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Part 3-1**

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l'Éthernet — Partie 3-1*

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IEEE Standard for Management Information Base (MIB) Definitions for Ethernet

IEEE Computer Society

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USA

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Abstract: The Management Information Base (MIB) module specifications for IEEE Std 802.3™, also known as Ethernet, are contained in this standard. It includes the Structure of Management Information Version 2 (SMIPv2) MIB module specifications formerly produced and published by the Internet Engineering Task Force (IETF), as well as extensions resulting from amendments to IEEE Std 802.3. The SMIPv2 MIB modules are intended for use with the Simple Network Management Protocol (SNMP), commonly used to manage Ethernet.

Keywords: Ethernet, IEEE 802.3.1™, Management Information Base (MIB), network management, Simple Network Management Protocol (SNMP), Structure of Management Information Version 2 (SMIPv2)

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Introduction

This introduction is not part of IEEE Std 802.3.1-2013, IEEE Standard for Management Information Base (MIB) Definitions for Ethernet.

The initial version of this standard was based on the managed object definitions provided in IEEE Std 802.3TM-2008, which subsumed and superseded IEEE Std 802.3anTM-2006, IEEE Std 802.3apTM-2007, IEEE Std 802.3aqTM-2006, and IEEE Std 802.3asTM-2006. It also includes the Logical Link Discovery Protocol Ethernet extensions provided in Annex F of IEEE Std 802.1ABTM-2009.^b In addition, the initial version of this standard incorporated and updated the MIB module definitions formerly defined in IETF RFC 2108 [B20],^c IETF RFC 3621 [B27], IETF RFC 3635 [B29], IETF RFC 3637 [B30], IETF RFC 4836 [B35], IETF RFC 4837 [B36], IETF RFC 4878 [B37], and IETF RFC 5066 [B38].

The first revision of this standard updated the MIB module definitions to reflect the managed object definitions provided in IEEE Std 802.3-2012, which subsumed and superseded IEEE Std 802.3-2008, IEEE Std 802.3atTM, IEEE Std 802.3avTM, IEEE Std 802.3azTM, IEEE Std 802.3baTM, IEEE Std 802.3bcTM, IEEE Std 802.3bdTM, IEEE Std 802.3bfTM, and IEEE Std 802.3bgTM.

^bInformation on references can be found in Clause 2.

^cThe numbers in brackets correspond to those of the bibliography in Annex A.

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IEEE Standard for Management Information Base (MIB) Definitions for Ethernet

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1. Overview

This document supersedes and makes obsolete Annex 30A and Annex 30B of IEEE Std 802.3™-2008, Annex F of IEEE Std 802.1AB™-2009,¹ IETF RFC 2108 [B20],² IETF RFC 3621 [B27], IETF RFC 3635 [B29], IETF RFC 3637 [B30], IETF RFC 4836 [B35], IETF RFC 4837 [B36], IETF RFC 4878 [B37], and IETF RFC 5066 [B38].

Ethernet technology, as defined by the IEEE 802.3 Working Group, continues to evolve, with scalable increases in speed, new types of cabling and interfaces, and new features. This evolution may require changes in the managed objects in order to reflect this new functionality. This document, as with other documents issued by this working group, reflects a certain stage in the evolution of Ethernet technology. In the future, this document might be revised, or new documents might be issued, in order to reflect the evolution of Ethernet technology.

The term "Ethernet-like interfaces" was historically used because the interfaces defined by the IEEE 802.3 Working Group were not considered "Ethernet" per se, but "Ethernet-like," because "Ethernet" was taken to

¹Information on references can be found in Clause 2.

²The numbers in brackets correspond to those of the bibliography in Annex A.

mean “Ethernet version 2” according to the (DEC, Intel, Xerox) DIX “blue book.” Today and in the context of SNMP management and SMIPv2 MIB modules, “Ethernet,” “Ethernet-like,” and “IEEE 802.3” are synonymous and interchangeable in the marketplace. The term “Ethernet-like” is retained in this document because of its common usage in the SNMP-based network management community.

1.1 Scope

This standard contains the Management Information Base (MIB) module specifications for IEEE Std 802.3, also known as Ethernet. It includes the Structure of Management Information Version 2 (SMIPv2) MIB module specifications formerly produced and published by the Internet Engineering Task Force (IETF), and the managed object branch and leaf assignments provided in the Guidelines for the Definition of Managed Objects (GDMO) MIB modules formerly specified within IEEE Std 802.3, as well as extensions resulting from recent amendments to IEEE Std 802.3. The SMIPv2 MIB modules are intended for use with the Simple Network Management Protocol (SNMP), commonly used to manage Ethernet.

1.2 Purpose

The purpose of the standard is to publish the SMIPv2 MIB module specifications in a single document that is separate from IEEE Std 802.3, and that can be published in a machine-readable format. Future amendments and revisions to IEEE Std 802.3.1 will be performed to update the MIB specifications as required to track future amendments and revisions to IEEE Std 802.3.

1.3 Internet-Standard Management Framework

For a detailed overview of the documents that describe the current Internet-Standard Management Framework, please refer to section 7 of IETF RFC 3410.

Managed objects are accessed via a virtual information store, termed the Management Information Base or MIB. MIB objects are generally accessed through the SNMP.

Objects in the MIB are defined using the mechanisms defined in the Structure of Management Information (SMI). This standard specifies MIB modules that are compliant to the SMIPv2, which is described in IETF STD 58 (RFC 2578), IETF STD 58 (RFC 2579), and IETF STD 58 (RFC 2580).

1.4 Security considerations

SNMP versions prior to SNMPv3 did not include adequate security. Even if the network itself is secure (for example by using IPsec), there is no control as to who on the secure network is allowed to access and GET/SET (read/change/create/delete) the objects in a MIB module.

Implementers should consider the security features as provided by the SNMPv3 framework (see section 8 of IETF RFC 3410), including full support for the SNMPv3 cryptographic mechanisms (for authentication and privacy).

SNMPv3 should be deployed, rather than previous versions of SNMP, and cryptographic security should be enabled. It is then a customer/operator responsibility to ensure that the SNMP entity giving access to an instance of this MIB module is properly configured to give access to the objects only to those principals (users) that have legitimate rights to indeed GET or SET (change/create/delete) them.

Throughout this standard, there are a number of accessible management objects that may be considered sensitive or vulnerable in some network environments. The support for some operations in a non-secure

environment without proper protection can have a negative effect on network operations. Such management objects are detailed in the clauses that define them.

The user of these MIB modules should therefore be aware that support for SET operations in a non-secure environment without proper protection can have a negative effect on network operations.

The readable objects in these MIB modules (i.e., those with MAX-ACCESS other than not-accessible) may be considered sensitive in some environments since, collectively, they provide information about the performance of network interfaces and can reveal some aspects of their configuration. In such environments, it is important to control GET and NOTIFY access to these objects and possibly encrypt their values when sending them over the network via SNMP.

1.5 Conformance

Specific conformance statements and compliance statements, written in accordance with IETF STD 58, RFC 2580, are included in each MIB module. They can be found by searching for the text strings “Conformance statements” and “Compliance statements.”

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2. Normative references

The following referenced documents are indispensable for the application of this document (i.e., they must be understood and used, so each referenced document is cited in text and its relationship to this document is explained). For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments or corrigenda) applies.

ANSI T1.231-1997, Layer 1 In-Service Digital Transmission Performance Monitoring.³

ANSI T1.424-2004, Interface Between Networks and Customer Installation—Very-high-bit-rate Digital Subscriber Lines (VDSL) Metallic Interface (DMT Based).

ETSI TS1 101 270-1 (1999), Transmission and Multiplexing (TM); Access transmission systems on metallic access cables; Very high speed Digital Subscriber Line (VDSL); Part 1: Functional requirements.

IEEE Std 802[®], IEEE Standard for Local and Metropolitan Area Networks—Architecture and Overview.^{5, 6}

IEEE Std 802.1D[™], IEEE Standard for Local and Metropolitan Area Networks—Media Access Control (MAC) Bridges.

IEEE Std 802.1AB[™]-2009, IEEE Standard for Local and Metropolitan Area Networks—Station and Media Access Control Discovery.

IEEE Std 802.3[™], IEEE Standard for Ethernet.

IEEE Std 802.9a[™]-1995, IEEE Standards for Local and Metropolitan Area Networks—Supplement to Integrated Services (IS) LAN Interface at the Medium Access Control (MAC) and Physical (PHY) Layers—Specification of IsLAN16-T.

IETF RFC 1213, Management Information Base for Network Management of TCP/IP-based internets: MIB-II, McCloghrie, K., and Rose, M., Mar. 1991.⁷

IETF RFC 1516, Definitions of Managed Objects for IEEE 802.3 Repeater Devices, McMaster, D., and McCloghrie, K., Sept. 1993.

IETF RFC 2119, Keywords for use in RFCs to Indicate Requirement Levels, Bradner, S., Mar. 1997.

IETF RFC 2434, Guidelines for Writing an IANA Considerations Section in RFCs, Narten, T. and Alvestrand, H., Oct. 1998.

IETF STD 58 (RFC 2578), Structure of Management Information Version 2 (SMIv2), McCloghrie, K., Perkins, D., and Schoenwaelder, J., Apr. 1999.

IETF STD 58 (RFC 2579), Textual Conventions for SMIv2, McCloghrie, K., Perkins, D., and Schoenwaelder, J., Apr. 1999.

IETF STD 58 (RFC 2580), Conformance Statements for SMIv2, McCloghrie, K., Perkins, D., and Schoenwaelder, J., Apr. 1999.

³ANSI publications are available from the American National Standards Institute (<http://www.ansi.org/>).

⁴ETSI publications are available from the European Telecommunications Standards Institute (<http://www.etsi.org/>).

⁵IEEE publications are available from The Institute of Electrical and Electronics Engineers (<http://standards.ieee.org/>).

⁶The IEEE standards or products referred to in this clause are trademarks of The Institute of Electrical and Electronics Engineers, Inc.

⁷IETF documents (i.e., RFCs) are available for download at <http://www.rfc-archive.org/>.

IETF RFC 2856, Textual Conventions for Additional High Capacity Data Types, Bierman, A., McCloghrie, K., and Presuhn, R., June 2000.

IETF RFC 2863, The Interfaces Group MIB, McCloghrie, K., and Kastenholz, F., June 2000.

IETF RFC 2864, The Inverted Stack Table Extension to the Interfaces Group MIB, McCloghrie, K., and Hanson, G., June 2000.

IETF RFC 3410, Introduction and Applicability Statements for Internet Standard Management Framework, Case, J., Mundy R., Partain, D., and Stewart, B., Dec. 2002.

IETF RFC 3411, An Architecture for Describing Simple Network Management Protocol (SNMP) Management Frameworks, Harrington, D., Presuhn, R., and Wijnen, B., Dec. 2002.

IETF RFC 3592, Definitions of Managed Objects for the Synchronous Optical Network/Synchronous Digital Hierarchy (SONET/SDH) Interface Type, Tesink, K., Sept. 2003.

ITU-T Recommendation G.983.1, 1998—Optical line systems for local and access networks—Broadband optical access systems based on Passive Optical Networks (PON).⁸

ITU-T Recommendation G.991.2, 2003—Single-pair High-speed Digital Subscriber Line (SHDSL) transceivers.

ITU-T Recommendation G.993.1, 2004—Very high speed digital subscriber line transceivers.

⁸ITU-T publications are available from the International Telecommunications Union (<http://www.itu.int/>).

3. Definitions

For the purposes of this document, the following terms and definitions apply. *The IEEE Standards Dictionary Online* should be consulted for terms not defined in this clause.⁹

agent: An entity, typically implemented in software, which provides remote access to management instrumentation, via the Simple Network Management Protocol (SNMP).

group: Within the context of the repeater management Management Information Base (MIB) module defined in Clause 7 of IEEE Std 802.3.1-2013: A recommended, but optional, entity defined in Clause 30 of IEEE Std 802.3, in order to support a modular numbering scheme. The classic example allows an implementor to represent field-replaceable units as groups of ports, with the port numbering matching the modular hardware implementation.

jack type: The jack connector type, as it appears on the outside of the system. The type of mechanical interface to the transmission medium.

Loss of Codegroup Delineation: See 50.3.5.3 of IEEE Std 802.3.

managed object: An abstract representation of network resources that are managed. A managed object is defined according to the *Structure of Management Information version 2 (SMIv2)* defined in IETF STD 58, RFC 2578.

managed repeater: A repeater as defined by IEEE Std 802.3 incorporating a management entity that complies with the Management Information Base (MIB) module definition contained in Clause 7 of IEEE Std 802.3.1-2013.

module: A building block in a modular system. In the context of the MIB definitions, a specification of management capabilities related to the system. In the context of a chassis, it typically maps into one “slot”; however, the range of configurations may be very large, with several modules entering one slot, or one module covering several slots.

non-trivial repeater: A repeater as defined by IEEE Std 802.3 having multiple ports.

Path Coding violations: In IEEE Std 802.3, the path layer coding violations count is based on block errors and not on BIP-8 errors; i.e., it is incremented only once for each B3 byte that indicates incorrect parity, regardless of the number of bits in error. Note that Section 8.4.5.1 of ANSI T1.231-1997 allows either path BIP-8 errors or path block errors to be used for the path layer error count.

repeater system: A managed entity compliant with this standard and incorporating at least one managed IEEE 802.3 repeater.

repeater unit: The portion of a repeater that is inboard of its Physical Medium Attachment (PMA)/Physical Signaling Sublayer (PLS) or PMA/Physical Coding Sublayer (PCS).

Signal Label Mismatch: This defect is called Payload Label Mismatch (PLM) in IEEE Std 802.3. It is reported by setting both the sonetPathSignalLabelMismatch bit in the appropriate instance of sonetPathCurrentStatus (defined in IETF RFC 3592) and the etherWisPathPLM bit in the corresponding instance of etherWisPathCurrentStatus.

stack: A scalable system in which modularity is achieved by interconnecting a number of different systems.

⁹The *IEEE Standards Dictionary Online* subscription is available at http://www.ieee.org/portal/innovate/products/standard/standards_dictionary.html.

STS-Path Remote Defect Indication: IEEE Std 802.3 mandates the use of ERDI-P (Enhanced Remote Defect Indication-Path) defined in ANSI T1.231-1997 to signal remote server defects (triggered by path AIS or path LOP) and remote payload defects (triggered by Payload Label Mismatch or Loss of Codegroup Delineation). IETF RFC 3592 defines the one-bit RDI-P (Remote Defect Indication-Path), which signals remote server defects (i.e., path AIS and path LOP) only. An implementation of the MIB module defined in Clause 12 of IEEE Std 802.3.1-2013 sets the sonetPathSTSRDI bit in the appropriate instance of sonetPathCurrentStatus when it receives an ERDI-P server defect indication from the remote end. Both ERDI-P payload defects and ERDI-P server defects are reported in the object etherWisFarEndPathCurrentStatus.

system: An entity compliant with one or more Management Information Base (MIB) modules of this standard.

system interconnect segment: An internal segment allowing interconnection of ports belonging to different physical entities into the same logical managed repeater, bridge, or other system. Examples of implementation might be backplane busses in modular hubs, or chaining cables in stacks of bridges/switches. It is not uncommon for such segments to be a proprietary implementation.

trivial repeater-unit: An isolated port that can gather statistics.

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4. Abbreviations

ACK	acknowledge
AIS	Alarm Indication Signal
ARP	address resolution protocol
ASCII	American Standard Code for Information Interchange
Atn	attenuation
BER	bit error ratio
BIP	bit interleaved parity
BW	bandwidth
CO	central office
CPE	customer premises equipment
CRC	cyclic redundancy check
DTE	data terminal equipment
EFM	Ethernet in the First Mile
EFMCu	EFM copper
ELTE	Ethernet line termination equipment
EPON	Ethernet passive optical network
ERDI-P	enhanced remote defect indication—path
FCS	frame check sequence
FEC	forward error correction
GDMO	Guidelines for Definition of Managed Objects
GMII	gigabit media independent interface
IANA	Internet Assigned Numbers Authority
IETF	Internet Engineering Task Force
IFG	inter-frame gap
ITU	International Telecommunication Union
LAN	local area network
LCD	Loss of Codegroup Delimitation
LLC	logical link control
LLDP	logical link discovery protocol
LLDPDU	logical link discovery protocol data unit
LLID	logical link identifier
LOP	Loss of Pointer
LTE	line termination equipment
MAC	media access control
MAU	medium attachment unit
Mb/s	megabit per second
MDI	medium dependent interface
MDIO	management data input/output
MII	media independent interface
MP2PE	multipoint-to-point emulation
MPCP	multipoint control protocol
MPCPDU	multipoint control protocol data unit
MTU	maximum transmission unit
NMS	network management system

OAM	operations, administration, and maintenance
OAMPDU	operations, administration, and maintenance protocol data unit
OID	object identifier
OLT	optical line terminal
OMP	optical multipoint
ONU	optical network unit
OSI	Open Systems Interconnection
P2MP	point-to-multipoint
P2PE	point-to-point emulation
PAF	PME aggregation function
PBO	power back-off
PCS	physical coding sublayer
PD	powered device
PDU	protocol data unit
PHY	Physical Layer entity
PLM	Payload Label Mismatch
PMA	physical medium attachment
PMD	physical medium dependent
PME	physical medium entity
PON	passive optical network
PSD	power spectral density
PSE	power sourcing equipment
RFC	Request for Comments
ROM	read-only-memory
RS	reconciliation sublayer
RTT	round-trip time
SDH	Synchronous Digital Hierarchy
SLA	service level agreement
SLD	start of LLID delimiter
SMIv2	structure of management information version 2
SNMP	simple network management protocol
SNR	signal-to-noise ratio
SONET	Synchronous Optical Network
TCPAM	trellis coded pulse amplitude modulation
TDM	time division multiplexing
TDMA	time division multiple access
TLV	type/length/value
TQ	time quanta
WAN	wide area network
WDM	wavelength division multiplexing
WIS	WAN interface sublayer

5. Ethernet logical link discovery protocol (LLDP) extension MIB module

The logical link discovery protocol (LLDP) is defined in IEEE Std 802.1AB-2009, Station and Media Access Control Discovery. Extensions to this protocol for Ethernet are defined in Clause 79 of IEEE Std 802.3.

5.1 Structure of the IEEE 802.3 LLDP extension MIB

Table 5-1 summarizes the particular object groups that are required for each operating mode. The implemented MIB shall comply with the MIB conformance section for the particular operating mode being supported.

Table 5-1—IEEE 802.3 LLDP extension MIB object group conformance requirements

MIB group	Rx mode	Tx mode	Tx/Rx mode
lldpV2Xdot3ConfigGroup	M ^a	M	M
lldpV2Xdot1LocSysGroup	M	—	M
lldpV2Xdot1RemSysGroup	—	M	M
ifGeneralInformationGroup	M	M	M

^aM = Mandatory.

Table 5-2 shows the structure of the MIB and the relationship of the MIB objects to the LLDP operational status/control variables, LLDP statistics variables, and TLV variables.

5.2 Relationship to other MIBs

Version 1 of the IEEE 802.3 LLDP extension MIB module is deprecated.

Table 5-2—IEEE 802.3/LLDP extension MIB cross reference

MIB table	MIB object	LLDP reference
<i>Configuration group</i>		
lldpV2Xdot3PortConfigTable		Augments lldpV2PortConfigEntry
	lldpV2Xdot3PortConfigTLVsTxEnable	Normal LLDPDUs
<i>Local devices information group</i>		
lldpV2Xdot3LocPortTable		
	lldpV2LocPortIfIndex	(Table index)
	lldpV2Xdot3LocPortAutoNegSupported	Auto-Negotiation support/status
	lldpV2Xdot3LocPortAutoNegEnabled	Auto-Negotiation support/status
	lldpV2Xdot3LocPortAutoNegAdvertisedCap	Auto-Negotiation advertised
	lldpV2Xdot3LocPortOperMauType	Operational MAU type
lldpV2Xdot3LocPowerTable		
	lldpV2LocPortIfIndex	(Table index)
	lldpV2Xdot3LocPowerPortClass	MDI power support
	lldpV2Xdot3LocPowerMDISupported	MDI power support
	lldpV2Xdot3LocPowerMDIEnabled	MDI power support
	lldpV2Xdot3LocPowerPairControlable	MDI power support
	lldpV2Xdot3LocPowerPairs	PSE power pair
	lldpV2Xdot3LocPowerClass	Power class
lldpV2Xdot3LocMaxFrameSizeTable		
	lldpV2LocPortIfIndex	(Table index)
	lldpV2Xdot3LocMaxFrameSize	Maximum frame size
<i>Remote devices information group</i>		
lldpV2Xdot3RemPortTable		
	lldpV2RemTimeMark	(Table index)
	lldpV2RemLocalIfIndex	(Table index)
	lldpV2RemLocalDestMACAddress	(Table index)
	lldpV2RemIndex	(Table index)
	lldpV2Xdot3RemPortAutoNegSupported	Auto-Negotiation support/status
	lldpV2Xdot3RemPortAutoNegEnabled	Auto-Negotiation support/status
	lldpV2Xdot3RemPortAutoNegAdvertisedCap	Auto-Negotiation advertised
	lldpV2Xdot3RemPortOperMauType	Operational MAU type

Table 5-2—IEEE 802.3/LLDP extension MIB cross reference (continued)

MIB table	MIB object	LLDP reference
lldpV2Xdot3RemPowerTable		
	lldpV2RemTimeMark	(Table index)
	lldpV2RemLocalIfIndex	(Table index)
	lldpV2RemLocalDestMACAddress	(Table index)
	lldpV2RemIndex	(Table index)
	lldpV2Xdot3RemPowerPortClass	MDI power support
	lldpV2Xdot3RemPowerMDISupported	MDI power support
	lldpV2Xdot3RemPowerMDIEnabled	MDI power support
	lldpV2Xdot3RemPowerPairControlable	MDI power support
	lldpV2Xdot3RemPowerPairs	PSE power pair
	lldpV2Xdot3RemPowerClass	Power class
lldpV2Xdot3RemMaxFrameSizeTable		
	lldpV2RemTimeMark	(Table index)
	lldpV2RemLocalIfIndex	(Table index)
	lldpV2RemLocalDestMACAddress	(Table index)
	lldpV2RemIndex	(Table index)
	lldpV2Xdot3RemMaxFrameSize	Maximum frame size

5.3 Security considerations for IEEE 802.3 LLDP extension MIB module

There are a number of management objects defined in this MIB module with a MAX-ACCESS clause of read-write.¹⁰ Such objects may be considered sensitive or vulnerable in some network environments. The support for SET operations in a non-secure environment without proper protection can have a negative effect on network operations.

Setting the object, `lldpXdot3PortConfigTLVsTxEnable`, to incorrect values can result in improper operation of LLDP.

The following readable objects in this MIB module may be considered to be sensitive or vulnerable in some network environments:

a) Objects that are associated with the transmit mode are as follows:

- 1) `lldpV2Xdot3LocPortAutoNegSupported`
- 2) `lldpV2Xdot3LocPortAutoNegEnabled`
- 3) `lldpV2Xdot3LocPortAutoNegAdvertisedCap`
- 4) `lldpV2Xdot3LocPortOperMauType`
- 5) `lldpV2Xdot3LocPowerPortClass`
- 6) `lldpV2Xdot3LocPowerMDISupported`
- 7) `lldpV2Xdot3LocPowerMDIEnabled`
- 8) `lldpV2Xdot3LocPowerPairControlable`
- 9) `lldpV2Xdot3LocPowerPairs`
- 10) `lldpV2Xdot3LocPowerClass`
- 11) `lldpV2Xdot3LocMaxFrameSize`

b) Objects that are associated with the receive mode are as follows:

- 1) `lldpV2Xdot3RemPortAutoNegSupported`
- 2) `lldpV2Xdot3RemPortAutoNegEnabled`
- 3) `lldpV2Xdot3RemPortAutoNegAdvertisedCap`
- 4) `lldpV2Xdot3RemPortOperMauType`
- 5) `lldpV2Xdot3RemPowerPortClass`
- 6) `lldpV2Xdot3RemPowerMDISupported`
- 7) `lldpV2Xdot3RemPowerMDIEnabled`
- 8) `lldpV2Xdot3RemPowerPairControlable`
- 9) `lldpV2Xdot3RemPowerPairs`
- 10) `lldpV2Xdot3RemPowerClass`
- 11) `lldpV2Xdot3RemMaxFrameSize`

This concern applies both objects that describe the configuration of the local host, as well as objects that describe information from the remote hosts, acquired via LLDP and displayed by the objects in this MIB module. It is thus also important to control GET and/or NOTIFY access to these objects and possibly to encrypt the values of these objects when sending them over the network via SNMP.

¹⁰In IETF MIB definitions, the MAX-ACCESS clause defines the type of access that is allowed for particular data elements in the MIB. An explanation of the MAX-ACCESS mapping is given in section 7.3 of IETF STD 58, RFC 2578.

5.4 MIB module definition

In the following MIB definition, should any discrepancy between the DESCRIPTION text and the corresponding definition in 5.2 through 5.3 of this clause occur, the definitions in 5.2 through 5.3 shall take precedence.

An ASCII text version of the MIB definition can be found at the following URL¹¹:

http://www.ieee802.org/3/1/public/mib_modules/20130411/802dot3dot1C5mib.txt

Two additional modules must be imported when compiling the IEEE 802.3 LLDP extension MIB module, and they can be found at the following URLs:

<http://www.ieee802.org/1/files/public/MIBs/LLDP-V2-MIB-200906080000Z.txt>

<http://www.ieee802.org/1/files/public/MIBs/LLDP-V2-TC-MIB-200906080000Z.txt>

¹¹Copyright release for MIB modules: Users of this standard may freely reproduce the MIB module contained in this subclause so that it can be used for its intended purpose.

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IEEE8023-DOT3-LLDP-EXT-V2-MIB DEFINITIONS ::= BEGIN

IMPORTS

MODULE-IDENTITY,
OBJECT-TYPE,
Unsigned32,
Integer32,
org

FROM SNMPv2-SMI

TruthValue

FROM SNMPv2-TC

MODULE-COMPLIANCE,

OBJECT-GROUP

FROM SNMPv2-CONF

ifGeneralInformationGroup

FROM IF-MIB

lldpV2LocPortIfIndex,

lldpV2RemLocalIfIndex,

lldpV2RemTimeMark,

lldpV2RemLocalDestMACAddress,

lldpV2RemIndex,

lldpV2PortConfigEntry

FROM LLDP-V2-MIB

-- <http://www.ieee802.org/1/files/public/MIBs/LLDP-V2-MIB-200906080000Z.txt>

LldpV2PowerPortClass

FROM LLDP-V2-TC-MIB

-- <http://www.ieee802.org/1/files/public/MIBs/LLDP-V2-TC-MIB-200906080000Z.txt>

;

ieee8023lldpV2Xdot3MIB MODULE-IDENTITY

LAST-UPDATED "201304110000Z" -- April 11, 2013

ORGANIZATION "IEEE 802.3 Working Group"

CONTACT-INFO

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Tel: +1.408.922.8164

E-mail: hfrazier@broadcom.com"

DESCRIPTION

"The LLDP Management Information Base extension module for
IEEE 802.3 organizationally defined discovery information."

REVISION "201304110000Z" -- April 11, 2013

DESCRIPTION

"Revision, based on an earlier version in IEEE Std 802.3.1-2011."

REVISION "201102020000Z" -- February 2, 2011

DESCRIPTION

"This revision incorporated changes to the MIB module to
add objects to support management of Energy Efficient
Ethernet (EEE) and Enhanced DTE Power via the MDI (PoE+)."

```

::= { org ieee(111)
      standards-association-numbers-series-standards(2)
      lan-man-stds(802)ieee802dot3(3) ieee802dot3dot1mibs(1) 5 }

-----
-----
--
-- Organizational Information Extension - IEEE 802.3
--
-----
-----

lldpV2dot3objects OBJECT IDENTIFIER ::= { ieee8023lldpV2dot3MIB 1 }

-- LLDP IEEE 802.3 extension MIB groups
lldpV2dot3Config OBJECT IDENTIFIER ::= { lldpV2dot3objects 1 }
lldpV2dot3LocalData OBJECT IDENTIFIER ::= { lldpV2dot3objects 2 }
lldpV2dot3RemoteData OBJECT IDENTIFIER ::= { lldpV2dot3objects 3 }

-----
-----
-- IEEE 802.3 - Configuration
--
-----
-----

--
-- Version 2 of lldpV2dot3PortConfigTable
-- supports use of multiple destination MAC addresses
--

lldpV2dot3PortConfigTable OBJECT-TYPE
    SYNTAX      SEQUENCE OF LldpV2dot3PortConfigEntry
    MAX-ACCESS   not-accessible
    STATUS       current
    DESCRIPTION
        "A table that controls selection of LLDP TLVs to be transmitted
         on individual ports."
    ::= { lldpV2dot3Config 1 }

lldpV2dot3PortConfigEntry OBJECT-TYPE
    SYNTAX      LldpV2dot3PortConfigEntry
    MAX-ACCESS   not-accessible
    STATUS       current
    DESCRIPTION
        "LLDP configuration information that controls the
         transmission of IEEE 802.3 organizationally defined TLVs on
         LLDP transmission capable ports.

        This configuration object augments the lldpV2PortConfigEntry of
        the LLDP-MIB, therefore it is only present along with the port
        configuration defined by the associated lldpV2PortConfigEntry
        entry.

        Each active lldpV2dot3PortConfigEntry is restored from non-volatile
        storage (along with the corresponding lldpV2PortConfigEntry)
        after a re-initialization of the management system."
    AUGMENTS { lldpV2PortConfigEntry }

```

```

 ::= { lldpV2Xdot3PortConfigTable 1 }

LldpV2Xdot3PortConfigEntry ::= SEQUENCE {
    lldpV2Xdot3PortConfigTLVsTxEnable BITS
}

lldpV2Xdot3PortConfigTLVsTxEnable OBJECT-TYPE
    SYNTAX      BITS {
        macPhyConfigStatus(0),
        powerViaMDI(1),
        unused(2), --avoids re-use of the old link agg bit number
        maxFrameSize(3)
    }
    MAX-ACCESS  read-write
    STATUS      current
    DESCRIPTION
        "The lldpV2Xdot3PortConfigTLVsTxEnable, defined as a bitmap,
        includes the IEEE 802.3 organizationally defined set of LLDP
        TLVs whose transmission is allowed by the local LLDP agent by
        the network management. Each bit in the bitmap corresponds
        to an IEEE 802.3 subtype associated with a specific IEEE
        802.3 optional TLV.

        The bit 'macPhyConfigStatus(0)' indicates that the LLDP agent
        should transmit 'MAC/PHY configuration/status TLV'.

        The bit 'powerViaMDI(1)' indicates that the LLDP agent should
        transmit 'Power via MDI TLV'.

        The bit 'unused(2)' is no longer used; this was used for
        the 'Link Aggregation TLV' in the previous version.

        The bit 'maxFrameSize(3)' indicates that the LLDP agent should
        transmit 'Maximum-frame-size TLV'.

        The default value for lldpV2Xdot3PortConfigTLVsTxEnable object
        is an empty set, which means no enumerated values are set.

        The value of this object is restored from non-volatile
        storage after a re-initialization of the management system."
    REFERENCE
        "IEEE Std 802.3 30.12.1.1.1"
    DEFVAL      { {} }
    ::= { lldpV2Xdot3PortConfigEntry 1 }

```

IEEE 802.3 - Local Device Information

```

---
--- lldpV2Xdot3LocPortTable: Ethernet Port AutoNeg/Speed/Duplex
---                               Information Table
--- V2 modified to be indexed by ifIndex.
---

```

```

lldpV2Xdot3LocPortTable OBJECT-TYPE
    SYNTAX      SEQUENCE OF LldpV2Xdot3LocPortEntry

```

```

MAX-ACCESS    not-accessible
STATUS        current
DESCRIPTION
    "This table contains one row per port of Ethernet port
    information (as a part of the LLDP 802.3 organizational
    extension) on the local system known to this agent."
 ::= { lldpV2Xdot3LocalData 1 }

```

```

lldpV2Xdot3LocPortEntry OBJECT-TYPE
    SYNTAX      LldpV2Xdot3LocPortEntry
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "Information about a particular port component."
    INDEX       { lldpV2LocPortIfIndex }
    ::= { lldpV2Xdot3LocPortTable 1 }

```

```

LldpV2Xdot3LocPortEntry ::= SEQUENCE {
    lldpV2Xdot3LocPortAutoNegSupported    TruthValue,
    lldpV2Xdot3LocPortAutoNegEnabled      TruthValue,
    lldpV2Xdot3LocPortAutoNegAdvertisedCap OCTET STRING,
    lldpV2Xdot3LocPortOperMauType         Unsigned32
}

```

```

lldpV2Xdot3LocPortAutoNegSupported OBJECT-TYPE
    SYNTAX      TruthValue
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "The truth value used to indicate whether the given port
        (associated with the local system) supports Auto-negotiation."
    REFERENCE
        "IEEE Std 802.3 30.12.2.1.1"
    ::= { lldpV2Xdot3LocPortEntry 1 }

```

```

lldpV2Xdot3LocPortAutoNegEnabled OBJECT-TYPE
    SYNTAX      TruthValue
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "The truth value used to indicate whether port
        Auto negotiation is enabled on the given port associated
        with the local system."
    REFERENCE
        "IEEE Std 802.3 30.12.2.1.2"
    ::= { lldpV2Xdot3LocPortEntry 2 }

```

```

lldpV2Xdot3LocPortAutoNegAdvertisedCap OBJECT-TYPE
    SYNTAX      OCTET STRING(SIZE(2))
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "This object contains the value (bitmap) of the
        ifMauAutoNegCapAdvertisedBits object (defined in IETF RFC
        3636) which is associated with the given port on the
        local system."
    REFERENCE
        "IEEE Std 802.3 30.12.2.1.3"
    ::= { lldpV2Xdot3LocPortEntry 3 }

```


lldpV2Xdot3LocPortOperMauType OBJECT-TYPE

SYNTAX Unsigned32(0..2147483647)

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"An integer value that indicates the operational MAU type of the given port on the local system.

This object contains the integer value derived from the list position of the corresponding dot3MauType as listed in Clause 13 and is equal to the last number in the respective dot3MauType OID.

For example, if the ifMauType object is dot3MauType1000BaseTb which corresponds to {dot3MauType 29}, the numerical value of this field is 29. For MAU types not listed in Clause 13, the value of this field shall be set to zero."

REFERENCE

"IEEE Std 802.3 30.12.2.1.4"

::= { lldpV2Xdot3LocPortEntry 4 }

--- lldpV2Xdot3LocPowerTable: Power Ethernet Information Table

--- V2 modified to be indexed by ifIndex.

lldpV2Xdot3LocPowerTable OBJECT-TYPE

SYNTAX SEQUENCE OF LldpV2Xdot3LocPowerEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"This table contains one row per port of power Ethernet information (as a part of the LLDP IEEE 802.3 organizational extension) on the local system known to this agent."

::= { lldpV2Xdot3LocalData 2 }

lldpV2Xdot3LocPowerEntry OBJECT-TYPE

SYNTAX LldpV2Xdot3LocPowerEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"Information about a particular port component."

INDEX { lldpV2LocPortIfIndex }

::= { lldpV2Xdot3LocPowerTable 1 }

LldpV2Xdot3LocPowerEntry ::= SEQUENCE {

lldpV2Xdot3LocPowerPortClass

LldpV2PowerPortClass,

lldpV2Xdot3LocPowerMDISupported

TruthValue,

lldpV2Xdot3LocPowerMDIEnabled

TruthValue,

lldpV2Xdot3LocPowerPairControlable

TruthValue,

lldpV2Xdot3LocPowerPairs

Unsigned32,

lldpV2Xdot3LocPowerClass

Unsigned32,

lldpV2Xdot3LocPowerType

INTEGER,

lldpV2Xdot3LocPowerSource

INTEGER,

```

        lldpV2Xdot3LocPowerPriority          INTEGER,
        lldpV2Xdot3LocPDRequestedPowerValue Integer32,
        lldpV2Xdot3LocPSEAllocatedPowerValue Integer32,
        lldpV2Xdot3LocResponseTime          Integer32,
        lldpV2Xdot3LocReady                 TruthValue,
        lldpV2Xdot3LocReducedOperationPowerValue Integer32
    }

```

lldpV2Xdot3LocPowerPortClass OBJECT-TYPE

SYNTAX lldpV2PowerPortClass

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The value that identifies the port Class of the given port associated with the local system."

REFERENCE

"IEEE Std 802.3 30.12.2.1.5"

::= { lldpV2Xdot3LocPowerEntry 1 }

lldpV2Xdot3LocPowerMDISupported OBJECT-TYPE

SYNTAX TruthValue

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The truth value used to indicate whether the MDI power is supported on the given port associated with the local system."

REFERENCE

"IEEE Std 802.3 30.12.2.1.6"

::= { lldpV2Xdot3LocPowerEntry 2 }

lldpV2Xdot3LocPowerMDIEnabled OBJECT-TYPE

SYNTAX TruthValue

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The truth value used to identify whether MDI power is enabled on the given port associated with the local system."

REFERENCE

"IEEE Std 802.3 30.12.2.1.7"

::= { lldpV2Xdot3LocPowerEntry 3 }

lldpV2Xdot3LocPowerPairControlable OBJECT-TYPE

SYNTAX TruthValue

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The truth value is derived from the value of pethPsePortPowerPairsControlAbility object (defined in Clause 8) and is used to indicate whether the pair selection can be controlled on the given port associated with the local system."

REFERENCE

"IEEE Std 802.3 30.12.2.1.8"

::= { lldpV2Xdot3LocPowerEntry 4 }

lldpV2Xdot3LocPowerPairs OBJECT-TYPE

SYNTAX Unsigned32(1|2)

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"This object contains the value of the pethPsePortPowerPairs object (defined in Clause 8) which is associated with the given port on the local system."

REFERENCE

"IEEE Std 802.3 30.12.2.1.9"

::= { lldpV2Xdot3LocPowerEntry 5 }

lldpV2Xdot3LocPowerClass OBJECT-TYPE

SYNTAX Unsigned32(1|2|3|4|5)

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"This object contains the value of the pethPsePortPowerClassifications object (defined in Clause 8) which is associated with the given port on the local system."

REFERENCE

"IEEE Std 802.3 30.12.2.1.10"

::= { lldpV2Xdot3LocPowerEntry 6 }

lldpV2Xdot3LocPowerType OBJECT-TYPE

SYNTAX INTEGER {
 psetype1(0),
 psetype2(1),
 pdtype(2),
 pdtype2(3)
}

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"A GET returns an integer indicating whether the local system is a PSE or a PD and whether it is Type 1 or Type 2."

REFERENCE

"IEEE Std 802.3 30.12.2.1.14"

::= { lldpV2Xdot3LocPowerEntry 7 }

lldpV2Xdot3LocPowerSource OBJECT-TYPE

SYNTAX INTEGER {
 pseprimary(0),
 psebackup(1),
 pseunknown(2),
 pdpseandlocal(3),
 pdpseonly(4),
 pdunknown(5)
}

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"A GET returns an integer indicating the power sources of the local system. A PSE indicates whether it is being powered by a primary power source; a backup power source; or unknown. A PD indicates whether it is being powered by a PSE and locally; by a PSE only; or unknown."

REFERENCE

"IEEE Std 802.3 30.12.2.1.15"

::= { lldpV2Xdot3LocPowerEntry 8 }

lldpV2Xdot3LocPowerPriority OBJECT-TYPE

SYNTAX INTEGER {
 low(0),
 high(1),
 critical(2),
 unknown(3)
}

MAX-ACCESS read-write

STATUS current

DESCRIPTION

"A GET returns the priority of a PD system. For a PSE, this is the priority that the PSE assigns to the PD. For a PD, this is the priority that the PD requests from the PSE. A SET operation changes the priority of the PD system to the indicated value."

REFERENCE

"IEEE Std 802.3 30.12.2.1.16"

::= { lldpV2Xdot3LocPowerEntry 9 }

lldpV2Xdot3LocPDRequestedPowerValue OBJECT-TYPE

SYNTAX Integer32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"A GET returns the PD requested power value.
For a PD, it is the power value that the PD has currently requested from the remote system. PD requested power value is the maximum input average power the PD ever draws under this power allocation if accepted. For a PSE, it is the power value that the PSE mirrors back to the remote system. This is the PD requested power value that was used by the PSE to compute the power it has currently allocated to the remote system. The PD requested power value is encoded according to IEEE Std 802.3 Equation (79-1), where X is the decimal value of aLldpXdot3LocPDRequestedPowerValue."

REFERENCE

"IEEE Std 802.3 30.12.2.1.17"

::= { lldpV2Xdot3LocPowerEntry 10 }

lldpV2Xdot3LocPSEAllocatedPowerValue OBJECT-TYPE

SYNTAX Integer32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"A GET returns the PSE allocated power value.
For a PSE, it is the power value that the PSE has currently allocated to the remote system. The PSE allocated power value is the maximum input average power that the PSE wants the PD to ever draw under this allocation if it is accepted. For a PD, it is the power value that the PD mirrors back to the remote system. This is the PSE allocated power value that was used by the PD to compute the power that it has currently requested from the remote system. The PSE allocated power value is encoded according to IEEE Std 802.3 Equation (79-2), where X is the decimal value of aLldpXdot3LocPSEAllocatedPowerValue."

REFERENCE

"IEEE Std 802.3 30.12.2.1.18"

::= { lldpV2Xdot3LocPowerEntry 11 }

lldpV2Xdot3LocResponseTime OBJECT-TYPE

SYNTAX Integer32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"A GET returns the response time in seconds of the local system. For a PD, it is the maximum time required to update the value of lldpV2Xdot3LocPDRequestedPowerValue when the remote system requests the PD to change its max power draw. For a PSE, it is the maximum time required to update the value of lldpV2Xdot3LocPDRequestedPowerValue when the remote system requests of the PSE a new power value."

REFERENCE

"IEEE Std 802.3 30.12.2.1.19"

::= { lldpV2Xdot3LocPowerEntry 12 }

lldpV2Xdot3LocReady OBJECT-TYPE

SYNTAX TruthValue

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The truth value used to identify whether the local Data Link Layer classification engine has completed initialization and is ready to receive and transmit LLDPDUs."

REFERENCE

"IEEE Std 802.3 30.12.2.1.20"

::= { lldpV2Xdot3LocPowerEntry 13 }

lldpV2Xdot3LocReducedOperationPowerValue OBJECT-TYPE

SYNTAX Integer32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"A GET returns the reduced operation power value. For a PD, it is a power value that is lower than the currently requested power value. This reduced operation power value represents a power state in which the PD could continue to operate, but with less functionality than at the current PD requested power value. The PSE could optionally use this information in the event that the PSE subsequently requests a lower PD power value than the PD requested power value. For a PSE, it is a power value that the PSE could ask the PD to move to if the PSE wants the PD to move to a lower power state. The definition and encoding of PD requested power value is the same as described in lldpV2Xdot3LocPDRequestedPowerValue. The default value for this field is the hexadecimal value FFFF"

REFERENCE

"IEEE Std 802.3 30.12.2.1.21"

::= { lldpV2Xdot3LocPowerEntry 14 }

--- lldpV2Xdot3LocMaxFrameSizeTable: Maximum Frame Size information

--- V2 modified to be indexed by ifIndex.

lldpV2Xdot3LocMaxFrameSizeTable OBJECT-TYPE

SYNTAX SEQUENCE OF LldpV2Xdot3LocMaxFrameSizeEntry

MAX-ACCESS not-accessible

```

STATUS      current
DESCRIPTION
    "This table contains one row per port of maximum frame
    size information (as a part of the LLDP IEEE 802.3 organizational
    extension) on the local system known to this agent."
 ::= { lldpV2Xdot3LocalData 3 }

```

```

lldpV2Xdot3LocMaxFrameSizeEntry OBJECT-TYPE
SYNTAX      LldpV2Xdot3LocMaxFrameSizeEntry
MAX-ACCESS  not-accessible
STATUS      current
DESCRIPTION
    "Maximum Frame Size information about a particular port
    component."
INDEX       { lldpV2LocPortIfIndex }
 ::= { lldpV2Xdot3LocMaxFrameSizeTable 1 }

```

```

LldpV2Xdot3LocMaxFrameSizeEntry ::= SEQUENCE {
    lldpV2Xdot3LocMaxFrameSize      Unsigned32
}

```

```

lldpV2Xdot3LocMaxFrameSize OBJECT-TYPE
SYNTAX      Unsigned32(0..65535)
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION
    "An integer value indicating the maximum supported frame
    size in octets on the given port of the local system."
REFERENCE
    "IEEE Std 802.3 30.12.2.1.13"
 ::= { lldpV2Xdot3LocMaxFrameSizeEntry 1 }

```

```

---
---
--- lldpV2Xdot3LocEEETable: Energy Efficient Ethernet Information Table
--- V2 modified to be indexed by ifIndex.
---
---

```

```

lldpV2Xdot3LocEEETable OBJECT-TYPE
SYNTAX      SEQUENCE OF LldpV2Xdot3LocEEEEEntry
MAX-ACCESS  not-accessible
STATUS      current
DESCRIPTION
    "This table contains one row per port of Energy Efficient Ethernet
    information (as a part of the LLDP IEEE 802.3 organizational
    extension) on the local system known to this agent."
 ::= { lldpV2Xdot3LocalData 4 }

```

```

lldpV2Xdot3LocEEEEEntry OBJECT-TYPE
SYNTAX      LldpV2Xdot3LocEEEEEntry
MAX-ACCESS  not-accessible
STATUS      current
DESCRIPTION
    "Information about a particular port component."
INDEX       { lldpV2LocPortIfIndex }
 ::= { lldpV2Xdot3LocEEETable 1 }

```

```

LldpV2Xdot3LocEEEEEntry ::= SEQUENCE {

```

```

        lldpV2Xdot3LocTxTwSys          Integer32,
        lldpV2Xdot3LocTxTwSysEcho      Integer32,
        lldpV2Xdot3LocRxTwSys          Integer32,
        lldpV2Xdot3LocRxTwSysEcho      Integer32,
        lldpV2Xdot3LocFbTwSys          Integer32,
        lldpV2Xdot3TxDllReady          TruthValue,
        lldpV2Xdot3RxDllReady          TruthValue,
        lldpV2Xdot3LocDllEnabled        TruthValue
    }

```

lldpV2Xdot3LocTxTwSys OBJECT-TYPE

```

    SYNTAX      Integer32
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION

```

"A GET returns the value of Tw_sys_tx that the local system can support in the transmit direction. This object maps to the variable LocTxSystemValue as defined in IEEE Std 802.3 78.4.2.3."

REFERENCE

"IEEE Std 802.3 30.12.2.1.22"

::= {lldpV2Xdot3LocEEEEEntry 1 }

lldpV2Xdot3LocTxTwSysEcho OBJECT-TYPE

```

    SYNTAX      Integer32
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION

```

"A GET returns the value of Tw_sys_tx that the remote system is advertising that it can support in the transmit direction and is echoed by the local system under the control of the IEEE DLL receiver state diagram. This object maps to the variable LocTxSystemValueEcho as defined in IEEE Std 802.3 78.4.2.3"

REFERENCE

"IEEE Std 802.3 30.12.2.1.23"

::= {lldpV2Xdot3LocEEEEEntry 2 }

lldpV2Xdot3LocRxTwSys OBJECT-TYPE

```

    SYNTAX      Integer32
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION

```

"A GET returns the value of Tw_sys_tx that the local system is requesting in the receive direction. This object maps to the variable LocRxSystemValue as defined in IEEE Std 802.3 78.4.2.3."

REFERENCE

"IEEE Std 802.3 30.12.2.1.24"

::= {lldpV2Xdot3LocEEEEEntry 3 }

lldpV2Xdot3LocRxTwSysEcho OBJECT-TYPE

```

    SYNTAX      Integer32
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION

```

"A GET returns the value of Tw_sys_tx that the remote system is advertising that it is requesting in the receive direction and is echoed by the local system under the control of the IEEE DLL transmitter state diagram. This object

maps to the variable LocRxSystemValueEcho as defined in
IEEE Std 802.3 78.4.2.3."

REFERENCE

"IEEE Std 802.3 30.12.2.1.25"

::= {lldpV2Xdot3LocEEEEEntry 4 }

lldpV2Xdot3LocFbTwSys OBJECT-TYPE

SYNTAX Integer32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"A GET returns the value of the fallback Tw_sys_tx
that the local system is advertising to the remote system.
This object maps to the variable LocFbSystemValue as defined
in IEEE Std 802.3 78.4.2.3."

REFERENCE

"IEEE Std 802.3 30.12.2.1.26"

::= {lldpV2Xdot3LocEEEEEntry 5 }

lldpV2Xdot3TxDllReady OBJECT-TYPE

SYNTAX TruthValue

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The truth value used to identify whether the local Data Link Layer
EEE layer management function has completed initialization and
is ready to receive and transmit LLDPDUs."

REFERENCE

"IEEE Std 802.3 30.12.2.1.27"

::= {lldpV2Xdot3LocEEEEEntry 6 }

lldpV2Xdot3RxDllReady OBJECT-TYPE

SYNTAX TruthValue

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The truth value used to identify whether the local Data Link Layer
EEE layer management function has completed initialization and
is ready to receive and transmit LLDPDUs."

REFERENCE

"IEEE Std 802.3 30.12.2.1.28"

::= {lldpV2Xdot3LocEEEEEntry 7 }

lldpV2Xdot3LocDllEnabled OBJECT-TYPE

SYNTAX TruthValue

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The truth value used to identify whether the local system has
completed auto-negotiation with a link partner that has
indicated at least one EEE capability."

REFERENCE

"IEEE Std 802.3 30.12.2.1.29"

::= {lldpV2Xdot3LocEEEEEntry 8 }

-- IEEE 802.3 - Remote Devices Information


```

-----
---
---

```

```

--- lldpV2Xdot3RemPortTable: Ethernet Information Table
--- V2 modified to be indexed by ifIndex and destination MAC address.
---

```

```

lldpV2Xdot3RemPortTable OBJECT-TYPE

```

```

    SYNTAX      SEQUENCE OF LldpV2Xdot3RemPortEntry

```

```

    MAX-ACCESS  not-accessible

```

```

    STATUS      current

```

```

    DESCRIPTION

```

```

        "This table contains Ethernet port information (as a part
        of the LLDP IEEE 802.3 organizational extension) of the remote
        system."

```

```

    ::= { lldpV2Xdot3RemoteData 1 }

```

```

lldpV2Xdot3RemPortEntry OBJECT-TYPE

```

```

    SYNTAX      LldpV2Xdot3RemPortEntry

```

```

    MAX-ACCESS  not-accessible

```

```

    STATUS      current

```

```

    DESCRIPTION

```

```

        "Information about a particular physical network connection."

```

```

    INDEX { lldpV2RemTimeMark,
            lldpV2RemLocalIfIndex,
            lldpV2RemLocalDestMACAddress,
            lldpV2RemIndex }

```

```

    ::= { lldpV2Xdot3RemPortTable 1 }

```

```

LldpV2Xdot3RemPortEntry ::= SEQUENCE {

```

```

    lldpV2Xdot3RemPortAutoNegSupported      TruthValue,
    lldpV2Xdot3RemPortAutoNegEnabled        TruthValue,
    lldpV2Xdot3RemPortAutoNegAdvertisedCap OCTET STRING,
    lldpV2Xdot3RemPortOperMauType           Unsigned32

```

```

}

```

```

lldpV2Xdot3RemPortAutoNegSupported OBJECT-TYPE

```

```

    SYNTAX      TruthValue

```

```

    MAX-ACCESS  read-only

```

```

    STATUS      current

```

```

    DESCRIPTION

```

```

        "The truth value used to indicate whether the given port
        (associated with remote system) supports Auto-negotiation."

```

```

    REFERENCE

```

```

        "IEEE Std 802.3 30.12.3.1.1"

```

```

    ::= { lldpV2Xdot3RemPortEntry 1 }

```

```

lldpV2Xdot3RemPortAutoNegEnabled OBJECT-TYPE

```

```

    SYNTAX      TruthValue

```

```

    MAX-ACCESS  read-only

```

```

    STATUS      current

```

```

    DESCRIPTION

```

```

        "The truth value used to indicate whether port
        Auto-negotiation is enabled on the given port associated
        with the remote system."

```

```

    REFERENCE

```

"IEEE Std 802.3 30.12.3.1.2"
 ::= { lldpV2Xdot3RemPortEntry 2 }

lldpV2Xdot3RemPortAutoNegAdvertisedCap OBJECT-TYPE
 SYNTAX OCTET STRING(SIZE(2))
 MAX-ACCESS read-only
 STATUS current
 DESCRIPTION
 "This object contains the value (bitmap) of the
 ifMauAutoNegCapAdvertisedBits object (defined in IETF RFC
 3636) which is associated with the given port on the
 remote system."
 REFERENCE
 "IEEE Std 802.3 30.12.3.1.3"
 ::= { lldpV2Xdot3RemPortEntry 3 }

lldpV2Xdot3RemPortOperMauType OBJECT-TYPE
 SYNTAX Unsigned32(0..2147483647)
 MAX-ACCESS read-only
 STATUS current
 DESCRIPTION
 "An integer value that indicates the operational MAU type
 of the sending device.

 This object contains the integer value derived from the
 list position of the corresponding dot3MauType as listed in
 in Clause 13 and is equal to the last number in
 the respective dot3MauType OID.

 For example, if the ifMauType object is dot3MauType1000BaseTHD
 which corresponds to {dot3MauType 29}, the numerical value of
 this field is 29. For MAU types not listed in Clause 13,
 the value of this field shall be set to zero."
 REFERENCE
 "IEEE Std 802.3 30.12.3.1.4"
 ::= { lldpV2Xdot3RemPortEntry 4 }

--- lldpV2Xdot3RemPowerTable: Power Ethernet Information Table
 --- V2 modified to be indexed by ifIndex and destination MAC address.

lldpV2Xdot3RemPowerTable OBJECT-TYPE
 SYNTAX SEQUENCE OF LldpV2Xdot3RemPowerEntry
 MAX-ACCESS not-accessible
 STATUS current
 DESCRIPTION
 "This table contains Ethernet power information (as a part
 of the LLDP IEEE 802.3 organizational extension) of the remote
 system."
 ::= { lldpV2Xdot3RemoteData 2 }

lldpV2Xdot3RemPowerEntry OBJECT-TYPE
 SYNTAX LldpV2Xdot3RemPowerEntry
 MAX-ACCESS not-accessible
 STATUS current

DESCRIPTION

"Information about a particular physical network connection."

```
INDEX { lldpV2RemTimeMark,
        lldpV2RemLocalIfIndex,
        lldpV2RemLocalDestMACAddress,
        lldpV2RemIndex }
```

```
::= { lldpV2Xdot3RemPowerTable 1 }
```

```
LldpV2Xdot3RemPowerEntry ::= SEQUENCE {
    lldpV2Xdot3RemPowerPortClass      LldpV2PowerPortClass,
    lldpV2Xdot3RemPowerMDISupported   TruthValue,
    lldpV2Xdot3RemPowerMDIEnabled     TruthValue,
    lldpV2Xdot3RemPowerPairControlable TruthValue,
    lldpV2Xdot3RemPowerPairs          Unsigned32,
    lldpV2Xdot3RemPowerClass          Unsigned32,
    lldpV2Xdot3RemPowerType           INTEGER,
    lldpV2Xdot3RemPowerSource         INTEGER,
    lldpV2Xdot3RemPowerPriority        INTEGER,
    lldpV2Xdot3RemPDRRequestedPowerValue Integer32,
    lldpV2Xdot3RemPSEAllocatedPowerValue Integer32
}
```

```
lldpV2Xdot3RemPowerPortClass OBJECT-TYPE
```

```
SYNTAX      LldpV2PowerPortClass
```

```
MAX-ACCESS  read-only
```

```
STATUS      current
```

DESCRIPTION

"The value that identifies the port Class of the given port associated with the remote system."

REFERENCE

"IEEE Std 802.3 30.12.3.1.5"

```
::= { lldpV2Xdot3RemPowerEntry 1 }
```

```
lldpV2Xdot3RemPowerMDISupported OBJECT-TYPE
```

```
SYNTAX      TruthValue
```

```
MAX-ACCESS  read-only
```

```
STATUS      current
```

DESCRIPTION

"The truth value used to indicate whether the MDI power is supported on the given port associated with the remote system."

REFERENCE

"IEEE Std 802.3 30.12.3.1.6"

```
::= { lldpV2Xdot3RemPowerEntry 2 }
```

```
lldpV2Xdot3RemPowerMDIEnabled OBJECT-TYPE
```

```
SYNTAX      TruthValue
```

```
MAX-ACCESS  read-only
```

```
STATUS      current
```

DESCRIPTION

"The truth value used to identify whether MDI power is enabled on the given port associated with the remote system."

REFERENCE

"IEEE Std 802.3 30.12.3.1.7"

```
::= { lldpV2Xdot3RemPowerEntry 3 }
```

```
lldpV2Xdot3RemPowerPairControlable OBJECT-TYPE
```

```
SYNTAX      TruthValue
```

```

MAX-ACCESS    read-only
STATUS        current
DESCRIPTION
    "The truth value is derived from the value of
    pethPsePortPowerPairsControlAbility object (defined in
    Clause 8) and is used to indicate whether the pair selection
    can be controlled on the given port associated with the
    remote system."
REFERENCE
    "IEEE Std 802.3 30.12.3.1.8"
 ::= { lldpV2Xdot3RemPowerEntry 4 }

```

```

lldpV2Xdot3RemPowerPairs OBJECT-TYPE
SYNTAX        Unsigned32(1|2)
MAX-ACCESS    read-only
STATUS        current
DESCRIPTION
    "This object contains the value of the pethPsePortPowerPairs
    object (defined in Clause 8) which is associated with
    the given port on the remote system."
REFERENCE
    "IEEE Std 802.3 30.12.3.1.9"
 ::= { lldpV2Xdot3RemPowerEntry 5 }

```

```

lldpV2Xdot3RemPowerClass OBJECT-TYPE
SYNTAX        Unsigned32(1|2|3|4|5)
MAX-ACCESS    read-only
STATUS        current
DESCRIPTION
    "This object contains the value of the
    pethPsePortPowerClassifications object (defined in
    Clause 8) which is associated with the given port on the
    remote system."
REFERENCE
    "IEEE Std 802.3 30.12.3.1.10"
 ::= { lldpV2Xdot3RemPowerEntry 6 }

```

```

lldpV2Xdot3RemPowerType OBJECT-TYPE
SYNTAX        INTEGER {
                    psetype1(0),
                    psetype2(1),
                    pdtype(2),
                    pdtype2(3)
                }
MAX-ACCESS    read-only
STATUS        current
DESCRIPTION
    "A GET returns an integer indicating whether the remote
    system is a PSE or a PD and whether it is Type 1 or Type 2."
REFERENCE
    "IEEE Std 802.3 30.12.3.1.14"
 ::= { lldpV2Xdot3RemPowerEntry 7 }

```

```

lldpV2Xdot3RemPowerSource OBJECT-TYPE
SYNTAX        INTEGER {
                    pseprimary(0),
                    psebackup(1),
                    pseunknown(2),

```

```

        pdpseandlocal(3),
        pdlocalonly(4),
        pdpseonly(5),
        pdunknown(6)
    }
MAX-ACCESS    read-only
STATUS        current
DESCRIPTION
    "A GET returns an integer indicating the power sources of the
    remote system. When the remote system is a PSE, it indicates
    whether it is being powered by a primary power source; a backup
    power source; or unknown. When the remote system is a PD, it
    indicates whether it is being powered by a PSE and locally;
    locally only; by a PSE only; or unknown."
REFERENCE
    "IEEE Std 802.3 30.12.3.1.15"
 ::= { lldpV2Xdot3RemPowerEntry 8 }

```

```

lldpV2Xdot3RemPowerPriority OBJECT-TYPE
SYNTAX        INTEGER {
                low(0),
                high(1),
                critical(2),
                unknown(3)
            }
MAX-ACCESS    read-write
STATUS        current
DESCRIPTION
    "A GET returns the priority of a PD system. For a PSE, this
    is the priority that the remote system requests. For a PD, this
    is the priority that the remote system has assigned."
REFERENCE
    "IEEE Std 802.3 30.12.3.1.16"
 ::= { lldpV2Xdot3RemPowerEntry 9 }

```

```

lldpV2Xdot3RemPDRequestedPowerValue OBJECT-TYPE
SYNTAX        Integer32
MAX-ACCESS    read-only
STATUS        current
DESCRIPTION
    "A GET returns the PD requested power value that was used
    by the remote system to compute the power value that is has
    currently allocated to the PD. For a PSE, it is the PD requested
    power value received from the remote system. The definition and
    encoding of PD requested power value is the same as described in
    lldpV2Xdot3LocPDRequestedPowerValue."
REFERENCE
    "IEEE Std 802.3 30.12.3.1.17"
 ::= { lldpV2Xdot3RemPowerEntry 10 }

```

```

lldpV2Xdot3RemPSEAllocatedPowerValue OBJECT-TYPE
SYNTAX        Integer32
MAX-ACCESS    read-only
STATUS        current
DESCRIPTION
    "A GET returns the PSE allocated power value
    received from the remote system. For a PSE, it is the PSE allocated
    power value that was used by the remote system to compute the power
    value that it has currently requested from the PSE. For a PD, it

```

is the PSE allocated power value received from the remote system.
The definition and encoding of PSE allocated power value is
the same as described in lldpV2Xdot3LocPSEAllocatedPowerValue."

REFERENCE

"IEEE Std 802.3 30.12.3.1.18"

::= { lldpV2Xdot3RemPowerEntry 11 }

--- lldpV2Xdot3RemMaxFrameSizeTable: Maximum Frame Size information
--- V2 modified to be indexed by ifIndex and destination MAC address.

lldpV2Xdot3RemMaxFrameSizeTable OBJECT-TYPE

SYNTAX SEQUENCE OF LldpV2Xdot3RemMaxFrameSizeEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"This table contains one row per port/destination
address pair of maximum frame
size information (as a part of the LLDP IEEE 802.3
organizational extension) of the remote system."

::= { lldpV2Xdot3RemoteData 3 }

lldpV2Xdot3RemMaxFrameSizeEntry OBJECT-TYPE

SYNTAX LldpV2Xdot3RemMaxFrameSizeEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"Maximum Frame Size information about a particular port
component."

INDEX { lldpV2RemTimeMark,
lldpV2RemLocalIfIndex,
lldpV2RemLocalDestMACAddress,
lldpV2RemIndex }

::= { lldpV2Xdot3RemMaxFrameSizeTable 1 }

LldpV2Xdot3RemMaxFrameSizeEntry ::= SEQUENCE {
lldpV2Xdot3RemMaxFrameSize Unsigned32
}

lldpV2Xdot3RemMaxFrameSize OBJECT-TYPE

SYNTAX Unsigned32(0..65535)

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"An integer value indicating the maximum supported frame
size in octets on the port component associated with the
remote system."

REFERENCE

"IEEE Std 802.3 30.12.3.1.13"

::= { lldpV2Xdot3RemMaxFrameSizeEntry 1 }

--- lldpV2Xdot3RemEEETable: Energy Efficient Ethernet Information Table
--- V2 modified to be indexed by ifIndex.

lldpV2Xdot3RemEEETable OBJECT-TYPE

SYNTAX SEQUENCE OF LldpV2Xdot3RemEEEEEntry
 MAX-ACCESS not-accessible
 STATUS current
 DESCRIPTION

"This table contains one row per port of Energy Efficient Ethernet information (as a part of the LLDP IEEE 802.3 organizational extension) on the local system known to this agent."

::= { lldpV2Xdot3RemoteData 4 }

lldpV2Xdot3RemEEEEEntry OBJECT-TYPE

SYNTAX LldpV2Xdot3RemEEEEEntry
 MAX-ACCESS not-accessible
 STATUS current
 DESCRIPTION

"Information about a particular port component."

INDEX { lldpV2RemLocalIfIndex }

::= { lldpV2Xdot3RemEEETable 1 }

LldpV2Xdot3RemEEEEEntry ::= SEQUENCE {

lldpV2Xdot3RemTxTwSys	Integer32,
lldpV2Xdot3RemTxTwSysEcho	Integer32,
lldpV2Xdot3RemRxTwSys	Integer32,
lldpV2Xdot3RemRxTwSysEcho	Integer32,
lldpV2Xdot3RemFbTwSys	Integer32

}

lldpV2Xdot3RemTxTwSys OBJECT-TYPE

SYNTAX Integer32
 MAX-ACCESS read-only
 STATUS current
 DESCRIPTION

"A GET returns the value of Tw_sys_tx that the remote system can support in the transmit direction.
 This object maps to the variable RemTxSystemValue as defined in IEEE Std 802.3 78.4.2.3."

REFERENCE

"IEEE Std 802.3 30.12.3.1.19"

::= { lldpV2Xdot3RemEEEEEntry 1 }

lldpV2Xdot3RemTxTwSysEcho OBJECT-TYPE

SYNTAX Integer32
 MAX-ACCESS read-only
 STATUS current
 DESCRIPTION

"A GET returns the value of Tw_sys_tx that the local system is advertising that it can support in the transmit direction as echoed by the remote system under the control of the EEE DLL receiver state diagram. This object maps to the variable RemTxSystemValueEcho as defined in IEEE Std 802.3 78.4.2.3"

REFERENCE

"IEEE Std 802.3 30.12.3.1.20"

::= { lldpV2Xdot3RemEEEEEntry 2 }

lldpV2Xdot3RemRxTwSys OBJECT-TYPE

SYNTAX Integer32
 MAX-ACCESS read-only

STATUS current

DESCRIPTION

"A GET returns the value of Tw_sys_tx that the remote system is requesting in the receive direction. This object maps to the variable RemRxSystemValue as defined in IEEE Std 802.3 78.4.2.3."

REFERENCE

"IEEE Std 802.3 30.12.3.1.21"

::= {lldpV2Xdot3RemEEEEEntry 3 }

lldpV2Xdot3RemRxTwSysEcho OBJECT-TYPE

SYNTAX Integer32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"A GET returns the value of Tw_sys_tx that the local system is advertising that it is requesting in the receive direction and is echoed by the remote system under the control of the EEE DLL transmitter state diagram. This object maps to the variable RemRxSystemValueEcho as defined in IEEE Std 802.3 78.4.2.3."

REFERENCE

"IEEE Std 802.3 30.12.3.1.22"

::= {lldpV2Xdot3RemEEEEEntry 4 }

lldpV2Xdot3RemFbTwSys OBJECT-TYPE

SYNTAX Integer32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"A GET returns the value of the fallback Tw_sys_tx that the remote system is advertising. This object maps to the variable RemFbSystemValue as defined in IEEE Std 802.3 78.4.2.3."

REFERENCE

"IEEE Std 802.3 30.12.3.1.23"

::= {lldpV2Xdot3RemEEEEEntry 5 }

-- Conformance statements

lldpV2Xdot3Conformance OBJECT IDENTIFIER ::= { ieee8023lldpV2Xdot3MIB 2 }

lldpV2Xdot3Compliances OBJECT IDENTIFIER ::= { lldpV2Xdot3Conformance 1 }

lldpV2Xdot3Groups OBJECT IDENTIFIER ::= { lldpV2Xdot3Conformance 2 }

-- Compliance statements

lldpV2Xdot3TxRxCompliance MODULE-COMPLIANCE

STATUS current

DESCRIPTION

"A compliance statement for SNMP entities that implement the LLDP IEEE 802.3 organizational extension MIB.

This group is mandatory for all agents that implement the LLDP IEEE 802.3 organizational extension in TX and/or RX mode.


```

        This version defines compliance requirements for
        V2 of the LLDP MIB."
MODULE -- this module
    MANDATORY-GROUPS { lldpV2Xdot3ConfigGroup,
                        ifGeneralInformationGroup
    }
    ::= { lldpV2Xdot3Compliances 1 }

lldpV2Xdot3TxCompliance MODULE-COMPLIANCE
    STATUS current
    DESCRIPTION
        "The compliance statement for SNMP entities that implement
        the LLDP IEEE 802.3 organizational extension MIB.

        This group is mandatory for agents that implement the
        LLDP IEEE 802.3 organizational extension in the TX mode.

        This version defines compliance requirements for
        V2 of the LLDP MIB."
MODULE -- this module
    MANDATORY-GROUPS { lldpV2Xdot3LocSysGroup }
    ::= { lldpV2Xdot3Compliances 2 }

lldpV2Xdot3RxCompliance MODULE-COMPLIANCE
    STATUS current
    DESCRIPTION
        "The compliance statement for SNMP entities that implement
        the LLDP IEEE 802.3 organizational extension MIB.

        This group is mandatory for agents that implement the
        LLDP IEEE 802.3 organizational extension in the RX mode.

        This version defines compliance requirements for
        V2 of the LLDP MIB."
MODULE -- this module
    MANDATORY-GROUPS { lldpV2Xdot3RemSysGroup }
    ::= { lldpV2Xdot3Compliances 3 }

-- MIB groupings

lldpV2Xdot3ConfigGroup OBJECT-GROUP
    OBJECTS {
        lldpV2Xdot3PortConfigTLVsTxEnable
    }
    STATUS current
    DESCRIPTION
        "The collection of objects that are used to configure the
        LLDP IEEE 802.3 organizational extension implementation behavior."
    ::= { lldpV2Xdot3Groups 1 }

lldpV2Xdot3LocSysGroup OBJECT-GROUP
    OBJECTS {
        lldpV2Xdot3LocPortAutoNegSupported,
        lldpV2Xdot3LocPortAutoNegEnabled,
        lldpV2Xdot3LocPortAutoNegAdvertisedCap,
        lldpV2Xdot3LocPortOperMauType,
        lldpV2Xdot3LocPowerPortClass,

```

```

        lldpV2Xdot3LocPowerMDISupported,
        lldpV2Xdot3LocPowerMDIEnabled,
        lldpV2Xdot3LocPowerPairControlable,
        lldpV2Xdot3LocPowerPairs,
        lldpV2Xdot3LocPowerClass,
        lldpV2Xdot3LocMaxFrameSize,
        lldpV2Xdot3LocPowerType,
        lldpV2Xdot3LocPowerSource,
        lldpV2Xdot3LocPowerPriority,
        lldpV2Xdot3LocPDRequestedPowerValue,
        lldpV2Xdot3LocPSEAllocatedPowerValue,
        lldpV2Xdot3LocResponseTime,
        lldpV2Xdot3LocReady,
        lldpV2Xdot3LocReducedOperationPowerValue,
        lldpV2Xdot3LocTxTwSys,
        lldpV2Xdot3LocTxTwSysEcho,
        lldpV2Xdot3LocRxTwSys,
        lldpV2Xdot3LocRxTwSysEcho,
        lldpV2Xdot3LocFbTwSys,
        lldpV2Xdot3TxDllReady,
        lldpV2Xdot3RxDllReady,
        lldpV2Xdot3LocDllEnabled
    }
    STATUS current
    DESCRIPTION
        "The collection of objects that are used to represent LLDP
        IEEE 802.3 organizational extension Local Device Information."
    ::= { lldpV2Xdot3Groups 2 }

lldpV2Xdot3RemSysGroup OBJECT-GROUP
    OBJECTS {
        lldpV2Xdot3RemPortAutoNegSupported,
        lldpV2Xdot3RemPortAutoNegEnabled,
        lldpV2Xdot3RemPortAutoNegAdvertisedCap,
        lldpV2Xdot3RemPortOperMauType,
        lldpV2Xdot3RemPowerPortClass,
        lldpV2Xdot3RemPowerMDISupported,
        lldpV2Xdot3RemPowerMDIEnabled,
        lldpV2Xdot3RemPowerPairControlable,
        lldpV2Xdot3RemPowerPairs,
        lldpV2Xdot3RemPowerClass,
        lldpV2Xdot3RemMaxFrameSize,
        lldpV2Xdot3RemPowerType,
        lldpV2Xdot3RemPowerSource,
        lldpV2Xdot3RemPowerPriority,
        lldpV2Xdot3RemPDRequestedPowerValue,
        lldpV2Xdot3RemPSEAllocatedPowerValue,
        lldpV2Xdot3RemTxTwSys,
        lldpV2Xdot3RemTxTwSysEcho,
        lldpV2Xdot3RemRxTwSys,
        lldpV2Xdot3RemRxTwSysEcho,
        lldpV2Xdot3RemFbTwSys
    }
    STATUS current
    DESCRIPTION
        "The collection of objects that are used to represent LLDP
        IEEE 802.3 organizational extension Local Device Information."
    ::= { lldpV2Xdot3Groups 3 }

```

END

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6. Ethernet operations, administration, and maintenance (OAM) MIB module

6.1 Introduction

The IEEE 802.3ah Ethernet in the First Mile (EFM) Task Force added management capabilities to Ethernet-like interfaces to provide some basic operations, administration and maintenance (OAM) functions. The defined functionality includes discovery, error signaling, loopback, and link monitoring.

This clause defines a MIB module for use with SNMP to manage these Ethernet-like interface capabilities.

6.2 Overview

Ethernet OAM is composed of a core set of functions and a set of optional functional groups as described in Clause 57 of IEEE Std 802.3. The core functions include discovery operations (determining if the other end of the link is OAM capable and what OAM functions it supports), state machine implementation, and some critical event flows. The optional functional groups are for (1) link events, (2) remote loopback, and (3) variable retrieval and response. Each optional functional group is controlled by a separate MIB table(s).

Ethernet OAM is complementary with SNMP management in that it provides some basic management functions at layer 2, rather than using layer 3 and above as required by SNMP over an IP infrastructure. Ethernet OAM provides single-hop functionality in that it works only between two directly connected Ethernet stations. SNMP can be used to manage the Ethernet OAM interactions of one Ethernet station with another.

Ethernet OAM has three functional objectives, which are detailed in 6.2.1 through 6.2.3. The definition of a basic Ethernet OAM protocol data unit is given in 6.2.4.

6.2.1 Remote fault indication

Remote fault indication provides a mechanism for one end of an Ethernet link to signal the other end that the receive path is non-operational. Some Ethernet Physical Layers offer mechanisms to signal this condition at the Physical Layer. Ethernet OAM added a mechanism so that some Ethernet Physical Layers can operate in unidirectional mode, allowing frames to be transmitted in one direction even when the other direction is non-operational. Traditionally, Ethernet PHYs do not allow frame transmission in one direction if the other direction is not operational. Using this mode, Ethernet OAM allows frame-based signaling of remote fault conditions while still not allowing higher layer applications to be aware of the unidirectional capability. This clause includes mechanisms for capturing that fault information and reflecting such information in objects and notifications within the SNMP management framework.

6.2.2 Link monitoring

Ethernet OAM includes event signaling capability so that one end of an Ethernet link can indicate the occurrence of certain important events to the other end of the link. This happens via layer 2 protocols. This clause defines methods for incorporating the occurrence of these layer 2 events, at both the local end and the far end of the link, into the SNMP management framework.

Ethernet OAM also includes mechanisms for one Ethernet station to query another directly connected Ethernet station about the status of its Ethernet interface variables and status. This clause does not include mechanisms for controlling how one Ethernet endpoint may use this functionality to query the status or statistics of a peer Ethernet entity.

6.2.3 Remote loopback

Remote loopback is a link state where the peer Ethernet entity echoes every received packet (without modifications) back onto the link. Remote loopback is intrusive in that the other end of the link is not forwarding traffic from higher layers out over the link. This clause defines objects controlling loopback operation and reading the status of the loopback state.

6.2.4 Ethernet OAM protocol data units

An Ethernet OAM protocol data unit is a valid Ethernet frame with a destination Media Access Control (MAC) address equal to the reserved MAC address for Slow Protocols (see Annex 57A of IEEE Std 802.3), a lengthOrType field equal to the reserved type for Slow Protocols, and a Slow Protocols subtype equal to that of the subtype reserved for Ethernet OAM.

OAMPDU is used throughout this clause as an abbreviation for Ethernet OAM protocol data unit. OAMPDUs are the mechanism by which two directly connected Ethernet interfaces exchange OAM information.

6.3 Relation to other MIB modules

The definitions presented here are based on Clause 30 and Clause 57 of IEEE Std 802.3. Note that these clauses describe many of these variables and their effects on the MAC sublayer. In some cases, there is a one-to-one relationship between an object in this clause and an object in the Clause 30 MIB. In other cases, the objects of this clause reflect a more complex entity and are reflected by more than one object in the Clause 30 MIB.

The objects defined in this clause manage OAM functionality introduced as part of the IEEE 802.3ah project. These objects do not overlap with the Interfaces Group MIB module defined in IETF RFC 2863, the Ethernet-like interface MIB module defined in Clause 10, or any other MIB module currently used to manage various aspects of an Ethernet interface. The objects defined here are defined for Ethernet-like interfaces only and use the same ifIndex as the associated Ethernet interface. Ethernet OAM can be implemented on any Ethernet-like interface.

6.3.1 Relation to other EFM MIB modules

The Ethernet OAM functionality and MIB module is independent of the other functionality and MIB modules derived from IEEE Std 802.3 for copper and EPON. Ethernet OAM may be implemented (or not) on the new EFM interface types, just as it can on any other Ethernet interface.

6.3.2 Mapping of IEEE 802.3 managed objects

Table 6-1 contains the mapping between managed objects defined in Clause 30 of IEEE Std 802.3 and managed objects defined in this clause.

All IEEE 802.3 OAM managed objects are reflected in this MIB module.

