Ethernet in the First Mile (EFM) OAM MIB

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Abstract

This document defines objects for managing Operations, Administration, and Maintenance (OAM) capabilities on Ethernet-like interfaces conformant to the Ethernet OAM functionality defined in [802.3ah]. The Ethernet OAM functionality is complementary to SNMP management in that it is focused on a small set of link-specific functions for Ethernet interfaces. This document defines objects for controlling those link OAM functions, and on providing mechanisms to take status and input from Ethernet OAM and feed it into a larger TCP/IP network management system.

Conventions used in this document
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].

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1. Introduction

The IEEE 802.3ah Ethernet in the First Mile (EFM) task force added new management capabilities to Ethernet like interfaces. These management capabilities were introduced to provide some basic OAM function on Ethernet media. The defined functionality includes discovery, error signaling, loopback, and link monitoring. This memo defines a portion of the Management Information Base (MIB) for use with network management protocols in the Internet community to manage these new EFM interface capabilities.

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 the past 30 years from simple LANs to a variety of other applications, including wide area networks. To address some of these emerging markets, the IEEE 802.3ah task force defined additional clauses for the IEEE 802.3 standard [802.3-2002] to better address Ethernet deployments in the public access network.

The Ethernet in the First Mile (EFM) task force was focused on four somewhat independent objectives to better address Ethernet access deployments: optics, copper, Ethernet passive optical networks (Ethernet PON, or EPON), and operations, administration, and maintenance (OAM). The optics sub-taskforce developed new optical physical layers that better served the long-reach outside plant networks typically found in the access network, including developing physical layers that operate up to 20Km and supporting the environmental conditions of outside deployments. The copper sub taskforce developed two new physical layers that run Ethernet natively over existing twisted pair wires that have been supporting voice services for decades. The EPON sub-taskforce developed a new point-to-multipoint Ethernet physical layer, utilizing Ethernet framing natively over a time-division multiple-access (TDMA) infrastructure. The OAM sub-taskforce introduced some basic management functionality into an Ethernet link to better monitor and maintain Ethernet networks in geographically disparate networks.

This document defines the management objects necessary to integrate Ethernet OAM functionality into the SNMP management framework.

Ethernet OAM is composed of a core set of functions and a set of optional functional groups that are not required to be implemented along with the core set. The mandatory functions include discovery operations (determining if the other end of the link is OAM capable, and what OAM functions it implements), state machine implementation, and some critical event flows. The optional functional groups are for (a) link events, (b) remote loopback, and (c) variable retrieval and response. Each optional functional group is controlled by a separate MIB table(s).

Ethernet OAM is complementary, not competitive, with SNMP management in that it provides some basic management functions at layer two,
rather than using layer three and above as required by SNMP over an IP infrastructure. Ethernet OAM provides single-hop functionality in that it works only between two directly connected Ethernet stations. SNMP can be used to manage the Ethernet OAM interactions of one Ethernet station with another.

Ethernet OAM has three functional objectives which are detailed in the following sections.

3.1 Remote fault indication

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

3.2 Link monitoring

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

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

3.3 Remote loopback

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

4. Relation to the Other MIBs

The definitions presented here are based on Clauses 30 and 57 of [802.3ah]. Note that these clauses describe many of these variables and their affects on the MAC layer. In some cases there is a one-to-one relationship between an object in this document and an object in the Clause 30 MIB of [802.3ah]. In other cases, the objects of this document reflect a more complex entity and are reflected by more than one objectx in the Clause 30 MIB of [802.3ah].

4.1 Relation to other SNMP MIBs

This objects defined in this document do not overlap with MIB-2 [RFC1213], the interfaces MIB [RFC2863], or the Ethernet-like interfaces MIB [RFC3635]. The objects defined here are defined for Ethernet-like interfaces only and use the same ifIndex as the associated Ethernet interface.

This document is independent of the other MIBs derived from [802.3ah] for copper [802.3ah-copper] and EPON [802.3ah-epon].

4.2 IANA Considerations

The EFM OAM MIB requires the allocation of a single object identifier for its MODULE-IDENTITY under the MIB-2 tree. IANA has not yet allocated this object identifier.

4.3 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.

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<tr>
<th>IEEE 802.3 Managed Object</th>
<th>Corresponding SNMP object</th>
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<td>.aOAMLocalFlagsField</td>
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dot3OamLclErrEventFlagsData

.aOAMRemoteFlagsField
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daOAMLocalRevision
dot3OamRemoteRevision
daOAMState
daOAMRemoteState
daOAMVendorOUI
daOAMVendorSpecificInfo
daOAMUnsupportedCodesTx
daOAMUnsupportedCodesRx
daOAMInformationTx
daOAMInformationRx
daOAMDuplicateEventNotificationTx
daOAMDuplicateEventNotificationRx
daOAMLoopbackControlTx
daOAMLoopbackControlRx
daOAMVariableRequestTx
daOAMVariableRequestRx
daOAMVariableResponseTx
daOAMVariableResponseRx
daOAMOrganizationSpecificTx
daOAMOrganizationSpecificRx

daOAMRemoteErrSymPeriodConfig
daOAMRemoteErrSymPeriodEvent
daOAMRemoteErrFrameConfig
daOAMRemoteErrFrameEvent
daOAMRemoteErrFramePeriodConfig
daOAMRemoteErrFramePeriodEvent
daOAMRemoteErrFrameSecsSummaryConfig
daOAMRemoteErrFrameSecsSummaryEvent

daOAMRemoteErrSymPeriodEvent
daOAMRemoteErrFrameEvent
daOAMRemoteErrFramePeriodEvent
daOAMRemoteErrFrameSecsSummaryEvent
There are no IEEE 802.3ah managed objects that are not reflected in this MIB in some way.

5. MIB Structure

The common EFM MIB objects of this memo focus on the OAM capabilities introduced in IEEE 802.3ah. 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.

6. MIB Definition

```c
EFM-COMMON-MIB DEFINITIONS ::= BEGIN IMPORTS
MODULE-IDENTITY, mib-2, OBJECT-TYPE, Counter32, Unsigned32,
    Integer32, NOTIFICATION-TYPE
    FROM SNMPv2-SMI
TEXTUAL-CONVENTION, RowStatus, MacAddress, TimeStamp
    FROM SNMPv2-TC
ifIndex
    FROM IF-MIB
MODULE-COMPLIANCE, OBJECT-GROUP, NOTIFICATION-GROUP
    FROM SNMPv2-CONF;
```
efmOamMIB MODULE-IDENTITY
LAST-UPDATED "200406010000Z"  -- June 01, 2004"
ORGANIZATION
"IETF Ethernet Interfaces and Hub MIB Working Group"
CONTACT-INFO
"WG Charter:
  http://www.ietf.org/html.charters/hubmib-charter.html
Mailing lists:
  General Discussion: hubmib@ietf.org
  To Subscribe: hubmib-requests@ietf.org
  In Body: subscribe your_email_address
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  Tel:    +1-919-991-5460
  Fax:    +1-919-991-0743
  E-mail: msquire@hatterasnetworks.com
"
DESCRIPTION
"The MIB module for managing the new Ethernet OAM features introduced by the Ethernet in the First Mile task force (IEEE P802.3ah). The functionality presented here is based on IEEE P802.3ah/D3.3 [802.3ah], released in April, 2004.

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

[802-2001] refers to:
  ‘IEEE Standard for LAN/MAN (Local Area

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: Remove these notes

REVISION "200406010000Z" -- June 01, 2004"
DESCRIPTION "Initial version, published as RFC XXXX."
-- RFC Editor: Update XXXX to appropriate RFC number
-- RFC Editor: Remove these notes

::= { mib-2 XXX }
-- RFC Editor: Replace value with IANA assigned number
-- RFC Editor: Remove these notes

--
-- Sections of the EFM OAM MIB
--
dot3OamMIB OBJECT IDENTIFIER ::= { efmOamMIB 1 }
dot3OamConformance OBJECT IDENTIFIER ::= { efmOamMIB 2 }

--
-- Textual conventions for OAM MIB
--
Dot3Oui ::= TEXTUAL-CONVENTION
STATUS current
DESCRIPTION "24-bit Organizationally Unique Identifier. Information on OUIs can be found in IEEE 802-2001 [802-2001] Clause 9."
SYNTAX OCTET STRING(SIZE(3))

Dot3OamUnsigned64 ::= TEXTUAL-CONVENTION
STATUS current
DESCRIPTION "This convention represents a 64 bit unsigned integer. The convention replaces the Counter64 type for objects requiring read-write access."
SYNTAX OCTET STRING ( SIZE(8) )

Dot3OamEventTLVData ::= TEXTUAL-CONVENTION
STATUS current
DESCRIPTION "This convention represents the fields in an Event TLV in an
Event Notification OAMPDU. The data is interpreted as a sequence of six integer fields. Some fields are longer than is required for specific TLVs, but since this convention will be shared between all TLVs, the maximum size field is used.

