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

B-PON ONT management and control interface (OMCI) support for wireless Local Area Network interfaces

ITU-T Recommendation G.983.9

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ITU-T Recommendation G.983.9

B-PON ONT management and control interface (OMCI) support for wireless Local Area Network interfaces

Summary

This Recommendation provides the Optical Network Termination (ONT) management and control interface (OMCI) specification for the support of wireless Local Area Network interfaces on Broadband Passive Optical Network (B-PON) systems as defined in ITU-T Rec. G.983.1.

The OMCI specification is based on ITU-T Recs G.983.2 and G.983.8, but provides the necessary enhancements to these Recommendations which are needed to support the management of IEEE 802.11 interfaces.

Source

ITU-T Recommendation G.983.9 was approved on 13 June 2004 by ITU-T Study Group 15 (2001-2004) under the ITU-T Recommendation A.8 procedure.

FOREWORD

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

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CONTENTS

ITU-T Recommendation G.983.9

B-PON ONT management and control interface (OMCI) support for wireless Local Area Network interfaces

1 Scope

This Recommendation focuses on the OMCI specifications related to support for ONTs with IEEE 802.11 interfaces. Though the OMCI specifications are based on ITU-T Rec. G.983.2 [2] and ITU-T Rec. G.983.8 [3], some enhancements are needed. The scope of this Recommendation is limited to the enhancements only.

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

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

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

[4] IEEE 802.11 MIB (1999), *Information technology – Telecommunications and information exchange between systems – Local and metropolitan area networks – Specific requirements – Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications, Annex D.*

3 Abbreviations

This Recommendation uses the following abbreviations:

AP	Access Point
B-PON	Broadband Passive Optical Network
BSS	Basic Service Set
CCA	Clear Channel Assessment
CFP	Contention Free Period
CTS	Clear To Send
DCF	Distributed Coordination Function
DSSS	Direct-Sequence Spread Spectrum

DTIM	Delivery Traffic Indication Message
ESS	Extended Service Set
FHSS	Frequency-Hopping Spread Spectrum
IBSS	Independent Basic Service Set
ICV	Integrity Check Value
IR	Infrared
LME	Layer Management Entity
MAC	Media Access Control
ME	Managed Entity
MIB	Management Information Base
MLME	MAC Layer Management Entity
MMPDU	MAC Management Protocol Data Unit
MPDU	MAC Protocol Data Unit
MSDU	MAC Service Data Unit
OLT	Optical Line Terminal
OMCI	ONT Management and Control Interface
ONT	Optical Network Terminal
ONU	Optical Network Unit
PCF	Point Coordination Function
PHY	Physical layer
PLCP	Physical Layer Convergence Protocol
PMD	Physical Medium Dependent
RF	Radio Frequency
RTS	Request To Send
SIFS	Short Interframe Space
SME	Station Management Entity
STA	Station
TU	Time Unit
UNI	User Network Interface
VCC	Virtual Channel Connection
WEP	Wired Equivalent Privacy

4 Reference model and terms

See 4/G.983.2.

5 Requirements of the management interface specification

See 5/G.983.2.

5.1 Configuration management

See 5.1/G.983.2.

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) IEEE 802.11 Counters

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 IEEE 802.11 interfaces

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

Table 1/G.983.9 – Additional managed entities in the OMCI

Managed Entity	Required/ Optional	Description
Physical Path Termination Point 802.11 UNI	CR	Used for IEEE 802.11 interface supported by the ONT
802.11 Station Management data 1	CR	Used for IEEE 802.11 interface supported by the ONT
802.11 Station Management data 2	CR	Used for IEEE 802.11 interface supported by the ONT
802.11 General Purpose Object	CR	Used for IEEE 802.11 interface supported by the ONT
802.11 MAC&PHY Operation and Antenna Data	CR	Used for IEEE 802.11 interface supported by the ONT
802.11 Counters	O	Used for IEEE 802.11 interface supported by the ONT
802.11 PHY FHSS DSSS IR Tables	O	Used for IEEE 802.11 interface supported by the ONT

6.2 Managed entity diagrams

6.2.1 Managed entity relation diagram for IEEE 802.11 interfaces

The relationships between the managed entities required for supporting IEEE 802.11 interfaces are indicated in Figure 1.

