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G.984.4
Amendment 3
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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

Gigabit-capable Passive Optical Networks (G-PON): ONT management and control interface specification

Amendment 3

ITU-T Recommendation G.984.4 (2004) – Amendment 3

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ITU-T Recommendation G.984.4

Gigabit-capable Passive Optical Networks (G-PON): ONT management and control interface specification

Amendment 3

Summary

Amendment 3 to ITU-T Recommendation G.984.4 (2004) includes various enhancements to the G-OMCI, as defined in ITU-T Rec. G.984.4. The major topic areas include optical level alarms, Ethernet port rate limiting, OMCI for OMCI, and pseudowire transport. Additionally, various editorial corrections are included.

FOREWORD

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Introduction

The OMCI as defined in ITU-T Rec. G.984.4 requires updates to support new service types being introduced, such as pseudowire transport of TDM services. This amendment calls out the modifications and additions needed to implement these new services.

ITU-T Recommendation G.984.4

**Gigabit-capable Passive Optical Networks (G-PON):
ONT management and control interface specification**

Amendment 3

1)   Modifications to existing clauses of G.984.4

1.1)   Modify clause 4, Abbreviations

a)   Add alphabetically the following to the list:

CAS   Channel Associated Signalling

PSN   Packet Switched Network

RTP   Real Time Protocol

VLAN   Virtual Local Area Network

b)   Modify the entry for "TDM" to read:

TDM   Time Division Multiplex

1.2)   Modify clause 7.2, Fault management

Add the following entry to the list:

Pseudowire termination point

1.3)   Modify clause 7.3, Performance management

Add the following entry to the list:

Pseudowire performance monitoring history data

1.4)   Modify clause 8.1

Add the following items to Table 1:

Managed entity	Required/ Optional	Description	Recommendation
Pseudowire termination point	CR	Used when the ONT supports PW function	G.984.4 Amd.3
RTP pseudowire parameters	CR	Used when the ONT supports PW function	G.984.4 Amd.3
Pseudowire maintenance profile	CR	Used when the ONT supports PW function	G.984.4 Amd.3
Pseudowire performance monitoring history data	CR	Used when the ONT supports PW function	G.984.4 Amd.3
Ethernet flow termination point	CR	Used when the ONT supports PW function over layer 2	G.984.4 Amd.3

Managed entity	Required/ Optional	Description	Recommendation
OMCI	CR	Used when OMCI self-description is supported	G.984.4 Amd.3
Managed Entity	CR	Used when OMCI self-description is supported	G.984.4 Amd.3
Attribute	CR	Used when OMCI self-description is supported	G.984.4 Amd.3

1.5) Modify clause 8.2

Editor's Note – When preparing the future revised version 2 of this Recommendation, all figures will have to be checked in order to ensure that diagrams are in agreement with revised text in all amendments. Specifically, the GEM IE TP and Priority Queue MEs.

Add the following figures and text to the end of the clause:

Figure 10a shows the ME relation diagram for Pseudowire transport of TDM service over layer 3 (UDP/IP). Note that the IP host config data managed entity would connect to any of the defined layer 2 structures, such as MAC bridging.
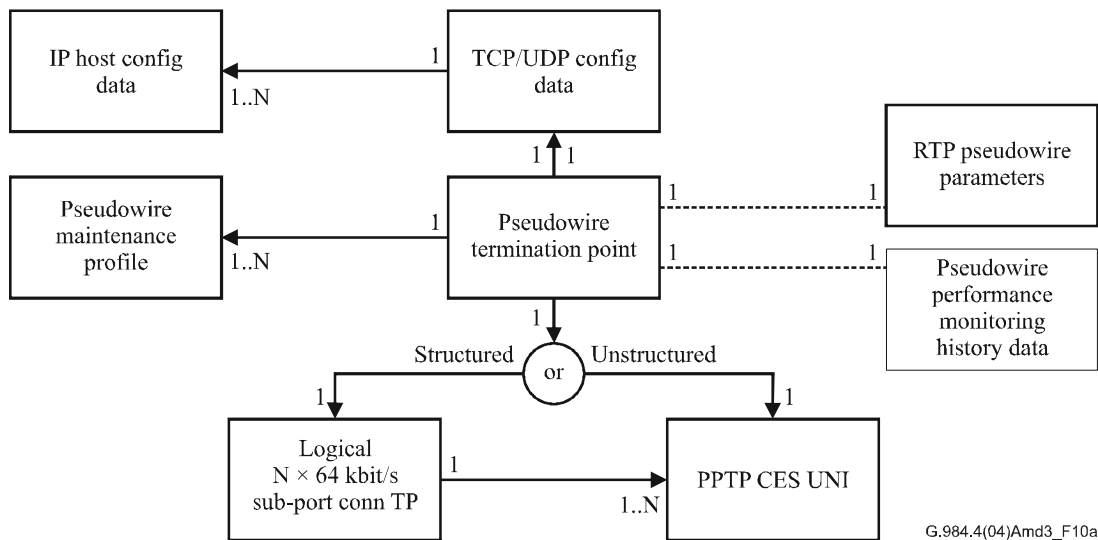

