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Ethernet in the First Mile Copper (EFMCu) Interfaces MIB
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Abstract

This document defines a portion of the Management Information Base (MIB) for use with network management protocols in TCP/IP based networks. This document proposes an extension to the Ethernet-like Interfaces MIB and MAU MIB with a set of objects for managing an Ethernet in the First Mile Copper (EFMCu) interfaces 10Pass-TS and 2Base-TL, defined in IEEE standard 802.3ah.

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1. Introduction

New Ethernet like interfaces have been defined in the Institute of Electrical and Electronics Engineers (IEEE) 802.3ah project a.k.a. Ethernet in the First Mile (EFM) [[802.3ah](#)]. 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 EFMCu, are based on ITU-T G.SHDSL and VDSL specifications and support variable rates and optional Physical Medium Entity (PME) aggregation (a.k.a. multi-pair bonding).

2Base-TL PHY is capable of providing at least 2Mbps over 2700 m long single copper pair with a mean Bit Error Rate (BER) of 10^{-7} (using 5dB target noise margin).

10PASS-TS PHY is capable of providing at least 10Mbps over 750 m long single copper pair with a mean BER of 10^{-7} (using 6dB target noise margin).

This memo defines a portion of the Management Information Base (MIB) for use with network management protocols in the Internet community to manage EFMCu interfaces.

Note that managed objects for Operation, Administration and Management (OAM) and Ethernet over Passive Optical Networks (EPON) clauses of IEEE 802.3ah are defined in EFM-COMMON-MIB [[I-D.ietf-hubmib-efm-mib](#)] and EFM-EPON-MIB [[I-D.ietf-hubmib-efm-epon-mib](#)] respectively.

2. The 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 RFC 3410](#) [[RFC3410](#)].

Managed objects are accessed via a virtual information store, termed the Management Information Base or MIB. MIB objects are generally accessed through the Simple Network Management Protocol (SNMP). Objects in the MIB are defined using the mechanisms defined in the Structure of Management Information (SMI). This memo specifies a MIB module that is compliant to the SMIV2, which is described in STD 58, [RFC 2578](#) [[RFC2578](#)], STD 58, [RFC 2579](#) [[RFC2579](#)] and STD 58, [RFC 2580](#) [[RFC2580](#)]. A detailed introduction to the current SNMP Management Framework can be found in [RFC 2570](#) [[RFC2570](#)].

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "MAY", and "OPTIONAL" in this

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document are to be interpreted as described in [RFC 2119](#) [[RFC2119](#)].

[3.](#) Relation to other MIBs

This section outlines the relationship of this MIB with other MIBs described in the relevant RFCs. Specifically, Interfaces Group MIB (IF-MIB), Ethernet-Like (EtherLike-MIB), MAU (MAU-MIB), SHDSL (HDSL2-SHDSL-LINE-MIB) and VDSL (VDSL-LINE-EXT-MCM-MIB) are discussed.

[3.1](#) Relation to Interfaces Group MIB

2Base-TL and 10Pass-TS PHY's specified in this MIB are stacked Ethernet interfaces and as such are managed using generic interface management objects defined in the IF-MIB [[RFC2863](#)]. The stack management is done via the ifStackTable, as defined in the IF-MIB [[RFC2863](#)] and ifInvStackTable, as defined in the IF-INVERTED-STACK-MIB [[RFC2864](#)].

[3.1.1](#) Layering Model

An EFMCu interface can aggregate up to 32 Physical Medium Entity (PME) sublayer devices (modems), using so called PME Aggregation Function (PAF).

An generic EFMCu device can have a number of Physical Coding Sublayer (PCS) ports, connected to a MAC via Medium Independent Interface (MII) at the upper layer, and cross-connected to a number of

underlying PMEs, with a single PCS per PME relationship, see clause 61.1 of [[802.3ah](#)] for more details.

Each PME comprising an aggregated EFMCu port is represented in the Interface table as a separate port with ifType of shdsl(169) for 2Base-TL or vdsl(97) for 10Pass-TS. The ifType values are defined in IANAifType-MIB. ifSpeed for each PME shall return an actual bitrate of the active PME or a configured bitrate for pre-activated modems (note that unassigned PME has its default bitrate).

The ifStackTable is indexed by the ifIndex values of the aggregated EFMCu port (PCS) and the PMEs connected to it. 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.

A new table efmCuAvailableStackTable defined in this MIB, specifies

for each PCS a list of PMEs, which can possibly be cross-connected to that PCS, determined by the cross-connect capability of the device. This table, modeled after ifStackTable, is read only, reflecting current cross-connect capability, which can be dynamic in some implementations (e.g. if PMEs are located on a pluggable module and the card is pulled out). Note that PME availability per PCS, described by efmCuAvailableStackTable, can be constrained by other parameters, for example by aggregation capacity of a PCS or by the PME in question being already connected to another PCS. So, in order to ensure that a particular PME can be connected to the PCS, all respective parameters (e.g. efmCuAvailableStackTable, ifStackTable and efmCuPAFCapacity) SHALL be inspected.

The efmCuAvailableStackTable allows to define new entries

*EdNote: Add efmCuInvAvailableStackTable describing which PCS ports can be connected to a particular PME. Possibly move these 2 tables to a separate MIB to make cross-connect capability available to other MIBs for import (changing the prefix of course from 'efmCu' to say 'if'). *

[3.1.2](#) PME Aggregation Function (PAF)

The PME Aggregation Function (PAF) is OPTIONAL and MAY not be supported. Note however that the agent is REQUIRED to report on the PAF capability for all EFMcu ports (2Base-TL and 10Pass-TS).

EdNote: Add more info.

[3.1.3](#) Discovery Operation

This MIB allows a Network Management application to control 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 Discovery mechanism: ifStackTable and efmCuAvailableStackTable defined. The following pseudo-code defines an example of Discovery and automatic PME assignment for a generic PAF enabled multi-PCS EFMcu device, located at Central Office (CO):

```
FOREACH pcs[i] IN co_device
{ // Discover only on PAF enabled ports with room for more PMEs
  IF ( pcs[i].PAFSupported AND pcs[i].NumPMEs < pcs[i].PAFCapacity )
    { dc = pcs[i].DiscoveryCode = MAC[i]; // unique 6 Byte per PCS
      // go over all currently disconnected PMEs, which can
      // potentially be connected to PCS[i]
      FOREACH pme[j] IN efmCuAvailableStackTable[pcs[i]] AND
        NOT IN ifInvStackTable[pme[j]] // unassigned
        { pme[j].RemoteDiscoveryCode = dc; // Set if Clear
          r = pme[j].RemoteDiscoveryCode; // Get
          IF ( r == dc AND pcs[i].NumPMEs < pcs[i].PAFCapacity)
            { // Remote CPE connected via PME[j] is/was a peer for
              // PCS[i]. Connect this PME to the PCS (there's room)
              ADD pme[j] TO ifStackTable[pcs[i]];
            }
          }
    }
}
```

```

pcs[i].NumPMEs = pcs[i].NumPMEs + 1;
// Discover all other currently disconnected PMEs,
// attached to the same CPE and connect them to the PCS
// provided there is enough room for more PMEs.
FOREACH pme[k] IN efmCuAvailableStackTable[pcs[i]] and
                NOT IN ifInvStackTable[pme[k]]
    { r = pme[k].RemoteDiscoveryCode;          // Get
      IF ( r == dc AND
          pcs[i].NumPMEs < pcs[i].PAFCapacity)
        { ADD pme[k] TO ifStackTable[pcs[i]];
          pcs[i].NumPMEs = pcs[i].NumPMEs + 1;
        }
    }
}
// Discovered all PMEs which lead to the same CPE and
// connected them to PCS[i]. Go to the next PCS.
BREAK;
}
}
}

```

The SNMP Agent builds efmCuStackTable according to the information contained in the Clause 45 PME_Available_register (see [802.3ah] 61.1.5.3 and 45.2.3.20).

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 Clause 45 PME_Aggregate_register (see [802.3ah] 61.1.5.3 and 45.2.3.21).

Note that 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 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.

[3.1.4](#) 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 required data rate on a particular copper pair. Sometimes, when the copper line is too long or the noise environment 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 and a PME port. Setting this object to 'up' instructs a particular PCS or PME to start 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 efmCuPmeOperStatus defined in this MIB 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 this MIB expands PME's ifOperStatus value of 'down' to 'downReady', 'downNotReady' and 'init' values, indicating various EFMCu PME specific states.

[3.1.5](#) Usage of ifTable

Both PME and PCS interfaces of the EFMCu PHY are managed using interface specific management objects defined in this MIB and generic interface objects from the ifTable of IF-MIB, with all management table entries referenced by the interface index ifIndex.

The following table summarizes EFMCu specific interpretations for some of the ifTable objects specified by the mandatory

ifGeneralInformationGroup:

IF-MIB object	EFMCu interpretation
ifIndex	Interface index. Note that each PME and each PCS in the EFMCu PHY MUST have a unique index, as there some PCS and PME specific attributes accessible only on the PCS or PME level.
ifType	ethernetCsmacd(6) for PCS, shdsl(169) for 2Base-TL PME, vdsl(97) for 10Pass-TS PME
ifSpeed	Actual 'net' data rate as seen across MII
ifAdminStatus	Setting this object to 'up' instructs a particular PCS (with all PMEs connected to it) or PME to start initialization process
ifOperStatus	efmCuPmeOperStatus supplements the 'down' value of ifOperStatus for PMEs.

Table 1

[3.2](#) Relation to SHDSL MIB

G.SHDSL.bis modems, similar to PME(s) comprising a 2BaseTL port, are described in HDSL2-SHDSL-LINE-MIB [[I-D.ietf-adslmib-gshdslbis](#)]. Note that not all attributes of G.SHDSL modems reflected in HDSL2-SHDSL-LINE-MIB have adequate management objects (Clause 30 attributes and Clause 45 registers) in the EFM standard.

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 2BaseTL PME related objects with 'efmCuPme2B' instead of 'hdsl2shdsl'), it was decided not to reference HDSL2-SHDSL-LINE-MIB objects, but define all the relevant objects in this MIB.