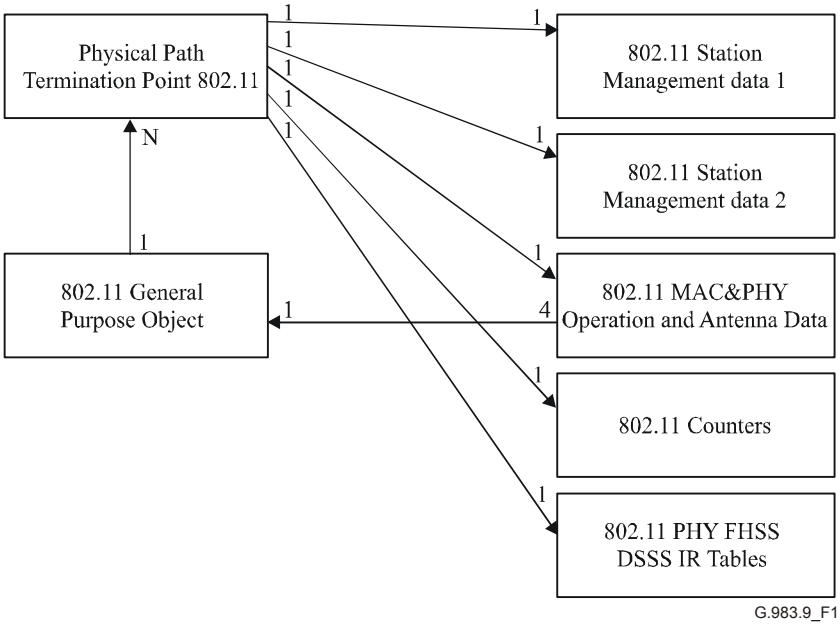

Figure 1/G.983.9 – Managed entity relation diagram for IEEE 802.11 interface support

7 Modified managed entities

7.1 Subscriber line cardholder

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

Coding	Contents	Description
40	802.11	IEEE 802.11 interface

7.2 Interworking VCC termination point

In the description of the Interworking Termination Point pointer attribute of the Interworking VCC Termination Point managed entity given in 7.1.6.1/G.983.8, add Physical Path Termination Point 802.11 UNI to the list of possible associated managed entities.

8 New managed entities for IEEE 802.11 management

The managed entities defined in this clause are based on the IEEE 802.11 MIB [4].

8.1 Physical path termination point 802.11 UNI

Relationships

One instance of this managed entity may exist for each instance of an IEEE 802.11 interface. An instance of this entity is created/deleted by the ONU whenever an IEEE 802.11 UNI card is inserted/removed from the ONU.

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).

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).

dot11SupportedDataRatesTx: This attribute shall specify the set of data rates (maximum of 8 data rates) at which the station is capable of transmitting data. Each octet contains a value representing a rate. Each rate shall be within the range from 2 to 127, corresponding to data rates in increments of 500 kbit/s from 1 Mbit/s to 63.5 Mbit/s, and shall be supported (as indicated in the supported rates table) for transmitting data. If fewer than 8 data rates are specified, each of the remaining bytes shall use the value 0x00. (R) (mandatory) (8 bytes).

dot11SupportedDataRatesRx: This attribute shall specify the set of data rates (maximum of 8 data rates) at which the station is capable of receiving data. Each octet contains a value representing a rate. Each rate shall be within the range from 2 to 127, corresponding to data rates in increments of 500 kbit/s from 1 Mbit/s to 63.5 Mbit/s, and shall be supported (as indicated in the supported rates table) for receiving data. If fewer than 8 data rates are specified, each of the remaining bytes shall use the value 0x00. (R) (mandatory) (8 bytes).

dot11TxPowerLevels: This attribute shall specify the set of transmit power levels (maximum of 8 power levels) which the station is capable of using. Each 16-bit word contains an integer representation of the power setting, in units of mW. If fewer than 8 power levels are specified, each of the remaining words shall use the value 0x0000. (R) (mandatory) (16 bytes).

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).

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 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 2.

Table 2/G.983.9 – AVC list for physical path termination point 802.11 UNI

Number	Attribute value change	Description
1	N/A	
2	OpState	Operational state of Physical Path Termination Point 802.11 UNI
3-9	N/A	
10-16	Reserved	

8.2 802.11 Station management data 1

Relationships

One instance of this managed entity may exist for each instance of an IEEE 802.11 interface. The ONU automatically creates an instance of this entity whenever a PPTP 802.11 UNI instance is created.

