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

This document defines Management Information Base (MIB) modules for use with network management protocols in TCP/IP based internets. This document describes extensions to the Ethernet-like Interfaces MIB and MAU MIB modules with a set of objects for managing Ethernet in the First Mile Copper (EFMCu) interfaces 10PASS-TS and 2BASE-TL, defined in IEEE Std 802.3ah-2004. In addition a set of objects is defined, describing cross-connect capability of a managed device with multi-layer (stacked) interfaces, extending the stack management

objects in the Interfaces Group MIB and the Inverted Stack Table MIB modules.

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## 1. Introduction

New Ethernet-like interfaces have been defined in the Institute of Electrical and Electronics Engineers (IEEE) Standard 802.3ah-2004 [[802.3ah](#)], a.k.a. Ethernet in the First Mile (EFM), which is now a part of the base IEEE Standard 802.3-2005 [[802.3](#)]. In particular 2BASE-TL and 10PASS-TS physical interfaces (PHYs), defined over voice-grade copper pairs, have been specified for the long and short reach respectively. These interfaces, collectively called EFM Copper (EFMCu), are based on Single-pair High-speed Digital Subscriber Line (SHDSL) [[G.991.2](#)] and Very High speed Digital Subscriber Line (VDSL) [[G.993.1](#)] technology, supporting optional Physical Medium Entity (PME) aggregation (a.k.a. multi-pair bonding) with variable rates.

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 Management Information Base (MIB) module for use with network management protocols in the Internet community to manage EFMCu interfaces. In addition a MIB module is defined describing cross-connect capability of a stacked interface.

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 MIB modules that are compliant to the SMIV2, which is described in STD 58, [RFC 2578](#) [[RFC2578](#)], STD 58, [RFC 2579](#) [[RFC2579](#)] and STD 58, [RFC 2580](#) [[RFC2580](#)].



The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in [RFC 2119](#) [[RFC2119](#)].

### **3. Relation to other MIB modules**

This section outlines the relationship of the MIB modules defined in this document with other MIB modules 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 module**

2BASE-TL and 10PASS-TS PHY's specified in the EFM-CU-MIB module are stacked (a.k.a. aggregated or bonded) Ethernet interfaces and as such are managed using generic interface management objects defined in the IF-MIB [[RFC2863](#)].

The stack management, i.e. actual connection of the sub-layers to the top layer interface, is done via the ifStackTable, as defined in the IF-MIB [[RFC2863](#)] and its inverse ifInvStackTable, as defined in the IF-INVERTED-STACK-MIB [[RFC2864](#)].

The new tables ifCapStackTable and its inverse ifInvCapStackTable defined in the IF-CAP-STACK-MIB module below, extend the stack management with an ability to describe possible connections or cross-connect capability, when a flexible cross-connect matrix is present between the interface layers.

##### **3.1.1. Layering Model**

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

A generic EFMCu device can have a number of Physical Coding Sublayer (PCS) ports, each 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 in the aggregated EFMCu port is represented in the Interface table (ifTable) as a separate interface with ifType of shdsl(169) for 2BASE-TL or vdsl(97) for 10PASS-TS. The ifType values are defined in [[IANAifType-MIB](#)].



ifSpeed for each PME SHALL return the actual data bitrate of the active PME (e.g. for 2BaseTL PMEs it is a multiple of 64Kbps). Zero value SHALL be returned when PME is initializing or down.

The ifSpeed of the PCS is the sum of the current operating data rates of all PMEs in the aggregation group, without the 64/65B encapsulation overhead and PAF overhead, but accounting for the Inter-Frame Gaps (IFG).

When using the stated definition of ifSpeed for the PCS, there would be no frame loss in the following configuration (the test-sets are configured to generate 100% of back to back traffic, i.e. minimal IFG, at 10 or 100Mbps, with min and max frame sizes; the EFM interfaces are aggregated, to achieve the shown speed):

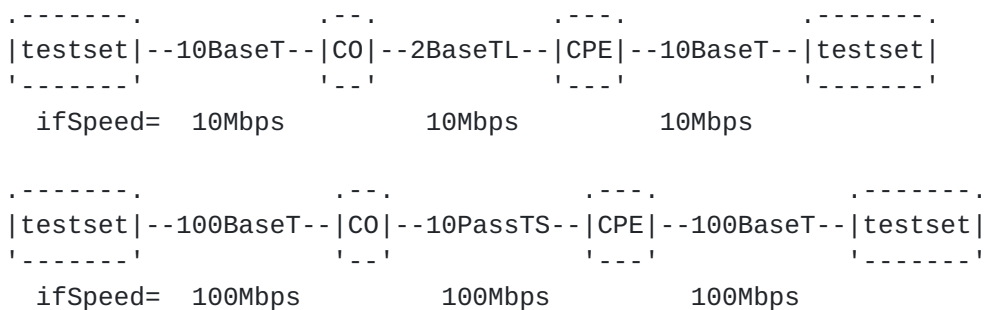
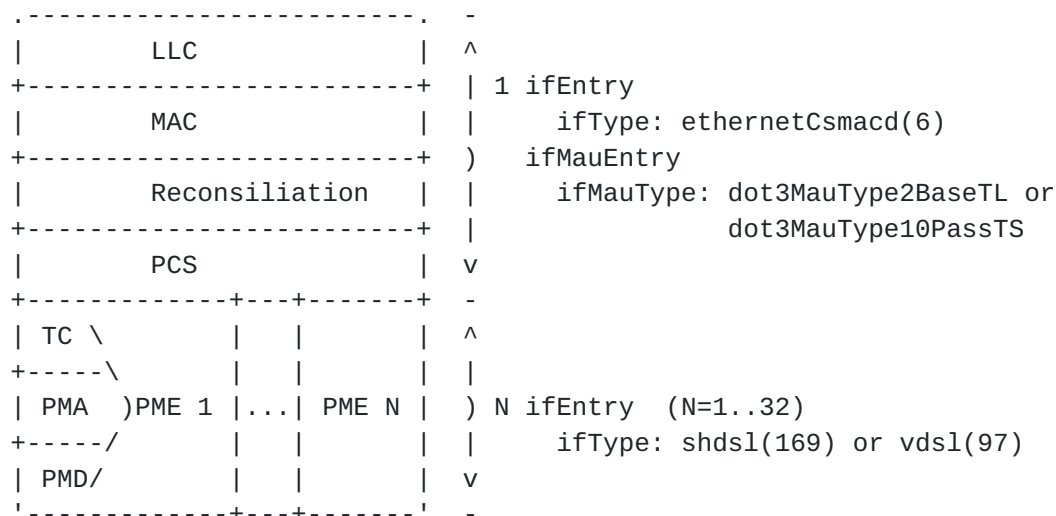


Figure 1: Example configuration with no frame loss





The following figure shows the IEEE 802.3 layering diagram and corresponding use of ifTable and ifMauTable:



LLC - Logical Link Control	PMA - Physical Medium Attachment
MAC - Media Access Control	PMD - Physical Medium Dependent
PCS - Physical Coding Sub-layer	PME - Physical Medium Entity
TC - Transmission Convergence	

Figure 2: Use of ifTable and ifMauTable for EFMCu ports

The ifStackTable is indexed by the ifIndex values of the aggregated EFMCu port (PCS) and the PMEs connected to it. 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 ifCapStackTable defined in the IF-CAP-STACK-MIB module, specifies for each higher-layer interface (e.g. PCS port) a list of lower-layer interfaces (e.g. PMEs), which can possibly be cross-connected to that higher-layer interface, determined by the cross-connect capability of the device. This table, modeled after ifStackTable, is read only, reflecting current cross-connect capability of a stacked interface, which can be dynamic in some implementations (e.g. if PMEs are located on a pluggable module and the module is pulled out). Note that PME availability per PCS, described by ifCapStackTable, 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. ifCapStackTable, ifStackTable and efMCuPAFCapacity) SHALL be inspected.

The ifInvCapStackTable, also defined in the IF-CAP-STACK-MIB module, describes which higher-layer interfaces (e.g. PCS ports) can possibly be connected to a particular lower-layer interface (e.g. PME), providing inverted mapping of ifCapStackTable. While it contains no additional information beyond that already contained in the ifCapStackTable, the ifInvCapStackTable has the ifIndex values in its INDEX clause in the reverse order, i.e., the lower-layer interface first, and the higher-layer interface second, providing an efficient means for a Network Management application to read a subset of the ifCapStackTable and thereby determine which interfaces can be connected to run on top of a particular interface.

### **3.1.2. PME Aggregation Function (PAF)**

The PME Aggregation Function (PAF) allows a number of PMEs to be aggregated onto a PCS port, by fragmenting the Ethernet frames, transmitting the fragments over multiple PMEs and assembling the original frames at the remote port. PAF is OPTIONAL, meaning that a device with a single PME MAY perform fragmentation and re-assembly if this function is supported by the device. Note however that the agent is REQUIRED to report on the PAF capability for all EFMCu ports (2BASE-TL and 10PASS-TS).

The EFM-CU-MIB module allows a Network Management application to query PAF capability and enable/disable it if supported. Note that enabling PAF effectively turns on fragmentation and re-assembly, even on a single-PME port.

### **3.1.3. Discovery Operation**

The EFMCu ports may optionally support discovery operation, whereby PMEs, during initialization, exchange information about their respective aggregation groups (PCS). This information can then be used to detect copper misconnections or for an automatic assignment of the local PMEs into aggregation groups instead of a fixed pre-configuration.

The MIB modules defined in this document allow 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 the EFM Discovery mechanism: ifStackTable and ifCapStackTable. The following pseudo-code gives an example of the Discovery and automatic PME assignment for a generic PAF enabled



multi-PCS EFMCu device, located at Central Office (CO), using objects defined in these MIB modules and in IF-MIB [Note that automatic PME assignment is only shown here for the purposes of the example. Fixed PME pre-assignment, manual assignment or auto-assignment using an alternative internal algorithm may be chosen by a particular implementation]:

```
// Go over all PCS ports in the CO device
FOREACH pcs[i] IN CO_device
{ // Perform discovery and auto-assignment only on PAF enabled ports
  // with room for more PMEs
  IF ( pcs[i].PAFSupported AND pcs[i].NumPMEs < pcs[i].PAFCapacity )
  { dc = pcs[i].DiscoveryCode = MAC[i]; // unique 6-octets per PCS
    // Go over all disconnected PMEs, which can
    // potentially be connected to the PCS
    FOREACH pme[j] IN ifCapStackTable[pcs[i]] AND
      NOT ifInvStackTable[pme[j]] // not connected
    { // Try to grab the remote RT_device, by writing the value
      // of the local 6-octet discovery code to the remote
      // discovery code register (via handshake mechanism).
      // This operation is atomic Set-if-Clear action, i.e. it
      // would succeed only if the remote discovery register was
      // zero. Read the remote discovery code register via Get
      // operation to see if the RT_device, attached via the PME
      // is indeed marked as being the CO_device peer.
      pme[j].RemoteDiscoveryCode = dc; // Set-if-Clear
      r = pme[j].RemoteDiscoveryCode; // Get
      IF ( r == dc AND pcs[i].NumPMEs < pcs[i].PAFCapacity )
      { // Remote RT_device connected via PME[j] is/was a peer
        // for PCS[i] and there is room for another PME in the
        // PCS[i] aggregation group (max. PAF capacity is not
        // reached yet).
        // Connect this PME to the PCS (via ifStackTable,
        // ifInvStackTable being inverse of ifStackTable is
        // updated automatically)
        ADD pme[j] TO ifStackTable[pcs[i]];
        // pcs[i] is auto-added to ifInvStackTable[pme[j]]
        pcs[i].NumPMEs = pcs[i].NumPMEs + 1;
        // Discover all other disconnected PMEs,
        // attached to the same RT_device and connect them to
        // the PCS provided there is enough room for more PMEs.
        FOREACH pme[k] IN ifCapStackTable[pcs[i]] and
          NOT 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] is added TO ifInvStackTable[pme[k]]
```



```
        pcs[i].NumPMEs = pcs[i].NumPMEs + 1;
    }
}
}
// At this point we have discovered all local PMEs which
// are physically connected to the same remote RT_device
// and connected them to PCS[i]. Go to the next PCS.
BREAK;
}
}
}
```

An SNMP Agent for a EFMCu device builds ifCapStackTable and its inverse ifInvCapStackTable 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 (and respective ifInvStackTable) entry.

It is RECOMMENDED that a removal of the last operationally 'up' PME from an operationally 'up' PCS would be rejected by the implementation, as this action would completely drop the link.

#### **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 on the line is too high, that 'training' process may fail to achieve a specific target rate with required characteristics.

The ifAdminStatus object from the IF-MIB, controls the desired state of a PCS with all the PMEs connected to it or of an individual PME port. Setting this object to 'up' instructs a particular PCS or PME to start 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 ifMauMediaAvailable object from MAU-MIB for PCS and efmCuPmeOperStatus defined in the EFM-CU-MIB module for PME interfaces).