However, if some functionality, not available in this MIB, 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.

[3.3](#) Relation to VDSL MIB

VDSL (DMT) modems, similar to the PME(s) comprising a 10PassTS port, are described in VDSL-LINE-EXT-MCM-MIB [[I-D.ietf-adslmib-vdsl-ext-mcm](#)]. Note that not all attributes of VDSL modems reflected in VDSL-LINE-EXT-MCM-MIB have adequate management objects (Clause 30 attributes and Clause 45 registers) in the EFM standard.

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 define all the relevant objects in this MIB.

However, if some functionality, not available in this MIB, 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.

[3.4](#) Relation to Ethernet-Like and MAU MIBs

The implementation of EtherLike-MIB [[RFC3635](#)] and MAU-MIB [[RFC3636](#)] is REQUIRED for the EFMCu interfaces. As such EFMCu interfaces 2Base-TL/10Pass-TS SHALL return an ifType of ethernetCsmacd(6). Information on the particular flavor of EFMCu that an interface is running is available from ifSpeed in the IF-MIB [[RFC2863](#)], and ifMauType in the MAU-MIB.

The MAU-MIB shall be augmented to include the following new values for ifMauType (instances of dot2MauType):

- o dot3MauType2BaseTL - voice grade UTP Phy specified in Clause 61 and 63
- o dot3MauType10PassTS - voice grade UTP Phy specified in Clause 61 and 62

EdNote: Should we also include -O/-R subtypes?

[4.](#) MIB Structure

[4.1](#) Overview

The main management objects defined in this MIB are split into 2 groups:

- o efmCuPort - containing objects for configuration, capabilities, status and notifications, common to all EFMCu PHYs.

- o efmCuPme - containing objects for configuration, capabilities, status and notifications of EFMCu PMEs.

In addition the efmCuAvailableStackTable is defined at the same level.

The efmCuPme group in turn contains efmCuPme2B and efmCuPme10P groups, which define configuration profiles specific to 2BaseTL and 10PassTS PMEs respectively as well as PME specific status information.

[4.2](#) Configuration Profiles

Since a managed node can have a large number of EFMCu PHYs, provisioning every parameter on every EFMCu PHY may become burdensome. Moreover, most PMEs are provisioned identically with the same set of parameters. To simplify the provisioning process, this MIB makes use of configuration profiles, similar to HDSL2-SHDSL-LINE-MIB and VDSL-LINE-EXT-MCM-MIB. A profile is a set of parameters that can be shared by multiple PME ports using the same configuration.

The configuration profiles are defined in efmCuPme2BConfProfileTable and efmCu10PConfProfileTable for 2Base-TL and 10Pass-TS PMEs respectively. There are 12 predefined standard profiles for 2Base-TL and 22 standard profiles for 10Pass-TS, defined in 802.3ah and dedicated for rapid provisioning of EFMCu PHYs in most scenarios. An ability to define new configuration profiles is also provided to allow for EFMCu deployment tailored to specific copper environment and spectral regulations.

A specific configuration profile is assigned to a specific PME via efmCuPmeAdminProfile object. Alternatively, by assigning a non-empty profile to a PCS port via efmCuAdminProfile, all PMEs connected to the PCS port are made to share that profile, which comes handy during configuration of aggregated ports.

4.3 Mapping of IEEE 802.3ah Managed Objects

This section contains the mapping between managed objects (attributes) defined in [802.3ah] Clause 30, and managed objects defined in this document and in associated MIB modules, i.e., the IF-MIB [RFC2863].

Note that majority of the objects defined in this MIB do not have direct counterparts in Clause 30 and instead refer to Clause 45 registers.

*EdNote: It would be a good idea to update Clause 30 of 802.3ah after this MIB is approved. I guess this should be done via a maintenance request. *

IEEE 802.3 Managed Object	Corresponding SNMP Object
oPAF - PME Basic Package (Mandatory)	
aPAFID	ifIndex (IF-MIB)
aPhyEnd	efmCuPhySide
aPHYCurrentStatus	efmCuStatus
aPAFSupported	efmCuPAFSupported
oPAF - PME Aggregation Package (Optional)	
aPAFAdminState	efmCuPAFAdminState
aPAFID	ifIndex (IF-MIB)
aLocalPAFCapacity	efmCuPAFCapacity
aLocalPMEAvailable	efmCuAvailableStackTable
aLocalPMEAggregate	ifStackTable (IF-MIB)
aRemotePAFSupported	efmCuRemotePAFSupported
aRemotePAFCapacity	efmCuRemotePAFCapacity
aRemotePMEAvailable	
aRemotePMEAggregate	
oPME - 10P/2B Package (Mandatory)	
aPMEID	ifIndex (IF-MIB)
aPMEAdminState	ifAdminState (IF-MIB)
aPMEStatus	efmCuPmeStatus

aPMESNRMgn	efmCuPmeSnrMgn
aTCCodingViolations	efmCuPmeTCCodingErrors
aProfileSelect	efmCuAdminProfile,
	efmCuPmeAdminProfile
aOperatingProfile	efmCuPmeOperProfile
aPMEFECCorrectedBlocks	efmCuPme10PFECCorrectedBlocks
aPMEFECUncorrectableBlocks	efmCuPme10PFECUncorrectedBlocks

Table 2

5. Definitions

EFM-CU-MIB DEFINITIONS ::= BEGIN

IMPORTS

MODULE-IDENTITY, OBJECT-TYPE, NOTIFICATION-TYPE, Integer32,
Unsigned32, Counter32, mib-2