Figure 10a – Pseudowire transported over UDP/IP

Figure 10b shows the ME relation diagram for Pseudowire transport of TDM service over layer 2 (raw Ethernet encapsulation). Note that the Ethernet flow termination point managed entity would connect to any of the defined layer 2 structures, such as MAC bridging (as shown).
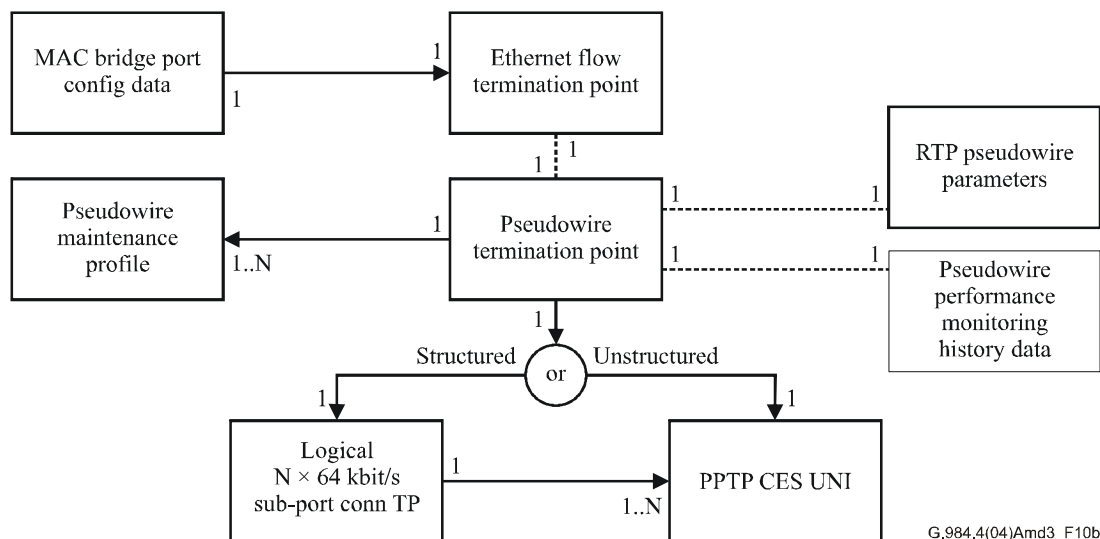
Figure 10b – Pseudowire transported over Ethernet

1.6)   Modify clause 9.1.1, ONT-G

*Change the "**Test**" action to read as follows*:

Test: Test the ONT. The test action can be used either to perform equipment diagnostics or to make measurements of parameters such as received optical power, video output level, battery voltage, etc. Extensions to the test and test response messages are defined for these purposes; refer to Appendix II.

1.7)   Modify clause 9.1.2, ONT2-G

Add the following attribute to the attribute table for ONT-G ME:

Total GEM Port-ID number: This attribute provides a total number of GEM Port-IDs supported by the ONT. Maximum value is 0x0FFF. Upon autonomous instantiation, this attribute is set to zero. (R) (optional) (2 bytes)

1.8)   Modify clause 9.2.1, ANI-G

a)   Add the following attributes to the attribute table for the ANI-G ME:

ARC: This attribute is used to control alarm reporting from this managed entity. See clause I.1.8/G.983.2 for a complete description. (R, W) (optional) (1 byte)

ARCInterval: This attribute provides a provisionable length of time. See clause I.1.8/G.983.2 for a complete description. (R, W) (optional) (1 byte)

Optical signal level: This attribute indicates the current measurement of the total optical signal level at 1490 nm. The attribute is a 2 s complement integer referred to 1 mW (i.e., in dBm), with 0.002 dB granularity. (R) (optional) (2 bytes)

Lower optical threshold: This attribute indicates the optical level the ONT uses to declare the 1490 nm low received optical power alarm. Valid values are –127 dBm (coded as 254) to 0 dBm (coded as 0) in 0.5 dB increments. The default value 0xFF selects the ONT's internal policy. (R, W) (optional) (1 byte)

| Upper optical threshold: | This attribute indicates the optical level the ONT uses to declare the 1490 nm high received optical power alarm. Valid values are –127 dBm (coded as 254) to 0 dBm (coded as 0) in 0.5 dB increments. The default value 0xFF selects the ONT's internal policy. (R, W) (optional) (1 byte) |

b)   *Replace the "Notifications" section with*:

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 5. |
| Alarm: | Both ONT and OLT should know the alarm list used by this entity. The alarm list for this entity is given in Table 5a. |

Table 5 – AVC list for ANI-G

Number	Attribute value change	Description
1-8	N/A	
9	ARC	Alarm reporting control cancellation
10-15	N/A	
16	Reserved	

Table 5a – Alarms list for ANI-G

Number	Event	Description
0	Low received optical power	Received 1490 nm optical power below threshold
1	High received optical power	Received 1490 nm optical power above threshold
2-223	Reserved	
224-239	Vendor specific alarms	Not to be standardized

1.9)   Modify clause 9.3.8, Multicast GEM Interworking Termination Point

*Add the following to the "**Actions**" subsection*:

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

1.10)   Modify clause 9.3.9, MAC Bridge Port Configuration Data

a)   *Modify subsections i) and ii) to read*:

i)   *Modification of TPType*

Append the following text to the attribute descriptions:

The value is set to 5 if this bridge port is associated with a GEM Interworking Termination Point ME.

The value is set to 6 if this bridge port is associated with a Multicast GEM Interworking Termination Point ME.

The value is set to 9 if this bridge port is associated with an Ethernet flow termination point ME.

ii)   *Modification of TPPointer*

Append the following text to the attribute descriptions:

If TPType = 5, the value of this attribute is the same as the id of the GEM Interworking Termination Point ME associated with this MAC bridge port.