In the list below, TYPE indicates one of Symbol, Frame, Frame Period or Frame Seconds Summary. See [802.3ah], 57.5.3, for details.

- The first field is 16 bit wide, and represents the Event Time Stamp field.
- The second field is 64 bit wide, and represents the Errored TYPE Window field.
- The third field is 64 bit wide, and represents the Errored TYPE Threshold field.
- The fourth field is 64 bit wide, and represents the Errored TYPE field.
- The fifth field is 64 bit wide, and represents the Error Running Total field.
- The sixth field is 32 bit wide, and represents the Event Running Total field.

Each integer field is encoded with the most important byte at the lowest number octet. The first integer field starts at location 0.

Values which do not use the whole field width, will be aligned to the right, with zeros padded at the start of the field.

SYNTAX OCTET STRING ( SIZE (38) )
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."
REFERENCE "[802.3ah], 57.1.2 point d.1"
::= { dot3OamEntry 1 }

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

The dot3OamAdminState always starts in the disabled(1) state
until an explicit management action or configuration
information retained by the system causes a transition to the
enabled(2) state.

Note that the value of this object is ignored when the interface is not operating in full-duplex mode. OAM is not supported on half-duplex links.

REFERENCE "[802.3ah], 30.3.6.1.2"
 ::= { dot3OamEntry 2 }

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

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

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

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

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

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

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

REFERENCE "[802.3ah], 30.3.6.1.4, 30.3.6.1.10, 30.3.6.1.11"

```plaintext
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."

Changing this value results in incrementing the configuration revision field of locally generated OAMPDUs (30.3.6.1.12) and
```

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potentially re-doing the OAM discovery process if the
dot3OamOperStatus was already operational(9). "
REFERENCE " [802.3ah], 30.3.6.1.3"
::= { 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 30.3.6.1.8"
::= { dot3OamEntry 5 }

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], 30.3.6.1.12"
::= { dot3OamEntry 6 }

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 functional sets beyond the basic
discovery process which is always required. These functional
groups can be supported independently by any implementation.
These values are communicated to the peer via the local
configuration field of Information OAMPDUs. "
REFERENCE " [802.3ah], 30.3.6.1.6"
::= { dot3OamEntry 7 }

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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. OAM entities communicate with a single OAM peer entity on full-duplex Ethernet links on which OAM is enabled and operating properly."
::= { dot3OamMIB 2 }

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.

Note that there is at most one OAM peer for each 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
}

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DESCRIPTION

"The peer row is automatically created when the
dot3OamOperStatus of this particular Ethernet interface is not
'disabled', 'linkFault', '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', 'linkfault', '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. The MAC address is
derived from the most recently received OAMPDU.

An OAMPDU is indicated by a valid frame with (1) destination
MAC address equal to that of the reserved MAC address for Slow
Protocols (See 43B of [802.3ah]), (2) a lengthOrType field
equal to the reserved type for Slow Protocols, (3) and a Slow
Protocols subtype equal to that of the subtype reserved for
OAM."

REFERENCE "[802.3ah], 30.3.6.1.5."
::= { 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 received with a Local Information TLV. The
OUI can be used to identify the vendor of the remote OAM
entity.

An Information OAMPDU is indicated by a valid frame with (1)
destination MAC address equal to that of the reserved MAC
address for Slow Protocols (See 43B of [802.3ah]), (2) a
lengthOrType field equal to the reserved type for Slow
Protocols, (3) a Slow Protocols subtype equal to that of the
subtype reserved for OAM, (4) a OAM code that equals the code
reserved for Information OAMPDUs."

REFERENCE "[802.3ah], 30.3.6.1.16."
dot3OamPeerVendorInfo OBJECT-TYPE
SYNTAX      Unsigned32
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION  "The Vendor Info of the OAM peer as reflected in the latest
Information OAMPDU received with a Local Information TLV. The
vendor information field is within the Local Information TLV,
and can be used to determine additional information about the
peer entity. The format of the vendor information is
unspecified within the 32-bit field.

An Information OAMPDU is indicated by a valid frame with (1)
destination MAC address equal to that of the reserved MAC
address for Slow Protocols (See 43B of [802.3ah]), (2) a
lengthOrType field equal to the reserved type for Slow
Protocols, (3) a Slow Protocols subtype equal to that of the
subtype reserved for OAM, and (4) a OAM code that equals the
code reserved for Information OAMPDUs."
REFERENCE   "[802.3ah], 30.3.6.1.17."
::= { 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
Information OAMPDU received with a Local Information TLV. The
mode of the peer can be determined from the Configuration
field in the Local Information TLV of the last Information
OAMPDU received from the peer.

An Information OAMPDU is indicated by a valid frame with (1)
destination MAC address equal to that of the reserved MAC
address for Slow Protocols (See 43B of [802.3ah]), (2) a
lengthOrType field equal to the reserved type for Slow
Protocols, (3) a Slow Protocols subtype equal to that of the
subtype reserved for OAM, and (4) a OAM code that equals the
code reserved for Information OAMPDUs."
REFERENCE   "[802.3ah], 30.3.6.1.7."
::= { 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 Information OAMPDU received with a Local Information TLV. Ethernet OAM on this interface must not use OAMPDUs that exceed this size. The maximum OAMPDU size can be determined from the PDU Configuration field of the Local Information TLV of the last Information OAMPDU received from the peer.

An Information OAMPDU is indicated by a valid frame with (1) destination MAC address equal to that of the reserved MAC address for Slow Protocols (See 43B of [802.3ah]), (2) a lengthOrType field equal to the reserved type for Slow Protocols, (3) a Slow Protocols subtype equal to that of the subtype reserved for OAM, and (4) a OAM code that equals the code reserved for Information OAMPDUs."
REFERENCE  "[802.3ah], 30.3.6.1.9."
::= { 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 this interface.

The configuration revision can be determined from the Revision field of the Local Information TLV of the most recently received Information OAMPDU with a Local Information TLV.

An Information OAMPDU is indicated by a valid frame with (1) destination MAC address equal to that of the reserved MAC address for Slow Protocols (See 43B of [802.3ah]), (2) a lengthOrType field equal to the reserved type for Slow Protocols, (3) a Slow Protocols subtype equal to that of the subtype reserved for OAM, and (4) a OAM code that equals the code reserved for Information OAMPDUs."
REFERENCE  "[802.3ah], 30.3.6.1.13."
::= { 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. This value indicates the capabilities of the peer OAM entity with respect to these functions.

The capabilities of the OAM peer can be determined from the configuration field of the Local Information TLV of the most recently received Information OAMPDU with a Local Information TLV.

An Information OAMPDU is indicated by a valid frame with (1) destination MAC address equal to that of the reserved MAC address for Slow Protocols (See 43B of [802.3ah]), (2) a lengthOrType field equal to the reserved type for Slow Protocols, (3) a Slow Protocols subtype equal to that of the subtype reserved for OAM, and (4) a OAM code that equals the code reserved for Information OAMPDUs."
REFERENCE   "[802.3ah], REFERENCE 30.3.6.1.7."

::= { dot3OamPeerEntry 8 }

------------------------------------------------------------------
-- 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 function.