Table 6-1—Mapping between IEEE 802.3 managed objects and SNMP objects

IEEE 802.3 managed object	Corresponding SNMP object
oOAM	
.aOAMID	IF-MIB ifIndex
.aOAMAdminState	dot3OamAdminState
.aOAMMode	dot3OamMode
.aOAMDiscoveryState	dot3OamOperStatus
.aOAMRemoteMACAddress	dot3OamPeerMacAddress
.aOAMLocalConfiguration	dot3OamFunctionsSupported
.aOAMRemoteConfiguration	dot3OamPeerFunctionsSupported, dot3OamPeerMode
.aOAMLocalPDUConfiguration	dot3OamMaxOamPduSize
.aOAMRemotePDUConfiguration	dot3OamPeerMaxOamPduSize
.aOAMLocalFlagsField	dot3OamOperStatus, dot3OamEventLogEntry
.aOAMRemoteFlagsField	dot3OamOperStatus, dot3OamEventLogEntry
.aOAMLocalRevision	dot3OamConfigRevision
.aOAMRemoteRevision	dot3OamPeerConfigRevision
.aOAMLocalState	dot3OamLoopbackStatus
.aOAMRemoteState	dot3OamLoopbackStatus
.aOAMRemoteVendorOUI	dot3OamPeerVendorOui
.aOAMRemoteVendorSpecificInfo	dot3OamPeerVendorInfo
.aOAMUnsupportedCodesTx	dot3OamUnsupportedCodesTx
.aOAMUnsupportedCodesRx	dot3OamUnsupportedCodesRx
.aOAMInformationTx	dot3OamInformationTx
.aOAMInformationRx	dot3OamInformationRx
.aOAMUniqueEventNotificationTx	dot3OamUniqueEventNotificationTx
.aOAMUniqueEventNotificationRx	dot3OamUniqueEventNotificationRx
.aOAMDuplicateEventNotificationTx	dot3OamDuplicateEventNotificationTx
.aOAMDuplicateEventNotificationRx	dot3OamDuplicateEventNotificationRx
.aOAMLoopbackControlTx	dot3OamLoopbackControlTx

Table 6-1—Mapping between IEEE 802.3 managed objects and SNMP objects (continued)

IEEE 802.3 managed object	Corresponding SNMP object
.aOAMLoopbackControlRx	dot3OamLoopbackControlRx
.aOAMVariableRequestTx	dot3OamVariableRequestTx
.aOAMVariableRequestRx	dot3OamVariableRequestRx
.aOAMVariableResponseTx	dot3OamVariableResponseTx
.aOAMVariableResponseRx	dot3OamVariableResponseRx
.aOAMOrganizationSpecificTx	dot3OamOrgSpecificTx
.aOAMOrganizationSpecificRx	dot3OamOrgSpecificTx
.aOAMLocalErrSymPeriodConfig	dot3OamErrSymPeriodWindow, dot3OamErrSymPeriodThreshold
.aOAMLocalErrSymPeriodEvent	dot3OamEventLogEntry
.aOAMLocalErrFrameConfig	dot3OamErrFrameWindow, dot3OamErrFrameThreshold
.aOAMLocalErrFrameEvent	dot3OamEventLogEntry
.aOAMLocalErrFramePeriodConfig	dot3OamErrFramePeriodWindow, dot3OamErrFramePeriodThreshold
.aOAMLocalErrFramePeriodEvent	dot3OamEventLogEntry
.aOAMLocalErrFrameSecsSummaryConfig	dot3OamErrFrameSecsSummaryWindow, dot3OamErrFrameSecsummaryThreshold
.aOAMLocalErrFrameSecsSummaryEvent	dot3OamEventLogEntry
.aOAMRemoteErrSymPeriodEvent	dot3OamEventLogEntry
.aOAMRemoteErrFrameEvent	dot3OamEventLogEntry
.aOAMRemoteErrFramePeriodEvent	dot3OamEventLogEntry
.aOAMRemoteErrFrameSecsSummaryEvent	dot3OamEventLogEntry
.aFramesLostDueToOAMError	dot3OamFramesLostDueToOam
.acOAMAdminControl	dot3OamAdminState

6.4 MIB structure

The Ethernet OAM MIB objects of this clause focus on the OAM capabilities introduced in IEEE Std 802.3. The MIB objects are partitioned into six different MIB groups.

The dot3OamTable group manages the primary OAM objects of the Ethernet interface. This group controls the state and status of OAM as well as the mode in which it operates. The dot3OamPeerTable maintains the current information on the status and configuration of the peer OAM entity on the Ethernet interface. Managed information includes the capabilities and function available on the peer OAM entity.

The dot3OamLoopbackTable manages the loopback function introduced in IEEE Std 802.3. This table controls enabling and disabling loopback, as well as indicating the loopback status of Ethernet OAM on this interface.

The dot3OamStatsTable maintains statistics on the number and type of Ethernet OAM frames being transmitted and received on the Ethernet interface.

The dot3OamEventConfigTable defines the objects for managing the event notification capability available in Ethernet OAM. With Ethernet OAM, one device may send notifications to its peer devices whenever an important event happens on the local device. This table provides management of which events result in notifications via Ethernet OAM notifications and/or via SNMP notifications.

The dot3OamEventLogTable manages the current status of local and remote events detected via Ethernet OAM. This table is updated whenever local events are detected by Ethernet OAM or whenever Ethernet OAM Event Notifications are received from the peer OAM entity.

There are two notifications defined to report Ethernet OAM events (one for threshold crossing events and one for non-threshold crossing events). Both notifications are contained within the same conformance group.

6.5 Security considerations for Ethernet operations, administration, and maintenance (OAM) MIB module

The readable objects in this module can provide information about network traffic, and therefore, they may be considered sensitive. In particular, OAM provides mechanisms for reading the Clause 30 IEEE 802.3 MIB attributes from a link partner via a specialized layer 2 protocol. Unlike SNMP, IEEE 802.3 OAM does not include encryption or authentication mechanisms. It should not be used in environments where this interface information is considered sensitive, and where the facility terminations are unprotected. By default, OAM is disabled on Ethernet-like interfaces and is therefore not a risk.

IEEE 802.3 OAM is designed to support deployment in access and enterprise networks. In access networks, one end of a link is the CO-side, and the other is the CPE-side, and the facilities are often protected in wiring cages or closets. In such deployments, it is often the case that the CO-side is protected from access from the CPE-side. Within IEEE 802.3 OAM, this protection from remote access is accomplished by configuring the CPE-side in passive mode using the dot3OamMode attribute. This prevents the CPE from accessing functions and information at the CO-side of the connection. In enterprise networks, read-only interface information is often considered non-sensitive.

The frequency of OAM PDUs on an Ethernet interface does not adversely affect data traffic, as OAM is a slow protocol with very limited bandwidth potential, and it is not required for normal link operation. Although there are a number of objects in this module with read-write or read-create MAX-ACCESS, they have limited effects on user data.

The loopback capability of OAM can have potentially disruptive effects; when remote loopback is enabled, the remote station automatically transmits all received traffic back to the local station except for OAM traffic. This completely disrupts all higher layer protocols such as bridging, IP, and SNMP. Therefore, an attribute (dot3OamLoopbackIgnoreRx) was introduced to control whether the local station processes or ignores received loopback commands.

The administrative state and mode are also read-write objects. Disabling OAM can interrupt management activities between peer devices, potentially causing serious problems. Setting the dot3OamMode to an undesired value can allow access to Ethernet monitoring, events, and functions that may not be acceptable in a particular deployment scenario. In addition to loopback functionality, Ethernet interface statistics and events can be accessed via the OAM protocol, which may not be desired in some circumstances.

OAM event configuration also contains read-write objects. These objects control whether events are sent, and at what thresholds. Note that the frequency of event communication is limited by the frequency limits of Slow Protocols on Ethernet interfaces. Also, the information available via OAM events is also available via OAM Variable Requests. Access to this information via either OAM events or Variable Requests is controlled by the dot3OamAdminState and dot3OamMode objects. As mentioned previously, inadequate protection of these variables can result in access to link information and functions.

6.6 MIB module definition

An ASCII text version of the MIB definition can be found at the following URL¹²:

http://www.ieee802.org/3/1/public/mib_modules/20130411/802dot3dot1C6mib.txt

¹²Copyright release for MIB modules: Users of this standard may freely reproduce the MIB module contained in this subclause so that it can be used for its intended purpose.

IEEE8023-DOT3-OAM-MIB DEFINITIONS ::= BEGIN

IMPORTS

MODULE-IDENTITY, OBJECT-TYPE, Counter32, Unsigned32,
Integer32, NOTIFICATION-TYPE, org
FROM SNMPv2-SMI
-- from [RFC2578]
TEXTUAL-CONVENTION, MacAddress, TimeStamp, TruthValue
FROM SNMPv2-TC
-- from [RFC2579]
CounterBasedGauge64
FROM HCNUM-TC
-- from [RFC2856]

ifIndex

FROM IF-MIB
-- from [RFC2863]

MODULE-COMPLIANCE, OBJECT-GROUP, NOTIFICATION-GROUP
FROM SNMPv2-CONF;
-- from [RFC2580]

ieee8023Dot3OamMIB MODULE-IDENTITY

LAST-UPDATED "201304110000Z" -- April 11, 2013

ORGANIZATION

"IEEE 802.3 working group"

CONTACT-INFO

"WG-URL: <http://www.ieee802.org/3/index.html>

WG-E-Mail: STDS-802-3-MIB@LISTSERV.IEEE.ORG

Contact: Howard Frazier

Postal: 3151 Zanker Road

San Jose, CA 95134

USA

Tel: +1.408.922.8164

E-mail: hfrazier@broadcom.com"

DESCRIPTION

"The MIB module for managing the new Ethernet OAM features introduced by the Ethernet in the First Mile Task Force (IEEE 802.3ah). The functionality presented here is based on IEEE Std 802.3ah, released in October, 2004, which was prepared as an addendum to IEEE Std 802.3. Since then, IEEE Std 802.3ah has been merged into the base IEEE 802.3 standard.

In particular, this MIB focuses on the new OAM functions introduced in Clause 57 of IEEE Std 802.3. The OAM functionality of Clause 57 is controlled by new management attributes introduced in Clause 30 of IEEE Std 802.3. The OAM functions are not specific to any particular Ethernet Physical Layer, and can be generically applied to any Ethernet interface.

An Ethernet OAM protocol data unit is a valid Ethernet frame with a destination MAC address equal to the reserved MAC address for Slow Protocols (See Annex 57A of IEEE Std 802.3), a lengthOrType field equal to the reserved type for Slow Protocols, and a Slow Protocols subtype equal to that of the subtype reserved for Ethernet OAM. OAMPDU is used throughout this document as an abbreviation for Ethernet OAM protocol data unit."

REVISION "201304110000Z" -- April 11, 2013

DESCRIPTION "Revision, based on an earlier version in IEEE Std 802.3.1-2011."

REVISION "201102020000Z" -- February 2, 2011
 DESCRIPTION "Initial version, based on an earlier version in RFC 4878."

```

 ::= { org ieee(111)
       standards-association-numbers-series-standards(2)
       lan-man-stds(802) ieee802dot3(3) ieee802dot3dot1mibs(1) 6 }

--
-- Sections of the Ethernet OAM MIB
--
dot30amNotifications OBJECT IDENTIFIER ::= { ieee8023Dot30amMIB 0 }
dot30amObjects        OBJECT IDENTIFIER ::= { ieee8023Dot30amMIB 1 }
dot30amConformance    OBJECT IDENTIFIER ::= { ieee8023Dot30amMIB 2 }

--
-- Textual conventions for the OAM MIB
--
Eight0Two0ui ::= TEXTUAL-CONVENTION
  DISPLAY-HINT "3x:"
  STATUS      current
  DESCRIPTION
    "24-bit Organizationally Unique Identifier. Information on
    OUIs can be found in IEEE 802-2001 [802-2001], Clause 9."
  SYNTAX      OCTET STRING(SIZE(3))

-- *****
--
-- Ethernet OAM Control group
--

dot30amTable OBJECT-TYPE
  SYNTAX      SEQUENCE OF Dot30amEntry
  MAX-ACCESS  not-accessible
  STATUS      current
  DESCRIPTION
    "This table contains the primary controls and status for the
    OAM capabilities of an Ethernet-like interface. There will be
    one row in this table for each Ethernet-like interface in the
    system that supports the OAM functions defined in IEEE Std 802.3."
  ::= { dot30amObjects 1 }

dot30amEntry OBJECT-TYPE
  SYNTAX      Dot30amEntry
  MAX-ACCESS  not-accessible
  STATUS      current
  DESCRIPTION
    "An entry in the table that contains information on the
    Ethernet OAM function for a single Ethernet like interface.
    Entries in the table are created automatically for each
    interface supporting Ethernet OAM. The status of the row
    entry can be determined from dot30amOperStatus.

    A dot30amEntry is indexed in the dot30amTable by the ifIndex
    object of the Interfaces Group MIB.
    "
  INDEX      { ifIndex }
  ::= { dot30amTable 1 }

```

```

Dot3OamEntry ::=
  SEQUENCE {
    dot3OamAdminState          INTEGER,
    dot3OamOperStatus          INTEGER,
    dot3OamMode                 INTEGER,
    dot3OamMaxOamPduSize        Unsigned32,
    dot3OamConfigRevision       Unsigned32,
    dot3OamFunctionsSupported    BITS
  }

dot3OamAdminState OBJECT-TYPE
  SYNTAX      INTEGER {
                enabled(1),
                disabled(2)
              }
  MAX-ACCESS  read-write
  STATUS      current
  DESCRIPTION
    "This object is used to provision the default administrative
    OAM mode for this interface. This object represents the
    desired state of OAM for this interface.

    The dot3OamAdminState starts in the disabled(2) state
    until an explicit management action or configuration
    information retained by the system causes a transition to the
    enabled(1) state. When enabled(1), Ethernet OAM will attempt
    to operate over this interface."

  REFERENCE   "IEEE Std 802.3, 30.3.6.1.2"
  ::= { dot3OamEntry 1 }

dot3OamOperStatus OBJECT-TYPE
  SYNTAX      INTEGER {
                disabled(1),
                linkFault(2),
                passiveWait(3),
                activeSendLocal(4),
                sendLocalAndRemote(5),
                sendLocalAndRemoteOk(6),
                oamPeeringLocallyRejected(7),
                oamPeeringRemotelyRejected(8),
                operational(9),
                nonOperHalfDuplex(10)
              }
  MAX-ACCESS  read-only
  STATUS      current
  DESCRIPTION
    "At initialization and failure conditions, two OAM entities on
    the same full-duplex Ethernet link begin a discovery phase to
    determine what OAM capabilities may be used on that link. The
    progress of this initialization is controlled by the OAM
    sublayer.

    This value is disabled(1) if OAM is disabled on this
    interface via the dot3OamAdminState.

    If the link has detected a fault and is transmitting OAMPDUs
    with a link fault indication, the value is linkFault(2).
  
```

Also, if the interface is not operational (ifOperStatus is not up(1)), linkFault(2) is returned. Note that the object ifOperStatus may not be up(1) as a result of link failure or administrative action (ifAdminState being down(2) or testing(3)).

The passiveWait(3) state is returned only by OAM entities in passive mode (dot3OamMode) and reflects the state in which the OAM entity is waiting to see if the peer device is OAM capable. The activeSendLocal(4) value is used by active mode devices (dot3OamMode) and reflects the OAM entity actively trying to discover whether the peer has OAM capability but has not yet made that determination.

The state sendLocalAndRemote(5) reflects that the local OAM entity has discovered the peer but has not yet accepted or rejected the configuration of the peer. The local device can, for whatever reason, decide that the peer device is unacceptable and decline OAM peering. If the local OAM entity rejects the peer OAM entity, the state becomes oamPeeringLocallyRejected(7). If the OAM peering is allowed by the local device, the state moves to sendLocalAndRemoteOk(6). Note that both the sendLocalAndRemote(5) and oamPeeringLocallyRejected(7) states fall within the state SEND_LOCAL_REMOTE of the Discovery state diagram (see IEEE Std 802.3, Figure 57-5), with the difference being whether the local OAM client has actively rejected the peering or has just not indicated any decision yet. Whether a peering decision has been made is indicated via the local flags field in the OAMPDU (reflected in the aOAMLocalFlagsField of IEEE Std 802.3 30.3.6.1.10).

If the remote OAM entity rejects the peering, the state becomes oamPeeringRemotelyRejected(8). Note that both the sendLocalAndRemoteOk(6) and oamPeeringRemotelyRejected(8) states fall within the state SEND_LOCAL_REMOTE_OK of the Discovery state diagram (see IEEE Std 802.3, Figure 57-5), with the difference being whether the remote OAM client has rejected the peering or has just not yet decided. This is indicated via the remote flags field in the OAMPDU (reflected in the aOAMRemoteFlagsField of IEEE Std 802.3 30.3.6.1.11).

When the local OAM entity learns that both it and the remote OAM entity have accepted the peering, the state moves to operational(9) corresponding to the SEND_ANY state of the Discovery state diagram (see IEEE Std 802.3, Figure 57-5).

Since Ethernet OAM functions are not designed to work completely over half-duplex interfaces, the value nonOperHalfDuplex(10) is returned whenever Ethernet OAM is enabled (dot3OamAdminState is enabled(1)), but the interface is in half-duplex operation."

REFERENCE "IEEE Std 802.3, 30.3.6.1.4, 30.3.6.1.10, 30.3.6.1.11"
 ::= { dot3OamEntry 2 }

dot3OamMode OBJECT-TYPE
 SYNTAX INTEGER {
 passive(1),

```

        active(2)
    }
MAX-ACCESS read-write
STATUS current
DESCRIPTION

```

"This object configures the mode of OAM operation for this Ethernet-like interface. OAM on Ethernet interfaces may be in 'active' mode or 'passive' mode. These two modes differ in that active mode provides additional capabilities to initiate monitoring activities with the remote OAM peer entity, while passive mode generally waits for the peer to initiate OAM actions with it. As an example, an active OAM entity can put the remote OAM entity in a loopback state, where a passive OAM entity cannot.

The default value of dot30amMode is dependent on the type of system on which this Ethernet-like interface resides. The default value should be 'active(2)' unless it is known that this system should take on a subservient role to the other device connected over this interface.

Changing this value results in incrementing the configuration revision field of locally generated OAMPDUS (IEEE Std 802.3 30.3.6.1.12) and potentially rerunning the OAM discovery process if the dot30amOperStatus was already operational(9)."

```

REFERENCE "IEEE Std 802.3, 30.3.6.1.3"
::= { dot30amEntry 3 }

```

dot30amMaxOamPduSize OBJECT-TYPE

```

SYNTAX      Unsigned32 (64..1518)
UNITS       "octets"
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION

```

"The largest OAMPDU that the OAM entity supports. OAM entities exchange maximum OAMPDU sizes and negotiate to use the smaller of the two maximum OAMPDU sizes between the peers. This value is determined by the local implementation."

```

REFERENCE "IEEE Std 802.3, 30.3.6.1.8"
::= { dot30amEntry 4 }

```

dot30amConfigRevision OBJECT-TYPE

```

SYNTAX      Unsigned32(0..65535)
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION

```

"The configuration revision of the OAM entity as reflected in the latest OAMPDU sent by the OAM entity. The config revision is used by OAM entities to indicate that configuration changes have occurred, which might require the peer OAM entity to re-evaluate whether OAM peering is allowed."

```

REFERENCE "IEEE Std 802.3, 30.3.6.1.12"
::= { dot30amEntry 5 }

```

dot30amFunctionsSupported OBJECT-TYPE

```

SYNTAX      BITS {

```



```

        unidirectionalSupport (0),
        loopbackSupport(1),
        eventSupport(2),
        variableSupport(3)
    }
MAX-ACCESS read-only
STATUS current
DESCRIPTION
    "The OAM functions supported on this Ethernet-like interface.
    OAM consists of separate functional sets beyond the basic
    discovery process that is required. These functional
    groups can be supported independently by any implementation.
    These values are communicated to the peer via the local
    configuration field of Information OAMPDUs.

    Setting 'unidirectionalSupport(0)' indicates that the OAM
    entity supports the transmission of OAMPDUs on links that are
    operating in unidirectional mode (traffic flowing in one
    direction only). Setting 'loopbackSupport(1)' indicates that
    the OAM entity can initiate and respond to loopback commands.
    Setting 'eventSupport(2)' indicates that the OAM entity can
    send and receive Event Notification OAMPDUs. Setting
    'variableSupport(3)' indicates that the OAM entity can send
    and receive Variable Request and Response OAMPDUs."

REFERENCE "IEEE Std 802.3, 30.3.6.1.6"
 ::= { dot30amEntry 6 }

-- *****
--
-- Ethernet OAM Peer group
--

dot30amPeerTable OBJECT-TYPE
    SYNTAX      SEQUENCE OF Dot30amPeerEntry
    MAX-ACCESS not-accessible
    STATUS      current
    DESCRIPTION
        "This table contains information about the OAM peer for a
        particular Ethernet-like interface. OAM entities communicate
        with a single OAM peer entity on Ethernet links on which OAM
        is enabled and operating properly. There is one entry in this
        table for each entry in the dot30amTable for which information
        on the peer OAM entity is available."
    ::= { dot30amObjects 2 }

dot30amPeerEntry OBJECT-TYPE
    SYNTAX      Dot30amPeerEntry
    MAX-ACCESS not-accessible
    STATUS      current
    DESCRIPTION
        "An entry in the table containing information on the peer OAM
        entity for a single Ethernet-like interface.

    Note that there is at most one OAM peer for each Ethernet-like
    interface. Entries are automatically created when information
    about the OAM peer entity becomes available, and automatically
    deleted when the OAM peer entity is no longer in

```


communication. Peer information is not available when dot3OamOperStatus is disabled(1), linkFault(2), passiveWait(3), activeSendLocal(4), or nonOperHalfDuplex(10)."

INDEX { ifIndex }
 ::= { dot3OamPeerTable 1 }

Dot3OamPeerEntry ::=

```
SEQUENCE {
    dot3OamPeerMacAddress      MacAddress,
    dot3OamPeerVendorOui      EightOTwoOui,
    dot3OamPeerVendorInfo     Unsigned32,
    dot3OamPeerMode           INTEGER,
    dot3OamPeerMaxOamPduSize  Unsigned32,
    dot3OamPeerConfigRevision Unsigned32,
    dot3OamPeerFunctionsSupported BITS
}
```

dot3OamPeerMacAddress OBJECT-TYPE

SYNTAX MacAddress

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The MAC address of the peer OAM entity. The MAC address is derived from the most recently received OAMPDU."

REFERENCE "IEEE Std 802.3, 30.3.6.1.5."

::= { dot3OamPeerEntry 1 }

dot3OamPeerVendorOui OBJECT-TYPE

SYNTAX EightOTwoOui

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The OUI of the OAM peer as reflected in the latest Information OAMPDU received with a Local Information TLV. The OUI can be used to identify the vendor of the remote OAM entity. This value is initialized to three octets of zero before any Local Information TLV is received."

REFERENCE "IEEE Std 802.3, 30.3.6.1.16."

::= { dot3OamPeerEntry 2 }

dot3OamPeerVendorInfo OBJECT-TYPE

SYNTAX Unsigned32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The Vendor Info of the OAM peer as reflected in the latest Information OAMPDU received with a Local Information TLV. The semantics of the Vendor Information field is proprietary and specific to the vendor (identified by the dot3OamPeerVendorOui). This information could, for example, be used to identify a specific product or product family. This value is initialized to zero before any Local Information TLV is received."

REFERENCE "IEEE Std 802.3, 30.3.6.1.17."

::= { dot3OamPeerEntry 3 }

dot30amPeerMode OBJECT-TYPE

SYNTAX INTEGER {
 passive(1),
 active(2),
 unknown(3)
 }

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The mode of the OAM peer as reflected in the latest Information OAMPDU received with a Local Information TLV. The mode of the peer can be determined from the Configuration field in the Local Information TLV of the last Information OAMPDU received from the peer. The value is unknown(3) whenever no Local Information TLV has been received. The values of active(2) and passive(1) are returned when a Local Information TLV has been received indicating that the peer is in active or passive mode, respectively."

REFERENCE "IEEE Std 802.3, 30.3.6.1.7."

::= { dot30amPeerEntry 4 }

dot30amPeerMaxOamPduSize OBJECT-TYPE

SYNTAX Unsigned32 (0 | 64..1518)

UNITS "octets"

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The maximum size of OAMPDU supported by the peer as reflected in the latest Information OAMPDU received with a Local Information TLV. Ethernet OAM on this interface shall not use OAMPDUs that exceed this size. The maximum OAMPDU size can be determined from the PDU Configuration field of the Local Information TLV of the last Information OAMPDU received from the peer. A value of zero is returned if no Local Information TLV has been received. Otherwise, the value of the OAM peer's maximum OAMPDU size is returned in this value."

REFERENCE "IEEE Std 802.3, 30.3.6.1.9."

::= { dot30amPeerEntry 5 }

dot30amPeerConfigRevision OBJECT-TYPE

SYNTAX Unsigned32(0..65535)

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The configuration revision of the OAM peer as reflected in the latest OAMPDU. This attribute is changed by the peer whenever it has a local configuration change for Ethernet OAM on this interface. The configuration revision can be determined from the Revision field of the Local Information TLV of the most recently received Information OAMPDU with a Local Information TLV. A value of zero is returned if no Local Information TLV has been received."

REFERENCE "IEEE Std 802.3, 30.3.6.1.13."

::= { dot30amPeerEntry 6 }

dot30amPeerFunctionsSupported OBJECT-TYPE

```

SYNTAX      BITS {
                unidirectionalSupport (0),
                loopbackSupport(1),
                eventSupport(2),
                variableSupport(3)
            }

```

```

MAX-ACCESS  read-only

```

```

STATUS      current

```

DESCRIPTION

"The OAM functions supported on this Ethernet-like interface. OAM consists of separate functionality sets above the basic discovery process. This value indicates the capabilities of the peer OAM entity with respect to these functions. This value is initialized so all bits are clear.

If unidirectionalSupport(0) is set, then the peer OAM entity supports sending OAM frames on Ethernet interfaces when the receive path is known to be inoperable. If loopbackSupport(1) is set, then the peer OAM entity can send and receive OAM loopback commands. If eventSupport(2) is set, then the peer OAM entity can send and receive event OAMPDUs to signal various error conditions. If variableSupport(3) is set, then the peer OAM entity can send and receive variable requests to monitor the attribute value as described in Clause 57 of IEEE Std 802.3.

The capabilities of the OAM peer can be determined from the configuration field of the Local Information TLV of the most recently received Information OAMPDU with a Local Information TLV. All zeros are returned if no Local Information TLV has yet been received."

```

REFERENCE   "IEEE Std 802.3-30.3.6.1.7."

```

```

 ::= { dot30amPeerEntry 7 }

```

```

-- *****
--
-- Ethernet OAM Loopback group
--

```

dot30amLoopbackTable OBJECT-TYPE

```

SYNTAX      SEQUENCE OF Dot30amLoopbackEntry

```

```

MAX-ACCESS  not-accessible

```

```

STATUS      current

```

DESCRIPTION

"This table contains controls for the loopback state of the local link as well as indicates the status of the loopback function. There is one entry in this table for each entry in dot30amTable that supports loopback functionality (where dot30amFunctionsSupported includes the loopbackSupport bit set).

Loopback can be used to place the remote OAM entity in a state where every received frame (except OAMPDUs) is echoed back over the same interface on which they were received. In this state, at the remote entity, 'normal' traffic is disabled as only the looped back frames are transmitted on the interface. Loopback is thus an intrusive operation that prohibits normal data flow and should be used accordingly."

```
::= { dot30amObjects 3 }
```

dot30amLoopbackEntry OBJECT-TYPE

SYNTAX Dot30amLoopbackEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"An entry in the table, containing information on the loopback status for a single Ethernet-like interface. Entries in the table are automatically created whenever the local OAM entity supports loopback capabilities. The loopback status on the interface can be determined from the dot30amLoopbackStatus object."

INDEX { ifIndex }

```
::= { dot30amLoopbackTable 1 }
```

Dot30amLoopbackEntry ::=

SEQUENCE {

dot30amLoopbackStatus INTEGER,

dot30amLoopbackIgnoreRx INTEGER

}

dot30amLoopbackStatus OBJECT-TYPE

SYNTAX INTEGER {

-- all values, except where noted, can be read

-- but cannot be written

noLoopback (1),

-- initiatingLoopback can be read or written

initiatingLoopback (2),

remoteLoopback (3),

-- terminatingLoopback can be read or written

terminatingLoopback (4),

localLoopback (5),

unknown (6)

}

MAX-ACCESS read-write

STATUS current

DESCRIPTION

"The loopback status of the OAM entity. This status is determined by a combination of the local parser and multiplexer states, the remote parser and multiplexer states, as well as by the actions of the local OAM client. When operating in normal mode with no loopback in progress, the status reads noLoopback(1).

The values initiatingLoopback(2) and terminatingLoopback(4) can be read or written. The other values can only be read - they can never be written. Writing initiatingLoopback causes the local OAM entity to start the loopback process with its peer. This value can only be written when the status is noLoopback(1). Writing the value initiatingLoopback(2) in any other state has no effect. When in remoteLoopback(3), writing terminatingLoopback(4) causes the local OAM entity to initiate the termination of the loopback state. Writing terminatingLoopback(4) in any other state has no effect.

If the OAM client initiates a loopback and has sent a Loopback OAMPDU and is waiting for a response, where the local parser and multiplexer states are DISCARD (see IEEE Std 802.3, 57.2.11.1), the status is 'initiatingLoopback'. In this case, the local OAM entity has yet to receive any acknowledgment that the remote OAM entity has received its loopback command request.

If the local OAM client knows that the remote OAM entity is in loopback mode (via the remote state information as described in IEEE Std 802.3, 57.2.11.1, 30.3.6.1.15), the status is remoteLoopback(3). If the local OAM client is in the process of terminating the remote loopback (see IEEE Std 802.3, 57.2.11.3, 30.3.6.1.14) with its local multiplexer and parser states in DISCARD, the status is terminatingLoopback(4). If the remote OAM client has put the local OAM entity in loopback mode as indicated by its local parser state, the status is localLoopback(5).

The unknown(6) status indicates that the parser and multiplexer combination is unexpected. This status may be returned if the OAM loopback is in a transition state but should not persist.

The values of this attribute correspond to the following values of the local and remote parser and multiplexer states.

value	LclPrsr	LclMux	RmtPrsr	RmtMux
noLoopback	FWD	FWD	FWD	FWD
initLoopback	DISCARD	DISCARD	FWD	FWD
rmtLoopback	DISCARD	FWD	LPBK	DISCARD
tmtngLoopback	DISCARD	DISCARD	LPBK	DISCARD
lclLoopback	LPBK	DISCARD	DISCARD	FWD
unknown	***	any other combination		***

"

REFERENCE "IEEE Std 802.3, 57.2.11, 30.3.6.1.14, 30.3.6.1.15"
 ::= { dot30amLoopbackEntry 1 }

dot30amLoopbackIgnoreRx OBJECT-TYPE

SYNTAX INTEGER { ignore(1), process(2) }

MAX-ACCESS read-write

STATUS current

DESCRIPTION

"Since OAM loopback is a disruptive operation (user traffic does not pass), this attribute provides a mechanism to provide controls over whether received OAM loopback commands are processed or ignored. When the value is ignore(1), received loopback commands are ignored. When the value is process(2), OAM loopback commands are processed. The default value is to ignore loopback commands (ignore(1))."

REFERENCE "IEEE Std 802.3, 57.2.11, 30.3.6.1.14, 30.3.6.1.15"
 ::= { dot30amLoopbackEntry 2 }

-- *****
 --
 -- Ethernet OAM Statistics group
 --

dot30amStatsTable OBJECT-TYPE

SYNTAX SEQUENCE OF Dot30amStatsEntry
 MAX-ACCESS not-accessible
 STATUS current
 DESCRIPTION

"This table contains statistics for the OAM function on a particular Ethernet-like interface. There is an entry in the table for every entry in the dot30amTable.

The counters in this table are defined as 32-bit entries to match the counter size as defined in IEEE Std 802.3. Given that the OAM protocol is a slow protocol, the counters increment at a slow rate."

::= { dot30amObjects 4 }

dot30amStatsEntry OBJECT-TYPE

SYNTAX Dot30amStatsEntry
 MAX-ACCESS not-accessible
 STATUS current
 DESCRIPTION

"An entry in the table containing statistics information on the Ethernet OAM function for a single Ethernet-like interface. Entries are automatically created for every entry in the dot30amTable. Counters are maintained across transitions in dot30amOperStatus."

INDEX { ifIndex }
 ::= { dot30amStatsTable 1 }

Dot30amStatsEntry ::=

SEQUENCE {
 dot30amInformationTx Counter32,
 dot30amInformationRx Counter32,
 dot30amUniqueEventNotificationTx Counter32,
 dot30amUniqueEventNotificationRx Counter32,
 dot30amDuplicateEventNotificationTx Counter32,
 dot30amDuplicateEventNotificationRx Counter32,
 dot30amLoopbackControlTx Counter32,
 dot30amLoopbackControlRx Counter32,
 dot30amVariableRequestTx Counter32,
 dot30amVariableRequestRx Counter32,
 dot30amVariableResponseTx Counter32,
 dot30amVariableResponseRx Counter32,
 dot30amOrgSpecificTx Counter32,
 dot30amOrgSpecificRx Counter32,
 dot30amUnsupportedCodesTx Counter32,
 dot30amUnsupportedCodesRx Counter32,
 dot30amFramesLostDueToOam Counter32
 }

dot30amInformationTx OBJECT-TYPE

SYNTAX Counter32
 UNITS "frames"
 MAX-ACCESS read-only
 STATUS current
 DESCRIPTION

"A count of the number of Information OAMPDUS transmitted on this interface.

Discontinuities of this counter can occur at re-initialization of the management system, and at other times as indicated by the value of the ifCounterDiscontinuityTime."

REFERENCE "IEEE Std 802.3, 30.3.6.1.20."
 ::= { dot30amStatsEntry 1 }

dot30amInformationRx OBJECT-TYPE

SYNTAX Counter32
 UNITS "frames"
 MAX-ACCESS read-only
 STATUS current

DESCRIPTION

"A count of the number of Information OAMPDUs received on this interface.

Discontinuities of this counter can occur at re-initialization of the management system, and at other times as indicated by the value of the ifCounterDiscontinuityTime."

REFERENCE "IEEE Std 802.3, 30.3.6.1.21."
 ::= { dot30amStatsEntry 2 }

dot30amUniqueEventNotificationTx OBJECT-TYPE

SYNTAX Counter32
 UNITS "frames"
 MAX-ACCESS read-only
 STATUS current

DESCRIPTION

"A count of the number of unique Event OAMPDUs transmitted on this interface. Event Notifications may be sent in duplicate to increase the probability of successfully being received, given the possibility that a frame may be lost in transit. Duplicate Event Notification transmissions are counted by dot30amDuplicateEventNotificationTx.

A unique Event Notification OAMPDU is indicated as an Event Notification OAMPDU with a Sequence Number field that is distinct from the previously transmitted Event Notification OAMPDU Sequence Number.

Discontinuities of this counter can occur at re-initialization of the management system, and at other times as indicated by the value of the ifCounterDiscontinuityTime."

REFERENCE "IEEE Std 802.3, 30.3.6.1.22."
 ::= { dot30amStatsEntry 3 }

dot30amUniqueEventNotificationRx OBJECT-TYPE

SYNTAX Counter32
 UNITS "frames"
 MAX-ACCESS read-only
 STATUS current

DESCRIPTION

"A count of the number of unique Event OAMPDUs received on this interface. Event Notification OAMPDUs may be sent in duplicate to increase the probability of successfully being received, given the possibility that a frame may be lost in transit. Duplicate Event Notification receptions are counted

by dot30amDuplicateEventNotificationRx.

A unique Event Notification OAMPDU is indicated as an Event Notification OAMPDU with a Sequence Number field that is distinct from the previously received Event Notification OAMPDU Sequence Number.

Discontinuities of this counter can occur at re-initialization of the management system, and at other times as indicated by the value of the ifCounterDiscontinuityTime."

REFERENCE "IEEE Std 802.3, 30.3.6.1.24."
::= { dot30amStatsEntry 4 }

dot30amDuplicateEventNotificationTx OBJECT-TYPE

SYNTAX Counter32

UNITS "frames"

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"A count of the number of duplicate Event OAMPDUs transmitted on this interface. Event Notification OAMPDUs may be sent in duplicate to increase the probability of successfully being received, given the possibility that a frame may be lost in transit.

A duplicate Event Notification OAMPDU is indicated as an Event Notification OAMPDU with a Sequence Number field that is identical to the previously transmitted Event Notification OAMPDU Sequence Number.

Discontinuities of this counter can occur at re-initialization of the management system, and at other times as indicated by the value of the ifCounterDiscontinuityTime."

REFERENCE "IEEE Std 802.3, 30.3.6.1.23."
::= { dot30amStatsEntry 5 }

dot30amDuplicateEventNotificationRx OBJECT-TYPE

SYNTAX Counter32

UNITS "frames"

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"A count of the number of duplicate Event OAMPDUs received on this interface. Event Notification OAMPDUs may be sent in duplicate to increase the probability of successfully being received, given the possibility that a frame may be lost in transit.

A duplicate Event Notification OAMPDU is indicated as an Event Notification OAMPDU with a Sequence Number field that is identical to the previously received Event Notification OAMPDU Sequence Number.

Discontinuities of this counter can occur at re-initialization of the management system, and at other times as indicated by the value of the ifCounterDiscontinuityTime."

REFERENCE "IEEE Std 802.3, 30.3.6.1.25."
 ::= { dot30amStatsEntry 6 }

dot30amLoopbackControlTx OBJECT-TYPE

SYNTAX Counter32

UNITS "frames"

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"A count of the number of Loopback Control OAMPDUs transmitted on this interface.

Discontinuities of this counter can occur at re-initialization of the management system, and at other times as indicated by the value of the ifCounterDiscontinuityTime."

REFERENCE "IEEE Std 802.3, 30.3.6.1.26."
 ::= { dot30amStatsEntry 7 }

dot30amLoopbackControlRx OBJECT-TYPE

SYNTAX Counter32

UNITS "frames"

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"A count of the number of Loopback Control OAMPDUs received on this interface.

Discontinuities of this counter can occur at re-initialization of the management system, and at other times as indicated by the value of the ifCounterDiscontinuityTime."

REFERENCE "IEEE Std 802.3, 30.3.6.1.27."
 ::= { dot30amStatsEntry 8 }

dot30amVariableRequestTx OBJECT-TYPE

SYNTAX Counter32

UNITS "frames"

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"A count of the number of Variable Request OAMPDUs transmitted on this interface.

Discontinuities of this counter can occur at re-initialization of the management system, and at other times as indicated by the value of the ifCounterDiscontinuityTime."

REFERENCE "IEEE Std 802.3, 30.3.6.1.28."
 ::= { dot30amStatsEntry 9 }

dot30amVariableRequestRx OBJECT-TYPE

SYNTAX Counter32

UNITS "frames"

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"A count of the number of Variable Request OAMPDUs received on this interface.

Discontinuities of this counter can occur at re-initialization of the management system, and at other times as indicated by the value of the ifCounterDiscontinuityTime."

REFERENCE "IEEE Std 802.3, 30.3.6.1.29."
 ::= { dot30amStatsEntry 10 }

dot30amVariableResponseTx OBJECT-TYPE

SYNTAX Counter32
 UNITS "frames"
 MAX-ACCESS read-only
 STATUS current

DESCRIPTION

"A count of the number of Variable Response OAMPDUs transmitted on this interface.

Discontinuities of this counter can occur at re-initialization of the management system, and at other times as indicated by the value of the ifCounterDiscontinuityTime."

REFERENCE "IEEE Std 802.3, 30.3.6.1.30."
 ::= { dot30amStatsEntry 11 }

dot30amVariableResponseRx OBJECT-TYPE

SYNTAX Counter32
 UNITS "frames"
 MAX-ACCESS read-only
 STATUS current

DESCRIPTION

"A count of the number of Variable Response OAMPDUs received on this interface.

Discontinuities of this counter can occur at re-initialization of the management system, and at other times as indicated by the value of the ifCounterDiscontinuityTime."

REFERENCE "IEEE Std 802.3, 30.3.6.1.31."
 ::= { dot30amStatsEntry 12 }

dot30amOrgSpecificTx OBJECT-TYPE

SYNTAX Counter32
 UNITS "frames"
 MAX-ACCESS read-only
 STATUS current

DESCRIPTION

"A count of the number of Organization Specific OAMPDUs transmitted on this interface.

Discontinuities of this counter can occur at re-initialization of the management system, and at other times as indicated by the value of the ifCounterDiscontinuityTime."

REFERENCE "IEEE Std 802.3, 30.3.6.1.32."
 ::= { dot30amStatsEntry 13 }

dot30amOrgSpecificRx OBJECT-TYPE

SYNTAX Counter32
 UNITS "frames"

MAX-ACCESS read-only
 STATUS current
 DESCRIPTION
 "A count of the number of Organization Specific OAMPDUs received on this interface.

Discontinuities of this counter can occur at re-initialization of the management system, and at other times as indicated by the value of the ifCounterDiscontinuityTime."

REFERENCE "IEEE Std 802.3, 30.3.6.1.33."
 ::= { dot30amStatsEntry 14 }

dot30amUnsupportedCodesTx OBJECT-TYPE

SYNTAX Counter32
 UNITS "frames"
 MAX-ACCESS read-only
 STATUS current
 DESCRIPTION

"A count of the number of OAMPDUs transmitted on this interface with an unsupported op-code.

Discontinuities of this counter can occur at re-initialization of the management system, and at other times as indicated by the value of the ifCounterDiscontinuityTime."

REFERENCE "IEEE Std 802.3, 30.3.6.1.18."
 ::= { dot30amStatsEntry 15 }

dot30amUnsupportedCodesRx OBJECT-TYPE

SYNTAX Counter32
 UNITS "frames"
 MAX-ACCESS read-only
 STATUS current
 DESCRIPTION

"A count of the number of OAMPDUs received on this interface with an unsupported op-code.

Discontinuities of this counter can occur at re-initialization of the management system, and at other times as indicated by the value of the ifCounterDiscontinuityTime."

REFERENCE "IEEE Std 802.3, 30.3.6.1.19."
 ::= { dot30amStatsEntry 16 }

dot30amFramesLostDueToOam OBJECT-TYPE

SYNTAX Counter32
 UNITS "frames"
 MAX-ACCESS read-only
 STATUS current
 DESCRIPTION

"A count of the number of frames that were dropped by the OAM multiplexer. Since the OAM multiplexer has multiple inputs and a single output, there may be cases where frames are dropped due to transmit resource contention. This counter is incremented whenever a frame is dropped by the OAM layer. Note that any Ethernet frame, not just OAMPDUs, may be dropped by the OAM layer. This can occur when an OAMPDU takes precedence over a 'normal' frame resulting in the 'normal'

frame being dropped.

When this counter is incremented, no other counters in this MIB are incremented.

Discontinuities of this counter can occur at re-initialization of the management system, and at other times as indicated by the value of the ifCounterDiscontinuityTime."

REFERENCE "IEEE Std 802.3, 30.3.6.1.46."
 ::= { dot30amStatsEntry 17 }

```
-- *****
--
-- Ethernet OAM Event Configuration group
--
```

dot30amEventConfigTable OBJECT-TYPE

SYNTAX SEQUENCE OF Dot30amEventConfigEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"Ethernet OAM includes the ability to generate and receive Event Notification OAMPDUS to indicate various link problems. This table contains the mechanisms to enable Event Notifications and configure the thresholds to generate the standard Ethernet OAM events. There is one entry in the table for every entry in dot30amTable that supports OAM events (where dot30amFunctionsSupported includes the eventSupport bit set). The values in the table are maintained across changes to dot30amOperStatus.

The standard threshold crossing events are:

- Errored Symbol Period Event. Generated when the number of symbol errors exceeds a threshold within a given window defined by a number of symbols (for example, 1,000 symbols out of 1,000,000 had errors).
- Errored Frame Period Event. Generated when the number of frame errors exceeds a threshold within a given window defined by a number of frames (for example, 10 frames out of 1000 had errors).
- Errored Frame Event. Generated when the number of frame errors exceeds a threshold within a given window defined by a period of time (for example, 10 frames in 1 second had errors).
- Errored Frame Seconds Summary Event. Generated when the number of errored frame seconds exceeds a threshold within a given time period (for example, 10 errored frame seconds within the last 100 seconds). An errored frame second is defined as a 1 second interval which had >0 frame errors.

There are other events (dying gasp, critical events) that are not threshold crossing events but that can be enabled/disabled via this table."

::= { dot30amObjects 5 }

dot30amEventConfigEntry OBJECT-TYPE

SYNTAX Dot30amEventConfigEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"Entries are automatically created and deleted from this table, and exist whenever the OAM entity supports Ethernet OAM events (as indicated by the eventSupport bit in dot30amFunctionsSupported). Values in the table are maintained across changes to the value of dot30amOperStatus.

Event configuration controls when the local management entity sends Event Notification OAMPDUs to its OAM peer, and when certain event flags are set or cleared in OAMPDUs."

INDEX { ifIndex }

::= { dot30amEventConfigTable 1 }

Dot30amEventConfigEntry ::=

SEQUENCE {

dot30amErrSymPeriodWindowHi	Unsigned32,
dot30amErrSymPeriodWindowLo	Unsigned32,
dot30amErrSymPeriodThresholdHi	Unsigned32,
dot30amErrSymPeriodThresholdLo	Unsigned32,
dot30amErrSymPeriodEvNotifEnable	TruthValue,
dot30amErrFramePeriodWindow	Unsigned32,
dot30amErrFramePeriodThreshold	Unsigned32,
dot30amErrFramePeriodEvNotifEnable	TruthValue,
dot30amErrFrameWindow	Unsigned32,
dot30amErrFrameThreshold	Unsigned32,
dot30amErrFrameEvNotifEnable	TruthValue,
dot30amErrFrameSecsSummaryWindow	Integer32,
dot30amErrFrameSecsSummaryThreshold	Integer32,
dot30amErrFrameSecsEvNotifEnable	TruthValue,
dot30amDyingGaspEnable	TruthValue,
dot30amCriticalEventEnable	TruthValue

}

dot30amErrSymPeriodWindowHi OBJECT-TYPE

SYNTAX Unsigned32

UNITS "2³² symbols"

MAX-ACCESS read-write

STATUS current

DESCRIPTION

"The two objects dot30amErrSymPeriodWindowHi and dot30amErrSymPeriodLo together form an unsigned 64-bit integer representing the number of symbols over which this threshold event is defined. This is defined as

$$\text{dot30amErrSymPeriodWindow} = ((2^{32}) * \text{dot30amErrSymPeriodWindowHi}) + \text{dot30amErrSymPeriodWindowLo}$$

If dot30amErrSymPeriodThreshold symbol errors occur within a window of dot30amErrSymPeriodWindow symbols, an Event Notification OAMPDU should be generated with an Errored Symbol Period Event TLV indicating that the threshold has been crossed in this window.

The default value for dot30amErrSymPeriodWindow is the number of symbols in one second for the underlying Physical Layer."

REFERENCE "IEEE Std 802.3, 30.3.6.1.34"

::= { dot30amEventConfigEntry 1 }

dot30amErrSymPeriodWindowLo OBJECT-TYPE

SYNTAX Unsigned32

UNITS "symbols"

MAX-ACCESS read-write

STATUS current

DESCRIPTION

"The two objects dot30amErrSymPeriodWindowHi and dot30amErrSymPeriodWindowLo together form an unsigned 64-bit integer representing the number of symbols over which this threshold event is defined. This is defined as

$$\text{dot30amErrSymPeriodWindow} = ((2^{32}) * \text{dot30amErrSymPeriodWindowHi}) + \text{dot30amErrSymPeriodWindowLo}$$

If dot30amErrSymPeriodThreshold symbol errors occur within a window of dot30amErrSymPeriodWindow symbols, an Event Notification OAMPDU should be generated with an Errored Symbol Period Event TLV indicating that the threshold has been crossed in this window.

The default value for dot30amErrSymPeriodWindow is the number of symbols in one second for the underlying Physical Layer."

REFERENCE "IEEE Std 802.3, 30.3.6.1.34"

::= { dot30amEventConfigEntry 2 }

dot30amErrSymPeriodThresholdHi OBJECT-TYPE

SYNTAX Unsigned32

UNITS "2³² symbols"

MAX-ACCESS read-write

STATUS current

DESCRIPTION

"The two objects dot30amErrSymPeriodThresholdHi and dot30amErrSymPeriodThresholdLo together form an unsigned 64-bit integer representing the minimum number of symbol errors occurring within a given window to cause an Errored Symbol Period Event.

This is defined as

$$\text{dot30amErrSymPeriodThreshold} = ((2^{32}) * \text{dot30amErrSymPeriodThresholdHi}) + \text{dot30amErrSymPeriodThresholdLo}$$

If dot30amErrSymPeriodThreshold symbol errors occur within a window of dot30amErrSymPeriodWindow symbols, an Event Notification OAMPDU is generated with an Errored Symbol Period Event TLV indicating that the threshold has been crossed in this window.

The default value for dot30amErrSymPeriodThreshold is one symbol errors. If the threshold value is zero, then an Event Notification OAMPDU is sent periodically (at the end of every window). This can be used as an asynchronous notification to the peer OAM entity of the statistics related to this threshold crossing alarm."

REFERENCE "IEEE Std 802.3, 30.3.6.1.34"

::= { dot30amEventConfigEntry 3 }

dot30amErrSymPeriodThresholdLo OBJECT-TYPE

SYNTAX Unsigned32
 UNITS "symbols"
 MAX-ACCESS read-write
 STATUS current

DESCRIPTION

"The two objects dot30amErrSymPeriodThresholdHi and dot30amErrSymPeriodThresholdLo together form an unsigned 64-bit integer representing the minimum number of symbol errors occurring within a given window to cause an Errored Symbol Period Event.

This is defined as

$$\text{dot30amErrSymPeriodThreshold} = ((2^{32}) * \text{dot30amErrSymPeriodThresholdHi}) + \text{dot30amErrSymPeriodThresholdLo}$$

If dot30amErrSymPeriodThreshold symbol errors occur within a window of dot30amErrSymPeriodWindow symbols, an Event Notification OAMPDU is generated with an Errored Symbol Period Event TLV indicating that the threshold has been crossed in this window.

The default value for dot30amErrSymPeriodThreshold is one symbol error. If the threshold value is zero, then an Event Notification OAMPDU is sent periodically (at the end of every window). This can be used as an asynchronous notification to the peer OAM entity of the statistics related to this threshold crossing alarm."

REFERENCE "IEEE Std 802.3, 30.3.6.1.34"
 ::= { dot30amEventConfigEntry 4 }

dot30amErrSymPeriodEvNotifEnable OBJECT-TYPE

SYNTAX TruthValue
 MAX-ACCESS read-write
 STATUS current

DESCRIPTION

"If true, the OAM entity sends an Event Notification OAMPDU when an Errored Symbol Period Event occurs.

The default value for this object is true for Ethernet-like interfaces that support OAM. If the OAM layer does not support Event Notifications (as indicated via the dot30amFunctionsSupported attribute), this value is ignored."

::= { dot30amEventConfigEntry 5 }

dot30amErrFramePeriodWindow OBJECT-TYPE

SYNTAX Unsigned32
 UNITS "frames"
 MAX-ACCESS read-write
 STATUS current

DESCRIPTION

"The number of frames over which the threshold is defined. The default value of the window is the number of minimum size Ethernet frames that can be received over the Physical Layer in one second.

If dot30amErrFramePeriodThreshold frame errors occur within a window of dot30amErrFramePeriodWindow frames, an Event Notification OAMPDU should be generated with an Errored Frame Period Event TLV indicating that the threshold has been crossed in this window."

REFERENCE "IEEE Std 802.3, 30.3.6.1.38"
 ::= { dot30amEventConfigEntry 6 }

dot30amErrFramePeriodThreshold OBJECT-TYPE

SYNTAX Unsigned32

UNITS "frames"

MAX-ACCESS read-write

STATUS current

DESCRIPTION

"The minimum number of frame errors that cause an Errored Frame Period Event. The default value is one frame error. If the threshold value is zero, then an Event Notification OAMPDU is sent periodically (at the end of every window). This can be used as an asynchronous notification to the peer OAM entity of the statistics related to this threshold crossing alarm.

If dot30amErrFramePeriodThreshold frame errors occur within a window of dot30amErrFramePeriodWindow frames, an Event Notification OAMPDU is generated with an Errored Frame Period Event TLV indicating that the threshold has been crossed in this window."

REFERENCE "IEEE Std 802.3, 30.3.6.1.38"
 ::= { dot30amEventConfigEntry 7 }

dot30amErrFramePeriodEvNotifEnable OBJECT-TYPE

SYNTAX TruthValue

MAX-ACCESS read-write

STATUS current

DESCRIPTION

"If true, the OAM entity should send an Event Notification OAMPDU when an Errored Frame Period Event occurs.

By default, this object should have the value true for Ethernet-like interfaces that support OAM. If the OAM layer does not support Event Notifications (as indicated via the dot30amFunctionsSupported attribute), this value is ignored."

::= { dot30amEventConfigEntry 8 }

dot30amErrFrameWindow OBJECT-TYPE

SYNTAX Unsigned32

UNITS "tenths of a second"

MAX-ACCESS read-write

STATUS current

DESCRIPTION

"The amount of time (in 100 ms increments) over which the threshold is defined. The default value is 10 (1 second).

If dot30amErrFrameThreshold frame errors occur within a window of dot30amErrFrameWindow seconds (measured in tenths of seconds), an Event Notification OAMPDU should be generated

with an Errored Frame Event TLV indicating that the threshold has been crossed in this window."

REFERENCE "IEEE Std 802.3, 30.3.6.1.36"
 DEFVAL { 10 }
 ::= { dot30amEventConfigEntry 9 }

dot30amErrFrameThreshold OBJECT-TYPE

SYNTAX Unsigned32
 UNITS "frames"
 MAX-ACCESS read-write
 STATUS current

DESCRIPTION

"The minimum number of frame errors that cause an Errored Frame Event. The default value is one frame error. If the threshold value is zero, then an Event Notification OAMPDU is sent periodically (at the end of every window). This can be used as an asynchronous notification to the peer OAM entity of the statistics related to this threshold crossing alarm.

If dot30amErrFrameThreshold frame errors occur within a window of dot30amErrFrameWindow (in tenths of seconds), an Event Notification OAMPDU is generated with an Errored Frame Event TLV indicating the threshold has been crossed in this window."

REFERENCE "IEEE Std 802.3, 30.3.6.1.36"
 DEFVAL { 1 }
 ::= { dot30amEventConfigEntry 10 }

dot30amErrFrameEvNotifEnable OBJECT-TYPE

SYNTAX TruthValue
 MAX-ACCESS read-write
 STATUS current

DESCRIPTION

"If true, the OAM entity should send an Event Notification OAMPDU when an Errored Frame Event occurs.

By default, this object should have the value true for Ethernet-like interfaces that support OAM. If the OAM layer does not support Event Notifications (as indicated via the dot30amFunctionsSupported attribute), this value is ignored."

DEFVAL { true }
 ::= { dot30amEventConfigEntry 11 }

dot30amErrFrameSecsSummaryWindow OBJECT-TYPE

SYNTAX Integer32 (100..9000)
 UNITS "tenths of a second"
 MAX-ACCESS read-write
 STATUS current

DESCRIPTION

"The amount of time (in 100 ms intervals) over which the threshold is defined. The default value is 100 (10 seconds).

If dot30amErrFrameSecsSummaryThreshold frame errors occur within a window of dot30amErrFrameSecsSummaryWindow (in tenths of seconds), an Event Notification OAMPDU should be generated with an Errored Frame Seconds Summary Event TLV indicating

that the threshold has been crossed in this window."

REFERENCE "IEEE Std 802.3, 30.3.6.1.40"
 DEFVAL { 100 }
 ::= { dot30amEventConfigEntry 12 }

dot30amErrFrameSecsSummaryThreshold OBJECT-TYPE

SYNTAX Integer32 (1..900)
 UNITS "errored frame seconds"
 MAX-ACCESS read-write
 STATUS current
 DESCRIPTION

"The minimum number of errored frame seconds that cause an Errored Frame Seconds Summary Event. The default value is one errored frame second. If the threshold value is zero, then an Event Notification OAMPDU is sent periodically (at the end of every window). This can be used as an asynchronous notification to the peer OAM entity of the statistics related to this threshold crossing alarm.

If dot30amErrFrameSecsSummaryThreshold frame errors occur within a window of dot30amErrFrameSecsSummaryWindow (in tenths of seconds), an Event Notification OAMPDU is generated with an Errored Frame Seconds Summary Event TLV indicating that the threshold has been crossed in this window."

REFERENCE "IEEE Std 802.3, 30.3.6.1.40"
 DEFVAL { 1 }
 ::= { dot30amEventConfigEntry 13 }

dot30amErrFrameSecsEvNotifEnable OBJECT-TYPE

SYNTAX TruthValue
 MAX-ACCESS read-write
 STATUS current
 DESCRIPTION

"If true, the local OAM entity sends an Event Notification OAMPDU when an Errored Frame Seconds Event occurs.

The default value for this object is true for Ethernet-like interfaces that support OAM. If the OAM layer does not support Event Notifications (as indicated via the dot30amFunctionsSupported attribute), this value is ignored."

DEFVAL { true }
 ::= { dot30amEventConfigEntry 14 }

dot30amDyingGaspEnable OBJECT-TYPE

SYNTAX TruthValue
 MAX-ACCESS read-write
 STATUS current
 DESCRIPTION

"If true, the local OAM entity should attempt to indicate a dying gasp via the OAMPDU flags field to its peer OAM entity when a dying gasp event occurs. The exact definition of a dying gasp event is implementation dependent. If the system does not support dying gasp capability, setting this object has no effect, and reading the object returns 'false'.

The default value for this object is true for

Ethernet-like interfaces that support OAM. If the OAM layer does not support Event Notifications (as indicated via the dot3OamFunctionsSupported attribute), this value is ignored."

```
DEFVAL { true }
::= { dot3OamEventConfigEntry 15 }
```

dot3OamCriticalEventEnable OBJECT-TYPE

```
SYNTAX      TruthValue
MAX-ACCESS  read-write
STATUS      current
DESCRIPTION
```

"If true, the local OAM entity should attempt to indicate a critical event via the OAMPDU flags to its peer OAM entity when a critical event occurs. The exact definition of a critical event is implementation dependent. If the system does not support critical event capability, setting this object has no effect, and reading the object should result in 'false'.

By default, this object should have the value true for Ethernet-like interfaces that support OAM. If the OAM layer does not support Event Notifications (as indicated via the dot3OamFunctionsSupported attribute), this value is ignored."

```
DEFVAL { true }
::= { dot3OamEventConfigEntry 16 }
```

```
-- *****
--
-- Ethernet OAM Event Log group
--
```

dot3OamEventLogTable OBJECT-TYPE

```
SYNTAX      SEQUENCE OF Dot3OamEventLogEntry
MAX-ACCESS  not-accessible
STATUS      current
DESCRIPTION
```

"This table records a history of the events that have occurred at the Ethernet OAM level. These events can include locally detected events, which may result in locally generated OAMPDUS, and remotely detected events, which are detected by the OAM peer entity and signaled to the local entity via Ethernet OAM. Ethernet OAM events can be signaled by Event Notification OAMPDUS or by the flags field in any OAMPDU.

This table contains both threshold crossing events and non-threshold crossing events. The parameters for the threshold window, threshold value, and actual value (dot3OamEventLogWindowXX, dot3OamEventLogThresholdXX, dot3OamEventLogValue) are only applicable to threshold crossing events, and are returned as all F's ($2^{32} - 1$) for non-threshold crossing events.

Entries in the table are automatically created when such events are detected. The size of the table is implementation dependent. When the table reaches its maximum size, older entries are automatically deleted to make room for newer entries."

```
::= { dot30amObjects 6 }
```

dot30amEventLogEntry OBJECT-TYPE

SYNTAX Dot30amEventLogEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"An entry in the dot30amEventLogTable. Entries are automatically created whenever Ethernet OAM events occur at the local OAM entity, and when Event Notification OAMPDUs are received at the local OAM entity (indicating that events have occurred at the peer OAM entity). The size of the table is implementation dependent, but when the table becomes full, older events are automatically deleted to make room for newer events. The table index dot30amEventLogIndex increments for each new entry, and when the maximum value is reached, the value restarts at zero."

INDEX { ifIndex, dot30amEventLogIndex }

```
::= { dot30amEventLogTable 1 }
```

Dot30amEventLogEntry ::=

SEQUENCE {

dot30amEventLogIndex	Unsigned32,
dot30amEventLogTimestamp	TimeStamp,
dot30amEventLogOui	Eight0TwoOui,
dot30amEventLogType	Unsigned32,
dot30amEventLogLocation	INTEGER,
dot30amEventLogWindowHi	Unsigned32,
dot30amEventLogWindowLo	Unsigned32,
dot30amEventLogThresholdHi	Unsigned32,
dot30amEventLogThresholdLo	Unsigned32,
dot30amEventLogValue	CounterBasedGauge64,
dot30amEventLogRunningTotal	CounterBasedGauge64,
dot30amEventLogEventTotal	Unsigned32

}

dot30amEventLogIndex OBJECT-TYPE

SYNTAX Unsigned32(1..4294967295)

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"An arbitrary integer for identifying individual events within the event log."

```
::= { dot30amEventLogEntry 1 }
```

dot30amEventLogTimestamp OBJECT-TYPE

SYNTAX TimeStamp

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The value of sysUpTime at the time of the logged event. For locally generated events, the time of the event can be accurately retrieved from sysUpTime. For remotely generated events, the time of the event is indicated by the reception of the Event Notification OAMPDU indicating that the event occurred on the peer. A system may attempt to adjust the timestamp value to more accurately reflect the time of the

event at the peer OAM entity by using other information, such as that found in the timestamp found of the Event Notification TLVs, which provides an indication of the relative time between events at the peer entity."

```
 ::= { dot30amEventLogEntry 2 }
```

dot30amEventLogOui OBJECT-TYPE

SYNTAX Eight0Two0ui
MAX-ACCESS read-only
STATUS current
DESCRIPTION

"The OUI of the entity defining the object type. All IEEE 802.3 defined events (as appearing in IEEE Std 802.3 except for the Organizationally Unique Event TLVs) use the IEEE 802.3 OUI of 0x0180C2. Organizations defining their own Event Notification TLVs include their OUI in the Event Notification TLV that gets reflected here."

```
 ::= { dot30amEventLogEntry 3 }
```

dot30amEventLogType OBJECT-TYPE

SYNTAX Unsigned32
MAX-ACCESS read-only
STATUS current
DESCRIPTION

"The type of event that generated this entry in the event log. When the OUI is the IEEE 802.3 OUI of 0x0180C2, the following event types are defined:

```
    erroredSymbolEvent(1),
    erroredFramePeriodEvent(2),
    erroredFrameEvent(3),
    erroredFrameSecondsEvent(4),
    linkFault(256),
    dyingGaspEvent(257),
    criticalLinkEvent(258)
```

The first four are considered threshold crossing events, as they are generated when a metric exceeds a given value within a specified window. The other three are not threshold crossing events.

When the OUI is not 71874 (0x0180C2 in hex), then some other organization has defined the event space. If event subtyping is known to the implementation, it may be reflected here. Otherwise, this value should return all F's ($2^{32} - 1$)."

REFERENCE "IEEE Std 802.3, 30.3.6.1.10 and 57.5.3."

```
 ::= { dot30amEventLogEntry 4 }
```

dot30amEventLogLocation OBJECT-TYPE

SYNTAX INTEGER { local(1), remote(2) }
MAX-ACCESS read-only
STATUS current
DESCRIPTION

"Whether this event occurred locally (local(1)), or was received from the OAM peer via Ethernet OAM (remote(2))."

```
 ::= { dot30amEventLogEntry 5 }
```

dot30amEventLogWindowHi OBJECT-TYPE

SYNTAX Unsigned32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"If the event represents a threshold crossing event, the two objects dot30amEventWindowHi and dot30amEventWindowLo, form an unsigned 64-bit integer yielding the window over which the value was measured for the threshold crossing event (for example, 5, when 11 occurrences happened in 5 seconds while the threshold was 10). The two objects are combined as:

$$\text{dot30amEventLogWindow} = ((2^{32}) * \text{dot30amEventLogWindowHi}) + \text{dot30amEventLogWindowLo}$$

Otherwise, this value is returned as all F's ($2^{32} - 1$) and adds no useful information."

REFERENCE "IEEE Std 802.3, 30.3.6.1.37 and 57.5.3.2."

::= { dot30amEventLogEntry 6 }

dot30amEventLogWindowLo OBJECT-TYPE

SYNTAX Unsigned32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"If the event represents a threshold crossing event, the two objects dot30amEventWindowHi and dot30amEventWindowLo form an unsigned 64-bit integer yielding the window over which the value was measured for the threshold crossing event (for example, 5, when 11 occurrences happened in 5 seconds while the threshold was 10). The two objects are combined as:

$$\text{dot30amEventLogWindow} = ((2^{32}) * \text{dot30amEventLogWindowHi}) + \text{dot30amEventLogWindowLo}$$

Otherwise, this value is returned as all F's ($2^{32} - 1$) and adds no useful information."

REFERENCE "IEEE Std 802.3, 30.3.6.1.37 and 57.5.3.2."

::= { dot30amEventLogEntry 7 }

dot30amEventLogThresholdHi OBJECT-TYPE

SYNTAX Unsigned32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"If the event represents a threshold crossing event, the two objects dot30amEventThresholdHi and dot30amEventThresholdLo form an unsigned 64-bit integer yielding the value that was crossed for the threshold crossing event (for example, 10, when 11 occurrences happened in 5 seconds while the threshold was 10). The two objects are combined as:

$$\text{dot30amEventLogThreshold} = ((2^{32}) * \text{dot30amEventLogThresholdHi}) + \text{dot30amEventLogThresholdLo}$$

Otherwise, this value is returned as all F's ($2^{32} - 1$) and adds no useful information."

REFERENCE "IEEE Std 802.3, 30.3.6.1.37 and 57.5.3.2."

::= { dot30amEventLogEntry 8 }

dot30amEventLogThresholdLo OBJECT-TYPE

SYNTAX Unsigned32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"If the event represents a threshold crossing event, the two objects dot30amEventThresholdHi and dot30amEventThresholdLo form an unsigned 64-bit integer yielding the value that was crossed for the threshold crossing event (for example, 10, when 11 occurrences happened in 5 seconds while the threshold was 10). The two objects are combined as:

$$\text{dot30amEventLogThreshold} = ((2^{32}) * \text{dot30amEventLogThresholdHi}) + \text{dot30amEventLogThresholdLo}$$

Otherwise, this value is returned as all F's ($2^{32} - 1$) and adds no useful information."

REFERENCE "IEEE Std 802.3, 30.3.6.1.37 and 57.5.3.2."

::= { dot30amEventLogEntry 9 }

dot30amEventLogValue OBJECT-TYPE

SYNTAX CounterBasedGauge64

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"If the event represents a threshold crossing event, this value indicates the value of the parameter within the given window that generated this event (for example, 11, when 11 occurrences happened in 5 seconds while the threshold was 10).

Otherwise, this value is returned as all F's ($2^{64} - 1$) and adds no useful information."

REFERENCE "IEEE Std 802.3, 30.3.6.1.37 and 57.5.3.2."

::= { dot30amEventLogEntry 10 }

dot30amEventLogRunningTotal OBJECT-TYPE

SYNTAX CounterBasedGauge64

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"Each Event Notification TLV contains a running total of the number of times an event has occurred, as well as the number of times an Event Notification for the event has been transmitted. For non-threshold crossing events, the number of events (dot30amLogRunningTotal) and the number of resultant Event Notifications (dot30amLogEventTotal) should be identical.

For threshold crossing events, since multiple occurrences may be required to cross the threshold, these values are likely different. This value represents the total number of times this event has happened since the last reset (for example, 3253, when 3253 symbol errors have occurred since the last reset, which has resulted in 51 symbol error threshold crossing events since the last reset)."

REFERENCE "IEEE Std 802.3, 30.3.6.1.37 and 57.5.3.2."
 ::= { dot30amEventLogEntry 11 }

dot30amEventLogEventTotal OBJECT-TYPE

SYNTAX Unsigned32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"Each Event Notification TLV contains a running total of the number of times an event has occurred, as well as the number of times an Event Notification for the event has been transmitted. For non-threshold crossing events, the number of events (dot30amLogRunningTotal) and the number of resultant Event Notifications (dot30amLogEventTotal) should be identical.

For threshold crossing events, since multiple occurrences may be required to cross the threshold, these values are likely different. This value represents the total number of times one or more of these occurrences have resulted in an Event Notification (for example, 51 when 3253 symbol errors have occurred since the last reset, which has resulted in 51 symbol error threshold crossing events since the last reset)."

REFERENCE "IEEE Std 802.3, 30.3.6.1.37 and 57.5.3.2."
 ::= { dot30amEventLogEntry 12 }

```
-- *****
--
-- Ethernet OAM Notifications
--
```

dot30amThresholdEvent NOTIFICATION-TYPE

OBJECTS { dot30amEventLogTimestamp,
 dot30amEventLogOui,
 dot30amEventLogType,
 dot30amEventLogLocation,
 dot30amEventLogWindowHi,
 dot30amEventLogWindowLo,
 dot30amEventLogThresholdHi,
 dot30amEventLogThresholdLo,
 dot30amEventLogValue,
 dot30amEventLogRunningTotal,
 dot30amEventLogEventTotal
 }

STATUS current

DESCRIPTION

"A dot30amThresholdEvent notification is sent when a local or remote threshold crossing event is detected. A local threshold crossing event is detected by the local entity, while a remote threshold crossing event is detected by the reception of an Ethernet OAM Event Notification OAMPDU that indicates a threshold event.

This notification should not be sent more than once per second.

The OAM entity can be derived from extracting the ifIndex from the variable bindings. The objects in the notification

correspond to the values in a row instance in the dot30amEventLogTable.

The management entity should periodically check dot30amEventLogTable to detect any missed events."
 ::= { dot30amNotifications 1 }

dot30amNonThresholdEvent NOTIFICATION-TYPE

OBJECTS { dot30amEventLogTimestamp,
 dot30amEventLogOui,
 dot30amEventLogType,
 dot30amEventLogLocation,
 dot30amEventLogEventTotal
 }

STATUS current

DESCRIPTION

"A dot30amNonThresholdEvent notification is sent when a local or remote non-threshold crossing event is detected. A local event is detected by the local entity, while a remote event is detected by the reception of an Ethernet OAM Event Notification OAMPDU that indicates a non-threshold crossing event.

This notification should not be sent more than once per second.

The OAM entity can be derived from extracting the ifIndex from the variable bindings. The objects in the notification correspond to the values in a row instance of the dot30amEventLogTable.

The management entity should periodically check dot30amEventLogTable to detect any missed events."
 ::= { dot30amNotifications 2 }

-- *****

--

-- Conformance statements

--

dot30amGroups OBJECT IDENTIFIER ::= { dot30amConformance 1 }

dot30amCompliances OBJECT IDENTIFIER ::= { dot30amConformance 2 }

-- Compliance statements

dot30amCompliance MODULE-COMPLIANCE

STATUS current

DESCRIPTION "The compliance statement for managed entities supporting OAM on Ethernet-like interfaces."

MODULE -- this module

MANDATORY-GROUPS { dot30amControlGroup,
 dot30amPeerGroup,
 dot30amStatsBaseGroup
 }

GROUP dot30amLoopbackGroup

DESCRIPTION

"This group is mandatory for all IEEE 802.3 OAM

implementations that support loopback functionality."

GROUP dot3OamErrSymbolPeriodEventGroup

DESCRIPTION

"This group is mandatory for all IEEE 802.3 OAM implementations that support event functionality."

GROUP dot3OamErrFramePeriodEventGroup

DESCRIPTION

"This group is mandatory for all IEEE 802.3 OAM implementations that support event functionality."

GROUP dot3OamErrFrameEventGroup

DESCRIPTION

"This group is mandatory for all IEEE 802.3 OAM implementations that support event functionality."

GROUP dot3OamErrFrameSecsSummaryEventGroup

DESCRIPTION

"This group is mandatory for all IEEE 802.3 OAM implementations that support event functionality."

GROUP dot3OamFlagEventGroup

DESCRIPTION

"This group is optional for all IEEE 802.3 OAM implementations. The ability to send critical events or dying gasp events is not required in any system."

GROUP dot3OamEventLogGroup

DESCRIPTION

"This group is optional for all IEEE 802.3 OAM implementations. Entries in this table are dependent on what event functionality is supported in the local OAM implementation. At least one type of event shall be supported for entries to appear in this table."

GROUP dot3OamNotificationGroup

DESCRIPTION

"This group is optional for all IEEE 802.3 OAM implementations. Since the information in the notifications is dependent on the dot3OamEventLogTable, that table shall be implemented for notifications."

::= { dot3OamCompliances 1 }

dot3OamControlGroup OBJECT-GROUP

```
OBJECTS {
    dot3OamAdminState,
    dot3OamOperStatus,
    dot3OamMode,
    dot3OamMaxOamPduSize,
    dot3OamConfigRevision,
    dot3OamFunctionsSupported
}
```

STATUS current

DESCRIPTION

"A collection of objects providing the abilities, configuration, and status of an Ethernet OAM entity."

::= { dot3OamGroups 1 }

```

dot30amPeerGroup OBJECT-GROUP
  OBJECTS      {      dot30amPeerMacAddress,
                      dot30amPeerVendorOui,
                      dot30amPeerVendorInfo,
                      dot30amPeerMode,
                      dot30amPeerFunctionsSupported,
                      dot30amPeerMaxOamPduSize,
                      dot30amPeerConfigRevision
                    }
  STATUS       current
  DESCRIPTION
    "A collection of objects providing the abilities,
    configuration, and status of a peer Ethernet OAM entity."
    ::= { dot30amGroups 2 }

dot30amStatsBaseGroup OBJECT-GROUP
  OBJECTS      {      dot30amInformationTx,
                      dot30amInformationRx,
                      dot30amUniqueEventNotificationTx,
                      dot30amUniqueEventNotificationRx,
                      dot30amDuplicateEventNotificationTx,
                      dot30amDuplicateEventNotificationRx,
                      dot30amLoopbackControlTx,
                      dot30amLoopbackControlRx,
                      dot30amVariableRequestTx,
                      dot30amVariableRequestRx,
                      dot30amVariableResponseTx,
                      dot30amVariableResponseRx,
                      dot30amOrgSpecificTx,
                      dot30amOrgSpecificRx,
                      dot30amUnsupportedCodesTx,
                      dot30amUnsupportedCodesRx,
                      dot30amFramesLostDueToOam
                    }
  STATUS       current
  DESCRIPTION
    "A collection of objects providing the statistics for the
    number of various transmit and receive events for OAM on an
    Ethernet-like interface. Note that all of these counters shall
    be supported even if the related function (as described in
    dot30amFunctionsSupported) is not supported."
    ::= { dot30amGroups 3 }

dot30amLoopbackGroup OBJECT-GROUP
  OBJECTS      {      dot30amLoopbackStatus,
                      dot30amLoopbackIgnoreRx
                    }
  STATUS       current
  DESCRIPTION
    "A collection of objects for controlling the OAM remote
    loopback function."
    ::= { dot30amGroups 4 }

dot30amErrSymbolPeriodEventGroup OBJECT-GROUP
  OBJECTS      {      dot30amErrSymPeriodWindowHi,
                      dot30amErrSymPeriodWindowLo,
                      dot30amErrSymPeriodThresholdHi,
                      dot30amErrSymPeriodThresholdLo,
                      dot30amErrSymPeriodEvNotifEnable
                    }

```

```

    }
    STATUS      current
    DESCRIPTION
        "A collection of objects for configuring the thresholds for an
        Errored Symbol Period Event.

```

Each IEEE Std 802.3 defined Event Notification TLV has its own conformance group because each event can be implemented independently of any other."

```

::= { dot30amGroups 5 }

```

```

dot30amErrFramePeriodEventGroup OBJECT-GROUP
    OBJECTS      {      dot30amErrFramePeriodWindow,
                        dot30amErrFramePeriodThreshold,
                        dot30amErrFramePeriodEvNotifEnable
                    }
    STATUS      current
    DESCRIPTION
        "A collection of objects for configuring the thresholds for an
        Errored Frame Period Event.

```

Each IEEE Std 802.3 defined Event Notification TLV has its own conformance group because each event can be implemented independently of any other."

```

::= { dot30amGroups 6 }

```

```

dot30amErrFrameEventGroup OBJECT-GROUP
    OBJECTS      {      dot30amErrFrameWindow,
                        dot30amErrFrameThreshold,
                        dot30amErrFrameEvNotifEnable
                    }
    STATUS      current
    DESCRIPTION
        "A collection of objects for configuring the thresholds for an
        Errored Frame Event.

```

Each IEEE Std 802.3 defined Event Notification TLV has its own conformance group because each event can be implemented independently of any other."

```

::= { dot30amGroups 7 }

```

```

dot30amErrFrameSecsSummaryEventGroup OBJECT-GROUP
    OBJECTS      {      dot30amErrFrameSecsSummaryWindow,
                        dot30amErrFrameSecsSummaryThreshold,
                        dot30amErrFrameSecsEvNotifEnable
                    }
    STATUS      current
    DESCRIPTION
        "A collection of objects for configuring the thresholds for an
        Errored Frame Seconds Summary Event.

```

Each IEEE Std 802.3 defined Event Notification TLV has its own conformance group because each event can be implemented independently of any other."

```

::= { dot30amGroups 8 }

```

```

dot30amFlagEventGroup OBJECT-GROUP
    OBJECTS      {      dot30amDyingGaspEnable,
                        dot30amCriticalEventEnable

```

```

    }
    STATUS      current
    DESCRIPTION
        "A collection of objects for configuring the sending OAMPDUs
        with the critical event flag or dying gasp flag enabled."
    ::= { dot30amGroups 9 }

dot30amEventLogGroup OBJECT-GROUP
    OBJECTS {
        dot30amEventLogTimestamp,
        dot30amEventLogOui,
        dot30amEventLogType,
        dot30amEventLogLocation,
        dot30amEventLogWindowHi,
        dot30amEventLogWindowLo,
        dot30amEventLogThresholdHi,
        dot30amEventLogThresholdLo,
        dot30amEventLogValue,
        dot30amEventLogRunningTotal,
        dot30amEventLogEventTotal
    }
    STATUS      current
    DESCRIPTION
        "A collection of objects for configuring the thresholds for an
        Errored Frame Seconds Summary Event and maintaining the event
        information."
    ::= { dot30amGroups 10 }

dot30amNotificationGroup NOTIFICATION-GROUP
    NOTIFICATIONS {
        dot30amThresholdEvent,
        dot30amNonThresholdEvent
    }
    STATUS      current
    DESCRIPTION
        "A collection of notifications used by Ethernet OAM to signal
        to a management entity that local or remote events have
        occurred on a specified Ethernet link."
    ::= { dot30amGroups 11 }

END

```

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7. Ethernet repeater device MIB module

7.1 Overview

This clause defines a portion of the MIB for use with SNMP. In particular, it defines objects for managing IEEE 802.3 repeaters.

7.1.1 Repeater management

Instances of the object types defined in this clause represent attributes of an IEEE 802.3 (Ethernet-like) repeater, as defined by Clause 9 and Clause 27 of IEEE Std 802.3. Implementors of these MIB objects should note that IEEE Std 802.3 explicitly describes when, where, and how various repeater attributes are measured. IEEE Std 802.3 also describes the effects of repeater actions that may be invoked by manipulating instances of the MIB objects defined here. The definitions presented here are based on 30.4 of IEEE Std 802.3. The counters in this clause are defined to be the same as the counters defined in IEEE Std 802.3, with the intention that the same instrumentation can be used to implement both standards.

These repeater MIB module objects may be used to manage non-standard repeater-like devices; however, defining objects to describe implementation-specific properties of non-standard repeater-like devices is outside the scope of this standard.

7.1.2 Structure of the MIB

Objects in this MIB module are arranged into packages, each of which contains a set of related objects within a broad functional category. Objects within a package are generally defined under the same OID subtree. These packages are intended for organizational convenience only and have no relation to the conformance groups defined later in the document.

7.1.2.1 Basic definitions

The basic definitions include objects that are applicable to all repeaters: status, parameter, and control objects for each repeater within the managed system, for the port groups within the system, and for the individual ports themselves.

7.1.2.2 Monitor definitions

The monitor definitions include monitoring statistics for each repeater within the system and for individual ports.

7.1.2.3 Address tracking definitions

This collection includes objects for tracking the MAC addresses of the DTEs attached to the ports within the system and for mapping the topology of a network.

7.1.2.4 Top N definitions

These objects may be used for tracking the ports with the most activity within the system or within particular repeaters.