A disconnected PME may be initialized by changing the ifAdminState from 'down' to 'up'. Changing the ifAdminState to 'up' on the PCS initializes all PMEs connected to that particular PCS. Note that in case of PAF some interfaces may fail to initialize while others succeed. The PCS is considered operationally 'up' if at least one PME aggregated by its PAF is operationally 'up'. When all PMEs connected to the PCS are 'down' the PCS SHALL be considered operationally 'lowerLayerDown'. The PCS SHALL be considered operationally 'notPresent' if it is not connected to any PME. The PCS/PME interface SHALL remain operationally 'down' during initialization.

The efmCuPmeOperStatus defined in the EFM-CU-MIB module expands PME's ifOperStatus value of 'down' to 'downReady', 'downNotReady' and 'init' values, indicating various EFMCu PME specific states.

#### **3.1.5. Usage of ifTable**

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

The following table summarizes EFMCu specific interpretations for some of the ifTable objects specified in 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 are 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	Operating data rate for the PME. For the PCS it	
	is the sum of the current operating data rates of	
	all PMEs in the aggregation group, without the	
	64/65B encapsulation overhead and PAF overhead,	
	but accounting for the Inter-Frame Gaps (IFG)	
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: EFMCu interpretation of IF-MIB objects

### 3.2. Relation to SHDSL MIB module

G.SHDSL.bis modems, similar to PME(s) comprising a 2BASE-TL port, are described in HDSL2-SHDSL-LINE-MIB [[RFC4319](#)]. 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 2BASE-TL PME related objects with 'efmCuPme2B' instead of 'hds12shdsl'), it was decided not to reference HDSL2-SHDSL-LINE-MIB objects, but define all the relevant objects in the EFM-CU-MIB module.

However, if some functionality, not available in the EFM-CU-MIB module, is required and supported by the PME, e.g. performance monitoring, relevant HDSL2-SHDSL-LINE-MIB groups MAY be included and applied for PMEs of 2BASE-TL subtype.

### 3.3. Relation to VDSL MIB module

VDSL modems, similar to the PME(s) comprising a 10PASS-TS port, are described in VDSL-LINE-EXT-MCM-MIB [[RFC4070](#)]. 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 the EFM-CU-MIB module.

However, if some functionality, not available in the EFM-CU-MIB module, is required and supported by the PME, relevant VDSL-LINE-EXT-MCM-MIB groups MAY be included and applied for PMEs of 10PASS-TS subtype.

### **3.4. Relation to Ethernet-Like and MAU MIB modules**

The implementation of EtherLike-MIB [[RFC3635](#)] and MAU-MIB [[I-D.ietf-hubmib-rfc3636bis](#)] is REQUIRED for the EFMCu interfaces.

Two new values of ifMauType (OBJECT-IDENTITIES of dot3MauType) and corresponding bit definitions of ifMauTypeListBits (IANAifMauTypeListBits) have been defined in the IANA-MAU-MIB [[I-D.ietf-hubmib-rfc3636bis](#)] for the EFMCu MAUs:

- o dot3MauType2BaseTL and b2BaseTL - for 2BASE-TL MAU
- o dot3MauType10PassTS and b10PassTS - for 10PASS-TS MAU

Additionally IANA-MAU-MIB defines two new values of ifMauMediaAvailable, as a textual convention IANAifMauMediaAvailable - availableReduced and ready, specifically for the EFMCu ports. Due to the PME aggregation, the EFMCu interpretation of some possible ifMauMediaAvailable values differs from other MAUs as follows:

- o unknown - the EFMCu interface (PCS with connected PMEs) is initializing
- o ready - the interface is down, at least one PME in the aggregation group (all PMEs connected to the PCS) is ready for handshake
- o available - the interface is up, all PMEs in the aggregation group are up
- o notAvailable - the interface is down, all PMEs in the aggregation group are down, no handshake tones are detected by any PME
- o availableReduced - the interface is up, a link fault is detected at the receive direction by one or more PMEs in the aggregation group, but at least one PME is up
- o pmdLinkFault - a link fault is detected at the receive direction by all PMEs in the aggregation group

As an EtherLike interface every EFMCu port (an ifEntry representing a



consolidation of LLC, MAC and PCS (sub)layers) SHALL return an ifType of ethernetCsmacd(6). While most of the MAU characteristics are not applicable to the EFMCu ports (no auto-negotiation, false carriers or jabber), they SHALL return an appropriate ifMauType (dot3MauType2BaseTL or dot3mauType10PassTS) in order to direct the management software to look in the EFM-CU-MIB module for the desired information. For example the information on the particular EFMCu flavor that an EFMCu port is running is available from efmCuOperSubType, defined in the EFM-CU-MIB module.

Since EFMCu PMEs are not EtherLike interfaces, they cannot be instantiated as MAU interface objects.

## **4. MIB Structure**

### **4.1. EFM Copper MIB Overview**

The main management objects defined in the EFM-CU-MIB module 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.

The efmCuPme group in turn contains efmCuPme2B and efmCuPme10P groups, which define PME Profiles specific to 2BASE-TL and 10PASS-TS PMEs respectively, as well as PME specific status information.

### **4.2. Interface stack capability MIB Overview**

The IF-CAP-STACK-MIB module contains 2 tables:

- o ifCapStackTable - containing objects that define possible relationships among the sub-layers of an interface with flexible cross-connect (cross-connect capability).
- o ifInvCapStackTable - an inverse of the ifCapstackTable.

### **4.3. PME 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, the EFM-CU-MIB module makes use of configuration profiles, similar to





HDSL2-SHDSL-LINE-MIB and VDSL-LINE-EXT-MCM-MIB. A profile is a set of parameters, used either for configuration or representation of a PME. The same profile can be shared by multiple PME ports, using the same configuration.

The PME profiles are defined in `efmCuPme2BProfileTable` and `efmCuPme10PProfileTable` 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. In addition the EFM-CU-MIB defines two additional predefined profiles for "best-effort" provisioning of 2BASE-TL PMEs. 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 or administrative profile is assigned to a specific PME via `efmCuPmeAdminProfile` object. If `efmCuPmeAdminProfile` is zero, then `efmCuAdminProfile` object of the PCS port, connected to the PME, determines the configuration profile (or a list of possible profiles) for that PME. This mechanism allows to specify a common profile(s) for all PMEs connected to the PCS port, with an ability to change individual PME profiles by setting `efmCuPmeAdminProfile` object, which overwrites the profile set by `efmCuAdminProfile`.

A current operating PME profile is pointed to by `efmCuPmeOperProfile` object. Note that this profile entry, can be created automatically, to reflect achieved parameters in adaptive (not fixed) initialization.

#### **4.4. Mapping of IEEE 802.3ah Managed Objects**

This section contains the mapping between relevant 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 the EFM-CU-MIB module do not have direct counterparts in Clause 30 and instead refer to Clause 45 registers.



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



aPMESNRMgn	efmCuPmeSnrMgn	
+-----+	+-----+	+-----+
aTCCodingViolations	efmCuPmeTCCodingErrors	
+-----+	+-----+	+-----+
aTCCRCErrors	efmCuPmeTCCrcErrors	
+-----+	+-----+	+-----+
aProfileSelect	efmCuAdminProfile,	
	efmCuPmeAdminProfile	
+-----+	+-----+	+-----+
aOperatingProfile	efmCuPmeOperProfile	
+-----+	+-----+	+-----+
aPMEFECCorrectedBlocks	efmCuPme10PFECCorrectedBlocks	
+-----+	+-----+	+-----+
aPMEFECUncorrectableBlocks	efmCuPme10PFECUncorrectedBlocks	
+-----+	+-----+	+-----+

Table 2: Mapping of IEEE 802.3 Managed Objects

## 5. Interface Stack Capability MIB Definitions

IF-CAP-STACK-MIB DEFINITIONS ::= BEGIN

IMPORTS

MODULE-IDENTITY, OBJECT-TYPE, mib-2  
FROM SNMPv2-SMI -- [RFC 2578](#)

TruthValue

FROM SNMPv2-TC -- [RFC 2579](#)

MODULE-COMPLIANCE, OBJECT-GROUP

FROM SNMPv2-CONF -- [RFC 2580](#)

ifStackGroup2, ifStackHigherLayer, ifStackLowerLayer

FROM IF-MIB -- [RFC 2863](#)

ifInvStackGroup

FROM IF-INVERTED-STACK-MIB -- [RFC 2864](#)

;

ifCapStackMIB MODULE-IDENTITY

LAST-UPDATED "200702210000Z" -- February 21, 2007

ORGANIZATION "IETF Ethernet Interfaces and Hub MIB Working Group"

CONTACT-INFO

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#### DESCRIPTION

"The objects in this MIB module are used to describe cross-connect capabilities of stacked (layered) interfaces, complementing ifStackTable and ifInvStackTable defined in IF-MIB and IF-INVERTED-STACK-MIB respectively.

Copyright (C) The IETF Trust (2007). This version of this MIB module is part of RFC XXXX; see the RFC itself for full legal notices."

REVISION "200702210000Z" -- February 21, 2007

DESCRIPTION "Initial version, published as RFC XXXX."

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

::= { mib-2 ZZZ }

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

-- Sections of the module  
-- Structured as recommended by [RFC 4181](#), see  
-- [Appendix D](#): Suggested OID Layout

ifCapStackObjects OBJECT IDENTIFIER ::= { ifCapStackMIB 1 }

ifCapStackConformance OBJECT IDENTIFIER ::= { ifCapStackMIB 2 }

-- Groups in the module

--





```
-- ifCapStackTable group
--
```

```
ifCapStackTable OBJECT-TYPE
```

```
SYNTAX      SEQUENCE OF IfCapStackEntry
```

```
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 described in ifStackTable). In particular, it contains information on which sub-layers MAY possibly run 'on top of' which other sub-layers, as determined by cross-connect capability of the device, where each sub-layer corresponds to a conceptual row in the ifTable. For example, when the sub-layer with ifIndex value x can be connected to run on top of the sub-layer with ifIndex value y, then this table contains:

```
    ifCapStackStatus.x.y=true
```

ifCapStackStatus.x.y row does not exist if it is impossible to connect between the sub-layers x and y.

Note that for most stacked interfaces (e.g. 2BASE-TL) there's always at least one higher-level interface (e.g. PCS port) for each lower-level interface (e.g. PME) and at least one lower-level interface for each higher-level interface, that is, there is at least a single row with a 'true' status for any existing value of x or y.

This table is read only as it describes device capability"

```
REFERENCE
```

```
    "IF-MIB, ifStackTable"
```

```
::= { ifCapStackObjects 1 }
```

```
ifCapStackEntry OBJECT-TYPE
```

```
SYNTAX      IfCapStackEntry
```

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

```
STATUS      current
```

```
DESCRIPTION
```

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

```
INDEX {
```



```
        ifStackHigherLayer,
        ifStackLowerLayer
    }
    ::= { ifCapStackTable 1 }
```

IfCapStackEntry ::= SEQUENCE {  
 ifCapStackStatus TruthValue  
}

ifCapStackStatus OBJECT-TYPE  
 SYNTAX TruthValue  
 MAX-ACCESS read-only  
 STATUS current  
 DESCRIPTION  
 "The status of the 'cross-connect capability' relationship  
 between two sub-layers. The following values can be returned:  
 true(1) - indicates that the sub-layer interface,  
 identified by the ifStackLowerLayer MAY  
 be connected to run 'below' the sub-layer  
 interface, identified by the  
 ifStackHigherLayer index.  
 false(2) - the sub-layer interfaces cannot be  
 connected temporarily due to  
 unavailability of the interface(s), e.g.  
 one of the interfaces is located on an  
 absent pluggable module.

Note that lower-layer interface availability per higher-layer,  
indicated by the value of 'true', can be constrained by  
other parameters, for example by the aggregation capacity of  
a higher-layer interface or by the lower-layer interface in  
question being already connected to another higher-layer  
interface. In order to ensure that a particular sub-layer can  
be connected to another sub-layer, all respective objects  
(e.g. ifCapStackTable, ifStackTable and efmCuPAFCapacity for  
for EFMCu interfaces) SHALL be inspected.

This object is read only, unlike ifStackStatus, as it  
describes a cross-connect capability."  
::= { ifCapStackEntry 1 }

ifInvCapStackTable OBJECT-TYPE  
 SYNTAX SEQUENCE OF IfInvCapStackEntry  
 MAX-ACCESS not-accessible  
 STATUS current  
 DESCRIPTION  
 "A table containing information on the possible relationships  
 between the multiple sub-layers of network interfaces. This



table, modeled after ifInvStackTable from IF-INVERTED-STACK-MIB, is an inverse of the ifCapStackTable defined in this MIB module. In particular, this table contains information on which sub-layers MAY run 'underneath' which other sub-layers, where each sub-layer corresponds to a conceptual row in the ifTable. For example, when the sub-layer with ifIndex value x MAY be connected to run underneath the sub-layer with ifIndex value y, then this table contains:

```
ifInvCapStackStatus.x.y=true
```

This table contains exactly the same number of rows as the ifCapStackTable, but the rows appear in a different order.

This table is read only as it describes a cross-connect capability."

#### REFERENCE

```
"IF-INVERTED-STACK-MIB, ifInvStackTable"
::= { ifCapStackObjects 2 }
```

#### ifInvCapStackEntry OBJECT-TYPE

```
SYNTAX      IfInvCapStackEntry
MAX-ACCESS   not-accessible
STATUS       current
```

#### DESCRIPTION

"Information on a particular relationship between two sub-layers, specifying that one sub-layer MAY run underneath the other sub-layer. Each sub-layer corresponds to a conceptual row in the ifTable."