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

```::= { dot3OamMIB 3 }
```

`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. There is an entry in this table for every Ethernet-like interface on which supports OAM and loopback function within OAM (as indicated in dot3OamFunctionsSupported)."
INDEX { ifIndex }
```::= { dot3OamLoopbackTable 1 }

```Dot3OamLoopbackEntry ::= SEQUENCE {
  dot3OamLoopbackCommand            INTEGER,
  dot3OamLoopbackStatus             INTEGER,
  dot3OamLoopbackIgnoreRx           INTEGER
}
```

`dot3OamLoopbackCommand OBJECT-TYPE`

```SYNTAX INTEGER {
  noLoopback (1),
  startRemoteLoopback (2),
  stopRemoteLoopback (3)
}
MAX-ACCESS read-write
STATUS current
DESCRIPTION
"This attribute initiates or terminates remote loopback with an OAM peer. Writing startRemoteLoopback(2) to this attribute cause the local OAM client to send a loopback OAMPDU to the OAM peer with the loopback enable flags set. Writing stopRemoteLoopback(3) 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.

Writes to this attribute are ignored unless the OAM status of this interface is ‘operational’ (dot3OamOperStatus).

The attribute always returns noLoopback on a read. To
determine the loopback status, use the attribute
dot3OamLoopbackStatus.  
REFERENCE  "[802.3ah], 57.2.11"
::= { dot3OamLoopbackEntry 1 }

dot3OamLoopbackStatus OBJECT-TYPE
SYNTAX      INTEGER {
    noLoopback (1),
    initiatingLoopback (2),
    remoteLoopback (3),
    terminatingLoopback (4),
    localLoopback (5),
    unknown (6)
}
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION
"The loopback status of the OAM entity.  This status is
determined by a combination of the local parser and
multiplexer states, the remote parser and multiplexer states,
as well as by the actions of the local OAM client.  When
operating in normal mode with no loopback in progress, the
status reads noLoopback(1).

If the OAM client has sent an Loopback OAMPDU 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’.  In this case, the local OAM entity has
yet to receive any acknowledgement that the remote OAM entity
has received its loopback command request.

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

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

The values of this attribute correspond to the following
values of the local and remote parser and multiplexer states.
value | LclPrsr | LclMux | RmtPrsr | RmtMux
---|---|---|---|---
noloopback | FWD | FWD | FWD | FWD
initloopback | DISCARD | DISCARD | FWD | FWD
rmtloopback | DISCARD | FWD | LPBK | DISCARD
tmtngloopback | DISCARD | DISCARD | LPBK | DISCARD
lclloopback | LPBK | DISCARD | DISCARD | FWD
unknown | *** | any other combination | ***
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 {
    dot3OamInformationTx                Counter32,
dot3OamInformationRx                Counter32,
dot3OamUniqueEventNotificationTx    Counter32,
dot3OamUniqueEventNotificationRx    Counter32,
dot3OamDuplicateEventNotificationTx Counter32,
dot3OamDuplicateEventNotificationRx Counter32,
dot3OamLoopbackControlTx            Counter32,
dot3OamLoopbackControlRx            Counter32,
dot3OamVariableRequestTx            Counter32,
dot3OamVariableRequestRx            Counter32,
dot3OamVariableResponseTx           Counter32,
dot3OamVariableResponseRx           Counter32,
dot3OamOrgSpecificTx                Counter32,
dot3OamOrgSpecificRx                Counter32,
dot3OamUnsupportedCodesTx           Counter32,
dot3OamUnsupportedCodesRx           Counter32,
dot3OamFramesLostDueToOam           Counter32
  }

dot3OamInformationTx OBJECT-TYPE
SYNTAX    Counter32
MAX-ACCESS read-only
STATUS    current
DESCRIPTION
  "A count of the number of Information OAMPDUs transmitted on
  this interface.

  An Information OAMPDU is indicated by a valid frame with (1)
  destination MAC address equal to that of the reserved MAC
  address for Slow Protocols (See 43B of [802.3ah]), (2) a
  lengthOrType field equal to the reserved type for Slow
  Protocols, (3) a Slow Protocols subtype equal to that of the
  subtype reserved for OAM, and (4) an OAMPDU code equals the
  OAM Information code.

  Discontinuities of this counter can occur at re-initialization
of the management system, and at other times as indicated by
the value of the ifCounterDiscontinuityTime. "
REFERENCE " [802.3ah], 30.3.6.1.20."
::= { dot3OamStatsEntry 1 }

dot3OamInformationRx OBJECT-TYPE
SYNTAX Counter32
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"A count of the number of Information OAMPDUs received on this
interface.

An Information OAMPDU is indicated by a valid frame with (1)
destination MAC address equal to that of the reserved MAC
address for Slow Protocols (See 43B of [802.3ah]), (2) a
lengthOrType field equal to the reserved type for Slow
Protocols, (3) a Slow Protocols subtype equal to that of the
subtype reserved for OAM, and (4) an OAMPDU code equals the
OAM Information code.

Discontinuities of this counter can occur at re-initialization
of the management system, and at other times as indicated by
the value of the ifCounterDiscontinuityTime."
REFERENCE " [802.3ah], 30.3.6.1.21."
::= { dot3OamStatsEntry 2 }

dot3OamUniqueEventNotificationTx OBJECT-TYPE
SYNTAX Counter32
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"A count of the number of unique Event OAMPDUs transmitted on
this interface. Event notifications may be sent in duplicate
to increase the probability of successfully being received,
given the possibility that a frame may be lost in transit.

An Event Notification OAMPDU is indicated by a valid frame
with (1) destination MAC address equal to that of the reserved
MAC address for Slow Protocols (See 43B of [802.3ah]), (2) a
lengthOrType field equal to the reserved type for Slow
Protocols, (3) a Slow Protocols subtype equal to that of the
subtype reserved for OAM, and (4) an OAMPDU code equals the
OAM Event code.

A unique Event Notification OAMPDU is indicated as an Event
Notification OAMPDU with a Sequence Number field that is
distinct from the previously transmitted Event Notification
OAMPDU Sequence Number.
Discontinuities of this counter can occur at re-initialization of the management system, and at other times as indicated by the value of the ifCounterDiscontinuityTime.

REFERENCE  
[802.3ah], 30.3.6.1.22.
::= { dot3OamStatsEntry 3 }

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. Event notification OAMPDUs may be sent in duplicate to increase the probability of successfully being received, given the possibility that a frame may be lost in transit.

An Event Notification OAMPDU is indicated by a valid frame with (1) destination MAC address equal to that of the reserved MAC address for Slow Protocols (See 43B of [802.3ah]), (2) a lengthOrType field equal to the reserved type for Slow Protocols, (3) a Slow Protocols subtype equal to that of the subtype reserved for OAM, and (4) an OAMPDU code equals the OAM Event code.

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

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

REFERENCE  
[802.3ah], 30.3.6.1.24.
::= { dot3OamStatsEntry 4 }

dot3OamDuplicateEventNotificationTx OBJECT-TYPE
SYNTAX      Counter32
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION  
"A count of the number of duplicate Event OAMPDUs transmitted on this interface. Event notification OAMPDUs may be sent in duplicate to increase the probability of successfully being received, given the possibility that a frame may be lost in transit."
An Event Notification OAMPDU is indicated by a valid frame with (1) destination MAC address equal to that of the reserved MAC address for Slow Protocols (See 43B of [802.3ah]), (2) a lengthOrType field equal to the reserved type for Slow Protocols, (3) a Slow Protocols subtype equal to that of the subtype reserved for OAM, and (4) an OAMPDU code equals the OAM Event code.

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

Discontinuities of this counter can occur at re-initialization of the management system, and at other times as indicated by the value of the ifCounterDiscontinuityTime. "REFERENCE "[802.3ah], 30.3.6.1.23."

::= { dot3OamStatsEntry 5 }

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. Event notification OAMPDUs may be sent in duplicate to increase the probability of successfully being received, given the possibility that a frame may be lost in transit.

An Event Notification OAMPDU is indicated by a valid frame with (1) destination MAC address equal to that of the reserved MAC address for Slow Protocols (See 43B of [802.3ah]), (2) a lengthOrType field equal to the reserved type for Slow Protocols, (3) a Slow Protocols subtype equal to that of the subtype reserved for OAM, and (4) an OAMPDU code equals the OAM Event code.

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

Discontinuities of this counter can occur at re-initialization of the management system, and at other times as indicated by the value of the ifCounterDiscontinuityTime. "REFERENCE "[802.3ah], 30.3.6.1.25."