Attributes

Managed Entity id: This attribute provides a unique number for each instance of this managed entity. This ME id shall be the same as that of the related instance of Physical Path Termination Point 802.11 UNI. (R) (mandatory) (2 bytes).

dot11MediumOccupancyLimit: This attribute shall indicate the maximum amount of time, in TU, that a point coordinator may control the usage of the wireless medium without relinquishing control for long enough to allow at least one instance of DCF access to the medium. The default value of this attribute shall be 100, and the maximum value shall be 1000. (R, W) (mandatory) (2 bytes).

dot11CFPollable: When this Boolean attribute is true, it shall indicate that the STA is able to respond to a CF-Poll with a data frame within a SIFS time. This attribute shall be false if the STA is not able to respond to a CF-Poll with a data frame within a SIFS time. (R) (mandatory) (1 byte).

dot11CFPPeriod: This attribute shall describe the number of DTIM intervals between the start of CFPs. (R, W) (mandatory) (1 byte).

dot11CFPMaxDuration: This attribute shall describe the maximum duration of the CFP in TU that may be generated by the PCF. (R, W) (mandatory) (2 bytes).

dot11AuthenticationResponseTimeOut: This attribute shall specify the number of TU that a responding STA should wait for the next frame in the authentication sequence. (R, W) (mandatory) (4 bytes).

dot11PrivacyOptionImplemented: This Boolean attribute, when true, shall indicate that the IEEE 802.11 WEP option is implemented. The default value of this attribute shall be false. (R) (mandatory) (1 byte).

dot11PowerManagementMode: This attribute shall specify the power management mode of the STA. When set to active (0x00), it shall indicate that the station is not in power-save mode. When set to powersave (0x01), it shall indicate that the station is in power-save mode. (R, W) (mandatory) (1 byte).

dot11DesiredSSID1: This attribute contains the first half of the Service Set ID used in the DesiredSSID parameter of the most recent MLME_Scan.request. This value may be modified by an external management entity and used by the local SME to make decisions about the scanning process. (R, W) (mandatory) (16 bytes).

dot11DesiredSSID2: This attribute contains the second half of the Service Set ID used in the DesiredSSID parameter of the most recent MLME_Scan.request. This value may be modified by an external management entity and used by the local SME to make decisions about the scanning process. (R, W) (mandatory) (16 bytes).

dot11DesiredBSSType: This attribute shall specify the type of BSS the station shall use when scanning for a BSS with which to synchronize. This value is used to filter probe response frames and beacons. When set to infrastructure (0x00), the station shall only synchronize with a BSS whose capability information field has the ESS subfield set to 1. When set to independent (0x01), the station shall only synchronize with a BSS whose capability information field has the IBSS subfield set to 1. When set to any (0x02), the station may synchronize to either type of BSS. (R, W) (mandatory) (1 byte).

dot11Operational Rate Set: This attribute shall specify the set of data rates (maximum of 8 data rates) at which the station may transmit data. Each octet contains a value representing a rate. Each rate shall be within the range from 2 to 127, corresponding to data rates in increments of 500 kbit/s from 1 Mbit/s to 63.5 Mbit/s, and shall be supported (as indicated in the supported rates table) for receiving data. If fewer than 8 data rates are specified, each of the remaining bytes shall use the value 0x00. This value is reported in transmitted beacon, probe request, probe response, association request, association response, reassociation request, and reassociation response frames, and is used to determine whether a BSS with which the station desires to synchronize is suitable. (R, W) (mandatory) (8 bytes).

dot11BeaconPeriod: This attribute shall specify the number of TU that a station shall use for scheduling beacon transmissions. This value is transmitted in beacon and probe response frames. (R, W) (mandatory) (2 bytes).

dot11DTIMPeriod: This attribute shall specify the number of beacon intervals that shall elapse between transmission of beacon frames containing a TIM element whose DTIM Count field is 0. This value is transmitted in the DTIM period field of beacon frames. (R, W) (mandatory) (1 byte).

dot11AssociationResponseTimeOut: This attribute shall specify the number of TU that a requesting STA should wait for a response to a transmitted association-request MMPDU. (R, W) (mandatory) (4 bytes).

dot11AuthenticationAlgorithm: This attribute shall indicate all of the authentication algorithms supported by the STAs. The attribute is a bit-mapped coding, formatted as follows:

0000 0000 0000 0000 0000 0000 0000 00yx, where

0 = reserved, must be set to zero

x = Open System (1=Supported, 0=Not supported)

y = Shared Key Supported (1=Supported, 0=Not supported)

(R) (mandatory) (4 bytes).

dot11AuthenticationAlgorithmsEnable: This attribute shall indicate the enable status of the authentication algorithms supported by the STAs. The attribute is a bit-mapped coding, formatted as follows:

0000 0000 0000 0000 0000 0000 0000 00yx, where

0 = reserved, must be set to zero

x = Open System (1=Enabled, 0=Not Enabled)

y = Shared Key (1=Enabled, 0=Not Enabled)

(R, W) (mandatory) (4 bytes).

