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Abstract

This memo defines a portion of the Management Information Base (MIB) for use with network management protocols in the Internet community. This document proposes an extension to the Ethernet-like Interfaces MIB for the capability to manage Ethernet-in-the-First-Mile (EFM) devices.

1 Introduction

New capabilities have been added to Ethernet like interfaces within the IEEE P802.3ah project for Ethernet in the First Mile (EFM). This memo defines a portion of the Management Information Base (MIB) for use with network management protocols in the Internet community to manage the new capabilities of EFM Ethernet interfaces.

1.1 Specification of Requirements
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.

2 The Internet-Standard Management Framework

For a detailed overview of the documents that describe the current Internet-Standard Management Framework, please refer to section 7 of RFC 3410 [RFC3410].

Managed objects are accessed via a virtual information store, termed the Management Information Base or MIB. MIB objects are generally accessed through the Simple Network Management Protocol (SNMP). Objects in the MIB are defined using the mechanisms defined in the Structure of Management Information (SMI). This memo specifies a MIB module that is compliant to the SMIv2, which is described in STD 58, RFC 2578 [RFC2578], STD 58, RFC 2579 [RFC2579] and STD 58, RFC 2580 [RFC2580].

3 Overview

Ethernet networks have evolved over time from an enterprise backbone to a variety of other applications. The IEEE P802.3ah task force has defined extensions to the Ethernet standard for Ethernet deployments in the access space.

The Ethernet-in-the-First-Mile (EFM) task force has focused its efforts into four categories: optics, copper, Ethernet passive optical networks (Ethernet PON, or EPON), and operations, administration, and maintenance (OAM).

Generally, one can categorize the changes developed by IEEE P802.3ah as extending Ethernet with new physical layers (e.g. new optical physical layers, new copper physical layers, EPON), or as adding new common functionality applicable to many Ethernet physical layers (e.g. OAM).

This memo focuses on the management extensions to the MIB for Ethernet-like interfaces to address the new common Ethernet functionality developed in IEEE P802.3ah.

Two additional Ethernet MIB extensions are defined for IEEE P802.3ah. The EFM Copper MIB [EFM-CU-MIB] and EFM P2MP MIB [EFM-P2MP-MIB] address the new physical layers introduced by IEEE P802.3ah.

EdNote: Might want to expand this more.

4 Relation to the Other MIBs

EdNote: Need to fill this section in

5 Mapping of IEEE 802.3ah Managed Objects
This section contains the mapping between managed objects defined in [802.3ah] Clause 30, and managed objects defined in this document.

EdNote: Add mapping table here.

6 MIB Structure

The common EFM MIB objects of this memo focus on the OAM capabilities introduced in IEEE P802.3ah. The MIB objects are partitioned into four (4) different MIB groups.

The dot3OamTable group manages the primary OAM objects of the Ethernet interface. This group controls the state and status of OAM as well as the mode in which it operates.

The dot3OamStats table maintains statistics on the number and type of Ethernet OAM frames being transmitted and received on the Ethernet interface.

The dot3OamPeer table maintains the current information on the status and configuration of the peer OAM entity on the Ethernet interface. Managed information includes the capabilities and function available on the peer OAM entity.

The dot3OamEvent table defines the management objects for the event notification capability available in IEEE P802.3ah OAM. With IEEE P802.3ah OAM, one device may send notifications to its peer devices whenever an important event happens on the local device.

7 Definitions

EFM-COMMON-MIB DEFINITIONS ::= BEGIN

IMPORTS
MODULE-IDENTITY, mib-2, OBJECT-TYPE, Counter32,
     Unsigned32, Integer32
FROM SNMPv2-SMI
TEXTUAL-CONVENTION, RowStatus, MacAddress
FROM SNMPv2-TC
ifIndex
FROM IF-MIB
MODULE-COMPLIANCE, OBJECT-GROUP
FROM SNMPv2-CONF;

efmCommonMIB MODULE-IDENTITY
LAST-UPDATED "200402010000Z" -- February 1, 2004"
ORGANIZATION "IETF Ethernet Interfaces and Hub MIB Working Group"
CONTACT-INFO
" WG Charter:
http://www.ietf.org/html.charters/hubmib-charter.html

[Page 3]
DESCRIPTION

"The MIB module for managing the new common Ethernet features introduced by the Ethernet in the First Mile task force (IEEE P802.3ah). The functionality presented here is based on IEEE P802.3ah/D3.0 [802.3ah], released in December 2003.

In particular, this MIB focused on the changes to Clause 30 of the draft that are not specific to any physical layer. These changes are primarily reflected in the new OAM features developed under this project, that can be applied to any Ethernet like interface. The OAM features are described in Clause 57 of [802.3ah].