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```

FROM SNMPv2-SMI          -- [RFC2578]
TEXTUAL-CONVENTION, TruthValue, RowStatus, PhysAddress
FROM SNMPv2-TC          -- [RFC2579]
SnmAdminString
FROM SNMP-FRAMEWORK-MIB -- [RFC3411]
ifIndex, ifSpeed, InterfaceIndex
FROM IF-MIB              -- [RFC2863]
MODULE-COMPLIANCE, OBJECT-GROUP, NOTIFICATION-GROUP
FROM SNMPv2-CONF        -- [RFC2580]
;

```

efmCuMIB MODULE-IDENTITY

LAST-UPDATED "200407150000Z" -- July 15, 2004

ORGANIZATION "IETF Ethernet Interfaces and Hub MIB Working Group"

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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 Draft P802.3ah/D3.3.

The following reference is used throughout this MIB module:

[802.3ah] refers to:

IEEE Draft P802.3ah/D3.3: 'Draft amendment to -

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Information technology - Telecommunications and information exchange between systems - Local and metropolitan area networks - Specific requirements - Part 3: Carrier sense multiple access with collision detection (CSMA/CD) access method and physical layer specifications - Media Access Control Parameters, Physical Layers and Management Parameters for subscriber access networks', 19 April 2003.

Of particular interest are Clause 61, 'Physical Coding Sublayer (PCS) and common specifications, type 10PASS-TS and type 2BASE-TL', Clause 30, 'Management', and Clause 45, 'Management Data Input/Output (MDIO) Interface'.

Naming Conventions:

Atn - Attenuation
CO - Central Office
CPE - Customer Premises Equipment
EFM - Ethernet in the First Mile
EFMCu - EFM Copper
MDIO - Management Data Input/Output
Mgn - Margin
PAF - PME Aggregation Function
PCS - Physical Coding Sublayer
PMD - Physical Medium Dependent
PME - Physical Medium Entity
PSD - Power Spectral Density
SNR - Signal to Noise Ratio
TCPAM - Trellis Coded Pulse Amplitude Modulation

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-- EdNote: Replace XXXX with the actual RFC number &
-- remove this note

REVISION "200407150000Z" -- July 15, 2004
DESCRIPTION "Initial version, published as RFC XXXX."

::= { mib-2 YYY }

-- EdNote: Replace YYY with a real OID once it is
-- allocated & remove this note.

-- Sections of the module

efmCuObjects OBJECT IDENTIFIER ::= { efmCuMIB 1 }

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efmCuConformance OBJECT IDENTIFIER ::= { efmCuMIB 2 }

-- Groups in the module

efmCuPort OBJECT IDENTIFIER ::= { efmCuObjects 1 }

efmCuPme OBJECT IDENTIFIER ::= { efmCuObjects 2 }

-- Textual Conventions

ProfileIndex ::= TEXTUAL-CONVENTION

DISPLAY-HINT "d"

STATUS current

DESCRIPTION

"A unique value, greater than zero, for each PME configuration profile in the managed EFMcu port. It is recommended that values are assigned contiguously starting from 1. The value for each profile must remain constant at least from one re-initialization of the entity's network management system to the next re-initialization."

SYNTAX Unsigned32 (1..255)

ProfileIndexOrZero ::= TEXTUAL-CONVENTION

DISPLAY-HINT "d"

STATUS current

DESCRIPTION

"This textual convention is an extension of the ProfileIndex 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 must therefore be defined as part of the description of any object which uses this syntax.

Examples of the usage of zero value might include situations where current operational profile is unknown."

SYNTAX Unsigned32 (0..255)

ProfileIndexList ::= TEXTUAL-CONVENTION

DISPLAY-HINT "1d:"

STATUS current

DESCRIPTION

"Represents a list of up to 6 ProfileIndex's.

The ProfileIndex textual convention defines a greater than zero value used to identify a PME profile in the managed EFMcu port. The value of this object is a concatenation of zero or more (up to 6) octets, where each octet contains an 8-bit ProfileIndex value.

A non-empty profile list specifies a list of alternative profiles any of which can be chosen for configuration of an

(empty). Examples of the usage of empty profile list might include situations where configuration profile(s) is unknown, or when no common profile(s) need to be referenced and sub-interface profile shall take precedence."
SYNTAX OCTET STRING (SIZE(0..6))

-- Port Notifications Group

efmCuPortNotifications OBJECT IDENTIFIER ::= { efmCuPort 0 }

efmCuLowBandwidth NOTIFICATION-TYPE

OBJECTS {
-- ifINDEX is not needed here since we are under specific PCS
ifSpeed,
efmCuThreshLowBandwidth
}
STATUS current
DESCRIPTION
"This notification indicates that EFMCu port's data rate reached or dropped below a Low Bandwidth Threshold (i.e. bandwidth degradation happening in case of PAF when one or more PMEs drop)."
-- EdNote: add throttling limitations here
::= { efmCuPortNotifications 1 }

-- PCS Port group

efmCuPortConfTable OBJECT-TYPE

SYNTAX SEQUENCE OF EfmCuPortConfEntry
MAX-ACCESS not-accessible
STATUS current
DESCRIPTION
"Table for Configuration of EFMCu 2BaseTL/10PassTS (PCS) Ports. Entries in this table MUST 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           ProfileIndexList,  
    efmCuTargetDataRate        Unsigned32,  
    efmCuTargetSnrMgn          Unsigned32,  
    efmCuThreshLowBandwidth    Unsigned32,  
    efmCuLowBandwidthEnable    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 ignored.

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 ignored 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."

REFERENCE

"[[802.3ah](#)] 61.2.2, 45.2.3.18.3"

::= { efmCuPortConfEntry 1 }

efmCuPAFDiscoveryCode OBJECT-TYPE

SYNTAX PhysAddress

MAX-ACCESS read-write

STATUS current

DESCRIPTION

"PAF Discovery Code of the EFMCu port (PCS).

A unique 6 Byte long code used by the Discovery function, when PAF is supported.

PCS ports incapable of supporting PAF SHALL return a value of all zeroes. Attempts to change this object SHALL be ignored in this case.

This object MUST 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 value of this object is read-only for -R port subtypes. The initial value of this object for -R ports after reset is 0. This value may be changed as a result of writing operation on efmCuPAFRemoteDiscoveryCode variable of remote PME of -0 subtype, connected to one of the local PMEs associated with the PCS.

Discovery MUST be performed when the link is Down.

Attempts to change this object MUST be rejected 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

"[[802.3ah](#)] 61.2.2.8.3, 61.2.2.8.4, 45.2.6.6.1"

::= { efmCuPortConfEntry 2 }

efmCuAdminProfile OBJECT-TYPE

SYNTAX ProfileIndexList

MAX-ACCESS read-write

STATUS current

DESCRIPTION

"Desired configuration profile(s), common for all PME's in the EFMcu port. This object is a list of pointers to entries in either efmCuPme2BConfProfileTable or efmCuPme10PConfProfileTable, 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 configuration profiles. If this list consists of a single

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Profile index, then all PME's assigned to this EFMcu port SHALL be configured according to the Configuration Profile referenced by that index. The list, consisting of more than one index, allows each PME in the port to be configured according to any configuration profile specified in the list. An empty list means that each PME in the port is configured via corresponding efmCuPmeAdminProfile object.

This object is writable and readable for the -0 subtype (2BaseTL-0 or 10PassTS-0) EFMcu ports. It is unavailable for the -R subtype (2BaseTL-R or 10PassTS-R) ports.

Note that current operational Profile value is available via efmCuPmeOperProfile object.

Modification of this object must be performed when the link is Down. Attempts to change this object MUST be rejected, if the link is Up or Initializing.

Attempts to set this object to a non-empty list with a member value, that is not the value of the index for an active entry in the corresponding profile table, MUST be rejected."

REFERENCE

"[[802.3ah](#)] 30.11.2.1.6"
 ::= { 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

Kbps, 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 64/65B framing overhead (e.g. target data rate of 10Mbps shall allow lossless transmission of full-duplex 10Mbps Ethernet frame stream with minimal inter-frame gap).

The value is limited above by 100Mbps 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 should 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 desired SNR margin. In case the copper environment allows to achieve higher total data rate than specified by the target, the excess capability SHALL be converted to additional SNR margin and spread evenly across all active PMEs assigned to the (PCS) port.

The value of 999999 means that the target data rate is not fixed and should be set to the maximum attainable rate during initialization (Best Effort), under specified spectral restrictions and with desired SNR Margin.

This object is read-write for the -0 subtype EFMcu ports (2BaseTL-0/10PassTS-0) and not available for the -R subtypes.

Changing of the Target Data Rate MUST be performed when the link is Down. Attempts to change this object MUST be rejected with the error inconsistentValue, if the link is Up or Initializing.

Note that current Data Rate of the EFMcu port is represented by ifSpeed object of IF-MIB."

::= { 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 802.3ah recommends using default Target SNR Margin of 5dB for 2BaseTL ports and 6dB for 10PassTS ports in order to achieve mean Bit Error Rate (BER) of 10^{-7} at the PMA service interface.

This object is read-write for the -0 subtype EFMcu ports (2BaseTL-0/10PassTS-0) and not available for the -R subtypes.

Changing of the Target SNR Margin MUST be performed when the link is Down. Attempts to change this object MUST be rejected with the error inconsistentValue, if the link is Up or Initializing.

Note that current SNR Margin of the PMEs comprising the EFMcu port is represented by efmCuPmeSnrMgn."

REFERENCE

"[[802.3ah](#)] 61.1.2"
 ::= { efmCuPortConfEntry 5 }

efmCuThreshLowBandwidth OBJECT-TYPE
SYNTAX Unsigned32(0..100000)
UNITS "Kbps"
MAX-ACCESS read-write
STATUS current
DESCRIPTION

"This object configures the EFMcu port Low Bandwidth alarm threshold. When the current value of ifSpeed for this port reaches or drops below this threshold, an efmCuLowBandwidth notification MAY be generated if enabled by efmCuLowBandwidthEnable.

The value of 0 means no efmCuLowBandwidth notifications SHALL ever be generated.

This object is read-write for the -0 subtype EFMcu ports (2BaseTL-0/10PassTS-0) and not available for the -R subtypes."
 ::= { efmCuPortConfEntry 6 }

efmCuLowBandwidthEnable OBJECT-TYPE

SYNTAX TruthValue

MAX-ACCESS read-write

STATUS current

DESCRIPTION

"Indicates whether efmCuLowBandwidth notifications should be generated for this interface.

Value of truth(1) indicates that efmCuLowBandwidth notification is enabled. Value of false(0) indicates the it is disabled."

::= { efmCuPortConfEntry 7 }

efmCuPortCapabilityTable OBJECT-TYPE

SYNTAX SEQUENCE OF EfmCuPortCapabilityEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"Table for Capabilities of EFMcu 2BaseTL/10PassTS (PCS) Ports. Entries in this table MUST 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     TruthValue,
    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

"[[802.3ah](#)] 61.2.2, 30.11.1.1.4, 45.2.3.17.1"

::= { efmCuPortCapabilityEntry 1 }

efmCuPeerPAFSupported OBJECT-TYPE

SYNTAX TruthValue

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 or cannot be reached because of the link state, SHALL return a value of false(2).

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

"[[802.3ah](#)] 61.2.2, 30.11.1.1.9, 45.2.3.17.2"
::= { 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

"[[802.3ah](#)] 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).
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

"[[802.3ah](#)] 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
    2BaseTL/10PassTS ports. 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),           -- peer Phy cannot be reached
    pmeSubTypeMismatch(1), -- Assigned PMEs Sub-type Mismatch
    lowBandwidth(2)     -- Low Bandwidth
}
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 - peer PHY cannot be reached (e.g.

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no PMEs attached, all PMEs are Down etc.) More info is available in efmCuPmeFltStatus.

pmeSubTypeMismatch - PMEs in the aggregation group are not of the same sub-type, e.g. PMEs with -0 and -R subtype

lowBandwidth - ifSpeed of the port reached or dropped below efmCuThreshLowBandwidth

This object is intended to supplement ifOperStatus object in IF-MIB.

Additional information is available via efmCuPmeFltStatus object for each PME in the aggregation group (single PME if PAF is disabled)."

REFERENCE

"ifOperStatus in IF-MIB; efmCuPmeFltStatus"
::= { efmCuPortStatusEntry 1 }

efmCuPortSide OBJECT-TYPE

SYNTAX INTEGER {
subscriber(1), -- -R sub-type
office(2), -- -0 sub-type
unknown(3) -- no PMEs assigned or PME sub-type mismatch
}

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"EFM port mode of operation (subtype).

The value of 'subscriber' indicates 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 '-0' subtype (all PMEs assigned to this port are of subtype '-0').

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

"[[802.3ah](#)] 61.1, 30.11.1.1.2"
 ::= { efmCuPortStatusEntry 2 }

efmCuNumPMEs OBJECT-TYPE
SYNTAX Unsigned32 (0..32)
MAX-ACCESS read-only
STATUS current

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DESCRIPTION

"Number of PMEs that is currently aggregated by the local PAF (assigned to the EFMCu port using 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 ifStackTable."

REFERENCE

"[[802.3ah](#)] 61.2.2, 30.11.1.1.6"
 ::= { efmCuPortStatusEntry 3 }

efmCuPAFInErrors OBJECT-TYPE

SYNTAX Counter32
MAX-ACCESS read-only
STATUS current

DESCRIPTION

"A 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."

REFERENCE

"[[802.3ah](#)] 45.2.3.21"
 ::= { efmCuPortStatusEntry 4 }

efmCuPAFInSmallFragments OBJECT-TYPE

SYNTAX Counter32
MAX-ACCESS read-only
STATUS current

DESCRIPTION

"A 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."

REFERENCE

"[[802.3ah](#)] 45.2.3.22"
 ::= { efmCuPortStatusEntry 5 }

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efmCuPAFInLargeFragments OBJECT-TYPE

SYNTAX Counter32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"A 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."

REFERENCE

"[[802.3ah](#)] 45.2.3.23"
 ::= { efmCuPortStatusEntry 6 }

efmCuPAFInBadFragments OBJECT-TYPE

SYNTAX Counter32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"A number of fragments which do not fit into the sequence expected by the frame assembly function, 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."

REFERENCE

"[[802.3ah](#)] 45.2.3.25"
 ::= { efmCuPortStatusEntry 7 }

efmCuPAFInLostFragments OBJECT-TYPE

SYNTAX Counter32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"A 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."

REFERENCE

"[[802.3ah](#)] 45.2.3.26"
 ::= { efmCuPortStatusEntry 8 }

efmCuPAFInLostStarts OBJECT-TYPE

SYNTAX Counter32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"A 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."

REFERENCE

"[[802.3ah](#)] 45.2.3.27"

::= { efmCuPortStatusEntry 9 }

efmCuPAFInLostEnds OBJECT-TYPE

SYNTAX Counter32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"A 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 start of fragment register."

REFERENCE

"[[802.3ah](#)] 45.2.3.28"

::= { efmCuPortStatusEntry 10 }

efmCuPAFInOverflows OBJECT-TYPE

SYNTAX Counter32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"A number of fragements, received accross 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."
REFERENCE
    "[802.3ah] 45.2.3.24"
 ::= { efmCuPortStatusEntry 11 }

-- PME Notifications Group

efmCuPmeNotifications OBJECT IDENTIFIER ::= { efmCuPme 0 }

-- EdNote: Should I add more notifications here, for example
--     efmCuPmePerfES,
--     efmCuPmePerfSES,
--     efmCuPmePerfCRCAnomalies,
--     efmCuPmePerfLOSWS,
--     efmCuPmePerfUAS,
--     efmCuPmeDeviceFault,
--     efmCuPmeLocalPowerLoss
-- Another option would be to reference HDSL2-SHDSL-LINE-MIB
-- or VDSL-LINE-EXT-MCM-MIB, reusing notifications defined there.

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."
        -- EdNote: add throttling limitations here
 ::= { 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."
-- EdNote: add throttling limitations here
::= { 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."
    -- EdNote: add throttling limitations here
    ::= { 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 requested
    configuration profile."
    -- EdNote: add throttling limitations here
    ::= { efmCuPmeNotifications 4 }
```

```
efmCuPmeProtocolInitFailure NOTIFICATION-TYPE
OBJECTS {
    efmCuPmeFltStatus,
    efmCuPmeOperSubType
}
STATUS      current
DESCRIPTION
    "This notification indicates that peer PME was using
    incompatible protocol during initialization."
    -- EdNote: add throttling limitations here
    ::= { 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 2BaseTL/10PassTS PME ports (modems). Configuration of aspects specific to 2BaseTL or 10PassTS PME types is represented in efmCuPme2BConfTable and efmCuPme10PConfTable respectively.

Entries in this table MUST 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	ProfileIndex,
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),

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```

    ieee10PassTSR(4),
    ieee2BaseTLor10PassTSR(5),
    ieee2BaseTLor10PassTS0(6),
    ieee10PassTSor2BaseTLO(7)
}
MAX-ACCESS    read-write
STATUS        current
DESCRIPTION
    "Administrative (desired) sub-type of the PME.
    Possible values are:
        ieee2BaseTLO          - PME shall operate as 2BaseTL-0
        ieee2BaseTLR         - PME shall operate as 2BaseTL-R
        ieee10PassTS0        - PME shall operate as 10PassTS-0
        ieee10PassTSR        - PME shall operate as 10PassTS-R
        ieee2BaseTLor10PassTSR - PME shall operate as 2BaseTL-R or
                                10PassTS-R. Actual value will be
                                set by -0 link partner during
                                initialization (handshake).
        ieee2BaseTLor10PassTS0 - PME shall operate as 2BaseTL-0
                                (preferred) or 10PassTS-0. Actual
                                value will be set during
                                initialization depending on -R
                                link partner capability (i.e. if
                                -R is incapable of the preferred
                                2BaseTL mode, 10PassTS will be
                                used).
        ieee10PassTSor2BaseTLO - PME shall operate as 10PassTS-0
                                (preferred) or 2BaseTL-0. Actual
                                value will be set during
                                initialization depending on -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 ignored if the link is Up or Initializing.

Attempts to change this object to an unsupported subtype (see efmCuPmeSubTypesSupported) SHALL be rejected.

The current operational sub type is indicated by efmCuPmeOperSubType variable.

If a Clause 45 MDIO Interface to the PMA/PMD is present, then this object combines values of the Port sub-type select bits and the PMA/PMD type selection bits in the 10P/2B

PMA/PMD control register"
REFERENCE
"[[802.3ah](#)] 61.1, 45.2.1.11.4, 45.2.1.11.7"
 ::= { efmCuPmeConfEntry 1 }

efmCuPmeAdminProfile OBJECT-TYPE

SYNTAX ProfileIndex

MAX-ACCESS read-write

STATUS current

DESCRIPTION

"Desired PME configuration profile. This object is a pointer to an entry in either efmCuPme2BConfProfileTable or efmCuPme10PConfProfileTable, depending on the current operating SubType of the PME. The value of this object is the index of the referenced profile.

Note that if PME is assigned to a PCS port and value of efmCuAdminProfile for that port is not an empty list, then the profile(s) referenced by efmCuAdminProfile takes precedence over the profile referenced by efmCuPmeAdminProfile, i.e. the PME SHALL be configured according to efmCuAdminProfile.

This object is writable and readable for the C0 subtype PMEs (2BaseTL-0 or 10PasSTS-0). It is unavailable for the CPE subtype (2BaseTL-R or 10PasSTS-R).

Note that current operational Profile value is available via efmCuPmeOperProfile object.

Modification of this object must be performed when the link is Down. Attempts to change this object MUST 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, MUST be rejected."

REFERENCE

"[802.3ah] 30.11.2.1.6"
 ::= { efmCuPmeConfEntry 2 }

efmCuPAFRemoteDiscoveryCode OBJECT-TYPE

SYNTAX PhysAddress

MAX-ACCESS read-write

STATUS current

DESCRIPTION

"PAF Remote Discovery Code of the PME port at C0.

A 6 Byte long Discovery Code of the peer PCS connected via the PME.

Reading this object results in a Discovery Get operation.

Writing a zero to this object 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.

This object does not exist in CPE port subtypes. A zero length octet string SHALL be returned for CPE port subtypes and also when PAF aggregation is not enabled.

Discovery MUST be performed when the link is Down.

Attempts to change this object MUST be rejected 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

"[802.3ah] 61.2.2.8.4, 45.2.6.6-45.2.6.8"

::= { 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, a efmCuPmeLineAtnCrossing notification MAY be generated, if enabled by efmCuPmeLineAtnCrossingEnable.

This object is writable for the CO subtype PMEs (-O).
It is read-only for the CPE subtype (-R).

Changing of the Line Attenuation Threshold must be performed when the link is Down. Attempts to change this object MUST be rejected 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 will map to the Loop attenuation threshold bits in the 2B PMD line quality thresholds register"

REFERENCE

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```
"[802.3ah] 45.2.1.36"  
 ::= { 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, a efmCuPmeSnrMgnCrossing notification MAY be generated, if enabled by efmCuPmeSnrMgnCrossingEnable.

This object is writable for the CO subtype PMEs (2BaseTL-0/10PassTS-R). It is read-only for the CPE subtype (2BaseTL-R/10PassTS-R).

Changing of the SNR Margin Threshold must be performed when

the link is Down. Attempts to change this object MUST be rejected 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 will map to the SNR margin threshold bits in the 2B PMD line quality thresholds register"

REFERENCE

"[[802.3ah](#)] 45.2.1.36"

::= { efmCuPmeConfEntry 5 }

efmCuPmeLineAtnCrossingEnable OBJECT-TYPE

SYNTAX TruthValue

MAX-ACCESS read-write

STATUS current

DESCRIPTION

"Indicates whether efmCuPmeLineAtnCrossing notifications should be generated for this interface.

Value of truth(1) indicates that efmCuPmeLineAtnCrossing notification is enabled. Value of false(0) indicates the it 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.

Value of truth(1) indicates that efmCuPmeSnrMgnCrossing notification is enabled. Value of false(0) indicates the it 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.

Value of truth(1) indicates that efmCuPmeDeviceFault notification is enabled. Value of false(0) indicates the it 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.

Value of truth(1) indicates that efmCuPmeConfigInitFailure notification is enabled. Value of false(0) indicates the it 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.

Value of truth(1) indicates that efmCuPmeProtocolInitFailure notification is enabled. Value of false(0) indicates the it is disabled."

::= { efmCuPmeConfEntry 10 }

efmCuPmeCapabilityTable OBJECT-TYPE

SYNTAX SEQUENCE OF EfmCuPmeCapabilityEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"Table for Configuration of common aspects for EFMCu 2BaseTL/10PassTS PME ports (modems). Configuration of aspects

specific to 2BaseTL or 10PassTS PME types is represented in efmCuPme2BConfTable and efmCuPme10PConfTable respectively.

Entries in this table MUST 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 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 }
```

```
::= { efmCuPmeCapabilityTable 1 }
```