7.1.3 Relationship to MIB-II

It is assumed that a repeater implementing this MIB will also implement (at least) the “system” group defined in IETF RFC 1213 (MIB-II).

7.1.3.1 Relationship to the “system” group

In MIB-II, the “system” group is defined as being mandatory for all systems such that each managed entity contains one instance of each object in the “system” group. Thus, those objects apply to the entity even if the entity’s sole functionality is management of repeaters.

7.1.3.2 Relationship to the “interfaces” group

In MIB-II, the “interfaces” group is defined as being mandatory for all systems and contains information on an entity’s interfaces, where each interface is thought of as being attached to a “subnetwork.” (Note that this term is not to be confused with “subnet,” which refers to an addressing partitioning scheme used in the Internet suite of protocols.)

This repeater MIB module uses the notion of ports on a repeater. The concept of a MIB-II interface has no specific relationship to a repeater’s port. Therefore, the “interfaces” group applies only to the one (or more) network interfaces on which the entity managing the repeater sends and receives management protocol operations, and does not apply to the repeater’s ports. This is consistent with the physical-layer nature of a repeater. A repeater-unit is a bitwise store-and-forward device. A repeater port has no MAC address, no MAC implementation, and does not pass packets up to higher level protocol entities for processing.

NOTE—When a network management entity is observing a repeater, it may appear as though the repeater is passing packets to a higher level protocol entity. However, this is only a means of implementing management, and this passing of management information is not part of the repeater functionality.¹³

7.2 Topology mapping

Network topology mapping is described in section 4 of IETF RFC 2108 [B20].

7.3 MIB module definition

An ASCII text version of the MIB definition can be found at the following URL¹⁴:

http://www.ieee802.org/3/1/public/mib_modules/20130411/802dot3dot1C7mib.txt

¹³Notes in text, tables, and figures are given for information only and do not contain requirements needed to implement the standard.

¹⁴Copyright release for MIB modules: Users of this standard may freely reproduce the MIB module contained in this subclause so that it can be used for its intended purpose.

IEEE8023-SNMP-REPEATER-MIB DEFINITIONS ::= BEGIN

IMPORTS

Counter32, Counter64, Integer32, Gauge32,
 OBJECT-TYPE, MODULE-IDENTITY, NOTIFICATION-TYPE, org
 FROM SNMPv2-SMI
 TimeStamp, MacAddress, TEXTUAL-CONVENTION,
 RowStatus, TestAndIncr
 FROM SNMPv2-TC
 OBJECT-GROUP, MODULE-COMPLIANCE, NOTIFICATION-GROUP
 FROM SNMPv2-CONF
 OwnerString
 FROM RFC1271-MIB;

ieee8023snmpRptrMIB MODULE-IDENTITY

LAST-UPDATED "201304110000Z" -- April 11, 2013

ORGANIZATION

"IEEE 802.3 working group"

CONTACT-INFO

"WG-URL: <http://www.ieee802.org/3/index.html>
 WG-EMail: STDS-802-3-MIB@LISTSERV.IEEE.ORG

Contact: Howard Frazier
 Postal: 3151 Zanker Road
 San Jose, CA 95134
 USA

Tel: +1.408.922.8164

E-mail: hfrazier@broadcom.com"

DESCRIPTION

"Management information for IEEE 802.3 repeaters."

REVISION "201304110000Z" -- April 11, 2013

DESCRIPTION

"Revision, based on an earlier version in IEEE Std 802.3.1-2011."

REVISION "201102020000Z" -- February 2, 2011

DESCRIPTION

"Initial revision, based on an earlier version in RFC 2108"

::= { org-ieee(111) standards-association-numbers-series-standards(2)
 lan-man-stds(802) ieee802dot3(3) ieee802dot3dot1mibs(1) 7 }

ieee8023snmpDot3RptrMgt OBJECT IDENTIFIER ::= { ieee8023snmpRptrMIB 1}

OptMacAddr ::= TEXTUAL-CONVENTION

DISPLAY-HINT "1x:"

STATUS current

DESCRIPTION

"Either a 6 octet address in the 'canonical'
 order defined by IEEE Std 802.1a, i.e., as if it
 were transmitted least significant bit first
 if a value is available or a zero length string."

REFERENCE

"See MacAddress in SNMPv2-TC. The only difference
 is that a zero length string is allowed as a value
 for OptMacAddr and not for MacAddress."

SYNTAX OCTET STRING (SIZE (0 | 6))

-- Basic information at the repeater, group, and port level.

```
rpPtrBasicPackage
  OBJECT IDENTIFIER ::= { ieee8023snmpDot3RptrMgt 1 }
  rpPtrGroupInfo
    OBJECT IDENTIFIER ::= { rpPtrBasicPackage 1 }
  rpPtrPortInfo
    OBJECT IDENTIFIER ::= { rpPtrBasicPackage 2 }
  rpPtrAllRptrInfo
    OBJECT IDENTIFIER ::= { rpPtrBasicPackage 3 }
```

-- Monitoring information at the repeater, group, and port level.

```
rpPtrMonitorPackage
  OBJECT IDENTIFIER ::= { ieee8023snmpDot3RptrMgt 2 }
  rpPtrMonitorRptrInfo
    OBJECT IDENTIFIER ::= { rpPtrMonitorPackage 1 }
  rpPtrMonitorGroupInfo
    OBJECT IDENTIFIER ::= { rpPtrMonitorPackage 2 }
  rpPtrMonitorPortInfo
    OBJECT IDENTIFIER ::= { rpPtrMonitorPackage 3 }
  rpPtrMonitorAllRptrInfo
    OBJECT IDENTIFIER ::= { rpPtrMonitorPackage 4 }
```

-- Address tracking information at the repeater, group,
-- and port level.

```
rpPtrAddrTrackPackage
  OBJECT IDENTIFIER ::= { ieee8023snmpDot3RptrMgt 3 }
  rpPtrAddrTrackRptrInfo
    OBJECT IDENTIFIER ::= { rpPtrAddrTrackPackage 1 }
  rpPtrAddrTrackGroupInfo
    -- this subtree is currently unused
    OBJECT IDENTIFIER ::= { rpPtrAddrTrackPackage 2 }
  rpPtrAddrTrackPortInfo
    OBJECT IDENTIFIER ::= { rpPtrAddrTrackPackage 3 }
```

-- TopN information:

```
rpPtrTopNPackage
  OBJECT IDENTIFIER ::= { ieee8023snmpDot3RptrMgt 4 }
  rpPtrTopNRptrInfo
    -- this subtree is currently unused
    OBJECT IDENTIFIER ::= { rpPtrTopNPackage 1 }
  rpPtrTopNGroupInfo
    -- this subtree is currently unused
    OBJECT IDENTIFIER ::= { rpPtrTopNPackage 2 }
  rpPtrTopNPortInfo
    OBJECT IDENTIFIER ::= { rpPtrTopNPackage 3 }
```

-- Basic information at the group level.

--

-- Configuration and status objects for each
-- managed group in the repeater system, independent
-- of whether there is one or more managed
-- repeater-units in the repeater system.

```
rpPtrGroupTable OBJECT-TYPE
  SYNTAX      SEQUENCE OF RptrGroupEntry
```

```

MAX-ACCESS    not-accessible
STATUS        current
DESCRIPTION
    "Table of descriptive and status information about
    the groups of ports."
 ::= { rptrGroupInfo 1 }

```

```

rptrGroupEntry OBJECT-TYPE
SYNTAX        RptrGroupEntry
MAX-ACCESS    not-accessible
STATUS        current
DESCRIPTION
    "An entry in the table, containing information
    about a single group of ports."
INDEX         { rptrGroupIndex }
 ::= { rptrGroupTable 1 }

```

```

RptrGroupEntry ::=
SEQUENCE {
    rptrGroupIndex
        Integer32,
    rptrGroupObjectID
        OBJECT IDENTIFIER,
    rptrGroupOperStatus
        INTEGER,
    rptrGroupPortCapacity
        Integer32
}

```

```

rptrGroupIndex OBJECT-TYPE
SYNTAX        Integer32 (1..2147483647)
MAX-ACCESS    not-accessible
STATUS        current
DESCRIPTION
    "This object identifies the group within the
    repeater system for which this entry contains
    information."
REFERENCE
    "IEEE Std 802.3, 30.4.2.1.1, aGroupID."
 ::= { rptrGroupEntry 1 }

```

```

rptrGroupObjectID OBJECT-TYPE
SYNTAX        OBJECT IDENTIFIER
MAX-ACCESS    read-only
STATUS        current
DESCRIPTION
    "The vendor's authoritative identification of the
    group. This value may be allocated within the SMI
    enterprises subtree (1.3.6.1.4.1) and provides a
    straight-forward and unambiguous means for
    determining what kind of group is being managed.

    For example, this object could take the value
    1.3.6.1.4.1.4242.1.2.14 if vendor 'Flintstones,
    Inc.' was assigned the subtree 1.3.6.1.4.1.4242,
    and had assigned the identifier
    1.3.6.1.4.1.4242.1.2.14 to its 'Wilma Flintstone
    6-Port FOIRL Plug-in module.'"
 ::= { rptrGroupEntry 2 }

```

rpPtrGroupOperStatus OBJECT-TYPE

```

SYNTAX      INTEGER {
                other(1),
                operational(2),
                malfunctioning(3),
                notPresent(4),
                underTest(5),
                resetInProgress(6)
            }

```

```

MAX-ACCESS  read-only

```

```

STATUS      current

```

DESCRIPTION

"An object that indicates the operational status of the group.

A status of notPresent(4) indicates that the group is temporarily or permanently physically and/or logically not a part of the repeater. It is an implementation-specific matter as to whether the agent effectively removes notPresent entries from the table.

A status of operational(2) indicates that the group is functioning, and a status of malfunctioning(3) indicates that the group is malfunctioning in some way."

```
 ::= { rpPtrGroupEntry 3 }
```

rpPtrGroupPortCapacity OBJECT-TYPE

```

SYNTAX      Integer32 (1..2147483647)

```

```

MAX-ACCESS  read-only

```

```

STATUS      current

```

DESCRIPTION

"The rpPtrGroupPortCapacity is the number of ports that can be contained within the group. Valid range is 1-2147483647. Within each group, the ports are uniquely numbered in the range from 1 to rpPtrGroupPortCapacity.

Some ports may not be present in the repeater system, in which case the actual number of ports present will be less than the value of rpPtrGroupPortCapacity. The number of ports present in the group will never be greater than the value of rpPtrGroupPortCapacity.

Note: In practice, this will generally be the number of ports on a module, card, or board, and the port numbers will correspond to numbers marked on the physical embodiment."

REFERENCE

"IEEE Std 802.3, 30.4.2.1.2, aGroupPortCapacity."

```
 ::= { rpPtrGroupEntry 4 }
```

```
-- Basic information at the port level.
```

```
--
```

```
-- Configuration and status objects for
```

```
-- each managed repeater port in the repeater system,
```

```
-- independent of whether there is one or more
-- managed repeater-units in the repeater system.
```

```
rpPtrPortTable OBJECT-TYPE
    SYNTAX      SEQUENCE OF RpPtrPortEntry
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "Table of descriptive and status information about
        the repeater ports in the repeater system. The number of
        entries is independent of the number of repeaters
        in the managed repeater system."
    ::= { rpPtrPortInfo 1 }
```

```
rpPtrPortEntry OBJECT-TYPE
    SYNTAX      RpPtrPortEntry
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "An entry in the table, containing information
        about a single port."

    INDEX      { rpPtrPortGroupIndex, rpPtrPortIndex }
    ::= { rpPtrPortTable 1 }
```

```
RpPtrPortEntry ::=
    SEQUENCE {
        rpPtrPortGroupIndex
            Integer32,
        rpPtrPortIndex
            Integer32,
        rpPtrPortAdminStatus
            INTEGER,
        rpPtrPortAutoPartitionState
            INTEGER,
        rpPtrPortOperStatus
            INTEGER,
        rpPtrPortRptrId
            Integer32
    }
```

```
rpPtrPortGroupIndex OBJECT-TYPE
    SYNTAX      Integer32 (1..2147483647)
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "This object identifies the group containing the
        port for which this entry contains information."
    ::= { rpPtrPortEntry 1 }
```

```
rpPtrPortIndex OBJECT-TYPE
    SYNTAX      Integer32 (1..2147483647)
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "This object identifies the port within the group
        for which this entry contains information. This
        identifies the port independently from the repeater
        to which it may be attached. The numbering scheme for
```

ports is implementation specific; however, this value can never be greater than `rpPtrGroupPortCapacity` for the associated group."

REFERENCE

"IEEE Std 802.3, 30.4.3.1.1, `aPortID`."

::= { `rpPtrPortEntry 2` }

`rpPtrPortAdminStatus` OBJECT-TYPE

SYNTAX INTEGER {
 `enabled(1)`,
 `disabled(2)`
}

MAX-ACCESS read-write

STATUS current

DESCRIPTION

"Setting this object to `disabled(2)` disables the port. A disabled port neither transmits nor receives. Once disabled, a port shall be explicitly enabled to restore operation. A port that is disabled when power is lost or when a reset is exerted shall remain disabled when normal operation resumes.

The admin status takes precedence over auto-partition and functionally operates between the auto-partition mechanism and the AUI/PMA.

Setting this object to `enabled(1)` enables the port and exerts a BEGIN on the port's auto-partition state machine.

(In effect, when a port is disabled, the value of `rpPtrPortAutoPartitionState` for that port is frozen until the port is next enabled. When the port becomes enabled, the `rpPtrPortAutoPartitionState` becomes `notAutoPartitioned(1)`, regardless of its pre-disabling state.)"

REFERENCE

"IEEE Std 802.3, 30.4.3.1.2, `aPortAdminState` and 30.4.3.2.1, `acPortAdminControl`."

::= { `rpPtrPortEntry 3` }

`rpPtrPortAutoPartitionState` OBJECT-TYPE

SYNTAX INTEGER {
 `notAutoPartitioned(1)`,
 `autoPartitioned(2)`
}

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The `autoPartitionState` flag indicates whether the port is currently partitioned by the repeater's auto-partition protection.

The conditions that cause port partitioning are specified in partition state machine in Clauses 9 and 27 of IEEE Std 802.3. They are not differentiated here."

REFERENCE

```
"IEEE Std 802.3, 30.4.3.1.3, aAutoPartitionState."
 ::= { rpPtrPortEntry 4 }
```

```
rpPtrPortOperStatus OBJECT-TYPE
```

```
SYNTAX      INTEGER {
                operational(1),
                notOperational(2),
                notPresent(3)
            }
```

```
MAX-ACCESS  read-only
```

```
STATUS      current
```

```
DESCRIPTION
```

"This object indicates the port's operational status. The notPresent(3) status indicates the port is physically removed (note this may or may not be possible depending on the type of port.) The operational(1) status indicates that the port is enabled (see rpPtrPortAdminStatus) and working, even though it might be auto-partitioned (see rpPtrPortAutoPartitionState).

If this object has the value operational(1) and rpPtrPortAdminStatus is set to disabled(2), it is expected that this object's value will soon change to notOperational(2)."

```
 ::= { rpPtrPortEntry 5 }
```

```
rpPtrPortRptrId OBJECT-TYPE
```

```
SYNTAX      Integer32 (0..2147483647)
```

```
MAX-ACCESS  read-only
```

```
STATUS      current
```

```
DESCRIPTION
```

"This object identifies the repeater to which this port belongs. The repeater identified by a particular value of this object is the same as that identified by the same value of rpPtrInfoId. A value of zero indicates that this port currently is not a member of any repeater."

```
 ::= { rpPtrPortEntry 6 }
```

```
-- New version of basic information at the repeater level.
```

```
--
```

```
-- Configuration, status, and control objects for
```

```
-- each managed repeater in the repeater system.
```

```
rpPtrInfoTable OBJECT-TYPE
```

```
SYNTAX      SEQUENCE OF RpPtrInfoEntry
```

```
MAX-ACCESS  not-accessible
```

```
STATUS      current
```

```
DESCRIPTION
```

"A table of information about each non-trivial repeater. The number of entries depends on the physical configuration of the managed repeater system."

```
 ::= { rpPtrAllRpPtrInfo 1 }
```

```
rpPtrInfoEntry OBJECT-TYPE
```

```

SYNTAX      RptrInfoEntry
MAX-ACCESS  not-accessible
STATUS      current
DESCRIPTION
    "An entry in the table, containing information
    about a single non-trivial repeater."
INDEX       { rptrInfoId }
 ::= { rptrInfoTable 1 }

```

```

RptrInfoEntry ::=
SEQUENCE {
    rptrInfoId
        Integer32,
    rptrInfoRptrType
        INTEGER,
    rptrInfoOperStatus
        INTEGER,
    rptrInfoReset
        INTEGER,
    rptrInfoPartitionedPorts
        Gauge32,
    rptrInfoLastChange
        TimeStamp
}

```

```

rptrInfoId OBJECT-TYPE
SYNTAX      Integer32 (1..2147483647)
MAX-ACCESS  not-accessible
STATUS      current
DESCRIPTION
    "This object identifies the repeater for which
    this entry contains information."
 ::= { rptrInfoEntry 1 }

```

```

rptrInfoRptrType OBJECT-TYPE
SYNTAX      INTEGER {
        other(1),                -- undefined or unknown
        tenMb(2),
        onehundredMbClassI(3),
        onehundredMbClassII(4)
    }
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION
    "The rptrInfoRptrType returns a value that identifies
    the CSMA/CD repeater type."
REFERENCE
    "IEEE Std 802.3, 30.4.1.1.2, aRepeaterType."
 ::= { rptrInfoEntry 2 }

```

```

rptrInfoOperStatus OBJECT-TYPE
SYNTAX      INTEGER {
        other(1),
        ok(2),
        failure(3)
    }
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION

```


"The rpPtrInfoOperStatus object indicates the operational state of the repeater."

REFERENCE

"IEEE Std 802.3, 30.4.1.1.5, aRepeaterHealthState."
 ::= { rpPtrInfoEntry 3 }

rpPtrInfoReset OBJECT-TYPE

SYNTAX INTEGER {
 noReset(1),
 reset(2)
 }

MAX-ACCESS read-write

STATUS current

DESCRIPTION

"Setting this object to reset(2) causes a transition to the START state of Figure 9-2 in Clause 9 IEEE Std 802.3 for a 10 Mb/s repeater, and to the START state of Figure 27-2 in Clause 27 of that standard for a 100 Mb/s repeater.

Setting this object to noReset(1) has no effect. The agent will return the value noReset(1) when this object is read.

After receiving a request to set this variable to reset(2), the agent is allowed to delay the reset for a short period. For example, the implementor may choose to delay the reset long enough to allow the SNMP response to be transmitted. In any event, SNMP requires that a response be transmitted.

This action does not reset the management counters defined in this document nor does it affect the portAdminStatus parameters. Included in this action is the execution of a disruptive Self-Test with the following characteristics: a) The nature of the tests is not specified. b) The test resets the repeater but without affecting management information about the repeater. c) The test does not inject packets onto any segment. d) Packets received during the test may or may not be transferred. e) The test does not interfere with management functions.

After performing this self-test, the agent will update the repeater health information (including rpPtrInfoOperStatus), and send a rpPtrInfoResetEvent notification."

REFERENCE

"IEEE Std 802.3, 30.4.1.2.1, acResetRepeater."
 ::= { rpPtrInfoEntry 4 }

rpPtrInfoPartitionedPorts OBJECT-TYPE

SYNTAX Gauge32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"This object returns the total number of ports in the repeater whose current state meets all three

```

of the following criteria: rptrPortOperStatus
does not have the value notPresent(3),
rptrPortAdminStatus is enabled(1), and
rptrPortAutoPartitionState is autoPartitioned(2)."
::= { rptrInfoEntry 5 }

rptrInfoLastChange OBJECT-TYPE
SYNTAX      TimeStamp
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION
    "The value of sysUpTime when any of the following
    conditions occurred:
    1) agent cold- or warm-started;
    2) this instance of repeater was created
       (such as when a device or module was
       added to the repeater system);
    3) a change in the value of rptrInfoOperStatus;
    4) ports were added or removed as members of
       the repeater; or
    5) any of the counters associated with this
       repeater had a discontinuity."
::= { rptrInfoEntry 6 }

-- Statistics at the port level.
--

rptrMonitorPortTable OBJECT-TYPE
SYNTAX      SEQUENCE OF RptrMonitorPortEntry
MAX-ACCESS  not-accessible
STATUS      current
DESCRIPTION
    "Table of performance and error statistics for the
    ports. The number of entries is the same as that
    in the rptrPortTable.

    The columnar object rptrMonitorPortLastChange
    is used to indicate possible discontinuities
    of counter type columnar objects in the table."
::= { rptrMonitorPortInfo 1 }

rptrMonitorPortEntry OBJECT-TYPE
SYNTAX      RptrMonitorPortEntry
MAX-ACCESS  not-accessible
STATUS      current
DESCRIPTION
    "An entry in the table, containing performance and
    error statistics for a single port."
INDEX      { rptrMonitorPortGroupIndex, rptrMonitorPortIndex }
::= { rptrMonitorPortTable 1 }

RptrMonitorPortEntry ::=
SEQUENCE {
    rptrMonitorPortGroupIndex
        Integer32,
    rptrMonitorPortIndex
        Integer32,
    rptrMonitorPortReadableFrames
        Counter32,

```

```

    rpPtrMonitorPortReadableOctets
        Counter32,
    rpPtrMonitorPortFCSErrors
        Counter32,
    rpPtrMonitorPortAlignmentErrors
        Counter32,
    rpPtrMonitorPortFrameTooLongs
        Counter32,
    rpPtrMonitorPortShortEvents
        Counter32,
    rpPtrMonitorPortRunts
        Counter32,
    rpPtrMonitorPortCollisions
        Counter32,
    rpPtrMonitorPortLateEvents
        Counter32,
    rpPtrMonitorPortVeryLongEvents
        Counter32,
    rpPtrMonitorPortDataRateMismatches
        Counter32,
    rpPtrMonitorPortAutoPartitions
        Counter32,
    rpPtrMonitorPortTotalErrors
        Counter32,
    rpPtrMonitorPortLastChange
        TimeStamp
}

rpPtrMonitorPortGroupIndex OBJECT-TYPE
    SYNTAX      Integer32 (1..2147483647)
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "This object identifies the group containing the
        port for which this entry contains information."
    ::= { rpPtrMonitorPortEntry 1 }

rpPtrMonitorPortIndex OBJECT-TYPE
    SYNTAX      Integer32 (1..2147483647)
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "This object identifies the port within the group
        for which this entry contains information."
    REFERENCE
        "IEEE Std 802.3, 30.4.3.1.1, aPortID."
    ::= { rpPtrMonitorPortEntry 2 }

rpPtrMonitorPortReadableFrames OBJECT-TYPE
    SYNTAX      Counter32
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "This object is the number of frames of valid
        frame length that have been received on this port.
        This counter is incremented by one for each frame
        received on this port whose OctetCount is greater
        than or equal to minFrameSize and less than or
        equal to maxFrameSize (Ref: IEEE 802.3 Std,

```

4.4.2.1) and for which the FCSError and CollisionEvent signals are not asserted.

A discontinuity may occur in the value when the value of object rptrMonitorPortLastChange changes.

This statistic provides one of the parameters necessary for obtaining the packet error ratio. The approximate minimum time for rollover of this counter is 80 hours at 10 Mb/s."

REFERENCE

"IEEE Std 802.3, 30.4.3.1.4, aReadableFrames."
::= { rptrMonitorPortEntry 3 }

rptrMonitorPortReadableOctets OBJECT-TYPE

SYNTAX Counter32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"This object is the number of octets contained in valid frames that have been received on this port. This counter is incremented by OctetCount for each frame received on this port that has been determined to be a readable frame (i.e., including FCS octets but excluding framing bits and dribble bits).

A discontinuity may occur in the value when the value of object rptrMonitorPortLastChange changes.

This statistic provides an indicator of the total data transferred. The approximate minimum time for rollover of this counter in a 10 Mb/s repeater is 58 minutes.

For ports receiving traffic at a maximum rate in a 100 Mb/s repeater, this counter can roll over in less than 6 minutes. Since that amount of time could be less than a management station's poll cycle time, in order to avoid a loss of information a management station is advised to also poll the rptrMonitorPortUpper32Octets object, or to use the 64-bit counter defined by rptrMonitorPortHCRreadableOctets instead of the two 32-bit counters."

REFERENCE

"IEEE Std 802.3, 30.4.3.1.5, aReadableOctets."
::= { rptrMonitorPortEntry 4 }

rptrMonitorPortFCSErrors OBJECT-TYPE

SYNTAX Counter32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"This counter is incremented by one for each frame received on this port with the FCSError signal asserted and the FramingError and CollisionEvent

signals deasserted and whose OctetCount is greater than or equal to minFrameSize and less than or equal to maxFrameSizeLimit (See IEEE Std 802.3 4.2.7.1).

A discontinuity may occur in the value when the value of object rptrMonitorPortLastChange changes.

The approximate minimum time for rollover of this counter is 80 hours at 10 Mb/s."

REFERENCE

"IEEE Std 802.3, 30.4.3.1.6, aFrameCheckSequenceErrors."

::= { rptrMonitorPortEntry 5 }

rptrMonitorPortAlignmentErrors OBJECT-TYPE

SYNTAX Counter32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"This counter is incremented by one for each frame received on this port with the FCSError and FramingError signals asserted and CollisionEvent signal deasserted and whose OctetCount is greater than or equal to minFrameSize and less than or equal to maxFrameSizeLimit (See IEEE Std 802.3, 4.2.7.1). If rptrMonitorPortAlignmentErrors is incremented then the rptrMonitorPortFCSErrors Counter shall not be incremented for the same frame.

A discontinuity may occur in the value when the value of object rptrMonitorPortLastChange changes.

The approximate minimum time for rollover of this counter is 80 hours at 10 Mb/s."

REFERENCE

"IEEE Std 802.3, 30.4.3.1.7, aAlignmentErrors."

::= { rptrMonitorPortEntry 6 }

rptrMonitorPortFrameTooLongs OBJECT-TYPE

SYNTAX Counter32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"This counter is incremented by one for each frame received on this port whose OctetCount is greater than maxFrameSizeLimit (See IEEE Std 802.3, 4.2.7.1). If rptrMonitorPortFrameTooLongs is incremented then neither the rptrMonitorPortAlignmentErrors nor the rptrMonitorPortFCSErrors counter shall be incremented for the frame.

A discontinuity may occur in the value when the value of object rptrMonitorPortLastChange changes.

The approximate minimum time for rollover of this

counter is 61 days in a 10 Mb/s repeater."

REFERENCE

"IEEE Std 802.3, 30.4.3.1.8, aFramesTooLong."

::= { rpPtrMonitorPortEntry 7 }

rpPtrMonitorPortShortEvents OBJECT-TYPE

SYNTAX Counter32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"This counter is incremented by one for each CarrierEvent on this port with ActivityDuration less than ShortEventMaxTime. ShortEventMaxTime is greater than 74 bit times and less than 82 bit times. ShortEventMaxTime has tolerances included to provide for circuit losses between a conformance test point at the AUI and the measurement point within the state machine.

Notes:

ShortEvents may indicate externally generated noise hits that will cause the repeater to transmit Runts to its other ports, or propagate a collision (which may be late) back to the transmitting DTE and damaged frames to the rest of the network.

Implementors may wish to consider selecting the ShortEventMaxTime towards the lower end of the allowed tolerance range to accommodate bit losses suffered through physical channel devices not budgeted for within this standard.

The significance of this attribute is different in 10 and 100 Mb/s collision domains. Clause 9 repeaters perform fragment extension of short events which would be counted as runts on the interconnect ports of other repeaters. Clause 27 repeaters do not perform fragment extension.

A discontinuity may occur in the value when the value of object rpPtrMonitorPortLastChange changes.

The approximate minimum time for rollover of this counter is 16 hours in a 10 Mb/s repeater."

REFERENCE

"IEEE Std 802.3, 30.4.3.1.9, aShortEvents."

::= { rpPtrMonitorPortEntry 8 }

rpPtrMonitorPortRunts OBJECT-TYPE

SYNTAX Counter32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"This counter is incremented by one for each CarrierEvent on this port that meets one of the following two conditions. Only one test need be

made. a) The ActivityDuration is greater than ShortEventMaxTime and less than ValidPacketMinTime and the CollisionEvent signal is deasserted. b) The OctetCount is less than 64, the ActivityDuration is greater than ShortEventMaxTime and the CollisionEvent signal is deasserted. ValidPacketMinTime is greater than or equal to 552 bit times and less than 565 bit times.

An event whose length is greater than 74 bit times but less than 82 bit times shall increment either the shortEvents counter or the runts counter but not both. A CarrierEvent greater than or equal to 552 bit times but less than 565 bit times may or may not be counted as a runt.

ValidPacketMinTime has tolerances included to provide for circuit losses between a conformance test point at the AUI and the measurement point within the state machine.

Runts usually indicate collision fragments, a normal network event. In certain situations associated with large diameter networks a percentage of collision fragments may exceed ValidPacketMinTime.

A discontinuity may occur in the value when the value of object rpPtrMonitorPortLastChange changes.

The approximate minimum time for rollover of this counter is 16 hours in a 10 Mb/s repeater."

REFERENCE

"IEEE Std 802.3, 30.4.3.1.10, aRunts."

::= { rpPtrMonitorPortEntry 9 }

rpPtrMonitorPortCollisions OBJECT-TYPE

SYNTAX Counter32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"For a Clause 9 repeater, this counter is incremented by one for any CarrierEvent signal on any port for which the CollisionEvent signal on this port is asserted. For a Clause 27 repeater port the counter increments on entering the Collision Count Increment state of the partition state diagram (Figure 27-8 of IEEE Std 802.3).

A discontinuity may occur in the value when the value of object rpPtrMonitorPortLastChange changes.

The approximate minimum time for rollover of this counter is 16 hours in a 10 Mb/s repeater."

REFERENCE

"IEEE Std 802.3, 30.4.3.1.11, aCollisions."

::= { rpPtrMonitorPortEntry 10 }

rpPtrMonitorPortLateEvents OBJECT-TYPE

SYNTAX Counter32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"For a Clause 9 repeater port, this counter is incremented by one for each CarrierEvent on this port in which the CollIn(X) variable transitions to the value SQE (see 9.6.6.2, IEEE Std 802.3) while the ActivityDuration is greater than the LateEventThreshold. For a Clause 27 repeater port, this counter is incremented by one on entering the Collision Count Increment state of the partition state diagram (Figure 27-8) while the ActivityDuration is greater than the LateEvent- Threshold. Such a CarrierEvent is counted twice, as both a collision and as a lateEvent.

The LateEventThreshold is greater than 480 bit times and less than 565 bit times. LateEventThreshold has tolerances included to permit an implementation to build a single threshold to serve as both the LateEventThreshold and ValidPacketMinTime threshold.

A discontinuity may occur in the value when the value of object rpPtrMonitorPortLastChange changes.

The approximate minimum time for rollover of this counter is 81 hours in a 10 Mb/s repeater."

REFERENCE

"IEEE Std 802.3, 30.4.3.1.12, aLateEvents."

::= { rpPtrMonitorPortEntry 11 }

rpPtrMonitorPortVeryLongEvents OBJECT-TYPE

SYNTAX Counter32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"For a Clause 9 repeater port, this counter is incremented by one for each CarrierEvent whose ActivityDuration is greater than the MAU Jabber Lockup Protection timer TW3 (See IEEE Std 802.3 9.6.1 and 9.6.5).

For a Clause 27 repeater port, this counter is incremented by one on entry to the Rx Jabber state of the receiver timer state diagram (Figure 27-7). Other counters may be incremented as appropriate.

A discontinuity may occur in the value when the value of object rpPtrMonitorPortLastChange changes."

REFERENCE

"IEEE Std 802.3, 30.4.3.1.13, aVeryLongEvents."
 ::= { rpPtrMonitorPortEntry 12 }

rpPtrMonitorPortDataRateMismatches OBJECT-TYPE

SYNTAX Counter32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"This counter is incremented by one for each frame received by this port that meets all of the conditions required by only one of the following two measurement methods:

Measurement method A: 1) The CollisionEvent signal is not asserted (10 Mb/s operation) or the Collision Count Increment state of the partition state diagram (Figure 27-8 of IEEE Std 802.3) has not been entered (100 Mb/s operation). 2) The ActivityDuration is greater than ValidPacketMinTime. 3) The frequency (data rate) is detectably mismatched from the local transmit frequency.

Measurement method B: 1) The CollisionEvent signal is not asserted (10 Mb/s operation) or the Collision Count Increment state of the partition state diagram (Figure 27-8 of IEEE Std 802.3) has not been entered (100 Mb/s operation). 2) The OctetCount is greater than 63. 3) The frequency (data rate) is detectably mismatched from the local transmit frequency. The exact degree of mismatch is vendor specific and is to be defined by the vendor for conformance testing.

When this event occurs, other counters whose increment conditions were satisfied may or may not also be incremented, at the implementor's discretion. Whether or not the repeater was able to maintain data integrity is beyond the scope of this standard.

A discontinuity may occur in the value when the value of object
 rpPtrMonitorPortLastChange changes."

REFERENCE

"IEEE Std 802.3, 30.4.3.1.14, aDataRateMismatches."
 ::= { rpPtrMonitorPortEntry 13 }

rpPtrMonitorPortAutoPartitions OBJECT-TYPE

SYNTAX Counter32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"This counter is incremented by one for each time the repeater has automatically partitioned this port.

The conditions that cause a Clause 9

repeater port to partition are specified in the partition state diagram in Clause 9 of IEEE Std 802.3. They are not differentiated here. A Clause 27 repeater port partitions on entry to the Partition Wait state of the partition state diagram (Figure 27-8 in IEEE Std 802.3).

A discontinuity may occur in the value when the value of object
rpPtrMonitorPortLastChange changes."

REFERENCE

"IEEE Std 802.3, 30.4.3.1.15, aAutoPartitions."
::= { rpPtrMonitorPortEntry 14 }

rpPtrMonitorPortTotalErrors OBJECT-TYPE

SYNTAX Counter32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The total number of errors which have occurred on this port. This counter is the summation of the values of other error counters (for the same port), namely:

rpPtrMonitorPortFCSErrors,
rpPtrMonitorPortAlignmentErrors,
rpPtrMonitorPortFrameTooLongs,
rpPtrMonitorPortShortEvents,
rpPtrMonitorPortLateEvents,
rpPtrMonitorPortVeryLongEvents,
rpPtrMonitorPortDataRateMismatches, and
rpPtrMonitorPortSymbolErrors.

This counter is redundant in the sense that it is the summation of information already available through other objects. However, it is included specifically because the regular retrieval of this object as a means of tracking the health of a port provides a considerable optimization of network management traffic over the otherwise necessary retrieval of the summed counters.

Note that rpPtrMonitorPortRunts is not included in this total; this is because runts usually indicate collision fragments, a normal network event.

A discontinuity may occur in the value when the value of object
rpPtrMonitorPortLastChange changes."

::= { rpPtrMonitorPortEntry 15 }

rpPtrMonitorPortLastChange OBJECT-TYPE

SYNTAX TimeStamp

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The value of sysUpTime when the last of

the following occurred:

- 1) the agent cold- or warm-started;
- 2) the row for the port was created
(such as when a device or module was added
to the repeater system); or
- 3) any condition that would cause one of
the counters for the row to experience
a discontinuity."

::= { rpPtrMonitorPortEntry 16 }

rpPtrMonitor100PortTable OBJECT-TYPE

SYNTAX SEQUENCE OF RpPtrMonitor100PortEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"Table of additional performance and error statistics for 100 Mb/s ports, above and beyond those parameters that apply to both 10 and 100 Mb/s ports. Entries exist only for ports attached to 100 Mb/s repeaters.

The columnar object rpPtrMonitorPortLastChange is used to indicate possible discontinuities of counter type columnar objects in this table."

::= { rpPtrMonitorPortInfo 2 }

rpPtrMonitor100PortEntry OBJECT-TYPE

SYNTAX RpPtrMonitor100PortEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"An entry in the table, containing performance and error statistics for a single 100 Mb/s port."

INDEX { rpPtrMonitorPortGroupIndex, rpPtrMonitorPortIndex }

::= { rpPtrMonitor100PortTable 1 }

RpPtrMonitor100PortEntry ::=

SEQUENCE {

rpPtrMonitorPortIsolates

Counter32,

rpPtrMonitorPortSymbolErrors

Counter32,

rpPtrMonitorPortUpper32Octets

Counter32,

rpPtrMonitorPortHCReadableOctets

Counter64

}

rpPtrMonitorPortIsolates OBJECT-TYPE

SYNTAX Counter32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"This counter is incremented by one each time that the repeater port automatically isolates as a consequence of false carrier events. The conditions which cause a port to automatically isolate are defined by the transition from the False Carrier state to the Link Unstable state of the carrier

integrity state diagram (Figure 27-9 of IEEE Std 802.3).

Note: Isolates do not affect the value of the PortOperStatus object.

A discontinuity may occur in the value when the value of object rpPtrMonitorPortLastChange changes."

REFERENCE

"IEEE Std 802.3, 30.4.3.1.16, aIsolates."

::= { rpPtrMonitor100PortEntry 1 }

rpPtrMonitorPortSymbolErrors OBJECT-TYPE

SYNTAX Counter32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"This counter is incremented by one each time when valid length packet was received at the port and there was at least one occurrence of an invalid data symbol. This can increment only once per valid carrier event. A collision presence at any port of the repeater containing port N, will not cause this attribute to increment.

A discontinuity may occur in the value when the value of object rpPtrMonitorPortLastChange changes.

The approximate minimum time for rollover of this counter is 7.4 hours at 100 Mb/s."

REFERENCE

"IEEE Std 802.3, 30.4.3.1.17, aSymbolErrorDuringPacket."

::= { rpPtrMonitor100PortEntry 2 }

rpPtrMonitorPortUpper32Octets OBJECT-TYPE

SYNTAX Counter32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"This object is the number of octets contained in valid frames that have been received on this port, modulo 2**32. That is, it contains the upper 32 bits of a 64-bit octets counter, of which the lower 32 bits are contained in the rpPtrMonitorPortReadableOctets object.

This two-counter mechanism is provided for those network management protocols that do not support 64-bit counters (e.g. SNMP V1) and are used to manage a repeater type of 100 Mb/s.

Conformance clauses for this MIB are defined such that implementation of this object is not required in a repeater system which does not support 100 Mb/s. However, repeater systems with mixed 10 and 100 Mb/s ports may implement this object across all ports,

including 10 Mb/s. If this object is implemented, the value shall be a valid count as defined in the first paragraph of this description.

A discontinuity may occur in the value when the value of object
rptrMonitorPortLastChange changes."

::= { rptrMonitor100PortEntry 3 }

rptrMonitorPortHCReadableOctets OBJECT-TYPE

SYNTAX Counter64

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"This object is the number of octets contained in valid frames that have been received on this port. This counter is incremented by OctetCount for each frame received on this port which has been determined to be a readable frame (i.e., including FCS octets but excluding framing bits and dribble bits).

This statistic provides an indicator of the total data transferred.

This counter is a 64-bit version of rptrMonitorPortReadableOctets. It should be used by network management protocols which support 64-bit counters (e.g., SNMPv2).

Conformance clauses for this MIB are defined such that implementation of this object is not required in a repeater system which does not support 100 Mb/s. However, repeater systems with mixed 10 and 100 Mb/s ports may implement this object across all ports, including 10 Mb/s. If this object is implemented, the value shall be a valid count as defined in the first paragraph of this description.

A discontinuity may occur in the value when the value of object
rptrMonitorPortLastChange changes."

REFERENCE

"IEEE Std 802.3, 30.4.3.1.5, aReadableOctets."

::= { rptrMonitor100PortEntry 4 }

-- New version of statistics at the repeater level.

-- Statistics objects for each managed repeater
-- in the repeater system.

rptrMonTable OBJECT-TYPE

SYNTAX SEQUENCE OF RptrMonEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"A table of information about each non-trivial repeater. The number of entries

in this table is the same as the number of entries in the rptrInfoTable.

The columnar object rptrInfoLastChange is used to indicate possible discontinuities of counter type columnar objects in this table."

::= { rptrMonitorAllRptrInfo 1 }

rptrMonEntry OBJECT-TYPE

SYNTAX RptrMonEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"An entry in the table, containing information about a single non-trivial repeater."

INDEX { rptrInfoId }

::= { rptrMonTable 1 }

RptrMonEntry ::=

SEQUENCE {

rptrMonTxCollisions

Counter32,

rptrMonTotalFrames

Counter32,

rptrMonTotalErrors

Counter32,

rptrMonTotalOctets

Counter32

}

rptrMonTxCollisions OBJECT-TYPE

SYNTAX Counter32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"For a Clause 9 (10 Mb/s) repeater, this counter is incremented every time the repeater state machine enters the TRANSMIT COLLISION state from any state other than ONE PORT LEFT (see Figure 9-2 IEEE Std 802.3).

For a Clause 27 repeater, this counter is incremented every time the repeater core state diagram enters the Jam state as a result of Activity(ALL) > 1 (see Figure 27-2 IEEE Std 802.3).

The approximate minimum time for rollover of this counter is 16 hours in a 10 Mb/s repeater and 1.6 hours in a 100 Mb/s repeater."

REFERENCE

"IEEE Std 802.3, 30.4.1.1.8, aTransmitCollisions"

::= { rptrMonEntry 1 }

rptrMonTotalFrames OBJECT-TYPE

SYNTAX Counter32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The number of frames of valid frame length

that have been received on the ports in this repeater and for which the FCSError and CollisionEvent signals were not asserted. If an implementation can not obtain a count of frames as seen by the repeater itself, this counter may be implemented as the summation of the values of the rptrMonitorPortReadableFrames counters for all of the ports in the repeater.

This statistic provides one of the parameters necessary for obtaining the packet error ratio. The approximate minimum time for rollover of this counter is 80 hours in a 10 Mb/s repeater."

::= { rptrMonEntry 3 }

rptrMonTotalErrors OBJECT-TYPE

SYNTAX Counter32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The total number of errors which have occurred on all of the ports in this repeater. The errors included in this count are the same as those listed for the rptrMonitorPortTotalErrors counter. If an implementation can not obtain a count of these errors as seen by the repeater itself, this counter may be implemented as the summation of the values of the rptrMonitorPortTotalErrors counters for all of the ports in the repeater."

::= { rptrMonEntry 4 }

rptrMonTotalOctets OBJECT-TYPE

SYNTAX Counter32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The total number of octets contained in the valid frames that have been received on the ports in this group. If an implementation can not obtain a count of octets as seen by the repeater itself, this counter may be the summation of the values of the rptrMonitorPortReadableOctets counters for all of the ports in the group.

This statistic provides an indicator of the total data transferred. The approximate minimum time for rollover of this counter in a 10 Mb/s repeater is 58 minutes divided by the number of ports in the repeater.

For 100 Mb/s repeaters processing traffic at a maximum rate, this counter can roll over in less than 6 minutes divided by the number of ports in the repeater. Since that amount of time could be less than a management station's poll cycle time, in order to avoid a loss of information a management station is advised to also poll the rptrMonUpper32TotalOctets object, or to use the 64-bit counter defined by rptrMonHCTotalOctets

instead of the two 32-bit counters."
 ::= { rpPtrMonEntry 5 }

rpPtrMon100Table OBJECT-TYPE
 SYNTAX SEQUENCE OF RpPtrMon100Entry
 MAX-ACCESS not-accessible
 STATUS current
 DESCRIPTION
 "A table of additional information about each
 100 Mb/s repeater, augmenting the entries in
 the rpPtrMonTable. Entries exist in this table
 only for 100 Mb/s repeaters.

 The columnar object rpPtrInfoLastChange is
 used to indicate possible discontinuities of
 counter type columnar objects in this table."
 ::= { rpPtrMonitorAllRpPtrInfo 2 }

rpPtrMon100Entry OBJECT-TYPE
 SYNTAX RpPtrMon100Entry
 MAX-ACCESS not-accessible
 STATUS current
 DESCRIPTION
 "An entry in the table, containing information
 about a single 100 Mb/s repeater."
 INDEX { rpPtrInfoId }
 ::= { rpPtrMon100Table 1 }

RpPtrMon100Entry ::=
 SEQUENCE {
 rpPtrMonUpper32TotalOctets
 Counter32,
 rpPtrMonHCTotalOctets
 Counter64
 }

rpPtrMonUpper32TotalOctets OBJECT-TYPE
 SYNTAX Counter32
 MAX-ACCESS read-only
 STATUS current
 DESCRIPTION
 "The total number of octets contained in the valid
 frames that have been received on the ports in
 this repeater, modulo 2^{32} . That is, it contains
 the upper 32 bits of a 64-bit counter, of which
 the lower 32 bits are contained in the
 rpPtrMonTotalOctets object. If an implementation
 can not obtain a count of octets as seen
 by the repeater itself, the 64-bit value
 may be the summation of the values of the
 rpPtrMonitorPortReadableOctets counters combined
 with the corresponding rpPtrMonitorPortUpper32Octets
 counters for all of the ports in the repeater.

This statistic provides an indicator of the total
 data transferred within the repeater.

This two-counter mechanism is provided for those
 network management protocols that do not support

64-bit counters (e.g., SNMP v1) and are used to manage a repeater type of 100 Mb/s.

Conformance clauses for this MIB are defined such that implementation of this object is not required in a repeater system which does not support 100 Mb/s. However, repeater systems with mixed 10 and 100 Mb/s ports may implement this object across all ports, including 10 Mb/s. If this object is implemented, the value shall be a valid count as defined in the first paragraph of this description."

```
::= { rpPtrMon100Entry 1 }
```

rpPtrMonHCTotalOctets OBJECT-TYPE

SYNTAX Counter64

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The total number of octets contained in the valid frames that have been received on the ports in this group. If a implementation can not obtain a count of octets as seen by the repeater itself, this counter may be the summation of the values of the rpPtrMonitorPortReadableOctets counters for all of the ports in the group.

This statistic provides an indicator of the total data transferred.

This counter is a 64-bit (high-capacity) version of rpPtrMonUpper32TotalOctets and rpPtrMonTotalOctets. It should be used by network management protocols which support 64-bit counters (e.g. SNMPv2).

Conformance clauses for this MIB are defined such that implementation of this object is not required in a repeater system which does not support 100 Mb/s. However, repeater systems with mixed 10 and 100 Mb/s ports may implement this object across all ports, including 10 Mb/s. If this object is implemented, the value shall be a valid count as defined in the first paragraph of this description."

```
::= { rpPtrMon100Entry 2 }
```

```
--
```

```
-- The Repeater Address Search Table
```

```
--
```

```
-- This table provides an active address tracking
-- capability which can be also used to collect the
-- necessary information for mapping the topology
-- of a network. Note that an NMS is required to have
-- read-write access to the table in order to access
-- this function. Section 4 "Topology Mapping" of
-- IETF RFC 2108 [B20] contains a description of an
-- algorithm that can make use of this table,
-- in combination with the forwarding databases
-- of managed bridges/switches in the network,
-- to map network topology. Devices may also
```

```
-- use the protocol and a set of managed
-- objects defined in IEEE Std 802.1AB Station
-- and Media Access Control Connectivity
-- Discovery to discover the physical topology
-- from adjacent stations.
--
```

rptrAddrSearchTable OBJECT-TYPE

```
SYNTAX      SEQUENCE OF RptrAddrSearchEntry
MAX-ACCESS  not-accessible
STATUS      current
DESCRIPTION
```

"This table contains one entry per repeater in the repeater system. It defines objects that allow a network management application to instruct an agent to watch for a given MAC address and report which port it was seen on. Only one address search can be in progress on each repeater at any one time. Before starting an address search, a management application should obtain 'ownership' of the entry in rptrAddrSearchTable for the repeater that is to perform the search. This is accomplished with the rptrAddrSearchLock and rptrAddrSearchStatus as follows:

```
try_again:
    get(rpTrAddrSearchLock, rpTrAddrSearchStatus)
    while (rpTrAddrSearchStatus != notInUse)
    {
        /* Loop waiting for objects to be available*/
        short delay
        get(rpTrAddrSearchLock, rpTrAddrSearchStatus)
    }

    /* Try to claim map objects */
    lock_value = rpTrAddrSearchLock
    if ( set(rpTrAddrSearchLock = lock_value,
            rpTrAddrSearchStatus = inUse,
            rpTrAddrSearchOwner = 'my-IP-address')
        == FAILURE)
        /* Another manager got the lock */
        goto try_again

    /* I have the lock */
    set (rpTrAddrSearchAddress = <search target>)

    wait for rpTrAddrSearchState to change from none

    if (rpTrAddrSearchState == single)
        get (rpTrAddrSearchGroup, rpTrAddrSearchPort)
    /* release the lock, making sure not to overwrite
       anyone else's lock */
    set (rpTrAddrSearchLock = lock_value+1,
        rpTrAddrSearchStatus = notInUse,
        rpTrAddrSearchOwner = '')
```

A management station first retrieves the values of the appropriate instances of the rptrAddrSearchLock and rptrAddrSearchStatus objects, periodically

repeating the retrieval if necessary, until the value of `rpPtrAddrSearchStatus` is 'notInUse'. The management station then tries to set the same instance of the `rpPtrAddrSearchLock` object to the value it just retrieved, the same instance of the `rpPtrAddrSearchStatus` object to 'inUse', and the corresponding instance of `rpPtrAddrSearchOwner` to a value indicating itself. If the set operation succeeds, then the management station has obtained ownership of the `rpPtrAddrSearchEntry`, and the value of `rpPtrAddrSearchLock` is incremented by the agent (as per the semantics of `TestAndIncr`). Failure of the set operation indicates that some other manager has obtained ownership of the `rpPtrAddrSearchEntry`.

Once ownership is obtained, the management station can proceed with the search operation. Note that the agent will reset `rpPtrAddrSearchStatus` to 'notInUse' if it has been in the 'inUse' state for an abnormally long period of time, to prevent a misbehaving manager from permanently locking the entry. It is suggested that this timeout period be between one and five minutes.

When the management station has completed its search operation, it should free the entry by setting the instance of the `rpPtrAddrSearchLock` object to the previous value + 1, the instance of the `rpPtrAddrSearchStatus` to 'notInUse', and the instance of `rpPtrAddrSearchOwner` to a zero length string. This is done to prevent overwriting another station's lock."

```
::= { rpPtrAddrTrackRpPtrInfo 1 }
```

```
rpPtrAddrSearchEntry OBJECT-TYPE
    SYNTAX      RpPtrAddrSearchEntry
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
```

```
    "An entry containing objects for invoking an address
    search on a repeater."
```

```
    INDEX      { rpPtrInfoId }
    ::= { rpPtrAddrSearchTable 1 }
```

```
RpPtrAddrSearchEntry ::=
```

```
    SEQUENCE {
        rpPtrAddrSearchLock      TestAndIncr,
        rpPtrAddrSearchStatus    INTEGER,
        rpPtrAddrSearchAddress   MacAddress,
        rpPtrAddrSearchState     INTEGER,
        rpPtrAddrSearchGroup     Integer32,
        rpPtrAddrSearchPort      Integer32,
        rpPtrAddrSearchOwner     OwnerString
    }
```

```
rpPtrAddrSearchLock OBJECT-TYPE
```

```
    SYNTAX      TestAndIncr
    MAX-ACCESS  read-write
```

```

STATUS      current
DESCRIPTION
    "This object is used by a management station as an
    advisory lock for this rptrAddrSearchEntry."
 ::= { rptrAddrSearchEntry 1 }

```

rptrAddrSearchStatus OBJECT-TYPE

```

SYNTAX      INTEGER {
                notInUse(1),
                inUse(2)
            }

```

MAX-ACCESS read-write

STATUS current

DESCRIPTION

"This object is used to indicate that some management station is currently using this rptrAddrSearchEntry. Cooperating managers should set this object to 'notInUse' when they are finished using this entry. The agent will automatically set the value of this object to 'notInUse' if it has been set to 'inUse' for an unusually long period of time."

```
 ::= { rptrAddrSearchEntry 2 }

```

rptrAddrSearchAddress OBJECT-TYPE

```

SYNTAX      MacAddress

```

MAX-ACCESS read-write

STATUS current

DESCRIPTION

"This object is used to search for a specified MAC address. When this object is set, an address search begins. This automatically sets the corresponding instance of the rptrAddrSearchState object to 'none' and the corresponding instances of the rptrAddrSearchGroup and rptrAddrSearchPort objects to 0.

When a valid frame is received by this repeater with a source MAC address that matches the current value of rptrAddrSearchAddress, the agent will update the corresponding instances of rptrAddrSearchState, rptrAddrSearchGroup and rptrAddrSearchPort to reflect the current status of the search, and the group and port on which the frame was seen."

```
 ::= { rptrAddrSearchEntry 3 }

```

rptrAddrSearchState OBJECT-TYPE

```

SYNTAX      INTEGER {
                none(1),
                single(2),
                multiple(3)
            }

```

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The current state of the MAC address search on this repeater. This object is initialized to 'none' when the corresponding instance of rptrAddrSearchAddress is set. If the agent detects the address on exactly one port, it will set this object to 'single', and

```

        set the corresponding instances of
        rptrAddrSearchGroup and rptrAddrSearchPort to reflect
        the group and port on which the address was heard.
        If the agent detects the address on more than one
        port, it will set this object to 'multiple'."
 ::= { rptrAddrSearchEntry 4 }

```

rptrAddrSearchGroup OBJECT-TYPE

```

SYNTAX      Integer32 (0..2147483647)
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION
    "The group from which an error-free frame whose
    source address is equal to the corresponding instance
    of rptrAddrSearchAddress has been received. The
    value of this object is undefined when the
    corresponding instance of rptrAddrSearchState is
    equal to 'none' or 'multiple'."
 ::= { rptrAddrSearchEntry 5 }

```

rptrAddrSearchPort OBJECT-TYPE

```

SYNTAX      Integer32 (0..2147483647)
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION
    "The port from which an error-free frame whose
    source address is equal to the corresponding instance
    of rptrAddrSearchAddress has been received. The
    value of this object is undefined when the
    corresponding instance of rptrAddrSearchState is
    equal to 'none' or 'multiple'."
 ::= { rptrAddrSearchEntry 6 }

```

rptrAddrSearchOwner OBJECT-TYPE

```

SYNTAX      OwnerString
MAX-ACCESS  read-write
STATUS      current
DESCRIPTION
    "The entity that currently has 'ownership' of this
    rptrAddrSearchEntry."
 ::= { rptrAddrSearchEntry 7 }

```

```

--
-- The Port Address Tracking Table
--
-- This table provides a way for a network management
-- application to passively gather information (using
-- read-only privileges) about which network addresses
-- are connected to which ports of a repeater.
--

```

rptrAddrTrackTable OBJECT-TYPE

```

SYNTAX      SEQUENCE OF RptrAddrTrackEntry
MAX-ACCESS  not-accessible
STATUS      current
DESCRIPTION
    "Table of address mapping information about the
    ports."

```

```
::= { rptrAddrTrackPortInfo 1 }
```

```
rptrAddrTrackEntry OBJECT-TYPE
```

```
SYNTAX      RptrAddrTrackEntry
```

```
MAX-ACCESS  not-accessible
```

```
STATUS      current
```

```
DESCRIPTION
```

```
"An entry in the table, containing address mapping
information about a single port."
```

```
INDEX       { rptrAddrTrackGroupIndex, rptrAddrTrackPortIndex }
```

```
::= { rptrAddrTrackTable 1 }
```

```
RptrAddrTrackEntry ::=
```

```
SEQUENCE {
```

```
    rptrAddrTrackGroupIndex
```

```
        INTEGER,
```

```
    rptrAddrTrackPortIndex
```

```
        INTEGER,
```

```
    rptrAddrTrackSourceAddrChanges
```

```
        Counter32,
```

```
    rptrAddrTrackNewLastSrcAddress
```

```
        OptMacAddr,
```

```
    rptrAddrTrackCapacity
```

```
        Integer32
```

```
}
```

```
rptrAddrTrackGroupIndex OBJECT-TYPE
```

```
SYNTAX      Integer32 (1..2147483647)
```

```
MAX-ACCESS  not-accessible
```

```
STATUS      current
```

```
DESCRIPTION
```

```
"This object identifies the group containing the
port for which this entry contains information."
```

```
::= { rptrAddrTrackEntry 1 }
```

```
rptrAddrTrackPortIndex OBJECT-TYPE
```

```
SYNTAX      Integer32 (1..2147483647)
```

```
MAX-ACCESS  not-accessible
```

```
STATUS      current
```

```
DESCRIPTION
```

```
"This object identifies the port within the group
for which this entry contains information."
```

```
REFERENCE
```

```
"IEEE Std 802.3, 30.4.3.1.1, aPortID."
```

```
::= { rptrAddrTrackEntry 2 }
```

```
rptrAddrTrackSourceAddrChanges OBJECT-TYPE
```

```
SYNTAX      Counter32
```

```
MAX-ACCESS  read-only
```

```
STATUS      current
```

```
DESCRIPTION
```

```
"This counter is incremented by one for each time
that the rptrAddrTrackNewLastSrcAddress attribute
for this port has changed."
```

This may indicate whether a link is connected to a single DTE or another multi-user segment.

A discontinuity may occur in the value when the

value of object rpTrMonitorPortLastChange changes.

The approximate minimum time for rollover of this counter is 81 hours in a 10 Mb/s repeater."

REFERENCE

"IEEE Std 802.3, 30.4.3.1.19, aSourceAddressChanges."

::= { rpTrAddrTrackEntry 3 }

rpTrAddrTrackNewLastSrcAddress OBJECT-TYPE

SYNTAX OptMacAddr

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"This object is the SourceAddress of the last readable frame (i.e., counted by rpTrMonitorPortReadableFrames) received by this port. If no frames have been received by this port since the agent began monitoring the port activity, the agent shall return a string of length zero."

REFERENCE

"IEEE Std 802.3, 30.4.3.1.18, aLastSourceAddress."

::= { rpTrAddrTrackEntry 4 }

rpTrAddrTrackCapacity OBJECT-TYPE

SYNTAX Integer32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The maximum number of addresses that can be detected on this port. This value indicates to the maximum number of entries in the rpTrExtAddrTrackTable relative to this port."

If this object has the value of 1, the agent implements only the LastSourceAddress mechanism described by IETF RFC 1368 or IETF RFC 1516."

::= { rpTrAddrTrackEntry 5 }

-- Table for multiple addresses per port

rpTrExtAddrTrackTable OBJECT-TYPE

SYNTAX SEQUENCE OF RptrExtAddrTrackEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"A table to extend the address tracking table (i.e., rpTrAddrTrackTable) with a list of source MAC addresses that were recently received on each port. The number of ports is the same as the number of entries in table rpTrPortTable. The number of entries in this table depends on the agent/repeater implementation and the number of different addresses received on each port."

The first entry for each port contains the same MAC address that is given by the rpTrAddrTrackNewLastSrcAddress for that port."

Entries in this table for a particular port are retained when that port is switched from one repeater to another.

The ordering of MAC addresses listed for a particular port is implementation dependent."

::= { rptrAddrTrackPortInfo 2 }

rptrExtAddrTrackEntry OBJECT-TYPE

SYNTAX RptrExtAddrTrackEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"A row in the table of extended address tracking information for ports. Entries cannot be directly created or deleted via SNMP operations."

INDEX { rptrAddrTrackGroupIndex,
rptrAddrTrackPortIndex,
rptrExtAddrTrackMacIndex }

::= { rptrExtAddrTrackTable 1 }

RptrExtAddrTrackEntry ::= SEQUENCE {

rptrExtAddrTrackMacIndex Integer32,

rptrExtAddrTrackSourceAddress MacAddress

}

rptrExtAddrTrackMacIndex OBJECT-TYPE

SYNTAX Integer32 (1..2147483647)

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"The index of a source MAC address seen on the port.

The ordering of MAC addresses listed for a particular port is implementation dependent.

There is no implied relationship between a particular index and a particular MAC address. The index for a particular MAC address may change without notice."

::= { rptrExtAddrTrackEntry 1 }

rptrExtAddrTrackSourceAddress OBJECT-TYPE

SYNTAX MacAddress

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The source MAC address from a readable frame (i.e., counted by rptrMonitorPortReadableFrames) recently received by the port."

REFERENCE

"IEEE Std 802.3, 30.4.3.1.18, aLastSourceAddress."

::= { rptrExtAddrTrackEntry 2 }

-- The Repeater Top "N" Port Group

-- The Repeater Top N Port group is used to prepare reports that


```

-- describe a list of ports ordered by one of the statistics in the
-- Repeater Monitor Port Table. The statistic chosen by the
-- management station is sampled over a management
-- station-specified time interval, making the report rate based.
-- The management station also specifies the number of ports that
-- are reported.
--
-- The rpPtrTopNPortControlTable is used to initiate the generation
-- of a report. The management station may select the parameters
-- of such a report, such as which repeater, which statistic, how
-- many ports, and the start and stop times of the sampling. When
-- the report is prepared, entries are created in the
-- rpPtrTopNPortTable associated with the relevant
-- rpPtrTopNControlEntry. These entries are static for
-- each report after it has been prepared.

-- Note that counter discontinuities may appear in some
-- implementations if ports' assignment to repeaters changes
-- during the collection of data for a Top "N" report.
-- A management application could read the corresponding
-- rpPtrMonitorPortLastChange timestamp in order to check
-- whether a discontinuity occurred.

```

rpPtrTopNPortControlTable OBJECT-TYPE

SYNTAX SEQUENCE OF RptrTopNPortControlEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"A table of control records for reports on the top 'N' ports for the rate of a selected counter. The number of entries depends on the configuration of the agent. The maximum number of entries is implementation dependent."

::= { rpPtrTopNPortInfo 1 }

rpPtrTopNPortControlEntry OBJECT-TYPE

SYNTAX RptrTopNPortControlEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"A set of parameters that control the creation of a report of the top N ports according to several metrics."

INDEX { rpPtrTopNPortControlIndex }

::= { rpPtrTopNPortControlTable 1 }

RptrTopNPortControlEntry ::= SEQUENCE {

rpPtrTopNPortControlIndex

Integer32,

rpPtrTopNPortRepeaterId

Integer32,

rpPtrTopNPortRateBase

INTEGER,

rpPtrTopNPortTimeRemaining

Integer32,

rpPtrTopNPortDuration

Integer32,

rpPtrTopNPortRequestedSize

Integer32,

```

    rpPtrTopNPortGrantedSize
        Integer32,
    rpPtrTopNPortStartTime
        TimeStamp,
    rpPtrTopNPortOwner
        OwnerString,
    rpPtrTopNPortRowStatus
        RowStatus
}

```

```

rpPtrTopNPortControlIndex OBJECT-TYPE
    SYNTAX      Integer32 (1 .. 65535)
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "An index that uniquely identifies an entry in the
        rpPtrTopNPortControl table. Each such entry defines
        one top N report prepared for a repeater or repeater system."
    ::= { rpPtrTopNPortControlEntry 1 }

```

```

rpPtrTopNPortRepeaterId OBJECT-TYPE
    SYNTAX      Integer32 (0..2147483647)
    MAX-ACCESS  read-create
    STATUS      current
    DESCRIPTION
        "Identifies the repeater for which a top N report will
        be prepared (see rpPtrInfoId). If the value of this
        object is positive, only ports assigned to this repeater
        will be used to form the list in which to order the
        Top N table. If this value is zero, all ports will be
        eligible for inclusion on the list.

        The value of this object may not be modified if the
        associated rpPtrTopNPortRowStatus object is equal to
        active(1).
        If, for a particular row in this table, the repeater
        specified by the value of this object goes away (is
        removed from the rpPtrInfoTable) while the associated
        rpPtrTopNPortRowStatus object is equal to active(1),
        the row in this table is preserved by the agent but
        the value of rpPtrTopNPortRowStatus is changed to
        notInService(2), and the agent may time out the row
        if appropriate. If the specified repeater comes
        back (reappears in the rpPtrInfoTable) before the row
        has been timed out, the management station sets
        the value of the rpPtrTopNPortRowStatus object back
        to active(1) if desired (the agent doesn't do this
        automatically)."
    ::= { rpPtrTopNPortControlEntry 2 }

```

```

rpPtrTopNPortRateBase OBJECT-TYPE
    SYNTAX      INTEGER {
        readableFrames(1),
        readableOctets(2),
        fcsErrors(3),
        alignmentErrors(4),
        frameTooLongs(5),
        shortEvents(6),
        runts(7),
    }

```

```

        collisions(8),
        lateEvents(9),
        veryLongEvents(10),
        dataRateMismatches(11),
        autoPartitions(12),
        totalErrors(13),
        isolates(14),
        symbolErrors(15)
    }
MAX-ACCESS read-create
STATUS current
DESCRIPTION
    "The monitored variable, which the rptrTopNPortRate
    variable is based upon.

    The value of this object may not be modified if
    the associated rptrTopNPortRowStatus object has
    a value of active(1)."
```

::= { rptrTopNPortControlEntry 3 }

rptrTopNPortTimeRemaining OBJECT-TYPE

```

SYNTAX      Integer32 (0..2147483647)
MAX-ACCESS  read-create
STATUS      current
DESCRIPTION
    "The number of seconds left in the report
    currently being collected. When this object
    is modified by the management station, a new
    collection is started, possibly aborting a
    currently running report. The new value is
    used as the requested duration of this report,
    which is loaded into the associated
    rptrTopNPortDuration object.

    When this object is set to a non-zero value,
    any associated rptrTopNPortEntries shall be
    made inaccessible by the agent. While the value
    of this object is non-zero, it decrements by one
    per second until it reaches zero. During this
    time, all associated rptrTopNPortEntries shall
    remain inaccessible. At the time that this object
    decrements to zero, the report is made accessible
    in the rptrTopNPortTable. Thus, the rptrTopNPort
    table needs to be created only at the end of the
    collection interval.

    If the value of this object is set to zero
    while the associated report is running, the
    running report is aborted and no associated
    rptrTopNPortEntries are created."
```

DEFVAL { 0 }

::= { rptrTopNPortControlEntry 4 }

rptrTopNPortDuration OBJECT-TYPE

```

SYNTAX      Integer32 (0..2147483647)
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION
    "The number of seconds that this report has
```

collected during the last sampling interval, or if this report is currently being collected, the number of seconds that this report is being collected during this sampling interval.

When the associated `rpPtrTopNPortTimeRemaining` object is set, this object shall be set by the agent to the same value and shall not be modified until the next time the `rpPtrTopNPortTimeRemaining` is set.

This value shall be zero if no reports have been requested for this `rpPtrTopNPortControlEntry`."

::= { `rpPtrTopNPortControlEntry` 5 }

`rpPtrTopNPortRequestedSize` OBJECT-TYPE

SYNTAX Integer32

MAX-ACCESS read-create

STATUS current

DESCRIPTION

"The maximum number of repeater ports requested for the Top N Table.

When this object is created or modified, the agent should set `rpPtrTopNPortGrantedSize` as close to this object as is possible for the particular implementation and available resources."

DEFVAL { 10 }

::= { `rpPtrTopNPortControlEntry` 6 }

`rpPtrTopNPortGrantedSize` OBJECT-TYPE

SYNTAX Integer32 (0..65535)

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The maximum number of repeater ports in the top N table.

When the associated `rpPtrTopNPortRequestedSize` object is created or modified, the agent should set this object as closely to the requested value as is possible for the particular implementation and available resources. The agent shall not lower this value except as a result of a set to the associated `rpPtrTopNPortRequestedSize` object."

::= { `rpPtrTopNPortControlEntry` 7 }

`rpPtrTopNPortStartTime` OBJECT-TYPE

SYNTAX TimeStamp

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The value of `sysUpTime` when this top N report was last started. In other words, this is the time that the associated `rpPtrTopNPortTimeRemaining` object was modified to start the requested report.

If the report has not yet been started, the value of this object is zero."

::= { `rpPtrTopNPortControlEntry` 8 }

rpPtrTopNPortOwner OBJECT-TYPE

SYNTAX OwnerString

MAX-ACCESS read-create

STATUS current

DESCRIPTION

"The entity that configured this entry and is using the resources assigned to it."

::= { rpPtrTopNPortControlEntry 9 }

rpPtrTopNPortRowStatus OBJECT-TYPE

SYNTAX RowStatus

MAX-ACCESS read-create

STATUS current

DESCRIPTION

"The status of this row.

If the value of this object is not equal to active(1), all associated entries in the rpPtrTopNPortTable shall be deleted by the agent."

::= { rpPtrTopNPortControlEntry 10 }

-- Top "N" reports

rpPtrTopNPortTable OBJECT-TYPE

SYNTAX SEQUENCE OF RpPtrTopNPortEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"A table of reports for the top 'N' ports based on setting of associated control table entries. The maximum number of entries depends on the number of entries in table rpPtrTopNPortControlTable and the value of object rpPtrTopNPortGrantedSize for each entry:

For each entry in the rpPtrTopNPortControlTable, repeater ports with the highest value of rpPtrTopNPortRate shall be placed in this table in decreasing order of that rate until there is no more room or until there are no more ports."

::= { rpPtrTopNPortInfo 2 }

rpPtrTopNPortEntry OBJECT-TYPE

SYNTAX RpPtrTopNPortEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"A set of statistics for a repeater port that is part of a top N report."

INDEX { rpPtrTopNPortControlIndex,
rpPtrTopNPortIndex }

::= { rpPtrTopNPortTable 1 }

RpPtrTopNPortEntry ::= SEQUENCE {

rpPtrTopNPortIndex

Integer32,

```

    rptrTopNPortGroupIndex
        Integer32,
    rptrTopNPortPortIndex
        Integer32,
    rptrTopNPortRate
        Gauge32
}

```

rptrTopNPortIndex OBJECT-TYPE

SYNTAX Integer32 (1..65535)

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"An index that uniquely identifies an entry in the rptrTopNPort table among those in the same report. This index is between 1 and N, where N is the number of entries in this report. Increasing values of rptrTopNPortIndex shall be assigned to entries with decreasing values of rptrTopNPortRate until index N is assigned to the entry with the lowest value of rptrTopNPortRate or there are no more rptrTopNPortEntries.

No ports are included in a report where their value of rptrTopNPortRate would be zero."

::= { rptrTopNPortEntry 1 }

rptrTopNPortGroupIndex OBJECT-TYPE

SYNTAX Integer32 (1..2147483647)

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"This object identifies the group containing the port for this entry. (See also object type rptrGroupIndex.)"

::= { rptrTopNPortEntry 2 }

rptrTopNPortPortIndex OBJECT-TYPE

SYNTAX Integer32 (1..2147483647)

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The index of the repeater port.
(See object type rptrPortIndex.)"

::= { rptrTopNPortEntry 3 }

rptrTopNPortRate OBJECT-TYPE

SYNTAX Gauge32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The amount of change in the selected variable during this sampling interval for the identified port. The selected variable is that port's instance of the object selected by rptrTopNPortRateBase."

::= { rptrTopNPortEntry 4 }

```
-- Notifications for use by Repeaters
-- Notifications for repeaters in a multiple-repeater implementation.
-- An implementation may send either the single-repeater OR
-- multiple-repeater version of these notifications (1 or 4; 2 or 5)
-- but not both.
```

```
ieee8023snmpDot3RptrNotifications OBJECT IDENTIFIER
    ::= { ieee8023snmpDot3RptrMgt 0 }
```

```
rpPtrInfoHealth NOTIFICATION-TYPE
```

```
    OBJECTS      { rpPtrInfoOperStatus }
```

```
    STATUS       current
```

```
    DESCRIPTION
```

"In a repeater system containing multiple managed repeaters, the rpPtrInfoHealth notification conveys information related to the operational status of a repeater. It is sent either when the value of rpPtrInfoOperStatus changes, or upon completion of a non-disruptive test.

The agent shall limit the generation of consecutive rpPtrInfoHealth notifications for the same repeater so that there is at least a five-second gap between notifications of this type. When notifications are throttled, they are dropped, not queued for sending at a future time. (Note that 'generating' a notification means sending to all configured recipients.)

```
    REFERENCE
```

"IEEE Std 802.3, 30.4.1.3.1, nRepeaterHealth notification."

```
    ::= { ieee8023snmpDot3RptrNotifications 4 }
```

```
rpPtrInfoResetEvent NOTIFICATION-TYPE
```

```
    OBJECTS      { rpPtrInfoOperStatus }
```

```
    STATUS       current
```

```
    DESCRIPTION
```

"In a repeater system containing multiple managed repeaters, the rpPtrInfoResetEvent notification conveys information related to the operational status of a repeater. This notification is sent on completion of a repeater reset action. A repeater reset action is defined as a transition to the START state of Figure 9-2 in Clause 9 of IEEE Std 802.3, when triggered by a management command (e.g., an SNMP Set on the rpPtrInfoReset object).

The agent shall limit the generation of consecutive rpPtrInfoResetEvent notifications for a single repeater so that there is at least a five-second gap between notifications of this type. When notifications are throttled, they are dropped, not queued for sending at a future time. (Note that 'generating' a notification means sending to all configured recipients.)

The rpPtrInfoResetEvent is not sent when the

agent restarts and sends an SNMP coldStart or warmStart trap. However, it is recommended that a repeater agent send the rptrInfoOperStatus object as an optional object with its coldStart and warmStart trap PDUs."

REFERENCE

"IEEE Std 802.3, 30.4.1.3.2, nRepeaterReset notification."

::= { ieee8023snmpDot3RptrNotifications 5 }

-- Conformance statements

snmpRptrModConf

OBJECT IDENTIFIER ::= { ieee8023snmpRptrMIB 2 }

snmpRptrModCompls

OBJECT IDENTIFIER ::= { snmpRptrModConf 1 }

snmpRptrModObjGrps

OBJECT IDENTIFIER ::= { snmpRptrModConf 2 }

snmpRptrModNotGrps

OBJECT IDENTIFIER ::= { snmpRptrModConf 3 }

-- Object groups

snmpRptrGrpBasic OBJECT-GROUP

OBJECTS { rptrGroupObjectID,
rptrGroupOperStatus,
rptrGroupPortCapacity,
rptrPortAdminStatus,
rptrPortAutoPartitionState,
rptrPortOperStatus,
rptrPortRptrId,
rptrInfoRptrType,
rptrInfoOperStatus,
rptrInfoReset,
rptrInfoPartitionedPorts,
rptrInfoLastChange }

STATUS current

DESCRIPTION

"Basic group for a repeater system with one or more repeater-units in multisegment (post-RFC 1516) version of the MIB module."

::= { snmpRptrModObjGrps 1 }

snmpRptrGrpMonitor OBJECT-GROUP

OBJECTS { rptrMonitorPortReadableFrames,
rptrMonitorPortReadableOctets,
rptrMonitorPortFCSErrors,
rptrMonitorPortAlignmentErrors,
rptrMonitorPortFrameTooLongs,
rptrMonitorPortShortEvents,
rptrMonitorPortRunts,
rptrMonitorPortCollisions,
rptrMonitorPortLateEvents,
rptrMonitorPortVeryLongEvents,
rptrMonitorPortDataRateMismatches,
rptrMonitorPortAutoPartitions,
rptrMonitorPortTotalErrors,


```

        rptrMonitorPortLastChange,

        rptrMonTxCollisions,
        rptrMonTotalFrames,
        rptrMonTotalErrors,
        rptrMonTotalOctets }
STATUS      current
DESCRIPTION
    "Monitor group for a repeater system with one or more
    repeater-units in multisegment (post-RFC 1516)
    version of the MIB module."
 ::= { snmpRptrModObjGrps 2 }

snmpRptrGrpMonitor100 OBJECT-GROUP
OBJECTS      { rptrMonitorPortIsolates,
               rptrMonitorPortSymbolErrors,
               rptrMonitorPortUpper32Octets,

               rptrMonUpper32TotalOctets }
STATUS      current
DESCRIPTION
    "Monitor group for 100 Mb/s ports and repeaters
    in a repeater system with one or more repeater-units in
    multisegment (post-RFC 1516) version of the MIB
    module. Repeater systems which support Counter64 should
    also implement snmpRptrGrpMonitor100w64."
 ::= { snmpRptrModObjGrps 3 }

snmpRptrGrpMonitor100w64 OBJECT-GROUP
OBJECTS      { rptrMonitorPortHCReadableOctets,
               rptrMonHCTotalOctets }
STATUS      current
DESCRIPTION
    "Monitor group for 100 Mb/s ports and repeaters in a
    repeater system with one or more repeater-units and support
    for Counter64."
 ::= { snmpRptrModObjGrps 4 }

snmpRptrGrpAddrTrack OBJECT-GROUP
OBJECTS      { rptrAddrTrackSourceAddrChanges,
               rptrAddrTrackNewLastSrcAddress,
               rptrAddrTrackCapacity }
STATUS      current
DESCRIPTION
    "Passive address tracking group for post-RFC 1516
    version of the MIB module."
 ::= { snmpRptrModObjGrps 5 }

snmpRptrGrpExtAddrTrack OBJECT-GROUP
OBJECTS      { rptrExtAddrTrackSourceAddress }
STATUS      current
DESCRIPTION
    "Extended passive address tracking group for
    a repeater system with one or more repeater-units in
    post-RFC 1516 version of the MIB module."
 ::= { snmpRptrModObjGrps 6 }

snmpRptrGrpRptrAddrSearch OBJECT-GROUP
OBJECTS      { rptrAddrSearchLock,

```

```

        rptrAddrSearchStatus,
        rptrAddrSearchAddress,
        rptrAddrSearchState,
        rptrAddrSearchGroup,
        rptrAddrSearchPort,
        rptrAddrSearchOwner }
STATUS      current
DESCRIPTION
    "Active MAC address search group and topology
    mapping support for repeaters."
 ::= { snmpRptrModObjGrps 7 }

snmpRptrGrpTopNPort OBJECT-GROUP
OBJECTS     { rptrTopNPortRepeaterId,
               rptrTopNPortRateBase,
               rptrTopNPortTimeRemaining,
               rptrTopNPortDuration,
               rptrTopNPortRequestedSize,
               rptrTopNPortGrantedSize,
               rptrTopNPortStartTime,
               rptrTopNPortOwner,
               rptrTopNPortRowStatus,
               rptrTopNPortGroupIndex,
               rptrTopNPortPortIndex,
               rptrTopNPortRate }
STATUS      current
DESCRIPTION
    "Top 'N' group for repeater ports."
 ::= { snmpRptrModObjGrps 8 }

ieee8023snmpDot3RptrNotGroup NOTIFICATION-GROUP
NOTIFICATIONS { rptrInfoHealth,
                 rptrInfoResetEvent }
STATUS      current
DESCRIPTION
    "Conformance Group for repeater notifications.
    Formerly an empty group."
 ::= {snmpRptrModNotGrps 1}

-- Compliance statements

snmpRptrModCompl MODULE-COMPLIANCE
STATUS      current
DESCRIPTION
    "Compliance for the multisection version of the
    MIB module for a repeater system with one or more
    repeater-units."

MODULE -- this module
MANDATORY-GROUPS { snmpRptrGrpBasic,
                    snmpRptrGrpMonitor,
                    snmpRptrGrpAddrTrack }

GROUP snmpRptrGrpMonitor100
DESCRIPTION
    "Implementation of this group is
    mandatory for managed repeater systems that
    contain 100 Mb/s repeaters."

```

GROUP snmpRptrGrpMonitor100w64

DESCRIPTION

"Implementation of this group is mandatory for managed repeater systems that contain 100 Mb/s repeaters and that can support Counter64."