If TPType = 6, the value of this attribute is the same as the id of the Multicast GEM Interworking Termination Point ME associated with this MAC bridge port.

If TPType = 9, the value of this attribute is the same as the id of the Ethernet Flow Termination Point ME associated with this MAC bridge port.

b)   Add the following Attributes to the list:

Outbound TD pointer: This attribute indicates which GEM traffic descriptor should be applied to describe the limitations on traffic rate leaving the MAC bridge. (R, W) (optional) (2 bytes)

Inbound TD pointer: This attribute indicates which GEM traffic descriptor should be applied to describe the limitations on traffic rate entering the MAC bridge. (R, W) (optional) (2 bytes)

1.11)   Modify clause 9.4.1, GEM Port Network CTP

*a)   Modify the description of the **"Priority Queue Pointer for Downstream"** attribute to read as follows*:

This attribute points to the instance of the Priority Queue-G used for this GEM Port Network CTP in the downstream direction. (R, Set-by-create) (mandatory) (2 bytes)

*b)   Modify the description of the **"Traffic Descriptor Profile Pointer"** attribute to read as follows*:

This attribute serves as a pointer to the instance of the GEM Traffic Descriptor managed entity that contains the traffic parameters used for this GEM port Network CTP-G ME. This attribute is used when the **Traffic Management Option** attribute in ONT-G ME is 0x01.

When traffic shaping is used, it applies to the ANI side GEM Port Network CTP ME. In this case, this pointer points to a GEM Traffic Descriptor managed entity and the **Traffic Management Pointer for upstream** attribute points to the associated T-CONT ME. (R, Set-by-create) (optional) (2 bytes)

See also Appendix IV/G.983.2.

1.12)   Modify clause 9.5.3, GEM Traffic descriptor

Replace "GEM Port-ID" *with* "GEM Port-ID or MAC bridge port" (two places).

1.13)   Modify clause 11.1.2, ATM header or GEM header

Add the following sentence to the end of the clause:

The header PTI should equal 001 for ATM, and can equal 000 or 001 for GEM (as per normal fragmentation rules).

1.14) Modify clause 11.1.6, Message identifier

Add/modify the following entries to Table 18:

Managed entity class value	Managed entity
282	Pseudowire termination point
283	RTP pseudowire parameters
284	Pseudowire maintenance profile
285	Pseudowire performance monitoring history data
286	Ethernet flow termination point
287	OMCI
288	Managed Entity
289	Attribute
290-65279	Reserved for future standardization
65280-65535	Reserved for vendor specific use

Editor's Note – When preparing the future revised version 2 of this Recommendation, the entries below number 256 will have to be modified in order to coincide with the fully updated ITU-T Rec. G.983.2.

1.15) Modify clause I.2.1, MAC bridge service connection set-up (GEM mode)

Editor's Note – When preparing the future revised version 2 of this Recommendation, figures will have to be checked to ensure that objects are created in the correct order. In particular, the GEM IW TP object must be created before the MAC bridge port (ANI side).

1.16) Modify clause II.1.4, Get, Get response and Set messages

a)   Change clause heading to: Get, Get response, Create response, and Set messages

b)   Modify the first sentence of the clause to read as follows:

For an attribute mask, a bitmap is used in the Get, Get response, Create response, and Set messages.

1.17) Modify clause II.2.2, Create response

Replace the clause with the following:

Field	Byte	8	7	6	5	4	3	2	1	Comments
Transaction identifier	6-7									
Message type	8	0	0	1						DB = 0, AR = 0, AK = 1 bits 5-1: action = create
Device identifier type	9	0	0	0	0	1	0	1	0	OMCI = 0x0A
Message identifier	10-11									entity class
	12									msb entity instance
	13									lsb entity instance

Field	Byte	8	7	6	5	4	3	2	1	Comments
Message contents	14	0	0	0	0	x	x	x	x	result, reason 0000 = command processed successfully 0001 = command processing error 0010 = command not supported 0011 = parameter error 0100 = unknown managed entity 0101 = unknown managed entity instance 0110 = device busy 0111 = instance exists
	15									Attribute execution mask (attributes 1-8), used with 0011 encoding: 0 = Attribute ok 1 = illegal value attribute
	16									Attribute execution mask (attributes 9-16), used with 0011 encoding: 0 = Attribute ok 1 = illegal value attribute
	17-45	0	0	0	0	0	0	0	0	padding

2)   Addition of new clauses to G.984.4

2.1)   Add the following clauses to the end of clause 9.1

Add the following clauses to define new managed entities for OMCI description of the ONU's OMCI implementation.

9.1.11   OMCI

This managed entity describes the ONT's general level of support for OMCI managed entities and messages.

Relationships

One instance exists in the ONT. The ME entities are related to the OMCI 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)

MEtype Table: This attribute lists the ME classes supported by the ONT. Each entry contains the managed entity class value (see Table 18) of a managed entity. For MEs inherited from G.983.2 B-PON, the most significant byte is zero. (R) (mandatory) (N * 2 bytes, where N is the number of entries in the list.)

MessageType Table: This attribute lists the message types supported by the ONT. Each entry contains the message type of an OMCI message (see Table 17). (R) (mandatory) (M * 1 byte, where M is the number of entries in the list.)

Get: Get one or more attributes. Latch a snapshot of the current instance and respond with the size of data 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.

9.1.12 Managed Entity

This managed entity describes the details of each ME that is supported by the ONT.

Relationships

One or more Managed Entity entities are related to the OMCI object entity.