EfmCuPmeCapabilityEntry ::=

```
SEQUENCE {
```

```
    efmCuPmeSubTypesSupported      BITS
```

```
}
```

efmCuPmeSubTypesSupported OBJECT-TYPE

```
SYNTAX      BITS {
```

```
    ieee2BaseTLO(0),
```

```
    ieee2BaseTLR(1),
```

```
    ieee10PassTSO(2),
```

```
    ieee10PassTSR(3)
```

```
}
```

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

```
STATUS      current
```

```
DESCRIPTION
```

"PME supported sub-types. This is a bitmap of possible sub-types. The various bit positions are:

ieee2BaseTLO - PME is capable of operating as 2BaseTL-0

ieee2BaseTLR - PME is capable of operating as 2BaseTL-R

ieee10PassTSO - PME is capable of operating as 10PassTS-0

ieee10PassTSR - PME is capable of operating as 10PassTS-R

An actual mode of operation is determined by efmCuPmeAdminSubType.

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 CO supported and CPE supported bits in the 10P/2B PMA/PMD status register"

REFERENCE

"[802.3ah] 61.1, 45.2.1.4.1, 45.2.1.4.2, 45.2.1.12.2, 45.2.1.12.3"

::= { efmCuPmeCapabilityEntry 1 }

efmCuPmeStatusTable OBJECT-TYPE

SYNTAX SEQUENCE OF EfmCuPmeStatusEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"Table for Configuration of common aspects for EFMcu 2BaseTL/10PassTS PME ports (modems). Configuration of aspects specific to 2BaseTL or 10PassTS PME types is represented in efmCuPme2BConfTable and efmCuPme10PConfTable respectively.