Actions

Get: Get one or more attributes.

Set: Set one or more attributes.

Notifications

None.

8.3 802.11 station management data 2

Relationships

One instance of this managed entity may exist for each instance of an IEEE 802.11 interface. The ONU automatically creates an instance of this entity whenever a PPTP 802.11 UNI instance is created.

Attributes

Managed Entity id: This attribute provides a unique number for each instance of this managed entity. This ME id shall be the same as that of the related instance of physical path termination point 802.11 UNI. (R) (mandatory) (2 bytes).

dot11DisassociateReason: This attribute holds the most recently transmitted reason code in a disassociation frame. If no disassociation frame has been transmitted, the value of this attribute shall be 0. (R) (mandatory) (2 bytes).

dot11DisassociateStation: This attribute holds the MAC address from the address 1 field of the most recently transmitted disassociation frame. If no disassociation frame has been transmitted, the value of this attribute shall be 0. (R) (mandatory) (6 bytes).

dot11DeauthenticateReason: This attribute holds the most recently transmitted reason code in a Deauthentication frame. If no deauthentication frame has been transmitted, the value of this attribute shall be 0. (R) (mandatory) (2 bytes).

dot11DeauthenticateStation: This attribute holds the MAC address from the address 1 field of the most recently transmitted deauthentication frame. If no deauthentication frame has been transmitted, the value of this attribute shall be 0. (R) (mandatory) (6 bytes).

dot11AuthenticateFailStatus: This attribute holds the most recently transmitted status code in a failed authentication frame. If no failed authentication frame has been transmitted, the value of this attribute shall be 0. (R) (mandatory) (2 bytes).

dot11AuthenticateFailStation: This attribute holds the MAC address from the address 1 field of the most recently transmitted failed authentication frame. If no failed authentication frame has been transmitted, the value of this attribute shall be 0. (R) (mandatory) (6 bytes).

dot11WEPDefaultKeyValue1: This attribute holds WEP default key #1. The WEP default secret keys are logically WRITE-ONLY. Attempts to read the entries in this table shall return unsuccessful status and values of null or zero. The default value of each WEP default key shall be null. (W) (mandatory) (5 bytes).

dot11WEPDefaultKeyValue2: This attribute holds WEP default key #2. (W) (mandatory) (5 bytes).

dot11WEPDefaultKeyValue3: This attribute holds WEP default key #3. (W) (mandatory) (5 bytes).

dot11WEPDefaultKeyValue4: This attribute holds WEP default key #4. (W) (mandatory) (5 bytes).

dot11PrivacyInvoked & dot11ExcludeUnencrypted: This attribute holds two truth values. It is coded 0000 00yx, where x indicates the dot11PrivacyInvoked value, and y indicates the dot11ExcludeUnencrypted value. When dot11PrivacyInvoked is true, it shall indicate that the IEEE 802.11 WEP mechanism is used for transmitting frames of type data. The default value of this attribute shall be false. When dot11ExcludeUnencrypted is true, the STA shall not indicate at the MAC service interface received MSDUs that have the WEP subfield of the frame control field equal to zero. When this attribute is false, the STA may accept MSDUs that have the WEP subfield of the frame control field equal to zero. The default value of this attribute shall be false. (R, W) (mandatory) (1 byte).

dot11WEPDefaultKeyID: This attribute shall indicate the use of the first, second, third, or fourth WEPDefaultKey when set to values of zero, one, two, or three. The default value of this attribute shall be 0. (R, W) (mandatory) (1 byte).

dot11WEPKeyMappingLength: The maximum number of tuples that dot11WEPKeyMappings can hold. (R, W) (mandatory) (4 bytes).

dot11WEPICVErrorCount: This counter shall increment when a frame is received with the WEP subfield of the frame control field set to one and the value of the ICV as received in the frame does not match the ICV value that is calculated for the contents of the received frame. (R) (mandatory) (4 bytes).

dot11WEPExcludedCount: This counter shall increment when a frame is received with the WEP subfield of the frame control field set to zero and the value of dot11ExcludeUnencrypted causes that frame to be discarded. (R) (mandatory) (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 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 3. Notifications should be sent when a Disassociate, Deauthenticate, or AuthenticationFail event occurs. These events will normally coincide with a change in the DisassociateStation, DeauthenticateStation, or AuthenticationFailStation attributes.