Attributes

Managed Entity id: This attribute provides a unique number for each instance of the managed entity. Its value is equal to the Managed Entity type value, and is the same code found in the MEtype Table attribute of the OMCI ME. (R) (mandatory) (2 bytes)

Name: This attribute contains a 25-byte ASCII coded mnemonic tag for the ME type. Strings shorter than 25 bytes are padded with null characters. (R) (mandatory) (25 bytes)

Attributes Table: This table contains pointers to the attribute MEs that describe each of this ME's attributes.

NOTE – The Managed Entity ID attribute is not included in the list, since the type of this attribute is fixed. (R) (mandatory) (X * 2 bytes, where X is the number of entries in the list.)

Access: This attribute represents who created this ME. The following code points are defined:

1   created by the ONT

2   created by the OLT

3   created by both ONT and OLT

(R) (mandatory) (1 byte)

Alarms Table: This attribute lists the alarm codes that are supported. (R) (mandatory) (Y * 1 byte, where Y is the number of entries in the list.)

AVCs Table: This attribute lists the AVCs that are supported. (R) (mandatory) (Z * 1 byte, where Z is the number of entries in the list.)

Actions: This attribute contains the action codes supported on this object, formatted as a bitmap. The action codes are the message types from Table 17. The least significant bit represents action 0, and so on. (R) (mandatory) (4 bytes)

Instances Table: This attribute contains a list of pointers to all instances of this ME. (R) (mandatory) (V * 2 bytes, where V is the number of entries in the list.)

Support: This attribute represents support capability of this ME in the ONU's implementation. This attribute does not declare if the OMCI implementation complies with the recommendations, but if it complies with the OMCI declaration itself. The following code points are defined:

1   Supported (supported as defined in this object)

2   Unsupported (OMCI will return error code if accessed)

3   Partially supported (some aspects of ME supported)

4   Ignored (OMCI supported, but underlying function is not)

(R) (mandatory) (1 byte)

Actions

Get: Get one or more attributes. If a table attribute, then latch a snapshot of the current instance and respond with the size of data that should be obtained using the Get next command.

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

Notifications

None.

Note that it is not required to upload all the "Managed Entity" managed entities during the MIB upload.

9.1.13 Attribute

This managed entity is used to describe a particular attribute type that is supported by the ONT.

Relationships

One or more attribute entities are related to each ME entity. More than one ME entity can refer to a given attribute entity.

Attributes

Managed Entity id: This attribute provides a unique number for each instance of this managed entity. This number is the same as that in the Attributes table in the Managed Entity. Only one instance of each unique attribute needs to be created. The ONU can assign attribute numbering as it pleases, out of the pool of 64K ids; however, it is suggested that the numbering follow a rational scheme to aid human readability. (R) (mandatory) (2 bytes)

Name: This attribute contains a 25-byte mnemonic tag for the attribute. Strings shorter than 25 bytes are padded with null characters. (R) (mandatory) (25 bytes)

Size: This attribute contains the size of the attribute, in bytes. The value 0 indicates that the attribute can have a variable/unknown size. (R) (mandatory) (2 bytes)

Access: This attribute represents the OMCI access characteristics of the attribute. The following code points are defined:

1   Read

2   Write

	3	Read, write
	5	Read, set-by-create
	6	Write, set-by-create
	7	Read, write, set-by-create

(R) (mandatory) (1 byte)

Format: This attribute represents the format of the attribute. The following code points are defined:

	1	Pointer
	2	Bit field
	3	Signed integer
	4	Unsigned integer
	5	String
	6	Enumeration (that is, a set of defined code points)
	7	Table

(R) (mandatory) (1 byte)

Lower Limit: This attribute provides the lowest value for the attribute. Valid for numeric types (pointer, signed integer, unsigned integer) only. For attributes smaller than 4 bytes, the desired numerical value is expressed in 4-byte representation (e.g., the signed 1-byte integer 0xFE is expressed as 0xFFFFFFFE; the unsigned 1-byte integer 0xFE is expressed as 0x000000FE). (R) (mandatory) (4 bytes)

Upper Limit: This attribute provides the highest value for the attribute, and has the same validity and format as the lower limit attribute. (R) (mandatory) (4 bytes)

Bit field: This attribute provides a mask of the supported bits in a bit field attribute. Valid for bit field type only. A '1' in any position signifies that its code point is supported, while '0' indicates not supported. For bit fields smaller than 4 bytes, the attribute is aligned at the least significant end of the mask. (R) (mandatory) (4 bytes)

Code points Table: This attribute lists the code points supported by an enumerated attribute. (R) (mandatory) (Q * 2 bytes, Q is the number of entries in the list.)

Support: This attribute represents the level of support of the attribute (same notation as the attribute of the same name in the ME). The following code points are defined:

	1	Fully supported (supported as defined in this object)
	2	Unsupported (OMCI will return error code if accessed)
	3	Partially supported (some aspects of attribute supported)
	4	Ignored (OMCI supported, but underlying function is not)

(R) (mandatory) (1 byte)

Actions

Get: Get one or more attributes.

Notifications

None.

Note that it is not required to upload all the "Attribute" managed entities during the MIB upload.

2.2)   Add the following clauses to the end of clause 9.3

Add the following clauses to define new managed entities for Pseudowire emulation service:

9.3.10 Pseudowire termination point

The pseudowire termination point supports packetized (rather than TDM) G-PON transport of TDM services, be they transported over Ethernet or UDP/IP.

