          Definitions and Managed Objects for
  Operations, Administration, and Maintenance (OAM) Functions on
                   Ethernet-Like Interfaces

Status of This Memo

   This document specifies an Internet standards track protocol for the
   Internet community, and requests discussion and suggestions for
   improvements. Please refer to the current edition of the "Internet
   Official Protocol Standards" (STD 1) for the standardization state
   and status of this protocol. Distribution of this memo is unlimited.

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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
   the Ethernet in the First Mile (EFM) clauses of the Ethernet
   standards. The Ethernet OAM functionality is complementary to the
   Simple Network Management Protocol (SNMP) in that it is focused on a
   small set of link-specific functions for directly connected Ethernet
   interfaces. This document defines objects for controlling those link
   OAM functions and for providing results and status of the OAM
   functions to management entities.

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1. Introduction

   The IEEE 802.3ah Ethernet in the First Mile (EFM) taskforce added new
   management capabilities to Ethernet-like interfaces. These
   management capabilities were introduced to provide some basic Ordered
   Aggregate (OA) 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 Ethernet interface capabilities.

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].

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 taskforce defined additional clauses in [802.3ah] for the
IEEE 802.3 standard [802.3-2002] to better address Ethernet
deployments in the public-access network. Although Ethernet-access
deployments were the primary motivation for the taskforce activity,
the results of the taskforce are not strictly limited to that
application. Ethernet OAM can be implemented on Ethernet links that
are not EFM.

The Ethernet in the First Mile (EFM) taskforce 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 20 Km and supporting the
environmental conditions of access 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. The mandatory functions include
discovery operations (determining if the other end of the link is OA
capable and what OAM functions it supports), 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 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 next three sections. The definition of a basic Ethernet OA
protocol data unit is given in Section 3.4.

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 fault information and reflecting such
information in objects and notifications within 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 layer two
protocols. 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.

3.4. Ethernet OAM Protocol Data Units

   An Ethernet OAM protocol data unit is a valid Ethernet frame with a
   destination Media Access Control (MAC) address equal to the reserved
   MAC address for Slow Protocols (See 43B of [802.3ah]), a lengthOrType
   field equal to the reserved type for Slow Protocols, and a Slow
   Protocols subtype equal to that of the subtype reserved for Ethernet
   OAM.

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

4. Relation to the Other MIB Modules

   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 effects 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 object in the Clause 30 MIB of [802.3ah].

4.1. Relation to Other MIB Modules

   The objects defined in this document manage OAM functionality
   introduced in [802.3ah] These objects do not overlap with the
   interfaces MIB [RFC2863], the Ethernet-like interfaces MIB [RFC3635],
   or any other MIB currently used to manage various aspects of an
   Ethernet interface. The objects defined here are defined for
   Ethernet-like interfaces only and use the same ifIndex as the
   associated Ethernet interface. Ethernet OAM can be implemented on
   any Ethernet-like interface.

4.2. Relation to Other EFM MIB Modules

   The Ethernet OAM functionality and MIB Module is independent of the
   other functionality and MIB Modules derived from [802.3ah] for copper
   [802.3ah-copper] and EPON [802.3ah-epon]. Ethernet OAM may be
   implemented (or not) on the new EFM interface types, just as it can
   on any other Ethernet interface.

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.

   IEEE 802.3 Managed Object   Corresponding SNMP object

   oOA
    .aOAMID   IF-MIB ifIndex
    .aOAMAdminState   dot3OamAdminState
    .aOAMMode   dot3OamMode
    .aOAMDiscoveryState   dot3OamOperStatus
    .aOAMRemoteMACAddress   dot3OamPeerMacAddress
    .aOAMLocalConfiguration   dot3OamFunctionsSupported
    .aOAMRemoteConfiguration   dot3OamPeerFunctionsSupported,
                                      dot3OamPeerMode
    .aOAMLocalPDUConfiguration   dot3OamMaxOamPduSize
    .aOAMRemotePDUConfiguration   dot3OamPeerMaxOamPduSize
    .aOAMLocalFlagsField   dot3OamOperStatus,
                                      dot3OamEventLogEntry
    .aOAMRemoteFlagsField   dot3OamOperStatus,
                                      dot3OamEventLogEntry
    .aOAMLocalRevision   dot3OamConfigRevision
    .aOAMRemoteRevision   dot3OamPeerConfigRevision
    .aOAMLocalState   dot3OamLoopbackStatus
    .aOAMRemoteState   dot3OamLoopbackStatus
    .aOAMRemoteVendorOUI   dot3OamPeerVendorOui
    .aOAMRemoteVendorSpecificInfo   dot3OamPeerVendorInfo
    .aOAMUnsupportedCodesTx   dot3OamUnsupportedCodesTx
    .aOAMUnsupportedCodesRx   dot3OamUnsupportedCodesRx
    .aOAMInformationTx   dot3OamInformationTx
    .aOAMInformationRx   dot3OamInformationRx

    .aOAMUniqueEventNotificationTx dot3OamUniqueEventNotificationTx
    .aOAMUniqueEventNotificationRx dot3OamUniqueEventNotificationRx
    .aOAMDuplicateEventNotificationTx
                                    dot3OamDuplicateEventNotificationTx
    .aOAMDuplicateEventNotificationRx
                                    dot3OamDuplicateEventNotificationRx
    .aOAMLoopbackControlTx   dot3OamLoopbackControlTx

```
      .aOAMLoopbackControlRx              dot3OamLoopbackControlRx
      .aOAMVariableRequestTx              dot3OamVariableRequestTx
      .aOAMVariableRequestRx              dot3OamVariableRequestRx
      .aOAMVariableResponseTx             dot3OamVariableResponseTx
      .aOAMVariableResponseRx             dot3OamVariableResponseRx
      .aOAMOrganizationSpecificTx         dot3OamOrgSpecificTx
      .aOAMOrganizationSpecificRx         dot3OamOrgSpecificTx

      .aOAMLocalErrSymPeriodConfig        dot3OamErrSymPeriodWindow,
                                          dot3OamErrSymPeriodThreshold
      .aOAMLocalErrSymPeriodEvent         dot3OamEventLogEntry
      .aOAMLocalErrFrameConfig            dot3OamErrFrameWindow,
                                          dot3OamErrFrameThreshold
      .aOAMLocalErrFrameEvent             dot3OamEventLogEntry
      .aOAMLocalErrFramePeriodConfig      dot3OamErrFramePeriodWindow,
                                          dot3OamErrFramePeriodThreshold
      .aOAMLocalErrFramePeriodEvent       dot3OamEventLogEntry
      .aOAMLocalErrFrameSecsSummaryConfig
                                          dot3OamErrFrameSecsSummaryWindow,
                                          dot3OamErrFrameSecssummaryThreshold
      .aOAMLocalErrFrameSecsSummaryEvent
                                          dot3OamEventLogEntry
      .aOAMRemoteErrSymPeriodEvent        dot3OamEventLogEntry
      .aOAMRemoteErrFrameEvent            dot3OamEventLogEntry
      .aOAMRemoteErrFramePeriodEvent      dot3OamEventLogEntry
      .aOAMRemoteErrFrameSecsSummaryEvent
                                          dot3OamEventLogEntry
      .aFramesLostDueToOAmError           dot3OamFramesLostDueToOam
      .acOAMAdminControl                  dot3OamAdminState
```

   There are no IEEE 802.3ah managed objects that are not reflected in
   this MIB Module in some manner.