GROUP snmpRptrGrpExtAddrTrack

DESCRIPTION

"Implementation of this group is recommended for repeater systems that have the necessary instrumentation to track MAC addresses of multiple DTEs attached to a single repeater port."

GROUP snmpRptrGrpRptrAddrSearch

DESCRIPTION

"Implementation of this group is recommended for repeater systems that allow read-write access and that have the necessary instrumentation to search all incoming data streams for a particular MAC address."

GROUP snmpRptrGrpTopNPort

DESCRIPTION

"Implementation of this group is recommended for repeater systems that have the necessary resources to support TopN statistics reporting."

GROUP ieee8023snmpDot3RptrNotGroup

DESCRIPTION

"Implementation of this group is recommended for repeaters that support notifications."

::= { snmpRptrModCompls 1 }

END

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8. Ethernet data terminal equipment (DTE) power via medium dependent interface (MDI) MIB module

8.1 Introduction

This clause defines a portion of the MIB for use with SNMP. In particular, it defines a set of MIB objects to manage Power via MDI Power Sourcing Equipment (PSE).

8.2 Overview

IEEE Std 802.3 defines the hardware registers that will allow for management interfaces to be built for a DTE Power via MDI device. The MIB module defined in this clause extends the Ethernet-like interface MIB defined in Clause 10 with the management objects required for the management of the DTE Power via MDI devices and ports.

8.3 MIB structure

These MIB objects are categorized into three MIB groups.

The pethPsePortTable defines the objects used for configuring and describing the status of ports on a PSE device. Examples of PSE devices are Ethernet switches that support power Ethernet and mid-span devices.

The pethMainPseObjects MIB group defines the management objects for a managed main power source in a PSE device. Ethernet switches are one example of devices that would support these objects.

The pethNotificationControlTable includes objects that control the transmission of notifications from the agent to a management application.

8.4 Security considerations for Ethernet data terminal equipment (DTE) power via medium dependent interface (MDI) MIB module

There are a number of management objects defined in this MIB module with a MAX-ACCESS clause of read-write. Such objects may be considered sensitive or vulnerable in some network environments. The support for SET operations in a non-secure environment without proper protection can have a negative effect on network operations.

Setting the following objects to incorrect values can result in improper operation of the PSE, including the possibility that the PD does not receive power from the PSE port:

- pethPsePortAdminEnable
- pethPsePortPowerPairs
- pethPsePortPowerPriority
- pethPsePortType

Setting the following objects to incorrect values can result in an excessive number of traps being sent to network management stations:

- pethMainPseUsageThreshold
- pethNotificationControlEnable

Some of the readable objects in this MIB module (i.e., objects with a MAX-ACCESS other than not-accessible) may be considered sensitive or vulnerable in some network environments. These are as follows:

- pethPsePortPowerPairsControlAbility
- pethPsePortPowerPriority
- pethPsePortPowerClassifications

It is thus important to control GET and/or NOTIFY access to these objects and possibly to encrypt their values when sending them over the network via SNMP.

8.5 MIB module definition

An ASCII text version of the MIB definition can be found at the following URL¹⁵:

http://www.ieee802.org/3/1/public/mib_modules/20130411/802dot3dot1C8mib.txt

¹⁵Copyright release for MIB modules: Users of this standard may freely reproduce the MIB module contained in this subclause so that it can be used for its intended purpose.

IEEE8023-POWER-ETHERNET-MIB DEFINITIONS ::= BEGIN

IMPORTS

MODULE-IDENTITY, OBJECT-TYPE, Integer32,
Gauge32, Counter32, NOTIFICATION-TYPE, org
FROM SNMPv2-SMI
TruthValue
FROM SNMPv2-TC
MODULE-COMPLIANCE, OBJECT-GROUP, NOTIFICATION-GROUP
FROM SNMPv2-CONF

SnmAdminString
FROM SNMP-FRAMEWORK-MIB;

ieee8023powerEthernetMIB MODULE-IDENTITY

LAST-UPDATED "201304110000Z" -- April 11, 2013

ORGANIZATION

"IEEE 802.3 working group"

CONTACT-INFO

"WG-URL: <http://www.ieee802.org/3/index.html>

WG-EMail: STDS-802-3-MIB@LISTSERV.IEEE.ORG

Contact: Howard Frazier

Postal: 3151 Zanker Road

San Jose, CA 95134

USA

Tel: +1.408.922.8164

E-mail: hfrazier@broadcom.com"

DESCRIPTION

"The MIB module for managing Power Source Equipment
(PSE) specified in IEEE Std 802.3 Clause 33."

REVISION "201304110000Z" -- April 11, 2013

DESCRIPTION

"Revision, based on an earlier version in IEEE Std 802.3.1-2011."

REVISION "201102020000Z" -- February 2, 2011

DESCRIPTION

"Initial version, based on an earlier version published
as RFC 3621."

::= { org ieee(111) standards-association-numbers-series-standards(2)
lan-man-stds(802) ieee802dot3(3) ieee802dot3dot1mibs(1) 8 }

pethNotifications OBJECT IDENTIFIER ::= { ieee8023powerEthernetMIB 0 }

pethObjects OBJECT IDENTIFIER ::= { ieee8023powerEthernetMIB 1 }

pethConformance OBJECT IDENTIFIER ::= { ieee8023powerEthernetMIB 2 }

-- PSE Objects

pethPsePortTable OBJECT-TYPE

SYNTAX SEQUENCE OF PethPsePortEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"A table of objects that display and control the power
characteristics of power Ethernet ports on a Power Source

Equipment (PSE) device. This group will be implemented in managed power Ethernet switches and mid-span devices. Values of all read-write objects in this table are persistent at restart/reboot."

::= { pethObjects 1 }

pethPsePortEntry OBJECT-TYPE

SYNTAX PethPsePortEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"A set of objects that display and control the power characteristics of a power Ethernet PSE port."

INDEX { pethPsePortGroupIndex , pethPsePortIndex }

::= { pethPsePortTable 1 }

PethPsePortEntry ::= SEQUENCE {

pethPsePortGroupIndex

Integer32,

pethPsePortIndex

Integer32,

pethPsePortAdminEnable

TruthValue,

pethPsePortPowerPairsControlAbility

TruthValue,

pethPsePortPowerPairs

INTEGER,

pethPsePortDetectionStatus

INTEGER,

pethPsePortPowerPriority

INTEGER,

pethPsePortMPSAbsentCounter

Counter32,

pethPsePortType

SnmpAdminString,

pethPsePortPowerClassifications

INTEGER,

pethPsePortInvalidSignatureCounter

Counter32,

pethPsePortPowerDeniedCounter

Counter32,

pethPsePortOverLoadCounter

Counter32,

pethPsePortShortCounter

Counter32,

pethPsePortActualPower

Integer32,

pethPsePortPowerAccuracy

Integer32,

pethPsePortCumulativeEnergy

Counter32

}

pethPsePortGroupIndex OBJECT-TYPE

SYNTAX Integer32 (1..2147483647)

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"This variable uniquely identifies the group containing the port to which a power Ethernet PSE is connected. Group means box in the stack, module in a rack and the value 1 shall be used for non-modular devices. Furthermore, the same value shall be used in this variable, pethMainPseGroupIndex, and pethNotificationControlGroupIndex to refer to a given box in a stack or module in a rack."

::= { pethPsePortEntry 1 }

pethPsePortIndex OBJECT-TYPE

SYNTAX Integer32 (1..2147483647)

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"This variable uniquely identifies the power Ethernet PSE port within group pethPsePortGroupIndex to which the power Ethernet PSE entry is connected."


```
::= { pethPsePortEntry 2 }
```

```
pethPsePortAdminEnable OBJECT-TYPE
```

```
SYNTAX TruthValue
```

```
MAX-ACCESS read-write
```

```
STATUS current
```

```
DESCRIPTION
```

```
"true (1) An interface that can provide the PSE functions.
false(2) The interface will act as it would if it had no PSE
function."
```

```
REFERENCE
```

```
"IEEE Std 802.3, 30.9.1.1.2 aPSEAdminState"
```

```
::= { pethPsePortEntry 3 }
```

```
pethPsePortPowerPairsControlAbility OBJECT-TYPE
```

```
SYNTAX TruthValue
```

```
MAX-ACCESS read-only
```

```
STATUS current
```

```
DESCRIPTION
```

```
"Describes the capability of controlling the power pairs
functionality to switch pins for sourcing power.
The value true indicate that the device has the capability
to control the power pairs. When false the PSE Pinout
Alternative used cannot be controlled through the
PethPsePortAdminEnable attribute."
```

```
REFERENCE
```

```
"IEEE Std 802.3, 30.9.1.1.3
```

```
aPSEPowerPairsControlAbility"
```

```
::= { pethPsePortEntry 4 }
```

```
pethPsePortPowerPairs OBJECT-TYPE
```

```
SYNTAX INTEGER {
```

```
    signal(1),
```

```
    spare(2)
```

```
}
```

```
MAX-ACCESS read-write
```

```
STATUS current
```

```
DESCRIPTION
```

```
"Describes or controls the pairs in use. If the value of
pethPsePortPowerPairsControl is true, this object is
writeable.
```

```
A value of signal(1) means that the signal pairs
only are in use.
```

```
A value of spare(2) means that the spare pairs
only are in use."
```

```
REFERENCE
```

```
"IEEE Std 802.3, 30.9.1.1.4 aPSEPowerPairs"
```

```
::= { pethPsePortEntry 5 }
```

```
pethPsePortDetectionStatus OBJECT-TYPE
```

```
SYNTAX INTEGER {
```

```
    disabled(1),
```

```
    searching(2),
```

```
    deliveringPower(3),
```

```
    fault(4),
```

```
    test(5),
```

```
    otherFault(6)
```

```
}
```

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"Describes the operational status of the port PD detection.

A value of disabled(1)- indicates that the PSE State diagram is in the state DISABLED.

A value of deliveringPower(3) - indicates that the PSE State diagram is in the state POWER_ON for a duration greater than tlim max (see IEEE Std 802.3 Table 33-11).

A value of fault(4) - indicates that the PSE State diagram is in the state TEST_ERROR.

A value of test(5) - indicates that the PSE State diagram is in the state TEST_MODE.

A value of otherFault(6) - indicates that the PSE State diagram is in the state IDLE due to the variable error_conditions.

A value of searching(2)- indicates the PSE State diagram is in a state other than those listed above."

REFERENCE

"IEEE Std 802.3, 30.9.1.1.5
aPSEPowerDetectionStatus"

::= { pethPsePortEntry 6 }

pethPsePortPowerPriority OBJECT-TYPE

```
SYNTAX INTEGER {
    critical(1),
    high(2),
    low(3)
}
```

MAX-ACCESS read-write

STATUS current

DESCRIPTION

"This object controls the priority of the port from the point of view of a power management algorithm. The priority that is set by this variable could be used by a control mechanism that prevents over current situations by disconnecting first ports with lower power priority. Ports that connect devices critical to the operation of the network - like the E911 telephones ports - should be set to higher priority."

::= { pethPsePortEntry 7 }

pethPsePortMPSAbsentCounter OBJECT-TYPE

```
SYNTAX Counter32
```

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"This counter is incremented when the PSE state diagram transitions directly from the state POWER_ON to the

state IDLE due to tmpdo_timer_done being asserted."

REFERENCE

"IEEE Std 802.3, 30.9.1.1.11
aPSEMPSAbsentCounter"

::= { pethPsePortEntry 8 }

pethPsePortType OBJECT-TYPE

```
SYNTAX SnmpAdminString
```

MAX-ACCESS read-write

STATUS current

DESCRIPTION

"A manager will set the value of this variable to indicate the type of powered device that is connected to the port. The default value supplied by the agent if no value has ever been set should be a zero-length octet string."

::= { pethPsePortEntry 9 }

pethPsePortPowerClassifications OBJECT-TYPE

```
SYNTAX INTEGER {
    class0(1),
    class1(2),
    class2(3),
    class3(4),
    class4(5)
}
```

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"Classification is a way to tag different terminals on the Power over LAN network according to their power consumption. Devices such as IP telephones, WLAN access points and others, will be classified according to their power requirements.

The meaning of the classification labels is defined in the IEEE specification.

This variable is valid only while a PD is being powered, that is, while the attribute pethPsePortDetectionStatus is reporting the enumeration deliveringPower."

REFERENCE

"IEEE Std 802.3, 30.9.1.1.6
aPSEPowerClassification"

::= { pethPsePortEntry 10 }

pethPsePortInvalidSignatureCounter OBJECT-TYPE

SYNTAX Counter32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"This counter is incremented when the PSE state diagram enters the state SIGNATURE_INVALID."

REFERENCE

"IEEE Std 802.3, 30.9.1.1.7
aPSEInvalidSignatureCounter"

::= { pethPsePortEntry 11 }

pethPsePortPowerDeniedCounter OBJECT-TYPE

SYNTAX Counter32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"This counter is incremented when the PSE state diagram enters the state POWER_DENIED."

REFERENCE

"IEEE Std 802.3, 30.9.1.1.8
aPSEPowerDeniedCounter"

::= { pethPsePortEntry 12 }

pethPsePortOverLoadCounter OBJECT-TYPE
SYNTAX Counter32
MAX-ACCESS read-only
STATUS current
DESCRIPTION
 "This counter is incremented when the PSE state diagram
 enters the state ERROR_DELAY_OVER."
REFERENCE
 "IEEE Std 802.3, 30.9.1.1.9
 aPSEOverLoadCounter"
 ::= { pethPsePortEntry 13 }

pethPsePortShortCounter OBJECT-TYPE
SYNTAX Counter32
MAX-ACCESS read-only
STATUS current
DESCRIPTION
 "This counter is incremented when the PSE state diagram
 enters the state ERROR_DELAY_SHORT."
REFERENCE
 "IEEE Std 802.3, 30.9.1.1.10
 aPSEShortCounter"
 ::= { pethPsePortEntry 14 }

pethPsePortActualPower OBJECT-TYPE
SYNTAX Integer32
MAX-ACCESS read-only
STATUS current
DESCRIPTION
 "See IEEE Std 802.3, 30.9.1.1.12 aPSEActualPower."
REFERENCE
 "IEEE Std 802.3, 30.9.1.1.12 aPSEActualPower."
 ::= { pethPsePortEntry 15 }

pethPsePortPowerAccuracy OBJECT-TYPE
SYNTAX Integer32
MAX-ACCESS read-only
STATUS current
DESCRIPTION
 "See IEEE Std 802.3, 30.9.1.1.13 aPSEPowerAccuracy."
REFERENCE
 "IEEE Std 802.3, 30.9.1.1.13 aPSEPowerAccuracy."
 ::= { pethPsePortEntry 16 }

pethPsePortCumulativeEnergy OBJECT-TYPE
SYNTAX Counter32
MAX-ACCESS read-only
STATUS current
DESCRIPTION
 "See IEEE Std 802.3, 30.9.1.1.14 aPSECumulativeEnergy."
REFERENCE
 "IEEE Std 802.3, 30.9.1.1.14 aPSECumulativeEnergy."
 ::= { pethPsePortEntry 17 }

-- Main PSE Objects

pethMainPseObjects OBJECT IDENTIFIER ::= { pethObjects 3 }

pethMainPseTable OBJECT-TYPE

SYNTAX SEQUENCE OF PethMainPseEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"A table of objects that display and control attributes of the main power source in a PSE device. Ethernet switches are one example of devices that would support these objects.

Values of all read-write objects in this table are persistent at restart/reboot."

::= { pethMainPseObjects 1 }

pethMainPseEntry OBJECT-TYPE

SYNTAX PethMainPseEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"A set of objects that display and control the Main power of a PSE."

INDEX { pethMainPseGroupIndex }

::= { pethMainPseTable 1 }

PethMainPseEntry ::= SEQUENCE {

pethMainPseGroupIndex

Integer32,

pethMainPsePower

Gauge32 ,

pethMainPseOperStatus

INTEGER,

pethMainPseConsumptionPower

Gauge32,

pethMainPseUsageThreshold

Integer32

}

pethMainPseGroupIndex OBJECT-TYPE

SYNTAX Integer32 (1..2147483647)

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"This variable uniquely identifies the group to which power Ethernet PSE is connected. Group means (box in the stack, module in a rack) and the value 1 shall be used for non-modular devices. Furthermore, the same value shall be used in this variable, pethPsePortGroupIndex, and pethNotificationControlGroupIndex to refer to a given box in a stack or module in a rack."

::= { pethMainPseEntry 1 }

pethMainPsePower OBJECT-TYPE

SYNTAX Gauge32 (1..65535)

UNITS "Watts"

MAX-ACCESS read-only

STATUS current

DESCRIPTION

```

        "The nominal power of the PSE expressed in Watts."
        ::= { pethMainPseEntry 2 }

pethMainPseOperStatus OBJECT-TYPE
    SYNTAX INTEGER {
        on(1),
        off(2),
        faulty(3)
    }
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
        "The operational status of the main PSE."
    ::= { pethMainPseEntry 3 }

pethMainPseConsumptionPower OBJECT-TYPE
    SYNTAX Gauge32
    UNITS "Watts"
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
        "Measured usage power expressed in Watts."
    ::= { pethMainPseEntry 4 }

pethMainPseUsageThreshold OBJECT-TYPE
    SYNTAX Integer32 (1..99)
    UNITS "%"
    MAX-ACCESS read-write
    STATUS current
    DESCRIPTION
        "The usage threshold expressed in percents for
        comparing the measured power and initiating
        an alarm if the threshold is exceeded."
    ::= { pethMainPseEntry 5 }

-- Notification Control Objects

pethNotificationControl OBJECT IDENTIFIER ::= { pethObjects 4 }

pethNotificationControlTable OBJECT-TYPE
    SYNTAX SEQUENCE OF PethNotificationControlEntry
    MAX-ACCESS not-accessible

    STATUS current
    DESCRIPTION
        "A table of objects that display and control the
        Notification on a PSE device.
        Values of all read-write objects in this table are
        persistent at restart/reboot."
    ::= { pethNotificationControl 1 }

pethNotificationControlEntry OBJECT-TYPE
    SYNTAX PethNotificationControlEntry
    MAX-ACCESS not-accessible
    STATUS current
    DESCRIPTION
        "A set of objects that control the Notification events."
    INDEX { pethNotificationControlGroupIndex }
    ::= { pethNotificationControlTable 1 }

```

```

PethNotificationControlEntry ::= SEQUENCE {
    pethNotificationControlGroupIndex
        Integer32,
    pethNotificationControlEnable
        TruthValue
}

pethNotificationControlGroupIndex OBJECT-TYPE
    SYNTAX      Integer32 (1..2147483647)
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "This variable uniquely identifies the group. Group
        means box in the stack, module in a rack and the value
        1 shall be used for non-modular devices. Furthermore,
        the same value shall be used in this variable,
        pethPsePortGroupIndex, and
        pethMainPseGroupIndex to refer to a given box in a
        stack or module in a rack."
    ::= { pethNotificationControlEntry 1 }

pethNotificationControlEnable OBJECT-TYPE
    SYNTAX      TruthValue
    MAX-ACCESS  read-write
    STATUS      current
    DESCRIPTION
        "This object controls, on a per-group basis, whether
        or not notifications from the agent are enabled. The
        value true(1) means that notifications are enabled; the
        value false(2) means that they are not."
    ::= { pethNotificationControlEntry 2 }

--
-- Notifications Section
--
--

pethPsePortOnOffNotification NOTIFICATION-TYPE
    OBJECTS      { pethPsePortDetectionStatus }
    STATUS      current
    DESCRIPTION
        "This Notification indicates if Pse Port is delivering or
        not power to the PD. This Notification should be sent on
        every status change except in the searching mode.
        At least 500 msec shall elapse between notifications
        being emitted by the same object instance."
    ::= { pethNotifications 1 }

pethMainPowerUsageOnNotification NOTIFICATION-TYPE
    OBJECTS      { pethMainPseConsumptionPower }
    STATUS      current
    DESCRIPTION
        "This Notification indicate PSE Threshold usage
        indication is on, the usage power is above the
        threshold. At least 500 msec shall elapse between
        notifications being emitted by the same object
        instance."
    ::= { pethNotifications 2 }

pethMainPowerUsageOffNotification NOTIFICATION-TYPE

```

```

OBJECTS      { pethMainPseConsumptionPower }
STATUS       current
DESCRIPTION
    "This Notification indicates PSE Threshold usage indication
    off, the usage power is below the threshold.
    At least 500 msec shall elapse between notifications being
    emitted by the same object instance."
    ::= { pethNotifications 3 }

--
-- Conformance statements
--
pethCompliances OBJECT IDENTIFIER ::= { pethConformance 1 }
pethGroups      OBJECT IDENTIFIER ::= { pethConformance 2 }

-- Compliance statements

pethCompliance MODULE-COMPLIANCE
    STATUS current
    DESCRIPTION
        "Describes the requirements for conformance to the
        Power Ethernet MIB."

    MODULE -- this module
        MANDATORY-GROUPS { pethPsePortGroup,
                           pethPsePortNotificationGroup,
                           pethNotificationControlGroup
                           }

        GROUP pethMainPseGroup
        DESCRIPTION
            "The pethMainPseGroup is mandatory for PSE systems
            that implement a main power supply."
        GROUP pethMainPowerNotificationGroup
        DESCRIPTION
            "The pethMainPowerNotificationGroup is mandatory for
            PSE systems that implement a main power supply."
        ::= { pethCompliances 1 }

pethPsePortGroup OBJECT-GROUP
    OBJECTS {
        pethPsePortAdminEnable,
        pethPsePortPowerPairsControlAbility,
        pethPsePortPowerPairs,
        pethPsePortDetectionStatus,
        pethPsePortPowerPriority,
        pethPsePortMPSAbsentCounter,
        pethPsePortInvalidSignatureCounter,
        pethPsePortPowerDeniedCounter,
        pethPsePortOverLoadCounter,
        pethPsePortShortCounter,
        pethPsePortType,
        pethPsePortPowerClassifications,
        pethPsePortActualPower,
        pethPsePortPowerAccuracy,
        pethPsePortCumulativeEnergy
    }
    STATUS current
    DESCRIPTION
        "PSE Port objects."

```



```

 ::= { pethGroups 1 }

pethMainPseGroup OBJECT-GROUP
  OBJECTS {
    pethMainPsePower,
    pethMainPseOperStatus,
    pethMainPseConsumptionPower,
    pethMainPseUsageThreshold
  }
  STATUS current
  DESCRIPTION
    "Main PSE Objects."
  ::= { pethGroups 2 }

pethNotificationControlGroup OBJECT-GROUP

  OBJECTS {
    pethNotificationControlEnable
  }
  STATUS current
  DESCRIPTION
    "Notification Control Objects."
  ::= { pethGroups 3 }

pethPsePortNotificationGroup NOTIFICATION-GROUP
  NOTIFICATIONS { pethPsePortOnOffNotification }
  STATUS current
  DESCRIPTION "Pse Port Notifications."
  ::= { pethGroups 4 }

pethMainPowerNotificationGroup NOTIFICATION-GROUP
  NOTIFICATIONS { pethMainPowerUsageOnNotification,
                  pethMainPowerUsageOffNotification }
  STATUS current
  DESCRIPTION "Main PSE Notifications."
  ::= { pethGroups 5 }

END

```

END

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9. Ethernet passive optical networks (EPON) MIB module

9.1 Overview

This clause defines a MIB module for use with SNMP to manage 1G-EPON interfaces for Ethernet Passive Optical Networks. The clause contains a list of management objects based on the attributes defined in the relevant parts of Clause 30 of IEEE Std 802.3, referring to EPON.

9.1.1 EPON architecture highlights

9.1.1.1 Introduction

The EPON standard, now part of IEEE Std 802.3, defines the Physical Layer and Media Access Control sublayer of EPON interfaces. EPON is a variant of Gigabit Ethernet used in optical access. The passive optical network (PON) comprises sections of single-mode fiber connected with passive optical splitter/coupler devices, forming a passive optical tree, as shown in Figure 9-1. Individual branches of the PON are terminated with the optical line terminal (OLT) in the central office and optical network units (ONUs) near the subscribers. ONUs can be located either in some remote location (e.g., basement in a multidwelling unit) or directly at the subscriber premises. Various types of customer premises equipment (CPE) can be connected to ONUs or even integrated with such devices. Figure 9-1 presents an example PON topology.

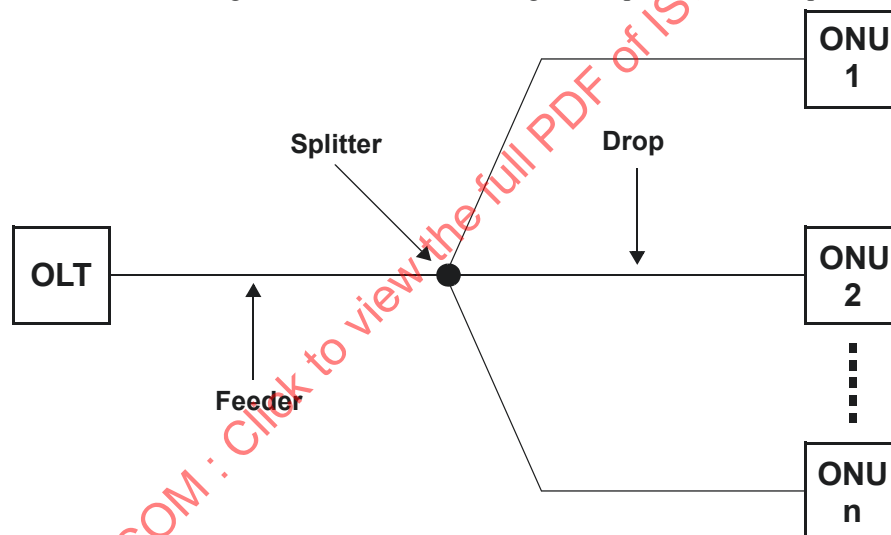


Figure 9-1—PON topology example

The IEEE layering architecture of an EPON interface is defined in the diagram of Figure 56-2 in IEEE Std 802.3. The following clauses in IEEE Std 802.3 define the corresponding layers of an EPON interface.

- Clause 30: Management
- Clause 60: PMD for EPON media (burst-mode PMD)
- Clause 64: MPCP (Multipoint Control Protocol), which defines the Multipoint architecture, and control protocol for the media access of EPON.
- Clause 65: Reconciliation Sublayer and Physical Coding Sublayer, which defines a number of extensions to standard Gigabit Ethernet PCS, i.e.:
 - a) Definition of Point-to-Point emulation function for EPON
 - b) Definition of the optional (frame-based) FEC for EPON
 - c) PMA for EPON

9.1.1.2 Principles of operation

The EPON interface specification extends the specification of Gigabit Ethernet as described in Clause 35 and Clause 36 of IEEE Std 802.3. The Ethernet MAC operates at the data rate of 1 Gb/s, and it is connected to a media-dependent interface through the GMII interface, as described in Clause 35. The EPON PCS layer extends the Gigabit Ethernet PCS as described in Clause 36. New, EPON-specific layers are added to Gigabit Ethernet layers in the following locations:

- MPCP is placed in the MAC control layer, providing EPON media access, station discovery, and registration protocol.
- Functionality of the reconciliation sublayer (RS) of Gigabit Ethernet was extended, creating logical links over shared passive optical medium, providing private transmission channels to each of the connected ONUs.
- (Optional) FEC functionality located between the PCS and PMA layers was added, extending the Gigabit Ethernet PCS layer, enhancing reach and split performance of the EPON optical link.

Figure 9-2 presents the EPON layering model.

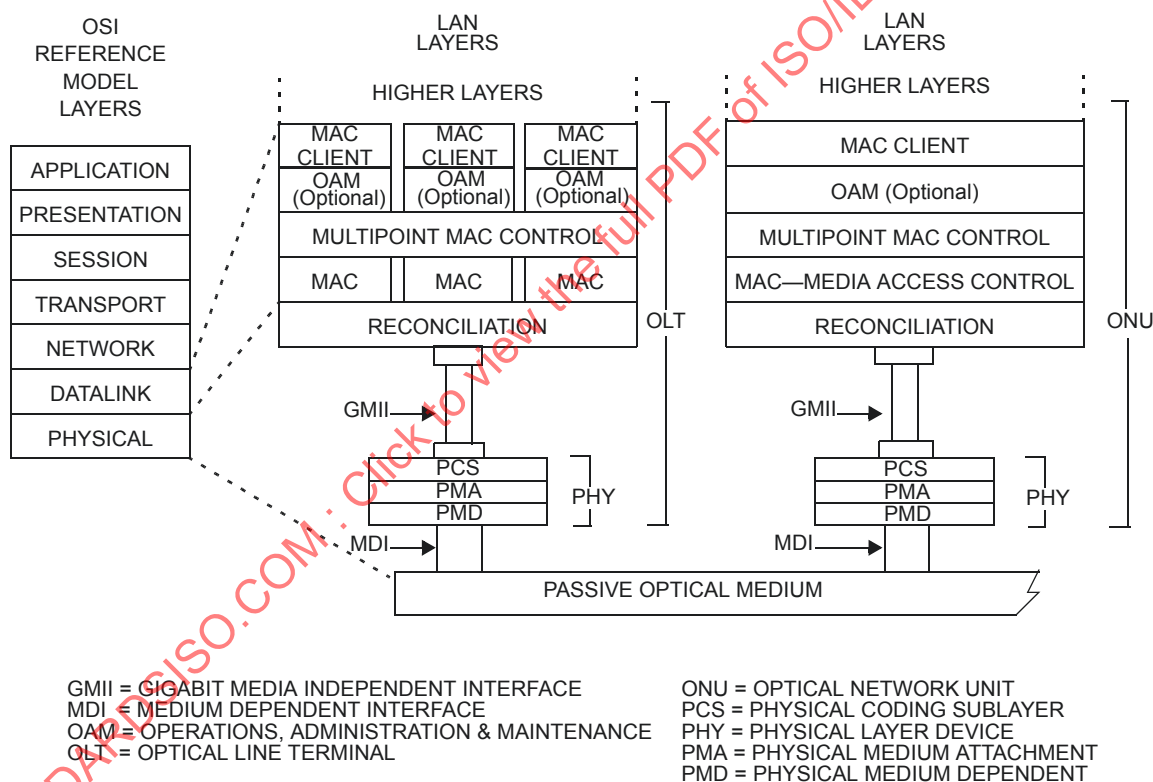


Figure 9-2—Relationship of Multipoint MAC control and the OSI protocol stack

9.1.1.3 Physical media

The physical link in EPON comprises single-mode fiber. The OLT and ONUs are connected through a passive optical network comprising sections of single-mode fiber interconnected with passive splitter/coupler devices.

The term *downstream* denotes transmission from the OLT to all connected ONUs, while the term *upstream* denotes transmission from the connected ONUs (one at the time) to the OLT. Upstream and downstream transmissions are wavelength division multiplexed (WDM) into a single strand of single-mode fiber, sharing the same physical link.

The downstream transmission channel is continuously available to the OLT; thus, Time Division Multiplexing (TDM) is used. Transmissions from the OLT arrive at all of the connected ONUs and the individual ONUs filter data from the OLT's transmission based on the logical link identifiers (LLIDs) assigned to them during the registration and discovery process.

The upstream transmission channel is shared among a number of connected and registered ONUs using Time Division Multiple Access (TDMA). Access to the upstream channel is controlled via the Multipoint Control Protocol (MPCP), where the OLT plays the role of the master and ONUs play the role of slave devices. An ONU upon registration remains silent until registered, and once registered, it transmits data toward OLT only when granted a transmission opportunity (slot).

9.1.1.4 PMD specifications

The EPON PMD specifications are based on a wavelength plan similar to that used by ITU-T G.983.1. The OLT and ONU optical parameters were derived in part from earlier 1000 Mb/s Ethernet PMD specifications, with the addition of WDM capabilities, and burst mode operation for ONU transmitters and the OLT receiver.

The upstream burst mode operation capability corresponds directly to the TDMA operation in the upstream direction, where queued data is burst from individual ONUs at full data rate for the duration of the allocated transmission period. Once completed, the ONU goes silent and another ONU starts transmitting its data.

9.1.1.5 Point-to-point emulation

The downstream link is a broadcast medium, which means that all data transmitted by the OLT is received by all connected ONUs. In order to facilitate compliance of EPON with Ethernet architecture, the P2PE function was included in the RS, creating a series of logical links between the OLT and connected ONUs. An additional broadcast link is also provided for delivery of any broadcast content. In this way, EPON becomes a collection of logical P2P connections established between the OLT and the ONUs. Therefore, the OLT can be seen as an Ethernet device with N+1 logical ports (N P2P logical interfaces and 1 broadcast interface, where N designates the number of connected ONUs).

Logical links also provide a solution for privacy of data, which otherwise would be shared by all subscribers connected to a single OLT port. In this way, each subscriber is isolated and restricted to accessing data streams addressed only to that particular subscriber.

This concept is illustrated in Figure 9-3, which shows an example of an EPON with a single OLT and three connected ONUs.

The single copy broadcast channel (addressed with a special, reserved LLID, see 65.1.3.1 of IEEE Std 802.3) was added to take advantage of the broadcast transmission capability of the underlying physical medium. In this way, it is very simple and very bandwidth efficient to deliver broadcast content to all ONUs at the same time, avoiding the need to replicate data into a series of P2P links.

The ONUs filter all downstream data and drop all frames addressed to other devices. Only broadcast frames and frames with correct unicast logical link ID (LLID) are admitted and processed. The LLID replaces two octets of the Ethernet frame preamble, identifying a logical link established between the OLT and the given ONU during the discovery and registration process. The LLID indicates the destination port in the

downstream and the source port in the upstream. The logical links are used effectively to prevent EPON from violating the IEEE 802.1D bridging rules.

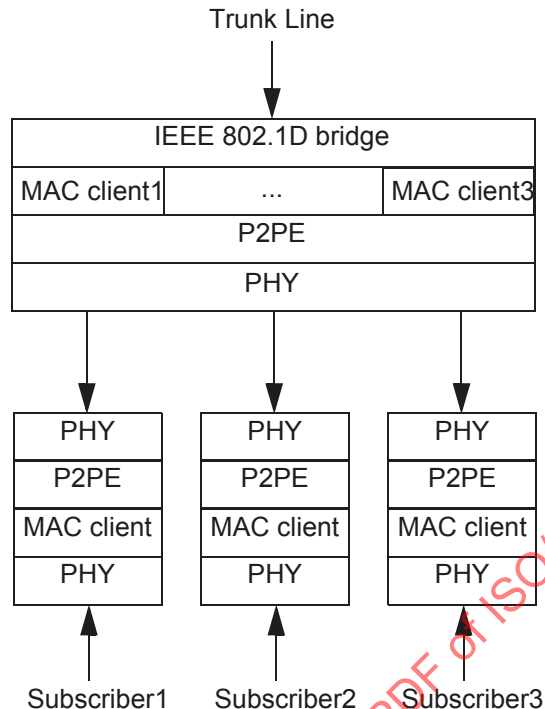


Figure 9-3—Example of point-to-point emulation used between an OLT and three ONUs

9.1.1.6 Principles of the MPCP

The EPON standard comprises a mechanism for media access control, referred to as the Multipoint Control Protocol (MPCP). An access network architecture is different from a typical LAN environment, primarily in terms of network provisioning. An access network is an administrated environment, with an operator providing services and subscribers consuming it depending on service provisioning contracts. The operator controls the network, manages traffic and medium access, and enforces the service level agreements (SLAs). For instance, the available bandwidth is controlled and subscribers may be billed for services. In this sense, the access network (and EPON specifically) requires a media access control protocol that provides a mechanism for station discovery and registration as well as bandwidth provisioning capabilities.

In the MPCP, the OLT is considered to be the master, controlling a series of connected ONUs (slave devices). The OLT manages the network and controls access to network resources from individual slave devices. The MPCP is also used for provisioning upstream channel access to individual slave devices via a MPCPDU pair, i.e., GATE and REPORT. The MPCP is part of the MAC control layer, and MPCPDUs are considered MAC control messages, carrying a specific Ethertype of 0x8808. These messages are not forwarded outside of the EPON domain and are used to manage the EPON link only.

A concept of time exists in the MPCP in order to schedule the upstream transmission. A timestamp, which is transmitted in the MPCPDUs downstream by the OLT and received by the connected ONUs, is used to synchronize slave devices to the master device clock. This coordinates upstream transmissions from individual ONUs so that the transmissions arrive at the OLT at precisely the anticipated time, and thus, data from different ONUs does not overlap.

The MPCP plane is also used to measure the round-trip time (RTT) for each connected ONU. Each MPCPDU carries a generalized timestamp field, which is filled in by the transmitting station with the current value of its MPCP clock at the time when the given MPCPDU is transmitted. The RTT is measured first during the discovery and registration process and then updated regularly upon each exchange of MPCPDUs between the OLT and one of the ONUs. RTT is used by the OLT bandwidth scheduler to schedule upstream transmission slots for individual ONUs in a non-overlapping manner. The IEEE 802.3 EPON standard provides support for the network diameter (distance between the OLT and the farthest ONU) of nominally up to 20 km, which corresponds to the RTT of approximately 200 μ s. However, nothing in the standard precludes support for larger network diameters.

The TDMA control is performed using a pair of MPDPUs, namely GATE generated by the OLT to indicate a future transmission opportunity to an ONU and REPORT generated by the ONU with information on the current queue status (bandwidth demand). Internal structure and possible encoding of GATE and REPORT MPCPDUs are defined in Clause 64 of IEEE Std 802.3.

A scheduling algorithm at the OLT, which is not defined in IEEE Std 802.3, is responsible for dividing the bandwidth and controlling the transmission delay of each ONU according to its SLA. The MPCP defines a closed loop operation in order for this algorithm to be efficient. The MPCP allows the ONUs to report on the amount of bandwidth they require for transmission using a special REPORT message. This allows allocating bandwidth to an ONU only when requested, relying on the statistical burst property of the traffic, and allowing different peak bandwidths for different ONUs at different times, hence, allowing oversubscription of the bandwidth. The REPORT message reports the amount of data waiting in the ONU queues.

In addition, the MPCP defines a protocol of auto-discovery and registration of ONUs.

The MPCP registration process is presented in Figure 9-4, while details are described in Clause 64 of IEEE Std 802.3.

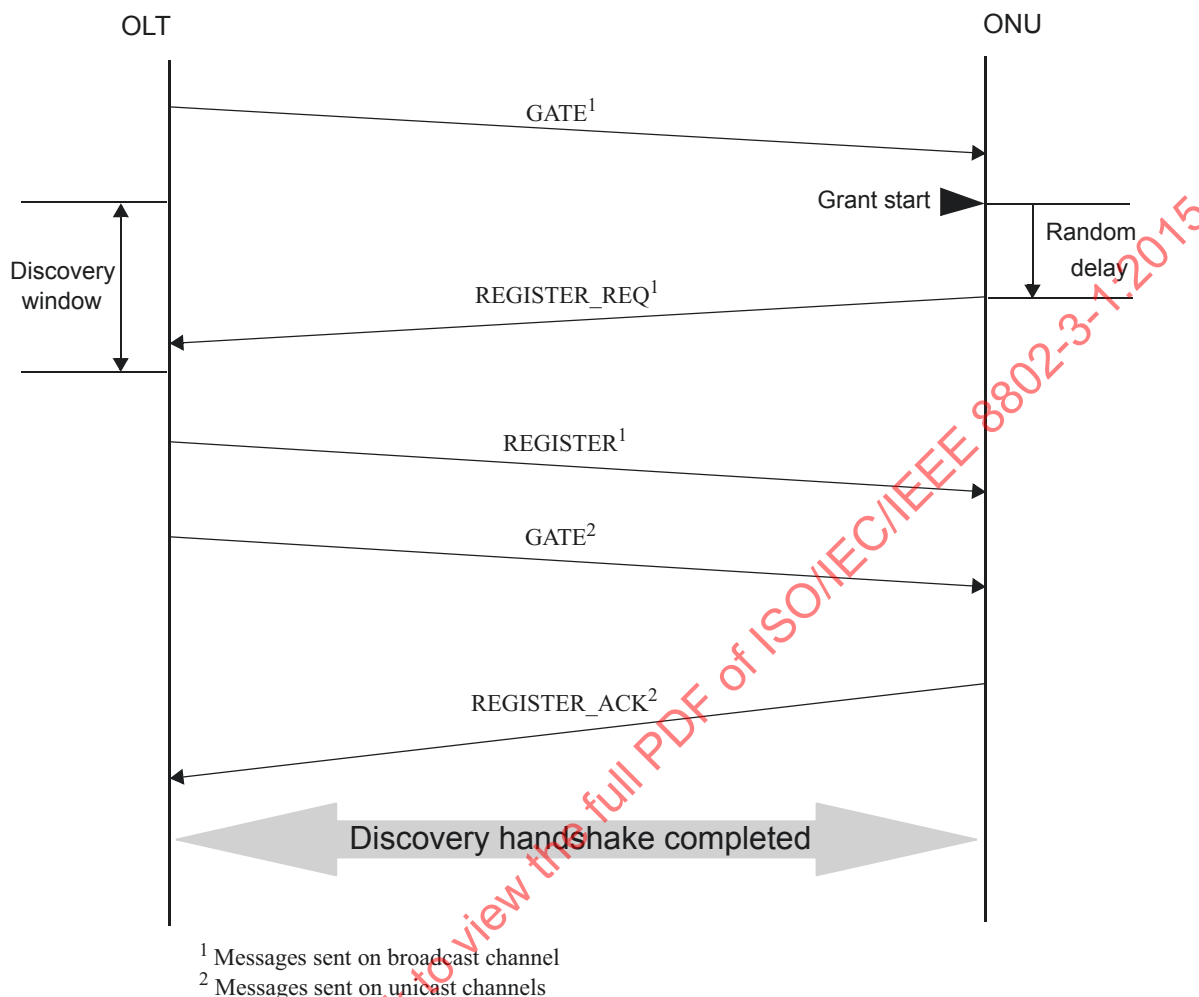


Figure 9-4—Discovery handshake message exchange

A new ONU requests to register during a special upstream window (called Discovery Window), sending the REGISTER_REQ MPCPDU. More than one ONU may attempt registration during that window, which means that their REGISTER_REQ MPCPDUs can potentially collide at the OLT receiver, since the ONU-specific RTT is not yet known and transmissions from individual ONUs cannot be scheduled in a non-overlapping manner. A random backoff mechanism was therefore developed and is used to increase the registration success probability.

When the OLT receives a REGISTER_REQ MPCPDU from an ONU, a decision on registration is taken and an LLID is assigned to that ONU. Next, the OLT sends a REGISTER MPCPDU to that ONU, informing the given slave device whether it is admitted to a network or not. The registration process is completed with the ONU sending REGISTER_ACK MPCPDU to the OLT, confirming assigned parameters and registration in the network. From that point onward, the OLT can schedule transmissions from that ONU using its LLID, using the measured RTT so that its transmissions do not collide with other ONUs.

Additional higher layer protocols may be employed to authenticate the ONU and allow it to participate in the network; however, their specification is outside the scope of IEEE Std 802.3.

9.1.1.7 Forward error correction (FEC)

The optional FEC mechanism is defined to enhance the EPON link budget. All the passive components of the fiber plant attenuate the optical signal; thus, the target distance (network diameter) and the number of supported splits are limited by the available link budget. The optional FEC mechanism increases the available link budget by improving the link BER from 10^{-4} to 10^{-12} (the target BER at the MAC), effectively increasing the target network diameter and/or split ratio. The target use of the increased power budget remains at the sole discretion of the network architects and is out of the scope of IEEE Std 802.3.

The optional FEC used in EPON is frame-based, meaning that parity information is added at the end of each Ethernet packet. Extra space between individual Ethernet packets is provided by the MAC rate adaptation function, while extra idle symbols were replaced within the FEC function.

The start and end of packet codewords also define the FEC boundaries, and they are outside the FEC protection. They are replaced by a series of symbols to reduce their vulnerability to link errors.

Figure 9-5 presents the structure of an FEC-protected EPON frame.

The optional FEC function is added to the extended Gigabit Ethernet PCS per 65.2 in IEEE Std 802.3. The added, optional FEC function introduces a fixed delay in the receive path and in the transmit path.

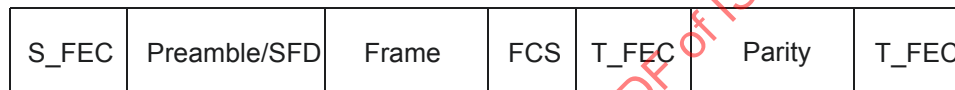


Figure 9-5—FEC-protected frame

9.1.2 Management architecture

All EPON layers are accompanied by a management interface that is controlled through mechanisms defined in Clause 30 of IEEE Std 802.3. Since IEEE Std 802.3 specifications may be used for different applications (and hence are extensible), and some of the clauses may be used separately, the management clause allocates a separate package for each independent layer. The structure of the MIB modules follows this separation.

Figure 9-6 presents the relation of the MIB module groups to the individual IEEE 802.3 layers.

The association is straightforward for the ONU interface. There is one logical and one physical interface, and a single copy of each layer can be remotely queried by the OLT.

The OLT has a single physical interface and N logical interfaces, one for each logical link connected to an ONU. There is also one logical interface for the single copy broadcast link. Per layering diagram in Figure 9-6, the MAC sublayer is virtually replicated. Therefore, in this clause it was elected that management of logical interfaces is performed in the manner identical to management of any physical interfaces—an interface index is allocated for each one of the logical links, and an additional interface index is allocated for the OLT.

For each physical interface, there would be an entry (ifIndex) in the tables of the interface MIB module defined in IETF RFC 2863, the MAU MIB module defined in Clause 13, and the Ethernet-like MIB module defined in Clause 10. Additionally, there would be entries (ifIndexes) for the virtual interfaces of the OLT interface. The justification for the additional allocation of indexes is that the virtual interfaces are quite well

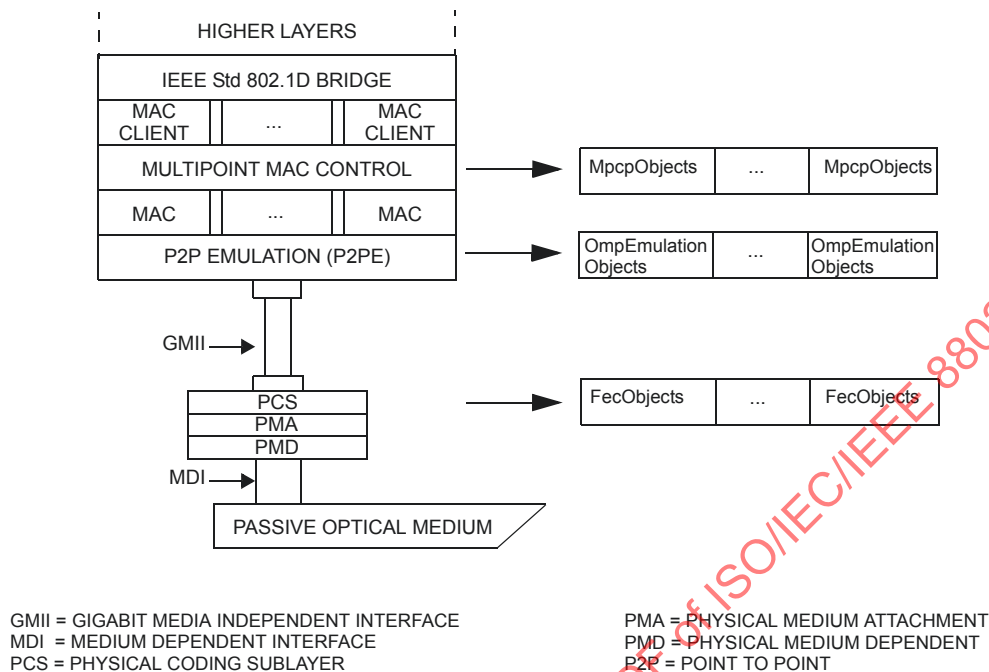


Figure 9-6—Relationship of the MIB groups to the EPON sublayers

distinguished, as they connect different physical ONUs from the OLT side. For instance, there is a meaning for separate bad frames counter or bad octets counter for each virtual link, as the ONUs can be differently distanced. This is quite similar to a case of separate physical interfaces.

The same partition concept exists for the MIB module of this clause. Each row in the tables is indexed according to the ifIndex; specifically, there is a row for each virtual link. There are some control objects that are shared and are the same for the virtual interfaces (and they should have the same value for each ifIndex), but most of the objects have different values for N+1 logical interfaces at the OLT. This is done for each MIB group. It is different from the EPON layering diagram, which presents the P2MP layer as a single layer, while duplicating the MAC and MAC client layers (please see Figure 9-6). However, from a management perspective, it is more convenient to partition the management of the layers for the virtual links, as the atomic managed entity is the virtual link. It is also convenient to use the interface index of the virtual link for that purpose, as it is already used to index the rows of the virtual links at the Interface, MAU, and Ethernet-like interface MIBs.

9.2 MIB structure

This subclause defines the DOT3 EPON MIB module. The DOT3 EPON MIB module defines the objects used for management of the IEEE Std 802.3 EPON interfaces. These MIB objects are included in the following four groups:

- a) MPCP MIB objects—MIB objects related to Clause 64 of IEEE Std 802.3, Multipoint Control Protocol attributes. The following tables are presented in this group:
 - 1) The dot3MpcpControlTable defines the objects used for the configuration and status indication, which are per logical link, of MPCP compliant interfaces.

- 2) The dot3MpcpStatTable defines the statistics objects that are per logical link, of MPCP compliant interfaces.
- 3) The operational mode of an OLT/ONU for the tables is defined by the dot3MpcpMode object in the dot3MpcpControlTable.
- b) The OMPEmulation MIB objects—MIB objects related to Clause 65 of IEEE Std 802.3, point-to-point emulation attributes. The following tables are presented in this group:
 - 1) The dot3OmpEmulationTable defines the objects used for the configuration and status indication, which are per logical links, of OMPEmulation compliant interfaces.
 - 2) The dot3OmpEmulationStatTable defines the statistics objects that are per logical link, of OMPEmulation compliant interfaces.
 - 3) The operational mode of an OLT/ONU for the tables is defined by the dot3OmpEmulationType object in the dot3OmpEmulationTable.
- c) The FEC MIB objects—MIB objects related to Clause 60 and Clause 65 of IEEE Std 802.3, EPON FEC attributes. The following table is presented in this group:
 - 1) The dot3EponFecTable defines the objects used for the configuration and status indication, which are per logical link, of FEC EPON compliant interfaces.
- d) The EPON extended package MIB objects—MIB objects used for configuration and status indication with extended capabilities of the EPON interfaces. The following tables are presented in this group:
 - 1) The dot3ExtPkgControlTable defines the objects, which are per logical link, used for the configuration and status indication of EPON compliant interfaces.
 - 2) The dot3ExtPkgQueueTable defines the objects, which are per logical link, and per queue, used for the configuration and status indication of the ONU queues reported in the MPCP REPORT message, of EPON compliant interfaces.
 - 3) The dot3ExtPkgQueueSetsTable defines the objects, which are per logical link, per queue, and per queue_set, used for the configuration and status indication of the ONU queue_sets reported in the MPCP REPORT message, of EPON compliant interfaces.
 - 4) The dot3ExtPkgOptIfTable defines the objects, which are per logical link, used for the control and status indication of the optical interface of EPON compliant interfaces.

The interface MIB module defined in IETF RFC 2863 defines the interface index (ifIndex). Interface Index, as specified in IETF RFC 2863, is used in this MIB module as an index to the EPON MIB tables. The ifIndex is used to denote the physical interface and the virtual link interfaces at the OLT. The OLT interface and the virtual link interfaces are stacked using the ifStack table defined in IETF RFC 2863 and the ifInvStack defined in IETF RFC 2864. The OLT interface is the lower layer of all other interfaces associated with the virtual links.

As described in 9.1.2, each row in the tables is indexed according to the ifIndex; specifically, there is a row for each virtual link. There are a few control objects that are shared and have the same value for the virtual interfaces (and they should have the same value for each ifIndex), but most of the objects have different values for N+1 logical interfaces at the OLT. This is done for each MIB group. It is a bit different from the EPON layering diagram, which presents the P2MP layer as a single layer while duplicating the MAC and MAC client layers. However, from a management perspective, it is more convenient to partition the management of the layers for the virtual links, as the atomic managed entity is the virtual link. It is also convenient to use the interface index of the virtual link for that purpose, as it is already used to index the rows of the virtual links at the Interface, MAU, and Ethernet-like interface MIB modules.

The creation of the rows of the ONU interface is done at initialization. Table 9-1 presents the MPCP control table of ONU1 after initialization. A single row exists in the table.

Table 9-2 presents the MPCP control table of ONU1 in working mode. A single row exists in the table.

Table 9-1—MPCP control table of ONU1 after initialization

MPCP control MIB object	Value
ifIndex	100
dot3MpcpOperStatus	true
dot3MpcpAdminState	true
dot3MpcpMode	onu
dot3MpcpSyncTime	0
dot3MpcpLinkID	0
dot3MpcpRemoteMACAddress	00:00:00:00:00:00
dot3MpcpRegistrationState	unregistered
dot3MpcpTransmitElapsed	0
dot3MpcpReceiveElapsed	0
dot3MpcpRoundTripTime	0

Table 9-2—MPCP control table of ONU1 in working mode

MPCP control MIB object	Value
ifIndex	100
dot3MpcpOperStatus	true
dot3MpcpAdminState	true
dot3MpcpMode	onu
dot3MpcpSyncTime	25
dot3MpcpLinkID	1
dot3MpcpRemoteMACAddress	OLT_MAC_Address ^a
dot3MpcpRegistrationState	registered
dot3MpcpTransmitElapsed	10
dot3MpcpReceiveElapsed	10
dot3MpcpRoundTripTime	100

^aOLT_MAC_Address is the MAC address of the OLT EPON interface.

The creation of the rows of the OLT interface and the broadcast virtual interface is done at initialization.

The creation of rows of the virtual interfaces at the OLT is done when the link is established (ONU registers) and the deletion is done when the link is deleted (ONU deregisters).

Table 9-3 presents the MPCP control table of the OLT after initialization, before the ONUs register. A single row exists in this table associated with the virtual broadcast link.

Table 9-3—MPCP control table of the OLT after initialization

MPCP control MIB object	Value
ifIndex	165535
dot3MpcpOperStatus	true
dot3MpcpAdminState	true
dot3MpcpMode	olt
dot3MpcpSyncTime	25
dot3MpcpLinkID	65535
dot3MpcpRemoteMACAddress	BRCT_MAC_Address ^a
dot3MpcpRegistrationState	registered
dot3MpcpTransmitElapsed	10
dot3MpcpReceiveElapsed	100000
dot3MpcpRoundTripTime	0

^aBRCT_MAC_Address is the MAC address of the broadcast EPON interface, which is the OLT MAC address.

Table 9-4 presents the MPCP control table of the OLT in working mode. Three rows exist in the table associated with the virtual links.

Table 9-4—MPCP control table of the OLT in working mode

MPCP control MIB object	Value	Value	Value
ifIndex	100001	100002	165535
dot3MpcpOperStatus	true	true	true
dot3MpcpAdminState	true	true	true
dot3MpcpMode	olt	olt	olt
dot3MpcpSyncTime	25	25	25

Table 9-4—MPCP control table of the OLT in working mode (continued)

MPCP control MIB object	Value	Value	Value
dot3MpcpLinkID	1	2	65535
dot3MpcpRemote MACAddress	ONU1_MAC_Address ^a	ONU2_MAC_Address ^b	BRCT_MAC_Address ^c
dot3MpcpRegistrationState	registered	registered	registered
dot3MpcpTransmitElapsed	10	10	10
dot3MpcpReceiveElapsed	10	10	10
dot3MpcpRoundTripTime	100	60	0

^aONU1_MAC_Address is the MAC address of the ONU1 EPON interface.

^bONU2_MAC_Address is the MAC address of the ONU2 EPON interface.

^cBRCT_MAC_Address is the MAC address of the broadcast EPON interface, which is the OLT MAC address.

9.3 Relationship to other MIB modules

9.3.1 Relation to the Interfaces Group MIB and Ethernet-like interface MIB

This MIB module extends the objects of the Interfaces Group MIB and the Ethernet-like interface MIB for the EPON type interface. Therefore, if this module is implemented, the Interfaces Group MIB module defined in IETF RFC 2863 and the Ethernet-like interface MIB module defined in Clause 10 shall also be implemented.

Thus, each managed EPON interface would have a corresponding entry in the mandatory tables of the Ethernet-like MIB module found in Clause 10, and likewise in the tables of the Interfaces Group MIB module found in IETF RFC 2863. Also, each managed virtual EPON interface would have a corresponding entry in the mandatory tables of the Ethernet-like MIB module found in Clause 10, and likewise in the tables of the Interfaces Group MIB module found in IETF RFC 2863 with a dedicated ifIndex for this interface.

In this clause, there is no replication of the objects from these MIBs. Therefore, for instance, the clause is defining the dot3MpcpRemoteMACAddress only while assuming that the local MAC address object is already defined in Clause 10.

This clause defines the specific EPON objects of an ONU interface and an OLT interface. Information in the tables is per LLID. The rows in the EPON MIB tables referring to the LLIDs are denoted with the corresponding ifIndexes of the virtual link interfaces.

Note that all virtual interfaces have the same physical MAC address at the OLT since the physical OLT interface used by all virtual interfaces is the same. The value of this physical MAC interface is specified in 64.1.2 of IEEE Std 802.3. The corresponding object of the Ethernet-like interface MIB is replicated for all virtual interfaces.

For example, the values of the Interfaces Group MIB objects are presented in the following tables, for an OLT with three registered ONUs.

Table 9-5 presents the objects of the Interfaces Group MIB of an ONU in working mode.

Table 9-5—Interfaces Group MIB of an ONU in working mode

Interfaces Group MIB object	Value
ifIndex	1
ifDescr	“interface description”
ifType	ethernetCsmacd (6) 1000base-Px
ifMtu	MTU size (1522)
ifSpeed	1000000000
ifPhysAddress	ONU_MAC_Address ^a
ifAdminStatus	up
ifOperStatus	Up
ifLastChange	ONUup_time
ifInOctets	ONU_octets_number
ifInUcastPkts	ONU_unicast_frame_number
ifInNUcastPkts	ONU_non_unicast_frame_number
ifInDiscards	ONU_discard_frame_number
ifInErrors	ONU_error_frame_number
ifInUnknownProtos	ONU_unknown_frame_number
ifOutOctets	ONU_octets_number
ifOutUcastPkts	ONU_unicast_frame_number
ifOutNUcastPkts	ONU_non_unicast_frame_number
ifOutDiscards	ONU_discard_frame_number
ifOutErrors	ONU_error_frame_number
ifOutQLen	ONU_queue_frame_number

^aONU_MAC_Address is the MAC address of the ONU EPON interface.

Table 9-6 presents the objects of the Interfaces Group MIB of the ONU interface.

Table 9-6—Interfaces Group MIB of the ONU interface

Interfaces Group MIB object	Value
ifIndex	100
ifDescr	“interface description”
ifType	ethernetCsmacd (6) 1000base-Px
ifMtu	MTU size (1522)
ifSpeed	1000000000
ifPhysAddress	ONU_MAC_Address ^a
ifAdminStatus	up
ifOperStatus	Up
ifLastChange	up_time
ifInOctets	ONU1_octets_number
ifInUcastPkts	ONU1_unicast_frame_number
ifInNUcastPkts	ONU1_non_unicast_frame_number
ifInDiscards	ONU1_discard_frame_number
ifInErrors	ONU1_error_frame_number
ifInUnknownProtos	ONU1_unknown_frame_number
ifOutOctets	ONU1_octets_number
ifOutUcastPkts	ONU1_unicast_frame_number
ifOutNUcastPkts	ONU1_non_unicast_frame_number
ifOutDiscards	ONU1_discard_frame_number
ifOutErrors	ONU1_error_frame_number
ifOutQLen	ONU1_queue_frame_number

^aONU_MAC_Address is the MAC address of the ONU EPON interface.

The following values will be set in the ifStack and ifInvStack tables related to this example.

ifStackTable:

- ifStackHigherLayer = 100, ifStackLowerLayer = 1 – map between the physical interface and the ONU

ifInvStackTable:

- ifStackLowerLayer = 1, ifStackHigherLayer = 100 – map between the ONU and the physical interface

Table 9-7 presents the Interfaces Group MIB objects of an OLT interface.

Table 9-7—Interfaces Group MIB objects of an OLT interface

Interfaces Group MIB object	Value
ifIndex	2
ifDescr	“interface description”
ifType	ethernetCsmacd (6) 1000base-Px
ifMtu	MTU size (1522)
ifSpeed	1000000000
ifPhysAddress	OLT_MAC_Address ^a
ifAdminStatus	up
ifOperStatus	Up
ifLastChange	OLTup_time
ifInOctets	OLT_octets_number
ifInUcastPkts	OLT_unicast_frame_number
ifInNUcastPkts	OLT_non_unicast_frame_number
ifInDiscards	OLT_discard_frame_number
ifInErrors	OLT_error_frame_number
ifInUnknownProtos	OLT_unknown_frame_number
ifOutOctets	OLT_octets_number
ifOutUcastPkts	OLT_unicast_frame_number
ifOutNUcastPkts	OLT_non_unicast_frame_number

Table 9-7—Interfaces Group MIB objects of an OLT interface (continued)

Interfaces Group MIB object	Value
ifOutDiscards	OLT_discard_frame_number
ifOutErrors	OLT_error_frame_number
ifOutQLen	OLT_queue_frame_number

^aOLT_MAC_Address is the MAC address of the OLT EPON interface.

Table 9-8 presents the Interfaces Group MIB objects of an OLT interface, associated with the virtual link interfaces.

Table 9-8—Interfaces Group MIB objects of an OLT interface, associated with the virtual link interfaces

Interface MIB object	Value	Value	Value
ifIndex	200001	200002	265535
ifDescr	“interface description”	“interface description”	“interface description”
ifType	ethernetCsmacd (6)	ethernetCsmacd (6)	ethernetCsmacd (6)
ifMtu	MTUsize(1522)	MTUsize(1522)	MTUsize(1522)
ifSpeed	1000000000	1000000000	1000000000
ifPhysAddress	OLT_MAC_Address ^a	OLT_MAC_Address	OLT_MAC_Address
ifAdminStatus	up	up	up
ifOperStatus	Up	Up	Up
ifLastChange	ONU1_up_time	ONU2_up_time	up_time
ifInOctets	ONU1_octets_number	ONU2_octets_number	BRCT_octets_number
ifInUcastPkts	ONU1_unic_frame_num	ONU2_unic_frame_num	BRCT_unic_frame_num
ifInNUcastPkts	ONU1_non_unic_frame_num	ONU2_non_unic_frame_num	BRCT_non_unic_frame_num
ifInDiscards	ONU1_disc_frame_num	ONU2_disc_frame_num	BRCT_disc_frame_numr
ifInErrors	ONU1_err_frame_num	ONU2_err_frame_num	BRCT_err_frame_num
ifInUnknownProtos	ONU1_unknw_frame_num	ONU2_unknw_frame_num	BRCT_unknw_frame_num
ifOutOctets	ONU1_octets_number	ONU2_octets_number	BRCT_octets_number
ifOutUcastPkts	ONU1_unic_frame_num	ONU2_unic_frame_num	BRCT_unic_frame_num
ifOutNUcastPkts	ONU1_non_unic_frame_num	ONU2_non_unic_frame_num	BRCT_non_unic_frame_num

Table 9-8—Interfaces Group MIB objects of an OLT interface, associated with the virtual link interfaces (continued)

Interface MIB object	Value	Value	Value
ifOutDiscards	ONU1_disc_frame_num	ONU2_disc_frame_num	BRCT_disc_frame_num
ifOutErrors	ONU1_err_frame_num	ONU2_err_frame_num	BRCT_err_frame_num
ifOutQLen	ONU1_queue_frame_num	ONU2_queue_frame_num	BRCT_queue_frame_num

^aOLT_MAC_Address is the MAC address of the OLT EPON interface.

The following values will be set in the ifStack and ifInvStack tables related to this example:

ifStackTable:

- ifStackHigherLayer = 265535, ifStackLowerLayer = 2 – map between the OLT physical interface and its broadcast virtual interface
- ifStackHigherLayer = 200001, ifStackLowerLayer = 2 – map between the OLT physical interface and its virtual interface of the 1st ONU
- ifStackHigherLayer = 200002, ifStackLowerLayer = 2 – map between the OLT physical interface and its virtual interface of the 2nd ONU
- ifStackHigherLayer = 200003, ifStackLowerLayer = 2 – map between the OLT physical interface and its virtual interface of the 3rd ONU

ifInvStackTable:

- ifStackLowerLayer = 2, ifStackHigherLayer = 265535 – map between the broadcast interface of the OLT and the OLT physical interface
- ifStackLowerLayer = 2, ifStackHigherLayer = 200001 – map between the OLT virtual interface of the 1st ONU and the OLT physical interface
- ifStackLowerLayer = 2, ifStackHigherLayer = 200002 – map between the OLT virtual interface of the 2nd ONU and the OLT physical interface
- ifStackLowerLayer = 2, ifStackHigherLayer = 200003 – map between the OLT virtual interface of the 3rd ONU and the OLT physical interface

The rows for the ONU interface, the OLT interface, and the OLT broadcast interface are created in initialization. The creation of a row for a virtual link is done when the virtual link is established (ONU registers), and deletion is done when the virtual link is deleted (ONU deregisters).

The EPON MIB module also extends the Interfaces Group MIB module with a set of counters, which are specific for the EPON interface. The EPON MIB module implements the same handling of the counters when the operation of the interface starts or stops. The interface MIB clause describes the possible behavior of counters when an interface is re-initialized using the ifCounterDiscontinuityTime indicator, indicating the discontinuity of the counters. See Section 3.1.5 of IETF RFC 2863 for more information. The counters of the EPON MIB should be handled in a similar manner.

9.3.2 Relation to the IEEE 802.3 MAU MIBs

The MAU types of the EPON Interface are defined in Clause 13. This clause assumes the implementation of the MAU MIB for this purpose and does not repeat the EPON MAU types. Therefore, if this module is implemented, the MAU-MIB module defined in Clause 13 shall also be implemented.

The handling of the ifMAU tables for the EPON case is similar to the handling described in the former subclause for the Interface and Ethernet-like interface MIBs. A single row exists for the ONU in the ifMauTable. A row for each virtual link (N+1 rows) exists at the OLT, with a separate value of ifMauIfIndex for each virtual link.

As specified above, the rows for the ONU interface, the OLT interface, and the OLT broadcast interface are created in initialization. The creation of a row for a virtual link is done when the virtual link is established (ONU registers), and deletion is done when the virtual link is deleted (ONU deregisters).

9.3.3 Relation to the Ethernet OAM MIB

The EPON interfaces are intended for use in optical subscriber access networks and most probably will be accompanied with the implementation of the OAM protocol defined in Clause 57 of IEEE Std 802.3. Therefore, the Ethernet OAM MIB module defined in Clause 6 may be implemented when this MIB module is implemented defining managed objects for the OAM protocol that are complementary to the EPON MIB module.

9.3.4 Relation to the bridge MIB

It is very probable that an EPON OLT will implement a bridging functionality above the EPON interface layer, bridging between the EPON users and the network. Bridge functionality is specified in IEEE Std 802.1D. In this scenario, the virtual ports of the EPON are corresponding to the virtual bridge ports. There is a direct mapping between the bridge ports and the LLIDs, which are virtual EPON channels.

Therefore, the bridge MIB modules defined in IEEE Std 802.1Q [B5] may be implemented when the EPON MIB module is implemented for an EPON OLT, defining managed objects for the bridge layer.

The values of dot1dBasePortIfIndex would correspond to the ifIndex of the virtual port (1 for LLID1, 2 for LLID2, etc.).

The broadcast virtual EPON interface of the OLT has no direct mapping to a virtual bridge port as it is not port specific but used for broadcast traffic.

9.4 Mapping of IEEE 802.3 managed objects

This subclause contains the mapping between the managed objects defined in this clause and the attributes defined in Clause 30 of IEEE Std 802.3. Table 9-9 provides the mapping between the dot3EPON MIB module MPCP objects and the MPCP attributes of Clause 30 of IEEE Std 802.3.

Table 9-10 provides the mapping between the dot3EPON MIB module OMPEmulation objects and the OMPE attributes of Clause 30 of IEEE Std 802.3.

Table 9-11 provides the mapping between the dot3EPON MIB module FEC objects and the MAU attributes of Clause 30 of IEEE Std 802.3.

Table 9-9—oMPCP managed object class (30.3.5 of IEEE Std 802.3)

dot3EPON MIB module object	IEEE 802.3 attribute	Reference
ifIndex	aMPCPID	30.3.5.1.1
dot3MpcpOperStatus	aMPCPAdminState	30.3.5.1.2
dot3MpcpMode	aMPCPMode	30.3.5.1.3
dot3MpcpLinkID	aMPCPLinkID	30.3.5.1.4
dot3MpcpRemoteMACAddress	aMPCPRemoteMACAddress	30.3.5.1.5
dot3MpcpRegistrationState	aMPCPRegistrationState	30.3.5.1.6
dot3MpcpMACCtrlFramesTransmitted	aMPCPMACCtrlFramesTransmitted	30.3.5.1.7
dot3MpcpMACCtrlFramesReceived	aMPCPMACCtrlFramesReceived	30.3.5.1.8
dot3MpcpTxGate	aMPCPTxGate	30.3.5.1.9
dot3MpcpTxRegAck	aMPCPTxRegAck	30.3.5.1.10
dot3MpcpTxRegister	aMPCPTxRegister	30.3.5.1.11
dot3MpcpTxRegRequest	aMPCPTxRegRequest	30.3.5.1.12
dot3MpcpTxReport	aMPCPTxReport	30.3.5.1.13
dot3MpcpRxGate	aMPCPRxGate	30.3.5.1.14
dot3MpcpRxRegAck	aMPCPRxRegAck	30.3.5.1.15
dot3MpcpRxRegister	aMPCPRxRegister	30.3.5.1.16
dot3MpcpRxRegRequest	aMPCPRxRegRequest	30.3.5.1.17
dot3MpcpRxReport	aMPCPRxReport	30.3.5.1.18
dot3MpcpTransmitElapsed	aMPCPTransmitElapsed	30.3.5.1.19
dot3MpcpReceiveElapsed	aMPCPReceiveElapsed	30.3.5.1.20
dot3MpcpRoundTripTime	aMPCPRoundTripTime	30.3.5.1.21
dot3MpcpDiscoveryWindowsSent	aMPCPDiscoveryWindowsSent	30.3.5.1.22
dot3MpcpDiscoveryTimeout	aMPCPDiscoveryTimeout	30.3.5.1.23
dot3MpcpMaximumPendingGrants	aMPCPMaximumPendingGrants	30.3.5.1.24
dot3MpcpAdminState	aMPCPAdminControl	30.3.5.2.1
dot3MpcpSyncTime	SyncTime	64.3.3.2

Table 9-10—oOMPEmulation managed object class (30.3.7 of IEEE Std 802.3)

dot3EPON MIB module object	IEEE 802.3 attribute	Reference
ifIndex	aOMPEmulationID	30.3.7.1.1
dot3OmpEmulationType	aOMPEmulationType	30.3.7.1.2
dot3OmpEmulationSLDErrors	aSLDErrors	30.3.7.1.3
dot3OmpEmulationCRC8Errors	aCRC8Errors	30.3.7.1.4
dot3OmpEmulationGoodLLID	aGoodLLID	30.3.7.1.5
dot3OmpEmulationOnuPonCastLLID	aONUPONcastLLID	30.3.7.1.6
dot3OmpEmulationOltPonCastLLID	aOLTPONcastLLID	30.3.7.1.7
dot3OmpEmulationBadLLID	aBadLLID	30.3.7.1.8
dot3OmpEmulationBroadcastBitNotOnuLlid	N/A	—
dot3OmpEmulationOnuLLIDNotBroadcast	N/A	—
dot3OmpEmulationBroadcastBitPlusOnuLlid	N/A	—
dot3OmpEmulationNotBroadcastBitNotOnuLlid	N/A	—

Table 9-11—oMAU managed object class (30.5.1 of IEEE Std 802.3)

dot3EPON MIB module object	IEEE 802.3 attribute	Reference
dot3EponFecPCSCodingViolation	aPCSCodingViolation	30.5.1.1.14
dot3EponFecAbility	aFECAbility	30.5.1.1.15
dot3EponFecMode	aFECmode	30.5.1.1.16
dot3EponFecCorrectedBlocks	aFECCorrectedBlocks	30.5.1.1.17
dot3EponFecUncorrectableBlocks	aFECUncorrectableBlocks	30.5.1.1.18
dot3EponFecBufferHeadCodingViolation	N/A	—

9.5 Security considerations for Ethernet passive optical network (EPON) MIB module

There are number of managed objects defined in this MIB module that have a MAX-ACCESS clause of read-write or read-create. Writing to these objects can have potentially disruptive effects on network operation, including those listed in 9.5.1 to 9.5.13.

9.5.1 dot3MpcpAdminState

Changing the dot3MpcpAdminState state can lead to disabling the Multipoint Control Protocol on the respective interface, leading to the interruption of service for the users connected to the respective EPON interface.

9.5.2 dot3EponFecMode

Changing the dot3EponFecMode state can lead to disabling the Forward Error Correction on the respective interface, which can lead to a degradation of the optical link, and therefore, it may lead to an interruption of service for the users connected to the respective EPON interface.

9.5.3 dot3ExtPkgObjectReset

Changing the dot3ExtPkgObjectReset state can lead to a reset of the respective interface leading to an interruption of service for the users connected to the respective EPON interface.

9.5.4 dot3ExtPkgObjectPowerDown

Changing the dot3ExtPkgObjectPowerDown state can lead to a power down of the respective interface, leading to an interruption of service for the users connected to the respective EPON interface.

9.5.5 dot3ExtPkgObjectFecEnabled

Changing the dot3ExtPkgObjectFecEnabled state can lead to disabling the Forward Error Correction on the respective interface, which can lead to a degradation of the optical link, and therefore, it may lead to an interruption of service for the users connected to the respective EPON interface.

9.5.6 dot3ExtPkgObjectRegisterAction

Changing the dot3ExtPkgObjectRegisterAction state can lead to a change in the registration state of the respective interface, leading to a deregistration and an interruption of service for the users connected to the respective EPON interface.

9.5.7 dot3ExtPkgObjectReportNumThreshold

Changing the dot3ExtPkgObjectReportNumThreshold can lead to a change in the reporting of the ONU interface and therefore to a change in the bandwidth allocation of the respective interface. This change may lead to a degradation or an interruption of service for the users connected to the respective EPON interface.

9.5.8 dot3ExtPkgObjectReportThreshold

Changing the dot3ExtPkgObjectReportThreshold can lead to a change in the reporting of the ONU interface and therefore to a change in the bandwidth allocation of the respective interface. This change may lead to a degradation or an interruption of service for the users connected to the respective EPON interface.

9.5.9 dot3ExtPkgOptIfLowerInputPowerThreshold

Changing the dot3ExtPkgOptIfLowerInputPowerThreshold can lead to a Threshold Crossing Alert (TCA) being sent for the respective interface. This alert may be leading to an interruption of service for the users connected to the respective EPON interface, depending on the system action on such an alert.

9.5.10 dot3ExtPkgOptIfUpperInputPowerThreshold

Changing the dot3ExtPkgOptIfUpperInputPowerThreshold can lead to a Threshold Crossing Alert (TCA) being sent for the respective interface. This alert may be leading to an interruption of service for the users connected to the respective EPON interface, depending on the system action on such an alert.

9.5.11 dot3ExtPkgOptIfLowerOutputPowerThreshold

Changing the dot3ExtPkgOptIfLowerOutputPowerThreshold can lead to a Threshold Crossing Alert (TCA) being sent for the respective interface. This alert may be leading to an interruption of service for the users connected to the respective EPON interface, depending on the system action on such an alert.

9.5.12 dot3ExtPkgOptIfUpperOutputPowerThreshold

Changing the dot3ExtPkgOptIfUpperOutputPowerThreshold can lead to a Threshold Crossing Alert (TCA) being sent for the respective interface. This alert may be leading to an interruption of service for the users connected to the respective EPON interface, depending on the system action on such an alert.

9.5.13 dot3ExtPkgOptIfTransmitEnable

Changing the dot3ExtPkgOptIfTransmitEnable state can lead to a halt in the optical transmission of the respective interface, leading to an interruption of service for the users connected to the respective EPON interface.

9.6 MIB module definition

An ASCII text version of the MIB definition can be found at the following URL¹⁶:

http://www.ieee802.org/3/1/public/mib_modules/20130411/802dot3dot1C9mib.txt

¹⁶Copyright release for MIB modules: Users of this standard may freely reproduce the MIB module contained in this subclause so that it can be used for its intended purpose.

IEEE8023-DOT3-EPON-MIB DEFINITIONS ::= BEGIN

IMPORTS

MODULE-IDENTITY, OBJECT-TYPE, Counter32,
Integer32, Unsigned32, Counter64, org
FROM SNMPv2-SMI
TruthValue, MacAddress
FROM SNMPv2-TC
ifIndex
FROM IF-MIB
MODULE-COMPLIANCE, OBJECT-GROUP
FROM SNMPv2-CONF
;

ieee8023dot3EponMIB MODULE-IDENTITY

LAST-UPDATED "201304110000Z" -- April 11, 2013

ORGANIZATION

"IEEE 802.3 working group"

CONTACT-INFO

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E-mail: hfrazier@broadcom.com"

DESCRIPTION

"The objects in this MIB module are used to manage the Ethernet in the First Mile (EFM) Ethernet Passive Optical Network (EPON) Interfaces as defined in IEEE Std 802.3 Clauses 60, 64, and 65.

Of particular interest are Clause 64 (MultiPoint Control Protocol - MPCP), Clause 65 (Point-to-Multipoint Reconciliation Sublayer - P2MP RS), Clause 60 (Ethernet Passive Optical Network Physical Medium Dependent - EPON PMDs), Clause 30, 'Management', and Clause 45, 'Management Data Input/Output (MDIO) Interface'."

REVISION "201304110000Z" -- April 11, 2013

DESCRIPTION

"Revision, based on an earlier version in IEEE Std 802.3.1-2011."

REVISION "201102020000Z" -- February 2, 2011

DESCRIPTION

"Initial version, based on an earlier version published as RFC 4837."

::= { org ieee(111) standards-association-numbers-series-standards(2)
lan-man-stds(802) ieee802dot3(3) ieee802dot3dot1mibs(1) 9 }

dot3EponObjects OBJECT IDENTIFIER ::= { ieee8023dot3EponMIB 1}

dot3EponConformance OBJECT IDENTIFIER ::= { ieee8023dot3EponMIB 2}

-- MPCP MIB modules definitions (IEEE Std 802.3, Clause 30.3.5)

dot3EponMpcpObjects
 OBJECT IDENTIFIER ::= { dot3EponObjects 1 }

dot3MpcpControlTable OBJECT-TYPE

SYNTAX SEQUENCE OF Dot3MpcpControlEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"A Table of dot3 MultiPoint Control Protocol (MPCP)

MIB objects. The entries in the table are control and

status objects of the MPCP.