Entries in this table MUST be maintained in a persistent manner."

::= { efmCuPme 3 }

efmCuPmeStatusEntry OBJECT-TYPE

SYNTAX EfmCuPmeStatusEntry

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 }

::= { efmCuPmeStatusTable 1 }

EfmCuPmeStatusEntry ::=

SEQUENCE {

efmCuPmeOperStatus INTEGER,

efmCuPmeFltStatus BITS,

efmCuPmeOperSubType INTEGER,

efmCuPmeOperProfile ProfileIndexOrZero,

efmCuPmeSnrMgn Integer32,

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```
    efmCuPmePeerSnrMgn          Integer32,
    efmCuPmeLineAtn            Integer32,
    efmCuPmePeerLineAtn        Integer32,
    efmCuPmeTCCodingErrors      Counter32
}
```

efmCuPmeOperStatus OBJECT-TYPE

```
SYNTAX      INTEGER {
    up(1),                -- link is Up
    downNotReady(2),      -- link is Down and not Ready
    downReady(3),         -- link is Down and Ready
    init(4)                -- link is Initializing
}
```

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"Current PME link Operational Status. Possible values are:

- up(1) - link is Up and ready to pass 64/65B encoded frames or fragments.
- downNotReady(2) - 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) - link is Down and the PME detects Handshake tones from its peer.
- init(4) - link is initializing, as a result of ifAdminStatus being set to 'up' for a particular PME or a PCS the PME is connected to.

This object is intended to supplement Down state of ifOperStatus.

This object partially maps to the Clause 30 attribute aPMEStatus.

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

```
"[802.3ah] 30.11.2.1.3, 45.2.1.12.4"
 ::= { efmCuPmeStatusEntry 1 }
```

efmCuPmeFltStatus OBJECT-TYPE

```
SYNTAX      BITS {
    lossOfFraming(0),      -- Loss of Framing
    snrMgnDefect(1),      -- SNR Margin dropped below Threshold
    lineAtnDefect(2),     -- Line Attenuation exceeds Threshold
```

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```
    deviceFault(3),      -- Vendor-dependent diag or self-test
                        -- fault
    configInitFailure(4), -- Configuration Init. failure
    protocolInitFailure(5) -- Protocol Initialization failure
}
MAX-ACCESS    read-only
STATUS        current
DESCRIPTION
    "Current 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 64/65B 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 configuration profile,
                        requested during initialization.
    protocolInitFailure - Protocol initialization failure,
                        due to incompatible protocol used by
                        the Peer PME during init (that could
                        happen if a peer PMD is G.SDHSL/VDSL
                        modem for 2BaseTL/10PassTS PME
                        respectively).
```

This object is intended to supplement ifOperStatus in IF-MIB.

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

"[[802.3ah](#)] 30.11.2.1.3, 45.2.1.2.1, 45.2.1.38, 45.2.1.39, 45.2.1.54"

::= { efmCuPmeStatusEntry 2 }

efmCuPmeOperSubType OBJECT-TYPE

SYNTAX INTEGER {
ieee2BaseTLO(1),
ieee2BaseTLR(2),
ieee10PassTSO(3),
ieee10PassTSR(4)
}

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"Current operational sub-type of the PME.

Possible values are:

ieee2BaseTLO	- PME operates as 2BaseTL-O
ieee2BaseTLR	- PME operates as 2BaseTL-R
ieee10PassTSO	- PME operates as 10PassTS-O
ieee10PassTSR	- PME operates as 10PassTS-R

The operational sub type of the PME can be configured via efmCuPmeAdminSubType variable.

If a Clause 45 MDIO Interface to the PMA/PMD is present, then this object combines values of the Port sub-type 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

"[[802.3ah](#)] 61.1, 45.2.1.11.4, 45.2.1.11.7, 45.2.1.12.4"

::= { efmCuPmeStatusEntry 3 }

efmCuPmeOperProfile OBJECT-TYPE

SYNTAX ProfileIndexOrZero
MAX-ACCESS read-only
STATUS current
DESCRIPTION

"PME current operating Profile. This object is a pointers to an entry in either efmCuPme2BConfProfileTable or efmCuPme10PConfProfileTable, depending on the current operating SubType of the PME as indicated by efmCuPmeOperSubType.
The value of zero indicates that PME is down or initializing.

This object partially maps to the aOperatingProfile attribute in Clause 30."

REFERENCE
"[[802.3ah](#)] 30.11.2.1.7"
::= { efmCuPmeStatusEntry 4 }

efmCuPmeSnrMgn OBJECT-TYPE
SYNTAX Integer32(-127..128)

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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.

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
"[[802.3ah](#)] 30.11.2.1.4, 45.2.1.16"
::= { efmCuPmeStatusEntry 5 }

efmCuPmePeerSnrMgn OBJECT-TYPE
SYNTAX Integer32(-127..128)
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.

This object is not supported by -R PME subtypes.

If a Clause 45 MDIO Interface is present, then this object maps to the 10P/2B link partner RX SNR margin register."

REFERENCE

"[[802.3ah](#)] 45.2.1.17"

::= { efmCuPmeStatusEntry 6 }

efmCuPmeLineAtn OBJECT-TYPE

SYNTAX Integer32(-127..128)

UNITS "dB"

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The current Line Attenuation in dB as perceived by the local PME.

If a Clause 45 MDIO Interface is present, then this object maps to the Line Attenuation register"

REFERENCE

"[[802.3ah](#)] 45.2.1.18"

::= { efmCuPmeStatusEntry 7 }

efmCuPmePeerLineAtn OBJECT-TYPE

SYNTAX Integer32(-127..128)

UNITS "dB"

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The current Line Attenuation in dB as perceived by the remote (link partner) PME.

This object is not supported by CPE port subtypes.

If a Clause 45 MDIO Interface is present, then this object maps to the 20P/2B link partner Line Attenuation register."

REFERENCE

```
"[802.3ah] 45.2.1.19"
 ::= { efmCuPmeStatusEntry 8 }
```

```
efmCuPmeTCCodingErrors OBJECT-TYPE
```

```
SYNTAX Counter32
```

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

```
STATUS current
```

```
DESCRIPTION
```

"A 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.

If a Clause 45 MDIO Interface to the PME TC is present, then this object maps to the TC coding violations register (see 45.2.6.12)."

```
REFERENCE
```

```
"[802.3ah] 61.3.3.1, 45.2.6.12"
```

```
 ::= { efmCuPmeStatusEntry 9 }
```

```
-- 2BaseTL specific PME group
```

```
efmCuPme2B OBJECT IDENTIFIER ::= { efmCuPme 5 }
```

```
efmCuPme2BConfProfileTable OBJECT-TYPE
```

```
SYNTAX SEQUENCE OF EfmCuPme2BConfProfileEntry
```

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

```
STATUS current
```

```
DESCRIPTION
```

"This table supports definitions of configuration profiles for 2BaseTL PMEs.

First 12 entries in this table SHALL always be defined as follows (see 802.3ah Annex 63A):

```
-----+-----+-----+-----+-----
```

```
Profile Rate Power Region Constellation
index (Kbps) (dBm) (G.991.2)
```

```
-----+-----+-----+-----+-----
```

1	5696	13.5	Annex A	32-TCPAM
2	3072	13.5	Annex A	32-TCPAM
3	2048	13.5	Annex A	16-TCPAM
4	1024	13.5	Annex A	16-TCPAM
5	704	13.5	Annex A	16-TCPAM

6	512	13.5	Annex A	16-TCPAM
7	5696	14.5	Annex B	32-TCPAM
8	3072	14.5	Annex B	32-TCPAM
9	2048	14.5	Annex B	16-TCPAM
10	1024	13.5	Annex B	16-TCPAM
11	704	13.5	Annex B	16-TCPAM
12	512	13.5	Annex B	16-TCPAM

These default entries SHALL be created by default and MUST not be deleted.

Entries following the first 12, can be dynamically created and deleted, to provide custom profiles.

This table MUST be maintained in a persistent manner."

REFERENCE

"[[802.3ah](#)] Annex 63A, 30.11.2.1.6"
::= { efmCuPme2B 2 }

efmCuPme2BConfProfileEntry OBJECT-TYPE

SYNTAX EfmCuPme2BConfProfileEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"Each entry corresponds to a single 2BaseTL PME configuration profile. Each profile contains a set of configuration parameters, which are applied to all 2BaseTL-0 PMEs assigned to the 2BaseTL (PCS) port, referencing that profile via efmCuAdminProfile object or, if efmCuAdminProfile is zero, all 2BaseTL-0 PMEs, referencing that profile via efmCuPmeAdminProfile.

Profiles may be created/deleted using the row creation/deletion mechanism via efmCuPme2BProfileRowStatus. If an active entry is referenced, the entry MUST remain 'active' until all references are removed.

Default entries (first 12) MUST not be removed."

INDEX { efmCuPme2BProfileIndex }

::= { efmCuPme2BConfProfileTable 1 }

```

SEQUENCE {
    efmCuPme2BProfileIndex      ProfileIndex,
    efmCuPme2BProfileDescr     SnmpAdminString,
    efmCuPme2BRegion           INTEGER,
    efmCuPme2BDataRate         Unsigned32,
    efmCuPme2BPower            Unsigned32,
    efmCuPme2BConstellation    INTEGER,
    efmCuPme2BProfileRowStatus RowStatus
}

```

efmCuPme2BProfileIndex OBJECT-TYPE

```

SYNTAX      ProfileIndex
MAX-ACCESS  not-accessible
STATUS      current
DESCRIPTION
    "2BaseTL PME Profile index.
    This object is the unique index associated with this profile.
    Entries in this table are referenced via efmCuAdminProfile
    or efmCuPmeAdminProfile objects."
 ::= { efmCuPme2BConfProfileEntry 1 }

```

efmCuPme2BProfileDescr OBJECT-TYPE

```

SYNTAX      SnmpAdminString (SIZE(0..255))
MAX-ACCESS  read-create
STATUS      current
DESCRIPTION
    "A textual string containing information about 2BaseTL PME
    Profile. The string MAY include information about data rate
    and spectral limitations of this particular profile."
 ::= { efmCuPme2BConfProfileEntry 2 }

```

efmCuPme2BRegion OBJECT-TYPE

```

SYNTAX      INTEGER {
    regionA(1), -- Annex A
    regionB(2), -- Annex B
    regionC(3)  -- Annex C
}
MAX-ACCESS  read-create
STATUS      current
DESCRIPTION
    "Desired Power Spectral Density (PSD) Regional setting as
    specified in Regional Annex of [ITU-T G.991.2] to operate
    under.