5. MIB Structure

   The Ethernet OAM MIB objects of this memo focus on the OA
   capabilities introduced in [802.3ah]. The MIB objects are
   partitioned into six different MIB groups.

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

   The dot3OamPeerTable maintains the current information on the status
   and configuration of the peer OAM entity on the Ethernet interface.
   Managed information includes the capabilities and function available
   on the peer OAM entity.

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

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

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

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

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

6. MIB Definition

    DOT3-OAM-MIB DEFINITIONS ::= BEGIN

     IMPORTS
       MODULE-IDENTITY, mib-2, OBJECT-TYPE, Counter32, Unsigned32,
         Integer32, NOTIFICATION-TYPE
         FROM SNMPv2-SMI
         -- from [RFC2578]
       TEXTUAL-CONVENTION, MacAddress, TimeStamp, TruthValue

         FROM SNMPv2-TC
         -- from [RFC2579]
       CounterBasedGauge64
         FROM HCNUM-TC
         -- from [RFC2856]
       ifIndex
         FROM IF-MIB
         -- from [RFC2863]
       MODULE-COMPLIANCE, OBJECT-GROUP, NOTIFICATION-GROUP
         FROM SNMPv2-CONF;

      -- from [RFC2580]

    dot3OamMIB MODULE-IDENTITY
      LAST-UPDATED "200706140000Z" -- June 14,2007"
      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
        Chair: Bert Wijnen
          Alcatel-Lucent
          Email: bwijnen at alcatel-lucent dot com
        Editor: Matt Squire
          Hatteras Networks
          E-mail: msquire at hatterasnetworks dot com
        "
      DESCRIPTION
        "The MIB module for managing the new Ethernet OAM features
        introduced by the Ethernet in the First Mile taskforce (IEEE
        802.3ah). The functionality presented here is based on IEEE
        802.3ah [802.3ah], released in October, 2004. [802.3ah] was
        prepared as an addendum to the standing version of IEEE 802.3
        [802.3-2002]. Since then, [802.3ah] has been
        merged into the base IEEE 802.3 specification in [802.3-2005].

        In particular, this MIB focuses on the new OAM functions
        introduced in Clause 57 of [802.3ah]. The OAM functionality
        of Clause 57 is controlled by new management attributes
        introduced in Clause 30 of [802.3ah]. The OAM functions are
        not specific to any particular Ethernet physical layer, and
        can be generically applied to any Ethernet interface of
        [802.3-2002].

        An Ethernet OAM protocol data unit is a valid Ethernet frame
        with a destination MAC address equal to the reserved MAC
        address for Slow Protocols (See 43B of [802.3ah]), a
        lengthOrType field equal to the reserved type for Slow
        Protocols, and a Slow Protocols subtype equal to that of the
        subtype reserved for Ethernet OAM. OAMPDU is used throughout
        this document as an abbreviation for Ethernet OAM protocol
        data unit.

        The following reference is used throughout this MIB module:

          [802.3ah] refers to:
            IEEE Std 802.3ah-2004: 'Draft amendment to -
            Information technology - Telecommunications and
            information exchange between systems - Local and
            metropolitan area networks - Specific requirements - Part
            3: Carrier sense multiple access with collision detection
            (CSMA/CD) access method and physical layer specifications
            - Media Access Control Parameters, Physical Layers and
            Management Parameters for subscriber access networks',
            October 2004.

          [802.3-2002] refers to:
            IEEE Std 802.3-2002:
            'Information technology - Telecommunications and
            information exchange between systems - Local and
            metropolitan area networks - Specific requirements - Part
            3: Carrier sense multiple access with collision detection
            (CSMA/CD) access method and physical layer specifications
            - Media Access Control Parameters, Physical Layers and
            Management Parameters for subscriber access networks',
            March 2002.

          [802.3-2005] refers to:
            IEEE Std 802.3-2005:
            'Information technology - Telecommunications and
            information exchange between systems - Local and
            metropolitan area networks - Specific requirements - Part
            3: Carrier sense multiple access with collision detection
            (CSMA/CD) access method and physical layer specifications
            - Media Access Control Parameters, Physical Layers and
            Management Parameters for subscriber access networks',
            December 2005.

          [802-2001] refers to:
            'IEEE Standard for LAN/MAN (Local Area
            Network/Metropolitan Area Network): Overview and
            Architecture', IEEE 802, June 2001.

        Copyright (c) The IETF Trust (2007). This version of
        this MIB module is part of RFC 4878; See the RFC itself for
        full legal notices. "

      REVISION   "200706140000Z" -- June 14, 2007"
      DESCRIPTION "Initial version, published as RFC 4878."
       ::= { mib-2 158 }

    --
    -- Sections of the Ethernet OAM MIB

```
      --
         dot3OamNotifications OBJECT IDENTIFIER ::= { dot3OamMIB 0 }
         dot3OamObjects       OBJECT IDENTIFIER ::= { dot3OamMIB 1 }
         dot3OamConformance   OBJECT IDENTIFIER ::= { dot3OamMIB 2 }

      --
      -- Textual conventions for the OAM MIB
      --
      EightOTwoOui ::= 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))

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

      dot3OamTable OBJECT-TYPE
        SYNTAX       SEQUENCE OF Dot3OamEntry
        MAX-ACCESS   not-accessible
        STATUS       current
        DESCRIPTION
          "This table contains the primary controls and status for the
          OAM capabilities of an Ethernet-like interface.  There will be
          one row in this table for each Ethernet-like interface in the
          system that supports the OAM functions defined in [802.3ah].
          "
        ::= { dot3OamObjects 1 }

      dot3OamEntry OBJECT-TYPE
        SYNTAX       Dot3OamEntry
        MAX-ACCESS   not-accessible
        STATUS       current
        DESCRIPTION
          "An entry in the table that contains information on the
          Ethernet OAM function for a single Ethernet like interface.
          Entries in the table are created automatically for each
          interface supporting Ethernet OAM.  The status of the row
          entry can be determined from dot3OamOperStatus.

          A dot3OamEntry is indexed in the dot3OamTable by the ifIndex
          object of the Interfaces MIB.
          "
        INDEX        { ifIndex }
        ::= { dot3OamTable 1 }
```