Instances of this managed entity are created and destroyed at the request of the OLT.

Relationships

One pseudowire termination point ME exists for each distinct TDM service that is mapped to a pseudowire.

Attributes

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

Underlying transport: 0 – Ethernet, MEF8

1 – UDP/IP

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

Service type: This attribute specifies the basic service type, either a transparent bit pipe or an encapsulation that recognizes the underlying structure of the payload.

0 – basic unstructured (also known as structure agnostic)

1 – octet aligned unstructured, structure agnostic. Applicable only to DS1, a mode in which each series of 193 bits is encapsulated in 25 bytes with 7 padding bits.

2 – structured (structure-locked)

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

Signalling: 0 – no signalling visible at this layer

1 – CAS, to be carried in the same packet stream as the payload

2 – CAS, to be carried in a separate signalling channel

(R, set-by-create) (mandatory for structured service type) (1 byte)

TDM UNI pointer: If service type = structured, this attribute points to a Logical $N \times 64$ kbit/s sub-port connection termination point.

Otherwise, this attribute points to a Physical path termination point CES UNI.

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

Near-end IP info: When the pseudowire service is transported via IP, this attribute points to an instance of the TCP/UDP config data managed entity. The default value 0 is applicable if the pseudowire is not transported via IP. (R, set-by-create) (mandatory for IP transport) (2 bytes)

Far-end IP info:	When the pseudowire service is transported via IP, this attribute points to a LargeString managed entity that contains the URI of the far-end termination point, for example:

<div style="text-align:center">

udp://192.168.100.221:5000 or

udp://pwe3srvr.int.example.net:2222

</div>

The default value 0 is applicable if the pseudowire is not transported via IP. (R, set-by-create) (mandatory for IP transport) (2 bytes)

Payload size: Number of payload bytes per packet. Valid only if service type = unstructured or unstructured octet-aligned. Valid choices depend on the TDM service, but must include the following. Other choices are at the vendor's discretion.

DS1   192

DS1   200   required only if unstructured octet aligned service is supported

E1   256

DS3   1024

E3   1024

(R, set-by-create) (mandatory for unstructured service) (2 bytes)

Payload encapsulation delay: Number of 125 microsecond frames to be encapsulated in each pseudowire packet. Valid only if service type = structured. Valid choices for various TDM services are listed below, and are affected by the possible presence of in-band signalling. Other choices are at the vendor's discretion.

NxDS0, no signalling, N = 1	64 (8 ms) required, 40 (5 ms) desired
NxDS0, no signalling, N = 2..4	32 (4 ms)
NxDS0, no signalling, N > 4	8 (1 ms)
NxDS0 with DS1 CAS	24 (3 ms)
NxDS0 with E1 CAS	16 (2 ms)

(R, set-by-create) (mandatory for structured service) (1 byte)

Timing mode: This attribute selects the timing mode of the TDM service. If RTP is used, this attribute must be set to be consistent with the value of the RTP time stamp mode attribute in the RTP parameters managed entity at the far end.

0 –   network timing (default)

1 –   differential timing

2 –   adaptive timing

3 –   loop timing: local TDM transmit clock derived from local TDM receive stream

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

Transmit circuit ID: This attribute is a pair of ECID (Ethernet circuit ID) values that the ONT transmits in the direction from the TDM termination toward the packet switched network. MEF8 ECIDs lie in the range 1-1'048'575 (2^20 – 1). To allow for the possibility of other transport (L2TP) in the future, each ECID is allocated 4 bytes.

The first value is used for the payload ECID; the second is used for the optional separate signalling ECID. The first ECID is required for all MEF8 pseudowires; the second is required only if signalling is to be carried in a distinct channel. If signalling is not present, or is carried in the same channel as the payload, the second ECID should be set to 0.

(R, W) (mandatory for MEF8 transport) (8 bytes)

Expected circuit ID: This attribute is a pair of ECID (Ethernet circuit ID) values that the ONT can expect in the direction from the packet switched network toward the TDM termination. Checking ECIDs may be a way to detect circuit misconnection. MEF8 ECIDs lie in the range 1-1'048'575 ($2^{20} – 1$). To allow for the possibility of other transport (L2TP) in the future, each ECID is allocated 4 bytes.

The first value is used for the payload ECID; the second is used for the optional separate signalling ECID. In both cases, the default value 0 indicates that no ECID checking is expected.

(R, W) (optional for MEF8 transport) (8 bytes)

Received circuit ID: This attribute indicates the actual ECID(s) received on the payload and signalling channels, respectively. It may be used for diagnostic purposes. (R) (optional for MEF8 transport) (8 bytes)

Exception policy: This attribute points to an instance of the pseudowire maintenance profile managed entity. If the pointer has its default value 0, the ONT's internal defaults apply. (R, W) (optional) (2 bytes)

ARC: This attribute is used to control alarm reporting from this managed entity. See clause I.1.8/G.983.2 for a complete description. (R, W) (optional) (1 byte)

ARCInterval: This attribute provides a provisionable alarm suppression time. See clause I.1.8/G.983.2 for a complete description. (R, W) (optional) (1 byte)

Actions

Create: Create an instance of this managed entity.

Delete: Delete an instance of this managed entity.

Get: Get one or more attributes.

Set: Set one or more attributes.

Notifications

Attribute value change: This notification is used to report autonomous changes of attributes of this managed entity. The notification identifies its new value. The AVC list appears in Table 11c.