```
INDEX { ifStackLowerLayer, ifStackHigherLayer }
::= { ifInvCapStackTable 1 }
```

```
IfInvCapStackEntry ::= SEQUENCE {
    ifInvCapStackStatus      TruthValue
}
```

#### ifInvCapStackStatus OBJECT-TYPE

```
SYNTAX      TruthValue
MAX-ACCESS   read-only
STATUS       current
```

#### DESCRIPTION

"The status of the possible 'cross-connect capability' relationship between two sub-layers.

An instance of this object exists for each instance of the ifCapStackStatus object, and vice versa. For example, if the variable ifCapStackStatus.H.L exists, then the variable



ifInvStackStatus.L.H must also exist, and vice versa. In addition, the two variables always have the same value.

The ifInvStackStatus object is read-only, as it describes a cross-connect capability."

REFERENCE

"ifCapStackStatus"

::= { ifInvCapStackEntry 1 }

--

-- Conformance Statements

--

ifCapStackGroups OBJECT IDENTIFIER ::=

{ ifCapStackConformance 1 }

ifCapStackCompliances OBJECT IDENTIFIER ::=

{ ifCapStackConformance 2 }

-- Units of Conformance

ifCapStackGroup OBJECT-GROUP

OBJECTS {

ifCapStackStatus,

ifInvCapStackStatus

}

STATUS current

DESCRIPTION

"A collection of objects providing information on the cross-connect capability of multi-layer (stacked) network interfaces."

::= { ifCapStackGroups 1 }

-- Compliance Statements

ifCapStackCompliance MODULE-COMPLIANCE

STATUS current

DESCRIPTION

"The compliance statement for SNMP entities, which provide information on the cross-connect capability of multi-layer (stacked) network interfaces, with flexible cross-connect between the sub-layers."

MODULE -- this module

MANDATORY-GROUPS {

ifCapStackGroup





```
    }

    OBJECT      ifCapStackStatus
    SYNTAX      TruthValue { true(1) }
    DESCRIPTION
        "Support for the false(2) value is OPTIONAL for
        implementations supporting pluggable interfaces."

    OBJECT      ifInvCapStackStatus
    SYNTAX      TruthValue { true(1) }
    DESCRIPTION
        "Support for the false(2) value is OPTIONAL for
        implementations supporting pluggable interfaces."

    MODULE IF-MIB
        MANDATORY-GROUPS {
            ifStackGroup2
        }

    MODULE IF-INVERTED-STACK-MIB
        MANDATORY-GROUPS {
            ifInvStackGroup
        }

    ::= { ifCapStackCompliances 1 }
END
```

## 6. EFM Copper MIB Definitions

```
EFM-CU-MIB DEFINITIONS ::= BEGIN

IMPORTS
    MODULE-IDENTITY, OBJECT-TYPE, NOTIFICATION-TYPE, Integer32,
    Unsigned32, Counter32, mib-2
    FROM SNMPv2-SMI          -- RFC 2578
    TEXTUAL-CONVENTION, TruthValue, RowStatus, PhysAddress
    FROM SNMPv2-TC          -- RFC 2579
    MODULE-COMPLIANCE, OBJECT-GROUP, NOTIFICATION-GROUP
    FROM SNMPv2-CONF        -- RFC 2580
    SnmpAdminString
    FROM SNMP-FRAMEWORK-MIB -- RFC 3411
    ifIndex, ifSpeed
    FROM IF-MIB              -- RFC 2863
    ;

efmCuMIB MODULE-IDENTITY
    LAST-UPDATED "200702210000Z" -- February 21, 2007
```



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 Std. 802.3ah-2004, which is now a part of IEEE Std. 802.3-2005.

The following references are used throughout this MIB module:

[802.3ah] refers to:

IEEE Std 802.3ah-2004: 'IEEE Standard for 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 -

Amendment: Media Access Control Parameters, Physical Layers and Management Parameters for Subscriber Access Networks', 07 September 2004.

Of particular interest are Clause 61, 'Physical Coding Sublayer (PCS) and common specifications, type 10PASS-TS and



type 2BASE-TL', Clause 30, 'Management', Clause 45,  
'Management Data Input/Output (MDIO) Interface', Annex 62A,  
'PMD profiles for 10PASS-TS' and Annex 63A, 'PMD profiles for  
2BASE-TL'.

[G.991.2] refers to:

ITU-T Recommendation G.991.2: 'Single-pair High-speed Digital  
Subscriber Line (SHDSL) transceivers', December 2003.

[ANFP] refers to:

NICC Document ND1602:2005/08: 'Specification of the Access  
Network Frequency Plan (ANFP) applicable to transmission  
systems used on the BT Access Network,' August 2005.

#### 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  
PBO - Power Back-Off  
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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of this MIB module is part of RFC XXXX; see the RFC  
itself for full legal notices."

REVISION "200702210000Z" -- February 21, 2007

DESCRIPTION "Initial version, published as RFC XXXX."

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

::= { 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 }

efmCuConformance OBJECT IDENTIFIER ::= { efmCuMIB 2 }

-- Groups in the module

efmCuPort         OBJECT IDENTIFIER ::= { efmCuObjects 1 }

efmCuPme          OBJECT IDENTIFIER ::= { efmCuObjects 2 }

-- Textual Conventions

EfmProfileIndex ::= TEXTUAL-CONVENTION
    DISPLAY-HINT "d"
    STATUS      current
    DESCRIPTION
        "A unique value, greater than zero, for each PME configuration
        profile in the managed EFMCu port. 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)

EfmProfileIndexOrZero ::= TEXTUAL-CONVENTION
    DISPLAY-HINT "d"
    STATUS      current
    DESCRIPTION
        "This textual convention is an extension of EfmProfileIndex
        convention. The latter defines a greater than zero value used
        to identify a PME profile in the managed EFMCu port. This
        extension permits the additional value of zero. The value of
        zero is object-specific and 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)

EfmProfileIndexList ::= TEXTUAL-CONVENTION
    DISPLAY-HINT "1d:"
    STATUS      current
    DESCRIPTION
        "This textual convention represents a list of up to 6
        EfmProfileIndex's, any of which can be chosen for
        configuration of an PME in a managed EFMCu port.
        The EfmProfileIndex textual convention defines a greater than
        zero value used to identify a PME profile.
        The value of this object is a concatenation of one or
```





more (up to 6) octets, where each octet contains an 8-bit EfmProfileIndex value.

A zero length octet string 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 length value might include situations where an object using this textual convention is irrelevant for a specific EFMCu port type."

SYNTAX OCTET STRING (SIZE(0..6))

EfmTruthValueOrUnknown ::= TEXTUAL-CONVENTION

STATUS current

DESCRIPTION

"This textual convention is an extension of the TruthValue convention. The latter defines a boolean value with possible values of true(1) and false(2). This extension permits the additional value of unknown(0), which can be returned as a result of GET operation, when an exact true or false value of the object cannot be determined."

SYNTAX INTEGER { unknown(0), true(1), false(2) }

-- Port Notifications Group

efmCuPortNotifications OBJECT IDENTIFIER ::= { efmCuPort 0 }

efmCuLowRateCrossing NOTIFICATION-TYPE

OBJECTS {

-- ifIndex is not needed here since we are under specific PCS  
ifSpeed,  
efmCuThreshLowRate

}

STATUS current

DESCRIPTION

"This notification indicates that the EFMCu port' data rate has reached/dropped below or exceeded the low rate threshold, specified by efmCuThreshLowRate.

This notification MAY be send for the -0 subtype ports (2BaseTL-0/10PassTS-0) while the port is up, on the crossing event in both directions: from normal (rate is above the threshold) to low (rate equals the threshold or below it) and from low to normal. This notification is not applicable to the -R subtypes.

It is RECOMMENDED that a small debouncing period of 2.5 sec, between the detection of the condition and notification, is implemented to prevent simultaneous LinkUp/LinkDown and efmCuLowRateCrossing notifications to be sent.



The adaptive nature of the EFMCu technology allows the port to adapt itself to the changes in the copper environment, e.g. an impulse noise, alien crosstalk or a micro-interruption may temporarily drop one or more PME's in the aggregation group, causing a rate degradation of the aggregated EFMCu link. The dropped PME's would then try to re-initialize, possibly at a lower rate than before, adjusting the rate to provide required target SNR margin.

Generation of this notification is controlled by the efmCuLowRateCrossingEnable object."

```
::= { efmCuPortNotifications 1 }
```

```
-- PCS Port group
```

```
efmCuPortConfTable OBJECT-TYPE
```

```
SYNTAX      SEQUENCE OF EfmCuPortConfEntry
```

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

```
STATUS      current
```

```
DESCRIPTION
```

"Table for Configuration of EFMCu 2BASE-TL/10PASS-TS (PCS) Ports. Entries in this table 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	EfmProfileIndexList,
efmCuTargetDataRate	Unsigned32,
efmCuTargetSnrMgn	Unsigned32,
efmCuAdaptiveSpectra	TruthValue,
efmCuThreshLowRate	Unsigned32,
efmCuLowRateCrossingEnable	TruthValue

```
}
```



**efmCuPAFAdminState OBJECT-TYPE**

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

MAX-ACCESS read-write

STATUS current

**DESCRIPTION**

"Administrative (desired) state of the PAF of the EFMCu port (PCS).

When 'disabled', PME Aggregation will not be performed by the PCS. No more than a single PME can be assigned to this PCS in this case.

When 'enabled', PAF will be performed by the PCS when the link is Up, even on a single attached PME, if PAF is supported.

PCS ports incapable of supporting PAF SHALL return a value of 'disabled'. Attempts to 'enable' such ports SHALL be rejected.

PAF 'enabled' port with multiple PMEs assigned cannot be 'disabled'. Attempts to 'disable' such port SHALL be rejected, until at most one PME is left assigned.

Changing PAFAdminState is a traffic disruptive operation and as such SHALL be done when the link is Down. Attempts to change this object SHALL be rejected if the link is Up or Initializing.

This object maps to the Clause 30 attribute aPAFAdminState.

If a Clause 45 MDIO Interface to the PCS is present, then this object maps to the PAF enable bit in the 10P/2B PCS control register.

This object MUST be maintained in a persistent manner."

**REFERENCE**

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

::= { efmCuPortConfEntry 1 }

**efmCuPAFDiscoveryCode OBJECT-TYPE**

SYNTAX PhysAddress (SIZE(0|6))

MAX-ACCESS read-write

STATUS current

**DESCRIPTION**

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

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

PCS ports incapable of supporting PAF SHALL return a zero



length octet string on an attempt to read this object. An attempt to write to this object SHALL be rejected for such ports.

This object MUST be instantiated for the -O subtype PCS before writing operations on the efmCuPAFRemoteDiscoveryCode (Set\_if\_Clear and Clear\_if\_Same) are performed by PMEs associated with the PCS.

The initial value of this object for -R subtype ports after reset is all zeroes. For -R subtype ports, the value of this object cannot be changed directly. This value may be changed as a result of writing operation on the efmCuPAFRemoteDiscoveryCode object of remote PME of -O 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 (in case of SNMP with the error inconsistentValue), if the link is Up or Initializing.

The PAF Discovery code maps to the local Discovery code variable in PAF (note that it does not have a corresponding Clause 45 register)"

#### REFERENCE

"[[802.3ah](#)] 61.2.2.8.3, 61.2.2.8.4, 45.2.6.6.1, 45.2.6.8, 61A.2"

::= { efmCuPortConfEntry 2 }

#### efmCuAdminProfile OBJECT-TYPE

SYNTAX EfmProfileIndexList

MAX-ACCESS read-write

STATUS current

#### DESCRIPTION

"Desired configuration Profile(s), common for all PMEs in the EFMCu port. This object is a list of pointers to entries in either efmCuPme2BProfileTable or efmCuPme10PProfileTable, depending on the current operating SubType of the EFMCu port as indicated by efmCuPortSide.

The value of this object is a list of up to 6 indices of Profiles. If this list consists of a single Profile index, then all PMEs assigned to this EFMCu port SHALL be configured according to the Profile referenced by that index, unless it is overwritten by corresponding non-zero efmCuPmeAdminProfile, which takes precedence over efmCuAdminProfile.