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

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

          The dot3OamAdminState always starts in the disabled(2) state
          until an explicit management action or configuration
          information retained by the system causes a transition to the
          enabled(1) state.  When enabled(1), Ethernet OAM will attempt
          to operate over this interface.
          "
        REFERENCE   "[802.3ah], 30.3.6.1.2"
        ::= { dot3OamEntry 1 }

      dot3OamOperStatus OBJECT-TYPE
        SYNTAX       INTEGER {
                       disabled(1),
                       linkFault(2),
                       passiveWait(3),
                       activeSendLocal(4),
                       sendLocalAndRemote(5),
                       sendLocalAndRemoteOk(6),
                       oamPeeringLocallyRejected(7),
                       oamPeeringRemotelyRejected(8),
                       operational(9),
                       nonOperHalfDuplex(10)
                     }
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
          "At initialization and failure conditions, two OAM entities on
```

the same full-duplex Ethernet link begin a discovery phase to
determine what OAM capabilities may be used on that link. The
progress of this initialization is controlled by the OA
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).
Also, if the interface is not operational (ifOperStatus is
not up(1)), linkFault(2) is returned. Note that the object
ifOperStatus may not be up(1) as a result of link failure or
administrative action (ifAdminState being down(2) or
testing(3)).

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

The state sendLocalAndRemote(5) reflects that the local OA
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 OAMPDU (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].

        Since Ethernet OAM functions are not designed to work
        completely over half-duplex interfaces, the value
        nonOperHalfDuplex(10) is returned whenever Ethernet OAM is
        enabled (dot3OamAdminState is enabled(1)), but the interface
        is in half-duplex operation.
        "
    REFERENCE   "[802.3ah], 30.3.6.1.4, 30.3.6.1.10, 30.3.6.1.11"
    ::= { dot3OamEntry 2 }

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

      The default value of dot3OamMode is dependent on the type of
      system on which this Ethernet-like interface resides. The
      default value should be 'active(2)' unless it is known that
      this system should take on a subservient role to the other
      device connected over this interface.

      Changing this value results in incrementing the configuration
      revision field of locally generated OAMPDUs (30.3.6.1.12) and
      potentially re-doing the OAM discovery process if the
      dot3OamOperStatus was already operational(9).
      "
    REFERENCE   "[802.3ah], 30.3.6.1.3"

```
     ::= { dot3OamEntry 3 }

dot3OamMaxOamPduSize OBJECT-TYPE
  SYNTAX      Unsigned32 (64..1518)
  UNITS       "octets"
  MAX-ACCESS  read-only
  STATUS      current
  DESCRIPTION
    "The largest OAMPDU that the OAM entity supports.  OA
    entities exchange maximum OAMPDU sizes and negotiate to use
    the smaller of the two maximum OAMPDU sizes between the peers.
    This value is determined by the local implementation.
    "
  REFERENCE   "[802.3ah], 30.3.6.1.8"
  ::= { dot3OamEntry 4 }

dot3OamConfigRevision OBJECT-TYPE
  SYNTAX      Unsigned32(0..65535)
  MAX-ACCESS  read-only
  STATUS      current
  DESCRIPTION
    "The configuration revision of the OAM entity as reflected in
    the latest OAMPDU sent by the OAM entity.  The config revision
    is used by OAM entities to indicate that configuration changes
    have occurred, which might require the peer OAM entity to
    re-evaluate whether OAM peering is allowed.
    "
  REFERENCE   "[802.3ah], 30.3.6.1.12"
  ::= { dot3OamEntry 5 }

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 that 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.

    Setting 'unidirectionalSupport(0)' indicates that the OA
```

      entity supports the transmission of OAMPDUs on links that are
      operating in unidirectional mode (traffic flowing in one
      direction only). Setting 'loopbackSupport(1)' indicates that
      the OAM entity can initiate and respond to loopback commands.
      Setting 'eventSupport(2)' indicates that the OAM entity can
      send and receive Event Notification OAMPDUs. Setting
      'variableSupport(3)' indicates that the OAM entity can send
      and receive Variable Request and Response OAMPDUs.
      "
    REFERENCE   "[802.3ah], 30.3.6.1.6"
    ::= { dot3OamEntry 6 }

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

    dot3OamPeerTable OBJECT-TYPE
      SYNTAX   SEQUENCE OF Dot3OamPeerEntry
      MAX-ACCESS   not-accessible
      STATUS   current
      DESCRIPTION
        "This table contains information about the OAM peer for a
        particular Ethernet-like interface. OAM entities communicate
        with a single OAM peer entity on Ethernet links on which OA
        is enabled and operating properly. There is one entry in this
        table for each entry in the dot3OamTable for which information
        on the peer OAM entity is available.
        "
      ::= { dot3OamObjects 2 }

    dot3OamPeerEntry OBJECT-TYPE
      SYNTAX   Dot3OamPeerEntry
      MAX-ACCESS   not-accessible
      STATUS   current
      DESCRIPTION
        "An entry in the table containing information on the peer OA
        entity for a single Ethernet-like interface.

        Note that there is at most one OAM peer for each Ethernet-like
        interface. Entries are automatically created when information
        about the OAM peer entity becomes available, and automatically
        deleted when the OAM peer entity is no longer in
        communication. Peer information is not available when
        dot3OamOperStatus is disabled(1), linkFault(2),
        passiveWait(3), activeSendLocal(4), or nonOperHalfDuplex(10).
        "
      INDEX   { ifIndex }

```
      ::= { dot3OamPeerTable 1 }

   Dot3OamPeerEntry ::=
     SEQUENCE {
       dot3OamPeerMacAddress             MacAddress,
       dot3OamPeerVendorOui              EightOTwoOui,
       dot3OamPeerVendorInfo             Unsigned32,
       dot3OamPeerMode                   INTEGER,
       dot3OamPeerMaxOamPduSize          Unsigned32,
       dot3OamPeerConfigRevision         Unsigned32,
       dot3OamPeerFunctionsSupported   BITS
     }

   dot3OamPeerMacAddress OBJECT-TYPE
     SYNTAX       MacAddress
     MAX-ACCESS   read-only
     STATUS       current
     DESCRIPTION
       "The MAC address of the peer OAM entity.  The MAC address is
       derived from the most recently received OAMPDU.
       "
     REFERENCE    "[802.3ah], 30.3.6.1.5."
     ::= { dot3OamPeerEntry 1 }

   dot3OamPeerVendorOui OBJECT-TYPE
     SYNTAX       EightOTwoOui
     MAX-ACCESS   read-only
     STATUS       current
     DESCRIPTION
       "The OUI of the OAM peer as reflected in the latest
       Information OAMPDU received with a Local Information TLV.  The
       OUI can be used to identify the vendor of the remote OA
       entity.  This value is initialized to three octets of zero
       before any Local Information TLV is received.
       "
     REFERENCE    "[802.3ah], 30.3.6.1.16."
     ::= { dot3OamPeerEntry 2 }

   dot3OamPeerVendorInfo OBJECT-TYPE
     SYNTAX       Unsigned32
     MAX-ACCESS   read-only
     STATUS       current
     DESCRIPTION
       "The Vendor Info of the OAM peer as reflected in the latest
       Information OAMPDU received with a Local Information TLV.
       The semantics of the Vendor Information field is proprietary
       and specific to the vendor (identified by the
       dot3OamPeerVendorOui).  This information could, for example,
```