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. Alarm criteria may be customized through reference to a pseudowire maintenance profile managed object, or defined by the ONT's internal defaults. The alarm list for this entity appears in Table 11d.

Table 11c – AVC list for Pseudowire termination point

Number	Attribute value change	Description
1..13	N/A	
14	ARC	Alarm reporting control cancellation
15	N/A	
16	Reserved	

Table 11d – Alarms list for Pseudowire termination point

Number	Event	Description
0	Misconnection	Excessive ratio of stray packets received from the PSN.
1	Loss of packets	Excessive ratio of lost packets from the PSN.
2	Buffer overrun	Excessive ratio of packets lost because they arrived from the PSN too early to be buffered for playout.
3	Buffer underrun	Excessive ratio of packets lost because they arrived from the PSN too late to be buffered for playout.
4	Malformed packets alarm	Excessive ratio of packets lost because their structure or payload type did not match the provisioned service.
5-223	Reserved	
224-239	Vendor specific alarms	Not to be standardized

9.3.11 RTP pseudowire parameters

If a pseudowire service uses RTP, the RTP pseudowire parameters managed entity provides configuration information for the RTP layer. Instances of this managed entity are created and deleted at the request of the OLT. The use of RTP on a pseudowire is optional, and is determined by the existence of the RTP pseudowire parameters managed entity.

Relationships

An instance of the RTP pseudowire parameters managed entity may exist for each Pseudowire termination point managed entity, to which it is implicitly bound by a common managed entity ID.

Attributes

Managed entity id: This attribute provides a unique number for each instance of this managed entity. This managed entity is implicitly linked to an instance of the Pseudowire termination point managed entity through an identical ME ID. (R, set-by-create) (mandatory) (2 bytes)

Clock reference: This attribute specifies the frequency of the common timing reference, in multiples of 8 kHz. The default value is 1 (8 kHz). (R, W, set-by-create) (mandatory) (2 bytes)

RTP timestamp mode: This attribute determines the mode in which RTP timestamps are generated in the TDM to PSN direction.

> 0 – unknown or not applicable (default)
>
> 1 – absolute. Timestamps are based on the timing of the incoming TDM signal.
>
> 2 – differential. Timestamps are based on the ONT's reference clock, which is understood to be stratum-traceable along with the reference clock used at the far end.

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

PTYPE: This attribute specifies the RTP payload type in the TDM to PSN direction. It comprises two values. The first is for the payload channel, the second, for the optional separate signalling channel. Assignable PTYPEs lie in the dynamic range 96-127. If signalling is not transported in its own channel, the second value should be set to 0. (R, W, set-by-create) (mandatory) (2 bytes)

SSRC: This attribute specifies the RTP synchronization source in the TDM to PSN direction. It comprises two values. The first is for the payload channel, the second for the optional separate signalling channel. If signalling is not transported in its own channel, the second value should be set to 0. (R, W, set-by-create) (mandatory) (8 bytes)

Expected PTYPE: This attribute specifies the RTP payload type in the PSN to TDM direction. The received payload type may be used to detect malformed packets. It comprises two values. The first is for the payload channel, the second for the optional separate signalling channel. To disable either or both of the check functions, set the corresponding value to its default value 0. (R, W, set-by-create) (optional) (2 bytes)

Expected SSRC: This attribute specifies the RTP synchronization source in the PSN to TDM direction. The received SSRC may be used to detect misconnection (stray packets). It comprises two values. The first is for the payload channel, the second for the optional separate signalling channel. To disable either or both of the check functions, set the corresponding value to its default value 0. (R, W, set-by-create) (optional) (8 bytes)

Actions

Create: Create an instance of this managed entity.

Delete: Delete an instance of this managed entity.

Get: Get one or more attributes.

Set: Set one or more attributes.

Notifications

None.

9.3.12   Pseudowire maintenance profile

The pseudowire maintenance profile permits the configuration of pseudowire service exception handling. It is created and destroyed on request of the OLT.

The settings, and indeed existence, of a pseudowire maintenance profile affect the behaviour of the pseudowire performance monitoring history data managed entity only in establishing criteria for

counting severely errored seconds, but in no other way. The pseudowire maintenance profile primarily affects the alarms declared by the subscribing pseudowire termination point.

Relationships

One or more instances of the pseudowire termination point may refer to an instance of the pseudowire maintenance profile. If the pseudowire termination point does not refer to a pseudowire maintenance profile, the ONT's default exception handling is implied.

Attributes

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

Jitter buffer maximum depth: This attribute specifies the desired maximum depth of the playout buffer in the PSN to TDM direction. The value is expressed as a multiple of the 125 μs frame rate. The default value 0 selects the ONT's internal policy. (R, W, SBC) (optional) (2 bytes)

Jitter buffer desired depth: This attribute specifies the desired nominal fill depth of the playout buffer in the PSN to TDM direction. The value is expressed as a multiple of the 125 μs frame rate. The default value 0 selects the ONT's internal policy. (R, W, SBC) (optional) (2 bytes)

Fill policy: This attribute defines the payload bit pattern to be applied toward the TDM service if no payload packet is available to play out. The default value 0 specifies that the ONT apply its internal policy.