The list, consisting of more than one index, allows each PME in the port to be configured according to any Profile specified in the list.





By default this object has a value of 0x01, referencing 1st entry in efmCuPme2BProfileTable or efmCuPme10PProfileTable.

This object is writable and readable for the -O subtype (2BaseTL-O or 10PasSTS-O) EFMCu ports. It is irrelevant for the -R subtype (2BaseTL-R or 10PasSTS-R) ports - a zero length octet string SHALL be returned on an attempt to read this object and an attempt to change this object MUST be rejected in this case.

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 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.

This object MUST be maintained in a persistent manner."

#### REFERENCE

"[[802.3ah](#)] 30.11.2.1.6"

DEFVAL { '01'H }

::= { efmCuPortConfEntry 3 }

#### efmCuTargetDataRate OBJECT-TYPE

SYNTAX Unsigned32(1..100000|999999)

UNITS "Kbps"

MAX-ACCESS read-write

STATUS current

#### DESCRIPTION

"Desired EFMCu port 'net' (as seen across MII) Data Rate in 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 SHALL



be equal to the target data rate or less, if the target data rate cannot be achieved under spectral restrictions specified by efmCuAdminProfile/efmCuPmeAdminProfile and with desired SNR margin. In case the copper environment allows to achieve higher total data rate than that specified by the target, the excess capability SHALL be either converted to additional SNR margin or reclaimed by minimizing transmit power as controlled by efmCuAdaptiveSpectra.

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

This object is read-write for the -O subtype EFMCu ports (2BaseTL-O/10PassTS-O) 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 (in case of SNMP 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.

This object MUST be maintained in a persistent manner."  
::= { efmCuPortConfEntry 4 }

efmCuTargetSnrMgn OBJECT-TYPE

SYNTAX Unsigned32(0..21)

UNITS "dB"

MAX-ACCESS read-write

STATUS current

DESCRIPTION

"Desired EFMCu port SNR Margin to be achieved on all PMEs assigned to the port, during initialization. (The SNR margin is the difference between the desired SNR and the actual SNR).

Note that 802.3ah recommends using default Target SNR Margin of 5dB for 2BASE-TL ports and 6dB for 10PASS-TS 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 -O subtype EFMCu ports (2BaseTL-O/10PassTS-O) 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



(in case of SNMP 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.

This object MUST be maintained in a persistent manner."

#### REFERENCE

"[[802.3ah](#)] 61.1.2"

::= { efmCuPortConfEntry 5 }

#### efmCuAdaptiveSpectra OBJECT-TYPE

SYNTAX TruthValue

MAX-ACCESS read-write

STATUS current

#### DESCRIPTION

"Indicates how to utilize excess capacity when the copper environment allows to achieve higher total data rate than that specified by the efmCuTargetDataRate.

Value of true(1) indicates that the excess capability SHALL be reclaimed by minimizing transmit power, e.g. using higher constellations and Power Back-Off, in order to reduce interference to other copper pairs in the binder and the adverse impact to link/system performance.

Value of false(2) indicates that the excess capability SHALL be converted to additional SNR margin and spread evenly across all active PMEs assigned to the (PCS) port, to increase link robustness.

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

Changing of this object MUST be performed when the link is Down. Attempts to change this object MUST be rejected (in case of SNMP with the error inconsistentValue), if the link is Up or Initializing.

This object MUST be maintained in a persistent manner."

::= { efmCuPortConfEntry 6 }

#### efmCuThreshLowRate OBJECT-TYPE

SYNTAX Unsigned32(1..100000)

UNITS "Kbps"

MAX-ACCESS read-write

STATUS current

#### DESCRIPTION



"This object configures the EFMCu port low rate crossing alarm threshold. When the current value of ifSpeed for this port reaches/drops below or exceeds this threshold, an efmCuLowRateCrossing notification MAY be generated if enabled by efmCuLowRateCrossingEnable.

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

This object MUST be maintained in a persistent manner."  
 ::= { efmCuPortConfEntry 7 }

efmCuLowRateCrossingEnable OBJECT-TYPE

SYNTAX TruthValue

MAX-ACCESS read-write

STATUS current

DESCRIPTION

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

Value of true(1) indicates that efmCuLowRateCrossing notification is enabled. Value of false(2) indicates that the notification is disabled.

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

This object MUST be maintained in a persistent manner."  
 ::= { efmCuPortConfEntry 8 }

efmCuPortCapabilityTable OBJECT-TYPE

SYNTAX SEQUENCE OF EfmCuPortCapabilityEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"Table for Capabilities of EFMCu 2BASE-TL/10PASS-TS (PCS) Ports. Entries in this table 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      EfmTruthValueOrUnknown,  
    efmCuPAFCapacity           Unsigned32,  
    efmCuPeerPAFCapacity       Unsigned32  
}
```

efmCuPAFSupported OBJECT-TYPE

SYNTAX TruthValue

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"PME Aggregation Function (PAF) Capability of the EFMCu port (PCS).

This object has a value of true(1) when the PCS can perform PME aggregation on the available PMEs.

Ports incapable of PAF SHALL return a value of false(2).

This object maps to the Clause 30 attribute aPAFSupported.

If a Clause 45 MDIO Interface to the PCS is present, then this object maps to the PAF available bit in the 10P/2B capability register."

REFERENCE

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

::= { efmCuPortCapabilityEntry 1 }

efmCuPeerPAFSupported OBJECT-TYPE

SYNTAX EfmTruthValueOrUnknown

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"PME Aggregation Function (PAF) Capability of the EFMCu port (PCS) link partner.

This object has a value of true(1) when the remote PCS can perform PME aggregation on its available PMEs.

Ports whose peers are incapable of PAF, SHALL return a value of false(2).

Ports whose peers cannot be reached because of the link state, SHALL return a value if unknown(0).

This object maps to the Clause 30 attribute



aRemotePAFSupported.

If a Clause 45 MDIO Interface to the PCS is present, then this object maps to the Remote PAF supported bit in the 10P/2B capability register."

REFERENCE

"[[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



2BASE-TL/10PASS-TS ports, complementing the generic status information from the ifTable of IF-MIB and ifMauTable of MAU-MIB. Additional status information about connected PMEs is available from efmCuPmeStatusTable.

This table contains live data from the equipment. As such, it is NOT persistent."

::= { efmCuPort 3 }

efmCuPortStatusEntry OBJECT-TYPE

SYNTAX EfmCuPortStatusEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"An entry in the EFMCu Port Status table.

Each entry represents an EFMCu port indexed by the ifIndex.

Note that an EFMCu PCS port runs on top of a single or multiple PME port(s), which are also indexed by ifIndex."

INDEX { ifIndex }

::= { efmCuPortStatusTable 1 }

EfmCuPortStatusEntry ::=

SEQUENCE {

efmCuFltStatus	BITS,
efmCuPortSide	INTEGER,
efmCuNumPMEs	Unsigned32,
efmCuPAFInErrors	Counter32,
efmCuPAFInSmallFragments	Counter32,
efmCuPAFInLargeFragments	Counter32,
efmCuPAFInBadFragments	Counter32,
efmCuPAFInLostFragments	Counter32,
efmCuPAFInLostStarts	Counter32,
efmCuPAFInLostEnds	Counter32,
efmCuPAFInOverflows	Counter32

}

efmCuFltStatus OBJECT-TYPE

SYNTAX BITS {

noPeer(0),  
peerPowerLoss(1),  
pmeSubTypeMismatch(2),  
lowRate(3)

}

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"EFMCu (PCS) port Fault Status. This is a bitmap of possible conditions. The various bit positions are:



- noPeer - peer PHY cannot be reached (e.g. no PME's attached, all PME's are Down etc.) More info is available in efmCuPmeFltStatus.
- peerPowerLoss - peer PHY has indicated impending unit failure due to loss of local power ('Dying Gasp').
- pmeSubTypeMismatch - local PME's in the aggregation group are not of the same sub-type, e.g. some PME's in the local device are -O while others are -R subtype.
- lowRate - ifSpeed of the port reached or dropped below efmCuThreshLowRate

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

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

#### REFERENCE

"IF-MIB, ifOperStatus; MAU-MIB, ifMauMediaAvailable; efmCuPmeFltStatus"

::= { efmCuPortStatusEntry 1 }

#### efmCuPortSide OBJECT-TYPE

```
SYNTAX      INTEGER {
    subscriber(1),
    office(2),
    unknown(3)
}
```

MAX-ACCESS read-only

STATUS current

#### DESCRIPTION

"EFM port mode of operation (subtype).

The value of 'subscriber' indicates the port is designated as '-R' subtype (all PME's assigned to this port are of subtype '-R').

The value of the 'office' indicates that the port is designated as '-O' subtype (all PME's assigned to this port are of subtype '-O').

The value of 'unknown' indicates that the port has no assigned PME's yet or that the assigned PME's 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

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.

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

REFERENCE

"[[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), which have been received across the gamma



interface and discarded.

This read-only counter is inactive when the PAF is unsupported or disabled. Upon disabling the PAF, the counter retains its previous value.

If a Clause 45 MDIO Interface to the PCS is present, then this object maps to the 10P/2B PAF small fragments register.

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

REFERENCE

"[[802.3ah](#)] 45.2.3.22"

::= { efmCuPortStatusEntry 5 }

efmCuPAFInLargeFragments OBJECT-TYPE

SYNTAX Counter32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"A number of fragments larger than maxFragmentSize (512 Bytes), which have been received across the gamma interface and discarded.

This read-only counter is inactive when the PAF is unsupported or disabled. Upon disabling the PAF, the counter retains its previous value.

If a Clause 45 MDIO Interface to the PCS is present, then this object maps to the 10P/2B PAF large fragments register.

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

REFERENCE

"[[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.

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

#### REFERENCE

"[[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, which have been received across the gamma interface (the frame buffer is flushed to the next valid frame start, when fragment/fragments expected by the frame assembly function is/are not received). This read-only counter is inactive when the PAF is unsupported or disabled. Upon disabling the PAF, the counter retains its previous value.

If a Clause 45 MDIO Interface to the PCS is present, then this object maps to the 10P/2B PAF lost fragment register.

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

#### REFERENCE

"[[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.

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

#### REFERENCE

"[[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.

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

#### REFERENCE

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

::= { efmCuPortStatusEntry 10 }

#### efmCuPAFInOverflows OBJECT-TYPE

SYNTAX Counter32

MAX-ACCESS read-only

STATUS current

#### DESCRIPTION

"A number of fragments, received across the gamma interface and discarded, which would have caused the frame assembly





buffer to overflow.

This read-only counter is inactive when the PAF is unsupported or disabled. Upon disabling the PAF, the counter retains its previous value.

If a Clause 45 MDIO Interface to the PCS is present, then this object maps to the 10P/2B PAF overflow register.

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

#### REFERENCE

"[[802.3ah](#)] 45.2.3.24"

::= { efmCuPortStatusEntry 11 }

#### -- PME Notifications Group

efmCuPmeNotifications OBJECT IDENTIFIER ::= { efmCuPme 0 }

#### efmCuPmeLineAtnCROSSING NOTIFICATION-TYPE

OBJECTS {  
    efmCuPmeLineAtn,  
    efmCuPmeThreshLineAtn  
}

STATUS current

#### DESCRIPTION

"This notification indicates that the loop attenuation threshold (as per the efmCuPmeThreshLineAtn value) has been reached/exceeded for the 2BASE-TL/10PASS-TS PME. This notification MAY be send on the crossing event in both directions: from normal to exceeded and from exceeded to normal.

It is RECOMMENDED that a small debouncing period of 2.5 sec, between the detection of the condition and notification, is implemented to prevent intermittent notifications to be sent.

Generation of this notification is controlled by the efmCuPmeLineAtnCROSSINGEnable object."

::= { efmCuPmeNotifications 1 }

#### efmCuPmeSnrMgnCROSSING NOTIFICATION-TYPE

OBJECTS {  
    efmCuPmeSnrMgn,  
    efmCuPmeThreshSnrMgn  
}



STATUS        current

DESCRIPTION

"This notification indicates that the SNR margin threshold (as per the efmCuPmeThreshSnrMgn value) has been reached/exceeded for the 2BASE-TL/10PASS-TS PME. This notification MAY be send on the crossing event in both directions: from normal to exceeded and from exceeded to normal.

It is RECOMMENDED that a small debouncing period of 2.5 sec, between the detection of the condition and notification, is implemented to prevent intermittent notifications to be sent.

Generation of this notification is controlled by the efmCuPmeSnrMgnCrossingEnable object."

::= { efmCuPmeNotifications 2 }

efmCuPmeDeviceFault NOTIFICATION-TYPE

OBJECTS {  
    efmCuPmeFltStatus  
}

STATUS        current

DESCRIPTION

"This notification indicates that a fault in the PME has been detected by a vendor specific diagnostic or a self-test.

Generation of this notification is controlled by the efmCuPmeDeviceFaultEnable object."

::= { efmCuPmeNotifications 3 }

efmCuPmeConfigInitFailure NOTIFICATION-TYPE

OBJECTS {  
    efmCuPmeFltStatus,  
    efmCuAdminProfile,  
    efmCuPmeAdminProfile  
}

STATUS        current

DESCRIPTION

"This notification indicates that PME initialization has failed, due to inability of the PME link to achieve requested configuration profile.

Generation of this notification is controlled by the efmCuPmeConfigInitFailEnable object."

::= { efmCuPmeNotifications 4 }

efmCuPmeProtocolInitFailure NOTIFICATION-TYPE



```
OBJECTS {
    efmCuPmeFltStatus,
    efmCuPmeOperSubType
}
STATUS      current
DESCRIPTION
    "This notification indicates that peer PME was using
    incompatible protocol during initialization.