```

Possible values for this object are:

```

    regionA      -- Annex A
    regionB      -- Annex B

```

regionC -- Annex C

Changing Regional Annex must be performed when the link is Down. Attempts to change this object MUST be rejected 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 Region bits in the 2B general parameter register."

REFERENCE

"[[802.3ah](#)] 45.2.1.42"

::= { efmCuPme2BConfProfileEntry 3 }

efmCuPme2BDataRate OBJECT-TYPE

SYNTAX Unsigned32(0..5696)

UNITS "Kbps"

MAX-ACCESS read-create

STATUS current

DESCRIPTION

"Desired 2BaseTL PME Data Rate.

The rate is fixed when the value of this object is $n \times 64$ Kbps, where $n=3..60$ for 16-TCPAM and $n=12..89$ for 32-TCPAM.

The value of 0 means that data rate is not fixed but is adaptive and should be set to the maximum attainable rate during line probing.

If a Clause 45 MDIO Interface to the PME is present, then this object maps to the Min/Max Data Rate1 bits in the 2B PMD parameters register."

REFERENCE

"[[802.3ah](#)] 45.2.1.43"

::= { efmCuPme2BConfProfileEntry 4 }

efmCuPme2BPower OBJECT-TYPE

SYNTAX Unsigned32(10..42)

UNITS "0.5 dBm"

MAX-ACCESS read-create

STATUS current

DESCRIPTION

"Desired Signal Transmit Power. Multiple of 0.5dBm.

Changing of the Signal Transmit Power must be performed when the link is Down. Attempts to change this object MUST be rejected 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 will map to the Power1 bits in the 2B PMD parameters register"

REFERENCE

"[[802.3ah](#)] 45.2.1.43"

::= { efmCuPme2BConfProfileEntry 5 }

efmCuPme2BConstellation OBJECT-TYPE

SYNTAX INTEGER {
tcpam16(1), -- 16-TCPAM
tcpam32(2) -- 32-TCPAM
}

MAX-ACCESS read-create

STATUS current

DESCRIPTION

"Desired TCPAM Constellation of the 2BaseTL PME. The possible values are:

tcpam16(1) - 16-TCPAM
tcpam32(2) - 32-TCPAM

If a Clause 45 MDIO Interface to the PME is present, then this object map to the Constellation1 bits in the 2B general parameter register."

REFERENCE

"[[802.3ah](#)] 45.2.1.43"

::= { efmCuPme2BConfProfileEntry 6 }

efmCuPme2BProfileRowStatus OBJECT-TYPE

SYNTAX RowStatus

MAX-ACCESS read-create

STATUS current

DESCRIPTION

"This object controls creation/deletion of the associated entry in efmCuPme2BConfProfileTable per the semantics of RowStatus.

If an 'active' entry is referenced via efmCuAdminProfile or efmCuPmeAdminProfile, the entry MUST remain 'active' until all references are removed."

::= { efmCuPme2BConfProfileEntry 7 }

-- 10PassTS specific PME group

efmCuPme10P OBJECT IDENTIFIER ::= { efmCuPme 6 }

efmCuPme10PConfProfileTable OBJECT-TYPE

SYNTAX SEQUENCE OF EfmCuPme10PConfProfileEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

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"This table supports definitions of configuration profiles for 10PassTL PMEs.

First 22 entries in this table SHALL always be defined as follows (see 802.3ah Annex 62B.3):

Profile Index	Bandplan PSDMask#	UPBO p#	BandNotch p#	DRate p#	URate p#
1	1	3	2,6,10,11	20	20(default)
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 by default and MUST

not be deleted.

Entries following the first 22, can be dynamically created and deleted, to provide custom profiles.

This table MUST be maintained in a persistent manner."

REFERENCE

"[[802.3ah](#)] Annex 62B.3, 30.11.2.1.6"
 ::= { efmCuPme10P 1 }

efmCuPme10PConfProfileEntry OBJECT-TYPE

SYNTAX EfmCuPme10PConfProfileEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"Each entry corresponds to a single 10PasSTS PME configuration

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profile. Each profile contains a set of configuration parameters, which are applied to all PMEs assigned to the 10PasSTS (PCS) port, referencing that profile via efmCuAdminProfile object, or, if efmCuAdminProfile is zero, to all PMEs referencing that profile via efmCuPmeAdminProfile. Profiles may be created/deleted using the row creation/deletion mechanism via efmCuPme10PProfileRowStatus. If an 'active' entry is referenced, the entry MUST remain 'active' until all references are removed.

Default entries (first 22) MUST not be removed."

INDEX { efmCuPme10PProfileIndex }

::= { efmCuPme10PConfProfileTable 1 }

EfmCuPme10PConfProfileEntry ::=

SEQUENCE {

efmCuPme10PProfileIndex	ProfileIndex,
efmCuPme10PProfileDescr	SnmpAdminString,
efmCuPme10PBandplanPSDMskProfile	INTEGER,
efmCuPme10PUPBReferenceProfile	INTEGER,
efmCuPme10PBandNotchProfiles	BITS,
efmCuPme10PPayloadURateProfile	INTEGER,
efmCuPme10PPayloadDRateProfile	INTEGER,
efmCuPme10PProfileRowStatus	RowStatus

}

efmCuPme10PProfileIndex OBJECT-TYPE

SYNTAX ProfileIndex
MAX-ACCESS not-accessible
STATUS current
DESCRIPTION

"10PasSTS PME Profile Index.
This object is the unique index associated with this profile.
Entries in this table are referenced via efmCuAdminProfile or
efmCuPmeAdminProfile."

::= { efmCuPme10PConfProfileEntry 1 }

efmCuPme10PProfileDescr OBJECT-TYPE

SYNTAX SnmpAdminString (SIZE(0..255))
MAX-ACCESS read-create
STATUS current
DESCRIPTION

"A textual string containing information about 10PasSTS PME
Profile. The string MAY include information about data rate
and spectral limitations of this particular profile."

::= { efmCuPme10PConfProfileEntry 2 }

efmCuPme10PBandplanPSDMskProfile OBJECT-TYPE

SYNTAX INTEGER {-- PSD Mask Bands Bandplan

profile1(1),	-- T1.424/T-U P1 FTTCab.M1	x/D/U/D/U	A
profile2(2),	-- T1.424/T-U P1 FTTEEx.M1		
profile3(3),	-- T1.424/T-U P1 FTTCab.M2		
profile4(4),	-- T1.424/T-U P1 FTTEEx.M2		
profile5(5),	-- T1.424/T-U P1 FTTCab.M1	D/D/U/D/U	
profile6(6),	-- T1.424/T-U P1 FTTEEx.M1		
profile7(7),	-- T1.424/T-U P1 FTTCab.M2		
profile8(8),	-- T1.424/T-U P1 FTTEEx.M2		
profile9(9),	-- T1.424/T-U P1 FTTCab.M1	U/D/U/D/x	
profile10(10),	-- T1.424/T-U P1 FTTEEx.M1		
profile11(11),	-- T1.424/T-U P1 FTTCab.M2		
profile12(12),	-- T1.424/T-U P1 FTTEEx.M2		
profile13(13),	-- TS1 101 270-1 Pcab.M1.A	x/D/U/D/U	B
profile14(14),	-- TS1 101 270-1 Pcab.M1.B		
profile15(15),	-- TS1 101 270-1 Pex.P1.M1		
profile16(16),	-- TS1 101 270-1 Pex.P2.M1		
profile17(17),	-- TS1 101 270-1 Pcab.M2		
profile18(18),	-- TS1 101 270-1 Pex.P1.M2		

```

profile19(19), -- TS1 101 270-1 Pex.P2.M2
profile20(20), -- TS1 101 270-1 Pcab.M1.A   U/D/U/D/x
profile21(21), -- TS1 101 270-1 Pcab.M1.B
profile22(22), -- TS1 101 270-1 Pex.P1.M1
profile23(23), -- TS1 101 270-1 Pex.P2.M1
profile24(24), -- TS1 101 270-1 Pcab.M2
profile25(25), -- TS1 101 270-1 Pex.P1.M2
profile26(26), -- TS1 101 270-1 Pex.P2.M2
profile27(27), -- G.993.1 F.1.2.1 (VDSL0POTS) x/D/U/D/U   F
profile28(28), -- G.993.1 F.1.2.2 (VDSL0TCM-ISDN)
profile29(29)  -- G.993.1 F.1.2.3 (PSD reduction)

```

```

}
MAX-ACCESS    read-create
STATUS        current
DESCRIPTION

```

"10PasSTS PME Bandplan and PSD Mask profile,
as specified in 802.3ah Annex 62A. Possible values are:

Profile Name	PSD Mask	Bands	Bandplan
profile1(1)	- T1.424/T-U P1 FTTCab.M1	x/D/U/D/U	A
profile2(2)	- T1.424/T-U P1 FTTEEx.M1		
profile3(3)	- T1.424/T-U P1 FTTCab.M2		
profile4(4)	- T1.424/T-U P1 FTTEEx.M2		
profile5(5)	- T1.424/T-U P1 FTTCab.M1	D/D/U/D/U	
profile6(6)	- T1.424/T-U P1 FTTEEx.M1		
profile7(7)	- T1.424/T-U P1 FTTCab.M2		
profile8(8)	- T1.424/T-U P1 FTTEEx.M2		
profile9(9)	- T1.424/T-U P1 FTTCab.M1	U/D/U/D/x	
profile10(10)	- T1.424/T-U P1 FTTEEx.M1		

```

profile11(11) - T1.424/T-U P1 FTTCab.M2
profile12(12) - T1.424/T-U P1 FTTEEx.M2
profile13(13) - TS1 101 270-1 Pcab.M1.A   x/D/U/D/U   B
profile14(14) - TS1 101 270-1 Pcab.M1.B
profile15(15) - TS1 101 270-1 Pex.P1.M1
profile16(16) - TS1 101 270-1 Pex.P2.M1
profile17(17) - TS1 101 270-1 Pcab.M2
profile18(18) - TS1 101 270-1 Pex.P1.M2
profile19(19) - TS1 101 270-1 Pex.P2.M2
profile20(20) - TS1 101 270-1 Pcab.M1.A   U/D/U/D/x
profile21(21) - TS1 101 270-1 Pcab.M1.B

```

```

profile22(22) - TS1 101 270-1 Pex.P1.M1
profile23(23) - TS1 101 270-1 Pex.P2.M1
profile24(24) - TS1 101 270-1 Pcab.M2
profile25(25) - TS1 101 270-1 Pex.P1.M2
profile26(26) - TS1 101 270-1 Pex.P2.M2
profile27(27) - G.993.1 F.1.2.1 (VDSL0POTS) x/D/U/D/U F
profile28(28) - G.993.1 F.1.2.2 (VDSL0TCM-ISDN)
profile29(29) - G.993.1 F.1.2.3 (PSD reduction)

```

This object maps to the aBandplanPSDMaskProfile attribute in Clause 30."