Table 3/G.983.9 – AVC list for 802.11 station management data 2

Number	Attribute value change	Description
1	N/A	
2	dot11DisassociateStation	MAC address from the Address 1 field of the most recently transmitted Disassociation frame
3	N/A	
4	dot11DeauthenticateStation	MAC address from the Address 1 field of the most recently transmitted Deauthentication frame
5	N/A	

Table 3/G.983.9 – AVC list for 802.11 station management data 2

Number	Attribute value change	Description
6	dot11AuthenticateFailStation	MAC address from the Address 1 field of the most recently transmitted failed Authentication frame
7-15	N/A	
16	Reserved	

8.4 802.11 General purpose object

Relationships

Many instances of this managed entity may exist for each instance of an IEEE 802.11 interface. This object is used to contain the following IEEE 802.11 data: WEP key mappings, group addresses, reg domain supported, and antennas list. Each of these uses has its own attributes defined, and a type attribute indicates which subset of attributes is active for each instance. Regardless of which attributes are active, each attribute shall be numbered (in attribute mask) according to the ordering of the full attribute set indicated below.

For object types 0 and 1, the OLT may create and delete instances of this object. For object types 2 and 3, the ONU instantiates as many instances as required to model the UNI's capabilities.

Attributes

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

ObjectType: This attribute indicates how this entity is to be used, defined as:

0: WEP Key Mapping

1: Group Addresses

2: Reg Domain Supported

3: Antennas List

For any given type, only the relevant attributes have valid contents. The other attributes are unspecified. (R, Set-by-create) (mandatory) (1 byte).

PhysicalPathTerminationPoint802.11Pointer: This attribute indicates the specific Physical Path Termination Point to which this object corresponds. (R, Set-by-create) (mandatory) (2 bytes).

dot11WEPKeyMappingAddress: Valid if ObjectType=0. The MAC address of the STA for which the values from this key mapping entry are to be used. (R, W, Set-by-create) (mandatory) (6 bytes).

dot11WEPKeyMappingWEPOn: Valid if ObjectType=0. Boolean as to whether WEP is to be used when communicating with the dot11WEPKeyMappingAddress STA. (R, W, Set-by-create) (mandatory) (1 byte).

dot11WEPKeyMappingValue: Valid if ObjectType=0. A WEP secret key value. (W, Set-by-create) (mandatory) (5 bytes).

dot11Address: Valid if ObjectType=1. MAC address identifying multicast addresses from which this STA will receive frames. (R, Set-by-create) (mandatory) (6 bytes).

dot11RegDomainsSupportValue: Valid if ObjectType=2. There are different operational requirements dependent on the regulatory domain. This attribute list describes the regulatory domains the PLCP and PMD support in this implementation. Currently defined values and their corresponding Regulatory Domains are: FCC (USA) = X'10', DOC (Canada) = X'20', ETSI (most of Europe) = X'30', Spain = X'31', France = X'32', MKK (Japan) = X'40'. (R) (mandatory) (1 byte).

dot11SupportedTxAntenna: Valid if ObjectType=3. When true, this Boolean object indicates that the antenna represented by this managed entity id can be used as a transmit antenna. (R) (mandatory) (1 byte).

dot11SupportedRxAntenna: Valid if ObjectType=3. When true, this Boolean object indicates that the antenna represented by this managed entity id can be used as a receive antenna. (R) (mandatory) (1 byte).

dot11DiversitySelectionRx: Valid if ObjectType=3. When true, this Boolean object indicates that the antenna represented by managed entity id can be used for receive diversity. This object may only be true if the antenna can be used as a receive antenna, as indicated by dot11SupportedRxAntenna. (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.

8.5 802.11 MAC&PHY operation and antenna data

Relationships

One instance of this managed entity may exist for each instance of an IEEE 802.11 interface. The ONU automatically creates an instance of this entity whenever a PPTP 802.11 UNI instance is created.