    Generation of this notification is controlled by the
    efmCuPmeProtocolInitFailEnable object."
::= { efmCuPmeNotifications 5 }

-- The PME group

efmCuPmeConfTable OBJECT-TYPE
    SYNTAX      SEQUENCE OF EfmCuPmeConfEntry
    MAX-ACCESS   not-accessible
    STATUS      current
    DESCRIPTION
        "Table for Configuration of common aspects for EFMCu
        2BASE-TL/10PASS-TS PME ports (modems). Configuration of
        aspects specific to 2BASE-TL or 10PASS-TS PME types is
        represented in efmCuPme2BConfTable and efmCuPme10PConfTable
        respectively.

        Entries in this table 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      EfmProfileIndexOrZero,
        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),
    ieee10PassTSR(4),
    ieee2BaseTLor10PassTSR(5),
    ieee2BaseTLor10PassTS0(6),
    ieee10PassTSor2BaseTL0(7)
}

```

MAX-ACCESS read-write

STATUS current

DESCRIPTION

"Administrative (desired) sub-type of the PME.

Possible values are:

- ieee2BaseTL0 - PME SHALL operate as 2BaseTL-0
- ieee2BaseTLR - PME SHALL operate as 2BaseTL-R
- ieee10PassTS0 - PME SHALL operate as 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).
- ieee10PassTSor2BaseTL0 - 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 rejected if the link is Up or Initializing. Attempts to change this object to an unsupported subtype (see efmCuPmeSubTypesSupported) SHALL be rejected.

The current operational 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 EfmProfileIndexOrZero

MAX-ACCESS read-write

STATUS current

#### DESCRIPTION

"Desired PME configuration Profile. This object is a pointer to an entry in either efmCuPme2BProfileTable or efmCuPme10PPProfileTable, depending on the current operating SubType of the PME. The value of this object is the index of the referenced profile.  
The value of zero (default) indicates that the PME is configured via efmCuAdminProfile object for the PCS port, to which this PME is assigned. That is, the profile referenced by efmCuPmeAdminProfile takes precedence over the profile(s) referenced by efmCuAdminProfile.

This object is writable and readable for the C0 subtype PMEs (2BaseTL-0 or 10PassTS-0). It is irrelevant for the CPE subtype (2BaseTL-R or 10PassTS-R) - a zero value SHALL be returned on an attempt to read this object and any attempt to change this object MUST be rejected in this case.

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"

DEFVAL { 0 }

::= { efmCuPmeConfEntry 2 }

## efmCuPAFRemoteDiscoveryCode OBJECT-TYPE

SYNTAX PhysAddress (SIZE(0|6))

MAX-ACCESS read-write

STATUS current

## DESCRIPTION

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

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

Reading this object results in a Discovery Get operation.

Setting this object to all zeroes results in a Discovery Clear\_if\_Same operation (the value of efmCuPAFDiscoveryCode at the peer PCS SHALL be the same as efmCuPAFDiscoveryCode of the local PCS associated with the PME for the operation to succeed).

Writing a non-zero value to this object results in a Discovery Set\_if\_Clear operation.

A zero-length octet string SHALL be returned on an attempt to read this object when PAF aggregation is not enabled.

This object is irrelevant in CPE port (-R) subtypes: in this case a zero length octet string SHALL be returned on an attempt to read this object, writing to this object SHALL be rejected.

Discovery MUST be performed when the link is Down.

Attempts to change this object MUST be rejected (in case of SNMP with the error inconsistentValue), if the link is Up or Initializing.

If a Clause 45 MDIO Interface to the PMA/PMD is present, then this object is a function of 10P/2B aggregation discovery control register, Discovery operation result bits in 10P/2B aggregation and discovery status register and 10P/2B aggregation discovery code register"

## REFERENCE

"[[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 (in case of SNMP with the error inconsistentValue), if the link is Up or Initializing.

If a Clause 45 MDIO Interface to the PME is present, then this object maps to the Loop attenuation threshold bits in the 2B PMD line quality thresholds register"

REFERENCE

"[[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-O/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 (in case of SNMP with the error inconsistentValue), if the link is Up or Initializing.

If a Clause 45 MDIO Interface to the PME is present, then this object maps to the SNR margin threshold bits in the 2B PMD line quality thresholds register"



## REFERENCE

"[[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 true(1) indicates that efmCuPmeLineAtnCrossing notification is enabled. Value of false(2) indicates that the notification is disabled."

::= { efmCuPmeConfEntry 6 }

## efmCuPmeSnrMgnCrossingEnable OBJECT-TYPE

SYNTAX TruthValue

MAX-ACCESS read-write

STATUS current

## DESCRIPTION

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

Value of true(1) indicates that efmCuPmeSnrMgnCrossing notification is enabled. Value of false(2) indicates that the notification is disabled."

::= { efmCuPmeConfEntry 7 }

## efmCuPmeDeviceFaultEnable OBJECT-TYPE

SYNTAX TruthValue

MAX-ACCESS read-write

STATUS current

## DESCRIPTION

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

Value of true(1) indicates that efmCuPmeDeviceFault notification is enabled. Value of false(2) indicates that the notification is disabled."

::= { efmCuPmeConfEntry 8 }

## efmCuPmeConfigInitFailEnable OBJECT-TYPE

SYNTAX TruthValue

MAX-ACCESS read-write

STATUS current

## DESCRIPTION





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

Value of true(1) indicates that efmCuPmeConfigInitFailure notification is enabled. Value of false(2) indicates that the notification is disabled."

::= { efmCuPmeConfEntry 9 }

efmCuPmeProtocolInitFailEnable OBJECT-TYPE

SYNTAX TruthValue

MAX-ACCESS read-write

STATUS current

DESCRIPTION

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

Value of true(1) indicates that efmCuPmeProtocolInitFailure notification is enabled. Value of false(2) indicates that the notification is disabled."

::= { efmCuPmeConfEntry 10 }

efmCuPmeCapabilityTable OBJECT-TYPE

SYNTAX SEQUENCE OF EfmCuPmeCapabilityEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"Table for Configuration of common aspects for EFMCu 2BASE-TL/10PASS-TS PME ports (modems). Configuration of aspects specific to 2BASE-TL or 10PASS-TS PME types is represented in efmCuPme2BConfTable and efmCuPme10PConfTable respectively.

Entries in this table 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 Capability table.

Each entry represents common aspects of an EFMCu PME port indexed by the ifIndex. Note that an EFMCu PME port can be stacked below a single PCS port, also indexed by ifIndex, possibly together with other PME ports if PAF is enabled."

INDEX { ifIndex }



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

```
EfmCuPmeCapabilityEntry ::=
```

```
SEQUENCE {  
    efmCuPmeSubTypesSupported    BITS  
}
```

```
efmCuPmeSubTypesSupported OBJECT-TYPE
```

```
SYNTAX      BITS {  
    ieee2BaseTL0(0),  
    ieee2BaseTLR(1),  
    ieee10PassTS0(2),  
    ieee10PassTSR(3)  
}
```

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

```
STATUS      current
```

```
DESCRIPTION
```

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

ieee2BaseTL0	- PME is capable of operating as 2BaseTL-0
ieee2BaseTLR	- PME is capable of operating as 2BaseTL-R
ieee10PassTS0	- PME is capable of operating as 10PassTS-0
ieee10PassTSR	- PME is capable of operating as 10PassTS-R

An desired mode of operation is determined by efmCuPmeAdminSubType, while efmCuPmeOperSubType reflects the current operating mode.

If a Clause 45 MDIO Interface to the PCS is present, then this object combines the 10PASS-TS capable and 2BASE-TL capable bits in the 10P/2B PMA/PMD speed ability register and the C0 supported and CPE supported bits in the 10P/2B PMA/PMD status register"

```
REFERENCE
```

"[[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
```

"This table provides common status information of EFMCu 2BASE-TL/10PASS-TS PME ports. Status information specific to 10PASS-TS PME is represented in efmCuPme10PStatusTable.



This table contains live data from the equipment. As such,  
it is NOT persistent."  
::= { efmCuPme 3 }

#### efmCuPmeStatusEntry OBJECT-TYPE

SYNTAX EfmCuPmeStatusEntry

MAX-ACCESS not-accessible

STATUS current

#### DESCRIPTION

"An entry in the EFMCu PME Status table.

Each entry represents common aspects of an EFMCu PME port indexed by the ifIndex. Note that an EFMCu PME port can be stacked below a single PCS port, also indexed by ifIndex, possibly together with other PME ports if PAF is enabled."

INDEX { ifIndex }

::= { efmCuPmeStatusTable 1 }

EfmCuPmeStatusEntry ::=

SEQUENCE {

efmCuPmeOperStatus	INTEGER,
efmCuPmeFltStatus	BITS,
efmCuPmeOperSubType	INTEGER,
efmCuPmeOperProfile	EfmProfileIndexOrZero,
efmCuPmeSnrMgn	Integer32,
efmCuPmePeerSnrMgn	Integer32,
efmCuPmeLineAtn	Integer32,
efmCuPmePeerLineAtn	Integer32,
efmCuPmeEquivalentLength	Unsigned32,
efmCuPmeTCCodingErrors	Counter32,
efmCuPmeTCCrcErrors	Counter32

}

#### efmCuPmeOperStatus OBJECT-TYPE

SYNTAX INTEGER {

up(1),  
downNotReady(2),  
downReady(3),  
init(4)

}

MAX-ACCESS read-only

STATUS current

#### DESCRIPTION

"Current PME link Operational Status. Possible values are:

- up(1) - 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),
    snrMgnDefect(1),
    lineAtnDefect(2),
    deviceFault(3),
    configInitFailure(4),
    protocolInitFailure(5)
}
```

MAX-ACCESS read-only

STATUS current

#### DESCRIPTION

"Current/Last PME link Fault Status. This is a bitmap of possible conditions. The various bit positions are:

- lossOfFraming - Loss of Framing for 10P or Loss of Sync word for 2B PMD or Loss of 64/65B 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 a regular  
 G.SDHSL/VDSL modem instead of a  
 2BASE-TL/10PASS-TS PME).

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

This object holds information about the last fault.  
 efmCuPmeFltStatus is cleared by the device restart.  
 In addition lossOfFraming, configInitFailure and  
 protocolInitFailure are cleared by PME init.  
 deviceFault is cleared by successful diagnostics/test.  
 snrMgnDefect and lineAtnDefect are cleared by SNR Margin  
 and line Attenuation respectively returning to norm and by  
 PME init.

This object partially maps to the Clause 30 attribute  
 aPMEStatus.

If a Clause 45 MDIO Interface to the PME is present, then this  
 object consolidates information from various PMA/PMD  
 registers, namely: Fault bit in PMA/PMD status 1 register,  
 10P/2B PMA/PMD link loss register,  
 10P outgoing indicator bits status register,  
 10P incoming indicator bits status register,  
 2B state defects register."

#### REFERENCE

"[[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 {
    ieee2BaseTL0(1),
    ieee2BaseTLR(2),
    ieee10PassTS0(3),
    ieee10PassTSR(4)
}
```

MAX-ACCESS read-only

STATUS current

#### DESCRIPTION

"Current operational sub-type of the PME.

Possible values are:

ieee2BaseTL0	- PME operates as 2BaseTL-0
ieee2BaseTLR	- PME operates as 2BaseTL-R
ieee10PassTS0	- PME operates as 10PassTS-0



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 EfmProfileIndexOrZero

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"PME current operating Profile. This object is a pointer to an entry in either efmCuPme2BProfileTable or efmCuPme10PProfileTable, depending on the current operating SubType of the PME as indicated by efmCuPmeOperSubType.

Note that a profile entry, to which efmCuPmeOperProfile is pointing to, can be created automatically, to reflect achieved parameters in adaptive (not fixed) initialization, i.e. values of efmCuPmeOperProfile and efmCuAdminProfile or efmCuPmeAdminProfile may differ.

The value of zero indicates that 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|65535)

UNITS "dB"

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The current Signal-to-Noise Ratio (SNR) margin with respect to the received signal as perceived by the local PME.