The following reference is used throughout this MIB module:

[802.3ah] refers to:
-- Editor’s note - update this to normative
-- reference when finalized

Copyright (c) The Internet Society (2004). This version of this MIB module is part of RFC XXXX; See the RFC itself for full legal notices. "
-- RFC Editor: Update XXXX to appropriate RFC number
-- RFC Editor: Remote these notes
::= { mib-2 XXX }

-- RFC Editor: Replace value with IANA assigned number
-- RFC Editor: Remove these notes

--

-- Sections of the EFM Common MIB
--
dot3OamMIB OBJECT IDENTIFIER ::= { efmCommonMIB 1}
  -- Editor’s Note: If only OAM content in this MIB, it
  -- may be worthwhile to eliminate the Common
  -- nomenclature and make this OAM only.

dot3OamConformance OBJECT IDENTIFIER ::= { efmCommonMIB 2 }

--

-- Textual conventions
--

Dot3oui ::= TEXTUAL-CONVENTION
  STATUS current
  DESCRIPTION "24-bit Organizationally Unique Identifier.
  Information on OUIs can be found in IEEE
  -- Editors Note - Include reference for [802-2001]
  SYNTAX OCTET STRING(SIZE(3))

--

-- Ethernet OAM Control group
--
dot3OamTable OBJECT-TYPE
  SYNTAX SEQUENCE OF Dot3OamEntry
  MAX-ACCESS not-accessible
  STATUS current
  DESCRIPTION "Primary controls and status for the OAM
  capabilities of an Ethernet like interface.
  There will be one row in this table for each
  Ethernet-like interface in the system that
  supports the Ethernet OAM functions defined
  in [802.3ah]."
  ::= { dot3OamMIB 1 }

dot3OamEntry OBJECT-TYPE
  SYNTAX Dot3OamEntry
  MAX-ACCESS not-accessible
  STATUS current
  DESCRIPTION "An entry in the table, containing
  information on the Ethernet OAM function for
  a single Ethernet-like interface."
INDEX       { ifIndex }  
 ::= { dot3OamTable 1 } 

Dot3OamEntry ::=  
 SEQUENCE {  
   dot3OamRowStatus                   RowStatus,  
   dot3OamAdminState                  INTEGER,  
   dot3OamOperStatus                  INTEGER,  
   dot3OamMode                        INTEGER,  
   dot3OamMaxOamPduSize               Integer32,  
   dot3OamConfigRevision              Unsigned32,  
   dot3OamFunctionsSupported          BITS  
 }  

dot3OamRowStatus OBJECT-TYPE  
 SYNTAX       RowStatus  
 MAX-ACCESS   read-create  
 STATUS       current  
 DESCRIPTION "Row creation is automatic for each Ethernet-  
 like interface that supports OAM functionality  
 as defined in [802.3ah].  
 Note that implementation of OAM is not  
 required for any Ethernet like interface.  
 "  
 ::= [ dot3OamEntry 1 ] 

dot3OamAdminState OBJECT-TYPE  
 SYNTAX       INTEGER {  
   disabled(1),  
   enabled(2)  
 }  
 MAX-ACCESS   read-write  
 STATUS       current  
 DESCRIPTION "This object is used to configure the default  
 administrative OAM mode for this interface.  
 This object represents the administratively  
 configured OAM state for this interface."  
 ::= [ dot3OamEntry 2 ] 

dot3OamOperStatus OBJECT-TYPE  
 SYNTAX       INTEGER {  
   disabled(1),  
   passiveWait(2),  
   activeSendLocal(3),  
   sendLocalAndRemote1(4),  
   sendLocalAndRemote2(5),  
   oamPeeringLocallyRejected(6),  
   oamPeeringRemotelyRejected(7),  
   operational(8)  
 }  

[Page 6]
At initialization and failure conditions, OAM entities on the same Ethernet link begin a discovery phase to determine what OAM capabilities maybe used on that link. The progress of this initialization is controlled by the OAM sublayer. This value is always ‘disabled’ if OAM is disabled via the dot3OamAdminState.

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

The state ‘sendLocalAndRemote1’ reflects that the local OAM entity has discovered the peer but has not yet accepted or rejected the configuration of the peer. The local device can, for whatever reason, decide that the peer device is unacceptable and decline OAM peering. If the local OAM entity rejects the peer OAM entity, the state becomes ‘oamPeeringLocallyRejected’. If the OAM peering is allowed by the local device, the state moves to ‘sendLocalAndRemote2’.

Note that both the ‘sendLocalAndRemote1’ and ‘oamPeeringLocallyRejected’ states fall within the state SEND_LOCAL_REMOTE_1 of the Discovery state diagram [802.3ah, Figure 57-5], with the difference being whether the local OAM client has rejected the peering or just not decided yet.

If the remote OAM entity rejects the peering, the state becomes ‘oamPeeringRemotelyRejected’.

Note that both the ‘sendLocalAndRemote2’ and ‘oamPeeringRemotelyRejected’ states fall within the state SEND_LOCAL_REMOTE_2 of the Discovery state diagram [802.3ah, Figure 57-5], with the difference being whether the remote OAM client has rejected the peering or has just not yet decided.

When the local OAM entity learns that both it
and the remote OAM entity have accepted the peering, the state moves to ‘operational’.