Each object has a row for every virtual link denoted by the corresponding ifIndex.

The LLID field, as defined in the IEEE Std 802.3, is a 2-byte

register (15-bit field and a broadcast bit) limiting the

number of virtual links to 32768. Typically the number of

expected virtual links in a PON is like the number of

ONUs, which is 32-64, plus an additional entry for

broadcast LLID."

::= { dot3EponMpcpObjects 1 }

dot3MpcpControlEntry OBJECT-TYPE

SYNTAX Dot3MpcpControlEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"An entry in the dot3 MPCP Control table.

Rows exist for an OLT interface and an ONU interface.

A row in the table is denoted by the ifIndex of the link and it is created when the ifIndex is created.

The rows in the table for an ONU interface are created at system initialization.

The row in the table corresponding to the OLT ifIndex and the row corresponding to the broadcast virtual link are created at system initialization.

A row in the table corresponding to the ifIndex of a virtual links is created when a virtual link is established (ONU registers) and deleted when the virtual link is deleted (ONU deregisters)."

INDEX { ifIndex }

::= { dot3MpcpControlTable 1 }

Dot3MpcpControlEntry ::=

SEQUENCE {

dot3MpcpOperStatus

TruthValue,

dot3MpcpAdminState

TruthValue,

dot3MpcpMode

INTEGER,

dot3MpcpSyncTime

Unsigned32,

dot3MpcpLinkID

Unsigned32,

dot3MpcpRemoteMACAddress

MacAddress,

dot3MpcpRegistrationState

INTEGER,

dot3MpcpTransmitElapsed

Unsigned32,

dot3MpcpReceiveElapsed

Unsigned32,

dot3MpcpRoundTripTime

Unsigned32,

dot3MpcpMaximumPendingGrants

Unsigned32

}

dot3MpcpOperStatus OBJECT-TYPE

SYNTAX TruthValue

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"This object reflects the operational state of the MultiPoint MAC Control sublayer as defined in IEEE Std 802.3, Clause 64 and Clause 77. When the value is true(1), the interface will act as if the MultiPoint Control Protocol is enabled. When the value is false(2), the interface will act as if the MultiPoint Control Protocol is disabled. The operational state can be changed using the dot3MpcpAdminState object.

This object is applicable for an OLT, with the same value for all virtual interfaces, and for an ONU."

REFERENCE "IEEE Std 802.3, 30.3.5.1.2."

::= { dot3MpcpControlEntry 1 }

dot3MpcpAdminState OBJECT-TYPE

SYNTAX TruthValue

MAX-ACCESS read-write

STATUS current

DESCRIPTION

"This object is used to define the admin state of the MultiPoint MAC Control sublayer, as defined in IEEE Std 802.3, Clause 64, and to reflect its state. When selecting the value as true(1), the MultiPoint Control Protocol of the interface is enabled. When selecting the value as false(2), the MultiPoint Control Protocol of the interface is disabled. This object reflects the administrative state of the MultiPoint Control Protocol of the interface. The write operation is not restricted in this document and can be done at any time. Changing dot3MpcpAdminState state can lead to disabling the MultiPoint Control Protocol on the respective interface, leading to the interruption of service for the users connected to the respective EPON interface.

This object is applicable for an OLT, with the same value for all virtual interfaces, and for an ONU."

REFERENCE "IEEE Std 802.3, 30.3.5.2.1."

DEFVAL { false }

::= { dot3MpcpControlEntry 2 }

dot3MpcpMode OBJECT-TYPE

SYNTAX INTEGER {

olt(1),

onu(2)

}

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"This object is used to identify the operational state of the MultiPoint MAC Control sublayer as defined in IEEE Std 802.3, Clause 64 and Clause 77. Reading olt(1) for an OLT (server) mode and onu(2) for an ONU (client) mode. This object is used to identify the operational mode for the MPCP tables.

This object is applicable for an OLT, with the same value for all virtual interfaces, and for an ONU."

REFERENCE "IEEE Std 802.3, 30.3.5.1.3."

```
DEFVAL { olt }
::= { dot3MpcpControlEntry 3 }
```

dot3MpcpSyncTime OBJECT-TYPE

SYNTAX Unsigned32

UNITS "TQ (16 ns)"

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"An object that reports the 'sync lock time' of the OLT receiver in increments of Time Quanta (TQ)-16ns as defined in IEEE Std 802.3, Clauses 60, 64, and 65. The value returned shall be (sync lock time ns)/16, rounded up to the nearest TQ. If this value exceeds (2³²-1), the value (2³²-1) shall be returned. This object is applicable for an OLT, with distinct values for all virtual interfaces, and for an ONU."

REFERENCE "IEEE Std 802.3, 64.3.3.2."

::= { dot3MpcpControlEntry 4 }

dot3MpcpLinkID OBJECT-TYPE

SYNTAX Unsigned32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"An object that identifies the Logical Link Identifier (LLID) associated with the MAC of the virtual link as specified in IEEE Std 802.3, 65.1.3.2.2 or 76.2.6.1.3.2, as appropriate.

This object is applicable for an OLT and an ONU. At the OLT, it has a distinct value for each virtual interface. The ONU and the corresponding virtual MAC of the OLT, for the same virtual link, have the same value. Value is assigned when the ONU registers. Value is freed when the ONU deregisters."

REFERENCE "IEEE Std 802.3, 30.3.5.1.4."

::= { dot3MpcpControlEntry 5 }

dot3MpcpRemoteMACAddress OBJECT-TYPE

SYNTAX MacAddress

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"An object that identifies the source_address parameter of the last MPCPDUs passed to the MAC Control. This value is updated on reception of a valid frame with 1) a destination Field equal to the reserved multicast address for MAC Control as specified in IEEE Std 802.3, Annex 31A; 2) the lengthOrType field value equal to the reserved Type for MAC Control as specified in IEEE Std 802.3, Annex 31A; 3) an MPCP subtype value equal to the subtype reserved for MPCP as specified in IEEE Std 802.3, Annex 31A. This object is applicable for an OLT and an ONU. At the OLT, it has a distinct value for each virtual interface. The value reflects the MAC address of the remote entity and therefore the OLT holds a value for each LLID, which is the MAC address of the ONU; the ONU has a single value that is the OLT MAC address."

REFERENCE "IEEE Std 802.3, 30.3.5.1.5."

```
::= { dot3MpcpControlEntry 6 }
```

```
dot3MpcpRegistrationState OBJECT-TYPE
```

```
SYNTAX INTEGER {
    unregistered(1),
    registering(2),
    registered(3)
}
```

```
MAX-ACCESS read-only
STATUS current
```

```
DESCRIPTION
```

"An object that identifies the registration state of the MultiPoint MAC Control sublayer as defined in IEEE Std 802.3, Clause 64. When this object has the enumeration unregistered(1), the interface is unregistered and may be used for registering a link partner. When this object has the enumeration registering(2), the interface is in the process of registering a link-partner. When this object has the enumeration registered(3), the interface has an established link-partner. This object is applicable for an OLT and an ONU. At the OLT, it has a distinct value for each virtual interface."

```
REFERENCE "IEEE Std 802.3, 30.3.5.1.6."
```

```
::= { dot3MpcpControlEntry 7 }
```

```
dot3MpcpTransmitElapsed OBJECT-TYPE
```

```
SYNTAX Unsigned32
UNITS "TQ (16 ns)"
MAX-ACCESS read-only
STATUS current
DESCRIPTION
```

"An object that reports the interval from the last MPCP frame transmission in increments of Time Quanta (TQ)-16ns. The value returned shall be (interval from last MPCP frame transmission in ns)/16. If this value exceeds (2³²-1), the value (2³²-1) shall be returned. This object is applicable for an OLT and an ONU. At the OLT, it has a distinct value for each virtual interface."

```
REFERENCE "IEEE Std 802.3, 30.3.5.1.19."
```

```
::= { dot3MpcpControlEntry 8 }
```

```
dot3MpcpReceiveElapsed OBJECT-TYPE
```

```
SYNTAX Unsigned32
UNITS "TQ (16 ns)"
MAX-ACCESS read-only
STATUS current
DESCRIPTION
```

"An object that reports the interval from last MPCP frame reception in increments of Time Quanta (TQ)-16ns. The value returned shall be (interval from last MPCP frame reception in ns)/16. If this value exceeds (2³²-1), the value (2³²-1) shall be returned. This object is applicable for an OLT and an ONU. At the OLT, it has a distinct value for each virtual interface."

```
REFERENCE "IEEE Std 802.3, 30.3.5.1.20."
```

```
::= { dot3MpcpControlEntry 9 }
```

```
dot3MpcpRoundTripTime OBJECT-TYPE
```

SYNTAX Unsigned32 (0..'ffff'h)
 UNITS "TQ (16 ns)"
 MAX-ACCESS read-only
 STATUS current
 DESCRIPTION
 "An object that reports the MPCP round trip time in increments of Time Quanta (TQ)-16ns. The value returned shall be (round trip time in ns)/16. If this value exceeds (2¹⁶-1), the value (2¹⁶-1) shall be returned. This object is applicable for an OLT. At the OLT, it has a distinct value for each virtual interface."
 REFERENCE "IEEE Std 802.3, 30.3.5.1.21."
 ::= { dot3MpcpControlEntry 10 }

dot3MpcpMaximumPendingGrants OBJECT-TYPE

SYNTAX Unsigned32 (0..255)
 MAX-ACCESS read-only
 STATUS current
 DESCRIPTION
 "An object that reports the maximum number of grants that an ONU can store for handling. The maximum number of grants that an ONU can store for handling has a range of 0 to 255. This object is applicable for an OLT and an ONU. At the OLT, it has a distinct value for each virtual interface. At the OLT, the value should be zero."
 REFERENCE "IEEE Std 802.3, 30.3.5.1.24."
 ::= { dot3MpcpControlEntry 11 }

dot3MpcpStatTable OBJECT-TYPE

SYNTAX SEQUENCE OF Dot3MpcpStatEntry
 MAX-ACCESS not-accessible
 STATUS current
 DESCRIPTION
 "This table defines the list of statistics counters of an interface implementing the IEEE Std 802.3, Clause 64 MPCP. Each object has a row for every virtual link denoted by the corresponding ifIndex. The LLID field, as defined in IEEE Std 802.3, is a 2-byte register (15-bit field and a broadcast bit) limiting the number of virtual links to 32768. Typically the number of expected virtual links in a PON is like the number of ONUs, which is 32-64, plus an additional entry for broadcast LLID."
 ::= { dot3EponMpcpObjects 2 }

dot3MpcpStatEntry OBJECT-TYPE

SYNTAX Dot3MpcpStatEntry
 MAX-ACCESS not-accessible
 STATUS current
 DESCRIPTION
 "An entry in the table of statistics counters of the IEEE Std 802.3, Clause 64, MPCP interface. Rows exist for an OLT interface and an ONU interface. A row in the table is denoted by the ifIndex of the link and it is created when the ifIndex is created. The rows in the table for an ONU interface are created

at system initialization.

The row in the table corresponding to the OLT ifIndex and the row corresponding to the broadcast virtual link are created at system initialization.

A row in the table corresponding to the ifIndex of a virtual link is created when a virtual link is established (ONU registers) and deleted when the virtual link is deleted (ONU deregisters)."

```
INDEX { ifIndex }
 ::= { dot3MpcpStatTable 1 }
```

Dot3MpcpStatEntry ::=

```
SEQUENCE {
    dot3MpcpMACCtrlFramesTransmitted Counter64,
    dot3MpcpMACCtrlFramesReceived Counter64,
    dot3MpcpDiscoveryWindowsSent Counter32,
    dot3MpcpDiscoveryTimeout Counter32,
    dot3MpcpTxRegRequest Counter64,
    dot3MpcpRxRegRequest Counter64,
    dot3MpcpTxRegAck Counter64,
    dot3MpcpRxRegAck Counter64,
    dot3MpcpTxReport Counter64,
    dot3MpcpRxReport Counter64,
    dot3MpcpTxGate Counter64,
    dot3MpcpRxGate Counter64,
    dot3MpcpTxRegister Counter64,
    dot3MpcpRxRegister Counter64
}
```

dot3MpcpMACCtrlFramesTransmitted OBJECT-TYPE

SYNTAX Counter64

UNITS "frames"

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"A count of MPCP frames passed to the MAC sublayer for transmission. This counter is incremented when a MA_CONTROL request service primitive is generated within the MAC control sublayer with an opcode indicating an MPCP frame.

This object is applicable for an OLT and an ONU. At the OLT it has a distinct value for each virtual interface.

Discontinuities of this counter can occur at

re-initialization of the management system, and at other times as indicated by the value of the

ifCounterDiscontinuityTime object of the Interfaces Group MIB module."

REFERENCE "IEEE Std 802.3, 30.3.5.1.7."

```
::= { dot3MpcpStatEntry 1 }
```

dot3MpcpMACCtrlFramesReceived OBJECT-TYPE

SYNTAX Counter64

UNITS "frames"

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"A count of MPCP frames passed by the MAC sublayer to the MAC Control sublayer. This counter is incremented when a ReceiveFrame function call returns a valid frame with

- 1) a lengthOrType field value equal to the reserved Type for 802.3_MAC_Control as specified in IEEE Std 802.3 31.4.1.3, and
 - 2) an opcode indicating an MPCP frame.
- This object is applicable for an OLT and an ONU. At the OLT, it has a distinct value for each virtual interface. Discontinuities of this counter can occur at re-initialization of the management system and at other times, as indicated by the value of the ifCounterDiscontinuityTime object of the Interfaces Group MIB module."

REFERENCE "IEEE Std 802.3, 30.3.5.1.8."
 ::= { dot3MpcpStatEntry 2}

dot3MpcpDiscoveryWindowsSent OBJECT-TYPE

SYNTAX Counter32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"A count of discovery windows generated. The counter is incremented by one for each generated discovery window. This object is applicable for an OLT and an ONU. At the OLT, it has a distinct value for each virtual interface. At the ONU, the value should be zero. Discontinuities of this counter can occur at re-initialization of the management system and at other times, as indicated by the value of the ifCounterDiscontinuityTime object of the Interfaces Group MIB module."

REFERENCE "IEEE Std 802.3, 30.3.5.1.22."
 ::= { dot3MpcpStatEntry 3}

dot3MpcpDiscoveryTimeout OBJECT-TYPE

SYNTAX Counter32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"A count of the number of times a discovery timeout occurs. Increment the counter by one for each discovery processing state-machine reset resulting from timeout waiting for message arrival. This object is applicable for an OLT and an ONU. At the OLT, it has a distinct value for each virtual interface. Discontinuities of this counter can occur at re-initialization of the management system and at other times, as indicated by the value of the ifCounterDiscontinuityTime object of the Interfaces Group MIB module."

REFERENCE "IEEE Std 802.3, 30.3.5.1.23."
 ::= { dot3MpcpStatEntry 4}

dot3MpcpTxRegRequest OBJECT-TYPE

SYNTAX Counter64

UNITS "frames"

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"A count of the number of times a REGISTER_REQ MPCP frame transmission occurs. Increment the counter by one

for each REGISTER_REQ MPCP frame transmitted as defined in IEEE Std 802.3, Clause 64.
 This object is applicable for an OLT and an ONU. At the OLT, it has a distinct value for each virtual interface. At the OLT, the value should be zero.
 Discontinuities of this counter can occur at re-initialization of the management system and at other times, as indicated by the value of the ifCounterDiscontinuityTime object of the Interfaces Group MIB module."

REFERENCE "IEEE Std 802.3, 30.3.5.1.12."
 ::= { dot3MpcpStatEntry 5}

dot3MpcpRxRegRequest OBJECT-TYPE

SYNTAX Counter64
 UNITS "frames"
 MAX-ACCESS read-only
 STATUS current
 DESCRIPTION

"A count of the number of times a REGISTER_REQ MPCP frame reception occurs.
 Increment the counter by one for each REGISTER_REQ MPCP frame received as defined in IEEE Std 802.3, Clause 64. This object is applicable for an OLT and an ONU. At the OLT, it has a distinct value for each virtual interface. At the ONU, the value should be zero.
 Discontinuities of this counter can occur at re-initialization of the management system and at other times, as indicated by the value of the ifCounterDiscontinuityTime object of the Interfaces Group MIB module."

REFERENCE "IEEE Std 802.3, 30.3.5.1.17."
 ::= { dot3MpcpStatEntry 6}

dot3MpcpTxRegAck OBJECT-TYPE

SYNTAX Counter64
 UNITS "frames"
 MAX-ACCESS read-only
 STATUS current
 DESCRIPTION

"A count of the number of times a REGISTER_ACK MPCP frame transmission occurs. Increment the counter by one for each REGISTER_ACK MPCP frame transmitted as defined in IEEE Std 802.3, Clause 64.
 This object is applicable for an OLT and an ONU. At the OLT, it has a distinct value for each virtual interface. At the OLT, the value should be zero.
 Discontinuities of this counter can occur at re-initialization of the management system and at other times, as indicated by the value of the ifCounterDiscontinuityTime object of the Interfaces Group MIB module."

REFERENCE "IEEE Std 802.3, 30.3.5.1.10."
 ::= { dot3MpcpStatEntry 7}

dot3MpcpRxRegAck OBJECT-TYPE

SYNTAX Counter64
 UNITS "frames"
 MAX-ACCESS read-only

STATUS current

DESCRIPTION

"A count of the number of times a REGISTER_ACK MPCP frame reception occurs. Increment the counter by one for each REGISTER_ACK MPCP frame received as defined in IEEE Std 802.3, Clause 64. This object is applicable for an OLT and an ONU. At the OLT, it has a distinct value for each virtual interface. At the ONU, the value should be zero. Discontinuities of this counter can occur at re-initialization of the management system and at other times, as indicated by the value of the ifCounterDiscontinuityTime object of the Interfaces Group MIB module."

REFERENCE "IEEE Std 802.3, 30.3.5.1.15."

::= { dot3MpcpStatEntry 8 }

dot3MpcpTxReport OBJECT-TYPE

SYNTAX Counter64

UNITS "frames"

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"A count of the number of times a REPORT MPCP frame transmission occurs. Increment the counter by one for each REPORT MPCP frame transmitted as defined in IEEE Std 802.3, Clause 64. This object is applicable for an OLT and an ONU. At the OLT, it has a distinct value for each virtual interface. At the ONU, the value should be zero. Discontinuities of this counter can occur at re-initialization of the management system and at other times, as indicated by the value of the ifCounterDiscontinuityTime object of the Interfaces Group MIB module."

REFERENCE "IEEE Std 802.3, 30.3.5.1.13."

::= { dot3MpcpStatEntry 9 }

dot3MpcpRxReport OBJECT-TYPE

SYNTAX Counter64

UNITS "frames"

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"A count of the number of times a REPORT MPCP frame reception occurs. Increment the counter by one for each REPORT MPCP frame received as defined in IEEE Std 802.3, Clause 64. This object is applicable for an OLT and an ONU. At the OLT, it has a distinct value for each virtual interface. At the ONU, the value should be zero. Discontinuities of this counter can occur at re-initialization of the management system and at other times, as indicated by the value of the ifCounterDiscontinuityTime object of the Interfaces Group MIB module."

REFERENCE "IEEE Std 802.3, 30.3.5.1.18."

::= { dot3MpcpStatEntry 10 }

dot3MpcpTxGate OBJECT-TYPE

SYNTAX Counter64

UNITS "frames"

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"A count of the number of times a GATE MPCP frame transmission occurs.

Increment the counter by one for each GATE MPCP frame transmitted as defined in IEEE Std 802.3, Clause 64.

This object is applicable for an OLT and an ONU. At the OLT, it has a distinct value for each virtual interface.

At the ONU, the value should be zero.

Discontinuities of this counter can occur at re-initialization of the management system and at other times, as indicated by the value of the

ifCounterDiscontinuityTime object of the Interfaces Group MIB module."

REFERENCE "IEEE Std 802.3, 30.3.5.1.9."

::= { dot3MpcpStatEntry 11}

dot3MpcpRxGate OBJECT-TYPE

SYNTAX Counter64

UNITS "frames"

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"A count of the number of times a GATE MPCP frame reception occurs.

Increment the counter by one for each GATE MPCP frame received as defined in IEEE Std 802.3, Clause 64.

This object is applicable for an OLT and an ONU. At the OLT, it has a distinct value for each virtual interface.

At the ONU, the value should be zero.

Discontinuities of this counter can occur at re-initialization of the management system and at other times, as indicated by the value of the

ifCounterDiscontinuityTime object of the Interfaces Group MIB module."

REFERENCE "IEEE Std 802.3, 30.3.5.1.14."

::= { dot3MpcpStatEntry 12}

dot3MpcpTxRegister OBJECT-TYPE

SYNTAX Counter64

UNITS "frames"

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"A count of the number of times a REGISTER MPCP frame transmission occurs.

Increment the counter by one for each REGISTER MPCP frame transmitted as defined in IEEE Std 802.3, Clause 64.

This object is applicable for an OLT and an ONU. At the OLT, it has a distinct value for each virtual interface.

At the ONU, the value should be zero.

Discontinuities of this counter can occur at re-initialization of the management system and at other times, as indicated by the value of the

ifCounterDiscontinuityTime object of the Interfaces Group MIB

```

        module."
REFERENCE   "IEEE Std 802.3, 30.3.5.1.11."
 ::= { dot3MpcpStatEntry 13}

dot3MpcpRxRegister OBJECT-TYPE
SYNTAX Counter64
UNITS      "frames"
MAX-ACCESS read-only
STATUS current
DESCRIPTION
    "A count of the number of times a REGISTER MPCP frame
    reception occurs.
    Increment the counter by one for each REGISTER MPCP
    frame received as defined in IEEE Std 802.3, Clause 64.
    This object is applicable for an OLT and an ONU. At the
    OLT, it has a distinct value for each virtual interface.
    At the OLT, the value should be zero.
    Discontinuities of this counter can occur at
    re-initialization of the management system and at other
    times, as indicated by the value of the
    ifCounterDiscontinuityTime object of the Interfaces Group MIB
    module."
REFERENCE   "IEEE Std 802.3, 30.3.5.1.16."
 ::= { dot3MpcpStatEntry 14}

-- Optical Multi Point Emulation (OMPEmulation)
-- managed object definitions

dot3OmpEmulationObjects OBJECT IDENTIFIER ::= {dot3EponObjects 2}

dot3OmpEmulationTable OBJECT-TYPE
SYNTAX SEQUENCE OF Dot3OmpEmulationEntry
MAX-ACCESS not-accessible
STATUS current
DESCRIPTION
    "A table of dot3 OmpEmulation MIB objects. The table
    contain objects for the management of the OMPEmulation
    sublayer.
    Each object has a row for every virtual link denoted by
    the corresponding ifIndex.
    The LLID field, as defined in the IEEE Std 802.3, is a 2-byte
    register (15-bit field and a broadcast bit) limiting the
    number of virtual links to 32768. Typically the number
    of expected virtual links in a PON is like the number of
    ONUs, which is 32-64, plus an additional entry for
    broadcast LLID."
 ::= { dot3OmpEmulationObjects 1 }

dot3OmpEmulationEntry OBJECT-TYPE
SYNTAX Dot3OmpEmulationEntry
MAX-ACCESS not-accessible
STATUS current
DESCRIPTION
    "An entry in the dot3 OmpEmulation table.
    Rows exist for an OLT interface and an ONU interface.
    A row in the table is denoted by the ifIndex of the link
    and it is created when the ifIndex is created.
    The rows in the table for an ONU interface are created
    at system initialization."

```

The row in the table corresponding to the OLT ifIndex and the row corresponding to the broadcast virtual link are created at system initialization.
A row in the table corresponding to the ifIndex of a virtual links is created when a virtual link is established (ONU registers) and deleted when the virtual link is deleted (ONU deregisters)."

```
INDEX { ifIndex }
 ::= { dot3OmpEmulationTable 1 }
```

```
Dot3OmpEmulationEntry ::=
SEQUENCE {
    dot3OmpEmulationType          INTEGER
}
```

dot3OmpEmulationType OBJECT-TYPE

```
SYNTAX  INTEGER {
    unknown(1),
    olt(2),
    onu(3)
}
```

```
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION
```

"An object that indicates the mode of operation of the Reconciliation Sublayer for Point-to-Point Emulation (see IEEE Std 802.3, 65.1 or 76.2 as appropriate). unknown(1) value is assigned in initialization; true state or type is not yet known. olt(2) value is assigned when the sublayer is operating in OLT mode. onu(3) value is assigned when the sublayer is operating in ONU mode.
This object is applicable for an OLT, with the same value for all virtual interfaces, and for an ONU."

```
REFERENCE  "IEEE Std 802.3, 80.3.7.1.2."
 ::= { dot3OmpEmulationEntry 1}
```

dot3OmpEmulationStatTable OBJECT-TYPE

```
SYNTAX      SEQUENCE OF Dot3OmpEmulationStatEntry
MAX-ACCESS  not-accessible
STATUS      current
DESCRIPTION
```

"This table defines the list of statistics counters of IEEE Std 802.3, Clause 65, OMPEmulation sublayer. Each object has a row for every virtual link denoted by the corresponding ifIndex.
The LLID field, as defined in the IEEE Std 802.3, is a 2-byte register (15-bit field and a broadcast bit) limiting the number of virtual links to 32768. Typically the number of expected virtual links in a PON is like the number of ONUs, which is 32-64, plus an additional entry for broadcast LLID."

```
 ::= { dot3OmpEmulationObjects 2}
```

dot3OmpEmulationStatEntry OBJECT-TYPE

```
SYNTAX      Dot3OmpEmulationStatEntry
MAX-ACCESS  not-accessible
STATUS      current
DESCRIPTION
```

"An entry in the table of statistics counters of

IEEE Std 802.3, Clause 65, OMPEmulation sublayer.
 Rows exist for an OLT interface and an ONU interface.
 A row in the table is denoted by the ifIndex of the link and it is created when the ifIndex is created.
 The rows in the table for an ONU interface are created at system initialization.
 The row in the table corresponding to the OLT ifIndex and the row corresponding to the broadcast virtual link are created at system initialization.
 A row in the table corresponding to the ifIndex of a virtual links is created when a virtual link is established (ONU registers) and deleted when the virtual link is deleted (ONU deregisters)."

```
INDEX { ifIndex}
 ::= { dot3OmpEmulationStatTable 1 }
```

```
Dot3OmpEmulationStatEntry ::=
```

```
SEQUENCE {
    dot3OmpEmulationSLDErrors          Counter64,
    dot3OmpEmulationCRC8Errors         Counter64,
    dot3OmpEmulationBadLLID            Counter64,
    dot3OmpEmulationGoodLLID           Counter64,
    dot3OmpEmulationOnuPonCastLLID     Counter64,
    dot3OmpEmulationOltPonCastLLID     Counter64,
    dot3OmpEmulationBroadcastBitNotOnuLlid Counter64,
    dot3OmpEmulationOnuLLIDNotBroadcast Counter64,
    dot3OmpEmulationBroadcastBitPlusOnuLlid Counter64,
    dot3OmpEmulationNotBroadcastBitNotOnuLlid Counter64
}
```

```
dot3OmpEmulationSLDErrors OBJECT-TYPE
```

```
SYNTAX Counter64
```

```
UNITS "frames"
```

```
MAX-ACCESS read-only
```

```
STATUS current
```

```
DESCRIPTION
```

"A count of frames received that do not contain a valid SLD field as defined in IEEE Std 802.3, 65.1.3.3.1 or 76.2.6.1.3.1, as appropriate.

This object is applicable for an OLT and an ONU. At the OLT, it has a distinct value for each virtual interface.s

Discontinuities of this counter can occur at

re-initialization of the management system and at other

times, as indicated by the value of the

ifCounterDiscontinuityTime object of the Interfaces Group MIB module."

```
REFERENCE "IEEE Std 802.3, 30.3.7.1.3."
```

```
::= { dot3OmpEmulationStatEntry 1}
```

```
dot3OmpEmulationCRC8Errors OBJECT-TYPE
```

```
SYNTAX Counter64
```

```
UNITS "frames"
```

```
MAX-ACCESS read-only
```

```
STATUS current
```

```
DESCRIPTION
```

"A count of frames received that contain a valid SLD field, as defined in IEEE Std 802.3, 65.1.3.3.1 or 76.2.6.1.3.1 as appropriate, but do not pass the CRC-8 check as defined in IEEE Std 802.3, 65.1.3.3.3 or 76.2.6.1.3.3 as appropriate.

This object is applicable for an OLT and an ONU. At the OLT, it has a distinct value for each virtual interface. Discontinuities of this counter can occur at re-initialization of the management system and at other times, as indicated by the value of the ifCounterDiscontinuityTime object of the Interfaces Group MIB module."

REFERENCE "IEEE Std 802.3, 30.3.7.1.4."
 ::= { dot3OmpEmulationStatEntry 2}

dot3OmpEmulationBadLLID OBJECT-TYPE

SYNTAX Counter64

UNITS "frames"

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"A count of frames received that contain a valid SLD field in an OLT, and pass the CRC-8 check, but are discarded due to the LLID check. The SLD is defined in IEEE Std 802.3, 65.1.3.3.1 or 76.2.6.1.3.1, as appropriate. The CRC-8 check is defined in IEEE Std 802.3, 65.1.3.3.3 or 76.2.6.1.3.3, as appropriate. The LLID check is defined in IEEE Std 802.3, 65.1.3.3.2 or 76.2.6.1.3.2, as appropriate.

This object is applicable for an OLT and an ONU. At the OLT, it has a distinct value for each virtual interface.

Discontinuities of this counter can occur at re-initialization of the management system and at other times, as indicated by the value of the ifCounterDiscontinuityTime object of the Interfaces Group MIB module."

REFERENCE "IEEE Std 802.3, 30.3.7.1.8."
 ::= { dot3OmpEmulationStatEntry 3}

dot3OmpEmulationGoodLLID OBJECT-TYPE

SYNTAX Counter64

UNITS "frames"

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"A count of frames received that contain a valid SLD field, as defined in IEEE Std 802.3, 65.1.3.3.1 or 76.2.6.1.3.1, as appropriate, and pass the CRC-8 check as defined in IEEE Std 802.3, 65.1.3.3.3 or 76.2.6.1.3.3, as appropriate.

This object is applicable for an OLT and an ONU. At the OLT, it has a distinct value for each virtual interface.

Discontinuities of this counter can occur at re-initialization of the management system and at other times, as indicated by the value of the ifCounterDiscontinuityTime object of the Interfaces Group MIB module."

REFERENCE "IEEE Std 802.3, 30.3.7.1.5."
 ::= { dot3OmpEmulationStatEntry 4}

dot3OmpEmulationOnuPonCastLLID OBJECT-TYPE

SYNTAX Counter64

UNITS "frames"

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"A count of frames received that: 1) contain a valid SLD field in an ONU, 2) meet the rules for frame acceptance, and 3) pass the CRC-8 check. The SLD is defined in IEEE Std 802.3, 65.1.3.3.1 or 76.2.6.1.3.1, as appropriate. The rules for LLID acceptance are defined in IEEE Std 802.3, 65.1.3.3.2 or 76.2.6.1.3.2, as appropriate. The CRC-8 check is defined in IEEE Std 802.3, 65.1.3.3.3 or 76.2.6.1.3.3, as appropriate. This object is applicable for an OLT and an ONU. At the OLT, it has a distinct value for each virtual interface. At the ONU, the value should be zero. Discontinuities of this counter can occur at re-initialization of the management system and at other times, as indicated by the value of the ifCounterDiscontinuityTime object of the Interfaces Group MIB module."

REFERENCE "IEEE Std 802.3, 30.3.7.1.6."
 ::= { dot3OmpEmulationStatEntry 5}

dot3OmpEmulationOltPonCastLLID OBJECT-TYPE

SYNTAX Counter64
 UNITS "frames"
 MAX-ACCESS read-only
 STATUS current
 DESCRIPTION

"A count of frames received that contain a valid SLD field, as defined in IEEE Std 802.3, 65.1.3.3.1 or 76.2.6.1.3.1, as appropriate, pass the CRC-8 check, as defined in IEEE Std 802.3, 65.1.3.3.3 or 76.2.6.1.3.3, as appropriate, and meet the rules of acceptance for an OLT defined in IEEE Std 802.3, 65.1.3.3.2 or 76.2.6.1.3.2, as appropriate. This object is applicable for an OLT and an ONU. At the OLT, it has a distinct value for each virtual interface. At the ONU, the value should be zero. Discontinuities of this counter can occur at re-initialization of the management system and at other times, as indicated by the value of the ifCounterDiscontinuityTime object of the Interfaces Group MIB module."

REFERENCE "IEEE Std 802.3, 30.3.7.1.7."
 ::= { dot3OmpEmulationStatEntry 6}

dot3OmpEmulationBroadcastBitNotOnuLlid OBJECT-TYPE

SYNTAX Counter64
 UNITS "frames"
 MAX-ACCESS read-only
 STATUS current
 DESCRIPTION

"A count of frames received that contain a valid SLD field, as defined in IEEE Std 802.3, 65.1.3.3.1, pass the CRC-8 check, as defined in IEEE Std 802.3, 65.1.3.3.3, and contain the broadcast bit in the LLID and not the ONU's LLID (frame accepted) as defined in IEEE Std 802.3, Clause 65. This object is applicable for an OLT and an ONU. At the OLT, it has a distinct value for each virtual interface. At the ONU, the value should be zero. Discontinuities of this counter can occur at re-initialization of the management system and at other times, as indicated by the value of the


```

        ifCounterDiscontinuityTime object of the Interfaces Group MIB
        module."
 ::= { dot3OmpEmulationStatEntry 7}

dot3OmpEmulationOnuLLIDNotBroadcast OBJECT-TYPE
    SYNTAX Counter64
    UNITS "frames"
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
        "A count of frames received that contain a valid SLD
        field, as defined in IEEE Std 802.3,
        65.1.3.3.1, pass the CRC-8 check, as defined in
        IEEE Std 802.3, 65.1.3.3.3, and contain the ONU's LLID
        as defined in IEEE Std 802.3, Clause 65.
        This object is applicable for an OLT and an ONU. At the
        OLT, it has a distinct value for each virtual interface.
        At the OLT, the value should be zero.
        Discontinuities of this counter can occur at
        re-initialization of the management system and at other
        times, as indicated by the value of the
        ifCounterDiscontinuityTime object of the Interfaces Group MIB
        module."
 ::= { dot3OmpEmulationStatEntry 8}

dot3OmpEmulationBroadcastBitPlusOnuLlid OBJECT-TYPE
    SYNTAX Counter64
    UNITS "frames"
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
        "A count of frames received that contain a valid SLD
        field, as defined in IEEE Std 802.3,
        65.1.3.3.1, pass the CRC-8 check, as defined in
        IEEE Std 802.3, 65.1.3.3.3, and contain the broadcast
        bit in the LLID and match the ONU's LLID (frame
        reflected) as defined in IEEE Std 802.3, Clause 65.
        This object is applicable for an OLT and an ONU. At the
        OLT, it has a distinct value for each virtual interface.
        At the OLT, the value should be zero.
        Discontinuities of this counter can occur at
        re-initialization of the management system and at other
        times, as indicated by the value of the
        ifCounterDiscontinuityTime object of the Interfaces Group MIB
        module."
 ::= { dot3OmpEmulationStatEntry 9}

dot3OmpEmulationNotBroadcastBitNotOnuLlid OBJECT-TYPE
    SYNTAX Counter64
    UNITS "frames"
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
        "A count of frames received that contain a valid SLD
        field, as defined in IEEE Std 802.3,
        65.1.3.3.1, pass the CRC-8 check, as defined in
        IEEE Std 802.3, 65.1.3.3.3, and do not contain
        the ONU's LLID as defined in IEEE Std 802.3, Clause 65.
        This object is applicable for an OLT and an ONU. At the

```

OLT, it has a distinct value for each virtual interface.
 At the OLT, the value should be zero.
 Discontinuities of this counter can occur at
 re-initialization of the management system and at other
 times, as indicated by the value of the
 ifCounterDiscontinuityTime object of the Interfaces Group MIB
 module."

```
 ::= { dot3OmpEmulationStatEntry 10 }
```

-- FEC managed object definitions (30.5.1)

dot3EponFecObjects OBJECT IDENTIFIER ::= { dot3EponObjects 3 }

dot3EponFecTable OBJECT-TYPE
 SYNTAX SEQUENCE OF Dot3EponFecEntry
 MAX-ACCESS not-accessible
 STATUS current
 DESCRIPTION
 "A table of dot3 EPON FEC management objects.
 The entries in the table are control and status objects
 and statistic counters for the FEC layer.
 Each object has a row for every virtual link denoted by
 the corresponding ifIndex.
 The LLID field, as defined in the IEEE Std 802.3, is a 2-byte
 register (15-bit field and a broadcast bit) limiting the
 number of virtual links to 32768. Typically the number
 of expected virtual links in a PON is like the number of
 ONUs, which is 32-64, plus an additional entry for
 broadcast LLID."
 ::= { dot3EponFecObjects 1 }

dot3EponFecEntry OBJECT-TYPE
 SYNTAX Dot3EponFecEntry
 MAX-ACCESS not-accessible
 STATUS current
 DESCRIPTION
 "An entry in the dot3 EPON FEC table.
 Rows exist for an OLT interface and an ONU interface.
 A row in the table is denoted by the ifIndex of the link
 and it is created when the ifIndex is created.
 The rows in the table for an ONU interface are created
 at system initialization.
 The row in the table corresponding to the OLT ifIndex
 and the row corresponding to the broadcast virtual link
 are created at system initialization.
 A row in the table corresponding to the ifIndex of a
 virtual links is created when a virtual link is
 established (ONU registers) and deleted when the virtual
 link is deleted (ONU deregisters)."
 INDEX { ifIndex }
 ::= { dot3EponFecTable 1 }

Dot3EponFecEntry ::=

SEQUENCE {	
dot3EponFecPCSCodingViolation	Counter64,
dot3EponFecAbility	INTEGER,
dot3EponFecMode	INTEGER,
dot3EponFecCorrectedBlocks	Counter64,
dot3EponFecUncorrectableBlocks	Counter64,

```

        dot3EponFecBufferHeadCodingViolation Counter64
    }

```

dot3EponFecPCSCodingViolation OBJECT-TYPE

SYNTAX Counter64

UNITS "octets"

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"For a 100 Mb/s operation, it is a count of the number of times an invalid code-group is received, other than the /H/ code-group. For a 1000 Mb/s operation, it is a count of the number of times an invalid codegroup is received, other than the /V/ code-group. /H/ denotes a special 4b5b codeword of the IEEE Std 802.3 Clause 24 100 Mb/s PCS layer, and /V/ denotes a special 8b10b codeword of the IEEE Std 802.3 Clause 36 1000 Mb/s PCS layer.

This object is applicable for an OLT and an ONU. At the OLT, it has a distinct value for each virtual interface.

Discontinuities of this counter can occur at re-initialization of the management system and at other times, as indicated by the value of the ifCounterDiscontinuityTime object of the Interfaces Group MIB module."

REFERENCE "IEEE Std 802.3, 30.5.1.1.14."

::= { dot3EponFecEntry 1}

dot3EponFecAbility OBJECT-TYPE

SYNTAX INTEGER {

unknown(1),

supported(2),

unsupported(3)

}

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"An object that indicates the support of operation of the optional FEC sublayer of the 1000BASE-PX PHY specified in IEEE Std 802.3, 65.2.

unknown(1) value is assigned in the initialization, for non FEC support state or type not yet known. unsupported(3)

value is assigned when the sublayer is not supported.

supported(2) value is assigned when the sublayer is supported.

This object is applicable for an OLT, with the same value for all virtual interfaces, and for an ONU.

The FEC counters will have a zero value when the interface is not supporting FEC.

The counters:

dot3EponFecPCSCodingViolation - not affected by FEC ability.

dot3EponFecCorrectedBlocks - has a zero value when dot3EponFecAbility is unknown(1) and unsupported(3).

dot3EponFecUncorrectableBlocks - has a zero value when dot3EponFecAbility is unknown(1) and unsupported(3).

dot3EponFecBufferHeadCodingViolation - has a zero value when dot3EponFecAbility is unknown(1) and unsupported(3)."

REFERENCE "IEEE Std 802.3, 30.5.1.1.15."

```
::= { dot3EponFecEntry 2}
```

dot3EponFecMode OBJECT-TYPE

```
SYNTAX INTEGER {
    unknown(1),
    disabled(2),
    enabled(3)
}
```

```
MAX-ACCESS read-write
STATUS current
```

DESCRIPTION

"An object that defines the mode of operation of the optional FEC sublayer of the 1000BASE-PX PHY, specified in IEEE Std 802.3, 65.2, and reflects its state. A GET operation returns the current mode of operation of the PHY. A SET operation changes the mode of operation of the PHY to the indicated value. unknown(1) value is assigned in the initialization for non FEC support state or type not yet known. disabled(2) value is assigned when the FEC sublayer is operating in disabled mode. enabled(3) value is assigned when the FEC sublayer is operating in FEC mode. The write operation is not restricted in this document and can be done at any time. Changing dot3EponFecMode state can lead to disabling the Forward Error Correction on the respective interface, which can lead to a degradation of the optical link, and therefore may lead to an interruption of service for the users connected to the respective EPON interface. This object is applicable for an OLT and an ONU. At the OLT, it has a distinct value for each virtual interface. The counting of the FEC counters will stop when the FEC of the interface is disabled. The counters:
dot3EponFecPCSCodingViolation - not affected by FEC mode.
dot3EponFecCorrectedBlocks - stops counting when Rx_FEC is not enabled. (unknown(1) and disabled(2)).
dot3EponFecUncorrectableBlocks - stops counting when Rx_FEC is not enabled (unknown(1) and disabled(2)).
dot3EponFecBufferHeadCodingViolation - stops counting when Rx_FEC is not enabled (unknown(1) and disabled(2)).
The object:
dot3EponFecAbility - indicates the FEC ability and is not affected by the dot3EponFecMode object."

REFERENCE "IEEE Std 802.3, 30.5.1.1.16."

```
DEFVAL { unknown }
```

```
::= { dot3EponFecEntry 3}
```

dot3EponFecCorrectedBlocks OBJECT-TYPE

```
SYNTAX Counter64
```

```
MAX-ACCESS read-only
```

```
STATUS current
```

DESCRIPTION

"For 1000BASE-PX, 10GBASE-PR or 10/1GBASE-PRX PHYs, it is a count of corrected FEC blocks. This counter will not

increment for other PHY Types. Increment the counter by one for each received block that is corrected by the FEC function in the PHY.
 This object is applicable for an OLT and an ONU. At the OLT, it has a distinct value for each virtual interface. Discontinuities of this counter can occur at re-initialization of the management system and at other times, as indicated by the value of the ifCounterDiscontinuityTime object of the Interfaces Group MIB module."

REFERENCE "IEEE Std 802.3, 30.5.1.1.17."
 ::= { dot3EponFecEntry 4}

dot3EponFecUncorrectableBlocks OBJECT-TYPE

SYNTAX Counter64

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"For 1000BASE-PX, 10GBASE-PR or 10/1GBASE-PRX PHYs, it is a count of uncorrectable FEC blocks. This counter will not increment for other PHY Types. Increment the counter by one for each FEC block that is determined to be uncorrectable by the FEC function in the PHY.
 This object is applicable for an OLT and an ONU. At the OLT, it has a distinct value for each virtual interface. Discontinuities of this counter can occur at re-initialization of the management system and at other times, as indicated by the value of the ifCounterDiscontinuityTime object of the Interfaces Group MIB module."

REFERENCE "IEEE Std 802.3, 30.5.1.1.18."
 ::= { dot3EponFecEntry 5}

dot3EponFecBufferHeadCodingViolation OBJECT-TYPE

SYNTAX Counter64

UNITS "octets"

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"For a 1000 Mb/s operation, it is a count of the number of invalid code-group received directly from the link. The value has a meaning only in 1000 Mb/s mode and it is zero otherwise.
 This object is applicable for an OLT and an ONU. At the OLT, it has a distinct value for each virtual interface. Discontinuities of this counter can occur at re-initialization of the management system and at other times, as indicated by the value of the ifCounterDiscontinuityTime object of the Interfaces Group MIB module."

::= { dot3EponFecEntry 6}

-- ExtendedPackage managed object definitions

dot3ExtPkgObjects OBJECT IDENTIFIER ::= {dot3EponObjects 4}

dot3ExtPkgControlObjects OBJECT IDENTIFIER ::= { dot3ExtPkgObjects 1}

dot3ExtPkgControlTable OBJECT-TYPE

SYNTAX SEQUENCE OF Dot3ExtPkgControlEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"A table of Extended package Control management objects. Entries in the table are control and status indication objects of an EPON interface, which are gathered in an extended package as an addition to the objects based on the IEEE Std 802.3, Clause 30, attributes. Each object has a row for every virtual link denoted by the corresponding ifIndex.

The LLID field, as defined in the IEEE Std 802.3, is a 2-byte register (15-bit field and a broadcast bit) limiting the number of virtual links to 32768. Typically the number of expected virtual links in a PON is like the number of ONUs, which is 32-64, plus an additional entry for broadcast LLID."

::= { dot3ExtPkgControlObjects 1 }

dot3ExtPkgControlEntry OBJECT-TYPE

SYNTAX Dot3ExtPkgControlEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"An entry in the Extended package Control table.

Rows exist for an OLT interface and an ONU interface.

A row in the table is denoted by the ifIndex of the link and it is created when the ifIndex is created.

The rows in the table for an ONU interface are created at system initialization.

The row in the table corresponding to the OLT ifIndex and the row corresponding to the broadcast virtual link are created at system initialization.

A row in the table corresponding to the ifIndex of a virtual links is created when a virtual link is established (ONU registers) and deleted when the virtual link is deleted (ONU deregisters)."

INDEX { ifIndex }

::= { dot3ExtPkgControlTable 1 }

Dot3ExtPkgControlEntry ::=

SEQUENCE {

dot3ExtPkgObjectReset

INTEGER,

dot3ExtPkgObjectPowerDown

TruthValue,

dot3ExtPkgObjectNumberOfLLIDs

Unsigned32,

dot3ExtPkgObjectFecEnabled

INTEGER,

dot3ExtPkgObjectReportMaximumNumQueues

Unsigned32,

dot3ExtPkgObjectRegisterAction

INTEGER

}

dot3ExtPkgObjectReset OBJECT-TYPE

SYNTAX INTEGER {

running(1),

reset(2)

}

MAX-ACCESS read-write

STATUS current

DESCRIPTION

"This object is used to reset the EPON interface. The

interface may be unavailable while the reset occurs and data may be lost.

Setting this object to running(1) will cause the interface to enter into running mode. Setting this object to reset(2) will cause the interface to go into reset mode. When getting running(1), the interface is in running mode. When getting reset(2), the interface is in reset mode.

The write operation is not restricted in this document and can be done at any time. Changing dot3ExtPkgObjectReset state can lead to a reset of the respective interface, leading to an interruption of service for the users connected to the respective EPON interface.

This object is applicable for an OLT and an ONU. At the OLT, it has a distinct value for each virtual interface. A reset for a specific virtual interface resets only this virtual interface and not the physical interface. Thus, a virtual link that is malfunctioning can be reset without affecting the operation of other virtual interfaces.

The reset can cause Discontinuities in the values of the counters of the interface, similar to re-initialization of the management system. Discontinuity should be indicated by the ifCounterDiscontinuityTime object of the Interfaces Group MIB module."

```
DEFVAL { running }
::= { dot3ExtPkgControlEntry 1 }
```

dot3ExtPkgObjectPowerDown OBJECT-TYPE

SYNTAX TruthValue

MAX-ACCESS read-write

STATUS current

DESCRIPTION

"This object is used to power down the EPON interface.

The interface may be unavailable while the power down occurs and data may be lost.

Setting this object to true(1) will cause the interface to enter into power down mode. Setting this object to false(2) will cause the interface to go out of power down mode. When getting true(1), the interface is in power down mode. When getting false(2), the interface is not in power down mode.

The write operation is not restricted in this document and can be done at any time. Changing dot3ExtPkgObjectPowerDown state can lead to a power down of the respective interface, leading to an interruption of service of the users connected to the respective EPON interface.

This object is applicable for an OLT and an ONU. At the OLT, it has a distinct value for each virtual interface. A power down/up of a specific virtual interface affects only the virtual interface and not the physical interface. Hence a virtual link, which needs a certain handling, can be powered down and then powered up without disrupting the operation of other virtual interfaces.

The object is relevant when the admin state of the interface is active as set by the dot3MpcpAdminState."

```
DEFVAL { false }
```



```
::= { dot3ExtPkgControlEntry 2 }
```

dot3ExtPkgObjectNumberOfLLIDs OBJECT-TYPE

SYNTAX Unsigned32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"A read only object that indicates the number of registered LLIDs. The initialization value is 0. This object is applicable for an OLT with the same value for all virtual interfaces and for an ONU. The LLID field, as defined in the IEEE Std 802.3, is a 2-byte register (15-bit field and a broadcast bit) limiting the number of virtual links to 32768. Typically the number of expected virtual links in a PON is like the number of ONUs, which is 32-64, plus an additional entry for broadcast LLID. At the ONU the number of LLIDs for an interface is one."

```
::= { dot3ExtPkgControlEntry 3 }
```

dot3ExtPkgObjectFecEnabled OBJECT-TYPE

SYNTAX INTEGER {

noFecEnabled(1),

fecTxEnabled(2),

fecRxEnabled(3),

fecTxRxEnabled(4)

}

MAX-ACCESS read-write

STATUS current

DESCRIPTION

"An object defining the FEC mode of operation of the interface, and indicating its state. The modes defined in this object are extensions to the FEC modes defined in the dot3EponFecMode object.

When noFECEnabled(1), the interface does not enable FEC mode.

When fecTxEnabled(2), the interface enables the FEC transmit mode.

When fecRxEnabled(3), the interface enables the FEC receive mode.

When fecTxRxEnabled(4), the interface enables the FEC transmit and receive mode.

This object is applicable for an OLT and an ONU. At the OLT, it has a distinct value for each virtual interface. The FEC counters are referring to the receive path. The FEC counters will stop when the FEC receive mode of the interface is disabled, as defined by fecRxEnabled(3) and fecTxRxEnabled(4) values.

The counters:

dot3EponFecPCSCodingViolation - not affected by FEC mode.

dot3EponFecCorrectedBlocks - stops counting when Rx_FEC is not enabled (noFecEnabled(1) and fecTxEnabled(2)).

dot3EponFecUncorrectableBlocks - stops counting when Rx_FEC is not enabled (noFecEnabled(1) and fecTxEnabled(2)).

dot3EponFecBufferHeadCodingViolation - stops counting when Rx_FEC is not enabled (noFecEnabled(1) and


```
fecTxEnabled(2)).
```

The objects:

dot3EponFecAbility - indicates the FEC ability and is not affected by the FEC mode.

dot3EponFecMode - indicates the FEC mode for combined RX and TX.

The write operation is not restricted in this document and can be done at any time. Changing dot3ExtPkgObjectFecEnabled state can lead to disabling the Forward Error Correction on the respective interface, which can lead to a degradation of the optical link, and therefore may lead to an interruption of service for the users connected to the respective EPON interface."

```
DEFVAL { noFecEnabled }
```

```
::= { dot3ExtPkgControlEntry 4 }
```

dot3ExtPkgObjectReportMaximumNumQueues OBJECT-TYPE

```
SYNTAX Unsigned32 (0..7)
```

```
MAX-ACCESS read-only
```

```
STATUS current
```

```
DESCRIPTION
```

"An object, that defines the maximal number of queues in the REPORT message as defined in IEEE Std 802.3, Clause 64. For further information please see the description of the queue table.

This object is applicable for an OLT and an ONU. At the OLT, it has a distinct value for each virtual interface."

```
DEFVAL { 0 }
```

```
::= { dot3ExtPkgControlEntry 5 }
```

dot3ExtPkgObjectRegisterAction OBJECT-TYPE

```
SYNTAX INTEGER {
```

```
  none(1),
```

```
  register(2),
```

```
  deregister(3),
```

```
  reregister(4)
```

```
}
```

```
MAX-ACCESS read-write
```

```
STATUS current
```

```
DESCRIPTION
```

"An object configuring the registration state of an interface, and indicating its registration state.

Write operation changes the registration state to its new value.

Read operation returns the value of the state.

The registration state is reflected in this object and in the dot3MpcpRegistrationState object.

none(1) indicates an unknown state,

register(2) indicates a registered LLID,

deregister(3) indicates a deregistered LLID,

reregister(4) indicates an LLID that is reregistering.

The following list describes the operation of the interface, as specified in the IEEE Std 802.3, when a write operation is setting a value.

none(1) - not doing any action.

register(2) - registering an LLID that has been requested for registration (The LLID is in registering mode.

dot3MpcpRegistrationState - registering(2)).

deregister(3) - deregisters an LLID that is registered

(dot3MpcpRegistrationState - registered(3)).
 reregister(4) - reregister an LLID that is registered
 (dot3MpcpRegistrationState - registered(3)).
 The behavior of an ONU and OLT interfaces, at each one
 of the detailed operation at each state, is described in
 the registration state machine of figure 64-22,
 IEEE Std 802.3.

This object is applicable for an OLT and an ONU. At the
 OLT, it has a distinct value for each virtual interface.
 The write operation is not restricted in this document
 and can be done at any time. Changing
 dot3ExtPkgObjectRegisterAction state can lead to a change
 in the registration state of the respective interface
 leading to a deregistration and an interruption of
 service of the users connected to the respective EPON
 interface."

DEFVAL { none }
 ::= { dot3ExtPkgControlEntry 6 }

dot3ExtPkgQueueTable OBJECT-TYPE

SYNTAX SEQUENCE OF Dot3ExtPkgQueueEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"A table of the extended package objects for queue
 management. The IEEE Std 802.3 MPCP defines a report message
 of the occupancy of the transmit queues for the feedback
 BW request from the ONUs. These queues serve the uplink
 transmission of the ONU and data is gathered there until
 the ONU is granted for transmission.

The management table of the queues is added here mainly
 to control the reporting and to gather some statistics
 of their operation. This table is not duplicating
 existing management objects of bridging queues,
 specified in IEEE Std 802.1D, since the existence of a
 dedicated transmit queuing mechanism is implied in the
 IEEE Std 802.3, and the ONU may be a device that is not a
 bridge with embedded bridging queues.

The format of the REPORT message, as specified
 in IEEE Std 802.3, is presented below:

Destination Address		
Source Address		
Length/Type		
OpCode		
TimeStamp		
Number of queue Sets		
Report bitmap		/ \
Queue 0 report		
Queue 1 report		repeated for every queue_set

	Queue 2 report		
+-----+		+-----+	
	Queue 3 report		
+-----+		+-----+	
	Queue 4 report		
+-----+		+-----+	
	Queue 5 report		
+-----+		+-----+	
	Queue 6 report		
+-----+		+-----+	
	Queue 7 report		
+-----+		+-----+	
	Pad/reserved		\\
+-----+		+-----+	/
	FCS		
+-----+		+-----+	

The 'Queue report' field reports the occupancy of each uplink transmission queue.

The number of queue sets defines the number of the reported sets, as would be explained in the description of the dot3ExtPkgQueueSetsTable table. For each set the report bitmap defines which queue is present in the report, meaning that although the MPCP REPORT message can report up to 8 queues in a REPORT message, the actual number is flexible. The Queue table has a variable size that is limited by the dot3ExtPkgObjectReportMaximumNumQueues object, as an ONU can have fewer queues to report.

The entries in the table are control and status indication objects for managing the queues of an EPON interface that are gathered in an extended package as an addition to the objects that are based on the IEEE Std 802.3 attributes.

Each object has a row for every virtual link and for every queue in the report.

The LLID field, as defined in the IEEE Std 802.3, is a 2-byte register (15-bit field and a broadcast bit) limiting the number of virtual links to 32768. Typically the number of expected virtual links in a PON is like the number of ONUs, which is 32-64, plus an additional entry for broadcast LLID.

The number of queues is between 0 and 7 and limited by dot3ExtPkgObjectReportMaximumNumQueues."

```
::= { dot3ExtPkgControlObjects 2 }
```

dot3ExtPkgQueueEntry OBJECT-TYPE

SYNTAX Dot3ExtPkgQueueEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"An entry in the Extended package Queue table. At the OLT, the rows exist for each ifIndex and dot3QueueIndex. At the ONU, rows exist for the single ifIndex for each dot3QueueIndex.

Rows in the table are created when the ifIndex of the link is created. A set of rows per queue are added for each ifIndex, denoted by the dot3QueueIndex.

A set of rows per queue in the table, for an ONU

interface, are created at the system initialization.
 A set of rows per queue in the table, corresponding to the OLT ifIndex and a set of rows per queue corresponding to the broadcast virtual link, are created at the system initialization.
 A set of rows per queue in the table, corresponding to the ifIndex of a virtual link, are created when the virtual link is established (ONU registers), and deleted when the virtual link is deleted (ONU deregisters)."

```
INDEX { ifIndex, dot3QueueIndex }
 ::= { dot3ExtPkgQueueTable 1 }
```

```
Dot3ExtPkgQueueEntry ::=
```

```
SEQUENCE {
  dot3QueueIndex                               Unsigned32,
  dot3ExtPkgObjectReportNumThreshold           Unsigned32,
  dot3ExtPkgObjectReportMaximumNumThreshold   Unsigned32,
  dot3ExtPkgStatTxFramesQueue                  Counter64,
  dot3ExtPkgStatRxFramesQueue                  Counter64,
  dot3ExtPkgStatDroppedFramesQueue             Counter64
}
```

```
dot3QueueIndex OBJECT-TYPE
```

```
SYNTAX Unsigned32 (0..7)
```

```
MAX-ACCESS not-accessible
```

```
STATUS current
```

```
DESCRIPTION
```

"An object that identifies an index for the queue table reflecting the queue index of the queues that are reported in the MPCP REPORT message as defined in IEEE Std 802.3, Clause 64.

The number of queues is between 0 and 7, and limited by dot3ExtPkgObjectReportMaximumNumQueues."

```
::= { dot3ExtPkgQueueEntry 1 }
```

```
dot3ExtPkgObjectReportNumThreshold OBJECT-TYPE
```

```
SYNTAX Unsigned32 (0..7)
```

```
MAX-ACCESS read-write
```

```
STATUS current
```

```
DESCRIPTION
```

"An object that defines the number of thresholds for each queue in the REPORT message as defined in IEEE Std 802.3, Clause 64.

Each queue_set reporting will provide information on the queue occupancy of frames below the matching Threshold. Read operation reflects the number of thresholds. Write operation sets the number of thresholds for each queue.

The write operation is not restricted in this document and can be done at any time. Value cannot exceed the maximal value defined by the

dot3ExtPkgObjectReportMaximumNumThreshold object.

Changing dot3ExtPkgObjectReportNumThreshold can lead to a change in the reporting of the ONU interface and therefore to a change in the bandwidth allocation of the respective interface. This change may lead a degradation or an interruption of service of the users connected to the respective EPON interface.

This object is applicable for an OLT and an ONU. At the

OLT, it has a distinct value for each virtual interface and for each queue. At the ONU, it has a distinct value for each queue."

DEFVAL { 0 }

::= { dot3ExtPkgQueueEntry 2 }

dot3ExtPkgObjectReportMaximumNumThreshold OBJECT-TYPE

SYNTAX Unsigned32 (0..7)

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"An object, that defines the maximal number of thresholds for each queue in the REPORT message as defined in IEEE Std 802.3, Clause 64. Each queue_set reporting will provide information on the queue occupancy of frames below the matching Threshold.
This object is applicable for an OLT and an ONU. At the OLT, it has a distinct value for each virtual interface and for each queue. At the ONU, it has a distinct value for each queue."

DEFVAL { 0 }

::= { dot3ExtPkgQueueEntry 3 }

dot3ExtPkgStatTxFramesQueue OBJECT-TYPE

SYNTAX Counter64

UNITS "frames"

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"A count of the number of times a frame transmission occurs from the corresponding 'Queue'.
Increment the counter by one for each frame transmitted, which is an output of the 'Queue'.
The 'Queue' marking matches the REPORT MPCP message Queue field as defined in IEEE Std 802.3, Clause 64.
This object is applicable for an OLT and an ONU. At the OLT, it has a distinct value for each virtual interface and for each queue. At the ONU, it has a distinct value for each queue.
At the OLT the value should be zero.
Discontinuities of this counter can occur at re-initialization of the management system and at other times, as indicated by the value of the ifCounterDiscontinuityTime object of the Interfaces Group MIB module."

::= { dot3ExtPkgQueueEntry 4 }

dot3ExtPkgStatRxFramesQueue OBJECT-TYPE

SYNTAX Counter64

UNITS "frames"

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"A count of the number of times a frame reception occurs from the corresponding 'Queue'.
Increment the counter by one for each frame received, which is an input to the corresponding 'Queue'.
The 'Queue' marking matches the REPORT MPCP message Queue field as defined in IEEE Std 802.3, Clause 64."

This object is applicable for an OLT and an ONU. At the OLT, it has a distinct value for each virtual interface and for each queue. At the ONU, it has a distinct value for each queue.

Discontinuities of this counter can occur at re-initialization of the management system and at other times, as indicated by the value of the ifCounterDiscontinuityTime object of the Interfaces Group MIB module."

```
::= { dot3ExtPkgQueueEntry 5}
```

dot3ExtPkgStatDroppedFramesQueue OBJECT-TYPE

SYNTAX Counter64

UNITS "frames"

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"A count of the number of times a frame drop occurs from the corresponding 'Queue'. Increment the counter by one for each frame dropped from the corresponding 'Queue'. The 'Queue' marking matches the REPORT MPCP message Queue field as defined in IEEE Std 802.3, Clause 64. This object is applicable for an OLT and an ONU. At the OLT, it has a distinct value for each virtual interface and for each queue. At the ONU, it has a distinct value for each queue.

At the OLT, the value should be zero.

Discontinuities of this counter can occur at re-initialization of the management system and at other times, as indicated by the value of the ifCounterDiscontinuityTime object of the Interfaces Group MIB module."

```
::= { dot3ExtPkgQueueEntry 6}
```

dot3ExtPkgQueueSetsTable OBJECT-TYPE

SYNTAX SEQUENCE OF Dot3ExtPkgQueueSetsEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"A table of Extended package objects used for the management of the queue_sets. Entries are control and status indication objects of an EPON interface, which are gathered in an extended package as an addition to the objects based on the IEEE Std 802.3 attributes. The objects in this table are specific for the queue_sets, which are reported in the MPCP REPORT message as defined in IEEE Std 802.3, Clause 64.

The IEEE Std 802.3 MPCP defines a report message of the occupancy of the transmit queues for the feedback BW request from the ONUs. These queues serve the uplink transmission of the ONU and data is gathered there until the ONU is granted for transmission.

The management table of the queues_sets is added here mainly to control the reporting and to gather some statistics of their operation. This table is not duplicating existing management objects of bridging queues, specified in IEEE Std 802.1D, since the existence of a dedicated transmit queuing mechanism is implied in the

IEEE Std 802.3, and the ONU may be a device that is not a bridge with embedded bridging queues. The format of the REPORT message, as specified in IEEE Std 802.3, is presented below:

Destination Address	
Source Address	
Length/Type	
OpCode	
TimeStamp	
Number of queue Sets	
Report bitmap	/\
Queue 0 report	repeated for every queue_set
Queue 1 report	
Queue 2 report	
Queue 3 report	
Queue 4 report	
Queue 5 report	
Queue 6 report	
Queue 7 report	
Pad/reserved	\/
FCS	

As can be seen from the message format, the ONU interface reports of the status of up to 8 queues and it can report in a single MPCP REPORT message of a few sets of queues.

The number of queue_sets defines the number of the reported sets, and it can reach a value of up to 8. It means that an ONU can hold a variable number of sets between 0 and 7.

The dot3ExtPkgQueueSetsTable table has a variable queue_set size that is limited by the dot3ExtPkgObjectReportMaximumNumThreshold object as an ONU can have fewer queue_sets to report.

The 'Queue report' field reports the occupancy of each uplink transmission queue. The queue_sets can be used to report the occupancy of the queues in a few levels as to allow granting, in an accurate manner, of only part of the data available in the queues. A Threshold is defined for each queue_set to define the level of the queue that is counted for the report of the occupancy.

The threshold is reflected in the queue_set table by the dot3ExtPkgObjectReportThreshold object.

For each queue set, the report bitmap defines which queues are present in the report, meaning that although the MPCP REPORT message can report of up to 8 queues in a REPORT message, the actual number is flexible.

The dot3ExtPkgQueueSetsTable table has a variable queue size that is limited by the dot3ExtPkgObjectReportMaximumNumQueues object as an ONU can have fewer queues to report.

Each object has a row for every virtual link, for each queue in the report and for each queue_set in the queue. The LLID field, as defined in the IEEE Std 802.3, is a 2-byte register (15-bit field and a broadcast bit) limiting the number of virtual links to 32768. Typically the number of expected virtual links in a PON is like the number of ONUs, which is 32-64, plus an additional entry for broadcast LLID.

The number of queues is between 0 and 7 and limited by dot3ExtPkgObjectReportMaximumNumQueues.

The number of queues_sets is between 0 and 7 and limited by dot3ExtPkgObjectReportMaximumNumThreshold."

```
::= { dot3ExtPkgControlObjects 3 }
```

dot3ExtPkgQueueSetsEntry OBJECT-TYPE

SYNTAX Dot3ExtPkgQueueSetsEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"An entry in the Extended package queue_set table. At the OLT, the rows exist for each ifIndex, dot3QueueSetQueueIndex and dot3QueueSetIndex. At the ONU, rows exist for the single ifIndex, for each dot3QueueSetQueueIndex and dot3QueueSetIndex. Rows in the table are created when the ifIndex of the link is created. A set of rows per queue and per queue_set are added for each ifIndex, denoted by dot3QueueSetIndex and dot3QueueSetQueueIndex. A set of rows per queue and per queue_set in the table, for an ONU interface are created at system initialization.

A set of rows per queue and per queue_Set in the table, corresponding to the OLT ifIndex and a set of rows per queue and per queue_set, corresponding to the broadcast virtual link, are created at system initialization.

A set of rows per queue and per queue_set in the table, corresponding to the ifIndex of a virtual link are created when the virtual link is established (ONU registers) and deleted when the virtual link is deleted (ONU deregisters)."

INDEX { ifIndex,
dot3QueueSetQueueIndex,dot3QueueSetIndex}

```
::= { dot3ExtPkgQueueSetsTable 1 }
```

Dot3ExtPkgQueueSetsEntry ::=

SEQUENCE {

dot3QueueSetQueueIndex

Unsigned32,

dot3QueueSetIndex

Unsigned32,


```

    dot3ExtPkgObjectReportThreshold
  }
  Unsigned32

```

dot3QueueSetQueueIndex OBJECT-TYPE

SYNTAX Unsigned32 (0..7)

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"An object that identifies the queue index for the dot3ExtPkgQueueSetsTable table. The queues are reported in the MPCP REPORT message as defined in IEEE Std 802.3, Clause 64.

The number of queues is between 0 and 7, and limited by dot3ExtPkgObjectReportMaximumNumQueues.

Value corresponds to the dot3QueueIndex of the queue table."

::= { dot3ExtPkgQueueSetsEntry 1 }

dot3QueueSetIndex OBJECT-TYPE

SYNTAX Unsigned32 (0..7)

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"An object that identifies the queue_set index for the dot3ExtPkgQueueSetsTable table. The queues are reported in the MPCP REPORT message as defined in IEEE Std 802.3, Clause 64.

The number of queues_sets is between 0 and 7, and limited by dot3ExtPkgObjectReportMaximumNumThreshold."

::= { dot3ExtPkgQueueSetsEntry 2 }

dot3ExtPkgObjectReportThreshold OBJECT-TYPE

SYNTAX Unsigned32

UNITS "TQ (16 ns)"

MAX-ACCESS read-write

STATUS current

DESCRIPTION

"An object that defines the value of a threshold report for each queue_set in the REPORT message as defined in IEEE Std 802.3, Clause 64. The number of sets for each queue is dot3ExtPkgObjectReportNumThreshold.

In the REPORT message, each queue_set reporting will provide information on the occupancy of the queues for frames below the matching Threshold.

The value returned shall be in Time quanta (TQ), which is 16 ns or 2 octets increments.

Read operation provides the threshold value. Write operation sets the value of the threshold.

The write operation is not restricted in this document and can be done at any time. Changing

dot3ExtPkgObjectReportThreshold can lead to a change in the reporting of the ONU interface and therefore to a change in the bandwidth allocation of the respective interface. This change may lead a degradation or an interruption of service for the users connected to the respective EPON interface.

This object is applicable for an OLT and an ONU. At the OLT, it has a distinct value for each virtual interface, for each queue and for each queue_set. At the ONU, it has

a distinct value for each queue and for each queue_set."

```

DEFVAL { 0 }
::= { dot3ExtPkgQueueSetsEntry 3 }

--Optical Interface status tables

dot3ExtPkgOptIfTable OBJECT-TYPE
    SYNTAX      SEQUENCE OF Dot3ExtPkgOptIfEntry
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "This table defines the control and status indication
        objects for the optical interface of the EPON interface.
        Each object has a row for every virtual link denoted by
        the corresponding ifIndex.
        The LLID field, as defined in the IEEE Std 802.3, is a 2-byte
        register (15-bit field and a broadcast bit) limiting the
        number of virtual links to 32768. Typically the number
        of expected virtual links in a PON is like the number of
        ONUs, which is 32-64, plus an additional entry for
        broadcast LLID.
        Although the optical interface is a physical interface,
        there is a row in the table for each virtual interface.
        The reason for having a separate row for each virtual
        link is that the OLT has a separate link for each one of
        the ONUs. For instance, ONUs could be in different
        distances with different link budgets and different
        receive powers, therefore having different power alarms.
        It is quite similar to a case of different physical
        interfaces."
    ::= { dot3ExtPkgControlObjects 5 }

dot3ExtPkgOptIfEntry OBJECT-TYPE
    SYNTAX      Dot3ExtPkgOptIfEntry
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "An entry in the optical interface table of the EPON
        interface.
        Rows exist for an OLT interface and an ONU interface.
        A row in the table is denoted by the ifIndex of the link
        and it is created when the ifIndex is created.
        The rows in the table for an ONU interface are created
        at system initialization.
        The row in the table corresponding to the OLT ifIndex
        and the row corresponding to the broadcast virtual link
        are created at system initialization.
        A row in the table corresponding to the ifIndex of a
        virtual links is created when a virtual link is
        established (ONU registers) and deleted when the virtual
        link is deleted (ONU deregisters)."


```

INDEX { ifIndex }
::= { dot3ExtPkgOptIfTable 1 }

Dot3ExtPkgOptIfEntry ::=
 SEQUENCE {
 dot3ExtPkgOptIfSuspectedFlag TruthValue,
 dot3ExtPkgOptIfInputPower Integer32,
 dot3ExtPkgOptIfLowInputPower Integer32,
```


```

```

dot3ExtPkgOptIfHighInputPower      Integer32,
dot3ExtPkgOptIfLowerInputPowerThreshold Integer32,
dot3ExtPkgOptIfUpperInputPowerThreshold Integer32,
dot3ExtPkgOptIfOutputPower          Integer32,
dot3ExtPkgOptIfLowOutputPower       Integer32,
dot3ExtPkgOptIfHighOutputPower      Integer32,
dot3ExtPkgOptIfLowerOutputPowerThreshold Integer32,
dot3ExtPkgOptIfUpperOutputPowerThreshold Integer32,
dot3ExtPkgOptIfSignalDetect          TruthValue,
dot3ExtPkgOptIfTransmitAlarm         TruthValue,
dot3ExtPkgOptIfTransmitEnable        TruthValue
}

```

dot3ExtPkgOptIfSuspectedFlag OBJECT-TYPE

SYNTAX TruthValue

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"This object is a reliability indication.

If true, the data in this entry may be unreliable.

This object is applicable for an OLT and an ONU. At the

OLT, it has a distinct value for each virtual interface."

::= { dot3ExtPkgOptIfEntry 1 }

dot3ExtPkgOptIfInputPower OBJECT-TYPE

SYNTAX Integer32

UNITS "0.1 dbm"

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The optical power monitored at the input.

This object is applicable for an OLT and an ONU. At the

OLT, it has a distinct value for each virtual interface."

::= { dot3ExtPkgOptIfEntry 2 }

dot3ExtPkgOptIfLowInputPower OBJECT-TYPE

SYNTAX Integer32

UNITS "0.1 dbm"

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The lowest optical power monitored at the input during the current 15-minute interval.

This object is applicable for an OLT and an ONU. At the

OLT, it has a distinct value for each virtual interface."

::= { dot3ExtPkgOptIfEntry 3 }

dot3ExtPkgOptIfHighInputPower OBJECT-TYPE

SYNTAX Integer32

UNITS "0.1 dbm"

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The highest optical power monitored at the input during the current 15-minute interval.

This object is applicable for an OLT and an ONU. At the

OLT, it has a distinct value for each virtual interface."

::= { dot3ExtPkgOptIfEntry 4 }

dot3ExtPkgOptIfLowerInputPowerThreshold OBJECT-TYPE

SYNTAX Integer32
 UNITS "0.1 dbm"
 MAX-ACCESS read-write
 STATUS current
 DESCRIPTION

"The lower limit threshold on input power. If dot3ExtPkgOptIfInputPower drops to this value or below, a Threshold Crossing Alert (TCA) should be sent. Reading will present the threshold value. Writing will set the value of the threshold. The write operation is not restricted in this document and can be done at any time. Changing dot3ExtPkgOptIfLowerInputPowerThreshold can lead to a Threshold Crossing Alert (TCA) being sent for the respective interface. This alert may be leading to an interruption of service for the users connected to the respective EPON interface, depending on the system action on such an alert. This object is applicable for an OLT and an ONU. At the OLT, it has a distinct value for each virtual interface."

::= { dot3ExtPkgOptIfEntry 5 }

dot3ExtPkgOptIfUpperInputPowerThreshold OBJECT-TYPE

SYNTAX Integer32
 UNITS "0.1 dbm"
 MAX-ACCESS read-write
 STATUS current
 DESCRIPTION

"The upper limit threshold on input power. If dot3ExtPkgOptIfInputPower reaches or exceeds this value, a Threshold Crossing Alert (TCA) should be sent. Reading will present the threshold value. Writing will set the value of the threshold. The write operation is not restricted in this document and can be done at any time. Changing dot3ExtPkgOptIfUpperInputPowerThreshold can lead to a Threshold Crossing Alert (TCA) being sent for the respective interface. This alert may be leading to an interruption of service for the users connected to the respective EPON interface, depending on the system action on such an alert. This object is applicable for an OLT and an ONU. At the OLT, it has a distinct value for each virtual interface."

::= { dot3ExtPkgOptIfEntry 6 }

dot3ExtPkgOptIfOutputPower OBJECT-TYPE

SYNTAX Integer32
 UNITS "0.1 dbm"
 MAX-ACCESS read-only
 STATUS current
 DESCRIPTION

"The optical power monitored at the output. This object is applicable for an OLT and an ONU. At the OLT, it has a distinct value for each virtual interface."

::= { dot3ExtPkgOptIfEntry 7 }

dot3ExtPkgOptIfLowOutputPower OBJECT-TYPE

SYNTAX Integer32
 UNITS "0.1 dbm"
 MAX-ACCESS read-only
 STATUS current

DESCRIPTION

"The lowest optical power monitored at the output during the current 15-minute interval.

This object is applicable for an OLT and an ONU. At the OLT, it has a distinct value for each virtual interface."

::= { dot3ExtPkgOptIfEntry 8 }

dot3ExtPkgOptIfHighOutputPower OBJECT-TYPE

SYNTAX Integer32

UNITS "0.1 dbm"

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The highest optical power monitored at the output during the current 15-minute interval.

This object is applicable for an OLT and an ONU. At the OLT, it has a distinct value for each virtual interface."

::= { dot3ExtPkgOptIfEntry 9 }

dot3ExtPkgOptIfLowerOutputPowerThreshold OBJECT-TYPE

SYNTAX Integer32

UNITS "0.1 dbm"

MAX-ACCESS read-write

STATUS current

DESCRIPTION

"The lower limit threshold on output power. If dot3ExtPkgOptIfOutputPower drops to this value or below, a Threshold Crossing Alert (TCA) should be sent.

Reading will present the threshold value. Writing will set the value of the threshold.

The write operation is not restricted in this document and can be done at any time. Changing

dot3ExtPkgOptIfLowerOutputPowerThreshold can lead to a Threshold Crossing Alert (TCA) being sent for the respective interface.

This alert may be leading to an interruption of service for the users connected to the respective EPON interface, depending on the system action on such an alert.

This object is applicable for an OLT and an ONU. At the OLT, it has a distinct value for each virtual interface."

::= { dot3ExtPkgOptIfEntry 10 }

dot3ExtPkgOptIfUpperOutputPowerThreshold OBJECT-TYPE

SYNTAX Integer32

UNITS "0.1 dbm"

MAX-ACCESS read-write

STATUS current

DESCRIPTION

"The upper limit threshold on output power. If

dot3ExtPkgOptIfOutputPower reaches or exceeds this value, a Threshold Crossing Alert (TCA) should be sent.

Reading will present the threshold value. Writing will set the value of the threshold.

The write operation is not restricted in this document and can be done at any time. Changing

dot3ExtPkgOptIfUpperOutputPowerThreshold can lead to a Threshold Crossing Alert (TCA) being sent for the respective interface.

This alert may be leading to an interruption of service of the users connected to the respective EPON interface, depending on the system action on such an alert.

This object is applicable for an OLT and an ONU. At the OLT, it has a distinct value for each virtual interface."
 ::= { dot3ExtPkgOptIfEntry 11 }

dot3ExtPkgOptIfSignalDetect OBJECT-TYPE

SYNTAX TruthValue

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"When getting true(1), there is a valid optical signal at the receive that is above the optical power level for signal detection. When getting false(2) the optical signal at the receive is below the optical power level for signal detection.

This object is applicable for an OLT and an ONU. At the OLT, it has a distinct value for each virtual interface."

DEFVAL { false }

::= { dot3ExtPkgOptIfEntry 12 }

dot3ExtPkgOptIfTransmitAlarm OBJECT-TYPE

SYNTAX TruthValue

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"When getting true(1) there is a non-valid optical signal at the transmit of the interface, either a higher level or lower level than expected. When getting false(2) the optical signal at the transmit is valid and in the required range.

This object is applicable for an OLT and an ONU. At the OLT, it has a distinct value for each virtual interface."

DEFVAL { false }

::= { dot3ExtPkgOptIfEntry 13 }

dot3ExtPkgOptIfTransmitEnable OBJECT-TYPE

SYNTAX TruthValue

MAX-ACCESS read-write

STATUS current

DESCRIPTION

"Setting this object to true(1) will cause the optical interface to start transmission (according to the control protocol specified for the logical interface). Setting this object to false(2) will cause the

interface to stop the optical transmission.

When getting true(1), the optical interface is in transmitting mode (obeying to the logical control protocol).

When getting false(2), the optical interface is not in transmitting mode.

The write operation is not restricted in this document and can be done at any time. Changing

dot3ExtPkgOptIfTransmitEnable state can lead to a halt in the optical transmission of the respective interface leading to an interruption of service of the users connected to the respective EPON interface.

The object is relevant when the admin state of the interface is active as set by the dot3MpcpAdminState.