The value of 65535 is returned when PME is down or initializing.



This object maps to the aPMESNRMgn attribute in Clause 30.

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

REFERENCE

"[[802.3ah](#)] 30.11.2.1.4, 45.2.1.16"

::= { efmCuPmeStatusEntry 5 }

efmCuPmePeerSnrMgn OBJECT-TYPE

SYNTAX Integer32(-127..128|65535)

UNITS "dB"

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The current SNR margin in dB with respect to the received signal, as perceived by the remote (link partner) PME. The value of 65535 is returned when PME is down or initializing.

This object is irrelevant for the -R PME subtypes. The value of 65535 SHALL be returned in this case.

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

REFERENCE

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

::= { efmCuPmeStatusEntry 6 }

efmCuPmeLineAtn OBJECT-TYPE

SYNTAX Integer32(-127..128|65535)

UNITS "dB"

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The current Line Attenuation in dB as perceived by the local PME. The value of 65535 is returned when PME is down or initializing.

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|65535)



UNITS            "dB"

MAX-ACCESS    read-only

STATUS         current

DESCRIPTION

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

The value of 65535 is returned when PME is down or initializing.

This object is irrelevant for the -R PME subtypes. The value of 65535 SHALL be returned in this case.

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

REFERENCE

"[[802.3ah](#)] 45.2.1.19"

::= { efmCuPmeStatusEntry 8 }

efmCuPmeEquivalentLength OBJECT-TYPE

SYNTAX         Unsigned32(0..8192|65535)

UNITS         "m"

MAX-ACCESS    read-only

STATUS         current

DESCRIPTION

"An estimate of the equivalent loop's Physical Length in meters, as perceived by the PME after the link is established. An equivalent loop is a hypothetical 26AWG (0.4mm) loop with a perfect square root attenuation characteristic, without any bridged taps.

The value of 65535 is returned if the link is Down or Initializing or the PME is unable to estimate the Equivalent Length.

For 10BASE-TL PME, if a Clause 45 MDIO Interface to the PME is present, then this object maps to the 10P Electrical Length register"

REFERENCE

"[[802.3ah](#)] 45.2.1.21"

::= { efmCuPmeStatusEntry 9 }

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.

This object maps to aTCCodingViolations attribute in clause 30.

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

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

REFERENCE

"[[802.3ah](#)] 61.3.3.1, 30.11.2.1.5, 45.2.6.12"  
::= { efmCuPmeStatusEntry 10 }

efmCuPmeTCCrcErrors OBJECT-TYPE

SYNTAX Counter32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"A number of TC-CRC errors. This counter is incremented for each TC-CRC error detected by the 64/65-octet receive function (see 61.3.3.3 and Figure 61-19).

This object maps to aTCCRCErrors attribute in clause 30.

If a Clause 45 MDIO Interface to the PCME TC is present, then this object maps to the TC CRC error register (see 45.2.6.11).

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

REFERENCE

"[[802.3ah](#)] 61.3.3.3, 30.11.2.1.10, 45.2.6.11"  
::= { efmCuPmeStatusEntry 11 }

-- 2BASE-TL specific PME group

efmCuPme2B OBJECT IDENTIFIER ::= { efmCuPme 5 }

efmCuPme2BProfileTable OBJECT-TYPE

SYNTAX SEQUENCE OF EfmCuPme2BProfileEntry

MAX-ACCESS not-accessible



STATUS current

#### DESCRIPTION

"This table supports definitions of administrative and operating Profiles for 2BASE-TL PMEs.

First 14 entries in this table SHALL always be defined as follows (see 802.3ah Annex 63A):

Profile index	MinRate (Kbps)	MaxRate (Kbps)	Power (dBm)	Region	Constellation
1	5696	5696	13.5	1	32-TCPAM (default)
2	3072	3072	13.5	1	32-TCPAM
3	2048	2048	13.5	1	16-TCPAM
4	1024	1024	13.5	1	16-TCPAM
5	704	704	13.5	1	16-TCPAM
6	512	512	13.5	1	16-TCPAM
7	5696	5696	14.5	2	32-TCPAM
8	3072	3072	14.5	2	32-TCPAM
9	2048	2048	14.5	2	16-TCPAM
10	1024	1024	13.5	2	16-TCPAM
11	704	704	13.5	2	16-TCPAM
12	512	512	13.5	2	16-TCPAM
13	192	5696	0	1	0 (best effort)
14	192	5696	0	2	0 (best effort)

These default entries SHALL be created during agent initialization and MUST NOT be deleted.

Entries following the first 14, can be dynamically created and deleted, to provide custom administrative (configuration) profiles and automatic operating profiles.

This table MUST be maintained in a persistent manner."

#### REFERENCE

"[[802.3ah](#)] Annex 63A, 30.11.2.1.6"

::= { efmCuPme2B 2 }

#### efmCuPme2BProfileEntry OBJECT-TYPE

SYNTAX EfmCuPme2BProfileEntry

MAX-ACCESS not-accessible

STATUS current

#### DESCRIPTION

"Each entry corresponds to a single 2BASE-TL PME profile.

Each profile contains a set of parameters, used either for configuration or representation of a 2BASE-TL PME.

In case a particular profile is referenced via

efmCuPmeAdminProfile object (or efmCuAdminProfile if

efmCuPmeAdminProfile is zero), it represent the desired



parameters the 2BaseTL-0 PME initialization.  
 If a profile is referenced via efmCuPmeOperProfile object,  
 it represents current operating parameters of the  
 operational PME.

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 MUST NOT be removed."

```
INDEX { efmCuPme2BProfileIndex }
::= { efmCuPme2BProfileTable 1 }
```

```
EfmCuPme2BProfileEntry ::=
```

```
SEQUENCE {
    efmCuPme2BProfileIndex      EfmProfileIndex,
    efmCuPme2BProfileDescr     SnmpAdminString,
    efmCuPme2BRegion            INTEGER,
    efmCuPme2BsMode             EfmProfileIndexOrZero,
    efmCuPme2BMinDataRate      Unsigned32,
    efmCuPme2BMaxDataRate      Unsigned32,
    efmCuPme2BPower             Unsigned32,
    efmCuPme2BConstellation     INTEGER,
    efmCuPme2BProfileRowStatus RowStatus
}
```

```
efmCuPme2BProfileIndex OBJECT-TYPE
```

```
SYNTAX      EfmProfileIndex
MAX-ACCESS  not-accessible
STATUS      current
```

```
DESCRIPTION
```

"2BASE-TL PME Profile index.

This object is the unique index associated with this profile.

Entries in this table are referenced via efmCuAdminProfile

or efmCuPmeAdminProfile objects."

```
::= { efmCuPme2BProfileEntry 1 }
```

```
efmCuPme2BProfileDescr OBJECT-TYPE
```

```
SYNTAX      SnmpAdminString
MAX-ACCESS  read-create
STATUS      current
```

```
DESCRIPTION
```

"A textual string containing information about 2BASE-TL PME  
 Profile. The string may include information about data rate  
 and spectral limitations of this particular profile."

```
::= { efmCuPme2BProfileEntry 2 }
```

```
efmCuPme2BRegion OBJECT-TYPE
```



```
SYNTAX      INTEGER {  
    region1(1),  
    region2(2)  
}
```

```
MAX-ACCESS  read-create
```

```
STATUS      current
```

#### DESCRIPTION

"Regional settings for 2BASE-TL PME, as specified in the relevant Regional Annex of [\[G.991.2\]](#).

Regional settings specify Power Spectral Density (PSD) mask, Power Back-Off (PBO) values and place limitations on the max allowed data rate, power and constellation.

Possible values for this object are:

- region1        - Annexes A and F (e.g. North America)
- region2        - Annexes B and G (e.g. Europe)

Annex A/B specify regional settings for data rates 192-2304 Kbps using 16-TCPAM encoding.

Annex F/G specify regional settings for rates 2320-3840 Kbps using 16-TCPAM encoding and 768-5696 Kbps using 32-TCPAM encoding.

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

#### REFERENCE

"[\[802.3ah\]](#) 45.2.1.42; [\[G.991.2\]](#) Annexes A, B, F and G"

::= { efmCuPme2BProfileEntry 3 }

#### efmCuPme2BsMode OBJECT-TYPE

```
SYNTAX      EfmProfileIndexOrZero
```

```
MAX-ACCESS  read-create
```

```
STATUS      current
```

#### DESCRIPTION

"Desired custom Spectral Mode for 2BASE-TL PME. This object is a pointer to an entry in efmCuPme2BsModeTable and a block of entries in efmCuPme2BRateReachTable, which together define (country-specific) reach dependent rate limitations in addition to those defined by efmCuPme2BRegion.

The value of this object is the index of the referenced spectral mode.

The value of zero (default) indicates that no specific spectral mode is applicable.

Attempts to set this object to a value that is not the value of the index for an active entry in the corresponding spectral





```
mode table, MUST be rejected."
REFERENCE
  "efmCuPme2BsModeTable, efmCuPme2BRateReachTable"
DEFVAL { 0 }
::= { efmCuPme2BProfileEntry 4 }
```

efmCuPme2BMinDataRate OBJECT-TYPE  
SYNTAX Unsigned32(192..5696)  
UNITS "Kbps"  
MAX-ACCESS read-create  
STATUS current  
DESCRIPTION  
 "Minimum Data Rate for the 2BASE-TL PME.  
 This object can take values of (n x 64)Kbps,  
 where n=3..60 for 16-TCPAM and n=12..89 for 32-TCPAM encoding.

The data rate of the 2BASE-TL PME is considered 'fixed' when the value of this object equals that of efmCuPme2BMaxDataRate. If efmCuPme2BMinDataRate is less than efmCuPme2BMaxDataRate in the administrative profile, the data rate is considered 'adaptive', and SHALL be set to the maximum attainable rate not exceeding efmCuPme2BMaxDataRate, under the spectral limitations placed by the efmCuPme2BRegion and efmCuPme2BsMode.

Note that current operational data rate of the PME is represented by ifSpeed object of IF-MIB.

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

This object MUST be maintained in a persistent manner."

```
REFERENCE
  "[802.3ah] 45.2.1.43"
::= { efmCuPme2BProfileEntry 5 }
```

efmCuPme2BMaxDataRate OBJECT-TYPE  
SYNTAX Unsigned32(192..5696)  
UNITS "Kbps"  
MAX-ACCESS read-create  
STATUS current  
DESCRIPTION  
 "Maximum Data Rate for the 2BASE-TL PME.  
 This object can take values of (n x 64)Kbps,  
 where n=3..60 for 16-TCPAM and n=12..89 for 32-TCPAM encoding.

The data rate of the 2BASE-TL PME is considered 'fixed' when



the value of this object equals that of efmCuPme2BMinDataRate. If efmCuPme2BMinDataRate is less than efmCuPme2BMaxDataRate in the administrative profile, the data rate is considered 'adaptive', and SHALL be set to the maximum attainable rate not exceeding efmCuPme2BMaxDataRate, under the spectral limitations placed by the efmCuPme2BRegion and efmCuPme2BsMode.

Note that current operational data rate of the PME is represented by ifSpeed object of IF-MIB.

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

This object MUST be maintained in a persistent manner."

REFERENCE

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

::= { efmCuPme2BProfileEntry 6 }

efmCuPme2BPower OBJECT-TYPE

SYNTAX Unsigned32(0|10..42)

UNITS "0.5 dBm"

MAX-ACCESS read-create

STATUS current

DESCRIPTION

"Signal Transmit Power. Multiple of 0.5dBm.

The value of 0 in the administrative profile means that the signal transmit power is not fixed and SHALL be set to maximize the attainable rate, under the spectral limitations placed by the efmCuPme2BRegion and efmCuPme2BsMode.

If a Clause 45 MDIO Interface to the PME is present, then this object maps to the Power1 bits in the 2B PMD parameters register"

REFERENCE

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

::= { efmCuPme2BProfileEntry 7 }

efmCuPme2BConstellation OBJECT-TYPE

SYNTAX INTEGER {  
adaptive(0),  
tcpam16(1),  
tcpam32(2)  
}

MAX-ACCESS read-create

STATUS current

DESCRIPTION



"TCPAM Constellation of the 2BASE-TL PME.

The possible values are:

- adaptive(0) - either 16- or 32-TCPAM
- tcpam16(1) - 16-TCPAM
- tcpam32(2) - 32-TCPAM

The value of adaptive(0) in the administrative profile means that the constellation is not fixed and SHALL be set to maximize the attainable rate, under the spectral limitations placed by the efmCuPme2BRegion and efmCuPme2BsMode.

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

#### REFERENCE

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

::= { efmCuPme2BProfileEntry 8 }

#### efmCuPme2BProfileRowStatus OBJECT-TYPE

SYNTAX RowStatus  
MAX-ACCESS read-create  
STATUS current  
DESCRIPTION

"This object controls creation, modification or deletion of the associated entry in efmCuPme2BProfileTable 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.