0 –	ONT default, vendor-specific (recommended: AIS for unstructured service, all 1s for structured service)
1 –	Play out AIS according to the service definition (for example, DS3 AIS)
2 –	Play out all 1s
3 –	Play out all 0s
4 –	Repeat the previous data
5 –	Play out DS1 idle (ANSI T1.403[*]-1999 appendix C)
6..15 –	Reserved for future standardization
16..255 –	Vendor-specific, not to be standardized

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

Misconnected packets declaration policy: This attribute defines the packet anomaly rate that causes the misconnected packets alarm to be declared. It is an integer percentage between 1-100. If this density of anomalies occurs during the alarm onset soak interval, the alarm is declared. The default value 0 selects the ONT's internal policy. (R, W, SBC) (optional) (1 byte)

Misconnected packets clear policy: This attribute defines the packet anomaly rate that causes the misconnected packets alarm to be cleared. It is an integer percentage between 0-99. If no more than this density of anomalies occurs during the alarm clear soak interval, the alarm is cleared. The default value 255 selects the ONT's internal policy. (R, W, SBC) (optional) (1 byte)

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[*] T1 standards are maintained since November 2003 by ATIS.

Loss of packets declaration policy:	This attribute defines the criterion for declaring the loss of packets alarm. It is defined in the same way as the misconnected packets declaration policy. (R, W, SBC) (optional) (1 byte)
Loss of packets clear policy:	This attribute defines the criterion for clearing the loss of packets alarm. It is defined in the same way as the misconnected packets clear policy. (R, W, SBC) (optional) (1 byte)
Buffer overrun/underrun declaration policy:	This attribute defines the criterion for declaring the buffer overrun and underrun alarms. It is defined in the same way as the misconnected packets declaration policy. (R, W, SBC) (optional) (1 byte)
Buffer overrun/underrun clear policy:	This attribute defines the criterion for clearing the buffer overrun and underrun alarms. It is defined in the same way as the misconnected packets clear policy. (R, W, SBC) (optional) (1 byte)
Malformed packets declaration policy:	This attribute defines the criterion for declaring the malformed packets alarm. It is defined in the same way as the misconnected packets declaration policy. (R, W, SBC) (optional) (1 byte)
Malformed packets clear policy:	This attribute defines the criterion for clearing the malformed packets alarm. It is defined in the same way as the misconnected packets clear policy. (R, W, SBC) (optional) (1 byte)
R-bit transmit set policy:	This attribute defines the number of consecutive lost packets that causes the transmitted R bit to be set in the TDM to PSN direction, indicating lost packets to the far end. The default value 0 selects the ONT's internal policy. (R, W, SBC) (optional) (1 byte)
R-bit transmit clear policy:	This attribute defines the number of consecutive valid packets that causes the transmitted R bit to be cleared in the TDM to PSN direction, removing the remote failure indication to the far end. The default value 0 selects the ONT's internal policy. (R, W, SBC) (optional) (1 byte)

R-bit receive policy: This attribute defines the action toward the $N \times 64$ TDM interface when remote failure is indicated on packets received from the PSN (either R bit set or M = 0b10 while L bit is cleared).

0 – Do nothing (default)

1 – Play out service-specific RAI/REI/RDI code

2 – Send channel idle signalling and idle channel payload to all DS0s comprising the service

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

L-bit receive policy: This attribute defines the action toward the TDM interface when far end TDM failure is indicated on packets received from the PSN (L bit set).

0 – Play out service-specific AIS (default)

1 – Repeat last received packet

2 – Send channel idle signalling and idle channel payload to all DS0s comprising the service

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

SES threshold: Number of lost, malformed or otherwise unusable packets expected in the PSN to TDM direction within a one-second interval that causes a severely errored second to be counted. Stray packets do not count

toward a severely-errored second, nor do packets whose L bit is set at the far end. The default value is 3. (R, W, SBC) (optional) (2 bytes)

Actions

Create: Create an instance of this managed entity.

Delete: Delete an instance of this managed entity.

Get: Get one or more attributes.

Set: Set one or more attributes.

Notifications

None.

9.3.13   Pseudowire performance monitoring history data

This managed entity contains the last completed 15-minute interval collected statistic data for a pseudowire termination point. The data values are only updated at the end of each period. Most of the parameters monitor packets received from the PSN, and may therefore be considered egress PM. For the most part, ingress PM is collected at the CES PPTP managed entity.

NOTE 1 – The pseudowire performance monitoring history data managed entity collects data similar, but not identical, to that available from the MAC bridge port PM history data ME associated with the Ethernet bridge. When the pseudowire is Ethernet-based, it may not be necessary to collect both.

An instance of this managed entity may be created by the OLT after an instance of the Pseudowire termination point managed entity is created.

Relationships

One instance of the Pseudowire performance monitoring history data managed entity may exist for each instance of the Pseudowire termination point.

Attributes

Managed entity id: This attribute provides a unique number for each instance of this managed entity. This 2-byte number is the same as that of the parent Pseudowire termination point. (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 256) that is incremented each time a new interval is finished and the attribute counters are updated. The value of this attribute is 0 during the 15-minute interval that starts with the reception of the synchronize time action. The value is 1 during the first period after this, and so on. If this managed entity is created after the reception of the synchronize time action, the value of this attribute is set equal to the number of the last completed interval. The actual counters of this managed entity start counting directly. (R) (mandatory) (1 byte)

Threshold data 1/2 id: This attribute points to an instance of the paired threshold data 1 and threshold data 2 managed entities that contain threshold values for the performance monitoring data collected by this managed entity. The value 0 is interpreted as a null pointer. (R, W, Set-by-create) (mandatory) (2 bytes)

Received packets: This attribute is a count of the total number of packets, both payload and signalling, received in the PSN to TDM direction. (R) (mandatory) (4 bytes)