::= { dot3OamStatsEntry 6 }
dot3OamLoopbackControlTx OBJECT-TYPE
SYNTAX Counter32
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"A count of the number of Loopback Control OAMPDUs transmitted on this interface.

An Loopback Control OAMPDU is indicated by a valid frame with (1) destination MAC address equal to that of the reserved MAC address for Slow Protocols (See 43B of [802.3ah]), (2) a lengthOrType field equal to the reserved type for Slow Protocols, (3) a Slow Protocols subtype equal to that of the subtype reserved for OAM, and (4) an OAMPDU code equals the OAM Loopback Control code.

Discontinuities of this counter can occur at re-initialization of the management system, and at other times as indicated by the value of the ifCounterDiscontinuityTime."
REFERENCE "[802.3ah], 30.3.6.1.26."
::= { dot3OamStatsEntry 7 }

dot3OamLoopbackControlRx OBJECT-TYPE
SYNTAX Counter32
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"A count of the number of Loopback Control OAMPDUs transmitted on this interface.

An Loopback Control OAMPDU is indicated by a valid frame with (1) destination MAC address equal to that of the reserved MAC address for Slow Protocols (See 43B of [802.3ah]), (2) a lengthOrType field equal to the reserved type for Slow Protocols, (3) a Slow Protocols subtype equal to that of the subtype reserved for OAM, and (4) an OAMPDU code equals the OAM Loopback Control code.

Discontinuities of this counter can occur at re-initialization of the management system, and at other times as indicated by the value of the ifCounterDiscontinuityTime."
REFERENCE "[802.3ah], 30.3.6.1.27."
::= { dot3OamStatsEntry 8 }

dot3OamVariableRequestTx OBJECT-TYPE
SYNTAX Counter32
MAX-ACCESS read-only
STATUS current
DESCRIPTION

M. Squire Expires - December 2004 [Page 27]
"A count of the number of Variable Request OAMPDUs transmitted on this interface.

An Variable Request OAMPDU is indicated by a valid frame with (1) destination MAC address equal to that of the reserved MAC address for Slow Protocols (See 43B of [802.3ah]), (2) a lengthOrType field equal to the reserved type for Slow Protocols, (3) a Slow Protocols subtype equal to that of the subtype reserved for OAM, and (4) an OAMPDU code equals the OAM Variable Request code.

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

REFERENCE "[802.3ah], 30.3.6.1.28."

::= { dot3OamStatsEntry 9 }

dot3OamVariableRequestRx OBJECT-TYPE
SYNTAX Counter32
MAX-ACCESS read-only
STATUS current
DESCRIPTION "A count of the number of Variable Request OAMPDUs received on this interface.

An Variable Request OAMPDU is indicated by a valid frame with (1) destination MAC address equal to that of the reserved MAC address for Slow Protocols (See 43B of [802.3ah]), (2) a lengthOrType field equal to the reserved type for Slow Protocols, (3) a Slow Protocols subtype equal to that of the subtype reserved for OAM, and (4) an OAMPDU code equals the OAM Variable Request code.

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

REFERENCE "[802.3ah], 30.3.6.1.29."

::= { dot3OamStatsEntry 10 }

dot3OamVariableResponseTx OBJECT-TYPE
SYNTAX Counter32
MAX-ACCESS read-only
STATUS current
DESCRIPTION "A count of the number of Variable Response OAMPDUs transmitted on this interface.

An Variable Response OAMPDU is indicated by a valid frame with (1) destination MAC address equal to that of the reserved MAC..."
address for Slow Protocols (See 43B of [802.3ah]), (2) a 
lengthOrType field equal to the reserved type for Slow 
Protocols, (3) a Slow Protocols subtype equal to that of the 
subtype reserved for OAM, and (4) an OAMPDU code equals the 
OAM Variable Response code.

Discontinuities of this counter can occur at re-initialization 
of the management system, and at other times as indicated by 
the value of the ifCounterDiscontinuityTime. " 
REFERENCE " [802.3ah], 30.3.6.1.30." 
::= { dot3OamStatsEntry 11 }

dot3OamVariableResponseRx OBJECT-TYPE
SYNTAX      Counter32
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION
"A count of the number of Variable Response OAMPDUs received 
on this interface.

An Variable Response OAMPDU is indicated by a valid frame with 
(1) destination MAC address equal to that of the reserved MAC 
address for Slow Protocols (See 43B of [802.3ah]), (2) a 
lengthOrType field equal to the reserved type for Slow 
Protocols, (3) a Slow Protocols subtype equal to that of the 
subtype reserved for OAM, and (4) an OAMPDU code equals the 
OAM Variable Response code.

Discontinuities of this counter can occur at re-initialization 
of the management system, and at other times as indicated by 
the value of the ifCounterDiscontinuityTime. " 
REFERENCE " [802.3ah], 30.3.6.1.31." 
::= { dot3OamStatsEntry 12 }

dot3OamOrgSpecificTx OBJECT-TYPE
SYNTAX      Counter32
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION
"A count of the number of Organization Specific OAMPDUs 
transmitted on this interface.

An Organization Specific OAMPDU is indicated by a valid frame 
with (1) destination MAC address equal to that of the reserved 
MAC address for Slow Protocols (See 43B of [802.3ah]), (2) a 
lengthOrType field equal to the reserved type for Slow 
Protocols, (3) a Slow Protocols subtype equal to that of the 
subtype reserved for OAM, and (4) an OAMPDU code equals the 
OAM Organization Specific code.
Discontinuities of this counter can occur at re-initialization of the management system, and at other times as indicated by the value of the ifCounterDiscontinuityTime. "

REFERENCE "[802.3ah], 30.3.6.1.32."
::= { dot3OamStatsEntry 13 }

dot3OamOrgSpecificRx OBJECT-TYPE
SYNTAX Counter32
MAX-ACCESS read-only
STATUS current
DESCRIPTION "A count of the number of Organization Specific OAMPDUs received on this interface.

An Organization Specific OAMPDU is indicated by a valid frame with (1) destination MAC address equal to that of the reserved MAC address for Slow Protocols (See 43B of [802.3ah]), (2) a lengthOrType field equal to the reserved type for Slow Protocols, (3) a Slow Protocols subtype equal to that of the subtype reserved for OAM, and (4) an OAMPDU code equals the OAM Organization Specific code.

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

REFERENCE "[802.3ah], 30.3.6.1.33."
::= { dot3OamStatsEntry 14 }

dot3OamUnsupportedCodesTx OBJECT-TYPE
SYNTAX Counter32
MAX-ACCESS read-only
STATUS current
DESCRIPTION "A count of the number of OAMPDUs transmitted on this interface with an unsupported op-code.

An unsupported opcode OAMPDU is indicated by a valid frame with (1) destination MAC address equal to that of the reserved MAC address for Slow Protocols (See 43B of [802.3ah]), (2) a lengthOrType field equal to the reserved type for Slow Protocols, (3) a Slow Protocols subtype equal to that of the subtype reserved for OAM, and (4) an OAMPDU code equals the opcode for a function that is not supported by the device.

Discontinuities of this counter can occur at re-initialization of the management system, and at other times as indicated by the value of the ifCounterDiscontinuityTime. "
dot3OamUnsupportedCodesRx OBJECT-TYPE  
SYNTAX        Counter32  
MAX-ACCESS    read-only  
STATUS        current  
DESCRIPTION   
 "A count of the number of OAMPDUs received on this interface with an unsupported op-code.

An unsupported opcode OAMPDU is indicated by a valid frame with (1) destination MAC address equal to that of the reserved MAC address for Slow Protocols (See 43B of [802.3ah]), (2) a lengthOrType field equal to the reserved type for Slow Protocols, (3) a Slow Protocols subtype equal to that of the subtype reserved for OAM, and (4) an OAMPDU code equals the opcode for a function that is not supported by the device.

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

REFERENCE   
"[802.3ah], 30.3.6.1.18."
::= { dot3OamStatsEntry 15 }

dot3OamFramesLostDueToOam OBJECT-TYPE  
SYNTAX        Counter32  
MAX-ACCESS    read-only  
STATUS        current  
DESCRIPTION   
 "A count of the number of frames that were dropped by the OAM multiplexer. Since the OAM multiplexer has multiple inputs and a single output, there may be cases where frames are dropped due to transmit resource contention. This counter is incremented whenever a frame is dropped by the OAM layer. When this counter is incremented, no other counters in this MIB are incremented.