Attributes

Managed Entity id: This attribute provides a unique number for each instance of this managed entity. This ME id shall be the same as that of the related instance of Physical Path Termination Point 802.11 UNI. (R) (mandatory) (2 bytes).

dot11MACAddress: Unique MAC address assigned to the STA. (R) (mandatory) (6 bytes).

dot11RTSThreshold: This attribute shall indicate the number of octets in an MPDU, below which an RTS/CTS handshake shall not be performed. An RTS/CTS handshake shall be performed at the beginning of any frame exchange sequence where the PDU is of type data or management, the MPDU has an individual address in the address 1 field, and the length of the MPDU is greater than this threshold. Setting this attribute to be larger than the maximum MSDU size shall have the effect of turning off the RTS/CTS handshake for frames of data or management type transmitted by this STA. Setting this attribute to zero

shall have the effect of turning on the RTS/CTS handshake for all frames of data or management type transmitted by this STA. The default value of this attribute shall be 2347 (R, W) (mandatory) (2 bytes).

dot11ShortRetryLimit: This attribute shall indicate the maximum number of transmission attempts of a frame, the length of which is less than or equal to dot11RTSThreshold, that shall be made before a failure condition is indicated. The default value of this attribute shall be 7. (R, W) (mandatory) (1 byte).

dot11LongRetryLimit: This attribute shall indicate the maximum number of transmission attempts of a frame, the length of which is greater than dot11RTSThreshold, that shall be made before a failure condition is indicated. The default value of this attribute shall be 4. (R, W) (mandatory) (1 byte).

dot11FragmentationThreshold: This attribute shall specify the current maximum size, in octets, of the MPDU that may be delivered to the PHY. An MSDU shall be broken into fragments if its size exceeds the value of this attribute after adding MAC headers and trailers. An MSDU or MMPDU shall be fragmented when the resulting frame has an individual address in the Address1 field, and the length of the frame is larger than this threshold. The default value for this attribute shall be the lesser of 2346 or the aMPDUMaxLength of the attached PHY and shall never exceed the lesser of 2346 or the aMPDUMaxLength of the attached PHY. The value of this attribute shall never be less than 256. (R, W) (mandatory) (2 bytes).

dot11MaxTransmitMSDULifetime: The MaxTransmitMSDULifetime shall be the elapsed time in TU, after the initial transmission of an MSDU, after which further attempts to transmit the MSDU shall be terminated. The default value of this attribute shall be 512. (R, W) (mandatory) (4 bytes).

dot11MaxReceiveLifetime: The MaxReceiveLifetime shall be the elapsed time in TU, after the initial reception of a fragmented MMPDU or MSDU, after which further attempts to reassemble the MMPDU or MSDU shall be terminated. The default value shall be 512. (R, W) (mandatory) (4 bytes).

dot11PHYType: This is an 8-bit integer value that identifies the PHY type supported by the attached PLCP and PMD. Currently defined values and their corresponding PHY types are: FHSS 2.4 GHz = 0x01, DSSS 2.4 GHz = 0x02, IR baseband = 0x03. (R) (mandatory) (1 byte).

dot11CurrentRegDomain: The current regulatory domain this instance of the PMD is supporting. This object corresponds to one of the RegDomains listed in dot11RegDomainsSupported. (R, W) (mandatory) (4 bytes).

dot11TempType: There are different operating temperature requirements dependent on the anticipated environmental conditions. This attribute describes the current PHY's operating temperature range capability. Currently defined values and their corresponding temperature ranges are: Type 1 = 0x01-Commercial range of 0 to 40 degrees C, Type 2 = 0x02-Industrial range of –30 to 70 degrees C. (R) (mandatory) (1 byte).

dot11CurrentTxAntennaPointer: The current antenna being used to transmit. This value is one of the values appearing in the dot11SupportedTxAntenna attribute of a general purpose object ME instance of ObjectType=3. This may be used by a management agent to control which antenna is used for transmission. (R, W) (mandatory) (2 bytes).

dot11DiversitySupport: This implementation's support for diversity, encoded as: 0x01-diversity is available and is performed over the fixed list of antennas defined by the dot11DiversitySelectionRx attribute values of the set of general purpose object ME instances of ObjectType=3. 0x02-diversity is not supported. 0x03-diversity is supported

and control of diversity is also available, in which case the attribute dot11DiversitySelectionRx can be dynamically modified by the LME. (R) (mandatory) (1 byte).

dot11CurrentRxAntennaPointer: The current antenna being used to receive, if the dot11DiversitySupport indicates that diversity is not supported. The selected antenna shall be one of the antennae marked for receive via the dot11SupportedRxAntenna attribute of a general purpose object ME instance of ObjectType=3. (R, W) (mandatory) (2 bytes).

dot11CurrentTxPowerLevel: The TxPowerLevel currently being used to transmit data. Some PHYs also use this value to determine the receiver sensitivity requirements for CCA. Valid values range from 0 to 7 and indicate which word in the dot11TxPowerLevels attribute of the physical path termination point 802.11 UNI object shall be the current power level. (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.