```
         be used to identify a specific product or product family.
         This value is initialized to zero before any Local
         Information TLV is received.
         "
      REFERENCE    "[802.3ah], 30.3.6.1.17."
      ::= { dot3OamPeerEntry 3 }

   dot3OamPeerMode OBJECT-TYPE
      SYNTAX       INTEGER {
                      passive(1),
                      active(2),
                      unknown(3)
                   }
      MAX-ACCESS   read-only
      STATUS       current
      DESCRIPTION
         "The mode of the OAM peer as reflected in the latest
         Information OAMPDU received with a Local Information TLV.  The
         mode of the peer can be determined from the Configuration
         field in the Local Information TLV of the last Information
         OAMPDU received from the peer.  The value is unknown(3)
         whenever no Local Information TLV has been received.  The
         values of active(2) and passive(1) are returned when a Local
         Information TLV has been received indicating that the peer is
         in active or passive mode, respectively.
         "
      REFERENCE    "[802.3ah], 30.3.6.1.7."
      ::= { dot3OamPeerEntry 4 }

   dot3OamPeerMaxOamPduSize OBJECT-TYPE
      SYNTAX       Unsigned32 (0 | 64..1518)
      UNITS        "octets"
      MAX-ACCESS   read-only
      STATUS       current
      DESCRIPTION
         "The maximum size of OAMPDU supported by the peer as reflected
         in the latest Information OAMPDU received with a Local
         Information TLV.  Ethernet OAM on this interface 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.  A value of zero is returned if no Local Information
         TLV has been received.  Otherwise, the value of the OAM peer's
         maximum OAMPDU size is returned in this value.
         "
      REFERENCE    "[802.3ah], 30.3.6.1.9."
      ::= { dot3OamPeerEntry 5 }
```

```
      dot3OamPeerConfigRevision OBJECT-TYPE
        SYNTAX      Unsigned32(0..65535)
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
          "The configuration revision of the OAM peer as reflected in
          the latest OAMPDU.  This attribute is changed by the peer
          whenever it has a local configuration change for Ethernet OA
          on this interface.  The configuration revision can be
          determined from the Revision field of the Local Information
          TLV of the most recently received Information OAMPDU with
          a Local Information TLV.  A value of zero is returned if
          no Local Information TLV has been received.
          "
        REFERENCE   "[802.3ah], 30.3.6.1.13."
        ::= { dot3OamPeerEntry 6 }

      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.  This
          value is initialized so all bits are clear.

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

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

```
           yet been received.
           "
      REFERENCE   "[802.3ah], REFERENCE 30.3.6.1.7."
      ::= { dot3OamPeerEntry 7 }


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

   dot3OamLoopbackTable OBJECT-TYPE
      SYNTAX      SEQUENCE OF Dot3OamLoopbackEntry
      MAX-ACCESS  not-accessible
      STATUS      current
      DESCRIPTION
        "This table contains controls for the loopback state of the
        local link as well as indicates the status of the loopback
        function.  There is one entry in this table for each entry in
        dot3OamTable that supports loopback functionality (where
        dot3OamFunctionsSupported includes the loopbackSupport bit
        set).

        Loopback can be used to place the remote OAM entity in a state
        where every received frame (except OAMPDUs) is echoed back
        over the same interface on which they were received.  In this
        state, at the remote entity, 'normal' traffic is disabled as
        only the looped back frames are transmitted on the interface.
        Loopback is thus an intrusive operation that prohibits normal
        data flow and should be used accordingly.
        "
      ::= { dot3OamObjects 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.  Entries in the
        table are automatically created whenever the local OAM entity
        supports loopback capabilities.  The loopback status on the
        interface can be determined from the dot3OamLoopbackStatus
        object.
        "
      INDEX       { ifIndex }
      ::= { dot3OamLoopbackTable 1 }

   Dot3OamLoopbackEntry ::=
```

```
      SEQUENCE {
        dot3OamLoopbackStatus              INTEGER,
        dot3OamLoopbackIgnoreRx            INTEGER
      }

    dot3OamLoopbackStatus OBJECT-TYPE
      SYNTAX        INTEGER {
                    -- all values, except where noted, can be read
                    -- but cannot be written
                    noLoopback (1),

                    -- initiatingLoopback can be read or written
                    initiatingLoopback (2),
                    remoteLoopback (3),

                    -- terminatingLoopback can be read or written
                    terminatingLoopback (4),
                    localLoopback (5),
                    unknown (6)
                    }
      MAX-ACCESS  read-write
      STATUS      current
      DESCRIPTION
        "The loopback status of the OAM entity.  This status is
        determined by a combination of the local parser and
        multiplexer states, the remote parser and multiplexer states,
        as well as by the actions of the local OAM client.  When
        operating in normal mode with no loopback in progress, the
        status reads noLoopback(1).

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

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

      If the local OAM client knows that the remote OAM entity is in
      loopback mode (via the remote state information as described
      in [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 that the parser and
      multiplexer combination is unexpected. This status may be
      returned if the OAM loopback is in a transition state but
      should not persist.

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

        value   LclPrsr   LclMux   RmtPrsr   RmtMux
        noLoopback   FWD   FWD   FWD   FWD
        initLoopback   DISCARD   DISCARD   FWD   FWD
        rmtLoopback   DISCARD   FWD   LPBK   DISCARD
        tmtngLoopback   DISCARD   DISCARD   LPBK   DISCARD
        lclLoopback   LPBK   DISCARD   DISCARD   FWD
        unknown   ***   any other combination   ***
      "
    REFERENCE   "[802.3ah], REFERENCE 57.2.11, 30.3.61.14,
      30.3.6.1.15"
    ::= { dot3OamLoopbackEntry 1 }

  dot3OamLoopbackIgnoreRx OBJECT-TYPE
    SYNTAX   INTEGER { ignore(1), process(2) }
    MAX-ACCESS   read-write
    STATUS   current
    DESCRIPTION
      "Since OAM loopback is a disruptive operation (user traffic
      does not pass), this attribute provides a mechanism to provide
      controls over whether received OAM loopback commands are
      processed or ignored. When the value is ignore(1), received
      loopback commands are ignored. When the value is process(2),
      OAM loopback commands are processed. The default value is to
      ignore loopback commands (ignore(1)).
      "
    REFERENCE   "[802.3ah], REFERENCE 57.2.11, 30.3.61.14,
      30.3.6.1.15"
    ::= { dot3OamLoopbackEntry 2 }

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

     dot3OamStatsTable OBJECT-TYPE
       SYNTAX       SEQUENCE OF Dot3OamStatsEntry
       MAX-ACCESS   not-accessible
       STATUS       current
       DESCRIPTION
         "This table contains statistics for the OAM function on a
         particular Ethernet-like interface.  There is an entry in the
         table for every entry in the dot3OamTable.

         The counters in this table are defined as 32-bit entries to
         match the counter size as defined in [802.3ah].  Given that
         the OA protocol is a slow protocol, the counters increment at
         a slow rate.
         "
       ::= { dot3OamObjects 4 }

     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.  Entries are automatically created for every entry
         in the dot3OamTable.  Counters are maintained across
         transitions in dot3OamOperStatus.
         "
       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
         UNITS         "frames"
         MAX-ACCESS    read-only
         STATUS        current
         DESCRIPTION
           "A count of the number of Information OAMPDUs transmitted on
           this interface.

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

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

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

       dot3OamUniqueEventNotificationTx OBJECT-TYPE
         SYNTAX        Counter32
         UNITS         "frames"
         MAX-ACCESS    read-only
         STATUS        current
         DESCRIPTION
           "A count of the number of unique Event OAMPDUs transmitted on
           this interface.  Event Notifications may be sent in duplicate
           to increase the probability of successfully being received,
```

     given the possibility that a frame may be lost in transit.
     Duplicate Event Notification transmissions are counted by
     dot3OamDuplicateEventNotificationTx.