This object is applicable for an OLT and an ONU. At the OLT it, has a distinct value for each virtual interface."

```

    DEFVAL { false }
    ::= { dot3ExtPkgOptIfEntry 14 }

    --
    -- The MulticastIDs Table
    --
dot3RecognizedMulticastIDsTable OBJECT-TYPE
    SYNTAX      SEQUENCE OF Dot3RecognizedMulticastIDsEntry
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "A table of MulticastIDs to be recognized by this device."
    REFERENCE   "IEEE Std 802.3, 30.3.5.1.25."
    ::= { dot3EponObjects 5 }

dot3RecognizedMulticastIDsEntry OBJECT-TYPE
    SYNTAX      Dot3RecognizedMulticastIDsEntry
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "An entry in the table of MulticastIDs to be recognized by this
        device."
    INDEX       { ifIndex, dot3RecognizedMulticastIDIndex }
    ::= { dot3RecognizedMulticastIDsTable 1 }

Dot3RecognizedMulticastIDsEntry ::=
    SEQUENCE {
        dot3RecognizedMulticastIDIndex Unsigned32,
        dot3RecognizedMulticastID      Unsigned32
    }

dot3RecognizedMulticastIDIndex OBJECT-TYPE
    SYNTAX      Unsigned32 (0..127)
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "An index into the table of MulticastIDs to be recognized by this
        device."
    ::= { dot3RecognizedMulticastIDsEntry 1 }

dot3RecognizedMulticastID OBJECT-TYPE
    SYNTAX      Unsigned32
    MAX-ACCESS  read-write
    STATUS      current
    DESCRIPTION
        "An Unsigned32 representing a single MulticastID to be recognized
        by this device."
    REFERENCE   "IEEE Std 802.3, 30.3.5.1.25."
    ::= { dot3RecognizedMulticastIDsEntry 2 }

-- Conformance statements

-- Conformance Groups

dot3EponGroups      OBJECT IDENTIFIER ::= { dot3EponConformance 1 }

dot3MpcpGroupBase OBJECT-GROUP
    OBJECTS {
        dot3MpcpOperStatus,

```



```

        dot3MpcpAdminState,
        dot3MpcpMode,
        dot3MpcpSyncTime,
        dot3MpcpLinkID,
        dot3MpcpRemoteMACAddress,
        dot3MpcpRegistrationState,
        dot3MpcpMaximumPendingGrants,
        dot3MpcpTransmitElapsed,
        dot3MpcpReceiveElapsed,
        dot3MpcpRoundTripTime
    }
    STATUS    current
    DESCRIPTION
        "A collection of objects of dot3 Mpcp Control entity state
        definition. Objects are per LLID."
    ::= { dot3EponGroups 1 }

```

dot3MpcpGroupStat OBJECT-GROUP

```

    OBJECTS {
        dot3MpcpMACCtrlFramesTransmitted,
        dot3MpcpMACCtrlFramesReceived,
        dot3MpcpDiscoveryWindowsSent,
        dot3MpcpDiscoveryTimeout,
        dot3MpcpTxRegRequest,
        dot3MpcpRxRegRequest,
        dot3MpcpTxRegAck,
        dot3MpcpRxRegAck,
        dot3MpcpTxReport,
        dot3MpcpRxReport,
        dot3MpcpTxGate,
        dot3MpcpRxGate,
        dot3MpcpTxRegister,
        dot3MpcpRxRegister
    }
    STATUS    current
    DESCRIPTION
        "A collection of objects of dot3 Mpcp Statistics.
        Objects are per LLID."
    ::= { dot3EponGroups 2 }

```

dot30mpeGroupID OBJECT-GROUP

```

    OBJECTS {
        dot30mpEmulationType
    }

```

STATUS current

DESCRIPTION

"A collection of objects of dot3 OMP emulation entity
state definition. Objects are per LLID."

```

    ::= { dot3EponGroups 3 }

```

dot30mpeGroupStat OBJECT-GROUP

```

    OBJECTS {
        dot30mpEmulationSLDErrors,
        dot30mpEmulationCRC8Errors,
        dot30mpEmulationBadLLID,
        dot30mpEmulationGoodLLID,
        dot30mpEmulationOnuPonCastLLID,
        dot30mpEmulationOltPonCastLLID,
        dot30mpEmulationBroadcastBitNotOnuLlid,
    }

```



```

        dot3OmpEmulationOnuLLIDNotBroadcast,
        dot3OmpEmulationBroadcastBitPlusOnuLlid,
        dot3OmpEmulationNotBroadcastBitNotOnuLlid
    }
    STATUS current
    DESCRIPTION
        "A collection of objects of dot3 OMP emulation
        Statistics. Objects are per LLID."
    ::= { dot3EponGroups 4 }

```

```

dot3EponFecGroupAll OBJECT-GROUP
    OBJECTS {
        dot3EponFecPCSCodingViolation,
        dot3EponFecAbility,
        dot3EponFecMode,
        dot3EponFecCorrectedBlocks,
        dot3EponFecUncorrectableBlocks,
        dot3EponFecBufferHeadCodingViolation
    }
    STATUS current
    DESCRIPTION
        "A collection of objects of dot3 FEC group control and
        statistics. Objects are per LLID."
    ::= { dot3EponGroups 5 }

```

```

dot3ExtPkgGroupControl OBJECT-GROUP
    OBJECTS {
        dot3ExtPkgObjectReset,
        dot3ExtPkgObjectPowerDown,
        dot3ExtPkgObjectNumberOfLLIDs,
        dot3ExtPkgObjectFecEnabled,
        dot3ExtPkgObjectReportMaximumNumQueues,
        dot3ExtPkgObjectRegisterAction
    }
    STATUS current
    DESCRIPTION
        "A collection of objects of dot3ExtPkg control
        definition. Objects are per LLID."
    ::= { dot3EponGroups 6 }

```

```

dot3ExtPkgGroupQueue OBJECT-GROUP
    OBJECTS {
        dot3ExtPkgObjectReportNumThreshold,
        dot3ExtPkgObjectReportMaximumNumThreshold,
        dot3ExtPkgStatTxFramesQueue,
        dot3ExtPkgStatRxFramesQueue,
        dot3ExtPkgStatDroppedFramesQueue
    }
    STATUS current
    DESCRIPTION
        "A collection of objects of dot3ExtPkg Queue
        control. Objects are per LLID, per queue."
    ::= { dot3EponGroups 7 }

```

```

dot3ExtPkgGroupQueueSets OBJECT-GROUP
    OBJECTS {
        dot3ExtPkgObjectReportThreshold
    }
    STATUS current

```

DESCRIPTION

"A collection of objects of dot3ExtPkg queue_set control. Objects are per LLID, per queue, per queue_set."

::= { dot3EponGroups 8 }

dot3ExtPkgGroupOptIf OBJECT-GROUP

OBJECTS {

dot3ExtPkgOptIfSuspectedFlag,
dot3ExtPkgOptIfInputPower,
dot3ExtPkgOptIfLowInputPower,
dot3ExtPkgOptIfHighInputPower,
dot3ExtPkgOptIfLowerInputPowerThreshold,
dot3ExtPkgOptIfUpperInputPowerThreshold,
dot3ExtPkgOptIfOutputPower,
dot3ExtPkgOptIfLowOutputPower,
dot3ExtPkgOptIfHighOutputPower,
dot3ExtPkgOptIfLowerOutputPowerThreshold,
dot3ExtPkgOptIfUpperOutputPowerThreshold,
dot3ExtPkgOptIfSignalDetect,
dot3ExtPkgOptIfTransmitAlarm,
dot3ExtPkgOptIfTransmitEnable
}

STATUS current

DESCRIPTION

"A collection of objects of control and status indication of the optical interface.
Objects are per LLID."

::= { dot3EponGroups 9 }

dot3EponGroupMulticastIDs OBJECT-GROUP

OBJECTS {

dot3RecognizedMulticastID
}

STATUS current

DESCRIPTION

"One of a set of MulticastIDs recognized by an EPON interface."

::= { dot3EponGroups 10 }

-- Compliance statements

dot3EponCompliances

OBJECT IDENTIFIER ::= { dot3EponConformance 2 }

dot3MPCPCompliance MODULE-COMPLIANCE

STATUS current

DESCRIPTION "The compliance statement for MultiPoint Control Protocol interfaces."

MODULE -- this module

MANDATORY-GROUPS { dot3MpcpGroupBase }

GROUP dot3MpcpGroupStat

DESCRIPTION "This group is mandatory for all MPCP supporting interfaces for statistics collection."

::= { dot3EponCompliances 1 }

dot30mpeCompliance MODULE-COMPLIANCE

STATUS current

DESCRIPTION "The compliance statement for OMPEmulation interfaces."

MODULE -- this module
MANDATORY-GROUPS { dot3OmpeGroupID }

GROUP dot3OmpeGroupStat
DESCRIPTION "This group is mandatory for all OMPemulation supporting interfaces for statistics collection."

::= { dot3EponCompliances 2 }

dot3EponFecCompliance MODULE-COMPLIANCE

STATUS current
DESCRIPTION "The compliance statement for FEC EPON interfaces.
This group is mandatory for all FEC supporting interfaces for control and statistics collection."

MODULE -- this module
MANDATORY-GROUPS { dot3EponFecGroupAll }

::= { dot3EponCompliances 3 }

dot3ExtPkgCompliance MODULE-COMPLIANCE

STATUS current
DESCRIPTION "The compliance statement for EPON Interfaces using the extended package."

MODULE -- this module
MANDATORY-GROUPS { dot3ExtPkgGroupControl }

GROUP dot3ExtPkgGroupQueue
DESCRIPTION " This group is mandatory for all EPON interfaces supporting REPORT queue management of the extended package."

GROUP dot3ExtPkgGroupQueueSets
DESCRIPTION " This group is mandatory for all EPON interfaces supporting REPORT queue_sets management of the extended package."

GROUP dot3ExtPkgGroupOptIf
DESCRIPTION "This group is mandatory for all EPON interfaces supporting optical interfaces management, of the extended package."

::= { dot3EponCompliances 4 }

dot3EponMulticastIDsCompliance MODULE-COMPLIANCE

STATUS current
DESCRIPTION "The compliance statement for EPON Interfaces that support MulticastIDs."

MODULE -- this module
MANDATORY-GROUPS { dot3EponGroupMulticastIDs }

::= { dot3EponCompliances 5 }

END

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10. Ethernet-like interface MIB module

10.1 Introduction

This clause defines a portion of the MIB for use with SNMP. In particular, it defines objects for managing Ethernet-like interfaces.

10.2 Overview

Instances of these object types represent attributes of an interface to an Ethernet-like communications medium.

The definitions presented here are based on Clause 30 of IEEE Std 802.3. Implementors of these MIB objects should note that IEEE Std 802.3 explicitly describes (in the form of Pascal pseudocode) when, where, and how various MAC attributes are measured. IEEE Std 802.3 also describes the effects of MAC actions that may be invoked by manipulating instances of the MIB objects defined here.

To the extent that some of the attributes defined in IEEE Std 802.3 are represented by previously defined objects in MIB-2 from IETF RFC 1213 or in the Interfaces Group MIB defined in IETF RFC 2863, such attributes are not redundantly represented by objects defined in this clause. Among the attributes represented by objects defined in other MIB module specifications are the number of octets transmitted or received on a particular interface, the number of frames transmitted or received on a particular interface, the promiscuous status of an interface, the MAC address of an interface, and multicast information associated with an interface.

10.2.1 Relation to MIB-2

This subclause applies only when this MIB is used in conjunction with the IETF RFC 1213 interface group.

The relationship between an Ethernet-like interface and an interface in the context of MIB-2 is one-to-one. As such, the value of an ifIndex object instance can be directly used to identify corresponding instances of the objects defined herein.

10.2.2 Relation to the Interfaces Group MIB

The Interfaces Group MIB defined in IETF RFC 2863 requires that any MIB that is an adjunct of the Interfaces Group MIB clarify specific areas within the Interfaces Group MIB. These areas were intentionally left vague in the Interfaces Group MIB to avoid overconstraining the MIB, thereby precluding management of certain media-types.

Section 4 of IETF RFC 2863 enumerates several areas that a media-specific MIB must (wherein the word "must" is used in accordance with the requirements of IETF RFC 2119) clarify. Each of these areas is addressed in a following subclause. The implementor is referred to IETF RFC 2863 in order to understand the general intent of these areas.

10.2.2.1 ifRcvAddressTable

This table contains all IEEE 802.3 addresses, unicast, multicast, and broadcast, for which this interface will receive packets and forward them up to a higher layer entity for local consumption. The format of the address, contained in ifRcvAddressAddress, is the same as for ifPhysAddress.

In the event that the interface is part of a MAC bridge, this table does not include unicast addresses that are accepted for possible forwarding out some other port. This table is explicitly not intended to provide a bridge address filtering mechanism.

10.2.2.2 ifType

All Ethernet-like interfaces shall return ethernetCsmacd(6) for ifType. Information on the particular port type and operating speed is available from ifSpeed in the Interfaces Group MIB, and ifMauType in the MAU-MIB module defined in Clause 13. All Ethernet-like interfaces shall also implement the MAU-MIB module defined in Clause 13.¹⁷

10.2.2.3 ifXxxOctets

The Interfaces Group MIB octet counters, ifInOctets, ifOutOctets, ifHCInOctets, and ifHCOctets, include all octets in valid frames sent or received on the interface, including the MAC header and FCS, but not the preamble, start of frame delimiter, or extension octets. This corresponds to the definition of frameSize/8 in 4.2.7.1 of IEEE Std 802.3 (frameSize is defined in bits rather than in octets, and it is defined as $2 \times \text{addressSize} + \text{lengthOrTypeSize} + \text{dataSize} + \text{crcSize}$). They do not include the number of octets in collided or failed transmit attempts, since the MAC layer driver typically does not have visibility to count these octets. They also do not include octets in received invalid frames, since this information is normally not passed to the MAC layer, and since non-promiscuous MAC implementations cannot reliably determine whether an invalid frame was actually addressed to this station.

Note that these counters do include octets in valid MAC control frames sent or received on the interface, as well as octets in otherwise valid received MAC frames that are discarded by the MAC layer for some reason (insufficient buffer space, unknown protocol, etc.).

Note that the octet counters in IF-MIB do not exactly match the definition of the octet counters in IEEE Std 802.3. aOctetsTransmittedOK and aOctetsReceivedOK count only the octets in the clientData and Pad fields, whereas ifInOctets and ifOutOctets include the entire MAC frame, including MAC header and FCS. However, the IF-MIB counters can be derived from the IEEE 802.3 counters as follows in Equation (1) and Equation (2):

$$\text{ifInOctets} = \text{aOctetsReceivedOK} + (18 \times \text{aFramesReceivedOK}) \quad (1)$$

$$\text{ifOutOctets} = \text{aOctetsTransmittedOK} + (18 \times \text{aFramesTransmittedOK}) \quad (2)$$

Another difference to keep in mind between the IF-MIB counters and IEEE 802.3 counters is that, in IEEE Std 802.3, the frame counters and octet counters are incremented together. aOctetsTransmittedOK counts the number of octets in frames that were counted by aFramesTransmittedOK. aOctetsReceivedOK counts the number of octets in frames that were counted by aFramesReceivedOK. This is not the case with the IF-MIB counters. The IF-MIB octet counters count the number of octets sent to or received from the layer below this interface, whereas the packet counters count the number of packets sent to or received from the layer above. Therefore, received MAC Control frames, ifInDiscards, and ifInUnknownProtos are counted by ifInOctets, but not by ifInXcastPkts. Transmitted MAC Control frames are counted by ifOutOctets, but not by ifOutXcastPkts. ifOutDiscards and ifOutErrors are counted by ifOutXcastPkts, but not by ifOutOctets.

¹⁷There are three other interface types defined in IANAifType-MIB for Ethernet, namely, fastEther(62), fastEtherFX(69), and gigabitEthernet(117). Management applications should be prepared to receive these obsolete ifType values from older implementations.

10.2.2.4 ifXxxXcastPkts

The packet counters in the IF-MIB do not exactly match the definition of the frame counters in IEEE Std 802.3. `aFramesTransmittedOK` counts the number of frames successfully transmitted on the interface, whereas `ifOutUcastPkts`, `ifOutMulticastPkts`, and `ifOutBroadcastPkts` count the number of transmit requests made from a higher layer, whether or not the transmit attempt was successful. This means that packets counted by `ifOutErrors` or `ifOutDiscards` are also counted by `ifOutXcastPkts`, but they are not counted by `aFramesTransmittedOK`. This also means that, since MAC Control frames are generated by a sublayer internal to the interface layer rather than by a higher layer, they are not counted by `ifOutXcastPkts`, but they are counted by `aFramesTransmittedOK`:

$$\begin{aligned} \text{aFramesTransmittedOK} = & \text{ifOutUcastPkts} + \text{ifOutMulticastPkts} \\ & + \text{ifOutBroadcastPkts} + \text{dot3OutPauseFrames} \\ & - (\text{ifOutErrors} + \text{ifOutDiscards}) \end{aligned} \quad (3)$$

Similarly, `aFramesReceivedOK` counts the number of frames received successfully by the interface, whether or not they are passed to a higher layer, whereas `ifInUcastPkts`, `ifInMulticastPkts`, and `ifInBroadcastPkts` count only the number of packets passed to a higher layer. This means that packets counted by `ifInDiscards` or `ifInUnknownProtos` are also counted by `aFramesReceivedOK`, but they are not counted by `ifInXcastPkts`. This also means that, since MAC Control frames are consumed by a sublayer internal to the interface layer and not passed to a higher layer, they are not counted by `ifInXcastPkts`, but they are counted by `aFramesReceivedOK`:

$$\begin{aligned} \text{aFramesReceivedOK} = & \text{ifInUcastPkts} + \text{ifInMulticastPkts} \\ & + \text{ifInBroadcastPkts} + \text{dot3InPauseFrames} \\ & + \text{ifInDiscards} + \text{ifInUnknownProtos} \end{aligned} \quad (4)$$

This specification chooses to treat MAC control frames as being originated and consumed within the interface and not counted by the IF-MIB packet counters. MAC control frames are normally sent as multicast packets. In many network environments, MAC control frames can greatly outnumber multicast frames carrying actual data. If MAC control frames were included in the `ifInMulticastPkts` and `ifOutMulticastPkts`, the count of data-carrying multicast packets would tend to be drowned out by the count of MAC control frames, rendering those counters considerably less useful.

To better understand the issues surrounding the mapping of the IF-MIB packet and octet counters to an Ethernet interface, it is useful to refer to a Case diagram (Case and Partridge [B2]) for the IF-MIB counters, with modifications to show the proper interpretation for the Ethernet interface. This is depicted in Figure 10-1.

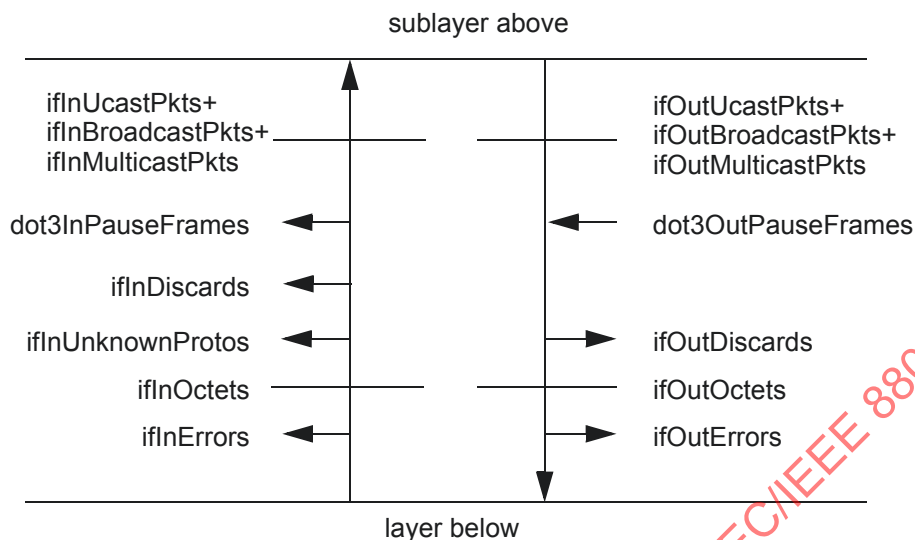


Figure 10-1—Case diagram for the IF-MIB counters

10.2.2.5 ifMtu

The defined standard MTU for Ethernet-like interfaces is 1500 octets. However, many implementations today support larger packet sizes than IEEE Std 802.3. The value of this object shall reflect the actual MTU in use on the interface, whether it matches the standard MTU or not.

This value should reflect the value seen by the MAC client interface. When a higher layer protocol, like IP, is running over Ethernet framing, this is the MTU that will be seen by that higher layer protocol. However, most Ethernet-like interfaces today run multiple protocols that use a mix of different framing types. For example, an IEEE 802.2 LLC type 1 client protocol will see an MTU of 1497 octets on an interface using the IEEE standard maximum packet size, and a protocol running over SNAP will see an MTU of 1492 octets on an interface using the IEEE standard maximum packet size. However, since the specification mandates using the MTU as seen at the MAC client interface, the value of ifMtu would be reported as 1500 octets in these cases.

10.2.2.6 ifSpeed and ifHighSpeed

For Ethernet-like interfaces operating at 1000 Megabits per second (Mb/s) or less, ifSpeed will represent the current operational speed of the interface in bits per second. For such interface types, this will be equal to 1 000 000 (1 million), 10 000 000 (10 million), 100 000 000 (100 million), or 1 000 000 000 (1 billion). ifHighSpeed will represent the current operational speed in millions of bits per second. For such Ethernet-like interfaces, this will be equal to 1, 10, 100, or 1000. If the interface implements Auto-Negotiation, Auto-Negotiation is enabled for this interface, and the interface has not yet negotiated to an operational speed, then these objects should reflect the maximum speed supported by the interface.

For Ethernet-like interfaces operating at greater than 1000 Mb/s, ifHighSpeed will represent the current operational speed of the interface in millions of bits per second. Note that for WAN implementations, this will be the payload data rate over the WAN interface sublayer. For current implementations, this will be equal to 10 000 for LAN implementations of 10 Gb/s, and 9294 for WAN implementations of the 10 Gb/s MAC over an OC-192 PHY. For these speeds, ifSpeed should report a maximum unsigned 32-bit value of 4 294 967 295 as specified in IETF RFC 2863.

These objects shall indicate the correct line speed regardless of the current duplex mode. They shall not indicate a doubled value when operating in full-duplex mode. The duplex mode of the interface may be determined by examining either the dot3StatsDuplexStatus object in this MIB module or the ifMauType MAU-MIB module object defined in Clause 13.

10.2.2.7 ifPhysAddress

This object contains the IEEE 802.3 address that is placed in the source-address field of any Ethernet, Starlan, or IEEE 802.3 frames that originate at this interface. Usually this will be kept in ROM on the interface hardware. Some systems may set this address via software.

In a system where there are several such addresses, the designer has a tougher choice. The address chosen should be the one most likely to be of use to network management (e.g., the address placed in ARP responses for systems that are primarily IP systems).

If the designer truly cannot choose, use of the factory-provided ROM address is suggested.

If the address cannot be determined, an octet string of zero length should be returned.

The address is stored in binary in this object. The address is stored in “canonical” bit order; that is, the Group Bit is positioned as the low-order bit of the first octet. Thus, the first byte of a multicast address would have the bit 0x01 set.

10.2.2.8 Specific Interfaces Group MIB objects

Table 10-1 provides specific implementation guidelines for applying the Interfaces Group objects to Ethernet-like interfaces.

Table 10-1—Implementation guidelines

Object	Guidelines
ifIndex	Each Ethernet-like interface is represented by an ifEntry. The dot3StatsTable in this MIB module is indexed by dot3StatsIndex. The interface identified by a particular value of dot3StatsIndex is the same interface as identified by the same value of ifIndex.
ifDescr	Refer to IETF RFC 2863.
ifType	Refer to 10.2.2.2.
ifMtu	Refer to 10.2.2.5.
ifSpeed	Refer to 10.2.2.6.
ifPhysAddress	Refer to 10.2.2.7.
ifAdminStatus	Write access is not required. Support for “testing” is not required.
ifOperStatus	The operational state of the interface. Support for “testing” is not required. The value “dormant” has no meaning for an Ethernet-like interface.
ifLastChange	Refer to IETF RFC 2863.
ifInOctets	The number of octets in valid MAC frames received on this interface, including the MAC header and FCS. This does include the number of octets in valid MAC Control frames received on this interface. See 10.2.2.3.
ifInUcastPkts	Refer to IETF RFC 2863. Note that this does not include MAC Control frames, since MAC Control frames are consumed by the interface layer and are not passed to any higher layer protocol. See 10.2.2.4.
ifInDiscards	Refer to IETF RFC 2863.
ifInErrors	The sum for this interface of dot3StatsAlignmentErrors, dot3StatsFCSErrors, dot3StatsFrameTooLongs, and dot3StatsInternalMacReceiveErrors.
ifInUnknownProtos	Refer to IETF RFC 2863.
ifOutOctets	The number of octets transmitted in valid MAC frames on this interface, including the MAC header and FCS. This does include the number of octets in valid MAC Control frames transmitted on this interface. See 10.2.2.3.
ifOutUcastPkts	Refer to IETF RFC 2863. Note that this does not include MAC Control frames, since MAC Control frames are generated by the interface layer, and are not passed from any higher layer protocol. See 10.2.2.4.
ifOutDiscards	Refer to IETF RFC 2863.
ifOutErrors	The sum for this interface of: dot3StatsSQETestErrors, dot3StatsLateCollisions, dot3StatsExcessiveCollisions, dot3StatsInternalMacTransmitErrors and dot3StatsCarrierSenseErrors.

Table 10-1—Implementation guidelines (continued)

Object	Guidelines
ifName	Locally significant textual name for the interface (e.g., lan0).
ifInMulticastPkts	Refer to IETF RFC 2863. Note that this does not include MAC Control frames, since MAC Control frames are consumed by the interface layer and are not passed to any higher layer protocol. See 10.2.2.4.
ifInBroadcastPkts	Refer to IETF RFC 2863. Note that this does not include MAC Control frames, since MAC Control frames are consumed by the interface layer, and are not passed to any higher layer protocol. See 10.2.2.4.
ifOutMulticastPkts	Refer to IETF RFC 2863. Note that this does not include MAC Control frames, since MAC Control frames are generated by the interface layer, and are not passed from any higher layer protocol. See 10.2.2.4.
ifOutBroadcastPkts	Refer to IETF RFC 2863. Note that this does not include MAC Control frames, since MAC Control frames are generated by the interface layer, and are not passed from any higher layer protocol. See 10.2.2.4.
ifHCInOctets, ifHCOctets	64-bit versions of counters. Required for Ethernet-like interfaces that are capable of operating at 20 Mb/s or faster, even if the interface is currently operating at less than 20 Mb/s.
ifHCInUcastPkts, ifHCInMulticastPkts, ifHCInBroadcastPkts, ifHCOctetsUcastPkts, ifHCOctetsMulticastPkts, ifHCOctetsBroadcastPkts	64-bit versions of packet counters. Required for Ethernet-like interfaces that are capable of operating at 640 Mb/s or faster, even if the interface is currently operating at less than 640 Mb/s.
ifLinkUpDownTrapEnable	Refer to IETF RFC 2863. Default is “enabled.”
ifHighSpeed	Refer to 10.2.2.6.
ifPromiscuousMode	Refer to IETF RFC 2863.
ifConnectorPresent	This will normally be “true.” It will be “false” in the case where this interface uses the WAN Interface Sublayer. See Clause 12 for details.
ifAlias	Refer to IETF RFC 2863.
ifCounterDiscontinuityTime	Refer to IETF RFC 2863. Note that a discontinuity in the Interfaces Group MIB counters may also indicate a discontinuity in some or all of the counters in this MIB that are associated with that interface.
ifStackHigherLayer, ifStackLowerLayer, ifStackStatus	Refer to 11.2.1.1.
ifRcvAddressAddress, ifRcvAddressStatus, ifRcvAddressType	Refer to 10.2.2.1.

10.2.3 Relation to the IEEE 802.3 MAU-MIB module

Support for the mauModIfCompl3 compliance statement of the MAU-MIB module defined in Clause 13 is required for Ethernet-like interfaces. This MIB module is needed in order to allow applications to determine

the current MAU type in use by the interface, and to control autonegotiation and duplex mode for the interface. Implementing this MIB module without implementing the MAU-MIB module would leave applications with no standard way to determine the media type in use, and no standard way to control the duplex mode of the interface.

10.2.4 Mapping of IEEE 802.3 managed objects

The mapping of IEEE 802.3 managed objects to SNMP objects is shown in Table 10-2.

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Table 10-2—Mapping of IEEE 802.3 managed objects

IEEE 802.3 managed object		Corresponding SNMP object
oMacEntity	.aMACID	dot3StatsIndex or IF-MIB – ifIndex
	.aFramesTransmittedOK	IF-MIB – ifOutUcastPkts + ifOutMulticastPkts + ifOutBroadcastPkts ^a
	.aSingleCollisionFrames	dot3StatsSingleCollisionFrames
	.aMultipleCollisionFrames	dot3StatsMultipleCollisionFrames
	.aFramesReceivedOK	IF-MIB – ifInUcastPkts + ifInMulticastPkts + ifInBroadcastPkts ^a
	.aFrameCheckSequenceErrors	dot3StatsFCSErrors
	.aAlignmentErrors	dot3StatsAlignmentErrors
	.aOctetsTransmittedOK	IF-MIB – ifOutOctets ^a
	.aFramesWithDeferredXmissions	dot3StatsDeferredTransmissions
	.aLateCollisions	dot3StatsLateCollisions
	.aFramesAbortedDueToXSColls	dot3StatsExcessiveCollisions
	.aFramesLostDueToIntMACXmitError	dot3StatsInternalMacTransmitErrors
	.aCarrierSenseErrors	dot3StatsCarrierSenseErrors
	.aOctetsReceivedOK	IF-MIB – ifInOctets ^a
	.aFramesLostDueToIntMACRcvError	dot3StatsInternalMacReceiveErrors
	.aPromiscuousStatus	IF-MIB – ifPromiscuousMode
	.aReadMulticastAddressList	IF-MIB – ifRevAddressTable
	.aMulticastFramesXmittedOK	IF-MIB – ifOutMulticastPkts ^a
	.aBroadcastFramesXmittedOK	IF-MIB – ifOutBroadcastPkts ^a
	.aMulticastFramesReceivedOK	IF-MIB – ifInMulticastPkts ^a
	.aBroadcastFramesReceivedOK	IF-MIB – ifInBroadcastPkts ^a
	.aFrameTooLongErrors	dot3StatsFrameTooLongs
	.aReadWriteMACAddress	IF-MIB – ifPhysAddress
	.aCollisionFrames	dot3CollFrequencies
	.aDuplexStatus	dot3StatsDuplexStatus
	.aRateControlAbility	dot3StatsRateControlAbility
	.aMaxFrameLength	dot3StatsMaxFrameLength

Table 10-2—Mapping of IEEE 802.3 managed objects (continued)

IEEE 802.3 managed object		Corresponding SNMP object
	.aSlowProtocolFrameLimit	dot3SlowProtocolFrameLimit
	.aRateControlStatus	dot3StatsRateControlStatus
	.acAddGroupAddress	IF-MIB - ifRcvAddressTable
	.acDeleteGroupAddress	IF-MIB - ifRcvAddressTable
	.acExecuteSelfTest	dot3TestLoopBack
oPHYEntity	.aPHYID	dot3StatsIndex or IF-MIB – ifIndex
	.aSQETestErrors	dot3StatsSQETestErrors
	.aSymbolErrorDuringCarrier	dot3StatsSymbolErrors
oMACControlEntity	.aMACControlID	dot3StatsIndex or IF-MIB – ifIndex
	.aMACControlFunctionsSupported	dot3ControlFunctionsSupported and dot3ControlFunctionsEnabled
	.aUnsupportedOpcodesReceived	dot3ControlInUnknownOpcodes
oPAUSEEntity	.aPAUSEMACCtrlFramesTransmitted	dot3OutPauseFrames
	.aPAUSEMACCtrlFramesReceived	dot3InPauseFrames

^aNote that the octet counters in IF-MIB do not exactly match the definition of the octet counters in IEEE Std 802.3. See 10.2.2.3 for details. Also note that the packet counters in the IF-MIB do not exactly match the definition of the frame counters in IEEE Std 802.3. See 10.2.2.4 for details.

10.3 Security considerations for Ethernet-like interface MIB module

There is one management object defined in this MIB that has a MAX-ACCESS clause of read-write. That object, dot3PauseAdminMode, may be used to change the flow control configuration on a network interface, which may result in dropped packets, or sending flow control packets on links where the link partner will not understand them. Either action could be detrimental to network performance.

Such objects may be considered sensitive or vulnerable in some network environments. The support for SET operations in a non-secure environment without proper protection can have a negative effect on network operations.

Most of the objects in this MIB module contain statistical information about particular network links. In some network environments, this information may be considered sensitive. It is thus important to control GET and/or NOTIFY access to these objects and possibly to encrypt the values of these objects when sending them over the network via SNMP.

10.4 MIB module definition

An ASCII text version of the MIB definition can be found at the following URL¹⁸:

http://www.ieee802.org/3/1/public/mib_modules/20130411/802dot3dot1C10mib.txt

STANDARDSISO.COM : Click to view the full PDF of ISO/IEC/IEEE 8802-3-1:2015

¹⁸Copyright release for MIB modules: Users of this standard may freely reproduce the MIB module contained in this subclause so that it can be used for its intended purpose.

STANDARDSISO.COM : Click to view the full PDF of ISO/IEC/IEEE 8802-3-1:2015

IEEE8023-EtherLike-MIB DEFINITIONS ::= BEGIN

IMPORTS

MODULE-IDENTITY, OBJECT-TYPE,
Integer32, Counter32, Counter64, org, Unsigned32
FROM SNMPv2-SMI
MODULE-COMPLIANCE, OBJECT-GROUP
FROM SNMPv2-CONF
TruthValue
FROM SNMPv2-TC
ifIndex, InterfaceIndex
FROM IF-MIB;

ieee8023etherMIB MODULE-IDENTITY

LAST-UPDATED "201304110000Z" -- April 11, 2013

ORGANIZATION

"IEEE 802.3 working group"

CONTACT-INFO

"WG-URL: <http://www.ieee802.org/3/index.html>
WG-Email: STDS-802-3-MIB@LISTSERV.IEEE.ORG

Contact: Howard Frazier
Postal: 3151 Zanker Road
San Jose, CA 95134
USA

Tel: +1.408.922.8164
E-mail: hfrazier@broadcom.com"

DESCRIPTION "The MIB module to describe generic objects for
Ethernet-like network interfaces."

REVISION "201304110000Z" -- April 11, 2013

DESCRIPTION

"Revision, based on an earlier version in IEEE Std 802.3.1-2011."

REVISION "201102020000Z" -- February 2, 2011

DESCRIPTION

"Initial version, based on an earlier version published
in RFC 3635."

::= { org ieee(111) standards-association-numbers-series-standards(2)
lan-man-stds(802) ieee802dot3(3) ieee802dot3dot1mibs(1) 10 }

ieee8023etherMIBObjects OBJECT IDENTIFIER ::= { ieee8023etherMIB 1 }

-- the Ethernet-like Statistics group

dot3StatsTable OBJECT-TYPE

SYNTAX SEQUENCE OF Dot3StatsEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION "Statistics for a collection of Ethernet-like
interfaces attached to a particular system.
There will be one row in this table for each
Ethernet-like interface in the system."

::= { ieee8023etherMIBObjects 2 }

dot3StatsEntry OBJECT-TYPE

```

SYNTAX      Dot3StatsEntry
MAX-ACCESS  not-accessible
STATUS      current
DESCRIPTION "Statistics for a particular interface to an
            Ethernet-like medium."
INDEX       { dot3StatsIndex }
::= { dot3StatsTable 1 }

```

```

Dot3StatsEntry ::=
SEQUENCE {

```

dot3StatsIndex	InterfaceIndex,
dot3StatsAlignmentErrors	Counter32,
dot3StatsFCSErrors	Counter32,
dot3StatsSingleCollisionFrames	Counter32,
dot3StatsMultipleCollisionFrames	Counter32,
dot3StatsSQETestErrors	Counter32,
dot3StatsDeferredTransmissions	Counter32,
dot3StatsLateCollisions	Counter32,
dot3StatsExcessiveCollisions	Counter32,
dot3StatsInternalMacTransmitErrors	Counter32,
dot3StatsCarrierSenseErrors	Counter32,
dot3StatsFrameTooLongs	Counter32,
dot3StatsInternalMacReceiveErrors	Counter32,
dot3StatsSymbolErrors	Counter32,
dot3StatsDuplexStatus	INTEGER,
dot3StatsRateControlAbility	TruthValue,
dot3StatsRateControlStatus	INTEGER,
dot3StatsMaxFrameLength	INTEGER

```

}

```

```

dot3StatsIndex OBJECT-TYPE

```

```

SYNTAX      InterfaceIndex
MAX-ACCESS  not-accessible
STATUS      current
DESCRIPTION "An index value that uniquely identifies an
            interface to an Ethernet-like medium. The
            interface identified by a particular value of
            this index is the same interface as identified
            by the same value of ifIndex."
REFERENCE   "IETF RFC 2863, ifIndex"
::= { dot3StatsEntry 1 }

```

```

dot3StatsAlignmentErrors OBJECT-TYPE

```

```

SYNTAX      Counter32
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION "A count of frames received on a particular
            interface that are not an integral number of
            octets in length and do not pass the FCS check.

```

The count represented by an instance of this object is incremented when the alignmentError status is returned by the MAC service to the LLC (or other MAC user). Received frames for which multiple error conditions pertain are, according to the conventions of IEEE 802.3 Layer Management, counted exclusively according to the error status presented to the LLC.

This counter does not increment for group encoding schemes greater than 4 bits per group.

For interfaces operating at 10 Gb/s, this counter can roll over in less than 5 minutes if it is incrementing at its maximum rate. Since that amount of time could be less than a management station's poll cycle time, in order to avoid a loss of information, a management station is advised to poll the dot3HCStatsAlignmentErrors object for 10 Gb/s or faster interfaces.

Discontinuities in the value of this counter can occur at re-initialization of the management system, and at other times as indicated by the value of ifCounterDiscontinuityTime."

REFERENCE "IEEE Std 802.3, 30.3.1.1.7,
aAlignmentErrors"

::= { dot3StatsEntry 2 }

dot3StatsFCSErrors OBJECT-TYPE

SYNTAX Counter32

MAX-ACCESS read-only

STATUS current

DESCRIPTION "A count of frames received on a particular interface that are an integral number of octets in length but do not pass the FCS check. This count does not include frames received with frame-too-long or frame-too-short error.

The count represented by an instance of this object is incremented when the frameCheckError status is returned by the MAC service to the LLC (or other MAC user). Received frames for which multiple error conditions pertain are, according to the conventions of IEEE 802.3 Layer Management, counted exclusively according to the error status presented to the LLC.

Note: Coding errors detected by the Physical Layer for speeds above 10 Mb/s will cause the frame to fail the FCS check.

For interfaces operating at 10 Gb/s, this counter can roll over in less than 5 minutes if

it is incrementing at its maximum rate. Since that amount of time could be less than a management station's poll cycle time, in order to avoid a loss of information, a management station is advised to poll the dot3HCStatsFCSErrors object for 10 Gb/s or faster interfaces.

Discontinuities in the value of this counter can occur at re-initialization of the management system, and at other times as indicated by the

value of ifCounterDiscontinuityTime."
 REFERENCE "IEEE Std 802.3, 30.3.1.1.6,
 aFrameCheckSequenceErrors."
 ::= { dot3StatsEntry 3 }

dot3StatsSingleCollisionFrames OBJECT-TYPE

SYNTAX Counter32
 MAX-ACCESS read-only
 STATUS current
 DESCRIPTION "A count of frames that are involved in a single collision, and are subsequently transmitted successfully.

A frame that is counted by an instance of this object is also counted by the corresponding instance of either the ifOutUcastPkts, ifOutMulticastPkts, or ifOutBroadcastPkts, and is not counted by the corresponding instance of the dot3StatsMultipleCollisionFrames object.

This counter does not increment when the interface is operating in full-duplex mode.

Discontinuities in the value of this counter can occur at re-initialization of the management system, and at other times as indicated by the value of ifCounterDiscontinuityTime."

REFERENCE "IEEE Std 802.3, 30.3.1.1.3,
 aSingleCollisionFrames."
 ::= { dot3StatsEntry 4 }

dot3StatsMultipleCollisionFrames OBJECT-TYPE

SYNTAX Counter32
 MAX-ACCESS read-only
 STATUS current
 DESCRIPTION "A count of frames that are involved in more than one collision and are subsequently transmitted successfully.

A frame that is counted by an instance of this object is also counted by the corresponding instance of either the ifOutUcastPkts, ifOutMulticastPkts, or ifOutBroadcastPkts, and is not counted by the corresponding instance of the dot3StatsSingleCollisionFrames object.

This counter does not increment when the interface is operating in full-duplex mode.

Discontinuities in the value of this counter can occur at re-initialization of the management system, and at other times as indicated by the value of ifCounterDiscontinuityTime."

REFERENCE "IEEE Std 802.3, 30.3.1.1.4,
 aMultipleCollisionFrames."
 ::= { dot3StatsEntry 5 }

dot3StatsSQETestErrors OBJECT-TYPE

SYNTAX Counter32

MAX-ACCESS read-only

STATUS current

DESCRIPTION "A count of times that the SQE TEST ERROR is received on a particular interface. The SQE TEST ERROR is set in accordance with the rules for verification of the SQE detection mechanism in the PLS Carrier Sense Function as described in IEEE Std 802.3, 7.2.4.6.

This counter does not increment on interfaces operating at speeds greater than 10 Mb/s, or on interfaces operating in full-duplex mode.

Discontinuities in the value of this counter can occur at re-initialization of the management system, and at other times as indicated by the value of ifCounterDiscontinuityTime."

REFERENCE "IEEE Std 802.3, 7.2.4.6, also 30.3.2.1.4, aSQETestErrors."

::= { dot3StatsEntry 6 }

dot3StatsDeferredTransmissions OBJECT-TYPE

SYNTAX Counter32

MAX-ACCESS read-only

STATUS current

DESCRIPTION "A count of frames for which the first transmission attempt on a particular interface is delayed because the medium is busy.

The count represented by an instance of this object does not include frames involved in collisions.

This counter does not increment when the interface is operating in full-duplex mode.

Discontinuities in the value of this counter can occur at re-initialization of the management system, and at other times as indicated by the value of ifCounterDiscontinuityTime."

REFERENCE "IEEE Std 802.3, 30.3.1.1.9, aFramesWithDeferredXmissions."

::= { dot3StatsEntry 7 }

dot3StatsLateCollisions OBJECT-TYPE

SYNTAX Counter32

MAX-ACCESS read-only

STATUS current

DESCRIPTION "The number of times that a collision is detected on a particular interface later than one slotTime into the transmission of a packet.

A (late) collision included in a count represented by an instance of this object is also considered as a (generic) collision for

purposes of other collision-related statistics.

This counter does not increment when the interface is operating in full-duplex mode.

Discontinuities in the value of this counter can occur at re-initialization of the management system, and at other times as indicated by the value of ifCounterDiscontinuityTime."

REFERENCE "IEEE Std 802.3, 30.3.1.1.10,
aLateCollisions."

::= { dot3StatsEntry 8 }

dot3StatsExcessiveCollisions OBJECT-TYPE

SYNTAX Counter32

MAX-ACCESS read-only

STATUS current

DESCRIPTION "A count of frames for which transmission on a particular interface fails due to excessive collisions.

This counter does not increment when the interface is operating in full-duplex mode.

Discontinuities in the value of this counter can occur at re-initialization of the management system, and at other times as indicated by the value of ifCounterDiscontinuityTime."

REFERENCE "IEEE Std 802.3, 30.3.1.1.11,
aFramesAbortedDueToXSColls."

::= { dot3StatsEntry 9 }

dot3StatsInternalMacTransmitErrors OBJECT-TYPE

SYNTAX Counter32

MAX-ACCESS read-only

STATUS current

DESCRIPTION "A count of frames for which transmission on a particular interface fails due to an internal MAC sublayer transmit error. A frame is only counted by an instance of this object if it is not counted by the corresponding instance of either the dot3StatsLateCollisions object, the dot3StatsExcessiveCollisions object, or the dot3StatsCarrierSenseErrors object.

The precise meaning of the count represented by an instance of this object is implementation-specific. In particular, an instance of this object may represent a count of transmission errors on a particular interface that are not otherwise counted.

For interfaces operating at 10 Gb/s, this counter can roll over in less than 5 minutes if it is incrementing at its maximum rate. Since that amount of time could be less than a management station's poll cycle time, in order

to avoid a loss of information, a management station is advised to poll the dot3HCStatsInternalMacTransmitErrors object for 10 Gb/s or faster interfaces.

Discontinuities in the value of this counter can

occur at re-initialization of the management system, and at other times as indicated by the value of ifCounterDiscontinuityTime."

REFERENCE "IEEE Std 802.3, 30.3.1.1.12,
aFramesLostDueToIntMACXmitError."

::= { dot3StatsEntry 10 }

dot3StatsCarrierSenseErrors OBJECT-TYPE

SYNTAX Counter32

MAX-ACCESS read-only

STATUS current

DESCRIPTION "The number of times that the carrier sense condition was lost or never asserted when attempting to transmit a frame on a particular interface.

The count represented by an instance of this object is incremented at most once per transmission attempt, even if the carrier sense condition fluctuates during a transmission attempt.

This counter does not increment when the interface is operating in full-duplex mode.

Discontinuities in the value of this counter can occur at re-initialization of the management system, and at other times as indicated by the value of ifCounterDiscontinuityTime."

REFERENCE "IEEE Std 802.3, 30.3.1.1.13,
aCarrierSenseErrors."

::= { dot3StatsEntry 11 }

-- { dot3StatsEntry 12 } is not assigned

dot3StatsFrameTooLongs OBJECT-TYPE

SYNTAX Counter32

MAX-ACCESS read-only

STATUS current

DESCRIPTION "A count of frames received on a particular interface that exceed the maximum permitted frame size.

The count represented by an instance of this object is incremented when the frameTooLong status is returned by the MAC service to the LLC (or other MAC user). Received frames for which multiple error conditions pertain are,

according to the conventions of IEEE 802.3 Layer Management, counted exclusively according to the error status presented to the LLC.

For interfaces operating at 10 Gb/s, this counter can roll over in less than 80 minutes if it is incrementing at its maximum rate. Since that amount of time could be less than a management station's poll cycle time, in order to avoid a loss of information, a management station is advised to poll the dot3HCStatsFrameTooLong object for 10 Gb/s or faster interfaces.

Discontinuities in the value of this counter can occur at re-initialization of the management system, and at other times as indicated by the value of ifCounterDiscontinuityTime."

REFERENCE "IEEE Std 802.3, 30.3.1.1.25,
aFrameTooLongErrors."

::= { dot3StatsEntry 13 }

-- { dot3StatsEntry 14 } is not assigned

-- { dot3StatsEntry 15 } is not assigned

dot3StatsInternalMacReceiveErrors OBJECT-TYPE

SYNTAX Counter32

MAX-ACCESS read-only

STATUS current

DESCRIPTION "A count of frames for which reception on a particular interface fails due to an internal MAC sublayer receive error. A frame is only counted by an instance of this object if it is not counted by the corresponding instance of either the dot3StatsFrameTooLong object, the dot3StatsAlignmentErrors object, or the dot3StatsFCSErrors object.

The precise meaning of the count represented by an instance of this object is implementation-specific. In particular, an instance of this object may represent a count of receive errors on a particular interface that are not otherwise counted.

For interfaces operating at 10 Gb/s, this counter can roll over in less than 5 minutes if

it is incrementing at its maximum rate. Since that amount of time could be less than a management station's poll cycle time, in order to avoid a loss of information, a management station is advised to poll the dot3HCStatsInternalMacReceiveErrors object for 10 Gb/s or faster interfaces.

Discontinuities in the value of this counter can occur at re-initialization of the management system, and at other times as indicated by the value of ifCounterDiscontinuityTime."

REFERENCE "IEEE Std 802.3, 30.3.1.1.15,


```

aFramesLostDueToIntMACRcvError."
 ::= { dot3StatsEntry 16 }

```

dot3StatsSymbolErrors OBJECT-TYPE

SYNTAX Counter32

MAX-ACCESS read-only

STATUS current

DESCRIPTION "For an interface operating at 100 Mb/s, the number of times there was an invalid data symbol when a valid carrier was present.

For an interface operating in half-duplex mode at 1000 Mb/s, the number of times the receiving media is non-idle (a carrier event) for a period of time equal to or greater than slotTime, and during which there was at least one occurrence of an event that causes the PHY to indicate 'Data reception error' or 'carrier extend error' on the GMII.

For an interface operating in full-duplex mode at 1000 Mb/s, the number of times the receiving media is non-idle (a carrier event) for a period of time equal to or greater than minFrameSize, and during which there was at least one occurrence of an event that causes the PHY to indicate 'Data reception error' on the GMII.

For an interface operating at 10 Gb/s, 40 Gb/s, and 100 Gb/s, it is a count of the number of times the receiving media is non-idle (the time between the Start of Packet Delimiter and the End of Packet Delimiter) for a period of time equal to or greater than minFrameSize, and during which there was at least one occurrence of an event that causes the PHY to indicate 'Receive Error' on the XGMII, the XLGMII, or the CGMII.

The count represented by an instance of this object is incremented at most once per carrier event, even if multiple symbol errors occur during the carrier event. This count does not increment if a collision is present.

This counter does not increment when the interface is operating at 10 Mb/s.

For interfaces operating at 10 Gb/s, this counter can roll over in less than 5 minutes if it is incrementing at its maximum rate. Since that amount of time could be less than a management station's poll cycle time, in order to avoid a loss of information, a management station is advised to poll the dot3HCStatsSymbolErrors object for 10 Gb/s or faster interfaces.

Discontinuities in the value of this counter can occur at re-initialization of the management

system, and at other times as indicated by the value of ifCounterDiscontinuityTime."

REFERENCE "IEEE Std 802.3, 30.3.2.1.5,
aSymbolErrorDuringCarrier."
::= { dot3StatsEntry 17 }

dot3StatsDuplexStatus OBJECT-TYPE

SYNTAX INTEGER {
 unknown(1),
 halfDuplex(2),
 fullDuplex(3)
}

MAX-ACCESS read-only

STATUS current

DESCRIPTION "The current mode of operation of the MAC entity. 'unknown' indicates that the current duplex mode could not be determined.

Management control of the duplex mode is accomplished through the MAU MIB. When an interface does not support autonegotiation, or when autonegotiation is not enabled, the duplex mode is controlled using ifMauDefaultType. When autonegotiation is supported and enabled, duplex mode is controlled using ifMauAutoNegAdvertisedBits. In either case, the currently operating duplex mode is reflected both in this object and in ifMauType.

Note that this object provides redundant information with ifMauType. Normally, redundant objects are discouraged. However, in this instance, it allows a management application to determine the duplex status of an interface without having to know every possible value of ifMauType. This was felt to be sufficiently valuable to justify the redundancy."

REFERENCE "IEEE Std 802.3, 30.3.1.1.32,
aDuplexStatus."
::= { dot3StatsEntry 18 }

dot3StatsRateControlAbility OBJECT-TYPE

SYNTAX TruthValue

MAX-ACCESS read-only

STATUS current

DESCRIPTION "'true' for interfaces operating at speeds above 1000 Mb/s that support Rate Control through lowering the average data rate of the MAC sublayer, with frame granularity, and 'false' otherwise."

REFERENCE "IEEE Std 802.3, 30.3.1.1.33,
aRateControlAbility."
::= { dot3StatsEntry 19 }

dot3StatsRateControlStatus OBJECT-TYPE

SYNTAX INTEGER {
 rateControlOff(1),
 rateControlOn(2),
 unknown(3)

```

    }
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION "The current Rate Control mode of operation of
    the MAC sublayer of this interface."
    REFERENCE "IEEE Std 802.3, 30.3.1.1.34,
    aRateControlStatus."
    ::= { dot3StatsEntry 20 }

dot3StatsMaxFrameLength OBJECT-TYPE
    SYNTAX INTEGER {
        unknown(1),
        baseFrame(2),
        qTaggedFrame(3),
        envelopeFrame(4)
    }
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION "This indicates the MAC frame length at
    which the dot3StatsFrameTooLong counter is
    incremented."
    REFERENCE "IEEE Std 802.3, 30.3.1.1.37, aMaxFrameLength."
    ::= { dot3StatsEntry 21 }

-- the Ethernet-like Collision Statistics group

-- Implementation of this group is optional; it is appropriate
-- for all systems which have the necessary metering

dot3CollTable OBJECT-TYPE
    SYNTAX SEQUENCE OF Dot3CollEntry
    MAX-ACCESS not-accessible
    STATUS current
    DESCRIPTION "A collection of collision histograms for a
    particular set of interfaces."
    REFERENCE "IEEE Std 802.3, 30.3.1.1.30,
    aCollisionFrames."
    ::= { ieee8023etherMIBObjects 5 }

dot3CollEntry OBJECT-TYPE
    SYNTAX Dot3CollEntry
    MAX-ACCESS not-accessible
    STATUS current
    DESCRIPTION "A cell in the histogram of per-frame
    collisions for a particular interface. An

    instance of this object represents the
    frequency of individual MAC frames for which
    the transmission (successful or otherwise) on a
    particular interface is accompanied by a
    particular number of media collisions."
    INDEX { ifIndex, dot3CollCount }
    ::= { dot3CollTable 1 }

Dot3CollEntry ::=
    SEQUENCE {
        dot3CollCount Integer32,
        dot3CollFrequencies Counter32
    }

```

-- { dot3CollEntry 1 } is no longer in use

dot3CollCount OBJECT-TYPE

SYNTAX Integer32 (1..16)
 MAX-ACCESS not-accessible
 STATUS current
 DESCRIPTION "The number of per-frame media collisions for
 which a particular collision histogram cell
 represents the frequency on a particular
 interface."
 ::= { dot3CollEntry 2 }

dot3CollFrequencies OBJECT-TYPE

SYNTAX Counter32
 MAX-ACCESS read-only
 STATUS current
 DESCRIPTION "A count of individual MAC frames for which the
 transmission (successful or otherwise) on a
 particular interface occurs after the
 frame has experienced exactly the number
 of collisions in the associated
 dot3CollCount object.

For example, a frame which is transmitted
 on interface 77 after experiencing
 exactly 4 collisions would be indicated
 by incrementing only dot3CollFrequencies.77.4.
 No other instance of dot3CollFrequencies would
 be incremented in this example.

This counter does not increment when the
 interface is operating in full-duplex mode.

Discontinuities in the value of this counter can

occur at re-initialization of the management
 system, and at other times as indicated by the
 value of ifCounterDiscontinuityTime."

::= { dot3CollEntry 3 }

dot3ControlTable OBJECT-TYPE

SYNTAX SEQUENCE OF Dot3ControlEntry
 MAX-ACCESS not-accessible
 STATUS current
 DESCRIPTION "A table of descriptive and status information
 about the MAC Control sublayer on the
 Ethernet-like interfaces attached to a
 particular system. There will be one row in
 this table for each Ethernet-like interface in
 the system which implements the MAC Control
 sublayer. If some, but not all, of the
 Ethernet-like interfaces in the system implement
 the MAC Control sublayer, there will be fewer
 rows in this table than in the dot3StatsTable."
 ::= { ieee8023etherMIBObjects 9 }

dot3ControlEntry OBJECT-TYPE

SYNTAX Dot3ControlEntry

```

MAX-ACCESS    not-accessible
STATUS        current
DESCRIPTION   "An entry in the table, containing information
              about the MAC Control sublayer on a single
              Ethernet-like interface."
INDEX         { dot3StatsIndex }
::= { dot3ControlTable 1 }

```

```

Dot3ControlEntry ::=
  SEQUENCE {
    dot3ControlFunctionsSupported    BITS,
    dot3ControlInUnknownOpcodes     Counter32,
    dot3HCControlInUnknownOpcodes   Counter64
  }

```

dot3ControlFunctionsSupported OBJECT-TYPE

```

SYNTAX        BITS {
                pause(0),    -- 802.3 pause flow control
                mpcp(1),     -- 802.3 multi-point control protocol
                pfc(2)       -- 802.3 priority-based flow control
              }
MAX-ACCESS    read-only
STATUS        current
DESCRIPTION   "A list of the possible MAC Control functions
              implemented for this interface."
REFERENCE    "IEEE Std 802.3, 30.3.3.2,
              aMACControlFunctionsSupported."

```

```
 ::= { dot3ControlEntry 1 }
```

dot3ControlInUnknownOpcodes OBJECT-TYPE

```

SYNTAX        Counter32
MAX-ACCESS    read-only
STATUS        current
DESCRIPTION   "A count of MAC Control frames received on this
              interface that contain an opcode that is not
              supported by this device.

```

For interfaces operating at 10 Gb/s, this counter can roll over in less than 5 minutes if it is incrementing at its maximum rate. Since that amount of time could be less than a management station's poll cycle time, in order to avoid a loss of information, a management station is advised to poll the dot3HCControlInUnknownOpcodes object for 10 Gb/s or faster interfaces.

Discontinuities in the value of this counter can occur at re-initialization of the management system, and at other times as indicated by the value of ifCounterDiscontinuityTime."

```

REFERENCE    "IEEE Std 802.3, 30.3.3.5,
              aUnsupportedOpcodesReceived"

```

```
 ::= { dot3ControlEntry 2 }
```

dot3HCControlInUnknownOpcodes OBJECT-TYPE

```

SYNTAX        Counter64
MAX-ACCESS    read-only

```

STATUS current

DESCRIPTION "A count of MAC Control frames received on this interface that contain an opcode that is not supported by this device.

This counter is a 64-bit version of dot3ControlInUnknownOpcodes. It should be used on interfaces operating at 10 Gb/s or faster.

Discontinuities in the value of this counter can occur at re-initialization of the management system, and at other times as indicated by the value of ifCounterDiscontinuityTime."

REFERENCE "IEEE Std 802.3, 30.3.3.5, aUnsupportedOpcodesReceived"

::= { dot3ControlEntry 3 }

dot3PauseTable OBJECT-TYPE

SYNTAX SEQUENCE OF Dot3PauseEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION "A table of descriptive and status information about the MAC Control PAUSE function on the Ethernet-like interfaces attached to a particular system. There will be one row in this table for each Ethernet-like interface in the system which supports the MAC Control PAUSE function (i.e., the 'pause' bit in the corresponding instance of dot3ControlFunctionsSupported is set). If some, but not all, of the Ethernet-like interfaces in the system implement the MAC Control PAUSE function (for example, if some interfaces only support half-duplex), there will be fewer rows in this table than in the dot3StatsTable."

::= { ieee8023etherMIBObjects 10 }

dot3PauseEntry OBJECT-TYPE

SYNTAX Dot3PauseEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION "An entry in the table, containing information about the MAC Control PAUSE function on a single Ethernet-like interface."

INDEX { dot3StatsIndex }

::= { dot3PauseTable 1 }

Dot3PauseEntry ::=

SEQUENCE {	
dot3PauseAdminMode	INTEGER,
dot3PauseOperMode	INTEGER,
dot3InPauseFrames	Counter32,
dot3OutPauseFrames	Counter32,
dot3HCInPauseFrames	Counter64,
dot3HCOutPauseFrames	Counter64
}	

dot3PauseAdminMode OBJECT-TYPE

```

SYNTAX      INTEGER {
                disabled(1),
                enabledXmit(2),
                enabledRcv(3),
                enabledXmitAndRcv(4)
            }

```

MAX-ACCESS read-write

STATUS current

DESCRIPTION "This object is used to configure the default administrative PAUSE mode for this interface.

This object represents the administratively-configured PAUSE mode for this interface. If Auto-Negotiation is not enabled or is not implemented for the active MAU attached to this interface, the value of this object determines the operational PAUSE mode of the interface whenever it is operating in full-duplex mode. In this case, a set to this object will force the interface into the specified mode.

If Auto-Negotiation is implemented and enabled for the MAU attached to this interface, the PAUSE mode for this interface is determined by Auto-Negotiation, and the value of this object denotes the mode to which the interface will automatically revert if/when Auto-Negotiation is later disabled. Note that when Auto-Negotiation is running, administrative control of the PAUSE mode may be accomplished using the ifMauAutoNegCapAdvertisedBits object in the MAU-MIB module.

Note that the value of this object is ignored when the interface is not operating in full-duplex mode.

An attempt to set this object to 'enabledXmit(2)' or 'enabledRcv(3)' will fail on interfaces that do not support operation at greater than 100 Mb/s."

```

::= { dot3PauseEntry 1 }

```

dot3PauseOperMode OBJECT-TYPE

```

SYNTAX      INTEGER {
                disabled(1),
                enabledXmit(2),
                enabledRcv(3),
                enabledXmitAndRcv(4)
            }

```

MAX-ACCESS read-only

STATUS current

DESCRIPTION "This object reflects the PAUSE mode currently

in use on this interface, as determined by either (1) the result of the Auto-Negotiation

function or (2) if Auto-Negotiation is not enabled or is not implemented for the active MAU attached to this interface, by the value of dot3PauseAdminMode. Interfaces operating at 100 Mb/s or less will never return 'enabledXmit(2)' or 'enabledRcv(3)'. Interfaces operating in half-duplex mode will return 'disabled(1)'. Interfaces on which Auto-Negotiation is enabled but not yet completed should return the value 'disabled(1)'."

::= { dot3PauseEntry 2 }

dot3InPauseFrames OBJECT-TYPE

SYNTAX Counter32
 MAX-ACCESS read-only
 STATUS current
 DESCRIPTION "A count of MAC Control frames received on this interface with an opcode indicating the PAUSE operation."

This counter does not increment when the interface is operating in half-duplex mode.

For interfaces operating at 10 Gb/s, this counter can roll over in less than 5 minutes if it is incrementing at its maximum rate. Since that amount of time could be less than a management station's poll cycle time, in order to avoid a loss of information, a management station is advised to poll the dot3HCInPauseFrames object for 10 Gb/s or faster interfaces.

Discontinuities in the value of this counter can occur at re-initialization of the management system, and at other times as indicated by the value of ifCounterDiscontinuityTime."

REFERENCE "IEEE Std 802.3, 30.3.4.3, aPAUSEMACCtrlFramesReceived."

::= { dot3PauseEntry 3 }

dot3OutPauseFrames OBJECT-TYPE

SYNTAX Counter32
 MAX-ACCESS read-only
 STATUS current
 DESCRIPTION "A count of MAC Control frames transmitted on this interface with an opcode indicating the PAUSE operation."

This counter does not increment when the interface is operating in half-duplex mode.

For interfaces operating at 10 Gb/s, this counter can roll over in less than 5 minutes if it is incrementing at its maximum rate. Since that amount of time could be less than a management station's poll cycle time, in order

to avoid a loss of information, a management station is advised to poll the dot3HCOutPauseFrames object for 10 Gb/s or faster interfaces.

Discontinuities in the value of this counter can occur at re-initialization of the management system, and at other times as indicated by the value of ifCounterDiscontinuityTime."

REFERENCE "IEEE Std 802.3, 30.3.4.2,
aPAUSEMACCtrlFramesTransmitted."
 ::= { dot3PauseEntry 4 }

dot3HCInPauseFrames OBJECT-TYPE

SYNTAX Counter64
MAX-ACCESS read-only
STATUS current
DESCRIPTION "A count of MAC Control frames received on this interface with an opcode indicating the PAUSE operation.

This counter does not increment when the interface is operating in half-duplex mode.

This counter is a 64-bit version of dot3InPauseFrames. It should be used on interfaces operating at 10 Gb/s or faster.

Discontinuities in the value of this counter can occur at re-initialization of the management system, and at other times as indicated by the value of ifCounterDiscontinuityTime."

REFERENCE "IEEE Std 802.3, 30.3.4.3,
aPAUSEMACCtrlFramesReceived."
 ::= { dot3PauseEntry 5 }

dot3HCOutPauseFrames OBJECT-TYPE

SYNTAX Counter64
MAX-ACCESS read-only
STATUS current
DESCRIPTION "A count of MAC Control frames transmitted on this interface with an opcode indicating the PAUSE operation.

This counter does not increment when the interface is operating in half-duplex mode.

This counter is a 64-bit version of dot3OutPauseFrames. It should be used on interfaces operating at 10 Gb/s or faster.

Discontinuities in the value of this counter can occur at re-initialization of the management system, and at other times as indicated by the value of ifCounterDiscontinuityTime."

REFERENCE "IEEE Std 802.3, 30.3.4.2,
aPAUSEMACCtrlFramesTransmitted."
 ::= { dot3PauseEntry 6 }

dot3HCStatsTable OBJECT-TYPE

SYNTAX SEQUENCE OF Dot3HCStatsEntry
 MAX-ACCESS not-accessible
 STATUS current
 DESCRIPTION "A table containing 64-bit versions of error counters from the dot3StatsTable. The 32-bit versions of these counters may roll over quite quickly on higher speed Ethernet interfaces. The counters that have 64-bit versions in this table are the counters that apply to full-duplex interfaces, since 10 Gb/s and faster Ethernet-like interfaces do not support half-duplex, and very few 1000 Mb/s Ethernet-like interfaces support half-duplex.

Entries in this table are recommended for interfaces capable of operating at 1000 Mb/s or faster, and are required for interfaces capable of operating at 10 Gb/s or faster. Lower speed Ethernet-like interfaces do not need entries in this table, in which case there may be fewer entries in this table than in the dot3StatsTable. However, implementations containing interfaces with a mix of speeds may choose to implement entries in this table for all Ethernet-like interfaces."

::= { ieee8023etherMIBObjects 11 }

dot3HCStatsEntry OBJECT-TYPE

SYNTAX Dot3HCStatsEntry
 MAX-ACCESS not-accessible
 STATUS current
 DESCRIPTION "An entry containing 64-bit statistics for a single Ethernet-like interface."
 INDEX { dot3StatsIndex }
 ::= { dot3HCStatsTable 1 }

Dot3HCStatsEntry ::=

SEQUENCE {
 dot3HCStatsAlignmentErrors Counter64,
 dot3HCStatsFCSErrors Counter64,
 dot3HCStatsInternalMacTransmitErrors Counter64,
 dot3HCStatsFrameTooLongs Counter64,
 dot3HCStatsInternalMacReceiveErrors Counter64,
 dot3HCStatsSymbolErrors Counter64,
 dot3HCStatsTransmitLPIMicroseconds Counter64,
 dot3HCStatsReceiveLPIMicroseconds Counter64,
 dot3HCStatsTransmitLPITransitions Counter64,
 dot3HCStatsReceiveLPITransitions Counter64
 }

dot3HCStatsAlignmentErrors OBJECT-TYPE

SYNTAX Counter64
 MAX-ACCESS read-only
 STATUS current
 DESCRIPTION "A count of frames received on a particular interface that are not an integral number of octets in length and do not pass the FCS check."

The count represented by an instance of this object is incremented when the alignmentError status is returned by the MAC service to the LLC (or other MAC user). Received frames for which multiple error conditions pertain are, according to the conventions of IEEE 802.3 Layer Management, counted exclusively according to the error status presented to the LLC.

This counter does not increment for group encoding schemes greater than 4 bits per group.

This counter is a 64-bit version of dot3StatsAlignmentErrors. It should be used on interfaces operating at 10 Gb/s or faster.

Discontinuities in the value of this counter can occur at re-initialization of the management

system, and at other times as indicated by the value of ifCounterDiscontinuityTime."

REFERENCE "IEEE Std 802.3, 30.3.1.1.7,
aAlignmentErrors"
::= { dot3HCStatsEntry 1 }

dot3HCStatsFCSErrors OBJECT-TYPE

SYNTAX Counter64

MAX-ACCESS read-only

STATUS current

DESCRIPTION "A count of frames received on a particular interface that are an integral number of octets in length but do not pass the FCS check. This count does not include frames received with frame-too-long or frame-too-short error.

The count represented by an instance of this object is incremented when the frameCheckError status is returned by the MAC service to the LLC (or other MAC user). Received frames for which multiple error conditions pertain are, according to the conventions of IEEE 802.3 Layer Management, counted exclusively according to the error status presented to the LLC.

Note: Coding errors detected by the Physical Layer for speeds above 10 Mb/s will cause the frame to fail the FCS check.

This counter is a 64-bit version of dot3StatsFCSErrors. It should be used on interfaces operating at 10 Gb/s or faster.

Discontinuities in the value of this counter can occur at re-initialization of the management system, and at other times as indicated by the value of ifCounterDiscontinuityTime."

REFERENCE "IEEE Std 802.3, 30.3.1.1.6,
aFrameCheckSequenceErrors."

```
::= { dot3HCStatsEntry 2 }
```

dot3HCStatsInternalMacTransmitErrors OBJECT-TYPE

SYNTAX Counter64

MAX-ACCESS read-only

STATUS current

DESCRIPTION "A count of frames for which transmission on a particular interface fails due to an internal MAC sublayer transmit error. A frame is only

counted by an instance of this object if it is not counted by the corresponding instance of either the dot3StatsLateCollisions object, the dot3StatsExcessiveCollisions object, or the dot3StatsCarrierSenseErrors object.

The precise meaning of the count represented by an instance of this object is implementation-specific. In particular, an instance of this object may represent a count of transmission errors on a particular interface that are not otherwise counted.

This counter is a 64-bit version of dot3StatsInternalMacTransmitErrors. It should be used on interfaces operating at 10 Gb/s or faster.

Discontinuities in the value of this counter can occur at re-initialization of the management system, and at other times as indicated by the value of ifCounterDiscontinuityTime."

REFERENCE "IEEE Std 802.3, 30.3.1.1.12, aFramesLostDueToIntMACXmitError."

```
::= { dot3HCStatsEntry 3 }
```

dot3HCStatsFrameTooLongs OBJECT-TYPE

SYNTAX Counter64

MAX-ACCESS read-only

STATUS current

DESCRIPTION "A count of frames received on a particular interface that exceed the maximum permitted frame size.

The count represented by an instance of this object is incremented when the frameTooLong status is returned by the MAC service to the LLC (or other MAC user). Received frames for which multiple error conditions pertain are, according to the conventions of IEEE 802.3 Layer Management, counted exclusively according to the error status presented to the LLC.

This counter is a 64-bit version of dot3StatsFrameTooLongs. It should be used on interfaces operating at 10 Gb/s or faster.

Discontinuities in the value of this counter can

occur at re-initialization of the management system, and at other times as indicated by the value of ifCounterDiscontinuityTime."

REFERENCE "IEEE Std 802.3, 30.3.1.1.25,
aFrameTooLongErrors."

::= { dot3HCStatsEntry 4 }

dot3HCStatsInternalMacReceiveErrors OBJECT-TYPE

SYNTAX Counter64

MAX-ACCESS read-only

STATUS current

DESCRIPTION "A count of frames for which reception on a particular interface fails due to an internal MAC sublayer receive error. A frame is only counted by an instance of this object if it is not counted by the corresponding instance of either the dot3StatsFrameTooLongs object, the dot3StatsAlignmentErrors object, or the dot3StatsFCSErrors object.

The precise meaning of the count represented by an instance of this object is implementation-specific. In particular, an instance of this object may represent a count of receive errors on a particular interface that are not otherwise counted.

This counter is a 64-bit version of dot3StatsInternalMacReceiveErrors. It should be used on interfaces operating at 10 Gb/s or faster.

Discontinuities in the value of this counter can occur at re-initialization of the management system, and at other times as indicated by the value of ifCounterDiscontinuityTime."

REFERENCE "IEEE Std 802.3, 30.3.1.1.15,
aFramesLostDueToIntMACRcvError."

::= { dot3HCStatsEntry 5 }

dot3HCStatsSymbolErrors OBJECT-TYPE

SYNTAX Counter64

MAX-ACCESS read-only

STATUS current

DESCRIPTION "For an interface operating at 100 Mb/s, the number of times there was an invalid data symbol when a valid carrier was present.

For an interface operating in half-duplex mode at 1000 Mb/s, the number of times the receiving media is non-idle (a carrier event) for a period of time equal to or greater than slotTime, and during which there was at least one occurrence of an event that causes the PHY to indicate 'Data reception error' or 'carrier extend error' on the GMII.

For an interface operating in full-duplex mode

at 1000 Mb/s, the number of times the receiving media is non-idle (a carrier event) for a period of time equal to or greater than minFrameSize, and during which there was at least one occurrence of an event that causes the PHY to indicate 'Data reception error' on the GMII.

For an interface operating at 10 Gb/s, 40 Gb/s and 100 Gb/s, the number of times the receiving media is non-idle (a carrier event) for a period of time equal to or greater than minFrameSize, and during which there was at least one occurrence of an event that causes the PHY to indicate 'Receive Error' on the XGMII, the XLGMII, or the CGMII.

The count represented by an instance of this object is incremented at most once per carrier event, even if multiple symbol errors occur during the carrier event. This count does not increment if a collision is present.

This counter is a 64-bit version of dot3StatsSymbolErrors. It should be used on interfaces operating at 10 Gb/s or faster.

Discontinuities in the value of this counter can occur at re-initialization of the management system, and at other times as indicated by the value of ifCounterDiscontinuityTime."

REFERENCE "IEEE Std 802.3, 30.3.2.1.5, aSymbolErrorDuringCarrier."

::= { dot3HCStatsEntry 6 }

dot3HCStatsTransmitLPIMicroseconds OBJECT-TYPE

SYNTAX Counter64

MAX-ACCESS read-only

STATUS current

DESCRIPTION "A count reflecting the amount of time that the LPI_REQUEST parameter has the value ASSERT. The request is indicated to the PHY according to the requirements of the RS (see IEEE Std 802.3 22.7, 35.4, and 46.4).

This counter has a maximum increment rate of 1 000 000 counts per second."

REFERENCE "IEEE Std 802.3, 30.3.2.1.8 aTransmitLPIMicroseconds."

::= { dot3HCStatsEntry 7 }

dot3HCStatsReceiveLPIMicroseconds OBJECT-TYPE

SYNTAX Counter64

MAX-ACCESS read-only

STATUS current

DESCRIPTION "A count reflecting the amount of time that the LPI_INDICATION parameter has the value ASSERT. The indication reflects the state of the PHY according to the requirements of the RS (see IEEE Std 802.3 22.7, 35.4, and 46.4).

This counter has a maximum increment rate of

1 000 000 counts per second."
 REFERENCE "IEEE Std 802.3, 30.3.2.1.9 aReceiveLPIMicroseconds."
 ::= { dot3HCStatsEntry 8 }

dot3HCStatsTransmitLPITransitions OBJECT-TYPE
 SYNTAX Counter64
 MAX-ACCESS read-only
 STATUS current
 DESCRIPTION "A count of occurrences of the transition from
 state LPI_DEASSERTED to state LPI_ASSERTED of
 the LPI transmit state diagram is the RS.
 The state transition corresponds to the assertion
 of the LPI_REQUEST parameter. The request is indicated
 to the PHY according to the requirements of the RS
 (see IEEE Std 802.3 22.7, 35.4, 46.4.)

This counter has a maximum increment rate of 50 000
 counts per second at 100 Mb/s; 90 000 counts per
 second at 1000 Mb/s; and 230 000 counts per second
 at 10 Gb/s."
 REFERENCE "IEEE Std 802.3, 30.3.2.1.10 aTransmitLPITransitions."
 ::= { dot3HCStatsEntry 9 }

dot3HCStatsReceiveLPITransitions OBJECT-TYPE
 SYNTAX Counter64
 MAX-ACCESS read-only
 STATUS current
 DESCRIPTION "A count of occurrences of the transition from DEASSERT
 to ASSERT of the LPI_INDICATE parameter. The
 indication reflects the state of the PHY according to
 the requirements of the RS
 (see IEEE Std 802.3 22.7, 35.4, and 46.4).

This counter has a maximum increment rate of 50 000
 counts per second at 100 Mb/s; 90 000 counts per second
 at 1000 Mb/s; and 230 000 counts per second at 10 Gb/s."
 REFERENCE "IEEE Std 802.3, 30.3.2.1.11 aReceiveLPITransitions."
 ::= { dot3HCStatsEntry 10 }

dot3SlowProtocolFrameLimit OBJECT-TYPE
 SYNTAX Integer32
 MAX-ACCESS read-write
 STATUS current
 DESCRIPTION "The maximum number of Slow Protocol frames
 of a given subtype that can be transmitted
 in a one second interval. The default value
 is 10."
 REFERENCE "IEEE Std 802.3, 30.3.1.1.38,
 aSlowProtocolFrameLimit."
 DEFVAL { 10 }
 ::= { ieee8023etherMIBObjects 12 }

dot3ExtensionTable OBJECT-TYPE
 SYNTAX SEQUENCE OF Dot3ExtensionEntry
 MAX-ACCESS not-accessible
 STATUS current
 DESCRIPTION "A table of status information
 about the Extension MAC Control frames transmitted

and received on the Ethernet-like interfaces attached to a particular system. There will be one row in this table for each Ethernet-like interface in the system which supports Extension MAC Control function (i.e., the 'mpcp' bit in the corresponding instance of dot3ControlFunctionsSupported is set). If some, but not all, of the Ethernet-like interfaces in the system implement the Extension MAC Control function, there will be fewer rows in this table than in the dot3StatsTable."

::= { ieee8023etherMIBObjects 13 }

dot3ExtensionEntry OBJECT-TYPE

SYNTAX Dot3ExtensionEntry
 MAX-ACCESS not-accessible
 STATUS current
 DESCRIPTION "An entry in the table, containing information about the Extension MAC Control function on a single Ethernet-like interface."
 INDEX { dot3StatsIndex }
 ::= { dot3ExtensionTable 1 }

Dot3ExtensionEntry ::=

SEQUENCE {
 dot3HCInExtensionFrames Counter64,
 dot3HCOutExtensionFrames Counter64,
 dot3ExtensionMacCtrlStatus Unsigned32
 }

dot3HCInExtensionFrames OBJECT-TYPE

SYNTAX Counter64
 MAX-ACCESS read-only
 STATUS current
 DESCRIPTION "A count of Extension MAC Control frames received on this interface."

Discontinuities in the value of this counter can occur at re-initialization of the management system, and at other times as indicated by the value of ifCounterDiscontinuityTime."

REFERENCE "IEEE Std 802.3, 30.3.8.2
 aEXTENSIONMACCtrlFramesReceived."

::= { dot3ExtensionEntry 1 }

dot3HCOutExtensionFrames OBJECT-TYPE

SYNTAX Counter64
 MAX-ACCESS read-only
 STATUS current
 DESCRIPTION "A count of Extension MAC Control frames transmitted on this interface."

Discontinuities in the value of this counter can occur at re-initialization of the management system, and at other times as indicated by the value of ifCounterDiscontinuityTime."