REFERENCE

```

"[802.3ah] Annex 62A, 30.5.1.1.22"
::= { efmCuPme10PConfProfileEntry 3 }

```

efmCuPme10PUPB0ReferenceProfile OBJECT-TYPE

SYNTAX INTEGER {-- Reference PSD

```

profile1(1), -- T1.424/T-U          Noise A M1
profile2(2), -- T1.424/T-U          Noise A M2
profile3(3), -- T1.424/T-U          Noise F M1
profile4(4), -- T1.424/T-U          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

```

}

MAX-ACCESS read-create

STATUS current

DESCRIPTION

"10PasSTS PME Upstream Power Back-Off (UPBO) Reference PSD Profile, as specified in 802.3ah Annex 62A. Possible values are:

```

profile1(1) - T1.424/T-U          Noise A M1
profile2(2) - T1.424/T-U          Noise A M2
profile3(3) - T1.424/T-U          Noise F M1
profile4(4) - T1.424/T-U          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

This object maps to the aUPB0ReferenceProfile attribute in Clause 30."

REFERENCE

"[802.3ah] Annex 62A.3.4, 30.5.1.1.23"
 ::= { efmCuPme10PConfProfileEntry 4 }

```
efmCuPme10PBandNotchProfiles OBJECT-TYPE
SYNTAX BITS { -- G.991.3 T1.424/T-U TS101 270-1 StartF EndF
               -- Table Table Table (MHz) (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
}
```

MAX-ACCESS read-create

STATUS current

DESCRIPTION

"10PassTS PME Egress Control Band Notch Profile bitmap, as specified in 802.3ah Annex 62A. Possible values are:

Profile Name	G.991.3 Table	T1.424/T-U Table	TS101 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 value of 0x0622 selects profiles 2,6,10 and 11.

This object maps to the aBandNotchProfile attribute in Clause 30."

REFERENCE

"[[802.3ah](#)] Annex 62A.3.5, 30.5.1.1.19"
 ::= { efmCuPme10PConfProfileEntry 5 }

efmCuPme10PPayloadURateProfile OBJECT-TYPE

SYNTAX INTEGER {-- Upstream Payload Rate (Mbps)

 profile5(5), -- 2.5
 profile10(10), -- 5
 profile15(15), -- 7.5
 profile20(20), -- 10
 profile25(25), -- 12.5
 profile30(30), -- 15
 profile50(50), -- 25
 profile70(70), -- 35
 profile100(100) -- 50

}

MAX-ACCESS read-create

STATUS current

DESCRIPTION

"10PassTS PME Upstream Payload Rate Profile,
 as specified in 802.3ah Annex 62A. Possible values are:

 profile5(5) - 2.5 Mbps
 profile10(10) - 5 Mbps
 profile15(15) - 7.5 Mbps
 profile20(20) - 10 Mbps
 profile25(25) - 12.5 Mbps
 profile30(30) - 15 Mbps
 profile50(50) - 25 Mbps
 profile70(70) - 35 Mbps
 profile100(100) - 50 Mbps

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.

This object maps to the aPayloadRateProfileUpstream attribute in Clause 30."

REFERENCE

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```
"[802.3ah] Annex 62A.3.6, 30.5.1.1.20"  
 ::= { efmCuPme10PConfProfileEntry 6 }
```

```
efmCuPme10PPayloadDRateProfile  OBJECT-TYPE  
SYNTAX      INTEGER {-- Downstream Payload Rate (Mbps)  
  profile5(5),      -- 2.5  
  profile10(10),    -- 5  
  profile15(15),    -- 7.5  
  profile20(20),    -- 10  
  profile25(25),    -- 12.5  
  profile30(30),    -- 15  
  profile50(50),    -- 25  
  profile70(70),    -- 35  
  profile100(100),  -- 50  
  profile140(140),  -- 70  
  profile200(200)   -- 100  
}  
MAX-ACCESS  read-create  
STATUS      current  
DESCRIPTION  
  "10PasSTS PME Downstream Payload Rate Profile,  
  as specified in 802.3ah Annex 62A. Possible values are:  
  profile5(5)      - 2.5 Mbps  
  profile10(10)    - 5 Mbps  
  profile15(15)    - 7.5 Mbps  
  profile20(20)    - 10 Mbps  
  profile25(25)    - 12.5 Mbps  
  profile30(30)    - 15 Mbps  
  profile50(50)    - 25 Mbps  
  profile70(70)    - 35 Mbps  
  profile100(100)  - 50 Mbps  
  profile140(140)  - 70 Mbps  
  profile200(200)  - 100 Mbps
```

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.

This object maps to the aPayloadRateProfileDownstream attribute in Clause 30."

REFERENCE

"[[802.3ah](#)] Annex 62A.3.6, 30.5.1.1.21"
 ::= { efmCuPme10PConfProfileEntry 7 }

efmCuPme10PProfileRowStatus OBJECT-TYPE

SYNTAX RowStatus

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MAX-ACCESS read-create

STATUS current

DESCRIPTION

"This object controls creation/deletion of the associated entry in efmCuPme10PConfProfileTable per the semantics of RowStatus.

If an active entry is referenced via efmCuAdminProfile or efmCuPmeAdminProfile, the entry MUST remain 'active' until all references are removed."

::= { efmCuPme10PConfProfileEntry 8 }

efmCuPme10PStatusTable OBJECT-TYPE

SYNTAX SEQUENCE OF EfmCuPme10PStatusEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"Table reflecting status of EFCu 10PassTS PMEs (modems)."

::= { efmCuPme10P 2 }

efmCuPme10PStatusEntry OBJECT-TYPE

SYNTAX EfmCuPme10PStatusEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"An entry in the EFCu 10PassTS PME Status table."

AUGMENTS { efmCuPmeStatusEntry }

::= { efmCuPme10PStatusTable 1 }

EfmCuPme10PStatusEntry ::=

SEQUENCE {

efmCuPme10PElectricalLength Integer32,

efmCuPme10PFECCorrectedBlocks Counter32,

```
efmCuPme10PFECUncorrectedBlocks Counter32
-- EdNote: To be continued
}
```

```
efmCuPme10PElectricalLength OBJECT-TYPE
SYNTAX      Integer32(0..8192|65535)
UNITS       "m"
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION
    "Electrical Length in meters as perceived by the 10PassTS PME
    after the link is established.
    The value of 65535 is returned if the link is Down or
    Initializing or the PME is unable to estimate the Electrical
    Length."
```

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If a Clause 45 MDIO Interface to the PME is present, then this object maps to the 10P Electrical Length register"

REFERENCE

```
"[802.3ah] 45.2.1.21"
 ::= { efmCuPme10PStatusEntry 1 }
```

```
efmCuPme10PFECCorrectedBlocks OBJECT-TYPE
SYNTAX      Counter32
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION
```

"A count of received and corrected FEC codewords in 10Pass-TS PME.

This object maps to 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"

REFERENCE

```
"[802.3ah] 45.2.1.22"
 ::= { efmCuPme10PStatusEntry 2 }
```

```
efmCuPme10PFECUncorrectedBlocks OBJECT-TYPE
SYNTAX      Counter32
```

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"A count of received FEC codewords in 10Pass-TS PME, which are uncorrectable.

This object maps to 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"

REFERENCE

"[[802.3ah](#)] 45.2.1.23"

::= { efmCuPme10PStatusEntry 3 }

-- efmCuAvailableStackTable for use in Discovery

efmCuAvailableStackTable OBJECT-TYPE

SYNTAX SEQUENCE OF EfmCuAvailableStackEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"This table, modeled after ifStackTable from [IF-MIB], contains information on the possible 'on-top-of' relationships between the multiple sub-layers of network interfaces (as opposed to actual relationships in ifStackTable). In particular, it contains information on which PCS ports (sublayers) can possibly run 'on top of' which PMEs (sublayers), as determined by cross-connect capability of the EFMCu device, where each sub-layer corresponds to a conceptual row in the ifTable. For example, when the PCS port with ifIndex value x can be connected to run on top of the PME with ifIndex value y, then this table contains:

efmCuAvailableStackStatus.x.y=capable

Note that there's always at least one PCS for each PME and at least one PME for each PCS in the EFMCu devices, with efmCuPAFCapacity and efmCuPeerPAFCapacity indicating

maximum number of PMEs which can be aggregated by local and remote PCS port respectively.

This table is read only as it describes device capability"

REFERENCE

"ifStackTable of [RFC 2863](#)"

::= { efmCuObjects 3 }

efmCuAvailableStackEntry OBJECT-TYPE

SYNTAX EfmCuAvailableStackEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"Information on a particular relationship between two sub-layers, specifying that one sub-layer (PCS) runs on 'top' of the other sub-layer (PME). Each sub-layer corresponds to a conceptual row in the ifTable (interface index for PCS and PME respectively)."