     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
   UNITS   "frames"
   MAX-ACCESS read-only
   STATUS   current
   DESCRIPTION
     "A count of the number of unique Event OAMPDUs received on
     this interface. Event Notification OAMPDUs may be sent in
     duplicate to increase the probability of successfully being
     received, given the possibility that a frame may be lost in
     transit. Duplicate Event Notification receptions are counted
     by dot3OamDuplicateEventNotificationRx.

     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
   UNITS   "frames"
   MAX-ACCESS read-only
   STATUS   current
   DESCRIPTION
     "A count of the number of duplicate Event OAMPDUs transmitted

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

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

         Discontinuities of this counter can occur at re-initialization
         of the management system, and at other times as indicated by
         the value of the ifCounterDiscontinuityTime.
         "
      REFERENCE   "[802.3ah], 30.3.6.1.23."
      ::= { dot3OamStatsEntry 5 }

   dot3OamDuplicateEventNotificationRx OBJECT-TYPE
      SYNTAX   Counter32
      UNITS   "frames"
      MAX-ACCESS   read-only
      STATUS   current
      DESCRIPTION
        "A count of the number of duplicate Event OAMPDUs received on
         this interface. Event Notification OAMPDUs may be sent in
         duplicate to increase the probability of successfully being
         received, given the possibility that a frame may be lost in
         transit.

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

         Discontinuities of this counter can occur at re-initialization
         of the management system, and at other times as indicated by
         the value of the ifCounterDiscontinuityTime.
         "
      REFERENCE   "[802.3ah], 30.3.6.1.25."
      ::= { dot3OamStatsEntry 6 }

   dot3OamLoopbackControlTx OBJECT-TYPE
      SYNTAX   Counter32
      UNITS   "frames"
      MAX-ACCESS   read-only
      STATUS   current
      DESCRIPTION
        "A count of the number of Loopback Control OAMPDUs transmitted

       on this interface.

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

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

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

   dot3OamVariableRequestTx OBJECT-TYPE
     SYNTAX   Counter32
     UNITS   "frames"
     MAX-ACCESS   read-only
     STATUS   current
     DESCRIPTION
       "A count of the number of Variable Request OAMPDUs transmitted
       on this interface.

       Discontinuities of this counter can occur at re-initialization
       of the management system, and at other times as indicated by
       the value of the ifCounterDiscontinuityTime.
       "
     REFERENCE   "[802.3ah], 30.3.6.1.28."
     ::= { dot3OamStatsEntry 9 }

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

      this interface.

      Discontinuities of this counter can occur at re-initialization
      of the management system, and at other times as indicated by
      the value of the ifCounterDiscontinuityTime.
      "
   REFERENCE   "[802.3ah], 30.3.6.1.29."
   ::= { dot3OamStatsEntry 10 }

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

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

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

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

 dot3OamOrgSpecificTx OBJECT-TYPE
   SYNTAX   Counter32
   UNITS   "frames"
   MAX-ACCESS read-only
   STATUS   current
   DESCRIPTION
     "A count of the number of Organization Specific OAMPDUs

```
     transmitted on this interface.

     Discontinuities of this counter can occur at re-initialization
     of the management system, and at other times as indicated by
     the value of the ifCounterDiscontinuityTime.
     "
   REFERENCE    "[802.3ah], 30.3.6.1.32."
   ::= { dot3OamStatsEntry 13 }

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

     Discontinuities of this counter can occur at re-initialization
     of the management system, and at other times as indicated by
     the value of the ifCounterDiscontinuityTime.
     "
   REFERENCE    "[802.3ah], 30.3.6.1.33."
   ::= { dot3OamStatsEntry 14 }

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

     Discontinuities of this counter can occur at re-initialization
     of the management system, and at other times as indicated by
     the value of the ifCounterDiscontinuityTime.
     "
   REFERENCE    "[802.3ah], 30.3.6.1.18."
   ::= { dot3OamStatsEntry 15 }

 dot3OamUnsupportedCodesRx OBJECT-TYPE
   SYNTAX       Counter32
   UNITS        "frames"
   MAX-ACCESS   read-only
   STATUS       current
   DESCRIPTION
     "A count of the number of OAMPDUs received on this interface
```

          with an unsupported op-code.

          Discontinuities of this counter can occur at re-initialization
          of the management system, and at other times as indicated by
          the value of the ifCounterDiscontinuityTime.
          "
        REFERENCE   "[802.3ah], 30.3.6.1.19."
        ::= { dot3OamStatsEntry 16 }

      dot3OamFramesLostDueToOam OBJECT-TYPE
        SYNTAX   Counter32
        UNITS   "frames"
        MAX-ACCESS read-only
        STATUS   current
        DESCRIPTION
          "A count of the number of frames that were dropped by the OA
          multiplexer. Since the OAM multiplexer has multiple inputs
          and a single output, there may be cases where frames are
          dropped due to transmit resource contention. This counter is
          incremented whenever a frame is dropped by the OAM layer.
          Note that any Ethernet frame, not just OAMPDUs, may be dropped
          by the OAM layer. This can occur when an OAMPDU takes
          precedence over a 'normal' frame resulting in the 'normal'
          frame being dropped.

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

          Discontinuities of this counter can occur at re-initialization
          of the management system, and at other times as indicated by
          the value of the ifCounterDiscontinuityTime.
          "
        REFERENCE   "[802.3ah], 30.3.6.1.46."
        ::= { dot3OamStatsEntry 17 }

      -- ***
      --
      -- Ethernet OAM Event Configuration 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 Notification OAMPDUs to indicate various link problems.
          This table contains the mechanisms to enable Event

Notifications and configure the thresholds to generate the
standard Ethernet OAM events. There is one entry in the table
for every entry in dot3OamTable that supports OAM events
(where dot3OamFunctionsSupported includes the eventSupport
bit set). The values in the table are maintained across
changes to dot3OamOperStatus.

The standard threshold crossing events are:
   - Errored Symbol Period Event. Generated when the number of
     symbol errors exceeds a threshold within a given window
     defined by a number of symbols (for example, 1,000 symbols
     out of 1,000,000 had errors).
   - Errored Frame Period Event. Generated when the number of
     frame errors exceeds a threshold within a given window
     defined by a number of frames (for example, 10 frames out
     of 1000 had errors).
   - Errored Frame Event. Generated when the number of frame
     errors exceeds a threshold within a given window defined
     by a period of time (for example, 10 frames in 1 second
     had errors).
   - Errored Frame Seconds Summary Event. Generated when the
     number of errored frame seconds exceeds a threshold within
     a given time period (for example, 10 errored frame seconds
     within the last 100 seconds). An errored frame second is
     defined as a 1 second interval which had >0 frame errors.
There are other events (dying gasp, critical events) that are
not threshold crossing events but which can be
enabled/disabled via this table.
        "
     ::= { dot3OamObjects 5 }

dot3OamEventConfigEntry OBJECT-TYPE
   SYNTAX   Dot3OamEventConfigEntry
   MAX-ACCESS   not-accessible
   STATUS   current
   DESCRIPTION
     "Entries are automatically created and deleted from this
     table, and exist whenever the OAM entity supports Ethernet OA
     events (as indicated by the eventSupport bit in
     dot3OamFunctionsSuppported). Values in the table are
     maintained across changes to the value of dot3OamOperStatus.