Transmitted packets: This attribute is a count of the total number of packets, both payload and signalling, transmitted from the TDM to the PSN. The count includes packets whose L bit is set and which may therefore contain no payload. (R) (mandatory) (4 bytes)

Missing packets: This attribute is a count of the number of lost packets, as indicated by gaps in the control word numbering sequence. Both payload and signalling packets, if any, contribute to this count. (R) (mandatory) (4 bytes)

Misordered packets, usable: This attribute is a count of the number of packets received out of order, but which were able to be successfully reordered and played out. Both payload and signalling packets, if any, contribute to this count. (R) (mandatory) (4 bytes)

Misordered packets dropped: This attribute is a count of the number of packets received out of sequence that were discarded, either because the ONT did not support reordering or because it was too late to reorder them. Both payload and signalling packets, if any, contribute to this count. (R) (mandatory) (4 bytes)

Playout buffer underruns/overruns: This attribute is a count of the number of packets that were discarded because they arrived too late or too early to be played out. Both payload and signalling packets, if any, contribute to this count. (R) (mandatory) (4 bytes)

Malformed packets: This attribute is a count of the number of malformed packets, for example, because the packet length was not as expected or because of unexpected RTP payload type. Both payload and signalling packets, if any, contribute to this count. (R) (mandatory) (4 bytes)

Stray packets: This attribute is a count of the number of packets whose ECID or RTP SSRC failed to match the expected value, or which are otherwise known to have been misdelivered. Stray packets are discarded without affecting any of the other PM counters. Both payload and signalling packets, if any, contribute to this count. (R) (mandatory) (4 bytes)

Remote packet loss: This attribute is a count of received packets whose R bit is set, indicating the loss of packets at the far end. Both payload and signalling packets, if any, contribute to this count. (R) (mandatory) (4 bytes)

TDM L-bit packets transmitted: This attribute is a count of the number of packets transmitted with the L bit set, indicating a near-end TDM fault. Both payload and signalling packets, if any, contribute to this count. (R) (mandatory) (4 bytes)

ES: This attribute counts errored seconds. Any discarded, lost, malformed or unusable packet received from the PSN during a given second causes this counter to increment. Both payload and signalling packets, if any, contribute to this count. (R) (mandatory) (4 bytes)

SES: This attribute counts severely errored seconds. The criterion for a SES may be configured through the pseudowire maintenance profile managed entity. Both payload and signalling packets, if any, contribute to this count. (R) (mandatory) (4 bytes)

UAS: This attribute counts unavailable seconds. An unavailable second begins at the onset of ten consecutive SESs and ends at the onset of ten consecutive seconds that are not severely errored. A service is unavailable if either its payload or its signalling, if any, are unavailable. During unavailable time,

only UAS should be counted; other anomalies should not be counted.
(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.

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 are reset at the end of the interval.

NOTE 2 – "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.

Notifications

Threshold crossing alert: This notification is used to notify the management system when a threshold crossing alert (TCA) is declared or cleared. The TCA change notification on is sent at the crossing of the threshold by the actual counter; the TCA change notification off is sent at the end of the 15-minute period, since that is when the actual counters are reset to 0. The event list for this entity is given in Table 11e.

Table 11e – Alarm list for Pseudowire performance monitoring history data

Number	Event	Description	Threshold data counter # (Note)
	Threshold Crossing Alert		
0	Missing packets	Missing packets	1
1	Misordered packets, usable	Misordered packets, usable	2
2	Misordered packets dropped	Misordered packets dropped	3
3	Playout buffer underruns/ overruns	Playout buffer underruns/overruns	4
4	Malformed packets	Malformed packets	5
5	Stray packets	Stray packets	6
6	Remote packet loss	Remote packet loss	7
7	ES	Errored seconds	8
8	SES	Severely errored seconds	9
9	UAS	Unavailable seconds	10
10-16	Reserved		
NOTE – This numbering is used with the associated threshold data 1/2 managed entities. Threshold data counter 1 indicates the 1st thresholded counter, etc.				

9.3.14 Ethernet flow termination point

The Ethernet flow termination point contains the attributes necessary to originate and terminate Ethernet frames in the ONT. It is appropriate when transporting pseudowire services via layer 2. Instances of this managed entity are created and deleted at the request of the OLT.

Relationships

One Ethernet flow termination point ME exists for each distinct pseudowire service that is transported via layer 2.

Attributes

Managed entity id: This attribute provides a unique number for each instance of this managed entity. Its value must be the same as that of the managed entity that is the termination point of its traffic (e.g., a pseudowire termination point managed entity). (R, set-by-create) (mandatory) (2 bytes)

Destination MAC: This attribute specifies the MAC address of the destination Ethernet frames. (R, W, set-by-create) (mandatory) (6 bytes)

Source MAC: This attribute specifies the near-end MAC address. It is established by other means (e.g., factory programmed into ONT flash memory) and included here for information only. (R) (mandatory) (6 bytes)

Tag policy: This attribute specifies the tagging policy to be applied to upstream Ethernet frames.

0   untagged frame (default)

1   tagged frame

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

TCI: If the tag policy calls for tagging of upstream Ethernet frames, this attribute specifies the tag control information, which includes the VLAN tag, P bits and CFI bit. (R, W) (optional) (2 bytes)

Loopback: This attribute is used to set the loopback configuration: No loopback (value 0x00), Loopback (value 0x01, Loopback of downstream traffic at MAC client). (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.

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