INDEX {

efmCuAvailableStackHigherLayer,

efmCuAvailableStackLowerLayer

}

::= { efmCuAvailableStackTable 1 }

EfmCuAvailableStackEntry ::=

SEQUENCE {

efmCuAvailableStackHigherLayer InterfaceIndex,

efmCuAvailableStackLowerLayer InterfaceIndex,

efmCuAvailableStackStatus INTEGER

}

efmCuAvailableStackHigherLayer OBJECT-TYPE

SYNTAX InterfaceIndex

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"The value of ifIndex corresponding to the higher sub-layer of the 'cross-connect capability' relationship, i.e., the PCS sub-layer which MAY run on 'top' of the PME sub-layer identified by the corresponding instance of efmCuAvailableStackLowerLayer."

::= { efmCuAvailableStackEntry 1 }

efmCuAvailableStackLowerLayer OBJECT-TYPE

SYNTAX InterfaceIndex

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"The value of ifIndex corresponding to the lower sub-layer of the 'cross-connect capability' relationship, i.e., the PME sub-layer which MAY run 'below' the PCS sub-layer identified by the corresponding instance of efmCuAvailableStackHigherLayer."

::= { efmCuAvailableStackEntry 2 }

efmCuAvailableStackStatus OBJECT-TYPE

SYNTAX INTEGER {

capable(1),

outOfService(2)

}

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The status of the 'cross-connect capability' relationship between two sub-layers. The following values are defined:

capable(1) - the PME sub-layer interface, identified by the efmCuAvailableStackLowerLayer MAY be connected to run 'below' the PCS sub-layer interface, identified by the efmCuAvailableStackLowerLayer.

outOfService(2) - the PME sub-layer interface cannot be connected due to unavailability of the interface.

Note that PME availability per PCS, indicated by 'capable' value, can be constrained by other parameters, for example by aggregation capacity of a PCS or by the PME in question being already connected to another PCS. So, in

order to ensure that a particular PME can be connected to the PCS, all respective parameters (e.g. efmCuAvailableStackTable, ifStackTable and efmCuPAFCapacity) SHALL be inspected.

This object is read only, unlike ifStackStatus, as it

```

    describes the device capability."
 ::= { efmCuAvailableStackEntry 3 }

--
-- Conformance Statements
--

efmCuGroups      OBJECT IDENTIFIER ::= { efmCuConformance 1 }

efmCuCompliances OBJECT IDENTIFIER ::= { efmCuConformance 2 }

-- Object Groups

efmCuBasicGroup OBJECT-GROUP
  OBJECTS {
    efmCuPAFSupported,
    efmCuAdminProfile,
    efmCuTargetDataRate,
    efmCuTargetSnrMgn,
    efmCuPortSide,
    efmCuFltStatus
  }
  STATUS      current
  DESCRIPTION
    "A collection of objects required for all of EFMcu ports."
 ::= { efmCuGroups 1 }

efmCuPAFGroup OBJECT-GROUP
  OBJECTS {
    efmCuPeerPAFSupported,
    efmCuPAFCapacity,
    efmCuPeerPAFCapacity,
    efmCuPAFAdminState,
    efmCuPAFDiscoveryCode,
    efmCuPAFRemoteDiscoveryCode,
    efmCuNumPMEs,
    efmCuAvailableStackStatus
  }
  STATUS      current
  DESCRIPTION
    "A collection of objects required for 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,  
    efmCuPmeTCCodingErrors,  
    efmCuPmeThreshLineAtn,  
    efmCuPmeThreshSnrMgn
```

```
}
```

```
STATUS      current
```

```
DESCRIPTION
```

```
    "A collection of objects providing information about  
    a 2BaseTL/10PasSTS PME."
```

```
::= { efmCuGroups 4 }
```

```
efmCuAlarmConfGroup OBJECT-GROUP
```

```
OBJECTS {
```

```
    efmCuThreshLowBandwidth,  
    efmCuLowBandwidthEnable,  
    efmCuPmeThreshLineAtn,
```

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```
    efmCuPmeLineAtnCrossingEnable,
    efmCuPmeThreshSnrMgn,
    efmCuPmeSnrMgnCrossingEnable,
    efmCuPmeLineAtnCrossingEnable,
    efmCuPmeDeviceFaultEnable,
    efmCuPmeConfigInitFailEnable,
    efmCuPmeProtocolInitFailEnable
--    efmCuPmeThreshES,
--    efmCuPmethreshSES,
--    efmCuPmeThreshCRCAnomalies,
--    efmCuPmeThreshLOSWS,
--    efmCuPmeThreshUAS
}
STATUS      current
DESCRIPTION
    "A collection of objects required for configuration of alarm
    thresholds and notifications in EFMCu ports."
 ::= { efmCuGroups 5 }

efmCuNotificationGroup NOTIFICATION-GROUP
NOTIFICATIONS {
    efmCuLowBandwidth,
    efmCuPmeLineAtnCrossing,
    efmCuPmeSnrMgnCrossing,
    efmCuPmeDeviceFault,
    efmCuPmeConfigInitFailure,
    efmCuPmeProtocolInitFailure
--    efmCuPmePerfES,
--    efmCuPmePerfSES,
--    efmCuPmePerfCRCAnomalies,
--    efmCuPmePerfLOSWS,
--    efmCuPmePerfUAS,
--    efmCuPmeDeviceFault,
--    efmCuPmeLocalPowerLoss
}
STATUS      current
DESCRIPTION
    "This group supports notifications of significant conditions
    associated with EFMCu ports."
 ::= { efmCuGroups 6 }

efmCuPme2BProfileGroup OBJECT-GROUP
```

```
OBJECTS {
    efmCuPme2BProfileDescr,
    efmCuPme2BRegion,
    efmCuPme2BDataRate,
    efmCuPme2BPower,
    efmCuPme2BConstellation,
```

```
    efmCuPme2BProfileRowStatus
}
STATUS      current
DESCRIPTION
    "A collection of objects that constitute a configuration
    profile for configuration of 2BaseTL ports."
 ::= { efmCuGroups 7 }

efmCuPme10PPProfileGroup OBJECT-GROUP
OBJECTS {
    efmCuPme10PPProfileDescr,
    efmCuPme10PBandplanPSDMskProfile,
    efmCuPme10PUPB0ReferenceProfile,
    efmCuPme10PBandNotchProfiles,
    efmCuPme10PPayloadURateProfile,
    efmCuPme10PPayloadDRateProfile,
    efmCuPme10PPProfileRowStatus
}
STATUS      current
DESCRIPTION
    "A collection of objects that constitute a configuration
    profile for configuration of 10PassTS ports."
 ::= { efmCuGroups 8 }

efmCuPme10PStatusGroup OBJECT-GROUP
OBJECTS {
    efmCuPme10PElectricalLength,
    efmCuPme10PFECCorrectedBlocks,
    efmCuPme10PFECUncorrectedBlocks
}
STATUS      current
DESCRIPTION
    "A collection of objects providing status information
    specific to 10PassTS PMEs."
 ::= { efmCuGroups 9 }
```

-- Compliance Statements

efmCuCompliance MODULE-COMPLIANCE

STATUS current

DESCRIPTION

"The compliance statement for 2BaseTL/10PassTS interfaces.
Compliance with the following external compliance statements
is prerequisite:

MIB Module	Compliance Statement
-----	-----
IF-MIB	ifCompliance3

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IF-INVERTED-STACK-MIB	ifInvCompliance
EtherLike-MIB	dot3Compliance2
MAU-MIB	mauModIfCompl3"

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 {
ieee2BaseTLO(0),
ieee2BaseTLR(1),
ieee10PassTSO(2),
ieee10PassTSR(3)
}

DESCRIPTION

"Support for all subtypes is not required. However at least one value SHALL be supported"

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OBJECT efmCuPmeAdminSubType

MIN-ACCESS read-only

DESCRIPTION

"Write access is not required (needed only for PMEs supporting more than a single subtype, e.g. ieee2BaseTLO and ieee2BaseTSR or ieee2BaseTLR and ieee10PassTSR)"

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 2BaseTL and 6dB for 10PassTS."

-- EdNote: To be Continued

::= { efmCuCompliances 1 }

END

6. Security Considerations

There is a number of managed objects defined in this 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:

- o Changing of efmCuPmeAdminSubType MAY lead to a potential locking of the link, as peer PMEs of the same sub-type cannot exchange handshake messages.
- o Changing of efmCuPAFAdminState to enabled MAY lead to a potential locking of the link, if the peer Phy does not support PAF.
- o Changing of efmCuPAFDiscoveryCode, before the discovery operation, MAY lead to a wrongful discovery, with possible multiple -0 ports connecting to the same -R (both -0 ports have the same Discovery register value) and similar cases.
- o 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 ability of an EFMCu port to support a particular configuration depends on the copper environment.

- o Activation of a PME can cause a severe degradation of service for another EFMCu Phy whose PME(s) MAY be affected by the cross-talk from the newly activated PME.
- o Removal of a PME from the operationally 'up' EFMCu port, aggregating several PMEs, MAY lead a link rate degradation

The user of this MIB module must 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 this 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 EFMCu 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 evasdrop to an EFMCu transmission simply by "listening" to a cross-talk from an EFMCu pair, especially if the parameters of the EFMCu link in question are known. In such environments it is important to control even GET and NOTIFY access to these objects and possibly even to encrypt their values when sending them over the network via SNMP.

SNMP versions prior to SNMPv3 did not include adequate security. Even if the network itself is secure (for example by using IPSec), even then, 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 this MIB module.

It is RECOMMENDED that implementers consider the security features as provided by the SNMPv3 framework (see [\[RFC3410\], section 8](#)), including full support for the SNMPv3 cryptographic mechanisms (for authentication and privacy).

Further, deployment of SNMP versions prior to SNMPv3 is NOT RECOMMENDED. Instead, it is RECOMMENDED to deploy SNMPv3 and to enable cryptographic security. 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.

[7.](#) Acknowledgments

Not yet.

[8.](#) References

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