     Event configuration controls when the local management entity
     sends Event Notification OAMPDUs to its OAM peer, and when
     certain event flags are set or cleared in OAMPDUs.
        "
   INDEX   { ifIndex }
   ::= { dot3OamEventConfigTable 1 }

```
Dot3OamEventConfigEntry ::=
  SEQUENCE {
            dot3OamErrSymPeriodWindowHi        Unsigned32,
            dot3OamErrSymPeriodWindowLo        Unsigned32,
            dot3OamErrSymPeriodThresholdHi     Unsigned32,
            dot3OamErrSymPeriodThresholdLo     Unsigned32,
            dot3OamErrSymPeriodEvNotifEnable   TruthValue,
            dot3OamErrFramePeriodWindow        Unsigned32,
            dot3OamErrFramePeriodThreshold     Unsigned32,
            dot3OamErrFramePeriodEvNotifEnable TruthValue,
            dot3OamErrFrameWindow              Unsigned32,
            dot3OamErrFrameThreshold           Unsigned32,
            dot3OamErrFrameEvNotifEnable       TruthValue,
            dot3OamErrFrameSecsSummaryWindow   Integer32,
            dot3OamErrFrameSecsSummaryThreshold Integer32,
            dot3OamErrFrameSecsEvNotifEnable   TruthValue,
            dot3OamDyingGaspEnable             TruthValue,
            dot3OamCriticalEventEnable         TruthValue
          }

dot3OamErrSymPeriodWindowHi OBJECT-TYPE
  SYNTAX      Unsigned32
  UNITS       "2^32 symbols"
  MAX-ACCESS  read-write
  STATUS      current
  DESCRIPTION
    "The two objects dot3OamErrSymPeriodWindowHi and
     dot3OamErrSymPeriodLo together form an unsigned 64-bit
     integer representing the number of symbols over which this
     threshold event is defined.  This is defined as
    dot3OamErrSymPeriodWindow = ((2^32)*dot3OamErrSymPeriodWindowHi)
                                    + dot3OamErrSymPeriodWindowLo

     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 that the threshold has been
     crossed in this window.

     The default value for dot3OamErrSymPeriodWindow is the number
     of symbols in one second for the underlying physical layer.
     "
  REFERENCE    "[802.3ah], 30.3.6.1.34"
  ::= { dot3OamEventConfigEntry 1 }

dot3OamErrSymPeriodWindowLo OBJECT-TYPE
  SYNTAX      Unsigned32
  UNITS       "symbols"
```

         MAX-ACCESS read-write
         STATUS   current
         DESCRIPTION
           "The two objects dot3OamErrSymPeriodWindowHi and
           dot3OamErrSymPeriodWindowLo together form an unsigned 64-bit
           integer representing the number of symbols over which this
           threshold event is defined. This is defined as

         dot3OamErrSymPeriodWindow = ((2^32)*dot3OamErrSymPeriodWindowHi)
                                       + dot3OamErrSymPeriodWindowLo

           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 that the threshold has been
           crossed in this window.

           The default value for dot3OamErrSymPeriodWindow is the number
           of symbols in one second for the underlying physical layer.
           "
         REFERENCE   "[802.3ah], 30.3.6.1.34"
         ::= { dot3OamEventConfigEntry 2 }

      dot3OamErrSymPeriodThresholdHi OBJECT-TYPE
         SYNTAX   Unsigned32
         UNITS   "2^32 symbols"
         MAX-ACCESS read-write
         STATUS   current
         DESCRIPTION
           "The two objects dot3OamErrSymPeriodThresholdHi and
           dot3OamErrSymPeriodThresholdLo together form an unsigned
           64-bit integer representing the number of symbol errors that
           must occur within a given window to cause this event.

           This is defined as

             dot3OamErrSymPeriodThreshold =
                          ((2^32) * dot3OamErrSymPeriodThresholdHi)
                                  + dot3OamErrSymPeriodThresholdLo

           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 that the threshold has been
           crossed in this window.

           The default value for dot3OamErrSymPeriodThreshold is one
           symbol errors. If the threshold value is zero, then an Event

      Notification OAMPDU is sent periodically (at the end of every
      window). This can be used as an asynchronous notification to
      the peer OAM entity of the statistics related to this
      threshold crossing alarm.
      "
   REFERENCE   "[802.3ah], 30.3.6.1.34"
   ::= { dot3OamEventConfigEntry 3 }

dot3OamErrSymPeriodThresholdLo OBJECT-TYPE
   SYNTAX   Unsigned32
   UNITS   "symbols"
   MAX-ACCESS   read-write
   STATUS   current
   DESCRIPTION
     "The two objects dot3OamErrSymPeriodThresholdHi and
     dot3OamErrSymPeriodThresholdLo together form an unsigned
     64-bit integer representing the number of symbol errors that
     must occur within a given window to cause this event.

     This is defined as

        dot3OamErrSymPeriodThreshold =
                        ((2^32) * dot3OamErrSymPeriodThresholdHi)
                             + dot3OamErrSymPeriodThresholdLo

     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 that the threshold has been
     crossed in this window.

     The default value for dot3OamErrSymPeriodThreshold is one
     symbol error. If the threshold value is zero, then an Event
     Notification OAMPDU is sent periodically (at the end of every
     window). This can be used as an asynchronous notification to
     the peer OAM entity of the statistics related to this
     threshold crossing alarm.
     "
   REFERENCE   "[802.3ah], 30.3.6.1.34"
   ::= { dot3OamEventConfigEntry 4 }

dot3OamErrSymPeriodEvNotifEnable OBJECT-TYPE
   SYNTAX   TruthValue
   MAX-ACCESS   read-write
   STATUS   current
   DESCRIPTION
     "If true, the OAM entity should send an Event Notification
     OAMPDU when an Errored Symbol Period Event occurs.

By default, this object should have the value true for
Ethernet-like interfaces that support OAM. If the OAM layer
does not support Event Notifications (as indicated via the
dot3OamFunctionsSupported attribute), this value is ignored.
"
::= { dot3OamEventConfigEntry 5 }

dot3OamErrFramePeriodWindow OBJECT-TYPE
   SYNTAX   Unsigned32
   UNITS   "frames"
   MAX-ACCESS   read-write
   STATUS   current
   DESCRIPTION
     "The number of frames over which the threshold is defined.
     The default value of the window is the number of minimum size
     Ethernet frames that can be received over the physical layer
     in one second.

     If 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 that the threshold has been
     crossed in this window.
     "
   REFERENCE   "[802.3ah], 30.3.6.1.38"
   ::= { dot3OamEventConfigEntry 6 }

dot3OamErrFramePeriodThreshold OBJECT-TYPE
   SYNTAX   Unsigned32
   UNITS   "frames"
   MAX-ACCESS   read-write
   STATUS   current
   DESCRIPTION
     "The number of frame errors that must occur for this event to
     be triggered. The default value is one frame error. If the
     threshold value is zero, then an Event Notification OAMPDU is
     sent periodically (at the end of every window). This can be
     used as an asynchronous notification to the peer OAM entity of
     the statistics related to this threshold crossing alarm.