REFERENCE "[802.3ah], REFERENCE TBD"
 ::= { dot3OamEntry 3 }

-- Editor’s Note: No C30 attribute in D3.0, should appear in D3.1

dot3OamMode OBJECT-TYPE
SYNTAX INTEGER {
    active(1),
    passive(2)
}
MAX-ACCESS read-write
STATUS current
DESCRIPTION "This object configures the mode of OAM operation for this Ethernet like interface. OAM on Ethernet interfaces may be in ‘active’ mode or ‘passive’ mode. These two modes differ in that active mode provides additional capabilities to initiate monitoring activities with the remote OAM peer entity, while passive mode generally waits for the peer to initiate OAM actions with it. As an example, an active OAM entity can put the remote OAM entity in a loopback state, where a passive OAM entity cannot."

REFERENCE "[802.3ah], 30.11.1.1.3"
 ::= { dot3OamEntry 4 }

dot3OamMaxOamPduSize OBJECT-TYPE
SYNTAX Integer32 (64..1522)
MAX-ACCESS read-only
STATUS current
DESCRIPTION "The largest OAMPDU that the OAM entity supports. OAM entities exchange maximum OAMPDU sizes and negotiate to use the smaller of the two maximum OAMPDU sizes between the peers."

REFERENCE "[802.3ah], REFERENCE TBD"
 ::= { dot3OamEntry 5 }

-- Editor’s Note: No C30 attribute in D3.0, should appear in D3.1

dot3OamConfigRevision OBJECT-TYPE
SYNTAX Unsigned32
MAX-ACCESS read-only
STATUS current
DESCRIPTION "The configuration revision of the OAM entity as reflected in the latest OAMPDU sent by the OAM entity. The config revision is used by
OAM entities to indicate configuration changes have occurred which might require the peer OAM entity to re-evaluate whether the peering is allowed. See local_satisfied in [802.3ah, 57.3.1.2].

REFERENCE "[802.3ah], REFERENCE TBD"
::= { dot3OamEntry 6 }

-- Editor’s Note: No C30 attribute in D3.0, should appear in D3.1

dot3OamFunctionsSupported OBJECT-TYPE
SYNTAX      BITS {
unidirectionalSupport (0),
loopbackSupport(1),
eventSupport (2),
variableSupport(3)
}
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION "The OAM functions supported on this Ethernet-like interface. OAM consists of separate functionality sets above the basic discovery process. These functional groups can be supported independently, and each is an optional capability above the basic discovery function."

REFERENCE "[802.3ah], REFERENCE TBD"
::= { dot3OamEntry 7 }

-- Editor’s Note: No C30 attribute in D3.0, should appear in D3.1

-- Ethernet OAM Statistics group

--

dot3OamStatsTable OBJECT-TYPE
SYNTAX     SEQUENCE OF Dot3OamStatsEntry
MAX-ACCESS not-accessible
STATUS      current
DESCRIPTION "Statistics for the OAM function on a particular Ethernet-like interface."
::= { dot3OamMIB 2 }

dot3OamStatsEntry OBJECT-TYPE
SYNTAX     Dot3OamStatsEntry
MAX-ACCESS not-accessible
STATUS      current
DESCRIPTION "An entry in the table, containing statistics information on the Ethernet OAM function for a single Ethernet-like interface."
INDEX      { ifIndex }
::= { dot3OamStatsTable 1 }

Dot3OamStatsEntry ::= SEQUENCE {
    dot3OamPduTx                        Counter32,
    dot3OamPduRx                        Counter32,
    dot3OamInformationTx                Counter32,
    dot3OamInformationRx                Counter32,
    dot3OamEventNotificationTx          Counter32,
    dot3OamUniqueEventNotificationRx    Counter32,
    dot3OamDuplicateEventNotificationRx Counter32,
    dot3OamLoopbackControlTx            Counter32,
    dot3OamLoopbackControlRx            Counter32,
    dot3OamVariableRequestTx            Counter32,
    dot3OamVariableRequestRx            Counter32,
    dot3OamVariableResponseTx           Counter32,
    dot3OamVariableResponseRx           Counter32,
    dot3OamOrgSpecificTx                Counter32,
    dot3OamOrgSpecificRx                Counter32,
    dot3OamUnsupportedCodesRx           Counter32
    -- Editor’s Note – This may change in D3.1

    dot3OamPduTx OBJECT-TYPE
    SYNTAX      Counter32
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION "A count of the number of Ethernet OAM frames
transmitted on this interface."
    REFERENCE   "[802.3ah], 30.11.1.1.14."
    ::= { dot3OamStatsEntry 1 }

    dot3OamPduRx OBJECT-TYPE
    SYNTAX      Counter32
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION "A count of the number of Ethernet OAM frames
received on this interface."
    REFERENCE   "[802.3ah], 30.11.1.1.15."
    ::= { dot3OamStatsEntry 2 }

    dot3OamInformationTx OBJECT-TYPE
    SYNTAX      Counter32
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION "A count of the number of Information OAMPDUs
transmitted on this interface."
    REFERENCE   "[802.3ah], 30.11.1.1.17."
    ::= { dot3OamStatsEntry 3 }