REFERENCE "IEEE Std 802.3, 30.3.8.1"


```

aEXTENSIONMACCtrlFramesTransmitted."
 ::= { dot3ExtensionEntry 2 }

dot3ExtensionMacCtrlStatus OBJECT-TYPE
    SYNTAX      Unsigned32
    MAX-ACCESS   read-only
    STATUS       current
    DESCRIPTION  "The current EXTENSIONMACCtrlStatus as described in
                  IEEE Std 802.3, 30.3.8.3."
    REFERENCE   "IEEE Std 802.3, 30.3.8.3, aEXTENSIONMACCtrlStatus."
    ::= { dot3ExtensionEntry 3 }

dot3PFCTable OBJECT-TYPE
    SYNTAX      SEQUENCE OF Dot3PFCEnterY
    MAX-ACCESS   not-accessible
    STATUS       current
    DESCRIPTION  "A table of descriptive and status information
                  about the MAC Control Priority-based Flow Control
                  function on the Ethernet-like interfaces attached to
                  a particular system. There will be one row in
                  this table for each Ethernet-like interface in
                  the system which supports the MAC Control PFC
                  function (i.e., the 'pfc' bit in the
                  corresponding instance of
                  dot3ControlFunctionsSupported is set). If some,
                  but not all, of the Ethernet-like interfaces in
                  the system implement the MAC Control PFC
                  function (for example, if some interfaces only
                  support half-duplex), there will be fewer rows
                  in this table than in the dot3StatsTable."
    ::= { ieee8023etherMIBObjects 14 }

dot3PFCEnterY OBJECT-TYPE
    SYNTAX      Dot3PFCEnterY
    MAX-ACCESS   not-accessible
    STATUS       current
    DESCRIPTION  "An entry in the table, containing information
                  about the MAC Control PFC function on a single
                  Ethernet-like interface."
    INDEX       { dot3StatsIndex }
    ::= { dot3PFCTable 1 }

Dot3PFCEnterY ::=
    SEQUENCE {
        dot3PFCAdminMode          INTEGER,
        dot3PFCOperMode           INTEGER,
        dot3HCInPFCFrames         Counter64,
        dot3HCOutPFCFrames        Counter64
    }

dot3PFCAdminMode OBJECT-TYPE
    SYNTAX      INTEGER {
                  disabled(1),
                  enabled(2)
                }
    MAX-ACCESS   read-write
    STATUS       current
    DESCRIPTION  "This object is used to configure the default

```

administrative PFC mode for this interface.

This object represents the administratively-configured PFC mode for this interface. The value of this object determines the operational PFC mode of the interface. A set to this object will force the interface into the specified mode.

Note that the value of this object is ignored when the interface is not operating in full-duplex mode."

::= { dot3PFCEntry 1 }

dot3PFCOperMode OBJECT-TYPE
 SYNTAX INTEGER {
 disabled(1),
 enabled(2)
 }
 MAX-ACCESS read-only
 STATUS current
 DESCRIPTION "This object reflects the PFC mode currently in use on this interface, as determined by the value of dot3PFCAdminMode."
 REFERENCE "IEEE Std 802.3, 30.3.3.6 aPFCenableStatus"
 ::= { dot3PFCEntry 2 }

dot3HCInPFCFrames OBJECT-TYPE
 SYNTAX Counter64
 MAX-ACCESS read-only
 STATUS current
 DESCRIPTION "A count of MAC Control frames received on this interface with an opcode indicating the PFC operation."

Discontinuities in the value of this counter can occur at re-initialization of the management system, and at other times as indicated by the value of ifCounterDiscontinuityTime."

::= { dot3PFCEntry 3 }

dot3HCOutPFCFrames OBJECT-TYPE
 SYNTAX Counter64
 MAX-ACCESS read-only
 STATUS current
 DESCRIPTION "A count of MAC Control frames transmitted on this interface with an opcode indicating the PFC operation."

Discontinuities in the value of this counter can occur at re-initialization of the management system, and at other times as indicated by the value of ifCounterDiscontinuityTime."

::= { dot3PFCEntry 4 }

```

-- { ieee8023etherMIBObjects 6 }, the dot3ChipSets tree,
--   is defined in [RFC2666]

-- Conformance statements

etherConformance OBJECT IDENTIFIER ::= { ieee8023etherMIB 2 }

etherGroups      OBJECT IDENTIFIER ::= { etherConformance 1 }
etherCompliances OBJECT IDENTIFIER ::= { etherConformance 2 }

-- Compliance statements

dot3Compliance2 MODULE-COMPLIANCE
    STATUS      current
    DESCRIPTION "The compliance statement for managed network
                entities which have Ethernet-like network
                interfaces.

                Note that compliance with this MIB module
                requires compliance with the ifCompliance3
                MODULE-COMPLIANCE statement of the IF-MIB
                (IETF RFC 2863). In addition, compliance with this
                MIB module requires compliance with the
                mauModIfCompl3 MODULE-COMPLIANCE statement of
                the MAU-MIB module defined in Clause 13."

MODULE -- this module
    MANDATORY-GROUPS { etherStatsBaseGroup2 }

    GROUP      etherDuplexGroup
    DESCRIPTION "This group is mandatory for all
                Ethernet-like network interfaces which are
                capable of operating in full-duplex mode.
                It is highly recommended for all
                Ethernet-like network interfaces."

    GROUP      etherRateControlGroup
    DESCRIPTION "This group is mandatory for all
                Ethernet-like network interfaces which are
                capable of operating at speeds faster than
                1000 Mb/s. It is highly recommended for all
                Ethernet-like network interfaces."

    GROUP      etherStatsLowSpeedGroup
    DESCRIPTION "This group is mandatory for all
                Ethernet-like network interfaces which are
                capable of operating at 10 Mb/s or slower in
                half-duplex mode."

    GROUP      etherStatsHighSpeedGroup
    DESCRIPTION "This group is mandatory for all
                Ethernet-like network interfaces which are
                capable of operating at 100 Mb/s or faster."

    GROUP      etherStatsHalfDuplexGroup
    DESCRIPTION "This group is mandatory for all
                Ethernet-like network interfaces which are
                capable of operating in half-duplex mode."

```

GROUP etherHCStatsGroup
DESCRIPTION "This group is mandatory for all Ethernet-like network interfaces which are capable of operating at 10 Gb/s or faster. It is recommended for all Ethernet-like network interfaces which are capable of operating at 1000 Mb/s or faster."

GROUP etherControlGroup
DESCRIPTION "This group is mandatory for all Ethernet-like network interfaces that support the MAC Control sublayer."

GROUP etherHCControlGroup
DESCRIPTION "This group is mandatory for all Ethernet-like network interfaces that support the MAC Control sublayer and are capable of operating at 10 Gb/s or faster."

GROUP etherControlPauseGroup
DESCRIPTION "This group is mandatory for all Ethernet-like network interfaces that support the MAC Control PAUSE function."

GROUP etherHCControlPauseGroup
DESCRIPTION "This group is mandatory for all Ethernet-like network interfaces that support the MAC Control PAUSE function and are capable of operating at 10 Gb/s or faster."

GROUP etherCollisionTableGroup
DESCRIPTION "This group is optional. It is appropriate for all Ethernet-like network interfaces which are capable of operating in half-duplex mode and have the necessary metering. Implementation in systems with such interfaces is highly recommended."

GROUP etherHCStatsLpiGroup
DESCRIPTION "This group is mandatory for all Ethernet-like network interfaces that support the Low Power Idle function."

GROUP etherSlowProtocolsGroup
DESCRIPTION "This group is optional. It is appropriate for Ethernet-like network interfaces that implement OAM as defined in Clause 57 of IEEE Std 802.3."

GROUP etherExtensionMacCtrlGroup
DESCRIPTION "This group is mandatory for all Ethernet-like network interfaces that implement Extension MAC Control."

GROUP etherPfcGroup
DESCRIPTION "This group is mandatory for all Ethernet-like network interfaces that implement Priority Flow Control."

```

 ::= { etherCompliances 1 }

-- units of conformance

etherCollisionTableGroup OBJECT-GROUP
    OBJECTS      { dot3CollFrequencies
    }
    STATUS       current
    DESCRIPTION "A collection of objects providing a histogram
                of packets successfully transmitted after
                experiencing exactly N collisions."
 ::= { etherGroups 1 }

etherStatsLowSpeedGroup OBJECT-GROUP
    OBJECTS      { dot3StatsSQETestErrors }
    STATUS       current
    DESCRIPTION "A collection of objects providing information
                applicable to Ethernet-like network interfaces
                capable of operating at 10 Mb/s or slower in
                half-duplex mode."
 ::= { etherGroups 2 }

etherStatsHighSpeedGroup OBJECT-GROUP
    OBJECTS      { dot3StatsSymbolErrors }
    STATUS       current
    DESCRIPTION "A collection of objects providing information
                applicable to Ethernet-like network interfaces
                capable of operating at 100 Mb/s or faster."
 ::= { etherGroups 3 }

etherDuplexGroup OBJECT-GROUP
    OBJECTS      { dot3StatsDuplexStatus }
    STATUS       current
    DESCRIPTION "A collection of objects providing information
                about the duplex mode of an Ethernet-like
                network interface."
 ::= { etherGroups 4 }

etherControlGroup OBJECT-GROUP
    OBJECTS      { dot3ControlFunctionsSupported,
                  dot3ControlInUnknownOpcodes
    }
    STATUS       current
    DESCRIPTION "A collection of objects providing information
                about the MAC Control sublayer on Ethernet-like
                network interfaces."
 ::= { etherGroups 5 }

etherControlPauseGroup OBJECT-GROUP
    OBJECTS      { dot3PauseAdminMode,
                  dot3PauseOperMode,
                  dot3InPauseFrames,
                  dot3OutPauseFrames
    }
    STATUS       current
    DESCRIPTION "A collection of objects providing information
                about and control of the MAC Control PAUSE
                function on Ethernet-like network interfaces."
 ::= { etherGroups 6 }

```

```

etherStatsBaseGroup2 OBJECT-GROUP
    OBJECTS      { dot3StatsAlignmentErrors,
                    dot3StatsFCSErrors,
                    dot3StatsInternalMacTransmitErrors,
                    dot3StatsFrameTooLongs,
                    dot3StatsInternalMacReceiveErrors,
                    dot3StatsMaxFrameLength
                  }
    STATUS        current
    DESCRIPTION   "A collection of objects providing information
                    applicable to all Ethernet-like network
                    interfaces."
    ::= { etherGroups 7 }

etherStatsHalfDuplexGroup OBJECT-GROUP
    OBJECTS      { dot3StatsSingleCollisionFrames,
                    dot3StatsMultipleCollisionFrames,
                    dot3StatsDeferredTransmissions,
                    dot3StatsLateCollisions,
                    dot3StatsExcessiveCollisions,
                    dot3StatsCarrierSenseErrors
                  }
    STATUS        current
    DESCRIPTION   "A collection of objects providing information
                    applicable only to half-duplex Ethernet-like
                    network interfaces."
    ::= { etherGroups 8 }

etherHCStatsGroup OBJECT-GROUP
    OBJECTS      { dot3HCStatsAlignmentErrors,
                    dot3HCStatsFCSErrors,
                    dot3HCStatsInternalMacTransmitErrors,
                    dot3HCStatsFrameTooLongs,
                    dot3HCStatsInternalMacReceiveErrors,
                    dot3HCStatsSymbolErrors
                  }
    STATUS        current
    DESCRIPTION   "A collection of objects providing high-capacity
                    statistics applicable to higher-speed
                    Ethernet-like network interfaces."
    ::= { etherGroups 9 }

etherHCControlGroup OBJECT-GROUP
    OBJECTS      { dot3HCControlInUnknownOpCodes }
    STATUS        current
    DESCRIPTION   "A collection of objects providing high-capacity
                    statistics for the MAC Control sublayer on
                    higher-speed Ethernet-like network interfaces."
    ::= { etherGroups 10 }

etherHCControlPauseGroup OBJECT-GROUP
    OBJECTS      { dot3HCInPauseFrames,
                    dot3HCOutPauseFrames
                  }
    STATUS        current
    DESCRIPTION   "A collection of objects providing high-capacity
                    statistics for the MAC Control PAUSE function on

```

```

        higher-speed Ethernet-like network interfaces."
 ::= { etherGroups 11 }

etherRateControlGroup OBJECT-GROUP
  OBJECTS      { dot3StatsRateControlAbility,
                  dot3StatsRateControlStatus
                }
  STATUS       current
  DESCRIPTION   "A collection of objects providing information
                  about the Rate Control function on Ethernet-like
                  interfaces."
 ::= { etherGroups 12 }

etherHCStatsLpiGroup OBJECT-GROUP
  OBJECTS      { dot3HCStatsTransmitLPIMicroseconds,
                  dot3HCStatsReceiveLPIMicroseconds,
                  dot3HCStatsTransmitLPITransitions,
                  dot3HCStatsReceiveLPITransitions
                }
  STATUS       current
  DESCRIPTION   "A collection of objects providing information
                  about the Low Power Idle function on Ethernet-like
                  interfaces."
 ::= { etherGroups 13 }

etherSlowProtocolsGroup OBJECT-GROUP
  OBJECTS      { dot3SlowProtocolFrameLimit }
  STATUS       current
  DESCRIPTION   "An object providing control and information
                  about the frame transmission rate limit for
                  Slow Protocols on Ethernet-like interfaces."
 ::= { etherGroups 14 }

etherExtensionMacCtrlGroup OBJECT-GROUP
  OBJECTS      { dot3HCInExtensionFrames,
                  dot3HCOutExtensionFrames,
                  dot3ExtensionMacCtrlStatus
                }
  STATUS       current
  DESCRIPTION   "A collection of objects providing information
                  about the Extension MAC Control function on
                  Ethernet-like interfaces."
 ::= { etherGroups 15 }

etherPfcGroup OBJECT-GROUP
  OBJECTS      { dot3PFCAdminMode,
                  dot3PFCOperMode,
                  dot3HCInPFCFrames,
                  dot3HCOutPFCFrames
                }
  STATUS       current
  DESCRIPTION   "A collection of objects providing information
                  about the Priority Flow Control function on
                  Ethernet-like interfaces."
 ::= { etherGroups 16 }

```

END

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11. Ethernet in the First Mile copper (EFMCu) interfaces MIB module

11.1 Introduction

Ethernet-like interfaces have been defined in IEEE Std 802.3 known as Ethernet in the First Mile (EFM). In particular, 2BASE-TL and 10PASS-TS physical interfaces (PHYs), defined over voice-grade copper pairs, have been specified for the long and short reach, respectively. These interfaces, collectively called EFM Copper (EFMCu), are based on single-pair high-speed digital subscriber line (SHDSL; see ITU-T G.991.2) and very high-speed digital subscriber line (VDSL; see ITU-T G.993.1) technology, supporting optional physical medium entity (PME) aggregation (a.k.a. multi-pair bonding) with variable rates.

The 2BASE-TL PHY is capable of providing at least 2 Mb/s over a 2700 m long single copper pair with a mean bit error ratio (BER) of 10^{-7} (using 5 dB target noise margin).

The 10PASS-TS PHY is capable of providing at least 10 Mb/s over a 750 m long single copper pair with a mean BER of 10^{-7} (using 6 dB target noise margin). This clause defines a MIB module for use with SNMP to manage EFMCu interfaces. In addition, a MIB module is defined describing the cross-connect capability of a stacked interface.

11.2 Relation to other MIB modules

This subclause outlines the relationship of the MIB modules defined in this clause with other MIB modules described in other clauses of this standard, or the relevant RFCs. Specifically, the Interfaces Group MIB (IF-MIB), Ethernet-Like (IEEE8023-EtherLike-MIB), MAU (MAU-MIB), SHDSL (HDSL2-SHDSL-LINE-MIB), and VDSL (VDSL-LINE-EXT-MCM-MIB) modules are discussed.

11.2.1 Relation to Interfaces Group MIB module

2BASE-TL and 10PASS-TS PHYs specified in the EFM-CU-MIB module are stacked (a.k.a. aggregated or bonded) Ethernet interfaces and as such are managed using generic interface management objects defined in the IF-MIB defined in IETF RFC 2863.

The stack management (i.e., actual connection of the sublayers to the top-layer interface) is done via the ifStackTable, as defined in the IF-MIB defined in IETF RFC 2863, and its inverse ifInvStackTable, as defined in the IF-INVERTED-STACK-MIB defined in IETF RFC 2864.

The table ifCapStackTable and its inverse ifInvCapStackTable are defined in the IF-CAP-STACK-MIB module. These tables extend the stack management with an ability to describe possible connections or cross-connect capability, when a flexible cross-connect matrix is present between the interface layers. The IF-CAP-STACK-MIB module definition (Beili [B1]) can be found in:

<https://datatracker.ietf.org/doc/draft-ietf-opsawg-rfc5066bis/>

11.2.1.1 Layering model

An EFMCu interface can aggregate up to 32 physical medium entity (PME) sublayer devices (modems), using the so-called PME aggregation function (PAF).

A generic EFMCu device can have a number of physical coding sublayer (PCS) ports, each connected to a media access controller (MAC) via a media independent interface (MII) at the upper layer, and cross-connected to a number of underlying PMEs, with a single PCS per PME relationship. See 61.1 of IEEE Std 802.3 for more details.

Each PME in the aggregated EFMCu port is represented in the Interface table (ifTable) as a separate interface with ifType of shdsl(169) for 2BASE-TL or vdsl(97) for 10PASS-TS. The ifType values are defined in [IANAifType-MIB].

The ifSpeed for each PME shall return the actual data bitrate of the active PME (e.g., for 2BaseTL PMEs, it is a multiple of 64 kb/s). A zero value shall be returned when the PME is Initializing or Down.

The ifSpeed of the PCS is the sum of the current operating data rates of all PMEs in the aggregation group, without the 64/65-octet encapsulation overhead and PAF overhead, but accounting for the inter-frame gaps (IFGs).

When using the stated definition of ifSpeed for the PCS, there would be no frame loss in the configuration shown in Figure 11-1 (the test-sets are configured to generate 100% of back-to-back traffic, i.e., minimal IFG, at 10 Mb/s or 100 Mb/s, with min and max frame sizes; the EFM interfaces are aggregated to achieve the shown speed).

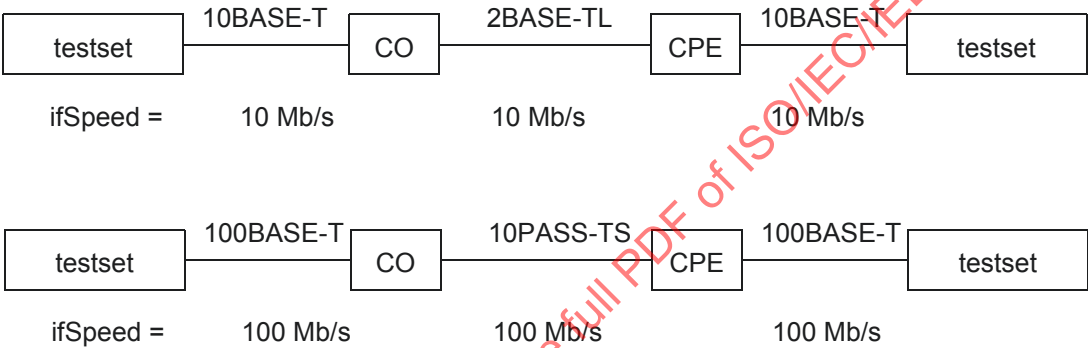


Figure 11-1—Example configuration with no frame loss

Figure 11-2 shows the IEEE 802.3 layering diagram and corresponding use of ifTable and ifMauTable.

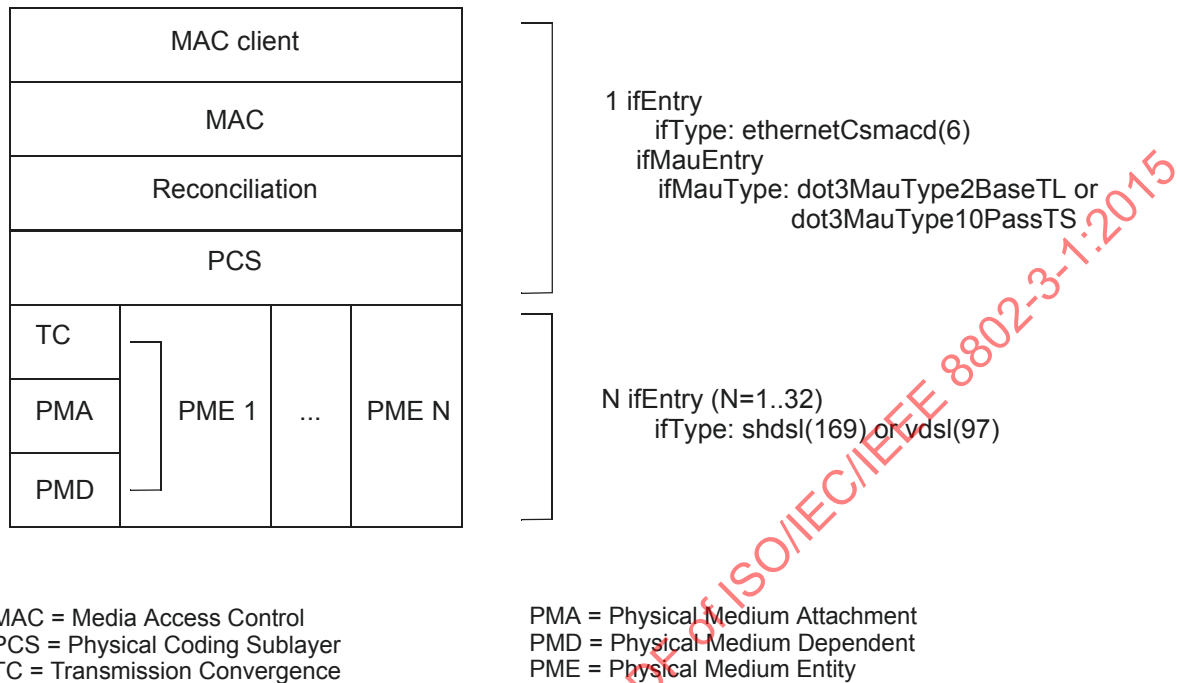


Figure 11-2—Use of ifTable and ifMauTable for EFMcu ports

The ifStackTable is indexed by the ifIndex values of the aggregated EFMcu port (PCS) and the PMEs connected to it. The ifStackTable allows a Network Management application to determine which PMEs are connected to a particular PCS and change connections (if supported by the application). The ifInvStackTable, being an inverted version of the ifStackTable, provides an efficient means for a Network Management application to read a subset of the ifStackTable and thereby determine which PCS runs on top of a particular PME.

The ifCapStackTable, defined in the IF-CAP-STACK-MIB module, specifies for each higher layer interface (e.g., PCS port) a list of lower layer interfaces (e.g., PMEs), which can possibly be cross-connected to that higher layer interface, determined by the cross-connect capability of the device. This table, modeled after the ifStackTable, is read-only, reflecting the current cross-connect capability of the stacked interface, which can be dynamic in some implementations (e.g., if PMEs are located on a pluggable module and the module is pulled out). Note that PME availability per PCS, described by the ifCapStackTable, can be constrained by other parameters, for example, by the aggregation capacity of a PCS or by the PME in question being already connected to another PCS. So that a particular PME can be connected to the PCS, all respective parameters (e.g., ifCapStackTable, ifStackTable, and efmCuPAFCapacity) shall be inspected.

The ifInvCapStackTable, also defined in the IF-CAP-STACK-MIB module, describes which higher layer interfaces (e.g., PCS ports) can possibly be connected to a particular lower layer interface (e.g., PME), providing an inverted mapping of the ifCapStackTable. While it contains no additional information beyond that already contained in the ifCapStackTable, the ifInvCapStackTable has the ifIndex values in its INDEX clause in the reverse order, i.e., the lower layer interface first, and the higher layer interface second, providing an efficient means for a Network Management application to read a subset of the ifCapStackTable and thereby determine which interfaces can be connected to run on top of a particular interface.

11.2.1.2 PME aggregation function (PAF)

The PME aggregation function (PAF) allows a number of PMEs to be aggregated onto a PCS port, by fragmenting the Ethernet frames, transmitting the fragments over multiple PMEs, and assembling the original frames at the remote port. PAF is optional, meaning that a device with a single PME may perform fragmentation and reassembly if this function is supported by the device. Note that the agent is required to report on the PAF capability for all EFM-Cu ports (2BASE-TL and 10PASS-TS).

The EFM-CU-MIB module allows a network management application to query the PAF capability and enable/disable it if supported. Note that enabling PAF effectively turns on fragmentation and reassembly, even on a single-PME port.

11.2.1.3 Discovery operation

The EFM-Cu ports may optionally support discovery operation, whereby PMEs, during initialization, exchange information about their respective aggregation groups (PCS). This information can then be used to detect copper misconnections or for an automatic assignment of the local PMEs into aggregation groups instead of a fixed pre-configuration.

The MIB modules defined in this clause allow a network management application to control the EFM discovery mechanism and query its results. Note that the discovery mechanism can work only if PAF is supported and enabled.

Two tables are used by the EFM discovery mechanism: ifStackTable and ifCapStackTable. The following pseudo-code gives an example of the discovery and automatic PME assignment for a generic PAF-enabled multi-PCS EFM-Cu device, located at central office (CO), using objects defined in these MIB modules and in the IF-MIB. (Note that automatic PME assignment is only shown here for the purposes of the example. Fixed PME pre-assignment, manual assignment, or auto-assignment using an alternative internal algorithm may be chosen by a particular implementation.)

```
// Go over all PCS ports in the CO device
FOREACH pcs[i] IN CO_device
{ // Perform discovery and auto-assignment only on PAF enabled ports
  // with room for more PMEs
  IF ( pcs[i].PAFSupported AND pcs[i].NumPMEs < pcs[i].PAFCapacity )
  { // Assign a unique 6-octet local discovery code to the PCS
    // e.g., MAC address
    dc = pcs[i].DiscoveryCode = MAC[i];
    // Go over all disconnected PMEs, which can
    // potentially be connected to the PCS
    FOREACH pme[j] IN ifCapStackTable[pcs[i]] AND
      NOT IN ifStackTable[pcs[i]] // not connected
    { // Try to grab the remote RT_device, by writing the value
      // of the local 6-octet discovery code to the remote
      // discovery code register (via handshake mechanism).
      // This operation is atomic Set-if-Clear action, i.e., it
      // would succeed only if the remote discovery register was
      // zero. Read the remote discovery code register via Get
      // operation to see if the RT_device, attached via the PME
      // is indeed marked as being the CO_device peer.
      pme[j].RemoteDiscoveryCode = dc; // Set-if-Clear
      r = pme[j].RemoteDiscoveryCode; // Get
      IF ( r == dc AND pcs[i].NumPMEs < pcs[i].PAFCapacity )
      { // Remote RT_device connected via PME[j] is/was a peer
```

```

        // for PCS[i] and there is room for another PME in the
        // PCS[i] aggregation group (max. PAF capacity is not
        // reached yet).
        // Connect this PME to the PCS (via ifStackTable,
        // ifInvStackTable being inverse of ifStackTable is
        // updated automatically, i.e., pcs[i] is auto-added
        // to ifInvStackTable[pme[j]])
        ADD pme[j] TO ifStackTable[pcs[i]];
        pcs[i].NumPMEs = pcs[i].NumPMEs + 1;
        // Discover all other disconnected PMEs,
        // attached to the same RT_device and connect them to
        // the PCS provided there is enough room for more PMEs.
        FOREACH pme[k] IN ifCapStackTable[pcs[i]] AND
            NOT IN ifStackTable[pcs[i]]
    { // Get Remote Discovery Code from the PME to see if
        // it belongs to a connected RT_device "grabbed" by
        // the CO_device.
        r = pme[k].RemoteDiscoveryCode;
        IF ( r == dc AND pcs[i].NumPMEs < pcs[i].PAFCapacity)
        { // Physically connect the PME to the PCS
            // (pcs[i] is auto-added TO ifInvStackTable[pme[k]])
            ADD pme[k] TO ifStackTable[pcs[i]];
            pcs[i].NumPMEs = pcs[i].NumPMEs + 1;
        }
    }
}
// At this point we have discovered all local PMEs which
// are physically connected to the same remote RT_device
// and connected them to PCS[i]. Go to the next PCS.
BREAK;
}
}
}

```

An SNMP Agent for an EFMcu device builds the ifCapStackTable and its inverse ifInvCapStackTable according to the information contained in the Clause 45 PME_Available_register (see 61.1.5.3 and 45.2.3.27 of IEEE Std 802.3).

Adding a PME to the ifStackTable row for a specific PCS involves actual connection of the PME to the PCS, which can be done by modifying the Clause 45 PME_Aggregate_register (see 61.1.5.3 and 45.2.3.28 of IEEE Std 802.3).

Note that the PCS port does not have to be operationally “down” for the connection to succeed. In fact, a dynamic PME addition (and removal) may be implemented with an available PME being initialized first (by setting its ifAdminStatus to “up”) and then added to an operationally “up” PCS port, by modifying a respective ifStackTable (and respective ifInvStackTable) entry.

It is recommended that a removal of the last operationally “up” PME from an operationally “up” PCS would be rejected by the implementation, as this action would completely drop the link.

11.2.1.4 EFMcu ports initialization

EFMCu ports being built on top of xDSL technology require a lengthy initialization or “training” process, before any data can pass. During this initialization, both ends of a link (peers) work cooperatively to achieve the required data rate on a particular copper pair. Sometimes, when the copper line is too long or the noise on

the line is too high, that “training” process may fail to achieve a specific target rate with required characteristics.

The ifAdminStatus object from the IF-MIB controls the desired state of a PCS with all the PMEs connected to it or of an individual PME port. Setting this object to “up” instructs a particular PCS or PME to start the initialization process, which may take tens of seconds for EFMcu ports, especially if PAF is involved. The ifOperStatus object shows the operational state of an interface (extended by the ifMauMediaAvailable object from the MAU-MIB module for PCS and efmCuPmeOperStatus defined in the EFM-CU-MIB module for PME interfaces).

A disconnected PME may be initialized by changing the ifAdminState from “down” to “up.” Changing the ifAdminState to “up” on the PCS initializes all PMEs connected to that particular PCS. Note that in case of PAF, some interfaces may fail to initialize while others succeed. The PCS is considered operationally “up” if at least one PME aggregated by its PAF is operationally “up.” When all PMEs connected to the PCS are “down,” the PCS shall be considered operationally “lowerLayerDown.” The PCS shall be considered operationally “notPresent” if it is not connected to any PME. The PCS/PME interface shall remain operationally “down” during initialization.

The efmCuPmeOperStatus defined in the EFM-CU-MIB module expands PME’s ifOperStatus value of “down” to “downReady,” “downNotReady,” and “init” values, indicating various EFMcu PME-specific states.

11.2.1.5 Usage of ifTable

Both the PME and PCS interfaces of the EFMcu PHY are managed using interface-specific management objects defined in the EFM-CU-MIB module and generic interface objects from the ifTable of IF-MIB, with all management table entries referenced by the interface index ifIndex.

Table 11-1 summarizes EFMcu-specific interpretations for some of the ifTable objects specified in the mandatory ifGeneralInformationGroup.

Table 11-1—EFMCu interpretation of IF-MIB objects

IF-MIB object	EFMCu interpretation
ifIndex	Interface index. Each PME and each PCS in the EFMcu PHY shall have a unique index, as there are some PCS- and PME-specific attributes accessible only on the PCS or the PME level.
ifType	ethernetCsmacd(6) for PCS, shdsl(169) for 2BASE-TL PME, vdsl(97) for 10PASS-TS PME. Operating data rate for the PME. For the PCS, it is the sum of the current operating data rates of all PMEs in the aggregation group, without the 64/65-octet encapsulation overhead and PAF overhead, but accounting for the Inter-Frame Gaps (IFGs).
ifSpeed	Setting this object to “up” instructs a particular PCS (with all PMEs connected to it) or PME to start the initialization process.
ifAdminStatus	Setting this object to “up” instructs a particular PCS (with all PMEs connected to it) or PME to start the initialization process.
ifOperStatus	efmCuPmeOperStatus supplements the “down” value of ifOperStatus for PMEs.

11.2.2 Relation to SHDSL MIB module

G.SHDSL.bis modems, similar to PMEs comprising a 2BASE-TL port, are described in the HDSL2-SHDSL-LINE-MIB module defined in IETF RFC 4319 [B34]. Note that not all attributes of G.SHDSL modems reflected in the HDSL2-SHDSL-LINE-MIB module have adequate management objects (Clause 30 attributes and Clause 45 registers) in IEEE Std 802.3.

Because of these differences and for the purposes of simplicity, unification of attributes common to both 2BASE-TL and 10PASS-TS PMEs, and name consistency (e.g., prefixing the 2BASE-TL PME related objects with “efmCuPme2B” instead of “hdl2shdsl”), it was decided not to reference HDSL2-SHDSL-LINE-MIB objects but to define all the relevant objects in the EFM-CU-MIB module.

However, if some functionality not available in the EFM-CU-MIB module is required and supported by the PME, e.g., performance monitoring, relevant HDSL2-SHDSL-LINE-MIB groups may be included and applied for PMEs of 2BASE-TL subtype.

11.2.3 Relation to VDSL MIB module

VDSL modems, similar to the PME(s) comprising a 10PASS-TS port, are described in the VDSL-LINE-EXT-MCM-MIB module defined in IETF RFC 4070 [B31]. Note that not all attributes of VDSL modems reflected in the VDSL-LINE-EXT-MCM-MIB module have adequate management objects (Clause 30 attributes and Clause 45 registers) in IEEE Std 802.3.

Because of these differences and for the purposes of simplicity, unification of attributes common to both 2BASE-TL and 10PASS-TS PMEs, and name consistency, it was decided not to reference VDSL-LINE-EXT-MCM-MIB objects but to define all the relevant objects in the EFM-CU-MIB module.

However, if some functionality not available in the EFM-CU-MIB module is required and supported by the PME, relevant VDSL-LINE-EXT-MCM-MIB groups may be included and applied for PMEs of 10PASS-TS subtype.

11.2.4 Relation to Ethernet-Like and MAU MIB modules

An agent implementing the objects defined in this clause shall also implement the objects required by the Ethernet-like interface MIB module defined in Clause 10 and the objects required by the MAU MIB module defined in Clause 13.

Two new values of ifMauType (OBJECT-IDENTITIES of dot3MauType) and corresponding bit definitions of ifMauTypeListBits (IANAifMauTypeListBits) have been defined in the IANA-MAU-MIB module for EFM-CU MAUs:

- dot3MauType2BaseTL and b2BaseTL, for 2BASE-TL MAU
- dot3MauType10PassTS and b10PassTS, for 10PASS-TS MAU

Additionally, the IANA-MAU-MIB module defines two new values of ifMauMediaAvailable, specifically for EFM-CU ports: availableReduced and ready (in textual convention IANAifMauMediaAvailable). Due to the PME aggregation, the EFM-CU interpretation of some possible ifMauMediaAvailable values differs from other MAUs as follows:

- unknown: the EFM-CU interface (PCS with connected PMEs) is Initializing
- ready: the interface is Down, at least one PME in the aggregation group (all PMEs connected to the PCS) is ready for handshake
- available: the interface is Up, all PMEs in the aggregation group are up

- notAvailable: the interface is Down, all PME's in the aggregation group are Down, no handshake tones are detected by any PME
- availableReduced: the interface is Up, a link fault is detected at the receive direction by one or more PME's in the aggregation group, but at least one PME is Up
- pmdLinkFault: a link fault is detected at the receive direction by all PME's in the aggregation group

As an Ethernet-like interface, every EFM-Cu port [an ifEntry representing a consolidation of LLC, MAC, and PCS (sub)layers] shall return an ifType of ethernetCsmacd(6). While most of the MAU characteristics are not applicable to the EFM-Cu ports (no Auto-Negotiation, false carriers, or jabber), they shall return an appropriate ifMauType (dot3MauType2BaseTL or dot3mauType10PassTS) in order to direct the management software to look in the EFM-CU-MIB module for the desired information. For example, the information on the particular EFM-Cu flavor that an EFM-Cu port is running is available from efmCuOperSubType, defined in the EFM-CU-MIB module.

Since EFM-Cu PME's are not Ethernet-like interfaces, they cannot be instantiated as MAU interface objects.

11.3 MIB structure

11.3.1 EFM copper MIB overview

The main management objects defined in the EFM-CU-MIB module are split into two groups:

- efmCuPort—containing objects for configuration, capabilities, status, and notifications, common to all EFM-Cu PHYs.
- efmCuPme—containing objects for configuration, capabilities, status, and notifications of EFM-Cu PME's.

The efmCuPme group in turn contains efmCuPme2B and efmCuPme10P groups, which define PME profiles specific to 2BASE-TL and 10PASS-TS PME's, respectively, as well as PME-specific status information.

11.3.2 PME profiles

Since a managed node can have a large number of EFM-Cu PHYs, provisioning every parameter on every EFM-Cu PHY may become burdensome. Moreover, most PME's are provisioned identically with the same set of parameters. To simplify the provisioning process, the EFM-CU-MIB module makes use of configuration profiles, similar to the HDSL2-SHDSL-LINE-MIB and VDSL-LINE-EXT-MCM-MIB modules. A profile is a set of parameters, used for either configuration or representation of a PME. The same profile can be shared by multiple PME ports using the same configuration.

The PME profiles are defined in the efmCuPme2BProfileTable and efmCuPme10PProfileTable for 2BASE-TL and 10PASS-TS PME's, respectively. There are 12 predefined standard profiles for 2BASE-TL and 22 standard profiles for 10PASS-TS, defined in IEEE Std 802.3 and dedicated for rapid provisioning of EFM-Cu PHYs in most scenarios. In addition, the EFM-CU-MIB defines two additional predefined profiles for “best-effort” provisioning of 2BASE-TL PME's. An ability to define new configuration profiles is also provided to allow for EFM-Cu deployment tailored to specific copper environments and spectral regulations.

A specific configuration or administrative profile is assigned to a specific PME via the efmCuPmeAdminProfile object. If efmCuPmeAdminProfile is zero, then the efmCuAdminProfile object of the PCS port connected to the PME determines the configuration profile (or a list of possible profiles) for that PME. This mechanism allows specifying a common profile for all PME's connected to the PCS port, with an ability to change individual PME profiles by setting the efmCuPmeAdminProfile object, which overwrites the profile set by efmCuAdminProfile.

A current operating PME profile is pointed to by the efmCuPmeOperProfile object. Note that this profile entry can be created automatically to reflect achieved parameters in adaptive (not fixed) initialization.

11.3.3 Mapping of IEEE 802.3 managed objects

This subclause contains the mapping between relevant managed objects (attributes) defined in Clause 30 of IEEE Std 802.3, and managed objects defined in this clause and in associated MIB modules, i.e., the IF-MIB defined in IETF RFC 2863. Note that the majority of the objects defined in the EFM-CU-MIB module do not have direct counterparts in Clause 30 and instead refer to Clause 45 registers.

Table 11-2—Mapping of IEEE 802.3 managed objects

IEEE 802.3 managed object		Corresponding SNMP object
oMAU - Basic Package (Mandatory)	aMAUType	ifMauType (MAU-MIB)
	aMAUTypeList	ifMauTypeListBits (MAU-MIB)
	aMediaAvailable	ifMediaAvailable (MAU-MIB)
oPAF - Basic Package (Mandatory)	aPAFID	ifIndex (IF-MIB)
	aPhyEnd	efmCuPhySide
	aPHYCurrentStatus	efmCuStatus
	aPAFSupported	efmCuPAFSupported
oPAF - PME Aggregation Package (Optional)	aPAFAdminState	efmCuPAFAdminState
	aLocalPAFCapacity	efmCuPAFCapacity
	aLocalPMEAvailable	ifCapStackTable (IF-CAP-STACK-MIB)
	aLocalPMEAggregate	ifStackTable (IF-MIB)
	aRemotePAFSupported	efmCuRemotePAFSupported
	aRemotePAFCapacity	efmCuRemotePAFCapacity
	aRemotePMEAggregate	
oPME - 10P/2B Package (Mandatory)	aPMEID	ifIndex (IF-MIB)
	aPMEAdminState	ifAdminState (IF-MIB)
	aPMEStatus	efmCuPmeStatus
	aPMESNRMgn	efmCuPmeSnrMgn
	aTCCodingViolations	efmCuPmeTCCodingErrors
	aTCCRCErrors	efmCuPmeTCCrcErrors
	aProfileSelect	efmCuAdminProfile, efmCuPmeAdminProfile
	aOperatingProfile	efmCuPmeOperProfile
	aPMEFECCorrectedBlocks	efmCuPme10PFECCorrectedBlocks
	aPMEFECUncorrectableBlocks	efmCuPme10PFECUncorrectedBlocks

11.4 Security considerations for Ethernet in the First Mile copper interfaces MIB module

There are a number of managed objects defined in the EFM-CU-MIB module that have a MAX-ACCESS clause of read-write or read-create. Most objects are writeable only when the link is Down. Writing to these objects can have potentially disruptive effects on network operation, for example:

- Changing of efmCuPmeAdminSubType may lead to a potential locking of the link, as peer PMEs of the same subtype cannot exchange handshake messages.
- Changing of efmCuPAFAdminState to enabled may lead to a potential locking of the link, if the peer PHY does not support PAF.
- Changing of efmCuPAFDiscoveryCode, before the discovery operation, may lead to a wrongful discovery, for example, when two -O ports are connected to the same multi-PME -R port and both -O ports have the same Discovery register value.
- Changing PCS or PME configuration parameters (e.g., profile of a PCS or PME via efmCuAdminProfile or efmCuPmeAdminProfile) may lead to anything from link quality and rate degradation to a complete link initialization failure, as the ability of an EFM-Cu port to support a particular configuration depends on the copper environment.
- Activation of a PME can cause a severe degradation of service for another EFM-Cu PHY, whose PME(s) may be affected by the crosstalk from the newly activated PME.
- Removal of a PME from an operationally “up” EFM-Cu port, aggregating several PMEs, may cause the port’s rate degradation.

The user of the EFM-CU-MIB module should therefore be aware that support for SET operations in a non-secure environment without proper protection can have a negative effect on network operations.

The readable objects in the EFM-CU-MIB module (i.e., those with MAX-ACCESS other than not-accessible) may be considered sensitive in some environments since, collectively, they provide information about the performance of network interfaces and can reveal some aspects of their configuration. In particular, since EFM-Cu can be carried over Unshielded Twisted Pair (UTP) voice-grade copper in a bundle with other pairs belonging to another operator/customer, it is theoretically possible to eavesdrop to an EFM-Cu transmission simply by “listening” to a crosstalk from the EFM-Cu pairs, especially if the parameters of the EFM-Cu link in question are known.

In such environments, it is important to control also GET and NOTIFY access to these objects and possibly to encrypt their values when sending them over the network via SNMP.

11.5 MIB module definition

An ASCII text version of the MIB definition can be found at the following URL¹⁹:

http://www.ieee802.org/3/1/public/mib_modules/20130411/802dot3dot1C11mib.txt

¹⁹Copyright release for MIB modules: Users of this standard may freely reproduce the MIB module contained in this subclause so that it can be used for its intended purpose.

```
IEEE8023-EFM-CU-MIB DEFINITIONS ::= BEGIN
```

```
IMPORTS
```

```
MODULE-IDENTITY, OBJECT-TYPE, NOTIFICATION-TYPE, Integer32,
Unsigned32, Counter32, org
FROM SNMPv2-SMI -- [RFC2578]
TEXTUAL-CONVENTION, TruthValue, RowStatus, PhysAddress
FROM SNMPv2-TC -- [RFC2579]
MODULE-COMPLIANCE, OBJECT-GROUP, NOTIFICATION-GROUP
FROM SNMPv2-CONF -- [RFC2580]
SnmpAdminString
FROM SNMP-FRAMEWORK-MIB -- [RFC3411]
ifIndex, ifSpeed
FROM IF-MIB -- [RFC2863]
;
```

```
ieee8023efmCuMIB MODULE-IDENTITY
```

```
LAST-UPDATED "201304110000Z" -- April 11, 2013
```

```
ORGANIZATION
```

```
"IEEE 802.3 working group"
```

```
CONTACT-INFO
```

```
"WG-URL: http://www.ieee802.org/3/index.html"
```

```
WG-E-Mail: STDS-802-3-MIB@LISTSERV.IEEE.ORG
```

```
Contact: Howard Frazier
```

```
Postal: 3151 Zanker Road
        San Jose, CA 95134
        USA
```

```
Tel: +1.408.922.8164
```

```
E-mail: hfrazier@broadcom.com"
```

```
DESCRIPTION
```

```
"The objects in this MIB module are used to manage
the Ethernet in the First Mile (EFM) Copper (EFMCu) Interfaces
2BASE-TL and 10PASS-TS, defined in IEEE Std 802.3.
```

```
Of particular interest are Clause 61, 'Physical Coding
Sublayer (PCS) and common specifications, type 10PASS-TS and
type 2BASE-TL', Clause 30, 'Management', Clause 45,
'Management Data Input/Output (MDIO) Interface', Annex 62A,
'PMD profiles for 10PASS-TS' and Annex 63A, 'PMD profiles for
2BASE-TL'."
```

```
REVISION "201304110000Z" -- April 11, 2013
```

```
DESCRIPTION
```

```
"Revision, based on an earlier version in IEEE Std 802.3.1-2011."
```

```
REVISION "201102020000Z" -- February 2, 2011
```

```
DESCRIPTION
```

```
"Initial version, based on an earlier version published
as RFC 5066."
```

```
::= { org ieee(111) standards-association-numbers-series-standards(2)
      lan-man-stds(802) ieee802dot3(3) ieee802dot3dot1mibs(1)
      ieee8023efmcu(11) 2 }
```

```
-- Sections of the module
```

```

efmCuObjects      OBJECT IDENTIFIER ::= { ieee8023efmCuMIB 1 }

efmCuConformance OBJECT IDENTIFIER ::= { ieee8023efmCuMIB 2 }

-- Groups in the module

efmCuPort         OBJECT IDENTIFIER ::= { efmCuObjects 1 }

efmCuPme          OBJECT IDENTIFIER ::= { efmCuObjects 2 }

-- Textual Conventions

EfmProfileIndex ::= TEXTUAL-CONVENTION
    DISPLAY-HINT "d"
    STATUS      current
    DESCRIPTION
        "A unique value, greater than zero, for each PME configuration
        profile in the managed EFMCu port. Values should be assigned
        contiguously starting from 1. The value for each profile shall
        remain constant at least from one re-initialization of the
        entity's network management system to the next re-initialization."
    SYNTAX      Unsigned32 (1..255)

EfmProfileIndexOrZero ::= TEXTUAL-CONVENTION
    DISPLAY-HINT "d"
    STATUS      current
    DESCRIPTION
        "This textual convention is an extension of the
        EfmProfileIndex convention. The latter defines a greater than
        zero value used to identify a PME profile in the managed EFMCu
        port. This extension permits the additional value of zero.
        The value of zero is object-specific and shall therefore be
        defined as part of the description of any object that uses
        this syntax.
        Examples of the usage of zero value might include situations
        where the current operational profile is unknown."
    SYNTAX      Unsigned32 (0..255)

EfmProfileIndexList ::= TEXTUAL-CONVENTION
    DISPLAY-HINT "1d:"
    STATUS      current
    DESCRIPTION
        "This textual convention represents a list of up to 6
        EfmProfileIndex values, any of which can be chosen for
        configuration of a PME in a managed EFMCu port.
        The EfmProfileIndex textual convention defines a greater than
        zero value used to identify a PME profile.
        The value of this object is a concatenation of zero or
        more (up to 6) octets, where each octet contains an 8-bit
        EfmProfileIndex value.
        A zero-length octet string is object-specific and shall
        therefore be defined as part of the description of any object
        that uses this syntax. Examples of the usage of a zero-length
        value might include situations where an object using this
        textual convention is irrelevant for a specific EFMCu port
        type."
    SYNTAX      OCTET STRING (SIZE(0..6))

```

```

EfmTruthValueOrUnknown ::= TEXTUAL-CONVENTION
    STATUS      current
    DESCRIPTION
        "This textual convention is an extension of the TruthValue
        convention. The latter defines a Boolean value with possible
        values of true(1) and false(2). This extension permits the
        additional value of unknown(0), which can be returned as the
        result of a GET operation when an exact true or false value
        of the object cannot be determined."
    SYNTAX      INTEGER { unknown(0), true(1), false(2) }

```

-- Port Notifications Group

```
efmCuPortNotifications OBJECT IDENTIFIER ::= { efmCuPort 0 }
```

```
efmCuLowRateCrossing NOTIFICATION-TYPE
```

```

OBJECTS {
    ifSpeed,
    efmCuThreshLowRate
}

```

```
STATUS      current
```

```
DESCRIPTION
```

"This notification indicates that the EFMcu port's data rate has reached/dropped below or exceeded the low rate threshold, specified by efmCuThreshLowRate.

This notification may be sent for the -0 subtype ports (2BaseTL-0/10PassTS-0) while the port is Up, on the crossing event in both directions: from normal (rate is above the threshold) to low (rate equals the threshold or below it) and from low to normal. This notification is not applicable to the -R subtypes.

A small debouncing period of 2.5 sec, between the detection of the condition and the notification, should be implemented to prevent simultaneous LinkUp/LinkDown and efmCuLowRateCrossing notifications to be sent.

The adaptive nature of the EFMcu technology allows the port to adapt itself to the changes in the copper environment, e.g., an impulse noise, alien crosstalk, or a micro-interruption may temporarily drop one or more PMEs in the aggregation group, causing a rate degradation of the aggregated EFMcu link.

The dropped PMEs would then try to re-initialize, possibly at a lower rate than before, adjusting the rate to provide required target SNR margin.

Generation of this notification is controlled by the efmCuLowRateCrossingEnable object."

```
 ::= { efmCuPortNotifications 1 }
```

-- PCS Port group

```
efmCuPortConfTable OBJECT-TYPE
```

```
SYNTAX      SEQUENCE OF EfmCuPortConfEntry
```

```
MAX-ACCESS  not-accessible
```

```
STATUS      current
```

```
DESCRIPTION
```

"Table for Configuration of EFMcu 2BASE-TL/10PASS-TS (PCS)

Ports. Entries in this table shall be maintained in a persistent manner."
 ::= { efmCuPort 1 }

efmCuPortConfEntry OBJECT-TYPE

SYNTAX EfmCuPortConfEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"An entry in the EFMcu Port Configuration table.
 Each entry represents an EFMcu port indexed by the ifIndex.
 Note that an EFMcu PCS port runs on top of a single
 or multiple PME port(s), which are also indexed by ifIndex."

INDEX { ifIndex }

::= { efmCuPortConfTable 1 }

EfmCuPortConfEntry ::=

SEQUENCE {

efmCuPAFAdminState	INTEGER,
efmCuPAFDiscoveryCode	PhysAddress,
efmCuAdminProfile	EfmProfileIndexList,
efmCuTargetDataRate	Unsigned32,
efmCuTargetSnrMgn	Unsigned32,
efmCuAdaptiveSpectra	TruthValue,
efmCuThreshLowRate	Unsigned32,
efmCuLowRateCrossingEnable	TruthValue

}

efmCuPAFAdminState OBJECT-TYPE

SYNTAX INTEGER {

enabled(1),

disabled(2)

}

MAX-ACCESS read-write

STATUS current

DESCRIPTION

"Administrative (desired) state of the PAF of the EFMcu port (PCS).

When 'disabled', PME aggregation will not be performed by the PCS. No more than a single PME can be assigned to this PCS in this case.

When 'enabled', PAF will be performed by the PCS when the link is Up, even on a single attached PME, if PAF is supported.

PCS ports incapable of supporting PAF shall return a value of 'disabled'. Attempts to 'enable' such ports shall be rejected.

A PAF 'enabled' port with multiple PMEs assigned cannot be 'disabled'. Attempts to 'disable' such port shall be rejected, until at most one PME is left assigned.

Changing PAFAdminState is a traffic-disruptive operation and as such shall be done when the link is Down. Attempts to change this object shall be rejected if the link is Up or Initializing.

This object maps to the Clause 30 attribute aPAFAdminState.

If a Clause 45 MDIO Interface to the PCS is present, then this object maps to the PAF enable bit in the 10P/2B PCS control register.

This object shall be maintained in a persistent manner."

REFERENCE

"IEEE Std 802.3, 61.2.2, 45.2.3.26.3"

::= { efmCuPortConfEntry 1 }

efmCuPAFDiscoveryCode OBJECT-TYPE

SYNTAX PhysAddress (SIZE(0|6))

MAX-ACCESS read-write

STATUS current

DESCRIPTION

"PAF Discovery Code of the EFMcu port (PCS).

A unique 6-octet code used by the Discovery function, when PAF is supported.

PCS ports incapable of supporting PAF shall return a zero-length octet string on an attempt to read this object.

An attempt to write to this object shall be rejected for such ports.

This object shall be instantiated for the -0 subtype PCS before writing operations on the efmCuPAFRemoteDiscoveryCode (Set_if_Clear and Clear_if_Same) are performed by PMEs associated with the PCS.

The initial value of this object for -R subtype ports after reset is all zeros. For -R subtype ports, the value of this object cannot be changed directly. This value may be changed as a result of writing operation on the efmCuPAFRemoteDiscoveryCode object of remote PME of -0 subtype, connected to one of the local PMEs associated with the PCS.

Discovery shall be performed when the link is Down.

Attempts to change this object shall be rejected (in case of SNMP with the error inconsistentValue), if the link is Up or Initializing.

The PAF Discovery Code maps to the local Discovery code variable in PAF (note that it does not have a corresponding Clause 45 register)."

REFERENCE

"IEEE Std 802.3, 61.2.2.8.3, 61.2.2.8.4, 45.2.6.6.1, 45.2.6.8, 61A.2"

::= { efmCuPortConfEntry 2 }

efmCuAdminProfile OBJECT-TYPE

SYNTAX EfmProfileIndexList

MAX-ACCESS read-write

STATUS current

DESCRIPTION

"Desired configuration profile(s), common for all PMEs in the EFMcu port. This object is a list of pointers to entries in either efmCuPme2BProfileTable or efmCuPme10PProfileTable, depending on the current operating SubType of the EFMcu port as indicated by efmCuPortSide.

The value of this object is a list of up to 6 indices of profiles. If this list consists of a single profile index, then all PMEs assigned to this EFMcu port shall be configured

according to the profile referenced by that index, unless it is overwritten by a corresponding non-zero efmCuPmeAdminProfile instance, which takes precedence over efmCuAdminProfile.

A list consisting of more than one index allows each PME in the port to be configured according to any profile specified in the list.

By default, this object has a value of 0x01, referencing the 1st entry in efmCuPme2BProfileTable or efmCuPme10PProfileTable.

This object is writeable and readable for the -0 subtype (2BaseTL-0 or 10PassTS-0) EFMCu ports. It is irrelevant for the -R subtype (2BaseTL-R or 10PassTS-R) ports -- a zero-length octet string shall be returned on an attempt to read this object and an attempt to change this object shall be rejected in this case.

Note that the current operational profile value is available via the efmCuPmeOperProfile object.

Any modification of this object shall be performed when the link is Down. Attempts to change this object shall be rejected, if the link is Up or Initializing. Attempts to set this object to a list with a member value that is not the value of the index for an active entry in the corresponding profile table shall be rejected.

This object maps to the Clause 30 attribute aProfileSelect.

This object shall be maintained in a persistent manner."

REFERENCE

"IEEE Std 802.3, 30.11.2-1.6"

DEFVAL { '01'H }

::= { efmCuPortConfEntry 3 }

efmCuTargetDataRate OBJECT-TYPE

SYNTAX Unsigned32(1..100000|999999)

UNITS "Kbps"

MAX-ACCESS read-write

STATUS current

DESCRIPTION

"Desired EFMCu port 'net' (as seen across MII) Data Rate in kb/s, to be achieved during initialization, under spectral restrictions placed on each PME via efmCuAdminProfile or efmCuPmeAdminProfile, with the desired SNR margin specified by efmCuTargetSnrMgn.

In case of PAF, this object represents a sum of individual PME data rates, modified to compensate for fragmentation and 64/65-octet encapsulation overhead (e.g., target data rate of 10 Mb/s shall allow lossless transmission of a full-duplex 10 Mb/s Ethernet frame stream with minimal inter-frame gap).

The value is limited above by 100 Mb/s as this is the max burst rate across MII for EFMCu ports.

The value between 1 and 100000 indicates that the total data rate (ifSpeed) of the EFMCu port after initialization shall be equal to the target data rate or less, if the target data rate

cannot be achieved under spectral restrictions specified by efmCuAdminProfile/efmCuPmeAdminProfile and with the desired SNR margin. In case the copper environment allows a higher total data rate to be achieved than that specified by the target, the excess capability shall be either converted to additional SNR margin or reclaimed by minimizing transmit power as controlled by efmCuAdaptiveSpectra.

The value of 999999 means that the target data rate is not fixed and shall be set to the maximum attainable rate during initialization (Best Effort), under specified spectral restrictions and with the desired SNR margin.

This object is read-write for the -O subtype EFMcu ports (2BaseTL-0/10PassTS-0) and not available for the -R subtypes.

Changing of the Target Data Rate shall be performed when the link is Down. Attempts to change this object shall be rejected (in case of SNMP with the error inconsistentValue), if the link is Up or Initializing.

Note that the current Data Rate of the EFMcu port is represented by the ifSpeed object of IF-MIB.

This object shall be maintained in a persistent manner."
 ::= { efmCuPortConfEntry 4 }

efmCuTargetSnrMgn OBJECT-TYPE
SYNTAX Unsigned32(0..21)
UNITS "dB"
MAX-ACCESS read-write
STATUS current
DESCRIPTION

"Desired EFMcu port SNR margin to be achieved on all PMEs assigned to the port, during initialization. (The SNR margin is the difference between the desired SNR and the actual SNR.)

Note that IEEE Std 802.3 recommends using a default target SNR margin of 5 dB for 2BASE-TL ports and 6 dB for 10PASS-TS ports in order to achieve a mean bit error ratio (BER) of 10^{-7} at the PMA service interface.

This object is read-write for the -O subtype EFMcu ports (2BaseTL-0/10PassTS-0) and not available for the -R subtypes.

Changing of the target SNR margin shall be performed when the link is Down. Attempts to change this object shall be rejected (in case of SNMP with the error inconsistentValue), if the link is Up or Initializing.

Note that the current SNR margin of the PMEs comprising the EFMcu port is represented by efmCuPmeSnrMgn.

This object shall be maintained in a persistent manner."
REFERENCE
"IEEE Std 802.3, 61.1.2"
 ::= { efmCuPortConfEntry 5 }

efmCuAdaptiveSpectra OBJECT-TYPE

SYNTAX TruthValue
 MAX-ACCESS read-write
 STATUS current
 DESCRIPTION

"Indicates how to utilize excess capacity when the copper environment allows a higher total data rate to be achieved than that specified by the efmCuTargetDataRate.

A value of true(1) indicates that the excess capability shall be reclaimed by minimizing transmit power, e.g., using higher constellations and Power Back-Off, in order to reduce interference to other copper pairs in the binder and the adverse impact to link/system performance.

A value of false(2) indicates that the excess capability shall be converted to additional SNR margin and spread evenly across all active PMEs assigned to the (PCS) port, to increase link robustness.

This object is read-write for the -O subtype EFMcu ports (2BaseTL-0/10PassTS-0) and not available for the -R subtypes.

Changing of this object shall be performed when the link is Down. Attempts to change this object shall be rejected (in case of SNMP with the error inconsistentValue), if the link is Up or Initializing.

This object shall be maintained in a persistent manner."
 ::= { efmCuPortConfEntry 6 }

efmCuThreshLowRate OBJECT-TYPE

SYNTAX Unsigned32(1..100000)
 UNITS "Kbps"
 MAX-ACCESS read-write
 STATUS current
 DESCRIPTION

"This object configures the EFMcu port low-rate crossing alarm threshold. When the current value of ifSpeed for this port reaches/drops below or exceeds this threshold, an efmCuLowRateCrossing notification may be generated if enabled by efmCuLowRateCrossingEnable.

This object is read-write for the -O subtype EFMcu ports (2BaseTL-0/10PassTS-0) and not available for the -R subtypes.

This object shall be maintained in a persistent manner."
 ::= { efmCuPortConfEntry 7 }

efmCuLowRateCrossingEnable OBJECT-TYPE

SYNTAX TruthValue
 MAX-ACCESS read-write
 STATUS current
 DESCRIPTION

"Indicates whether efmCuLowRateCrossing notifications should be generated for this interface.

A value of true(1) indicates that efmCuLowRateCrossing notification is enabled. A value of false(2) indicates that the notification is disabled.

This object is read-write for the -O subtype EFMcu ports (2BaseTL-0/10PassTS-0) and not available for the -R subtypes.

This object shall be maintained in a persistent manner."
 ::= { efmCuPortConfEntry 8 }

efmCuPortCapabilityTable OBJECT-TYPE

SYNTAX SEQUENCE OF EfmCuPortCapabilityEntry
 MAX-ACCESS not-accessible
 STATUS current

DESCRIPTION

"Table for Capabilities of EFMcu 2BASE-TL/10PASS-TS (PCS) Ports. Entries in this table shall be maintained in a persistent manner"

::= { efmCuPort 2 }

efmCuPortCapabilityEntry OBJECT-TYPE

SYNTAX EfmCuPortCapabilityEntry
 MAX-ACCESS not-accessible
 STATUS current

DESCRIPTION

"An entry in the EFMcu Port Capability table.
 Each entry represents an EFMcu port indexed by the ifIndex.
 Note that an EFMcu PCS port runs on top of a single or multiple PME port(s), which are also indexed by ifIndex."

INDEX { ifIndex }

::= { efmCuPortCapabilityTable 1 }

EfmCuPortCapabilityEntry ::=

SEQUENCE {	
efmCuPAFSupported	TruthValue,
efmCuPeerPAFSupported	EfmTruthValueOrUnknown,
efmCuPAFCapacity	Unsigned32,
efmCuPeerPAFCapacity	Unsigned32
}	

efmCuPAFSupported OBJECT-TYPE

SYNTAX TruthValue
 MAX-ACCESS read-only
 STATUS current

DESCRIPTION

"PME Aggregation Function (PAF) capability of the EFMcu port (PCS).

This object has a value of true(1) when the PCS can perform PME aggregation on the available PMEs.
 Ports incapable of PAF shall return a value of false(2).

This object maps to the Clause 30 attribute aPAFSupported.

If a Clause 45 MDIO Interface to the PCS is present, then this object maps to the PAF available bit in the 10P/2B capability register."

REFERENCE

"IEEE Std 802.3, 61.2.2, 30.11.1.1.4, 45.2.3.25.1"

::= { efmCuPortCapabilityEntry 1 }

efmCuPeerPAFSupported OBJECT-TYPE

SYNTAX EfmTruthValueOrUnknown
 MAX-ACCESS read-only
 STATUS current
 DESCRIPTION
 "PME Aggregation Function (PAF) capability of the EFMcu port (PCS) link partner.
 This object has a value of true(1) when the remote PCS can perform PME aggregation on its available PMEs.
 Ports whose peers are incapable of PAF shall return a value of false(2).
 Ports whose peers cannot be reached because of the link state shall return a value of unknown(0)."

This object maps to the Clause 30 attribute aRemotePAFSupported.

If a Clause 45 MDIO Interface to the PCS is present, then this object maps to the Remote PAF supported bit in the 10P/2B capability register."

REFERENCE

"IEEE Std 802.3, 61.2.2, 30.11.1.1.9, 45.2.3.25.2"
 ::= { efmCuPortCapabilityEntry 2 }

efmCuPAFCapacity OBJECT-TYPE

SYNTAX Unsigned32 (1..32)
 MAX-ACCESS read-only
 STATUS current
 DESCRIPTION

"Number of PMEs that can be aggregated by the local PAF.
 The number of PMEs currently assigned to a particular EFMcu port (efmCuNumPMEs) is never greater than efmCuPAFCapacity."

This object maps to the Clause 30 attribute aLocalPAFCapacity."

REFERENCE

"IEEE Std 802.3, 61.2.2, 30.11.1.1.6"
 ::= { efmCuPortCapabilityEntry 3 }

efmCuPeerPAFCapacity OBJECT-TYPE

SYNTAX Unsigned32 (0|1..32)
 MAX-ACCESS read-only
 STATUS current
 DESCRIPTION

"Number of PMEs that can be aggregated by the PAF of the peer PHY (PCS port).
 A value of 0 is returned when peer PAF capacity is unknown (peer cannot be reached).
 This object maps to the Clause 30 attribute aRemotePAFCapacity."

REFERENCE

"IEEE Std 802.3, 61.2.2, 30.11.1.1.10"
 ::= { efmCuPortCapabilityEntry 4 }

efmCuPortStatusTable OBJECT-TYPE

SYNTAX SEQUENCE OF EfmCuPortStatusEntry
 MAX-ACCESS not-accessible
 STATUS current
 DESCRIPTION

"This table provides overall status information of EFMcu 2BASE-TL/10PASS-TS ports, complementing the generic status information from the ifTable of IF-MIB and ifMauTable of the MAU-MIB module. Additional status information about connected PMEs is available from the efmCuPmeStatusTable.

This table contains live data from the equipment. As such, it is not persistent."

::= { efmCuPort 3 }

efmCuPortStatusEntry OBJECT-TYPE

SYNTAX EfmCuPortStatusEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"An entry in the EFMcu Port Status table.

Each entry represents an EFMcu port indexed by the ifIndex.

Note that an EFMcu PCS port runs on top of a single

or multiple PME port(s), which are also indexed by ifIndex."

INDEX { ifIndex }

::= { efmCuPortStatusTable 1 }

EfmCuPortStatusEntry ::=

SEQUENCE {

efmCuFltStatus

BITS,

efmCuPortSide

INTEGER,

efmCuNumPMEs

Unsigned32,

efmCuPAFInErrors

Counter32,

efmCuPAFInSmallFragments

Counter32,

efmCuPAFInLargeFragments

Counter32,

efmCuPAFInBadFragments

Counter32,

efmCuPAFInLostFragments

Counter32,

efmCuPAFInLostStarts

Counter32,

efmCuPAFInLostEnds

Counter32,

efmCuPAFInOverflows

Counter32

}

efmCuFltStatus OBJECT-TYPE

SYNTAX BITS {

noPeer(0),

peerPowerLoss(1),

pmeSubTypeMismatch(2),

lowRate(3)

}

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"EFMCu (PCS) port Fault Status. This is a bitmap of possible conditions. The various bit positions are:

- noPeer - the peer PHY cannot be reached (e.g., no PMEs attached, all PMEs are Down, etc.). More info is available in efmCuPmeFltStatus.
- peerPowerLoss - the peer PHY has indicated impending unit failure due to loss of local power ('Dying Gasp').
- pmeSubTypeMismatch - local PMEs in the aggregation group are not of the same subtype, e.g., some PMEs in the local device are -0

lowRate while others are -R subtype.
 - ifSpeed of the port reached or dropped below efmCuThreshLowRate.

This object is intended to supplement the ifOperStatus object in IF-MIB and ifMauMediaAvailable in the MAU-MIB module.

Additional information is available via the efmCuPmeFltStatus object for each PME in the aggregation group (single PME if PAF is disabled)."

REFERENCE

"IF-MIB, ifOperStatus; MAU-MIB, ifMauMediaAvailable;
 efmCuPmeFltStatus"
 ::= { efmCuPortStatusEntry 1 }

efmCuPortSide OBJECT-TYPE

SYNTAX INTEGER {
 subscriber(1),
 office(2),
 unknown(3)
 }

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"EFM port mode of operation (subtype).
 The value of 'subscriber' indicates that the port is designated as '-R' subtype (all PMEs assigned to this port are of subtype '-R').
 The value of the 'office' indicates that the port is designated as '-O' subtype (all PMEs assigned to this port are of subtype '-O').
 The value of 'unknown' indicates that the port has no assigned PMEs yet or that the assigned PMEs are not of the same side (subTypePMEMismatch)."

This object partially maps to the Clause 30 attribute aPhyEnd."

REFERENCE

"IEEE Std 802.3, 61.1, 30.11.1.1.2"
 ::= { efmCuPortStatusEntry 2 }

efmCuNumPMEs OBJECT-TYPE

SYNTAX Unsigned32 (0..32)

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The number of PMEs that is currently aggregated by the local PAF (assigned to the EFMcu port using the ifStackTable).
 This number is never greater than efmCuPAFCapacity."

This object shall be automatically incremented or decremented when a PME is added or deleted to/from the EFMcu port using the ifStackTable."

REFERENCE

"IEEE Std 802.3, 61.2.2, 30.11.1.1.6"
 ::= { efmCuPortStatusEntry 3 }

efmCuPAFInErrors OBJECT-TYPE

SYNTAX Counter32

MAX-ACCESS read-only
STATUS current

DESCRIPTION

"The number of fragments that have been received across the gamma interface with RxErr asserted and discarded.
This read-only counter is inactive (not incremented) when the PAF is unsupported or disabled. Upon disabling the PAF, the counter retains its previous value.

If a Clause 45 MDIO Interface to the PCS is present, then this object maps to the 10P/2B PAF RX error register.

Discontinuities in the value of this counter can occur at re-initialization of the management system, and at other times as indicated by the value of ifCounterDiscontinuityTime, defined in IF-MIB."

REFERENCE

"IEEE Std 802.3, 45.2.3.29"

::= { efmCuPortStatusEntry 4 }

efmCuPAFInSmallFragments OBJECT-TYPE

SYNTAX Counter32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The number of fragments smaller than minFragmentSize (64 bytes) that have been received across the gamma interface and discarded.

This read-only counter is inactive when the PAF is unsupported or disabled. Upon disabling the PAF, the counter retains its previous value.

If a Clause 45 MDIO Interface to the PCS is present, then this object maps to the 10P/2B PAF small fragments register.

Discontinuities in the value of this counter can occur at re-initialization of the management system, and at other times as indicated by the value of ifCounterDiscontinuityTime, defined in IF-MIB."

REFERENCE

"IEEE Std 802.3, 45.2.3.30"

::= { efmCuPortStatusEntry 5 }

efmCuPAFInLargeFragments OBJECT-TYPE

SYNTAX Counter32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The number of fragments larger than maxFragmentSize (512 bytes) that have been received across the gamma interface and discarded.

This read-only counter is inactive when the PAF is unsupported or disabled. Upon disabling the PAF, the counter retains its previous value.

If a Clause 45 MDIO Interface to the PCS is present, then this object maps to the 10P/2B PAF large fragments register.

Discontinuities in the value of this counter can occur at

re-initialization of the management system, and at other times as indicated by the value of ifCounterDiscontinuityTime, defined in IF-MIB."

REFERENCE

"IEEE Std 802.3, 45.2.3.31"

::= { efmCuPortStatusEntry 6 }

efmCuPAFInBadFragments OBJECT-TYPE

SYNTAX Counter32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The number of fragments that do not fit into the sequence expected by the frame assembly function and that have been received across the gamma interface and discarded (the frame buffer is flushed to the next valid frame start). This read-only counter is inactive when the PAF is unsupported or disabled. Upon disabling the PAF, the counter retains its previous value.

If a Clause 45 MDIO Interface to the PCS is present, then this object maps to the 10P/2B PAF bad fragments register.

Discontinuities in the value of this counter can occur at re-initialization of the management system, and at other times as indicated by the value of ifCounterDiscontinuityTime, defined in IF-MIB."

REFERENCE

"IEEE Std 802.3, 45.2.3.33"

::= { efmCuPortStatusEntry 7 }

efmCuPAFInLostFragments OBJECT-TYPE

SYNTAX Counter32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The number of gaps in the sequence of fragments that have been received across the gamma interface (the frame buffer is flushed to the next valid frame start, when fragment/fragments expected by the frame assembly function is/are not received). This read-only counter is inactive when the PAF is unsupported or disabled. Upon disabling the PAF, the counter retains its previous value.

If a Clause 45 MDIO Interface to the PCS is present, then this object maps to the 10P/2B PAF lost fragment register.

Discontinuities in the value of this counter can occur at re-initialization of the management system, and at other times as indicated by the value of ifCounterDiscontinuityTime, defined in IF-MIB."

REFERENCE

"IEEE Std 802.3, 45.2.3.34"

::= { efmCuPortStatusEntry 8 }

efmCuPAFInLostStarts OBJECT-TYPE

SYNTAX Counter32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The number of missing StartOfPacket indicators expected by the frame assembly function.
This read-only counter is inactive when the PAF is unsupported or disabled. Upon disabling the PAF, the counter retains its previous value.

If a Clause 45 MDIO Interface to the PCS is present, then this object maps to the 10P/2B PAF lost start of fragment register.

Discontinuities in the value of this counter can occur at re-initialization of the management system, and at other times as indicated by the value of ifCounterDiscontinuityTime, defined in IF-MIB."

REFERENCE

"IEEE Std 802.3, 45.2.3.35"
::= { efmCuPortStatusEntry 9 }

efmCuPAFInLostEnds OBJECT-TYPE

SYNTAX Counter32
MAX-ACCESS read-only
STATUS current

DESCRIPTION

"The number of missing EndOfPacket indicators expected by the frame assembly function.
This read-only counter is inactive when the PAF is unsupported or disabled. Upon disabling the PAF, the counter retains its previous value.

If a Clause 45 MDIO Interface to the PCS is present, then this object maps to the 10P/2B PAF lost ends of fragments register.

Discontinuities in the value of this counter can occur at re-initialization of the management system, and at other times as indicated by the value of ifCounterDiscontinuityTime, defined in IF-MIB."

REFERENCE

"IEEE Std 802.3, 45.2.3.36"
::= { efmCuPortStatusEntry 10 }

efmCuPAFInOverflows OBJECT-TYPE

SYNTAX Counter32
MAX-ACCESS read-only
STATUS current

DESCRIPTION

"The number of fragments, received across the gamma interface and discarded, which would have caused the frame assembly buffer to overflow.

This read-only counter is inactive when the PAF is unsupported or disabled. Upon disabling the PAF, the counter retains its previous value.

If a Clause 45 MDIO Interface to the PCS is present, then this object maps to the 10P/2B PAF overflow register.

Discontinuities in the value of this counter can occur at re-initialization of the management system, and at other times as indicated by the value of ifCounterDiscontinuityTime,

```

        defined in IF-MIB."
REFERENCE
    "IEEE Std 802.3, 45.2.3.32"
    ::= { efmCuPortStatusEntry 11 }

-- PME Notifications Group

efmCuPmeNotifications OBJECT IDENTIFIER ::= { efmCuPme 0 }

efmCuPmeLineAtnCrossing NOTIFICATION-TYPE
    OBJECTS {
        efmCuPmeLineAtn,
        efmCuPmeThreshLineAtn
    }
    STATUS          current
    DESCRIPTION
        "This notification indicates that the loop attenuation
        threshold (as per the efmCuPmeThreshLineAtn
        value) has been reached/exceeded for the 2BASE-TL/10PASS-TS
        PME. This notification may be sent on the crossing event in
        both directions: from normal to exceeded and from exceeded
        to normal.

        A small debouncing period of 2.5 sec, between the detection
        of the condition and the notification, should be implemented
        to prevent intermittent notifications from being sent.

        Generation of this notification is controlled by the
        efmCuPmeLineAtnCrossingEnable object."
    ::= { efmCuPmeNotifications 1 }

efmCuPmeSnrMgnCrossing NOTIFICATION-TYPE
    OBJECTS {
        efmCuPmeSnrMgn,
        efmCuPmeThreshSnrMgn
    }
    STATUS          current
    DESCRIPTION
        "This notification indicates that the SNR margin threshold
        (as per the efmCuPmeThreshSnrMgn value) has been
        reached/exceeded for the 2BASE-TL/10PASS-TS PME.
        This notification may be sent on the crossing event in
        both directions: from normal to exceeded and from exceeded
        to normal.

        A small debouncing period of 2.5 sec, between the detection
        of the condition and the notification, should be implemented
        to prevent intermittent notifications from being sent.

        Generation of this notification is controlled by the
        efmCuPmeSnrMgnCrossingEnable object."
    ::= { efmCuPmeNotifications 2 }

efmCuPmeDeviceFault NOTIFICATION-TYPE
    OBJECTS {
        efmCuPmeFltStatus
    }
    STATUS          current
    DESCRIPTION

```

"This notification indicates that a fault in the PME has been detected by a vendor-specific diagnostic or a self-test.

Generation of this notification is controlled by the efmCuPmeDeviceFaultEnable object."

::= { efmCuPmeNotifications 3 }

efmCuPmeConfigInitFailure NOTIFICATION-TYPE

OBJECTS {
 efmCuPmeFltStatus,
 efmCuAdminProfile,
 efmCuPmeAdminProfile

}

STATUS current

DESCRIPTION

"This notification indicates that PME initialization has failed, due to inability of the PME link to achieve the requested configuration profile.

Generation of this notification is controlled by the efmCuPmeConfigInitFailEnable object."

::= { efmCuPmeNotifications 4 }

efmCuPmeProtocolInitFailure NOTIFICATION-TYPE

OBJECTS {
 efmCuPmeFltStatus,
 efmCuPmeOperSubType

}

STATUS current

DESCRIPTION

"This notification indicates that the peer PME was using an incompatible protocol during initialization.

Generation of this notification is controlled by the efmCuPmeProtocolInitFailEnable object."

::= { efmCuPmeNotifications 5 }

-- The PME group

efmCuPmeConfTable OBJECT-TYPE

SYNTAX SEQUENCE OF EfmCuPmeConfEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"Table for Configuration of common aspects for EFMcu 2BASE-TL/10PASS-TS PME ports (modems). Configuration of aspects specific to 2BASE-TL or 10PASS-TS PME types is represented in efmCuPme2BConfTable and efmCuPme10PConfTable, respectively.

Entries in this table shall be maintained in a persistent manner."

::= { efmCuPme 1 }

efmCuPmeConfEntry OBJECT-TYPE

SYNTAX EfmCuPmeConfEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"An entry in the EFMcu PME Configuration table.
Each entry represents common aspects of an EFMcu PME port indexed by the ifIndex. Note that an EFMcu PME port can be stacked below a single PCS port, also indexed by ifIndex, possibly together with other PME ports if PAF is enabled."

```
INDEX { ifIndex }
::= { efmCuPmeConfTable 1 }
```

```
EfmCuPmeConfEntry ::=
```

```
SEQUENCE {
    efmCuPmeAdminSubType      INTEGER,
    efmCuPmeAdminProfile      EfmProfileIndex0rZero,
    efmCuPAFRemoteDiscoveryCode PhysAddress,
    efmCuPmeThreshLineAtn     Integer32,
    efmCuPmeThreshSnrmgn      Integer32,
    efmCuPmeLineAtnCrossingEnable TruthValue,
    efmCuPmeSnrmgnCrossingEnable TruthValue,
    efmCuPmeDeviceFaultEnable TruthValue,
    efmCuPmeConfigInitFailEnable TruthValue,
    efmCuPmeProtocolInitFailEnable TruthValue
}
```

```
efmCuPmeAdminSubType OBJECT-TYPE
```

```
SYNTAX INTEGER {
    ieee2BaseTL0(1),
    ieee2BaseTLR(2),
    ieee10PasSTS0(3),
    ieee10PasTSR(4),
    ieee2BaseTLor10PasTSR(5),
    ieee2BaseTLor10PasTS0(6),
    ieee10PasTSor2BaseTL0(7)
}
```

```
MAX-ACCESS read-write
```

```
STATUS current
```

```
DESCRIPTION
```

"Administrative (desired) subtype of the PME.