     If 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 that the threshold has been
     crossed in this window.
     "
   REFERENCE   "[802.3ah], 30.3.6.1.38"

```
      ::= { dot3OamEventConfigEntry 7 }

   dot3OamErrFramePeriodEvNotifEnable OBJECT-TYPE
     SYNTAX       TruthValue
     MAX-ACCESS   read-write
     STATUS       current
     DESCRIPTION
       "If true, the OAM entity should send an Event Notification
       OAMPDU when an Errored Frame Period Event occurs.

       By default, this object should have the value true for
       Ethernet-like interfaces that support OAM.  If the OAM layer
       does not support Event Notifications (as indicated via the
       dot3OamFunctionsSupported attribute), this value is ignored.
       "
     ::= { dot3OamEventConfigEntry 8 }

   dot3OamErrFrameWindow OBJECT-TYPE
     SYNTAX       Unsigned32
     UNITS        "tenths of a second"
     MAX-ACCESS   read-write
     STATUS       current
     DESCRIPTION
       "The amount of time (in 100ms increments) over which the
       threshold is defined.  The default value is 10 (1 second).

       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 that the threshold
       has been crossed in this window.
       "
     REFERENCE    "[802.3ah], 30.3.6.1.36"
     DEFVAL { 10 }
     ::= { dot3OamEventConfigEntry 9 }

   dot3OamErrFrameThreshold OBJECT-TYPE
     SYNTAX       Unsigned32
     UNITS        "frames"
     MAX-ACCESS   read-write
     STATUS       current
     DESCRIPTION
       "The number of frame errors that must occur for this event to
       be triggered.  The default value is one frame error.  If the
       threshold value is zero, then an Event Notification OAMPDU is
       sent periodically (at the end of every window).  This can be
       used as an asynchronous notification to the peer OAM entity of
       the statistics related to this threshold crossing alarm.
```

         If 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"
      DEFVAL { 1 }
      ::= { dot3OamEventConfigEntry 10 }

   dot3OamErrFrameEvNotifEnable OBJECT-TYPE
      SYNTAX   TruthValue
      MAX-ACCESS   read-write
      STATUS   current
      DESCRIPTION
        "If true, the OAM entity should send an Event Notification
        OAMPDU when an Errored Frame Event occurs.

        By default, this object should have the value true for
        Ethernet-like interfaces that support OAM. If the OAM layer
        does not support Event Notifications (as indicated via the
        dot3OamFunctionsSupported attribute), this value is ignored.
        "
      DEFVAL { true }
      ::= { dot3OamEventConfigEntry 11 }

   dot3OamErrFrameSecsSummaryWindow OBJECT-TYPE
      SYNTAX   Integer32 (100..9000)
      UNITS   "tenths of a second"
      MAX-ACCESS   read-write
      STATUS   current
      DESCRIPTION
        "The amount of time (in 100 ms intervals) over which the
        threshold is defined. The default value is 100 (10 seconds).

        If 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
        that the threshold has been crossed in this window.
        "
      REFERENCE   "[802.3ah], 30.3.6.1.40"
      DEFVAL { 100 }
      ::= { dot3OamEventConfigEntry 12 }

   dot3OamErrFrameSecsSummaryThreshold OBJECT-TYPE
      SYNTAX   Integer32 (1..900)

```
      UNITS        "errored frame seconds"
      MAX-ACCESS   read-write
      STATUS       current
      DESCRIPTION
        "The number of errored frame seconds that must occur for this
        event to be triggered.  The default value is one errored frame
        second.  If the threshold value is zero, then an Event
        Notification OAMPDU is sent periodically (at the end of every
        window).  This can be used as an asynchronous notification to
        the peer OAM entity of the statistics related to this
        threshold crossing alarm.

        If 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
        that the threshold has been crossed in this window.
        "
      REFERENCE    "[802.3ah], 30.3.6.1.40"
      DEFVAL { 1 }
      ::= { dot3OamEventConfigEntry 13 }

   dot3OamErrFrameSecsEvNotifEnable OBJECT-TYPE
      SYNTAX       TruthValue
      MAX-ACCESS   read-write
      STATUS       current
      DESCRIPTION
        "If true, the local OAM entity should send an Event
        Notification OAMPDU when an Errored Frame Seconds Event
        occurs.

        By default, this object should have the value true for
        Ethernet-like interfaces that support OAM.  If the OAM layer
        does not support Event Notifications (as indicated via the
        dot3OamFunctionsSupported attribute), this value is ignored.
        "
      DEFVAL { true }
      ::= { dot3OamEventConfigEntry 14 }

   dot3OamDyingGaspEnable OBJECT-TYPE
      SYNTAX       TruthValue
      MAX-ACCESS   read-write
      STATUS       current
      DESCRIPTION
        "If true, the local OAM entity should attempt to indicate a
        dying gasp via the OAMPDU flags field to its peer OAM entity
        when a dying gasp event occurs.  The exact definition of a
        dying gasp event is implementation dependent.  If the system
```

        does not support dying gasp capability, setting this object
        has no effect, and reading the object should always result in
        'false'.

        By default, this object should have the value true for
        Ethernet-like interfaces that support OAM. If the OAM layer
        does not support Event Notifications (as indicated via the
        dot3OamFunctionsSupported attribute), this value is ignored.
        "
      DEFVAL { true }
      ::= { dot3OamEventConfigEntry 15 }

    dot3OamCriticalEventEnable OBJECT-TYPE
      SYNTAX   TruthValue
      MAX-ACCESS   read-write
      STATUS   current
      DESCRIPTION
        "If true, the local OAM entity should attempt to indicate a
        critical event via the OAMPDU flags to its peer OAM entity
        when a critical event occurs. The exact definition of a
        critical event is implementation dependent. If the system
        does not support critical event capability, setting this
        object has no effect, and reading the object should always
        result in 'false'.

        By default, this object should have the value true for
        Ethernet-like interfaces that support OAM. If the OAM layer
        does not support Event Notifications (as indicated via the
        dot3OamFunctionsSupported attribute), this value is ignored.
        "
      DEFVAL { true }
      ::= { dot3OamEventConfigEntry 16 }

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

    dot3OamEventLogTable OBJECT-TYPE
      SYNTAX   SEQUENCE OF Dot3OamEventLogEntry
      MAX-ACCESS   not-accessible
      STATUS   current
      DESCRIPTION
        "This table records a history of the events that have occurred
        at the Ethernet OAM level. These events can include locally
        detected events, which may result in locally generated
        OAMPDUs, and remotely detected events, which are detected by
        the OAM peer entity and signaled to the local entity via

Ethernet OAM. Ethernet OAM events can be signaled by Event
Notification OAMPDUs or by the flags field in any OAMPDU.