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

REFERENCE   
"[802.3ah], 30.3.6.1.19."
::= { dot3OamStatsEntry 16 }

-- 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 of
  1,000,000 had errors).
- Errored Frame Period Event. Generated when the number of
  frame errors exceeds a threshold within a given window
defined by a number of frames (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.

 ::= { dot3OamMIB 5 }

dot3OamEventConfigEntry OBJECT-TYPE
SYNTAX Dot3OamEventConfigEntry
MAX-ACCESS not-accessible
STATUS current
DESCRIPTION
"Event configuration information is available for every
Ethernet like interface that supports OAM and the event
function of OAM as indicated in the dot3OamFunctionsSupported
attribute.

Event configuration controls when the local management entity
sends Event Notification OAMPDUs to its OAM peer."
INDEX { ifIndex }
 ::= { dot3OamEventConfigTable 1 }

Dot3OamEventConfigEntry ::=
SEQUENCE {
  dot3OamErrSymPeriodWindow    Dot3OamUnsigned64,
  dot3OamErrSymPeriodThreshold  Dot3OamUnsigned64,
  dot3OamErrSymPeriodEvNotifEnable  INTEGER,
  dot3OamErrFramePeriodWindow  Unsigned32,
  dot3OamErrFramePeriodThreshold Unsigned32,
  dot3OamErrFramePeriodEvNotifEnable INTEGER,
  dot3OamErrFrameWindow        Unsigned32,
  dot3OamErrFrameThreshold     Unsigned32,
  dot3OamErrFrameEvNotifEnable INTEGER,
  dot3OamErrFrameSecsSummaryWindow  Integer32,
  dot3OamErrFrameSecsSummaryThreshold Integer32,
  dot3OamErrFrameSecsEvNotifEnable INTEGER,
}

dot3OamErrSymPeriodWindow OBJECT-TYPE
SYNTAX       Dot3OamUnsigned64
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], 30.3.6.1.34"
 ::= { dot3OamEventConfigEntry 1 }

dot3OamErrSymPeriodThreshold OBJECT-TYPE
SYNTAX       Dot3OamUnsigned64
MAX-ACCESS   read-write
STATUS       current
DESCRIPTION
  "The number of symbols errors that must occur for this event
  to be triggered.

  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], 30.3.6.1.34"
 ::= { dot3OamEventConfigEntry 2 }

dot3OamErrSymPeriodEvNotifEnable OBJECT-TYPE
SYNTAX       INTEGER { enabled(1), disabled(2) }
MAX-ACCESS   read-write
"Indicates whether the occurrence of Errored Symbol Period Events should result in Event Notification OAMPDUs generated by the OAM layer.

By default, this object should have the value enabled(1) for Ethernet like interfaces that support OAM. If the OAM layer does not support event notifications (as indicated via the dot3OamFunctionsSupported attribute), this value is ignored.

REFERENCE "N/A"

::= { dot3OamEventConfigEntry 3 }

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], 30.3.6.1.38"

::= { dot3OamEventConfigEntry 4 }

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], 30.3.6.1.38"

::= { dot3OamEventConfigEntry 5 }

dot3OamErrFramePeriodEvNotifEnable OBJECT-TYPE
SYNTAX   INTEGER { enabled(1), disabled(2) }
MAX-ACCESS  read-write
STATUS      current
DESCRIPTION

"Indicates whether the occurrence of an Errored Frame Period Event should result in an Event Notification OAMPDU generated by the OAM layer.

By default, this object should have the value enabled(1) for Ethernet like interfaces that support OAM. If the OAM layer does not support event notifications (as indicated via the dot3OamFunctionsSupported attribute), this value is ignored."

REFERENCE  "N/A"

::= { dot3OamEventConfigEntry 6 }

dot3OamErrFrameWindow OBJECT-TYPE
SYNTAX      Unsigned32
MAX-ACCESS  read-write
STATUS      current
DESCRIPTION

"The amount of time (in 100ms increments) over which the threshold is defined.

If dot3OamErrFrameThreshold frame errors occur within a window of dot3OamErrFrameWindow seconds (measured 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], 30.3.6.1.36"

::= { dot3OamEventConfigEntry 7 }

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], 30.3.6.1.36"

::= { dot3OamEventConfigEntry 8 }

dot3OamErrFrameEvNotifEnable OBJECT-TYPE
SYNTAX      INTEGER { enabled(1), disabled(2) }
MAX-ACCESS  read-write
STATUS      current
DESCRIPTION

"Indicates whether the occurrence of an Errored Frame Event should result in an Event Notification OAMPDU generated by the OAM layer.

By default, this object should have the value enabled(1) for Ethernet like interfaces that support OAM. If the OAM layer does not support event notifications (as indicated via the dot3OamFunctionsSupported attribute), this value is ignored."

REFERENCE "N/A"

::= { dot3OamEventConfigEntry 9 }

dot3OamErrFrameSecsSummaryWindow OBJECT-TYPE
SYNTAX Integer32 (100..9000)
MAX-ACCESS read-write
STATUS current
DESCRIPTION

"The amount of time (in 100ms intervals) 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 

::= { dot3OamEventConfigEntry 10 }

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 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 

::= { dot3OamEventConfigEntry 11 }

dot3OamErrFrameSecsEvNotifEnable OBJECT-TYPE
SYNTAX INTEGER { enabled(1), disabled(2) }
MAX-ACCESS read-write
STATUS current
DESCRIPTION
"Indicates whether the occurrence of an Errored Frame Seconds Summary Event should result in an Event Notification OAMPDU generated by the OAM layer.

By default, this object should have the value enabled(1) for Ethernet like interfaces that support OAM. If the OAM layer does not support event notifications (as indicated via the dot3OamFunctionsSupported attribute), this value is ignored."

REFERENCE "N/A"
 ::= { dot3OamEventConfigEntry 12 }

-- Ethernet OAM Event Status group
--

dot3OamEventStatusTable OBJECT-TYPE
 SYNTAX       SEQUENCE OF Dot3OamEventStatusEntry
 MAX-ACCESS   not-accessible
 STATUS       current
 DESCRIPTION
 "OAM event status information for a particular Ethernet-like interface. These objects will contain the most recently transmitted or received TLV event.

There is a strict one-to-one relation between entries in this table and entries in the dot3OamTable."
 ::= { dot3OamMIB 6 }

Dot3OamEventStatusEntry OBJECT-TYPE
 SYNTAX       Dot3OamEventStatusEntry
 MAX-ACCESS   not-accessible
 STATUS       current
 DESCRIPTION "An entry in the dot3OamEventStatusTable."
 INDEX       { ifIndex }
 ::= { dot3OamEventStatusTable 1 }

Dot3OamEventStatusEntry ::= SEQUENCE {
  -- Local events
  dot3OamLclErrSymPeriodTime          TimeStamp,
  dot3OamLclErrSymPeriodData          Dot3OamEventTLVData,
  dot3OamLclErrFramePeriodTime        TimeStamp,
  dot3OamLclErrFramePeriodData        Dot3OamEventTLVData,
  dot3OamLclErrFrameTime              TimeStamp,
  dot3OamLclErrFrameData              Dot3OamEventTLVData,
  dot3OamLclErrFrameSecsSumTime       TimeStamp,
  dot3OamLclErrFrameSecsSumData       Dot3OamEventTLVData,
dot3OamLclErrEventFlagsTime OBJECT-TYPE
SYNTAX TimeStamp
MAX-ACCESS read-only
STATUS current
DESCRIPTION "The time at which the last Errored Symbol Period Event occurred locally."
REFERENCE "[802.3ah], 30.3.6.1.35 and 57.5.3.1."
::= {dot3OamEventStatusEntry 1}

dot3OamLclErrSymPeriodTime OBJECT-TYPE
SYNTAX TimeStamp
MAX-ACCESS read-only
STATUS current
DESCRIPTION "The time at which the last Errored Symbol Period Event occurred locally."
REFERENCE "[802.3ah], 30.3.6.1.35 and 57.5.3.1."
::= {dot3OamEventStatusEntry 1}

dot3OamLclErrSymPeriodData OBJECT-TYPE
SYNTAX Dot3OamEventTLVData
MAX-ACCESS read-only
STATUS current
DESCRIPTION "A sequence of six integers corresponding to the respective fields in the most recently transmitted Errored Symbol Period Event TLV in an Event Notification OAMPDU."
REFERENCE "[802.3ah], 30.3.6.1.35 and 57.5.3.1."
::= {dot3OamEventStatusEntry 2}

dot3OamLclErrFramePeriodTime OBJECT-TYPE
SYNTAX TimeStamp
MAX-ACCESS read-only
STATUS current
DESCRIPTION "The time at which the last Errored Frame Period Event occurred locally."