Possible values are:

- ieee2BaseTL0 - PME shall operate as 2BaseTL-0
- ieee2BaseTLR - PME shall operate as 2BaseTL-R
- ieee10PasSTS0 - PME shall operate as 10PasTS-0
- ieee10PasTSR - PME shall operate as 10PasTS-R
- ieee2BaseTLor10PasTSR - PME shall operate as 2BaseTL-R or 10PasTS-R. The actual value will be set by the -0 link partner during initialization (handshake).
- ieee2BaseTLor10PasTS0 - PME shall operate as 2BaseTL-0 (preferred) or 10PasTS-0. The actual value will be set during initialization depending on the -R link partner capability (i.e., if -R is incapable of the preferred 2BaseTL mode, 10PasTS will be used).
- ieee10PasTSor2BaseTL0 - PME shall operate as 10PasTS-0 (preferred) or 2BaseTL-0. The actual value will be set during initialization depending on the -R link partner capability (i.e., if -R is incapable of the preferred

10PasSTS mode, 2BaseTL will be used).

Changing efmCuPmeAdminSubType is a traffic-disruptive operation and as such shall be done when the link is Down. Attempts to change this object shall be rejected if the link is Up or Initializing.

Attempts to change this object to an unsupported subtype (see efmCuPmeSubTypesSupported) shall be rejected.

The current operational subtype is indicated by the efmCuPmeOperSubType variable.

If a Clause 45 MDIO Interface to the PMA/PMD is present, then this object combines values of the Port subtype select bits and the PMA/PMD type selection bits in the 10P/2B PMA/PMD control register."

REFERENCE

"IEEE Std 802.3, 61.1, 45.2.1.14.4, 45.2.1.14.7"
::= { efmCuPmeConfEntry 1 }

efmCuPmeAdminProfile OBJECT-TYPE

SYNTAX EfmProfileIndexOrZero

MAX-ACCESS read-write

STATUS current

DESCRIPTION

"Desired PME configuration profile. This object is a pointer to an entry in either the efmCuPme2BProfileTable or the efmCuPme10PProfileTable, depending on the current operating SubType of the PME. The value of this object is the index of the referenced profile.

The value of zero (default) indicates that the PME is configured via the efmCuAdminProfile object for the PCS port to which this PME is assigned. That is, the profile referenced by efmCuPmeAdminProfile takes precedence over the profile(s) referenced by efmCuAdminProfile.

This object is writeable and readable for the C0 subtype PMEs (2BaseTL-0 or 10PasSTS-0). It is irrelevant for the CPE subtype (2BaseTL-R or 10PasSTS-R) -- a zero value shall be returned on an attempt to read this object and any attempt to change this object shall be rejected in this case.

Note that the current operational profile value is available via efmCuPmeOperProfile object.

Any modification of this object shall be performed when the link is Down. Attempts to change this object shall be rejected, if the link is Up or Initializing.

Attempts to set this object to a value that is not the value of the index for an active entry in the corresponding profile table shall be rejected.

This object maps to the Clause 30 attribute aProfileSelect.

This object shall be maintained in a persistent manner."

REFERENCE

"IEEE Std 802.3, 30.11.2.1.6"
DEFVAL { 0 }

```
 ::= { efmCuPmeConfEntry 2 }
```

efmCuPAFRemoteDiscoveryCode OBJECT-TYPE

SYNTAX PhysAddress (SIZE(0|6))

MAX-ACCESS read-write

STATUS current

DESCRIPTION

"PAF Remote Discovery Code of the PME port at the C0.

The 6-octet Discovery Code of the peer PCS connected via the PME.

Reading this object results in a Discovery Get operation.

Setting this object to all zeros results in a Discovery Clear_if_Same operation (the value of efmCuPAFDiscoveryCode at the peer PCS shall be the same as efmCuPAFDiscoveryCode of the local PCS associated with the PME for the operation to succeed).

Writing a non-zero value to this object results in a Discovery Set_if_Clear operation.

A zero-length octet string shall be returned on an attempt to read this object when PAF aggregation is not enabled.

This object is irrelevant in CPE port (-R) subtypes: in this case, a zero-length octet string shall be returned on an attempt to read this object; writing to this object shall be rejected.

Discovery shall be performed when the link is Down.

Attempts to change this object shall be rejected (in case of SNMP with the error inconsistentValue), if the link is Up or Initializing.

If a Clause 45 MDIO Interface to the PMA/PMD is present, then this object is a function of 10P/2B aggregation discovery control register, Discovery operation result bits in 10P/2B aggregation and discovery status register and 10P/2B aggregation discovery code register."

REFERENCE

"IEEE Std 802.3, 61.2.2.8.4, 45.2.6.6 to 45.2.6.8"

```
 ::= { efmCuPmeConfEntry 3 }
```

efmCuPmeThreshLineAtn OBJECT-TYPE

SYNTAX Integer32(-127..128)

UNITS "dB"

MAX-ACCESS read-write

STATUS current

DESCRIPTION

"Desired Line Attenuation threshold for the 2B/10P PME.

This object configures the line attenuation alarm threshold.

When the current value of Line Attenuation reaches or exceeds this threshold, an efmCuPmeLineAtnCrossing notification may be generated, if enabled by efmCuPmeLineAtnCrossingEnable.

This object is writeable for the C0 subtype PMEs (-0).

It is read-only for the CPE subtype (-R).

Changing of the Line Attenuation threshold shall be performed when the link is Down. Attempts to change this object shall be rejected (in case of SNMP with the error inconsistentValue),

if the link is Up or Initializing.

If a Clause 45 MDIO Interface to the PME is present, then this object maps to the loop attenuation threshold bits in the 2B PMD line quality thresholds register."

REFERENCE

"IEEE Std 802.3, 45.2.1.23"

::= { efmCuPmeConfEntry 4 }

efmCuPmeThreshSnrMgn OBJECT-TYPE

SYNTAX Integer32(-127..128)

UNITS "dB"

MAX-ACCESS read-write

STATUS current

DESCRIPTION

"Desired SNR margin threshold for the 2B/10P PME.

This object configures the SNR margin alarm threshold.

When the current value of SNR margin reaches or exceeds this threshold, an efmCuPmeSnrMgnCrossing notification may be generated, if enabled by efmCuPmeSnrMgnCrossingEnable.

This object is writable for the CO subtype PMEs (2BaseTL-0/10PassTS-0). It is read-only for the CPE subtype (2BaseTL-R/10PassTS-R).

Changing of the SNR margin threshold shall be performed when the link is Down. Attempts to change this object shall be rejected (in case of SNMP with the error inconsistentValue), if the link is Up or Initializing.

If a Clause 45 MDIO Interface to the PME is present, then this object maps to the SNR margin threshold bits in the 2B PMD line quality thresholds register."

REFERENCE

"IEEE Std 802.3, 45.2.1.23"

::= { efmCuPmeConfEntry 5 }

efmCuPmeLineAtnCrossingEnable OBJECT-TYPE

SYNTAX TruthValue

MAX-ACCESS read-write

STATUS current

DESCRIPTION

"Indicates whether efmCuPmeLineAtnCrossing notifications should be generated for this interface.

A value of true(1) indicates that efmCuPmeLineAtnCrossing notification is enabled. A value of false(2) indicates that the notification is disabled."

::= { efmCuPmeConfEntry 6 }

efmCuPmeSnrMgnCrossingEnable OBJECT-TYPE

SYNTAX TruthValue

MAX-ACCESS read-write

STATUS current

DESCRIPTION

"Indicates whether efmCuPmeSnrMgnCrossing notifications should be generated for this interface.

A value of true(1) indicates that efmCuPmeSnrMgnCrossing notification is enabled. A value of false(2) indicates that

the notification is disabled."
 ::= { efmCuPmeConfEntry 7 }

efmCuPmeDeviceFaultEnable OBJECT-TYPE

SYNTAX TruthValue

MAX-ACCESS read-write

STATUS current

DESCRIPTION

"Indicates whether efmCuPmeDeviceFault notifications should be generated for this interface.

A value of true(1) indicates that efmCuPmeDeviceFault notification is enabled. A value of false(2) indicates that the notification is disabled."

::= { efmCuPmeConfEntry 8 }

efmCuPmeConfigInitFailEnable OBJECT-TYPE

SYNTAX TruthValue

MAX-ACCESS read-write

STATUS current

DESCRIPTION

"Indicates whether efmCuPmeConfigInitFailure notifications should be generated for this interface.

A value of true(1) indicates that efmCuPmeConfigInitFailure notification is enabled. A value of false(2) indicates that the notification is disabled."

::= { efmCuPmeConfEntry 9 }

efmCuPmeProtocolInitFailEnable OBJECT-TYPE

SYNTAX TruthValue

MAX-ACCESS read-write

STATUS current

DESCRIPTION

"Indicates whether efmCuPmeProtocolInitFailure notifications should be generated for this interface.

A value of true(1) indicates that efmCuPmeProtocolInitFailure notification is enabled. A value of false(2) indicates that the notification is disabled."

::= { efmCuPmeConfEntry 10 }

efmCuPmeCapabilityTable OBJECT-TYPE

SYNTAX SEQUENCE OF EfmCuPmeCapabilityEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"Table for the configuration of common aspects for EFMcu 2BASE-TL/10PASS-TS PME ports (modems). The configuration of aspects specific to 2BASE-TL or 10PASS-TS PME types is represented in the efmCuPme2BConfTable and the efmCuPme10PConfTable, respectively.

Entries in this table shall be maintained in a persistent manner."

::= { efmCuPme 2 }

efmCuPmeCapabilityEntry OBJECT-TYPE

SYNTAX EfmCuPmeCapabilityEntry


```

MAX-ACCESS    not-accessible
STATUS        current
DESCRIPTION
    "An entry in the EFMcu PME Capability table.
    Each entry represents common aspects of an EFMcu PME port
    indexed by the ifIndex. Note that an EFMcu PME port can be
    stacked below a single PCS port, also indexed by ifIndex,
    possibly together with other PME ports if PAF is enabled."
INDEX { ifIndex }
 ::= { efmCuPmeCapabilityTable 1 }

```

```

EfmCuPmeCapabilityEntry ::=
    SEQUENCE {
        efmCuPmeSubTypesSupported    BITS
    }

```

```

efmCuPmeSubTypesSupported    OBJECT-TYPE

```

```

SYNTAX    BITS {
        ieee2BaseTL0(0),
        ieee2BaseTLR(1),
        ieee10PassTS0(2),
        ieee10PassTSR(3)
    }

```

```

MAX-ACCESS    read-only
STATUS        current

```

```

DESCRIPTION

```

"PME supported subtypes. This is a bitmap of possible subtypes. The various bit positions are:

ieee2BaseTL0	- PME is capable of operating as 2BaseTL-0
ieee2BaseTLR	- PME is capable of operating as 2BaseTL-R
ieee10PassTS0	- PME is capable of operating as 10PassTS-0
ieee10PassTSR	- PME is capable of operating as 10PassTS-R

The desired mode of operation is determined by efmCuPmeAdminSubType, while efmCuPmeOperSubType reflects the current operating mode.

If a Clause 45 MDIO Interface to the PCS is present, then this object combines the 10PASS-TS capable and 2BASE-TL capable bits in the 10P/2B PMA/PMD speed ability register and the C0 supported and CPE supported bits in the 10P/2B PMA/PMD status register."

```

REFERENCE

```

"IEEE Std 802.3, 61.1, 45.2.1.4.7, 45.2.1.4.8, 45.2.1.15.2, 45.2.1.15.3"

```

 ::= { efmCuPmeCapabilityEntry 1 }

```

```

efmCuPmeStatusTable OBJECT-TYPE

```

```

SYNTAX    SEQUENCE OF EfmCuPmeStatusEntry

```

```

MAX-ACCESS    not-accessible

```

```

STATUS        current

```

```

DESCRIPTION

```

"This table provides common status information of EFMcu 2BASE-TL/10PASS-TS PME ports. Status information specific to 10PASS-TS PME is represented in efmCuPme10PStatusTable.

This table contains live data from the equipment. As such, it is not persistent."

```

 ::= { efmCuPme 3 }

```

efmCuPmeStatusEntry OBJECT-TYPE
 SYNTAX EfmCuPmeStatusEntry
 MAX-ACCESS not-accessible
 STATUS current
 DESCRIPTION

"An entry in the EFMcu PME Status table.
 Each entry represents common aspects of an EFMcu PME port indexed by the ifIndex. Note that an EFMcu PME port can be stacked below a single PCS port, also indexed by ifIndex, possibly together with other PME ports if PAF is enabled."

INDEX { ifIndex }
 ::= { efmCuPmeStatusTable 1 }

EfmCuPmeStatusEntry ::=

SEQUENCE {
 efmCuPmeOperStatus INTEGER,
 efmCuPmeFltStatus BITS,
 efmCuPmeOperSubType INTEGER,
 efmCuPmeOperProfile EfmProfileIndexOrZero,
 efmCuPmeSnrMgn Integer32,
 efmCuPmePeerSnrMgn Integer32,
 efmCuPmeLineAtn Integer32,
 efmCuPmePeerLineAtn Integer32,
 efmCuPmeEquivalentLength Unsigned32,
 efmCuPmeTCCodingErrors Counter32,
 efmCuPmeTCCrcErrors Counter32
 }

efmCuPmeOperStatus OBJECT-TYPE

SYNTAX INTEGER {
 up(1),
 downNotReady(2),
 downReady(3),
 init(4)
 }

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"Current PME link Operational Status. Possible values are:
 up(1) - The link is Up and ready to pass 64/65-octet encoded frames or fragments.
 downNotReady(2) - The link is Down and the PME does not detect Handshake tones from its peer. This value may indicate a possible problem with the peer PME.
 downReady(3) - The link is Down and the PME detects Handshake tones from its peer.
 init(4) - The link is Initializing, as a result of ifAdminStatus being set to 'up' for a particular PME or a PCS to which the PME is connected."

This object is intended to supplement the Down(2) state of ifOperStatus.

This object partially maps to the Clause 30 attribute aPMESatus.

If a Clause 45 MDIO Interface to the PME is present, then this object partially maps to PMA/PMD link status bits in 10P/2B PMA/PMD status register."

REFERENCE

"IEEE Std 802.3, 30.11.2.1.3, 45.2.1.15.4"

::= { efmCuPmeStatusEntry 1 }

efmCuPmeFltStatus OBJECT-TYPE

```
SYNTAX      BITS {
    lossOfFraming(0),
    snrMgnDefect(1),
    lineAtnDefect(2),
    deviceFault(3),
    configInitFailure(4),
    protocolInitFailure(5)
}
```

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"Current/Last PME link Fault Status. This is a bitmap of possible conditions. The various bit positions are:

lossOfFraming	- Loss of Framing for 10P or Loss of Sync word for 2B PMD or Loss of 64/65-octet framing.
snrMgnDefect	- SNR margin dropped below the threshold.
lineAtnDefect	- Line Attenuation exceeds the threshold.
deviceFault	- Indicates a vendor-dependent diagnostic or self-test fault has been detected.
configInitFailure	- Configuration initialization failure, due to inability of the PME link to support the configuration profile, requested during initialization.
protocolInitFailure	- Protocol initialization failure, due to an incompatible protocol used by the peer PME during init (that could happen if a peer PMD is a regular G.SDHSL/VDSL modem instead of a 2BASE-TL/10PASS-TS PME).

This object is intended to supplement ifOperStatus in IF-MIB.

This object holds information about the last fault. efmCuPmeFltStatus is cleared by the device restart. In addition, lossOfFraming, configInitFailure, and protocolInitFailure are cleared by PME init; deviceFault is cleared by successful diagnostics/test; snrMgnDefect and lineAtnDefect are cleared by SNR margin and Line attenuation, respectively, returning to norm and by PME init.

This object partially maps to the Clause 30 attribute aPMEStatus.

If a Clause 45 MDIO Interface to the PME is present, then this object consolidates information from various PMA/PMD

registers, namely: Fault bit in PMA/PMD status 1 register,
 10P/2B PMA/PMD link loss register,
 10P outgoing indicator bits status register,
 10P incoming indicator bits status register,
 2B state defects register."

REFERENCE

"IEEE Std 802.3, 30.11.2.1.3, 45.2.1.2.1, 45.2.1.41,
 45.2.1.42, 45.2.1.57"

::= { efmCuPmeStatusEntry 2 }

efmCuPmeOperSubType OBJECT-TYPE

SYNTAX INTEGER {

ieee2BaseTL0(1),
 ieee2BaseTLR(2),
 ieee10PasSTS0(3),
 ieee10PasSTR(4)

}

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"Current operational subtype of the PME.

Possible values are:

ieee2BaseTL0	- PME operates as 2BaseTL-0
ieee2BaseTLR	- PME operates as 2BaseTL-R
ieee10PasSTS0	- PME operates as 10PasSTS-0
ieee10PasSTR	- PME operates as 10PasSTR-R

The desired operational subtype of the PME can be configured via the efmCuPmeAdminSubType variable.

If a Clause 45 MDIO Interface to the PMA/PMD is present, then this object combines values of the Port subtype select bits, the PMA/PMD type selection bits in the 10P/2B PMA/PMD control register, and the PMA/PMD link status bits in the 10P/2B PMA/PMD status register."

REFERENCE

"IEEE Std 802.3, 61.1, 45.2.1.14.4, 45.2.1.14.7, 45.2.1.15.4"

::= { efmCuPmeStatusEntry 3 }

efmCuPmeOperProfile OBJECT-TYPE

SYNTAX EfmProfileIndexOrZero

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"PME current operating profile. This object is a pointer to an entry in either the efmCuPme2BProfileTable or the efmCuPme10PProfileTable, depending on the current operating SubType of the PME as indicated by efmCuPmeOperSubType. Note that a profile entry to which efmCuPmeOperProfile is pointing can be created automatically to reflect achieved parameters in adaptive (not fixed) initialization, i.e., values of efmCuPmeOperProfile and efmCuAdminProfile or efmCuPmeAdminProfile may differ. The value of zero indicates that the PME is Down or Initializing.

This object partially maps to the aOperatingProfile attribute in Clause 30."

REFERENCE

"IEEE Std 802.3, 30.11.2.1.7"
 ::= { efmCuPmeStatusEntry 4 }

efmCuPmeSnrmMgn OBJECT-TYPE
 SYNTAX Integer32(-127..128|65535)
 UNITS "dB"
 MAX-ACCESS read-only
 STATUS current
 DESCRIPTION
 "The current signal-to-noise ratio (SNR) margin with respect to the received signal as perceived by the local PME. The value of 65535 is returned when the PME is Down or Initializing."

This object maps to the aPMESNRMgn attribute in Clause 30.

If a Clause 45 MDIO Interface is present, then this object maps to the 10P/2B RX SNR margin register."

REFERENCE
 "IEEE Std 802.3, 30.11.2.1.4, 45.2.1.19"
 ::= { efmCuPmeStatusEntry 5 }

efmCuPmePeerSnrmMgn OBJECT-TYPE
 SYNTAX Integer32(-127..128|65535)
 UNITS "dB"
 MAX-ACCESS read-only
 STATUS current
 DESCRIPTION
 "The current SNR margin in dB with respect to the received signal, as perceived by the remote (link partner) PME. The value of 65535 is returned when the PME is Down or Initializing."

This object is irrelevant for the -R PME subtypes. The value of 65535 shall be returned in this case.

If a Clause 45 MDIO Interface is present, then this object maps to the 10P/2B link partner RX SNR margin register."

REFERENCE
 "IEEE Std 802.3, 45.2.1.20"
 ::= { efmCuPmeStatusEntry 6 }

efmCuPmeLineAtn OBJECT-TYPE
 SYNTAX Integer32(-127..128|65535)
 UNITS "dB"
 MAX-ACCESS read-only
 STATUS current
 DESCRIPTION
 "The current Line Attenuation in dB as perceived by the local PME. The value of 65535 is returned when the PME is Down or Initializing."

If a Clause 45 MDIO Interface is present, then this object maps to the Line Attenuation register."

REFERENCE
 "IEEE Std 802.3, 45.2.1.21"
 ::= { efmCuPmeStatusEntry 7 }

efmCuPmePeerLineAtn OBJECT-TYPE

SYNTAX Integer32(-127..128|65535)

UNITS "dB"

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The current Line Attenuation in dB as perceived by the remote (link partner) PME.

The value of 65535 is returned when the PME is Down or Initializing.

This object is irrelevant for the -R PME subtypes. The value of 65535 shall be returned in this case.

If a Clause 45 MDIO Interface is present, then this object maps to the 20P/2B link partner Line Attenuation register."

REFERENCE

"IEEE Std 802.3, 45.2.1.22"

::= { efmCuPmeStatusEntry 8 }

efmCuPmeEquivalentLength OBJECT-TYPE

SYNTAX Unsigned32(0..8192|65535)

UNITS "m"

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"An estimate of the equivalent loop's physical length in meters, as perceived by the PME after the link is established. An equivalent loop is a hypothetical 26AWG (0.4mm) loop with a perfect square root attenuation characteristic, without any bridged taps.

The value of 65535 is returned if the link is Down or Initializing or the PME is unable to estimate the equivalent length.

For a 10BASE-TL PME, if a Clause 45 MDIO Interface to the PME is present, then this object maps to the 10P Electrical Length register."

REFERENCE

"IEEE Std 802.3, 45.2.1.29"

::= { efmCuPmeStatusEntry 9 }

efmCuPmeTCCodingErrors OBJECT-TYPE

SYNTAX Counter32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The number of 64/65-octet encapsulation errors. This counter is incremented for each 64/65-octet encapsulation error detected by the 64/65-octet receive function.

This object maps to aTCCodingViolations attribute in Clause 30.

If a Clause 45 MDIO Interface to the PME TC is present, then this object maps to the TC coding violations register (see IEEE Std 802.3 45.2.6.12).

Discontinuities in the value of this counter can occur at re-initialization of the management system, and at other times as indicated by the value of ifCounterDiscontinuityTime, defined in IF-MIB."

REFERENCE

"IEEE Std 802.3, 61.3.3.1, 30.11.2.1.5, 45.2.6.12"
 ::= { efmCuPmeStatusEntry 10 }

efmCuPmeTCCrcErrors OBJECT-TYPE

SYNTAX Counter32
 MAX-ACCESS read-only
 STATUS current

DESCRIPTION

"The number of TC-CRC errors. This counter is incremented for each TC-CRC error detected by the 64/65-octet receive function (see IEEE Std 802.3 61.3.3.3 and IEEE Std 802.3 Figure 61-19).

This object maps to aTCCRCErrors attribute in Clause 30.

If a Clause 45 MDIO Interface to the PME TC is present, then this object maps to the TC CRC error register (see IEEE Std 802.3 45.2.6.11).

Discontinuities in the value of this counter can occur at re-initialization of the management system, and at other times as indicated by the value of ifCounterDiscontinuityTime, defined in IF-MIB."

REFERENCE

"IEEE Std 802.3, 61.3.3.3, 30.11.2.1.10, 45.2.6.11"
 ::= { efmCuPmeStatusEntry 11 }

-- 2BASE-TL specific PME group

efmCuPme2B OBJECT IDENTIFIER ::= { efmCuPme 5 }

efmCuPme2BProfileTable OBJECT-TYPE

SYNTAX SEQUENCE OF EfmCuPme2BProfileEntry
 MAX-ACCESS not-accessible
 STATUS current

DESCRIPTION

"This table supports definitions of administrative and operating profiles for 2BASE-TL PMEs.

The first 14 entries in this table shall be defined as follows (see IEEE Std 802.3 Annex 63A):

Profile index	MinRate (kb/s)	MaxRate (kb/s)	Power (dBm)	Region	Constellation	Comment
1	5696	5696	13.5	1	32-TCPAM	default
2	3072	3072	13.5	1	32-TCPAM	
3	2048	2048	13.5	1	16-TCPAM	
4	1024	1024	13.5	1	16-TCPAM	
5	704	704	13.5	1	16-TCPAM	
6	512	512	13.5	1	16-TCPAM	
7	5696	5696	14.5	2	32-TCPAM	
8	3072	3072	14.5	2	32-TCPAM	
9	2048	2048	14.5	2	16-TCPAM	
10	1024	1024	13.5	2	16-TCPAM	

11	704	704	13.5	2	16-TCPAM	
12	512	512	13.5	2	16-TCPAM	
13	192	5696	0	1	0	best effort
14	192	5696	0	2	0	best effort
-----+-----+-----+-----+-----+-----+-----						

These default entries shall be created during agent initialization and shall not be deleted.

Entries following the first 14 can be dynamically created and deleted to provide custom administrative (configuration) profiles and automatic operating profiles.

This table shall be maintained in a persistent manner."

REFERENCE

"IEEE Std 802.3, Annex 63A, 30.11.2.1.6"

::= { efmCuPme2B 2 }

efmCuPme2BProfileEntry OBJECT-TYPE

SYNTAX EfmCuPme2BProfileEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"Each entry corresponds to a single 2BASE-TL PME profile.

Each profile contains a set of parameters, used either for configuration or representation of a 2BASE-TL PME.

In case a particular profile is referenced via the efmCuPmeAdminProfile object (or efmCuAdminProfile if efmCuPmeAdminProfile is zero), it represents the desired parameters for the 2BaseTL-0 PME initialization.

If a profile is referenced via an efmCuPmeOperProfile object, it represents the current operating parameters of an operational PME.

Profiles may be created/deleted using the row creation/deletion mechanism via efmCuPme2BProfileRowStatus. If an active entry is referenced, the entry shall remain 'active' until all references are removed.

Default entries shall not be removed."

INDEX { efmCuPme2BProfileIndex }

::= { efmCuPme2BProfileTable 1 }

EfmCuPme2BProfileEntry ::=

SEQUENCE {

efmCuPme2BProfileIndex

efmCuPme2BProfileDescr

efmCuPme2BRegion

efmCuPme2BsMode

efmCuPme2BMinDataRate

efmCuPme2BMaxDataRate

efmCuPme2BPower

efmCuPme2BConstellation

efmCuPme2BProfileRowStatus

}

EfmProfileIndex,

SnmpAdminString,

INTEGER,

EfmProfileIndexOrZero,

Unsigned32,

Unsigned32,

Unsigned32,

INTEGER,

RowStatus

efmCuPme2BProfileIndex OBJECT-TYPE

SYNTAX EfmProfileIndex

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"2BASE-TL PME profile index.
 This object is the unique index associated with this profile.
 Entries in this table are referenced via efmCuAdminProfile or
 efmCuPmeAdminProfile objects."
 ::= { efmCuPme2BProfileEntry 1 }
 efmCuPme2BProfileDescr OBJECT-TYPE
 SYNTAX SnmpAdminString
 MAX-ACCESS read-create
 STATUS current
 DESCRIPTION
 "A textual string containing information about a 2BASE-TL PME
 profile. The string may include information about the data
 rate and spectral limitations of this particular profile."
 ::= { efmCuPme2BProfileEntry 2 }

efmCuPme2BRegion OBJECT-TYPE
 SYNTAX INTEGER {
 region1(1),
 region2(2)
 }
 MAX-ACCESS read-create
 STATUS current
 DESCRIPTION
 "Regional settings for a 2BASE-TL PME, as specified in the
 relevant Regional Annex of ITU-T Recommendation G.991.2.
 Regional settings specify the Power Spectral Density (PSD)
 mask and the Power Back-Off (PBO) values, and place
 limitations on the max allowed data rate, power, and
 constellation.

Possible values for this object are:

- region1 - Annexes A and F (e.g., North America)
- region2 - Annexes B and G (e.g., Europe)

Annex A/B specify regional settings for data rates from
 192 kb/s to 2304 kb/s using 16-TCPAM encoding.
 Annex F/G specify regional settings for rates from
 2320 kb/s to 3840 kb/s using 16-TCPAM encoding and from
 768 kb/s to 5696 kb/s using 32-TCPAM encoding.

If a Clause 45 MDIO Interface to the PME is present, then this
 object partially maps to the Region bits in the 2B general
 parameter register."

REFERENCE

"IEEE Std 802.3, 45.2.1.45; ITU-T Recommendation G.991.2,
 Annexes A, B, F and G"

::= { efmCuPme2BProfileEntry 3 }

efmCuPme2BsMode OBJECT-TYPE
 SYNTAX EfmProfileIndexOrZero
 MAX-ACCESS read-create
 STATUS current
 DESCRIPTION
 "Desired custom Spectral Mode for a 2BASE-TL PME. This object
 is a pointer to an entry in efmCuPme2BsModeTable and a block
 of entries in efmCuPme2BRateReachTable, which together define
 (country-specific) reach-dependent rate limitations in
 addition to those defined by efmCuPme2BRegion.

The value of this object is the index of the referenced spectral mode.

The value of zero (default) indicates that no specific spectral mode is applicable.

Attempts to set this object to a value that is not the value of the index for an active entry in the corresponding spectral mode table shall be rejected."

REFERENCE

"efmCuPme2BsModeTable, efmCuPme2BRateReachTable"

DEFVAL { 0 }

::= { efmCuPme2BProfileEntry 4 }

efmCuPme2BMinDataRate OBJECT-TYPE

SYNTAX Unsigned32(192..5696)

UNITS "Kbps"

MAX-ACCESS read-create

STATUS current

DESCRIPTION

"Minimum Data Rate for the 2BASE-TL PME.

This object can take values of (n x 64)kb/s, where n=3..60 for 16-TCPAM and n=12..89 for 32-TCPAM encoding.

The data rate of the 2BASE-TL PME is considered 'fixed' when the value of this object equals that of efmCuPme2BMaxDataRate. If efmCuPme2BMinDataRate is less than efmCuPme2BMaxDataRate in the administrative profile, the data rate is considered 'adaptive', and shall be set to the maximum attainable rate not exceeding efmCuPme2BMaxDataRate, under the spectral limitations placed by the efmCuPme2BRegion and efmCuPme2BsMode.

Note that the current operational data rate of the PME is represented by the ifSpeed object of IF-MIB.

If a Clause 45 MDIO Interface to the PME is present, then this object maps to the Min Data Rate1 bits in the 2B PMD parameters register.

This object shall be maintained in a persistent manner."

REFERENCE

"IEEE Std 802.3, 45.2.1.46"

::= { efmCuPme2BProfileEntry 5 }

efmCuPme2BMaxDataRate OBJECT-TYPE

SYNTAX Unsigned32(192..5696)

UNITS "Kbps"

MAX-ACCESS read-create

STATUS current

DESCRIPTION

"Maximum Data Rate for the 2BASE-TL PME.

This object can take values of (n x 64)kb/s, where n=3..60 for 16-TCPAM and n=12..89 for 32-TCPAM encoding.

The data rate of the 2BASE-TL PME is considered 'fixed' when the value of this object equals that of efmCuPme2BMinDataRate. If efmCuPme2BMinDataRate is less than efmCuPme2BMaxDataRate in the administrative profile, the data rate is considered 'adaptive', and shall be set to the maximum attainable rate not exceeding efmCuPme2BMaxDataRate, under the spectral

limitations placed by the efmCuPme2BRegion and efmCuPme2BsMode.

Note that the current operational data rate of the PME is represented by the ifSpeed object of IF-MIB.

If a Clause 45 MDIO Interface to the PME is present, then this object maps to the Max Data Rate1 bits in the 2B PMD parameters register.

This object shall be maintained in a persistent manner."

REFERENCE

"IEEE Std 802.3, 45.2.1.46"

::= { efmCuPme2BProfileEntry 6 }

efmCuPme2BPower OBJECT-TYPE

SYNTAX Unsigned32(0|10..42)

UNITS "0.5 dBm"

MAX-ACCESS read-create

STATUS current

DESCRIPTION

"Signal Transmit Power. Multiple of 0.5 dBm.

The value of 0 in the administrative profile means that the signal transmit power is not fixed and shall be set to maximize the attainable rate, under the spectral limitations placed by the efmCuPme2BRegion and efmCuPme2BsMode.

If a Clause 45 MDIO Interface to the PME is present, then this object maps to the Power1 bits in the 2B PMD parameters register."

REFERENCE

"IEEE Std 802.3, 45.2.1.46"

::= { efmCuPme2BProfileEntry 7 }

efmCuPme2BConstellation OBJECT-TYPE

SYNTAX INTEGER {

adaptive(0),

tcpam16(1),

tcpam32(2)

}

MAX-ACCESS read-create

STATUS current

DESCRIPTION

"TCPAM Constellation of the 2BASE-TL PME.

The possible values are:

adaptive(0) - either 16- or 32-TCPAM

tcpam16(1) - 16-TCPAM

tcpam32(2) - 32-TCPAM

The value of adaptive(0) in the administrative profile means that the constellation is not fixed and shall be set to maximize the attainable rate, under the spectral limitations placed by the efmCuPme2BRegion and efmCuPme2BsMode.

If a Clause 45 MDIO Interface to the PME is present, then this object maps to the Constellation1 bits in the 2B general parameter register."

REFERENCE

"IEEE Std 802.3, 45.2.1.46"

```
::= { efmCuPme2BProfileEntry 8 }
```

efmCuPme2BProfileRowStatus OBJECT-TYPE

```
SYNTAX      RowStatus
MAX-ACCESS  read-create
STATUS      current
```

DESCRIPTION

"This object controls the creation, modification, or deletion of the associated entry in the efmCuPme2BProfileTable per the semantics of RowStatus.

If an 'active' entry is referenced via efmCuAdminProfile or efmCuPmeAdminProfile instance(s), the entry shall remain 'active'.

An 'active' entry shall not be modified. In order to modify an existing entry, it shall be taken out of service (by setting this object to 'notInService'), modified, and set 'active' again."

```
::= { efmCuPme2BProfileEntry 9 }
```

efmCuPme2BsModeTable OBJECT-TYPE

```
SYNTAX      SEQUENCE OF EfmCuPme2BsModeEntry
MAX-ACCESS  not-accessible
STATUS      current
```

DESCRIPTION

"This table, together with efmCu2BReachRateTable, supports definition of administrative custom spectral modes for 2BASE-TL PMEs, describing spectral limitations in addition to those specified by efmCuPme2BRegion.

In some countries, spectral regulations (e.g., UK ANFP) limit the length of the loops for certain data rates. This table allows these country-specific limitations to be specified.

Entries in this table referenced by the efmCuPme2BsMode shall not be deleted until all the active references are removed.

This table shall be maintained in a persistent manner."

REFERENCE

"efmCu2BReachRateTable"

```
::= { efmCuPme2B 3 }
```

efmCuPme2BsModeEntry OBJECT-TYPE

```
SYNTAX      EfmCuPme2BsModeEntry
MAX-ACCESS  not-accessible
STATUS      current
```

DESCRIPTION

"Each entry specifies a spectral mode description and its index, which is used to reference corresponding entries in the efmCu2BReachRateTable.

Entries may be created/deleted using the row creation/deletion mechanism via efmCuPme2BsModeRowStatus."

```
INDEX { efmCuPme2BsModeIndex }
```

```
::= { efmCuPme2BsModeTable 1 }
```

EfmCuPme2BsModeEntry ::=

```
SEQUENCE {
```

```

    efmCuPme2BsModeIndex      EfmProfileIndex,
    efmCuPme2BsModeDescr      SnmpAdminString,
    efmCuPme2BsModeRowStatus   RowStatus
}

```

efmCuPme2BsModeIndex OBJECT-TYPE

SYNTAX EfmProfileIndex

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"2BASE-TL PME Spectral Mode index.

This object is the unique index associated with this spectral mode.

Entries in this table are referenced via the efmCuPme2BsMode object."

```
 ::= { efmCuPme2BsModeEntry 1 }
```

efmCuPme2BsModeDescr OBJECT-TYPE

SYNTAX SnmpAdminString

MAX-ACCESS read-create

STATUS current

DESCRIPTION

"A textual string containing information about a 2BASE-TL PME spectral mode. The string may include information about corresponding (country-specific) spectral regulations and rate/reach limitations of this particular spectral mode."

```
 ::= { efmCuPme2BsModeEntry 2 }
```

efmCuPme2BsModeRowStatus OBJECT-TYPE

SYNTAX RowStatus

MAX-ACCESS read-create

STATUS current

DESCRIPTION

"This object controls creation, modification, or deletion of the associated entry in efmCuPme2BsModeTable per the semantics of RowStatus.

If an 'active' entry is referenced via efmCuPme2BsMode instance(s), the entry shall remain 'active'.

An 'active' entry shall not be modified. In order to modify an existing entry, it shall be taken out of service (by setting this object to 'notInService'), modified, and set 'active' again."

```
 ::= { efmCuPme2BsModeEntry 3 }
```

efmCuPme2BReachRateTable OBJECT-TYPE

SYNTAX SEQUENCE OF EfmCuPme2BReachRateEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"This table supports the definition of administrative custom spectral modes for 2BASE-TL PMEs, providing spectral limitations in addition to those specified by efmCuPme2BRegion.

The spectral regulations in some countries (e.g., UK ANFP) limit the length of the loops for certain data rates.

This table allows these country-specific limitations to be

specified.

Below is an example of this table for NICC Document ND1602:2005/08:

Equivalent Length (m)	MaxRate PAM16 (kb/s)	MaxRate PAM32 (kb/s)
975	2304	5696
1125	2304	5504
1275	2304	5120
1350	2304	4864
1425	2304	4544
1500	2304	4288
1575	2304	3968
1650	2304	3776
1725	2304	3520
1800	2304	3264
1875	2304	3072
1950	2048	2688
2100	1792	2368
2250	1536	0
2400	1408	0
2550	1280	0
2775	1152	0
2925	1152	0
3150	1088	0
3375	1024	0

Entries in this table referenced by an efmCuPme2BsMode instance shall not be deleted.

This table shall be maintained in a persistent manner."

REFERENCE

"NICC Document ND1602:2005/08"

::= { efmCuPme2B 4 }

efmCuPme2BReachRateEntry OBJECT-TYPE

SYNTAX EfmCuPme2BReachRateEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"Each entry specifies maximum 2BASE-TL PME data rates allowed for a certain equivalent loop length, when using 16-TCPAM or 32-TCPAM encoding.

When a 2BASE-TL PME is initialized, its data rate shall not exceed the following limitations:

- the value of efmCuPme2BMaxDataRate
- maximum data rate allowed by efmCuPme2BRegion and efmCuPme2BPower
- maximum data rate for a given encoding specified in the efmCuPme2BsModeEntry, corresponding to the equivalent loop length, estimated by the PME

efmCuPme2BEquivalentLength values should be assigned in increasing order, starting from the minimum value.

Entries may be created/deleted using the row creation/
deletion mechanism via efmCuPme2ReachRateRowStatus."
INDEX { efmCuPme2BsModeIndex, efmCuPme2BReachRateIndex }
 ::= { efmCuPme2BReachRateTable 1 }

EfmCuPme2BReachRateEntry ::=

```

SEQUENCE {
    efmCuPme2BReachRateIndex          EfmProfileIndex,
    efmCuPme2BEquivalentLength        Unsigned32,
    efmCuPme2BMaxDataRatePam16        Unsigned32,
    efmCuPme2BMaxDataRatePam32        Unsigned32,
    efmCuPme2BReachRateRowStatus      RowStatus
}

```

efmCuPme2BReachRateIndex OBJECT-TYPE
SYNTAX EfmProfileIndex
MAX-ACCESS not-accessible
STATUS current
DESCRIPTION
"2BASE-TL custom spectral mode Reach-Rate table index.
This object is the unique index associated with each entry."
 ::= { efmCuPme2BReachRateEntry 1 }

efmCuPme2BEquivalentLength OBJECT-TYPE
SYNTAX Unsigned32(0..8192)
UNITS "m"
MAX-ACCESS read-create
STATUS current
DESCRIPTION
"Maximum allowed equivalent loop's physical length in meters
for the specified data rates.
An equivalent loop is a hypothetical 26AWG (0.4mm) loop with a
perfect square root attenuation characteristic, without any
bridged taps."
 ::= { efmCuPme2BReachRateEntry 2 }

efmCuPme2BMaxDataRatePam16 OBJECT-TYPE
SYNTAX Unsigned32(0|192..5696)
UNITS "Kbps"
MAX-ACCESS read-create
STATUS current
DESCRIPTION
"Maximum data rate for a 2BASE-TL PME at the specified
equivalent loop's length using TC-PAM16 encoding.
The value of zero means that TC-PAM16 encoding should not be
used at this distance."
 ::= { efmCuPme2BReachRateEntry 3 }

efmCuPme2BMaxDataRatePam32 OBJECT-TYPE
SYNTAX Unsigned32(0|192..5696)
UNITS "Kbps"
MAX-ACCESS read-create
STATUS current
DESCRIPTION
"Maximum data rate for a 2BASE-TL PME at the specified
equivalent loop's length using TC-PAM32 encoding.
The value of zero means that TC-PAM32 encoding should not be
used at this distance."
 ::= { efmCuPme2BReachRateEntry 4 }

efmCuPme2BReachRateRowStatus OBJECT-TYPE

SYNTAX RowStatus
MAX-ACCESS read-create
STATUS current

DESCRIPTION

"This object controls the creation, modification, or deletion of the associated entry in the efmCuPme2BReachRateTable per the semantics of RowStatus.

If an 'active' entry is referenced via efmCuPme2BsMode instance(s), the entry shall remain 'active'.

An 'active' entry shall not be modified. In order to modify an existing entry, it shall be taken out of service (by setting this object to 'notInService'), modified, and set 'active' again."

::= { efmCuPme2BReachRateEntry 5 }

-- 10PASS-TS specific PME group

efmCuPme10P OBJECT IDENTIFIER ::= { efmCuPme 6 }

efmCuPme10PProfileTable OBJECT-TYPE

SYNTAX SEQUENCE OF EfmCuPme10PProfileEntry
MAX-ACCESS not-accessible
STATUS current

DESCRIPTION

"This table supports definitions of configuration profiles for 10PASS-TS PMEs.

The first 22 entries in this table shall be defined as follows (see IEEE Std 802.3 Annex 62B.3, Table 62B-1):

-----+-----+-----+-----+-----+-----+-----						
Profile	Bandplan	UPBO	BandNotch	DRate	URate	Comment
Index	PSDMask#	p#	p#	p#	p#	
-----+-----+-----+-----+-----+-----+-----						
1	1	3	2,6,10,11	20	20	default profile
2	13	5	0	20	20	
3	1	1	0	20	20	
4	16	0	0	100	100	
5	16	0	0	70	50	
6	6	0	0	50	10	
7	17	0	0	30	30	
8	8	0	0	30	5	
9	4	0	0	25	25	
10	4	0	0	15	15	
11	23	0	0	10	10	
12	23	0	0	5	5	
13	16	0	2,5,9,11	100	100	
14	16	0	2,5,9,11	70	50	
15	6	0	2,6,10,11	50	10	
16	17	0	2,5,9,11	30	30	
17	8	0	2,6,10,11	30	5	
18	4	0	2,6,10,11	25	25	
19	4	0	2,6,10,11	15	15	
20	23	0	2,5,9,11	10	10	
21	23	0	2,5,9,11	5	5	
22	30	0	0	200	50	
-----+-----+-----+-----+-----+-----+-----						

These default entries shall be created during agent initialization and shall not be deleted.

Entries following the first 22 can be dynamically created and deleted to provide custom administrative (configuration) profiles and automatic operating profiles.

This table shall be maintained in a persistent manner."

REFERENCE

"IEEE Std 802.3, Annex 62B.3, 30.11.2.1.6"

::= { efmCuPme10P 1 }

efmCuPme10PProfileEntry OBJECT-TYPE

SYNTAX EfmCuPme10PProfileEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"Each entry corresponds to a single 10PASS-TS PME profile.

Each profile contains a set of parameters, used either for configuration or representation of a 10PASS-TS PME.

In case a particular profile is referenced via the efmCuPmeAdminProfile object (or efmCuAdminProfile if efmCuPmeAdminProfile is zero), it represents the desired parameters for the 10PassTS-0 PME initialization. If a profile is referenced via an efmCuPmeOperProfile object, it represents the current operating parameters of the PME.

Profiles may be created/deleted using the row creation/deletion mechanism via efmCuPme10PProfileRowStatus. If an 'active' entry is referenced, the entry shall remain 'active' until all references are removed.

Default entries shall not be removed."

INDEX { efmCuPme10PProfileIndex }

::= { efmCuPme10PProfileTable 1 }

EfmCuPme10PProfileEntry ::=

SEQUENCE {

efmCuPme10PProfileIndex	EfmProfileIndex,
efmCuPme10PProfileDescr	SnmpAdminString,
efmCuPme10PBandplanPSDMskProfile	INTEGER,
efmCuPme10PUPBReferenceProfile	INTEGER,
efmCuPme10PBandNotchProfiles	BITS,
efmCuPme10PPayloadDRateProfile	INTEGER,
efmCuPme10PPayloadURateProfile	INTEGER,
efmCuPme10PProfileRowStatus	RowStatus

}

efmCuPme10PProfileIndex OBJECT-TYPE

SYNTAX EfmProfileIndex

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"10PASS-TS PME profile index.

This object is the unique index associated with this profile.

Entries in this table are referenced via efmCuAdminProfile or efmCuPmeAdminProfile."

::= { efmCuPme10PProfileEntry 1 }

efmCuPme10PProfileDescr OBJECT-TYPE

SYNTAX SnmpAdminString

MAX-ACCESS read-create

STATUS current

DESCRIPTION

"A textual string containing information about a 10PASS-TS PME profile. The string may include information about data rate and spectral limitations of this particular profile."

::= { efmCuPme10PProfileEntry 2 }

efmCuPme10PBandplanPSDMskProfile OBJECT-TYPE

SYNTAX INTEGER {

profile1(1),

profile2(2),

profile3(3),

profile4(4),

profile5(5),

profile6(6),

profile7(7),

profile8(8),

profile9(9),

profile10(10),

profile11(11),

profile12(12),

profile13(13),

profile14(14),

profile15(15),

profile16(16),

profile17(17),

profile18(18),

profile19(19),

profile20(20),

profile21(21),

profile22(22),

profile23(23),

profile24(24),

profile25(25),

profile26(26),

profile27(27),

profile28(28),

profile29(29),

profile30(30)

}

MAX-ACCESS read-create

STATUS current

DESCRIPTION

"The 10PASS-TS PME Bandplan and PSD Mask Profile, as specified in IEEE Std 802.3 Annex 62A, table 62A-1. Possible values are:

Profile Name	PSD Mask	Bands					ITU-T G.993.1 Bandplan
		0	1	2	3	4/5	
profile1(1)	ANSI T1.424 FTTCab.M1	x	D	U	D	U	A
profile2(2)	ANSI T1.424 FTTEEx.M1	x	D	U	D	U	A
profile3(3)	ANSI T1.424 FTTCab.M2	x	D	U	D	U	A
profile4(4)	ANSI T1.424 FTTEEx.M2	x	D	U	D	U	A
profile5(5)	ANSI T1.424 FTTCab.M1	D	D	U	D	U	A
profile6(6)	ANSI T1.424 FTTEEx.M1	D	D	U	D	U	A

profile7(7)	ANSI T1.424	FTTCab.M2	D/D/U/D/U	A
profile8(8)	ANSI T1.424	FTTEx.M2	D/D/U/D/U	A
profile9(9)	ANSI T1.424	FTTCab.M1	U/D/U/D/x	A
profile10(10)	ANSI T1.424	FTTEx.M1	U/D/U/D/x	A
profile11(11)	ANSI T1.424	FTTCab.M2	U/D/U/D/x	A
profile12(12)	ANSI T1.424	FTTEx.M2	U/D/U/D/x	A
profile13(13)	ETSI TS 101 270-1	Pcab.M1.A	x/D/U/D/U	B
profile14(14)	ETSI TS 101 270-1	Pcab.M1.B	x/D/U/D/U	B
profile15(15)	ETSI TS 101 270-1	Pex.P1.M1	x/D/U/D/U	B
profile16(16)	ETSI TS 101 270-1	Pex.P2.M1	x/D/U/D/U	B
profile17(17)	ETSI TS 101 270-1	Pcab.M2	x/D/U/D/U	B
profile18(18)	ETSI TS 101 270-1	Pex.P1.M2	x/D/U/D/U	B
profile19(19)	ETSI TS 101 270-1	Pex.P2.M2	x/D/U/D/U	B
profile20(20)	ETSI TS 101 270-1	Pcab.M1.A	U/D/U/D/x	B
profile21(21)	ETSI TS 101 270-1	Pcab.M1.B	U/D/U/D/x	B
profile22(22)	ETSI TS 101 270-1	Pex.P1.M1	U/D/U/D/x	B
profile23(23)	ETSI TS 101 270-1	Pex.P2.M1	U/D/U/D/x	B
profile24(24)	ETSI TS 101 270-1	Pcab.M2	U/D/U/D/x	B
profile25(25)	ETSI TS 101 270-1	Pex.P1.M2	U/D/U/D/x	B
profile26(26)	ETSI TS 101 270-1	Pex.P2.M2	U/D/U/D/x	B
profile27(27)	ITU-T G.993.1	F.1.2.1	x/D/U/D/U	Annex F
profile28(28)	ITU-T G.993.1	F.1.2.2	x/D/U/D/U	Annex F
profile29(29)	ITU-T G.993.1	F.1.2.3	x/D/U/D/U	Annex F
profile30(30)	ANSI T1.424	FTTCab.M1 (ext.)	x/D/U/D/U/D	Annex A

REFERENCE

"IEEE Std 802.3, Annex 62A"

::= { efmCuPme10PProfileEntry 3 }

efmCuPme10PUPB0ReferenceProfile OBJECT-TYPE

SYNTAX INTEGER {

profile0(0),
profile1(1),
profile2(2),
profile3(3),
profile4(4),
profile5(5),
profile6(6),
profile7(7),
profile8(8),
profile9(9)

}

MAX-ACCESS read-create

STATUS current

DESCRIPTION

"The 10PASS-TS PME Upstream Power Back-Off (UPB0) Reference PSD Profile, as specified in 802.3 Annex 62A, table 62A-3. Possible values are:

Profile Name	Reference	PSD
profile0(0)	no profile	
profile1(1)	ANSI T1.424	Noise A M1
profile2(2)	ANSI T1.424	Noise A M2
profile3(3)	ANSI T1.424	Noise F M1
profile4(4)	ANSI T1.424	Noise F M2
profile5(5)	ETSI TS 101 270-1	Noise A&B
profile6(6)	ETSI TS 101 270-1	Noise C

```

profile7(7)  ETSI TS 101 270-1  Noise D
profile8(8)  ETSI TS 101 270-1  Noise E
profile9(9)  ETSI TS 101 270-1  Noise F
-----+-----

```

```

"

```

REFERENCE

```

"IEEE Std 802.3, Annex 62A.3.5"

```

```

::= { efmCuPme10PProfileEntry 4 }

```

```

efmCuPme10PBandNotchProfiles  OBJECT-TYPE

```

```

SYNTAX  BITS {

```

```

    profile0(0),
    profile1(1),
    profile2(2),
    profile3(3),
    profile4(4),
    profile5(5),
    profile6(6),
    profile7(7),
    profile8(8),
    profile9(9),
    profile10(10),
    profile11(11)

```

```

}

```

```

MAX-ACCESS  read-create

```

```

STATUS      current

```

DESCRIPTION

"The 10PASS-TS PME Egress Control Band Notch Profile bitmap, as specified in IEEE Std 802.3 Annex 62A, table 62A-4. Possible values are:

Profile Name	G.991.3 table	T1.424 table	TS 101 270-1 table	StartF (MHz)	EndF (MHz)
profile0(0)	no profile				
profile1(1)	F-5 #01	-	-	1.810	1.825
profile2(2)	6-2	15-1	17	1.810	2.000
profile3(3)	F-5 #02	-	-	1.907	1.912
profile4(4)	F-5 #03	-	-	3.500	3.575
profile5(5)	6-2	-	17	3.500	3.800
profile6(6)	-	15-1	-	3.500	4.000
profile7(7)	F-5 #04	-	-	3.747	3.754
profile8(8)	F-5 #05	-	-	3.791	3.805
profile9(9)	6-2	-	17	7.000	7.100
profile10(10)	F-5 #06	15-1	-	7.000	7.300
profile11(11)	6-2	15-1	1	10.100	10.150

Any combination of profiles can be specified by ORing individual profiles, for example, a value of 0x2230 selects profiles 2, 6, 10, and 11."

REFERENCE

```

"IEEE Std 802.3, Annex 62A.3.5"

```

```

::= { efmCuPme10PProfileEntry 5 }

```

```

efmCuPme10PPayloadDRateProfile  OBJECT-TYPE

```

```

SYNTAX  INTEGER {

```

```

    profile5(5),
    profile10(10),

```

```

    profile15(15),
    profile20(20),
    profile25(25),
    profile30(30),
    profile50(50),
    profile70(70),
    profile100(100),
    profile140(140),
    profile200(200)
}
MAX-ACCESS    read-create
STATUS        current
DESCRIPTION

```

"The 10PASS-TS PME Downstream Payload Rate Profile, as specified in IEEE Std 802.3 Annex 62A. Possible values are:

```

    profile5(5)      - 2.5 Mb/s
    profile10(10)     - 5 Mb/s
    profile15(15)     - 7.5 Mb/s
    profile20(20)     - 10 Mb/s
    profile25(25)     - 12.5 Mb/s
    profile30(30)     - 15 Mb/s
    profile50(50)     - 25 Mb/s
    profile70(70)     - 35 Mb/s
    profile100(100)   - 50 Mb/s
    profile140(140)   - 70 Mb/s
    profile200(200)   - 100 Mb/s

```

Each value represents a target for the PME's Downstream Payload Bitrate as seen at the MII. If the payload rate of the selected profile cannot be achieved based on the loop environment, bandplan, and PSD mask, the PME initialization shall fail."

REFERENCE

"IEEE Std 802.3, Annex 62A.3.6"
 ::= { efmCuPme10PProfileEntry 6 }

efmCuPme10PPayloadURateProfile OBJECT-TYPE

```

SYNTAX      INTEGER {
    profile5(5),
    profile10(10),
    profile15(15),
    profile20(20),
    profile25(25),
    profile30(30),
    profile50(50),
    profile70(70),
    profile100(100)
}

```

```

MAX-ACCESS    read-create
STATUS        current

```

DESCRIPTION

"The 10PASS-TS PME Upstream Payload Rate Profile, as specified in 802.3 Annex 62A. Possible values are:

```

    profile5(5)      - 2.5 Mb/s
    profile10(10)     - 5 Mb/s
    profile15(15)     - 7.5 Mb/s
    profile20(20)     - 10 Mb/s
    profile25(25)     - 12.5 Mb/s
    profile30(30)     - 15 Mb/s

```

```

    profile50(50)      - 25 Mb/s
    profile70(70)      - 35 Mb/s
    profile100(100)    - 50 Mb/s

```

Each value represents a target for the PME's Upstream Payload Bitrate as seen at the MII. If the payload rate of the selected profile cannot be achieved based on the loop environment, bandplan, and PSD mask, the PME initialization shall fail."

REFERENCE

"IEEE Std 802.3, Annex 62A.3.6"
 ::= { efmCuPme10PProfileEntry 7 }

efmCuPme10PProfileRowStatus OBJECT-TYPE

```

SYNTAX      RowStatus
MAX-ACCESS  read-create
STATUS      current
DESCRIPTION

```

"This object controls creation, modification, or deletion of the associated entry in efmCuPme10PProfileTable per the semantics of RowStatus.

If an active entry is referenced via efmCuAdminProfile or efmCuPmeAdminProfile, the entry shall remain 'active' until all references are removed.

An 'active' entry shall not be modified. In order to modify an existing entry, it shall be taken out of service (by setting this object to 'notInService'), modified, and set 'active' again."

::= { efmCuPme10PProfileEntry 8 }

efmCuPme10PStatusTable OBJECT-TYPE

```

SYNTAX      SEQUENCE OF EfmCuPme10PStatusEntry
MAX-ACCESS  not-accessible
STATUS      current
DESCRIPTION

```

"This table provides status information of EFMcu 10PASS-TS PMEs (modems).

This table contains live data from the equipment. As such, it is not persistent."

::= { efmCuPme10P 2 }

efmCuPme10PStatusEntry OBJECT-TYPE

```

SYNTAX      EfmCuPme10PStatusEntry
MAX-ACCESS  not-accessible
STATUS      current
DESCRIPTION

```

"An entry in the EFMcu 10PASS-TS PME Status table."

```

INDEX { ifIndex }

```

::= { efmCuPme10PStatusTable 1 }

EfmCuPme10PStatusEntry ::=

```

SEQUENCE {
    efmCuPme10PFECCorrectedBlocks    Counter32,
    efmCuPme10PFECUncorrectedBlocks Counter32
}

```

efmCuPme10PFECCorrectedBlocks OBJECT-TYPE

SYNTAX Counter32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The number of received and corrected Forward Error Correction (FEC) codewords in this 10PASS-TS PME.

This object maps to the aPMEFECCorrectedBlocks attribute in Clause 30.

If a Clause 45 MDIO Interface to the PMA/PMD is present, then this object maps to the 10P FEC correctable errors register.

Discontinuities in the value of this counter can occur at re-initialization of the management system, and at other times as indicated by the value of ifCounterDiscontinuityTime, defined in IF-MIB."

REFERENCE

"IEEE Std 802.3, 45.2.1.25, 30.11.2.1.8"

::= { efmCuPme10PStatusEntry 1 }

efmCuPme10PFECUncorrectedBlocks OBJECT-TYPE

SYNTAX Counter32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The number of received uncorrectable FEC codewords in this 10PASS-TS PME.

This object maps to the aPMEFECUncorrectableBlocks attribute in Clause 30.

If a Clause 45 MDIO Interface to the PMA/PMD is present, then this object maps to the 10P FEC uncorrectable errors register.

Discontinuities in the value of this counter can occur at re-initialization of the management system, and at other times as indicated by the value of ifCounterDiscontinuityTime, defined in IF-MIB."

REFERENCE

"IEEE Std 802.3, 45.2.1.26, 30.11.2.1.9"

::= { efmCuPme10PStatusEntry 2 }

-- Conformance statements

--

efmCuGroups OBJECT IDENTIFIER ::= { efmCuConformance 1 }

efmCuCompliances OBJECT IDENTIFIER ::= { efmCuConformance 2 }

-- Object Groups

efmCuBasicGroup OBJECT-GROUP

OBJECTS {
efmCuPAFSupported,

```

    efmCuAdminProfile,
    efmCuTargetDataRate,
    efmCuTargetSnrMgn,
    efmCuAdaptiveSpectra,
    efmCuPortSide,
    efmCuFltStatus
}
STATUS      current
DESCRIPTION
    "A collection of objects representing management information
    common for all types of EFMCu ports."
::= { efmCuGroups 1 }

efmCuPAFGroup OBJECT-GROUP
OBJECTS {
    efmCuPeerPAFSupported,
    efmCuPAFCapacity,
    efmCuPeerPAFCapacity,
    efmCuPAFAdminState,
    efmCuPAFDiscoveryCode,
    efmCuPAFRemoteDiscoveryCode,
    efmCuNumPMEs
}
STATUS      current
DESCRIPTION
    "A collection of objects supporting optional PME
    Aggregation Function (PAF) and PAF discovery in EFMCu ports."
::= { efmCuGroups 2 }

efmCuPAFErrorsGroup OBJECT-GROUP
OBJECTS {
    efmCuPAFInErrors,
    efmCuPAFInSmallFragments,
    efmCuPAFInLargeFragments,
    efmCuPAFInBadFragments,
    efmCuPAFInLostFragments,
    efmCuPAFInLostStarts,
    efmCuPAFInLostEnds,
    efmCuPAFInOverflows
}
STATUS      current
DESCRIPTION
    "A collection of objects supporting optional error counters
    of PAF on EFMCu ports."
::= { efmCuGroups 3 }

efmCuPmeGroup OBJECT-GROUP
OBJECTS {
    efmCuPmeAdminProfile,
    efmCuPmeOperStatus,
    efmCuPmeFltStatus,
    efmCuPmeSubTypesSupported,
    efmCuPmeAdminSubType,
    efmCuPmeOperSubType,
    efmCuPAFRemoteDiscoveryCode,
    efmCuPmeOperProfile,
    efmCuPmeSnrMgn,
    efmCuPmePeerSnrMgn,
    efmCuPmeLineAtn,
    efmCuPmePeerLineAtn,

```



```

    efmCuPmeEquivalentLength,
    efmCuPmeTCCodingErrors,
    efmCuPmeTCCrcErrors,
    efmCuPmeThreshLineAtn,
    efmCuPmeThreshSnrMgn
}
STATUS      current
DESCRIPTION
    "A collection of objects providing information about
    a 2BASE-TL/10PASS-TS PME."
 ::= { efmCuGroups 4 }

```

```

efmCuAlarmConfGroup OBJECT-GROUP
OBJECTS {
    efmCuThreshLowRate,
    efmCuLowRateCrossingEnable,
    efmCuPmeThreshLineAtn,
    efmCuPmeLineAtnCrossingEnable,
    efmCuPmeThreshSnrMgn,
    efmCuPmeSnrMgnCrossingEnable,
    efmCuPmeDeviceFaultEnable,
    efmCuPmeConfigInitFailEnable,
    efmCuPmeProtocolInitFailEnable
}
STATUS      current
DESCRIPTION
    "A collection of objects supporting configuration of alarm
    thresholds and notifications in EFMCu ports."
 ::= { efmCuGroups 5 }

```

```

efmCuNotificationGroup NOTIFICATION-GROUP
NOTIFICATIONS {
    efmCuLowRateCrossing,
    efmCuPmeLineAtnCrossing,
    efmCuPmeSnrMgnCrossing,
    efmCuPmeDeviceFault,
    efmCuPmeConfigInitFailure,
    efmCuPmeProtocolInitFailure
}
STATUS      current
DESCRIPTION
    "This group supports notifications of significant conditions
    associated with EFMCu ports."
 ::= { efmCuGroups 6 }

```

```

efmCuPme2BProfileGroup OBJECT-GROUP
OBJECTS {
    efmCuPme2BProfileDescr,
    efmCuPme2BRegion,
    efmCuPme2BsMode,
    efmCuPme2BMinDataRate,
    efmCuPme2BMaxDataRate,
    efmCuPme2BPower,
    efmCuPme2BConstellation,
    efmCuPme2BProfileRowStatus,
    efmCuPme2BsModeDescr,
    efmCuPme2BsModeRowStatus,
    efmCuPme2BEquivalentLength,
    efmCuPme2BMaxDataRatePam16,

```

```

        efmCuPme2BMaxDataRatePam32,
        efmCuPme2BReachRateRowStatus
    }
    STATUS      current
    DESCRIPTION
        "A collection of objects that constitute a configuration
        profile for configuration of 2BASE-TL ports."
    ::= { efmCuGroups 7}

efmCuPme10PProfileGroup OBJECT-GROUP
    OBJECTS {
        efmCuPme10PProfileDescr,
        efmCuPme10PBandplanPSDMskProfile,
        efmCuPme10PUPBReferenceProfile,
        efmCuPme10PBandNotchProfiles,
        efmCuPme10PPayloadDRateProfile,
        efmCuPme10PPayloadURateProfile,
        efmCuPme10PProfileRowStatus
    }
    STATUS      current
    DESCRIPTION
        "A collection of objects that constitute a configuration
        profile for configuration of 10PASS-TS ports."
    ::= { efmCuGroups 8 }

efmCuPme10PStatusGroup OBJECT-GROUP
    OBJECTS {
        efmCuPme10PFECCorrectedBlocks,
        efmCuPme10PFECUncorrectedBlocks
    }
    STATUS      current
    DESCRIPTION
        "A collection of objects providing status information
        specific to 10PASS-TS PMEs."
    ::= { efmCuGroups 9 }

-- Compliance statements

efmCuCompliance MODULE-COMPLIANCE
    STATUS      current
    DESCRIPTION
        "The compliance statement for 2BASE-TL/10PASS-TS interfaces.
        Compliance with the following external compliance statements
        is required:

        MIB module                Compliance Statement
        -----
        IF-MIB                     ifCompliance3
        IEEE8023-EtherLike-MIB     dot3Compliance2
        MAU-MIB                    mauModIfCompl3

        Compliance with the following external compliance statements
        is optional for implementations supporting PME Aggregation
        Function (PAF) with flexible cross-connect between the PCS
        and PME ports:

        MIB module                Compliance Statement
        -----
        IF-INVERTED-STACK-MIB     ifInvCompliance

```

IF-CAP-STACK-MIB ifCapStackCompliance"

MODULE -- this module

```
MANDATORY-GROUPS {
    efmCuBasicGroup,
    efmCuPmeGroup,
    efmCuAlarmConfGroup,
    efmCuNotificationGroup
}
```

GROUP efmCuPme2BProfileGroup

DESCRIPTION

"Support for this group is only required for implementations supporting 2BASE-TL PHY."

GROUP efmCuPme10PProfileGroup

DESCRIPTION

"Support for this group is only required for implementations supporting 10PASS-TS PHY."

GROUP efmCuPAFGroup

DESCRIPTION

"Support for this group is only required for implementations supporting PME Aggregation Function (PAF)."

GROUP efmCuPAFErrorsGroup

DESCRIPTION

"Support for this group is optional for implementations supporting PME Aggregation Function (PAF)."

GROUP efmCuPme10PStatusGroup

DESCRIPTION

"Support for this group is optional for implementations supporting 10PASS-TS PHY."

OBJECT efmCuPmeSubTypesSupported

```
SYNTAX BITS {
    ieee2BaseTL0(0),
    ieee2BaseTLR(1),
    ieee10PasSTS0(2),
    ieee10PasTSR(3)
}
```

DESCRIPTION

"Support for all subtypes is not required. However, at least one value shall be supported."

OBJECT efmCuPmeAdminSubType

MIN-ACCESS read-only

DESCRIPTION

"Write access is not required (needed only for PMEs supporting more than a single subtype, e.g., ieee2BaseTL0 and ieee2BaseTLR or ieee10PasSTS0 and ieee10PasTSR)."

OBJECT efmCuTargetSnrMgn

MIN-ACCESS read-only

DESCRIPTION

"Write access is optional. For PHYs without write access, the target SNR margin shall be fixed at 5dB for 2BASE-TL

and 6dB for 10PASS-TS."

OBJECT efmCuAdaptiveSpectra

MIN-ACCESS read-only

DESCRIPTION

"Write access is optional. For PHYs without write access,
the default value should be false."

::= { efmCuCompliances 1 }

END

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12. Ethernet wide area network (WAN) interface sublayer (WIS) MIB module

This clause defines a portion of the MIB for use with SNMP. In particular, it defines objects for managing IEEE 802.3 WAN interface sublayers.

12.1 Overview

The objects defined in this clause are used in conjunction with objects defined in the Interfaces Group MIB in IETF RFC 2863, the SONET/SDH Interface MIB in IETF RFC 3592, and the IEEE 802.3 MAU MIB defined in Clause 13 of this document to manage the Ethernet WAN interface sublayer (WIS) defined in IEEE Std 802.3. The WIS contains functions to perform OC-192c/VC-4-64c framing and scrambling. It resides between the Physical Coding Sublayer (PCS) and the Physical Medium Attachment (PMA) sublayer within a 10GBASE-W 10 Gb/s WAN-compatible Physical Layer device (PHY) and may be used in conjunction with any of the PCS, PMA, and physical medium dependent (PMD) sublayers defined in IEEE Std 802.3 for 10GBASE-W PHYs. Three types of 10GBASE-W PHYs are defined, distinguished by the type of optics employed: 10GBASE-SW, 10GBASE-LW, and 10GBASE-EW. The objects defined in this clause may be used to manage an Ethernet interface employing any type of 10GBASE-W PHY. They do not apply to any other kind of interface. In particular, they do not apply to so-called Ethernet line terminating equipment (ELTE) residing within a SONET network element that uses the 10GBASE-W PMA/PMD sublayers but otherwise acts as SONET line terminating equipment (LTE).

The objects presented here—along with those incorporated by reference from the Interfaces Group MIB, the SONET/SDH Interface MIB, and the IEEE 802.3 MAU MIB—are intended to provide exact representations of the mandatory attributes in the oWIS managed object class (i.e., the members of the pWISBasic package) defined in Clause 30 of IEEE Std 802.3. They are also intended to provide approximate representations of the optional attributes (i.e., the members of the pWISOptional package). Some objects with no analogs in oWIS are defined to support WIS testing features required by Clause 50 of IEEE Std 802.3.

12.1.1 Relationship to the SONET/SDH interface MIB

Since the Ethernet WAN interface sublayer was designed to be SONET-compatible, information similar to that provided by most of the members of the oWIS managed object class is available from objects defined in the SONET-MIB in IETF RFC 3592. Thus, the MIB module defined in this clause is a sparse augmentation of the SONET-MIB—in other words, every table defined here is an extension of some table in the SONET-MIB—and its compliance statement REQUIRES that an agent implementing the objects defined in this clause also implement the relevant SONET-MIB objects. That includes all objects required by sonetCompliance2 as well as some that it leaves optional.

It should be noted that some of the objects incorporated by reference from the SONET-MIB—specifically, the threshold objects and interval counter objects—provide only approximate representations of the corresponding oWIS attributes, as detailed in 12.1.6. An alternative approach would have been to define new objects to exactly match the oWIS definitions. That approach was rejected because the SONET-MIB objects are already used in deployed systems to manage the SONET sublayers of ATM over SONET and PPP over SONET interfaces, and it was deemed undesirable to use a different scheme to manage the SONET sublayers of 10 Gb/s WAN-compatible Ethernet interfaces. Note that the approach adopted by this clause requires no hardware support beyond that mandated by 50.3.11 of IEEE Std 802.3.

12.1.2 Relationship to the Ethernet-like interface MIB

An interface that includes the Ethernet WIS is, by definition, an Ethernet-like interface, and an agent implementing the objects defined in this clause shall also implement the objects required by the Ethernet-like interface MIB module defined in Clause 10.

12.1.3 Relationship to the IEEE 802.3 MAU MIB

Support for the mauModIfComp13 compliance statement of the MAU-MIB module defined in Clause 13 is required for all Ethernet-like interfaces. The MAU-MIB module is needed in order to allow applications to control and/or determine the media type in use; this is important for devices that can support both the 10GBASE-R 10 Gb/s LAN format (which does not include the WIS) and the 10GBASE-W 10 Gb/s WAN format (which does include the WIS). The MAU-MIB module also provides the means to put a device in standby mode or to reset it; the latter may be used to re-initialize the WIS.

12.1.4 Use of the ifTable

This subclause specifies how the ifTable, as defined in IETF RFC 2863, is used for the Ethernet WIS application.

12.1.4.1 Layering model

Ethernet interfaces that employ the WIS are layered as defined in IEEE Std 802.3. The corresponding use of the ifTable defined in IETF RFC 2863 is shown in Figure 12-1.

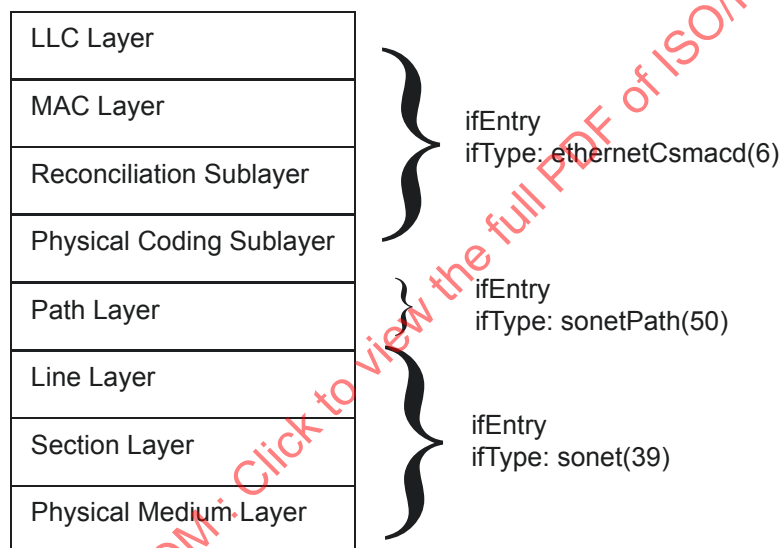


Figure 12-1—Use of ifTable for an Ethernet WIS port

The exact configuration and multiplexing of the layers is maintained in the ifStackTable in IETF RFC 2863 and in the ifInvStackTable in IETF RFC 2864.

12.1.4.2 Use of ifTable for LLC layer/MAC sublayer/reconciliation sublayer/physical coding sublayer

The ifTable shall be used as specified in Clause 10 and Clause 13 for the LLC Layer/MAC sublayer/reconciliation sublayer/physical coding sublayer.

12.1.4.3 Use of ifTable for SONET/SDH path layer

The ifTable shall be used as specified in IETF RFC 3592 for the SONET/SDH path layer. The value of ifHighSpeed is set to 9585. ifSpeed reports a value of 4294967295.

12.1.4.4 Use of ifTable for SONET/SDH medium/section/line layer

The ifTable shall be used as specified in IETF RFC 3592 for the SONET/SDH Medium/Section/Line Layer. The value of ifHighSpeed is set to 9953. ifSpeed reports a value of 4294967295.

12.1.5 SONET/SDH terminology

The SONET/SDH terminology used in IEEE Std 802.3 is mostly the same as in IETF RFC 3592, but there are a few differences. In those cases, the definitions in Clause 3 take precedence.

12.1.6 Mapping of IEEE 802.3 managed objects

Table 12-1 contains the mapping between oWIS managed objects in the pWIS Basic package defined in IEEE Std 802.3 and managed objects defined in this clause and in associated MIB modules, i.e., the IF-MIB in IETF RFC 2863, the SONET-MIB in IETF RFC 3592, and the IEEE 802.3 MAU-MIB module defined in Clause 13 of this document.

Table 12-1—Mapping of IEEE 802.3 managed objects (pWIS Basic package)

IEEE 802.3 managed object		Corresponding SNMP object
oWIS - pWISBasic package	aWISID	IF-MIB - ifIndex
	aSectionStatus	SONET-MIB - sonetSectionCurrentStatus
	aLineStatus	SONET-MIB - sonetLineCurrentStatus
	aPathStatus	etherWisPathCurrentStatus
	aFarEndPathStatus	etherWisFarEndPathCurrentStatus

The Unequipped defect is not defined by IEEE Std 802.3.

Table 12-2 contains the same mapping information for the pWIS optional package.

The threshold and counter objects imported from the SONET-MIB are not completely equivalent to the corresponding IEEE 802.3 objects. The specific differences are presented in Table 12-3. Despite the semantic differences between the threshold objects and counter objects imported from the SONET-MIB and the corresponding IEEE 802.3 objects, the hardware support mandated by 50.3.11 of IEEE Std 802.3 suffices for both. See Annex 12A for details.

Table 12-2—Mapping of IEEE 802.3 managed objects (pWIS optional package)

IEEE 802.3 managed object		Corresponding SNMP object
oWIS – pWISOptional package	aSectionSESThreshold	SONET-MIB – sonetSESthresholdSe
	aSectionSESs	SONET-MIB – sonetSectionCurrentSESs + sonetSectionIntervalSESs
	aSectionESs	SONET-MIB – sonetSectionCurrentESs + sonetSectionIntervalESs
	aSectionSEFSs	SONET-MIB – sonetSectionCurrentSEFSs + sonetSectionIntervalSEFSs
	aSectionCVs	SONET-MIB – sonetSectionCurrentCVs + sonetSectionIntervalCVs
	aJ0ValueTX	etherWisSectionCurrentJ0Transmitted
	aJ0ValueRX	etherWisSectionCurrentJ0Received
	aLineSESThreshold	SONET-MIB – sonetSESthresholdSet
	aLineSESs	SONET-MIB – sonetLineCurrentSESs + sonetLineIntervalSESs
	aLineESs	SONET-MIB – sonetLineCurrentESs + sonetLineIntervalESs
	aLineCVs	SONET-MIB – sonetLineCurrentCVs + sonetLineIntervalCVs
	aFarEndLineSESs	SONET-MIB – sonetFarEndLineCurrentSESs + sonetFarEndLineIntervalSESs
	aFarEndLineESs	SONET-MIB – sonetFarEndLineCurrentESs + sonetFarEndLineIntervalESs
	aFarEndLineCVs	SONET-MIB – sonetFarEndLineCurrentCVs + sonetFarEndLineIntervalCVs
	aPathSESThreshold	SONET-MIB – sonetSESthresholdSet
	aPathSESs	SONET-MIB – sonetPathCurrentSESs + sonetPathIntervalSESs
	aPathESs	SONET-MIB – sonetPathCurrentESs + sonetPathIntervalESs
	aPathCVs	SONET-MIB – sonetPathCurrentCVs + sonetPathIntervalCVs
	aJ1ValueTX	etherWisPathCurrentJ1Transmitted

Table 12-2—Mapping of IEEE 802.3 managed objects (pWIS optional package) (continued)

IEEE 802.3 managed object		Corresponding SNMP object
oWIS - pWISOptional package (continued)	aJ1ValueRX	etherWisPathCurrentJ1Received
	aFarEndPathSESSs	SONET-MIB – sonetFarEndPathCurrentSESSs + sonetFarEndPathIntervalSESSs
	aFarEndPathESs	SONET-MIB – sonetFarEndPathCurrentESs + sonetFarEndPathIntervalESs
	aFarEndPathCVs	SONET-MIB – sonetFarEndPathCurrentCVs + sonetFarEndPathIntervalCVs

Table 12-3—IEEE 802.3 managed object and SNMP object differences

IEEE 802.3 managed object	How corresponding SNMP object differs
aSectionSESThreshold	This object is defined in IEEE Std 802.3 as an integer with one instance per interface. sonetSESThresholdSet is an enumerated value that has one instance per network element; it controls the thresholds for all layers simultaneously and allows only certain discrete values to be selected.
aSectionSESSs	This object is defined in IEEE Std 802.3 as a generalized nonresettable counter. The objects sonetSectionCurrentSESSs and sonetSectionIntervalSESSs are 15-minute interval counters.
aSectionESs	This object is defined as a generalized nonresettable counter in IEEE Std 802.3. The objects sonetSectionCurrentESs and sonetSectionIntervalESs are 15-minute interval counters.
aSectionSEFSs	This object is defined as a generalized nonresettable counter in IEEE Std 802.3. The objects sonetSectionCurrentSEFSs and sonetSectionIntervalSEFSs are 15-minute interval counters.
aSectionCVs	This object is defined as a generalized nonresettable counter in IEEE Std 802.3, and it is not subject to inhibiting. The objects sonetSectionCurrentCVs and sonetSectionIntervalCVs are 15-minute interval counters, and they are inhibited (not incremented) during 1-second intervals that qualify as severely errored seconds.
aLineSESThreshold	This object is defined in IEEE Std 802.3 as an integer with one instance per interface. sonetSESThresholdSet is an enumerated value that has one instance per network element; it controls the thresholds for all layers simultaneously and allows only certain discrete values to be selected.
aLineSESSs	This object is defined as a generalized nonresettable counter in IEEE Std 802.3, and it is not subject to inhibiting. The objects sonetLineCurrentSESSs and sonetLineIntervalSESSs are 15-minute interval counters, and they are inhibited (not incremented) during 1-second intervals that qualify as unavailable seconds.
aLineESs	This object is defined as a generalized nonresettable counter in IEEE Std 802.3, and it is not subject to inhibiting. The objects sonetLineCurrentESs and sonetLineIntervalESs are 15-minute interval counters, and they are inhibited (not incremented) during 1-second intervals that qualify as unavailable seconds.