An 'active' entry SHALL NOT be modified. In order to modify an existing entry it MUST be taken out of service (by setting this object to 'notInService'), modified and set 'active' again."

::= { efmCuPme2BProfileEntry 9 }

#### efmCuPme2BsModeTable OBJECT-TYPE

SYNTAX SEQUENCE OF EfmCuPme2BsModeEntry  
MAX-ACCESS not-accessible  
STATUS current  
DESCRIPTION

"This table, together with efmCu2BReachRateTable, supports definition of administrative custom spectral modes for 2BASE-TL PMEs, describing spectral limitations in addition to those specified by efmCuPme2BRegion.



Some countries spectral regulations (e.g. UK ANFP) limit the length of the loops for certain data rates. This table allows these country-specific limitations to be specified.

Entries in this table referenced by the efmCuPme2BsMode MUST NOT be deleted until all the active references are removed.

This table MUST be maintained in a persistent manner."

REFERENCE

"efmCu2BReachRateTable"

::= { efmCuPme2B 3 }

efmCuPme2BsModeEntry OBJECT-TYPE

SYNTAX EfmCuPme2BsModeEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"Each entry specifies spectral mode description and its index, which is used to reference corresponding entries in the efmCu2BReachRateTable.

Entries may be created/deleted using the row creation/deletion mechanism via efmCuPme2BsModeRowStatus."

INDEX { efmCuPme2BsModeIndex }

::= { efmCuPme2BsModeTable 1 }

EfmCuPme2BsModeEntry ::=

SEQUENCE {

efmCuPme2BsModeIndex	EfmProfileIndex,
efmCuPme2BsModeDescr	SnmpAdminString,
efmCuPme2BsModeRowStatus	RowStatus

}

efmCuPme2BsModeIndex OBJECT-TYPE

SYNTAX EfmProfileIndex

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"2BASE-TL PME Spectral Mode index.

This object is the unique index associated with this spectral mode.

Entries in this table are referenced via efmCuPme2BsMode object."

::= { efmCuPme2BsModeEntry 1 }

efmCuPme2BsModeDescr OBJECT-TYPE

SYNTAX SnmpAdminString





MAX-ACCESS read-create  
 STATUS current  
 DESCRIPTION

"A textual string containing information about 2BASE-TL PME spectral mode. The string may include information about corresponding (country-specific) spectral regulations and rate/reach limitations of this particular spectral mode."

::= { efmCuPme2BsModeEntry 2 }

#### efmCuPme2BsModeRowStatus OBJECT-TYPE

SYNTAX RowStatus  
 MAX-ACCESS read-create  
 STATUS current  
 DESCRIPTION

"This object controls creation, modification or deletion of the associated entry in efmCuPme2BsModeTable per the semantics of RowStatus.

If an 'active' entry is referenced via efmCuPme2BsMode, the entry MUST remain 'active' until all references are removed.

An 'active' entry SHALL NOT be modified. In order to modify an existing entry it MUST be taken out of service (by setting this object to 'notInService'), modified and set 'active' again."

::= { efmCuPme2BsModeEntry 3 }

#### efmCuPme2BReachRateTable OBJECT-TYPE

SYNTAX SEQUENCE OF EfmCuPme2BReachRateEntry  
 MAX-ACCESS not-accessible  
 STATUS current  
 DESCRIPTION

"This table supports definition of administrative custom spectral modes for 2BASE-TL PMEs, providing spectral limitations in addition to those specified by efmCuPme2BRegion.

The spectral regulations in some countries (e.g. UK ANFP) limit the length of the loops for certain data rates. This table allows these country-specific limitations to be specified.

Below is an example of this table for [[ANFP](#)]:

```
-----+-----+-----+
Equivalent MaxRate MaxRate
Length      PAM16   PAM32
(m)         (Kbps)  (Kbps)
```



975	2304	5696
1125	2304	5504
1275	2304	5120
1350	2304	4864
1425	2304	4544
1500	2304	4288
1575	2304	3968
1650	2304	3776
1725	2304	3520
1800	2304	3264
1875	2304	3072
1950	2048	2688
2100	1792	2368
2250	1536	0
2400	1408	0
2550	1280	0
2775	1152	0
2925	1152	0
3150	1088	0
3375	1024	0

Entries in this table referenced by the efmCuPme2BsMode MUST NOT be deleted until all the active references are removed.

This table MUST be maintained in a persistent manner."

REFERENCE

"[[ANFP](#)]"

::= { efmCuPme2B 4 }

efmCuPme2BReachRateEntry OBJECT-TYPE

SYNTAX EfmCuPme2BReachRateEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"Each entry specifies maximum 2BASE-TL PME data rates allowed for a certain equivalent loop length, when using 16-TCPAM or 32-TCPAM encoding.

When 2BASE-TL PME is initialized, its data rate MUST NOT exceed one of the following limitations:

- the value of efmCuPme2BMaxDataRate
- maximum data rate allowed by efmCuPme2BRegion and efmCuPme2BPower
- maximum data rate for a given encoding specified in the efmCuPme2BsModeEntry, corresponding to the equivalent loop



length, estimated by the PME.

It is RECOMMENDED that the efmCuPme2BEquivalentLength values are assigned in the increasing order, starting from the minimum value.

Entries may be created/deleted using the row creation/deletion mechanism via efmCuPme2ReachRateRowStatus."

INDEX { efmCuPme2BsModeIndex, efmCuPme2BReachRateIndex }  
 ::= { efmCuPme2BReachRateTable 1 }

EfmCuPme2BReachRateEntry ::=

```
SEQUENCE {  
    efmCuPme2BReachRateIndex      EfmProfileIndex,  
    efmCuPme2BEquivalentLength    Unsigned32,  
    efmCuPme2BMaxDataRatePam16    Unsigned32,  
    efmCuPme2BMaxDataRatePam32    Unsigned32,  
    efmCuPme2BReachRateRowStatus  RowStatus  
}
```

efmCuPme2BReachRateIndex OBJECT-TYPE

SYNTAX EfmProfileIndex

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"2BASE-TL custom spectral mode Reach-Rate table index.

This object is the unique index associated with each entry."

::= { efmCuPme2BReachRateEntry 1 }

efmCuPme2BEquivalentLength OBJECT-TYPE

SYNTAX Unsigned32(0..8192)

UNITS "m"

MAX-ACCESS read-create

STATUS current

DESCRIPTION

"Maximum allowed Equivalent loop's Physical Length in meters for the specified data rates.

An equivalent loop is a hypothetical 26AWG (0.4mm) loop with a perfect square root attenuation characteristic, without any bridged taps."

::= { efmCuPme2BReachRateEntry 2 }

efmCuPme2BMaxDataRatePam16 OBJECT-TYPE

SYNTAX Unsigned32(0|192..5696)

UNITS "Kbps"

MAX-ACCESS read-create

STATUS current

DESCRIPTION



"Maximum data rate for 2BASE-TL PME at the specified Equivalent loop's Length using TC-PAM16 encoding. The value of zero means that TC-PAM16 encoding should not be used at this distance."

::= { efmCuPme2BReachRateEntry 3 }

efmCuPme2BMaxDataRatePam32 OBJECT-TYPE

SYNTAX Unsigned32(0|192..5696)

UNITS "Kbps"

MAX-ACCESS read-create

STATUS current

DESCRIPTION

"Maximum data rate for 2BASE-TL PME at the specified Equivalent loop's Length using TC-PAM32 encoding. The value of zero means that TC-PAM32 encoding should not be used at this distance."

::= { efmCuPme2BReachRateEntry 4 }

efmCuPme2BReachRateRowStatus OBJECT-TYPE

SYNTAX RowStatus

MAX-ACCESS read-create

STATUS current

DESCRIPTION

"This object controls creation, modification or deletion of the associated entry in efmCuPme2BReachRateTable per the semantics of RowStatus.

If an 'active' entry is referenced via efmCuPme2BsMode, the entry MUST remain 'active' until all references are removed.

An 'active' entry SHALL NOT be modified. In order to modify an existing entry it MUST be taken out of service (by setting this object to 'notInService'), modified and set 'active' again."

::= { efmCuPme2BReachRateEntry 5 }

-- 10PASS-TS specific PME group

efmCuPme10P OBJECT IDENTIFIER ::= { efmCuPme 6 }

efmCuPme10PProfileTable OBJECT-TYPE

SYNTAX SEQUENCE OF EfmCuPme10PProfileEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"This table supports definitions of configuration profiles for 10PASS-TS PMEs.





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

Profile Index	Bandplan PSDMask#	UPB0 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 during agent initialization and MUST NOT be deleted.

Entries following the first 22, can be dynamically created and deleted, to provide custom administrative (configuration) profiles and automatic operating profiles.

This table MUST be maintained in a persistent manner."

#### REFERENCE

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

#### efmCuPme10PProfileEntry OBJECT-TYPE

SYNTAX EfmCuPme10PProfileEntry

MAX-ACCESS not-accessible

STATUS current

#### DESCRIPTION

"Each entry corresponds to a single 10PASS-TS PME profile."



Each profile contains a set of parameters, used either for configuration or representation of a 10PASS-TS PME.

In case a particular profile is referenced via efmCuPmeAdminProfile object (or efmCuAdminProfile if efmCuPmeAdminProfile is zero), it represent the desired parameters the 10PassTS-0 PME initialization.

If a profile is referenced via efmCuPmeOperProfile object, it represents current operating parameters of the PME.

Profiles may be created/deleted using the row creation/deletion mechanism via efmCuPme10PProfileRowStatus. If an 'active' entry is referenced, the entry MUST remain 'active' until all references are removed.

Default entries MUST NOT be removed."

```
INDEX { efmCuPme10PProfileIndex }
 ::= { efmCuPme10PProfileTable 1 }
```

```
EfmCuPme10PProfileEntry ::=
```

```
SEQUENCE {
    efmCuPme10PProfileIndex      EfmProfileIndex,
    efmCuPme10PProfileDescr     SnmpAdminString,
    efmCuPme10PBandplanPSDMskProfile  INTEGER,
    efmCuPme10PUPB0ReferenceProfile  INTEGER,
    efmCuPme10PBandNotchProfiles    BITS,
    efmCuPme10PPayloadURateProfile   INTEGER,
    efmCuPme10PPayloadDRateProfile   INTEGER,
    efmCuPme10PProfileRowStatus     RowStatus
}
```

```
efmCuPme10PProfileIndex OBJECT-TYPE
```

```
SYNTAX      EfmProfileIndex
```

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

```
STATUS      current
```

```
DESCRIPTION
```

```
"10PASS-TS PME Profile Index.
```

```
This object is the unique index associated with this profile.
```

```
Entries in this table are referenced via efmCuAdminProfile or
efmCuPmeAdminProfile."
```

```
::= { efmCuPme10PProfileEntry 1 }
```

```
efmCuPme10PProfileDescr OBJECT-TYPE
```

```
SYNTAX      SnmpAdminString
```

```
MAX-ACCESS  read-create
```

```
STATUS      current
```

```
DESCRIPTION
```

```
"A textual string containing information about 10PASS-TS PME
Profile. The string may include information about data rate
and spectral limitations of this particular profile."
```



```
::= { efmCuPme10PPProfileEntry 2 }
```

```
efmCuPme10PBandplanPSDMskProfile OBJECT-TYPE
```

```
SYNTAX INTEGER {
```

```
    profile1(1),
    profile2(2),
    profile3(3),
    profile4(4),
    profile5(5),
    profile6(6),
    profile7(7),
    profile8(8),
    profile9(9),
    profile10(10),
    profile11(11),
    profile12(12),
    profile13(13),
    profile14(14),
    profile15(15),
    profile16(16),
    profile17(17),
    profile18(18),
    profile19(19),
    profile20(20),
    profile21(21),
    profile22(22),
    profile23(23),
    profile24(24),
    profile25(25),
    profile26(26),
    profile27(27),
    profile28(28),
    profile29(29)
}
```

```
MAX-ACCESS read-create
```

```
STATUS current
```

```
DESCRIPTION
```

```
    "10PASS-TS 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"

```
::= { efmCuPme10PPProfileEntry 3 }
```

efmCuPme10PUPB0ReferenceProfile OBJECT-TYPE

SYNTAX INTEGER {

```

    profile1(1),
    profile2(2),
    profile3(3),
    profile4(4),
    profile5(5),
    profile6(6),
    profile7(7),
    profile8(8),
    profile9(9)

```

}

MAX-ACCESS read-create

STATUS current

#### DESCRIPTION

"10PASS-TS PME Upstream Power Back-Off (UPB0) 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"  
 ::= { efmCuPme10PPProfileEntry 4 }

## efmCuPme10PBandNotchProfiles OBJECT-TYPE