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REFERENCE "[802.3ah], 30.3.6.1.39 and 57.5.3.3."
::= { dot3OamStatusEntry 3 }

dot3OamLclErrFramePeriodData OBJECT-TYPE
SYNTAX Dot3OamEventTLVData
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"A sequence of six integers corresponding to the respective
fields in the most recently transmitted Errored Frame Period
Event TLV in an Event Notification OAMPDU."
REFERENCE "[802.3ah], 30.3.6.1.39 and 57.5.3.3."
::= { dot3OamStatusEntry 4 }

dot3OamLclErrFrameTime OBJECT-TYPE
SYNTAX TimeStamp
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"The time at which the last Errored Frame Event occurred
locally."
REFERENCE "[802.3ah], 30.3.6.1.37 and 57.5.3.2."
::= { dot3OamStatusEntry 5 }

dot3OamLclErrFrameData OBJECT-TYPE
SYNTAX Dot3OamEventTLVData
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"A sequence of six integers corresponding to the respective
fields in the most recently transmitted Errored Frame Event
TLV in an Event Notification OAMPDU."
REFERENCE "[802.3ah], 30.3.6.1.37 and 57.5.3.2."
::= { dot3OamStatusEntry 6 }

dot3OamLclErrFrameSecsSumTime OBJECT-TYPE
SYNTAX TimeStamp
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"The time at which the last Errored Frame Seconds Summary
Event occurred locally."
REFERENCE "[802.3ah], 30.3.6.1.36 and 57.5.3.4."
::= { dot3OamStatusEntry 7 }

dot3OamLclErrFrameSecsSumData OBJECT-TYPE
SYNTAX Dot3OamEventTLVData
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"A sequence of six integers corresponding to the respective
fields in the most recently transmitted Errored Frame Seconds
Summary Event TLV in an Event Notification OAMPDU."
REFERENCE "[802.3ah], 30.3.6.1.36 and 57.5.3.4."
 ::= { dot3OamEventStatusEntry 8 }
dot3OamLclErrEventFlagsTime OBJECT-TYPE
SYNTAX TimeStamp
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"The time at which the flag field in outgoing OAMPDUs changed."
REFERENCE "[802.3ah], 30.3.6.1.10"
 ::= { dot3OamEventStatusEntry 9 }
dot3OamLclErrEventFlagsData OBJECT-TYPE
SYNTAX BITS {
   linkFault (0),
   dyingGasp(1),
   miscCritical(2)
 }
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"The value of the OAM event flags on the most recently
generated OAMPDU. These flags are used to signal critical
events to an OAM peer entity."
REFERENCE "[802.3ah], 30.3.6.1.10"
 ::= { dot3OamEventStatusEntry 10 }
dot3OamLclErrEventOtherTime OBJECT-TYPE
SYNTAX TimeStamp
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"The time at which the last non-802.3 define link event
occurred.

The 802.3ah OAM protocol allows for organization specific
events to be defined by any organization. Whenever a
non-802.3 defined link event occurs, this timestamp is updated
to reflect that occurrence."
REFERENCE "[802.3ah], 57.5.3.5"
 ::= { dot3OamEventStatusEntry 11 }
dot3OamLclErrEventOtherData OBJECT-TYPE
SYNTAX OCTET STRING ( SIZE(3..255) )
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION
"The value of the data field for the most recent Organization
Specific link event occurring on the interface. The
information syntax is defined by the vendor specified in the
OUI field (the first 3 octets) of the data."
REFERENCE   "[802.3ah], 57.5.3.5"
 ::= { dot3OamEventStatusEntry 12 }

dot3OamRmtErrSymPeriodTime  OBJECT-TYPE
SYNTAX      TimeStamp
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION
"The time at which the last Errored Symbol Period TLV was
received in a unique Event Notification OAMPDU, indicating
receipt of a notification about a remote Errored Symbol Period
Event."
REFERENCE   "[802.3ah], 30.3.6.1.42 and 57.5.3.1."
 ::= { dot3OamEventStatusEntry 13 }

dot3OamRmtErrSymPeriodData  OBJECT-TYPE
SYNTAX      Dot3OamEventTLVData
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION
"A sequence of six integers corresponding to the respective
fields in the most recently received Errored Symbol Period
Event TLV in an Event Notification OAMPDU."
REFERENCE   "[802.3ah], 30.3.6.1.42 and 57.5.3.1."
 ::= { dot3OamEventStatusEntry 14 }

dot3OamRmtErrFramePeriodTime  OBJECT-TYPE
SYNTAX      TimeStamp
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION
"The time at which the last Errored Frame Period TLV was
received in a unique Event Notification OAMPDU, indicating
receipt of a notification about a remote Errored Frame Period
Event."
REFERENCE   "[802.3ah], 30.3.6.1.44 and 57.5.3.3."
 ::= { dot3OamEventStatusEntry 15 }

dot3OamRmtErrFramePeriodData  OBJECT-TYPE
SYNTAX      Dot3OamEventTLVData
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION

"A sequence of six integers corresponding to the respective
fields in the most recently received Errored Frame Period
Event TLV in an Event Notification OAMPDU."
REFERENCE "[802.3ah], 30.3.6.1.44 and 57.5.3.3."
::= { dot3OamEventStatusEntry 16 }

dot3OamRmtErrFrameTime OBJECT-TYPE
SYNTAX TimeStamp
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"The time at which the last Errored Frame TLV was received in
a unique Event Notification OAMPDU, indicating receipt of a
notification about a remote Errored Frame Event."
REFERENCE "[802.3ah], 30.3.6.1.43 and 57.5.3.2."
::= { dot3OamEventStatusEntry 17 }

dot3OamRmtErrFrameData OBJECT-TYPE
SYNTAX Dot3OamEventTLVData
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"A sequence of six integers corresponding to the respective
fields in the most recently received Errored Frame Event TLV
in an Event Notification OAMPDU."
REFERENCE "[802.3ah], 30.3.6.1.43 and 57.5.3.2."
::= { dot3OamEventStatusEntry 18 }

dot3OamRmtErrFrameSecsSumTime OBJECT-TYPE
SYNTAX TimeStamp
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"The time at which the last Errored Frame Seconds Summary TLV
was received in a unique Event Notification OAMPDU, indicating
receipt of a notification about a remote Errored Frame Seconds
Summary Event."
REFERENCE "[802.3ah], 30.3.6.1.45 and 57.5.3.4."
::= { dot3OamEventStatusEntry 19 }

dot3OamRmtErrFrameSecsSumData OBJECT-TYPE
SYNTAX Dot3OamEventTLVData
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"A sequence of six integers corresponding to the respective
fields in the most recently received Errored Frame Seconds
Summary Event TLV in an Event Notification OAMPDU."
REFERENCE  "[802.3ah], 30.3.6.1.45 and 57.5.3.4."
::= { dot3OamEventStatusEntry 20 }

dot3OamRmtErrEventFlagsTime  OBJECT-TYPE
SYNTAX      TimeStamp
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION  "The time at which the flags field in incoming OAMPDUs last
changed."
REFERENCE  "[802.3ah], 30.3.6.1.10"
::= { dot3OamEventStatusEntry 21 }

dot3OamRmtErrEventFlagsData OBJECT-TYPE
SYNTAX      BITS {
               linkFault (0),
               dyingGasp(1),
               miscCritical(2)
             }
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION  "The value of the OAM event flags on the most recently
received OAMPDU. These flags are used to signal critical
events to an OAM peer entity."
REFERENCE  "[802.3ah], 30.3.6.1.10"
::= { dot3OamEventStatusEntry 22 }

dot3OamRmtErrEventOtherTime  OBJECT-TYPE
SYNTAX      TimeStamp
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION  "The time at which the last non-802.3 defined link event
TLV was received.