8.6 802.11 counters

Relationships

One instance of this managed entity may exist for each instance of an IEEE 802.11 interface. An instance of this managed entity is created/deleted by the OLT after an instance of a physical path termination point 802.11 UNI managed entity is created/deleted.

Attributes

Managed Entity id: This attribute provides a unique number for each instance of this managed entity. (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 0x0100 (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 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).

dot11TransmittedFragmentCount: This counter shall be incremented for an acknowledged MPDU with an individual address in the address 1 field or an MPDU with a multicast address in the address 1 field of type data or management. If the actual counter saturates, it remains on its maximum value. Default value is 0x00. (R) (mandatory) (4 bytes).

dot11MulticastTransmittedFrameCount: This counter shall increment only when the multicast bit is set in the destination MAC address of a successfully transmitted MSDU. When operating as a STA in an ESS, where these frames are directed to the AP, this implies having received an acknowledgment to all associated MPDUs. If the actual counter saturates, it remains on its maximum value. Default value is 0x00. (R) (mandatory) (4 bytes).

dot11FailedCount: This counter shall increment when an MSDU is not transmitted successfully due to the number of transmit attempts exceeding either the dot11ShortRetryLimit or dot11LongRetryLimit (specified in the corresponding attributes of the associated 802.11 MAC&PHY operation and antenna data managed entity). If the actual counter saturates, it remains on its maximum value. Default value is 0x00. (R) (mandatory) (4 bytes).

dot11RetryCount: This counter shall increment when an MSDU is successfully transmitted after one or more retransmissions. If the actual counter saturates, it remains on its maximum value. Default value is 0x00. (R) (mandatory) (4 bytes).

dot11MultipleRetryCount: This counter shall increment when an MSDU is successfully transmitted after more than one retransmission. If the actual counter saturates, it remains on its maximum value. Default value is 0x00. (R) (mandatory) (4 bytes).

dot11FrameDuplicateCount: This counter shall increment when a frame is received that the Sequence Control field indicates is a duplicate. If the actual counter saturates, it remains on its maximum value. Default value is 0x00. (R) (mandatory) (4 bytes).

dot11RTSSuccessCount: This counter shall increment when a CTS is received in response to an RTS. If the actual counter saturates, it remains on its maximum value. Default value is 0x00. (R) (mandatory) (4 bytes).

dot11RTSFailureCount: This counter shall increment when a CTS is not received in response to an RTS. If the actual counter saturates, it remains on its maximum value. Default value is 0x00. (R) (mandatory) (4 bytes).

dot11ACKFailureCount: This counter shall increment when an ACK is not received when expected. If the actual counter saturates, it remains on its maximum value. Default value is 0x00. (R) (mandatory) (4 bytes).

dot11ReceivedFragmentCount: This counter shall be incremented for each successfully received MPDU of type data or management. If the actual counter saturates, it remains on its maximum value. Default value is 0x00. (R) (mandatory) (4 bytes).

dot11MulticastReceivedFrameCount: This counter shall increment when an MSDU is received with the multicast bit set in the destination MAC address. If the actual counter saturates, it remains on its maximum value. Default value is 0x00. (R) (mandatory) (4 bytes).

dot11FCSErrorCount: This counter shall increment when an FCS error is detected in a received MPDU. If the actual counter saturates, it remains on its maximum value. Default value is 0x00. (R) (mandatory) (4 bytes).

dot11TransmittedFrameCount: This counter shall increment for each successfully transmitted MSDU. If the actual counter saturates, it remains on its maximum value. Default value is 0x00. (R) (mandatory) (4 bytes).

dot11WEPUndecryptableCount: This counter shall increment when a frame is received with the WEP subfield of the Frame Control field set to one and the WEPOn value for the key mapped to the TA's MAC address indicates that the frame should not have been encrypted, or that frame is discarded due to the receiving STA not implementing the

privacy option. 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.

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. Support of this action is optional.

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.