    dot3OamInformationRx OBJECT-TYPE
    SYNTAX      Counter32


MAX-ACCESS read-only
STATUS current
DESCRIPTION "A count of the number of Information OAMPDUs received on this interface."
REFERENCE "[802.3ah], 30.11.1.1.18."
::= { dot3OamStatsEntry 4 }

dot3OamEventNotificationTx OBJECT-TYPE
SYNTAX Counter32
MAX-ACCESS read-only
STATUS current
DESCRIPTION "A count of the number of Event OAMPDUs transmitted on this interface."
REFERENCE "[802.3ah], 30.11.1.1.19."
::= { dot3OamStatsEntry 5 }

dot3OamUniqueEventNotificationRx OBJECT-TYPE
SYNTAX Counter32
MAX-ACCESS read-only
STATUS current
DESCRIPTION "A count of the number of unique Event OAMPDUs received on this interface."
REFERENCE "[802.3ah], 30.11.1.1.20."
::= { dot3OamStatsEntry 6 }

dot3OamDuplicateEventNotificationRx OBJECT-TYPE
SYNTAX Counter32
MAX-ACCESS read-only
STATUS current
DESCRIPTION "A count of the number of duplicate Event OAMPDUs received on this interface."
REFERENCE "[802.3ah], 30.11.1.1.21."
::= { dot3OamStatsEntry 7 }

dot3OamLoopbackControlTx OBJECT-TYPE
SYNTAX Counter32
MAX-ACCESS read-only
STATUS current
DESCRIPTION "A count of the number of Loopback OAMPDUs transmitted on this interface."
REFERENCE "[802.3ah], 30.11.1.1.22."
::= { dot3OamStatsEntry 8 }

dot3OamLoopbackControlRx OBJECT-TYPE
SYNTAX Counter32
MAX-ACCESS read-only
STATUS current
DESCRIPTION "A count of the number of Loopback OAMPDUs received on this interface."
REFERENCE "[802.3ah], 30.11.1.1.23."
::= { dot3OamStatsEntry 9 }

dot3OamVariableRequestTx OBJECT-TYPE

[Page 11]
dot3OamStatsEntry 10.

**dot3OamStatsEntry 11.**

**dot3OamStatsEntry 12.**

**dot3OamStatsEntry 13.**

**dot3OamStatsEntry 14.**

**dot3OamStatsEntry 15.**
dot3OamUnsupportedCodesRx OBJECT-TYPE
   SYNTAX      Counter32
   MAX-ACCESS  read-only
   STATUS      current
   DESCRIPTION "A count of the number of OAMPDUs with an
                unrecognized type received on this
                interface."
   REFERENCE   
                "[802.3ah], 30.11.1.1.16."
   ::= { dot3OamStatsEntry 16 }

-- Ethernet OAM Peer group
--

dot3OamPeerTable OBJECT-TYPE
   SYNTAX     SEQUENCE OF Dot3OamPeerEntry
   MAX-ACCESS not-accessible
   STATUS     current
   DESCRIPTION "Information about the OAM peer for a
                particular Ethernet like interface."
   ::= { dot3OamMIB 3 }

dot3OamPeerEntry OBJECT-TYPE
   SYNTAX     Dot3OamPeerEntry
   MAX-ACCESS not-accessible
   STATUS     current
   DESCRIPTION "An entry in the table, containing information
                on the peer OAM entity for a single Ethernet
                like interface."
   INDEX       { ifIndex }
   ::= { dot3OamPeerTable 1 }

Dot3OamPeerEntry ::= 
   SEQUENCE {
      dot3OamPeerRowStatus                RowStatus,
      dot3OamPeerMacAddress               MacAddress,
      dot3OamPeerVendorOui                Dot3Oui,
      dot3OamPeerVendorInfo               Unsigned32,
      dot3OamPeerMode                     INTEGER,
      dot3OamPeerMaxOamPduSize            Integer32,
      dot3OamPeerConfigRevision           Unsigned32,
      dot3OamPeerFunctionsSupported       BITS,
      dot3OamPeerMultiplexorState         INTEGER,
      dot3OamPeerParserState              INTEGER
   }

dot3OamPeerRowStatus OBJECT-TYPE
   SYNTAX     RowStatus
   MAX-ACCESS read-create
   STATUS     current
DESCRIPTION "The peer row is automatically created when the dot3OamOperStatus of this particular Ethernet interface is not 'disabled', 'passiveWait' or 'activeSendLocal'. In such cases, the remote OAM entity has been identified and its information and status can be made available.

This row is automatically deleted if the dot3OamOperStatus changes to 'disabled', 'passiveWait', or 'activeSendLocal'."