The 802.3ah OAM protocol allows for organization specific
events to be defined by any organization. Whenever an
Organization Specific Link Event TLV is received in an Event
OAMPDU, this timestamp is updated to reflect the occurrence."
REFERENCE  "[802.3ah], 57.5.3.5"
::= { dot3OamEventStatusEntry 23 }

dot3OamRmtErrEventOtherData OBJECT-TYPE
SYNTAX      OCTET STRING ( SIZE(3..255) )
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION
"The value of the data field for the most recent Organization Specific Link Event TLV received on the interface. The information syntax is defined by the vendor specified in the OUI field (the first 3 octets) of the data."

REFERENCE "[802.3ah], 57.5.3.5"

::= { dot3OamEventStatusEntry 24 }

---

-- Ethernet OAM Notifications
--

dot3OamTraps OBJECT IDENTIFIER ::= { dot3OamMIB 7 }
dot3OamTrapsPrefix OBJECT IDENTIFIER ::= {dot3OamTraps 0}

dot3OamLclErrSymPeriod NOTIFICATION-TYPE
  OBJECTS { ifIndex, dot3OamLclErrSymPeriodData }
  STATUS current
  DESCRIPTION
  "A dot3OamLclErrSymPeriod trap is sent when the value of the dot3OamLclErrSymPeriodTime changes for an Ethernet like interface supporting Ethernet OAM.

  This trap can be utilized to indicate to a management system that too many symbol errors have occurred on the specified interface, resulting in an Event Notification OAMPDU to a peer and trap to the management entity.

  The management entity should periodically check the value of dot3OamLclErrSymPeriodTime to detect any missed dot3OamErrSymPeriod trap-events."

::= { dot3OamTrapsPrefix 1 }

dot3OamLclErrFramePeriod NOTIFICATION-TYPE
  OBJECTS { ifIndex, dot3OamLclErrFramePeriodData }
  STATUS current
  DESCRIPTION
  "A dot3OamLclErrFramePeriod trap is sent when the value of the dot3OamLclErrFramePeriodTime changes for an Ethernet like interface supporting Ethernet OAM.

  This trap can be utilized to indicate to a management system that too many frame errors have occurred on the specified interface, resulting in an Event Notification OAMPDU to a peer
and trap to the management entity.

The management entity should periodically check the value of

dot3LclErrFramePeriodTime to detect any missed

  dot3OamErrFramePeriod trap-events."

::= { dot3OamTrapsPrefix 2 }

dot3OamLclErrFrame NOTIFICATION-TYPE

OBJECTS { ifIndex,
          dot3OamLclErrFrameData
       }

STATUS  current

DESCRIPTION
"A dot3OamLclErrFrame trap is sent when the value of the
dot3OamLclErrFrameTime changes for an Ethernet like interface
supporting Ethernet OAM.

This trap can be utilized to indicate to a management system
that too many frame errors have occurred on the specified
interface, resulting in an Event Notification OAMPDU to a peer
and trap to the management entity.

The management entity should periodically check the value of
dot3LclErrFrameTime to detect any missed dot3OamErrFrame

  trap-events."

::= { dot3OamTrapsPrefix 3 }

dot3OamLclErrFrameSecsSum NOTIFICATION-TYPE

OBJECTS { ifIndex,
          dot3OamLclErrFrameSecsSumData
       }

STATUS  current

DESCRIPTION
"A dot3OamLclErrFrameSecsSum trap is sent when the value of the
dot3OamLclErrFrameSecsSumTime changes for an Ethernet like
interface supporting Ethernet OAM.

This trap can be utilized to indicate to a management system
that too many errored frame seconds have occurred on the
specified interface, resulting in an Event Notification OAMPDU
to a peer and trap to the management entity.

The management entity should periodically check the value of
dot3LclErrFrameSecsSumTime to detect any missed
dot3OamErrFrameSecsSum trap-events."

::= { dot3OamTrapsPrefix 4 }

dot3OamLclErrEventFlags NOTIFICATION-TYPE
OBJECTS { ifIndex,
         dot3OamLclErrEventFlagsData
  }
STATUS  current
DESCRIPTION
"A dot3OamLclErrEventFlags trap is sent when the value of
the dot3OamLclErrEventFlagsTime changes for an Ethernet like
interface supporting Ethernet OAM.

This trap can be utilized to indicate to a management system
that a critical link event has been signaled by the sending
entity on the given interface. The value of the
dot3OamLclErrEventFlagsData provides additional details on the
critical event.

The management entity should periodically check the value of
dot3LclErrEventFlagsTime to detect any missed
dot3OamEventFlags trap-events."
::= { dot3OamTrapsPrefix 5 }

dot3OamLclErrEventOther NOTIFICATION-TYPE
OBJECTS { ifIndex,
         dot3OamLclErrEventOtherData
  }
STATUS  current
DESCRIPTION
"A dot3OamLclErrEventOther trap is sent when the value of
the dot3OamLclErrEventOtherTime changes for an Ethernet like
interface supporting Ethernet OAM.

This trap can be utilized to indicate to a management system
that an organization specific link event has occurred on the
specified interface. The value of the
dot3OamLclErrEventOtherData provides additional details on the
organization specific link event.

The management entity should periodically check the value of
dot3LclErrEventOtherTime to detect any missed
dot3OamEventOther trap-events."
::= { dot3OamTrapsPrefix 6 }

dot3OamRmtErrSymPeriod NOTIFICATION-TYPE
OBJECTS { ifIndex,
         dot3OamRmtErrSymPeriodData
  }
STATUS  current
DESCRIPTION
"A dot3OamRmtErrSymPeriod trap is sent when the value of the
dot3OamRmtErrSymPeriodTime changes for an Ethernet like
interface supporting Ethernet OAM.

This trap can be utilized to indicate to a management system that a Event Notification OAMPDU has been received on the specified interface indicating an Errored Symbol Period Event on the OAM peer entity.

The management entity should periodically check the value of dot3OamRmtErrSymPeriodTime to detect any missed dot3OamErrSymPeriod trap-events. 

::= { dot3OamTrapsPrefix 7 }

dot3OamRmtErrFramePeriod NOTIFICATION-TYPE
OBJECTS { ifIndex,
            dot3OamRmtErrFramePeriodData }
STATUS  current
DESCRIPTION
"A dot3OamRmtErrFramePeriod trap is sent when the value of the dot3OamRmtErrFramePeriodTime changes for an Ethernet like interface supporting Ethernet OAM.

This trap can be utilized to indicate to a management system that a Event Notification OAMPDU has been received on the specified interface indicating an Errored Frame Period Event on the OAM peer entity.

The management entity should periodically check the value of dot3OamRmtErrFramePeriodTime to detect any missed dot3OamErrFramePeriod trap-events. 

::= { dot3OamTrapsPrefix 8 }

dot3OamRmtErrFrame NOTIFICATION-TYPE
OBJECTS { ifIndex,
            dot3OamRmtErrFrameData }
STATUS  current
DESCRIPTION
"A dot3OamRmtErrFrame trap is sent when the value of the dot3OamRmtErrFrameTime changes for an Ethernet like interface supporting Ethernet OAM.

This trap can be utilized to indicate to a management system that a Event Notification OAMPDU has been received on the specified interface indicating an Errored Frame Event on the OAM peer entity.

The management entity should periodically check the value of dot3OamRmtErrFrameTime to detect any missed dot3OamErrFrame
trap-events."
 ::= { dot3OamTrapsPrefix 9 }

dot3OamRmtErrFrameSecsSum NOTIFICATION-TYPE
 OBJECTS { ifIndex,
 dot3OamRmtErrFrameSecsSumData
 }
 STATUS current
 DESCRIPTION
 "A dot3OamRmtErrFrameSecsSum trap is sent when the value of the dot3OamRmtErrFrameSecsSumTime changes for an Ethernet like interface supporting Ethernet OAM.

This trap can be utilized to indicate to a management system that a Event Notification OAMPDU has been received on the specified interface indicating an Errored Frame Seconds Summary Event on the OAM peer entity.