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.983.9 – Alarm list for 802.11 counters

Number	Event	Description	Threshold data counter # (Note)
	Threshold Crossing Alert		
0	dot11Failed	MSDU transmit failure threshold crossing	1
1	dot11RTSFailure	RTS failure count threshold crossing	2
2	dot11ACKFailure	ACK failure count threshold crossing	3
3	dot11FCSError	FCS error count threshold crossing	4
4	dot11WEPUndecryptable	WEP undecryptable count threshold crossing	5
5-255	Reserved		

NOTE – This numbering is used with the associated Threshold Data managed entity. Threshold data counter 1 indicates the 1st thresholded counter that is associated with the Threshold Value 1 attribute of the Threshold $Data_{B\text{-}PON}$ managed entity.

8.7 802.11 PHY FHSS DSSS IR tables

Relationships

One instance of this managed entity may exist for each instance of an IEEE 802.11 interface. The ONU automatically creates an instance of this entity whenever a PPTP 802.11 UNI instance is created.

Attributes

Managed Entity id: This attribute provides a unique number for each instance of this managed entity. This ME id shall be the same as that of the related instance of physical path termination point 802.11 UNI. (R) (mandatory) (2 bytes).

dot11HopTime: The time in microseconds for the PMD to change from channel 2 to channel 80. (R) (mandatory) (1 byte).

dot11CurrentChannelNumber: The current channel number of the frequency output by the RF synthesizer. (R, W) (mandatory) (1 byte).

dot11MaxDwellTime: The maximum time in TU that the transmitter is permitted to operate on a single channel. (R) (mandatory) (2 bytes).

dot11CurrentDwellTime: The current time in TU that the transmitter shall operate on a single channel, as set by the MAC. Default is 19 TU. (R, W) (mandatory) (2 bytes).

dot11CurrentSet: The current set of patterns the PHY LME is using to determine the hopping sequence. (R, W) (mandatory) (1 byte).

dot11CurrentPattern: The current pattern the PHY LME is using to determine the hop sequence. (R, W) (mandatory) (1 byte).

dot11CurrentIndex: The current index value the PHY LME is using to determine the CurrentChannelNumber. (R, W) (mandatory) (1 byte).

dot11CurrentChannel: The current operating frequency channel of the DSSS PHY. Valid channel numbers are as defined in ETSI TS 101 270-1 VI.2.1 Section 15.4.6.2. (R, W) (mandatory) (1 byte).

dot11CCAModeSupported: dot11CCAModeSupported is a bit-significant value, representing all of the CCA modes supported by the PHY. Valid values are: energy detect only (ED_ONLY) = 0x01, carrier sense only (CS_ONLY) = 0x02, carrier sense and energy detect (ED_and_CS) = 0x04 or the logical sum of any of these values. (R) (mandatory) (1 byte).

dot11CurrentCCAMode: The current CCA method in operation. Valid values are: energy detect only (edonly) = 0x01, carrier sense only (csonly) = 0x02, carrier sense and energy detect (edandcs) = 0x04 (R, W) (mandatory) (1 byte).

dot11EDThreshold: The current energy detect threshold being used by the DSSS PHY. (R, W) (mandatory) (4 bytes).

dot11CCAWatchdogTimerMax: This parameter, together with CCAWatchdogCountMax, determines when energy detected in the channel can be ignored. Units are in time ticks. (R, W) (mandatory) (4 bytes).

dot11CCAWatchdogCountMax: This parameter, together with CCAWatchdogTimerMax, determines when energy detected in the channel can be ignored. Units are in time ticks. (R, W) (mandatory) (4 bytes).

dot11CCAWatchdogTimerMin: The minimum value to which CCAWatchdogTimerMax can be set. Units are in time ticks. (R, W) (mandatory) (4 bytes).

dot11CCAWatchdogCountMin: The minimum value to which CCAWatchdogCount can be set. Units are in time ticks. (R, W) (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

None.

9 Managed entity identifiers

The ONT management and control protocol cell format is defined in ITU-T Rec. G.983.2. As new managed entities are introduced into the OMCI specifications, the managed entity identifier that is used in the message identifier field shall be defined. Table 5 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 5/G.983.9 – Managed entity identifiers

Managed entity class value	Managed entity
91	Physical Path Termination Point 802.11 UNI
92	802.11 Station Management data 1
93	802.11 Station Management data 2
94	802.11 General Purpose Object
95	802.11 MAC&PHY Operation and Antenna Data
96	802.11 Counters
97	802.11 PHY FHSS DSSS IR Tables
98..255	Reserved

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