REFERENCE "N/A"
::= { dot3OamPeerEntry 1 }

dot3OamPeerMacAddress OBJECT-TYPE
SYNTAX MacAddress
MAX-ACCESS read-only
STATUS current
DESCRIPTION "The MAC address of the peer OAM entity."
REFERENCE "[802.3ah], 30.11.1.1.4."
::= { dot3OamPeerEntry 2 }

dot3OamPeerVendorOui OBJECT-TYPE
SYNTAX Dot3Oui
MAX-ACCESS read-only
STATUS current
DESCRIPTION "The OUI of the OAM peer as reflected in the latest information OAMPDU."
REFERENCE "[802.3ah], 30.11.1.1.11."
::= { dot3OamPeerEntry 3 }

dot3OamPeerVendorInfo OBJECT-TYPE
SYNTAX Unsigned32
MAX-ACCESS read-only
STATUS current
DESCRIPTION "The Vendor Info of the OAM peer as reflected in the latest information OAMPDU."
REFERENCE "[802.3ah], 30.11.1.1.12, 30.11.1.1.13"
::= { dot3OamPeerEntry 4 }

dot3OamPeerMode OBJECT-TYPE
SYNTAX INTEGER {
   active(1),
   passive(2)
}
MAX-ACCESS read-only
STATUS current
DESCRIPTION "The mode of the OAM peer as reflected in the latest OAMPDU."
REFERENCE "[802.3ah], 30.11.1.1.5."
::= {dot3OamPeerEntry 5}

dot3OamPeerMaxOamPduSize OBJECT-TYPE
SYNTAX Integer32 (64..1522)
MAX-ACCESS read-only
STATUS current
DESCRIPTION "The maximum size of OAMPDU supported by the peer as reflected in the latest OAMPDU. Ethernet OAM on this interface must not use OAMPDUs that exceed this size."
REFERENCE "[802.3ah], 30.11.1.1.6."
::= {dot3OamPeerEntry 6}

dot3OamPeerConfigRevision OBJECT-TYPE
SYNTAX Unsigned32
MAX-ACCESS read-only
STATUS current
DESCRIPTION "The configuration revision of the OAM peer as reflected in the latest OAMPDU. This attribute is changed by the peer whenever it has a local configuration change for Ethernet OAM on this interface."
REFERENCE "[802.3ah], 30.11.1.1.9."
::= {dot3OamPeerEntry 7}

dot3OamPeerFunctionsSupported OBJECT-TYPE
SYNTAX BITS {
  unidirectionalSupport (0),
  loopbackSupport (1),
  eventSupport (2),
  variableSupport (3)
}
MAX-ACCESS read-only
STATUS current
DESCRIPTION "The OAM functions supported on this Ethernet like interface. OAM consists of separate functionality sets above the basic discovery process."
REFERENCE "[802.3ah], REFERENCE 30.11.1.1.5"
::= {dot3OamPeerEntry 8}

dot3OamPeerMultiplexorState OBJECT-TYPE
SYNTAX INTEGER {
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forward(1),
discard(2)
}
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION "The state of the multiplexor function in the OAM peer as reflected in the latest OAMPDU. This value is changed based on loopback actions by either the local or remote device. The normal value for this attribute is 'forward'. When transitioning into or out of a loopback state, the value goes to discard."
REFERENCE   "[802.3ah], 30.11.1.1.10."
::= { dot3OamPeerEntry 9 }

dot3OamPeerParserState OBJECT-TYPE
SYNTAX      INTEGER {
                forward(1),
                loopback(2),
                discard(3)
            }
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION "The state of the parser function in the OAM peer as reflected in the latest OAMPDU. This value is changed based on loopback actions by either the local or remote device. The normal value for this attribute is forward.

When the remote OAM entity is performing loopback operations with the local OAM entity, the value goes to discard (when traffic is looped back at the peer) or loopback (when traffic is looped back locally)."
REFERENCE   "[802.3ah], 30.11.1.1.10."
::= { dot3OamPeerEntry 10 }

--
-- Ethernet OAM Loopback group
--

dot3OamLoopbackTable OBJECT-TYPE
SYNTAX     SEQUENCE OF Dot3OamLoopbackEntry
MAX-ACCESS not-accessible
STATUS     current
DESCRIPTION "This table contains methods to control the loopback state of the local link as well as indicating the status of the loopback
dot3OamLoopbackEntry OBJECT-TYPE
SYNTAX    Dot3OamLoopbackEntry
MAX-ACCESS not-accessible
STATUS    current
DESCRIPTION "An entry in the table, containing information on the loopback status for a single Ethernet like interface."
INDEX     { ifIndex }
 ::= { dot3OamLoopbackTable 1 }

Dot3OamLoopbackEntry ::= SEQUENCE {
    dot3OamLoopbackCommand            INTEGER,
    dot3OamLoopbackStatus             INTEGER
 }

dot3OamLoopbackCommand OBJECT-TYPE
SYNTAX       INTEGER {
    noLoopback (1),
    startRemoteLoopback (2),
    endRemoteLoopback (3)
}
MAX-ACCESS  read-write
STATUS      current
DESCRIPTION "This attribute initiates or terminates remote loopback with an OAM peer. Writing 'startRemoteLoopback' to this attribute cause the local OAM client to send a loopback OAMPDU to the OAM peer with the loopback enable flags set. Writing 'endRemoteLoopback' to this attribute will cause the local OAM client to send a loopback OAMPDU to the OAM peer with the loopback enable flags cleared. Writing noLoopback to this attribute has no effect.