The management entity should periodically check the value of dot3OamRmtErrFrameSecsSumTime to detect any missed dot3OamRmtErrFrameSecsSum trap-events."
 ::= { dot3OamTrapsPrefix 10 }

dot3OamRmtErrEventFlags NOTIFICATION-TYPE
 OBJECTS { ifIndex,
 dot3OamRmtErrEventFlagsData
 }
 STATUS current
 DESCRIPTION
 "A dot3OamRmtErrEventFlags trap is sent when the value of the dot3OamRmtErrEventFlagsTime changes for an Ethernet like interface supporting Ethernet OAM.

This trap can be utilized to indicate to a management system that a Event Notification OAMPDU has been received on the specified interface indicating a change in the critical event flags carried in the Flags field of the OAMPDU.

The management entity should periodically check the value of dot3OamRmtErrEventFlagsTime to detect any missed dot3OamRmtErrEventFlags trap-events."
 ::= { dot3OamTrapsPrefix 11 }

dot3OamRmtErrEventOther NOTIFICATION-TYPE
 OBJECTS { ifIndex,
 dot3OamRmtErrEventOtherData
 }
 STATUS current
DESCRIPTION
"A dot3OamRmtErrEventOther trap is sent when the value of the dot3OamRmtErrEventOtherTime changes for an Ethernet like interface supporting Ethernet OAM.

This trap can be utilized to indicate to a management system that an organization specific link event has been received on the specified interface indicating an Organization Specific Link Event has occurred on the OAM Peer entity.

The management entity should periodically check the value of dot3RmtErrEventOtherTime to detect any missed dot3OamRmtErrEventOther trap-events."

::= { dot3OamTrapsPrefix 12 }

-- 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."

-- 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       dot3OamEventFlagsGroup
DESCRIPTION       "This group is mandatory for all IEEE 802.3 OAM
implementations that support critical event functionality."

GROUP       dot3OamEventOtherGroup
DESCRIPTION       "This group is mandatory for all IEEE 802.3 OAM
implementations that support Organization Specific Event
signaling."

GROUP       dot3OamNotificationGroup
DESCRIPTION       "This group is mandatory for all IEEE 802.3 OAM
implementations that support critical event 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
}
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 { dot3OamInformationTx,
   dot3OamInformationRx,
   dot3OamUniqueEventNotificationTx,
   dot3OamUniqueEventNotificationRx,
   dot3OamDuplicateEventNotificationTx,
   dot3OamDuplicateEventNotificationRx,
   dot3OamLoopbackControlTx,
   dot3OamLoopbackControlRx,
   dot3OamVariableRequestTx,
   dot3OamVariableRequestRx,
   dot3OamVariableResponseTx,
   dot3OamVariableResponseRx,
   dot3OamOrgSpecificTx,
   dot3OamOrgSpecificRx,
   dot3OamUnsupportedCodesTx,
   dot3OamUnsupportedCodesRx,
   dot3OamFramesLostDueToOam
}
STATUS  current
DESCRIPTION
   "A collection of objects providing the statistics for the number of various transmit and receive events for OAM on an Ethernet like interface. Note that all of these counters must be supported even if the related function (as described in dot3OamFunctionsSupported) is not supported."
::= { dot3OamGroups 3 }

dot3OamLoopbackGroup OBJECT-GROUP
OBJECTS { dot3OamLoopbackCommand,
   dot3OamLoopbackStatus,
   dot3OamLoopbackIgnoreRx
}
A collection of objects for controlling the OAM remote loopback function.

::= { dot3OamGroups 4 }

dot3OamErrSymbolPeriodEventGroup OBJECT-GROUP
OBJECTS
    {  dot3OamErrSymPeriodWindow,
        dot3OamErrSymPeriodThreshold,
        dot3OamErrSymPeriodEvNotifEnable,
        dot3OamLclErrSymPeriodTime,
        dot3OamLclErrSymPeriodData,
        dot3OamRmtErrSymPeriodTime,
        dot3OamRmtErrSymPeriodData
    }

A collection of objects for configuring the thresholds for an Errored Symbol Period Event and maintaining the event information.

::= { dot3OamGroups 5 }

dot3OamErrFramePeriodEventGroup OBJECT-GROUP
OBJECTS
    {  dot3OamErrFramePeriodWindow,
        dot3OamErrFramePeriodThreshold,
        dot3OamErrFramePeriodEvNotifEnable,
        dot3OamLclErrFramePeriodTime,
        dot3OamLclErrFramePeriodData,
        dot3OamRmtErrFramePeriodTime,
        dot3OamRmtErrFramePeriodData
    }

A collection of objects for configuring the thresholds for an Errored Frame Period Event and maintaining the event information.

::= { dot3OamGroups 6 }

dot3OamErrFrameEventGroup OBJECT-GROUP
OBJECTS
    {  dot3OamErrFrameWindow,
        dot3OamErrFrameThreshold,
        dot3OamErrFrameEvNotifEnable,
        dot3OamLclErrFrameTime,
        dot3OamLclErrFrameData,
        dot3OamRmtErrFrameTime,
        dot3OamRmtErrFrameData
    }

A collection of objects for configuring the thresholds for an Errored Frame Event and maintaining the event information.
"A collection of objects for configuring the thresholds for an Errored Frame Event and maintaining the event information."

::= { dot3OamGroups 7 }

dot3OamErrFrameSecsSummaryEventGroup OBJECT-GROUP

OBJECTS

{ dot3OamErrFrameSecsSummaryWindow,
dot3OamErrFrameSecsSummaryThreshold,
dot3OamErrFrameSecsEvNotifEnable,
dot3OamLclErrFrameSecsSumTime,
dot3OamLclErrFrameSecsSumData,
dot3OamRmtErrFrameSecsSumTime,
dot3OamRmtErrFrameSecsSumData }

STATUS current

DESCRIPTION

"A collection of objects for configuring the thresholds for an Errored Frame Seconds Summary Event and maintaining the event information."

::= { dot3OamGroups 8 }

dot3OamEventFlagsGroup OBJECT-GROUP

OBJECTS

{ dot3OamLclErrEventFlagsTime,
dot3OamLclErrEventFlagsData,
dot3OamRmtErrEventFlagsTime,
dot3OamRmtErrEventFlagsData }

STATUS current

DESCRIPTION

"A collection of objects for displaying the status of the event flags (link fault, critical, dying gasp) in transmitted and received OAMPDUs, reflecting the current status of critical event information."

::= { dot3OamGroups 9 }

dot3OamEventOtherGroup OBJECT-GROUP

OBJECTS

{ dot3OamLclErrEventOtherTime,
dot3OamLclErrEventOtherData,
dot3OamRmtErrEventOtherTime,
dot3OamRmtErrEventOtherData }

STATUS current

DESCRIPTION

"A collection of objects for displaying the status of any Organization Specific Events that have occurred on the Ethernet-like interface."

::= { dot3OamGroups 10 }

dot3OamNotificationGroup NOTIFICATION-GROUP

NOTIFICATIONS
dot3OamLclErrSymPeriod,
dot3OamLclErrFramePeriod,
dot3OamLclErrFrame,
dot3OamLclErrFrameSecsSum,
dot3OamLclErrEventFlags,
dot3OamLclErrEventOther,
dot3OamRmtErrSymPeriod,
dot3OamRmtErrFramePeriod,
dot3OamRmtErrFrame,
dot3OamRmtErrFrameSecsSum,
dot3OamRmtErrEventFlags,
dot3OamRmtErrEventOther

<table>
<thead>
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<th>STATUS</th>
<th>current</th>
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DESCRIPTION

"A collection of notifications used by Ethernet OAM to signal to a management entity that local or remote events have occurred on a specified Ethernet link."

::= { dot3OamGroups 11 }

END

7. 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. By default, OAM is disabled on Ethernet-like interfaces and is therefore not a risk.

IEEE 802.3ah 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. Therefore an attribute (dot3OamLoopbackIgnoreRx) was introduced to control whether the local station processes or ignores received loopback commands.

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.

8. References

8.1 Normative References

Informative References


[RFC2119] Bradner, S., "Key words for use in RFCs to Indicate Requirement Levels", BCP 14, RFC 2119, March 1997


8.2 Informative References


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