```

SYNTAX BITS {
    profile0(0),
    profile1(1),
    profile2(2),
    profile3(3),
    profile4(4),
    profile5(5),
    profile6(6),
    profile7(7),
    profile8(8),
    profile9(9),
    profile10(10),
    profile11(11)
}

```

MAX-ACCESS read-create

STATUS current

## DESCRIPTION

"10PASS-TS 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"  
 ::= { efmCuPme10PPProfileEntry 5 }

efmCuPme10PPayloadURateProfile OBJECT-TYPE

SYNTAX INTEGER {

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

}

MAX-ACCESS read-create

STATUS current

#### DESCRIPTION

"10PASS-TS 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

"[[802.3ah](#)] Annex 62A.3.6, 30.5.1.1.20"

::= { efmCuPme10PPProfileEntry 6 }

efmCuPme10PPayloadDRateProfile OBJECT-TYPE

SYNTAX INTEGER {

profile5(5),  
profile10(10),  
profile15(15),  
profile20(20),  
profile25(25),  
profile30(30),  
profile50(50),  
profile70(70),  
profile100(100),  
profile140(140),  
profile200(200)

}

MAX-ACCESS read-create

STATUS current

## DESCRIPTION

"10PASS-TS 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"

::= { efmCuPme10PPProfileEntry 7 }



## efmCuPme10PProfileRowStatus OBJECT-TYPE

SYNTAX        RowStatus  
MAX-ACCESS   read-create  
STATUS        current

## DESCRIPTION

"This object controls creation, modification or deletion of the associated entry in efmCuPme10PProfileTable per the semantics of RowStatus.

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

An 'active' entry SHALL NOT be modified. In order to modify an existing entry it MUST be taken out of service (by setting this object to 'notInService'), modified and set 'active' again."

::= { efmCuPme10PProfileEntry 8 }

## efmCuPme10PStatusTable OBJECT-TYPE

SYNTAX        SEQUENCE OF EfmCuPme10PStatusEntry  
MAX-ACCESS   not-accessible  
STATUS        current

## DESCRIPTION

"This table provides status information of EFMCu 10PASS-TS PMEs (modems).

This table contains live data from the equipment. As such, it is NOT persistent."

::= { efmCuPme10P 2 }

## efmCuPme10PStatusEntry OBJECT-TYPE

SYNTAX        EfmCuPme10PStatusEntry  
MAX-ACCESS   not-accessible  
STATUS        current

## DESCRIPTION

"An entry in the EFMCu 10PASS-TS PME Status table."

AUGMENTS { efmCuPmeStatusEntry }

::= { efmCuPme10PStatusTable 1 }

## EfmCuPme10PStatusEntry ::=

SEQUENCE {  
    efmCuPme10PFECCorrectedBlocks     Counter32,  
    efmCuPme10PFECUncorrectedBlocks   Counter32  
}

## 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

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

REFERENCE

"[[802.3ah](#)] 45.2.1.22, 30.11.2.1.8"

::= { efmCuPme10PStatusEntry 1 }

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

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

REFERENCE

"[[802.3ah](#)] 45.2.1.23, 30.11.2.1.9"

::= { efmCuPme10PStatusEntry 2 }

--

-- Conformance Statements

--



```
efmCuGroups      OBJECT IDENTIFIER ::= { efmCuConformance 1 }

efmCuCompliances OBJECT IDENTIFIER ::= { efmCuConformance 2 }

-- Object Groups

efmCuBasicGroup OBJECT-GROUP
  OBJECTS {
    efmCuPAFSupported,
    efmCuAdminProfile,
    efmCuTargetDataRate,
    efmCuTargetSnrMgn,
    efmCuAdaptiveSpectra,
    efmCuPortSide,
    efmCuFltStatus
  }
  STATUS      current
  DESCRIPTION
    "A collection of objects representing management information
    common for all types of EFMCu ports."
    ::= { efmCuGroups 1 }

efmCuPAFGroup OBJECT-GROUP
  OBJECTS {
    efmCuPeerPAFSupported,
    efmCuPAFCapacity,
    efmCuPeerPAFCapacity,
    efmCuPAFAdminState,
    efmCuPAFDiscoveryCode,
    efmCuPAFRemoteDiscoveryCode,
    efmCuNumPMEs
  }
  STATUS      current
  DESCRIPTION
    "A collection of objects supporting OPTIONAL PME
    Aggregation Function (PAF) and PAF discovery in EFMCu ports."
    ::= { efmCuGroups 2 }

efmCuPAFErrorsGroup OBJECT-GROUP
  OBJECTS {
    efmCuPAFInErrors,
    efmCuPAFInSmallFragments,
    efmCuPAFInLargeFragments,
    efmCuPAFInBadFragments,
    efmCuPAFInLostFragments,
    efmCuPAFInLostStarts,
    efmCuPAFInLostEnds,
    efmCuPAFInOverflows
```



```
}
STATUS      current
DESCRIPTION
    "A collection of objects supporting OPTIONAL error counters
    of PAF on EFMCu ports."
::= { efmCuGroups 3 }

efmCuPmeGroup OBJECT-GROUP
OBJECTS {
    efmCuPmeAdminProfile,
    efmCuPmeOperStatus,
    efmCuPmeFltStatus,
    efmCuPmeSubTypesSupported,
    efmCuPmeAdminSubType,
    efmCuPmeOperSubType,
    efmCuPAFRemoteDiscoveryCode,
    efmCuPmeOperProfile,
    efmCuPmeSnrMgn,
    efmCuPmePeerSnrMgn,
    efmCuPmeLineAtn,
    efmCuPmePeerLineAtn,
    efmCuPmeEquivalentLength,
    efmCuPmeTCCodingErrors,
    efmCuPmeTCCrcErrors,
    efmCuPmeThreshLineAtn,
    efmCuPmeThreshSnrMgn
}
STATUS      current
DESCRIPTION
    "A collection of objects providing information about
    a 2BASE-TL/10PASS-TS PME."
::= { efmCuGroups 4 }

efmCuAlarmConfGroup OBJECT-GROUP
OBJECTS {
    efmCuThreshLowRate,
    efmCuLowRateCrossingEnable,
    efmCuPmeThreshLineAtn,
    efmCuPmeLineAtnCrossingEnable,
    efmCuPmeThreshSnrMgn,
    efmCuPmeSnrMgnCrossingEnable,
    efmCuPmeDeviceFaultEnable,
    efmCuPmeConfigInitFailEnable,
    efmCuPmeProtocolInitFailEnable
}
STATUS      current
DESCRIPTION
    "A collection of objects supporting configuration of alarm
```



```
    thresholds and notifications in EFMCu ports."
 ::= { efmCuGroups 5 }

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

efmCuPme2BProfileGroup OBJECT-GROUP
  OBJECTS {
    efmCuPme2BProfileDescr,
    efmCuPme2BRegion,
    efmCuPme2BsMode,
    efmCuPme2BMinDataRate,
    efmCuPme2BMaxDataRate,
    efmCuPme2BPower,
    efmCuPme2BConstellation,
    efmCuPme2BProfileRowStatus,
    efmCuPme2BsModeDescr,
    efmCuPme2BsModeRowStatus,
    efmCuPme2BEquivalentLength,
    efmCuPme2BMaxDataRatePam16,
    efmCuPme2BMaxDataRatePam32,
    efmCuPme2BReachRateRowStatus
  }
  STATUS      current
  DESCRIPTION
    "A collection of objects that constitute a configuration
    profile for configuration of 2BASE-TL ports."
  ::= { efmCuGroups 7}

efmCuPme10PProfileGroup OBJECT-GROUP
  OBJECTS {
    efmCuPme10PProfileDescr,
    efmCuPme10PBandplanPSDMskProfile,
    efmCuPme10PUPB0ReferenceProfile,
```





```
    efmCuPme10PBandNotchProfiles,
    efmCuPme10PPayloadURateProfile,
    efmCuPme10PPayloadDRateProfile,
    efmCuPme10PProfileRowStatus
}
STATUS    current
DESCRIPTION
    "A collection of objects that constitute a configuration
    profile for configuration of 10PASS-TS ports."
 ::= { efmCuGroups 8 }

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

-- Compliance Statements

efmCuCompliance MODULE-COMPLIANCE
STATUS    current
DESCRIPTION
    "The compliance statement for 2BASE-TL/10PASS-TS interfaces.
    Compliance with the following external compliance statements
    is REQUIRED:

    MIB Module          Compliance Statement
    -----
    IF-MIB               ifCompliance3
    EtherLike-MIB        dot3Compliance2
    MAU-MIB              mauModIfCompl3

    Compliance with the following external compliance statements
    is OPTIONAL for implementations supporting PME Aggregation
    Function (PAF) with flexible cross-connect between the PCS
    and PME ports:

    MIB Module          Compliance Statement
    -----
    IF-INVERTED-STACK-MIB ifInvCompliance
    IF-CAP-STACK-MIB      ifCapStackCompliance"

MODULE  -- this module
```



```
MANDATORY-GROUPS {
    efmCuBasicGroup,
    efmCuPmeGroup,
    efmCuAlarmConfGroup,
    efmCuNotificationGroup
}

GROUP          efmCuPme2BProfileGroup
DESCRIPTION
    "Support for this group is only required for implementations
    supporting 2BASE-TL Phy."

GROUP          efmCuPme10PProfileGroup
DESCRIPTION
    "Support for this group is only required for implementations
    supporting 10PASS-TS Phy."

GROUP          efmCuPAFGroup
DESCRIPTION
    "Support for this group is only required for
    implementations supporting PME Aggregation Function (PAF)."
```

```
GROUP          efmCuPAFErrorsGroup
DESCRIPTION
    "Support for this group is OPTIONAL for implementations
    supporting PME Aggregation Function (PAF)."
```

```
GROUP          efmCuPme10PStatusGroup
DESCRIPTION
    "Support for this group is OPTIONAL for implementations
    supporting 10PASS-TS Phy."
```

```
OBJECT          efmCuPmeSubTypesSupported
SYNTAX          BITS {
    ieee2BaseTL0(0),
    ieee2BaseTLR(1),
    ieee10PassTS0(2),
    ieee10PassTSR(3)
}
DESCRIPTION
    "Support for all subtypes is not required. However at least
    one value SHALL be supported"
```

```
OBJECT          efmCuPmeAdminSubType
MIN-ACCESS      read-only
DESCRIPTION
    "Write access is not required (needed only for PMEs
    supporting more than a single subtype, e.g.
```



ieee2BaseTL0 and ieee2BaseTLR or ieee10PassTS0 and  
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 2BASE-TL  
and 6dB for 10PASS-TS."

OBJECT efmCuAdaptiveSpectra

MIN-ACCESS read-only

DESCRIPTION

"Write access is OPTIONAL. For PHYs without write access  
the default value SHOULD be false."

::= { efmCuCompliances 1 }

END

## 7. Security Considerations

There is a number of managed objects defined in the EFM-CU-MIB module that have a MAX-ACCESS clause of read-write or read-create. Most objects are writeable only when the link is Down. Writing to these objects can have potentially disruptive effects on network operation, for example:

- 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, for example when two -0 ports are connected to the same multi-PME -R port and both -0 ports have the same Discovery register value.
- 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 an operationally 'up' EFMCu port, aggregating several PMEs, may cause port's rate degradation

The user of the EFM-CU-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 the EFM-CU-MIB module (i.e., those with MAX-ACCESS other than not-accessible) may be considered sensitive in some environments since, collectively, they provide information about the performance of network interfaces and can reveal some aspects of their configuration. In particular, since 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 the EFMCu pairs, especially if the parameters of the EFMCu link in question are known.

In such environments it is important to control also 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 these MIB modules.

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 these MIB modules 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.





## **8. IANA Considerations**

The two new values of dot3MauType (dot3MauType2BaseTL and dot3MauType10PassTS) and corresponding IANAifMauTypeListBits bit definitions (b2BaseTL and b10PassTS), as well as the new values for IANAifMauMediaAvailable (availableReduced and ready) SHALL be defined by the IANA in the IANA-MAU-MIB module (see [[I-D.ietf-hubmib-rfc3636bis](#)]) before this document is published as an RFC.

Additionally, object identifiers for efmCuMIB MODULE-IDENTITY and ifCapStackMIB MODULE-IDENTITY SHALL be allocated by IANA in the MIB-2 sub-tree, before this document is published.

## **9. Acknowledgments**

This document was produced by the IETF Ethernet Interfaces and Hub MIB Working Group [[1](#)], whose efforts were greatly advanced by the contributions of the following people (in alphabetical order):

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Mike Heard

Udi Ashkenazi (Actelis)

## **10. Notes to RFC Editor**

This section contains notes to the RFC Editor and should be removed prior to publication.

Please replace [[I-D.ietf-hubmib-efm-mib](#)] and [[I-D.ietf-hubmib-rfc3636bis](#)] with actual RFC numbers if those are available at time of publication.

## **11. References**



### **11.1. Normative References**

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## **11.2. Informative References**

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[1] <<http://www.ietf.org/html.charters/hubmib-charter.html>>

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