The attribute always returns noLoopback on a read. To determine the loopback status, use the attribute dot3OamLoopbackStatus."
REFERENCE   "[802.3ah], REFERENCE 57.2.11"
 ::= { dot3OamLoopbackEntry 1 }
dot3OamLoopbackStatus OBJECT-TYPE
SYNTAX       INTEGER {
    noLoopback (1),
    initiatingLoopback (2),
    remoteLoopback (3),
    terminatingLoopback (4),
localLoopback (5)

MAX-ACCESS  read-only
STATUS      current
DESCRIPTION "The loopback status of the link. This status is determined by a combination of the local parser and multiplexer states, as well as by the actions of the local OAM client. When operating in normal mode with no loopback in progress, the status is 'noLoopback'.

If the OAM client has sent an OAM loopback PDU and is waiting for a response, where the local parser and multiplexer states are DISCARD (see [802.3ah, 57.2.11.1]), the status is 'initiatingLoopback'.

If the local OAM client knows that the remote OAM entity is in loopback mode (via the remote state information as described in [802.3ah, 57.2.11.1]), the status is 'remoteLoopback'.

If the local OAM client is in the process of terminating the remote loopback [802.3ah, 57.2.11.3], with its local multiplexer and parser states in DISCARD, the status is 'terminatingLoopback'. If the remote OAM client has put the local OAM entity in loopback mode as indicated by its local parser state, the status is 'localLoopback'."

REFERENCE  "[802.3ah], REFERENCE 57.2.11"
 ::= { dot3OamLoopbackEntry 2 }
-- Editor's Note: No C30 attribute in D3.0, should appear in D3.1

-- Ethernet OAM Event group
--

dot3OamEventConfigTable OBJECT-TYPE
SYNTAX     SEQUENCE OF Dot3OamEventConfigEntry
MAX-ACCESS not-accessible
STATUS      current
DESCRIPTION "Ethernet OAM includes the ability to generate and receive event notifications to indicate various link problems. This table contains the mechanisms to configure the thresholds to generate the standard Ethernet OAM events. These events are:
- Errored Symbol Period Event. Generated when the number of symbol errors exceeds a threshold within a given window defined by a number of symbols (e.g. 1,000 symbols out
- Errored Frame Period Event. Generated when the number of frame errors exceeds a threshold within a given window defined by a number of frames (e.g. 10 frames out of 1000 had errors).
- Errored Frame Event. Generated when the number of frame errors exceeds a threshold within a given window defined by a period of time (e.g. 10 frames in 1 second had errors).
- Errored Frame Seconds Summary Event. Generated when the number of errored frame seconds exceeds a threshold within a given time period (e.g. 10 errored frame seconds within the last 100 seconds). An errored frame second is defined as a 1 second interval which had >0 frame errors.

```plaintext
::= { dot3OamMIB 5 }

dot3OamEventConfigEntry OBJECT-TYPE
SYNTAX     Dot3OamEventConfigEntry
MAX-ACCESS not-accessible
STATUS     current
DESCRIPTION ""

INDEX       { ifIndex }
 ::= { dot3OamEventConfigTable 1 }

Dot3OamEventConfigEntry ::= 
SEQUENCE {
  dot3OamErrSymPeriodWindow          Unsigned32,
  dot3OamErrSymPeriodThreshold       Unsigned32,
  dot3OamErrFramePeriodWindow        Unsigned32,
  dot3OamErrFramePeriodThreshold     Unsigned32,
  dot3OamErrFrameWindow              Integer32,
  dot3OamErrFrameThreshold           Unsigned32,
  dot3OamErrFrameSecsSummaryWindow   Integer32,
  dot3OamErrFrameSecsSummaryThreshold Integer32
}
```

`dot3OamErrSymPeriodWindow` OBJECT-TYPE
SYNTAX     Unsigned32
MAX-ACCESS read-write
STATUS     current
DESCRIPTION "The number of symbols over which the threshold is defined. If
dot3OamErrSymPeriodThreshold symbol errors occur within a window of dot3OamErrSymPeriodWindow symbols, an Event Notification OAMPDU should be generated with an Errored Symbol Period Event TLV indicating the threshold has been crossed in this window.

REFERENCE "[802.3ah], 30.11.1.1.29"
::= { dot3OamEventConfigEntry 1 }

dot3OamErrFramePeriodWindow OBJECT-TYPE
SYNTAX Unsigned32
MAX-ACCESS read-write
STATUS current
DESCRIPTION "The number of frames over which the threshold is defined. If dot3OamErrFramePeriodThreshold frame errors occur within a window of dot3OamErrFramePeriodWindow frames, an Event Notification OAMPDU should be generated with an Errored Frame Period Event TLV indicating the threshold has been crossed in this window."

REFERENCE "[802.3ah], 30.11.1.1.33"
::= { dot3OamEventConfigEntry 2 }

dot3OamErrFramePeriodThreshold OBJECT-TYPE
SYNTAX Unsigned32
MAX-ACCESS read-write
STATUS current
DESCRIPTION "The number of frame errors that must occur for this event to be triggered. If dot3OamErrFramePeriodThreshold frame errors occur within a window of dot3OamErrFramePeriodWindow frames, an Event Notification OAMPDU should be generated with an Errored Frame Period Event TLV indicating the threshold has been crossed in this window."

