000000001	–	
7	AppleTalk	0xFFFFFFFFFFFF	0x809B, 0x80F3	RFC 1700 [App IV-3]
		0x090007000000 ~ 0x0900070000FC, 0x090007FFFFFF	–	
8	Bridge Management Information	0x0180C2000000 ~ 0x0180C20000FF	–	IEEE 802.1D [5]
9	ARP	0xFFFFFFFFFFFF	0x0806	RFC 1700 [App IV-3]
10	PPPoE Broadcast	0xFFFFFFFFFFFF	0x8863	RFC 2516 [App IV-5]

Appendix IV

Bibliography

[App.IV-1] IETF RFC 815 (1982), *IP Datagram Reassembly Algorithms.*

[App IV-2] IETF RFC 1213 (1991), *Management Information Base for Network Management of TCP/IP-based internets: MIB-II.*

[App IV-3] IETF RFC 1700 (1994), *Assigned Numbers.*

[App IV-4] IETF RFC 2464 (1998), *Transmission of IPv6 Packets over Ethernet Networks.*

[App IV-5] IETF RFC 2516 (1999), *A Method for Transmitting PPP Over Ethernet (PPPoE).*

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