REFERENCE "[802.3ah], 30.11.1.1.33"
::= { dot3OamEventConfigEntry 3 }
Notification OAMPDU should be generated with an Errored Frame Period Event TLV indicating the threshold has been crossed in this window.

REFERENCE "[802.3ah], 30.11.1.33"
::= { dot3OamEventConfigEntry 4 }

dot3OamErrFrameWindow OBJECT-TYPE
SYNTAX Integer32 (10..600)
MAX-ACCESS read-write
STATUS current
DESCRIPTION "The amount of time over which the threshold is defined. If dot3OamErrFrameThreshold frame errors occur within a window of dot3OamErrFrameWindow (in tenths of seconds), an Event Notification OAMPDU should be generated with an Errored Frame Event TLV indicating the threshold has been crossed in this window."

REFERENCE "[802.3ah], 30.11.1.31"
::= { dot3OamEventConfigEntry 5 }

dot3OamErrFrameThreshold OBJECT-TYPE
SYNTAX Unsigned32
MAX-ACCESS read-write
STATUS current
DESCRIPTION "The number of frame errors that must occur for this event to be triggered. If dot3OamErrFrameThreshold frame errors occur within a window of dot3OamErrFrameWindow (in tenths of seconds), an Event Notification OAMPDU should be generated with an Errored Frame Event TLV indicating the threshold has been crossed in this window."

REFERENCE "[802.3ah], 30.11.1.31"
::= { dot3OamEventConfigEntry 6 }

dot3OamErrFrameSecsSummaryWindow OBJECT-TYPE
SYNTAX Integer32 (100..9000)
MAX-ACCESS read-write
STATUS current
DESCRIPTION "The amount of time over which the threshold is defined. If dot3OamErrFrameSecsSummaryThreshold frame errors occur within a window of dot3OamErrFrameSecsSummaryWindow (in tenths of seconds), an Event Notification OAMPDU should be generated with an Errored Frame Seconds Summary Event TLV indicating the threshold has been crossed in this window."

REFERENCE "[802.3ah], 30.11.1.31"
::= { dot3OamEventConfigEntry 7 }
REFERENCE "[802.3ah], 30.11.1.1.35"
  ::= { dot3OamEventConfigEntry 7 }

dot3OamErrFrameSecsSummaryThreshold OBJECT-TYPE
SYNTAX      Integer32 (1..900)
MAX-ACCESS  read-write
STATUS      current
DESCRIPTION "The number of errored frame seconds that must
occur for this event to be triggered. If
dot3OamErrFrameSecsSummaryThreshold errored
seconds occur within a window of
dot3OamErrFrameSecsSummaryWindow (in
tenths of seconds), an Event Notification
OAMPDU should be generated with an Errored
Frame Seconds Summary Event TLV indicating the
threshold has been crossed in this window."

REFERENCE "[802.3ah], 30.11.1.1.35"
  ::= { dot3OamEventConfigEntry 8 }

-- Ethernet OAM Compliance group
--

dot3OamGroups OBJECT IDENTIFIER ::= { dot3OamConformance 1 }
dot3OamCompliances OBJECT IDENTIFIER ::= { dot3OamConformance 2 }

-- Compliance statements

dot3OamCompliance MODULE-COMPLIANCE
STATUS          current
DESCRIPTION "The compliance statement for managed entities
supporting OAM on Ethernet like interfaces."

MODULE -- this module
MANDATORY-GROUPS { dot3OamControlGroup, dot3OamPeerGroup,
dot3OamStatsBaseGroup }

GROUP           dot3OamLoopbackGroup
DESCRIPTION "This group is mandatory for all IEEE 802.3 OAM
implementations that support loopback
functionality."

GROUP           dot3OamErrSymbolPeriodEventGroup
DESCRIPTION "This group is mandatory for all IEEE 802.3 OAM
implementations that support event functionality."

GROUP           dot3OamErrFramePeriodEventGroup
DESCRIPTION "This group is mandatory for all IEEE 802.3 OAM
implementations that support event functionality."
GROUP dot3OamErrFrameEventGroup
DESCRIPTION "This group is mandatory for all IEEE 802.3 OAM implementations that support event functionality."

GROUP dot3OamErrFrameSecsSummaryEventGroup
DESCRIPTION "This group is mandatory for all IEEE 802.3 OAM implementations that support event functionality."

--GROUP dot3OamVariableGroup
--DESCRIPTION "This group is mandatory for all IEEE 802.3 OAM implementations that support variable retrieval functionality."
--
::= { dot3OamCompliances 1}

dot3OamControlGroup OBJECT-GROUP
OBJECTS { dot3OamRowStatus,
            dot3OamAdminState,
            dot3OamOperStatus,
            dot3OamMode,
            dot3OamMaxOamPduSize,
            dot3OamConfigRevision,
            dot3OamFunctionsSupported
          }
STATUS current
DESCRIPTION "A collection of objects providing the abilities, configuration, and status of an Ethernet OAM entity."
::= { dot3OamGroups 1 }

dot3OamPeerGroup OBJECT-GROUP
OBJECTS { dot3OamPeerRowStatus,
            dot3OamPeerMacAddress,
            dot3OamPeerVendorOui,
            dot3OamPeerVendorInfo,
            dot3OamPeerMode,
            dot3OamPeerFunctionsSupported,
            dot3OamPeerMaxOamPduSize,
            dot3OamPeerConfigRevision,
            dot3OamPeerMultiplexorState,
            dot3OamPeerParserState
          }
STATUS current
DESCRIPTION "A collection of objects providing the abilities, configuration, and status of a peer Ethernet OAM entity."
::= { dot3OamGroups 2 }

dot3OamStatsBaseGroup OBJECT-GROUP
OBJECTS {
    dot3OamPduTx,
    dot3OamPduRx,
    dot3OamInformationTx,
    dot3OamInformationRx,
    dot3OamEventNotificationTx,
    dot3OamEventNotificationRx,
    dot3OamUniqueEventNotificationRx,
    dot3OamDuplicateEventNotificationRx,
    dot3OamLoopbackControlTx,
    dot3OamLoopbackControlRx,
    dot3OamVariableRequestTx,
    dot3OamVariableRequestRx,
    dot3OamVariableResponseTx,
    dot3OamVariableResponseRx,
    dot3OamOrgSpecificTx,
    dot3OamOrgSpecificRx,
    dot3OamUnsupportedCodesRx
}

STATUS current
DESCRIPTION "A collection of objects providing the statistics for the number of various OAM PDUs sent and received on an Ethernet like interface."

::= { dot3OamGroups 3 }

dot3OamLoopbackGroup OBJECT-GROUP
OBJECTS {
    dot3OamLoopbackCommand,
    dot3OamLoopbackStatus
}

STATUS current
DESCRIPTION "A collection of objects for controlling the OAM remote loopback function."

::= { dot3OamGroups 4 }

dot3OamErrSymbolPeriodEventGroup OBJECT-GROUP
OBJECTS {
    dot3OamErrSymPeriodWindow,
    dot3OamErrSymPeriodThreshold
}

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

::= { dot3OamGroups 5 }

dot3OamErrFramePeriodEventGroup OBJECT-GROUP
OBJECTS {
    dot3OamErrFramePeriodWindow,
    dot3OamErrFramePeriodThreshold
}
STATUS current
DESCRIPTION "A collection of objects for configuring the thresholds for an Errored Frame Period Event."
::= { dot3OamGroups 6 }
dot3OamErrFrameEventGroup OBJECT-GROUP
OBJECTS { dot3OamErrFrameWindow, dot3OamErrFrameThreshold }
STATUS current
DESCRIPTION "A collection of objects for configuring the thresholds for an Errored Frame Event."
::= { dot3OamGroups 7 }
dot3OamErrFrameSecsSummaryEventGroup OBJECT-GROUP
OBJECTS { dot3OamErrFrameSecsSummaryWindow, dot3OamErrFrameSecsSummaryThreshold }
STATUS current
DESCRIPTION "A collection of objects for configuring the thresholds for an Errored Frame Seconds Summary Event."
::= { dot3OamGroups 8 }

END

8 Security Considerations

The readable objects in this module can provide information about network traffic, and therefore may be considered sensitive. In particular, OAM provides mechanisms for reading the IEEE 802.3 Clause 30 MIB attributes from a link partner via a specialized layer two protocol. Unlike SNMP, IEEE P802.3ah OAM does not include encryption or authorization mechanisms. It should be used in environments where either this interface information is not considered sensitive, or where the facility terminations are protected.

IEEE P802.3ah OAM is designed to support deployment in access and enterprise networks. In access networks, one end of a link is the CO-side, and the other is the CPE-side, and the facilities are often protected in wiring cages or closets. In such deployments, it is often the case that the CO-side is protected from access from the CPE side. Within IEEE P802.3ah OAM, this protection from remote access is accomplished by configuring the CPE-side in passive mode using the dot3OamMode attribute. This prevents the CPE from accessing functions and information at the CO-side of the connection. In
enterprise networks, read-only interface information is often considered non-sensitive.

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

The loopback capability of OAM can have potentially disruptive effects in that when enabling remote loopback, the remote station automatically transmits all received traffic back to the local station except for OAM traffic. This completely disrupts all higher layer protocols such as bridging, IP, and SNMP.

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

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

Further, deployment of SNMP versions prior to SNMPv3 is NOT RECOMMENDED. Instead, it is RECOMMENDED to deploy SNMPv3 and to enable cryptographic security. It is then a customer/operator responsibility to ensure that the SNMP entity giving access to an instance of this MIB module is properly configured to give access to the objects only to those principals (users) that have legitimate rights to indeed GET or SET (change/create/delete) them.

9 References

9.1 Normative References

[802.3ah]
[802-2001]
[RFC2119]
[RFC2570]
[RFC2578]
[RFC2580]
[RFC3410]

9.2 Informative References

[RFC2863]
[RFC3635]
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