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

Entries in the table are automatically created when such
events are detected. The size of the table is implementation
dependent. When the table reaches its maximum size, older
entries are automatically deleted to make room for newer
entries.
"
::= { dot3OamObjects 6 }

dot3OamEventLogEntry OBJECT-TYPE
  SYNTAX   Dot3OamEventLogEntry
  MAX-ACCESS not-accessible
  STATUS   current
  DESCRIPTION
    "An entry in the dot3OamEventLogTable. Entries are
    automatically created whenever Ethernet OAM events occur at
    the local OAM entity, and when Event Notification OAMPDUs are
    received at the local OAM entity (indicating that events have
    occurred at the peer OAM entity). The size of the table is
    implementation dependent, but when the table becomes full,
    older events are automatically deleted to make room for newer
    events. The table index dot3OamEventLogIndex increments for
    each new entry, and when the maximum value is reached, the
    value restarts at zero.
    "
  INDEX   { ifIndex, dot3OamEventLogIndex }
  ::= { dot3OamEventLogTable 1 }

Dot3OamEventLogEntry ::=
  SEQUENCE {
    dot3OamEventLogIndex   Unsigned32,
    dot3OamEventLogTimestamp   TimeStamp,
    dot3OamEventLogOui   EightOTwoOui,
    dot3OamEventLogType   Unsigned32,
    dot3OamEventLogLocation   INTEGER,
    dot3OamEventLogWindowHi   Unsigned32,
    dot3OamEventLogWindowLo   Unsigned32,
    dot3OamEventLogThresholdHi   Unsigned32,

```
      dot3OamEventLogThresholdLo              Unsigned32,
      dot3OamEventLogValue                    CounterBasedGauge64,
      dot3OamEventLogRunningTotal             CounterBasedGauge64,
      dot3OamEventLogEventTotal               Unsigned32
    }

dot3OamEventLogIndex        OBJECT-TYPE
  SYNTAX        Unsigned32(1..4294967295)
  MAX-ACCESS    not-accessible
  STATUS        current
  DESCRIPTION
    "An arbitrary integer for identifying individual events
    within the event log.  "
  ::= { dot3OamEventLogEntry 1 }

dot3OamEventLogTimestamp  OBJECT-TYPE
  SYNTAX        TimeStamp
  MAX-ACCESS    read-only
  STATUS        current
  DESCRIPTION
    "The value of sysUpTime at the time of the logged event.  For
    locally generated events, the time of the event can be
    accurately retrieved from sysUpTime.  For remotely generated
    events, the time of the event is indicated by the reception of
    the Event Notification OAMPDU indicating that the event
    occurred on the peer.  A system may attempt to adjust the
    timestamp value to more accurately reflect the time of the
    event at the peer OAM entity by using other information, such
    as that found in the timestamp found of the Event Notification
    TLVs, which provides an indication of the relative time
    between events at the peer entity.  "
  ::= { dot3OamEventLogEntry 2 }

dot3OamEventLogOui  OBJECT-TYPE
  SYNTAX        EightOTwoOui
  MAX-ACCESS    read-only
  STATUS        current
  DESCRIPTION
    "The OUI of the entity defining the object type.  All IEEE
    802.3 defined events (as appearing in [802.3ah] except for the
    Organizationally Unique Event TLVs) use the IEEE 802.3 OUI of
    0x0180C2.  Organizations defining their own Event Notification
    TLVs include their OUI in the Event Notification TLV that
    gets reflected here.  "
  ::= { dot3OamEventLogEntry 3 }

dot3OamEventLogType        OBJECT-TYPE
  SYNTAX        Unsigned32
```

```
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
      "The type of event that generated this entry in the event log.
      When the OUI is the IEEE 802.3 OUI of 0x0180C2, the following
      event types are defined:
          erroredSymbolEvent(1),
          erroredFramePeriodEvent(2),
          erroredFrameEvent(3),
          erroredFrameSecondsEvent(4),
          linkFault(256),
          dyingGaspEvent(257),
          criticalLinkEvent(258)
      The first four are considered threshold crossing events, as
      they are generated when a metric exceeds a given value within
      a specified window.  The other three are not threshold
      crossing events.

      When the OUI is not 71874 (0x0180C2 in hex), then some other
      organization has defined the event space.  If event subtyping
      is known to the implementation, it may be reflected here.
      Otherwise, this value should return all F's (2^32 - 1).
      "
    REFERENCE   "[802.3ah], 30.3.6.1.10 and 57.5.3."
    ::= { dot3OamEventLogEntry 4 }

dot3OamEventLogLocation OBJECT-TYPE
    SYNTAX      INTEGER { local(1), remote(2) }
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
      "Whether this event occurred locally (local(1)), or was
      received from the OAM peer via Ethernet OAM (remote(2)).
      "
    ::= { dot3OamEventLogEntry 5 }

dot3OamEventLogWindowHi     OBJECT-TYPE
    SYNTAX      Unsigned32
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
      "If the event represents a threshold crossing event, the two
      objects dot3OamEventWindowHi and dot3OamEventWindowLo, form
      an unsigned 64-bit integer yielding the window over which the
      value was measured for the threshold crossing event (for
      example, 5, when 11 occurrences happened in 5 seconds while
      the threshold was 10).  The two objects are combined as:
```

```
   dot3OamEventLogWindow = ((2^32) * dot3OamEventLogWindowHi)
                                  + dot3OamEventLogWindowLo


 Otherwise, this value is returned as all F's (2^32 - 1) and
 adds no useful information.
 "
REFERENCE   "[802.3ah], 30.3.6.1.37 and 57.5.3.2."
::= { dot3OamEventLogEntry 6 }


dot3OamEventLogWindowLo      OBJECT-TYPE
  SYNTAX       Unsigned32
  MAX-ACCESS   read-only
  STATUS       current
  DESCRIPTION
    "If the event represents a threshold crossing event, the two
    objects dot3OamEventWindowHi and dot3OamEventWindowLo form an
    unsigned 64-bit integer yielding the window over which the
    value was measured for the threshold crossing event (for
    example, 5, when 11 occurrences happened in 5 seconds while
    the threshold was 10).  The two objects are combined as:

    dot3OamEventLogWindow = ((2^32) * dot3OamEventLogWindowHi)
                                    + dot3OamEventLogWindowLo


    Otherwise, this value is returned as all F's (2^32 - 1) and
    adds no useful information.
    "
  REFERENCE   "[802.3ah], 30.3.6.1.37 and 57.5.3.2."
  ::= { dot3OamEventLogEntry 7 }


dot3OamEventLogThresholdHi      OBJECT-TYPE
  SYNTAX       Unsigned32
  MAX-ACCESS   read-only
  STATUS       current
  DESCRIPTION
    "If the event represents a threshold crossing event, the two
    objects dot3OamEventThresholdHi and dot3OamEventThresholdLo
    form an unsigned 64-bit integer yielding the value that was
    crossed for the threshold crossing event (for example, 10,
    when 11 occurrences happened in 5 seconds while the threshold
    was 10).  The two objects are combined as:

  dot3OamEventLogThreshold = ((2^32) * dot3OamEventLogThresholdHi)
                                      + dot3OamEventLogThresholdLo


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

```
             REFERENCE    "[802.3ah], 30.3.6.1.37 and 57.5.3.2."
             ::= { dot3OamEventLogEntry 8 }

        dot3OamEventLogThresholdLo      OBJECT-TYPE
          SYNTAX       Unsigned32
          MAX-ACCESS   read-only
          STATUS       current
          DESCRIPTION
            "If the event represents a threshold crossing event, the two
            objects dot3OamEventThresholdHi and dot3OamEventThresholdLo
            form an unsigned 64-bit integer yielding the value that was
            crossed for the threshold crossing event (for example, 10,
            when 11 occurrences happened in 5 seconds while the threshold
            was 10).  The two objects are combined as:

            dot3OamEventLogThreshold = ((2^32) * dot3OamEventLogThresholdHi)
                                            + dot3OamEventLogThresholdLo

            Otherwise, this value is returned as all F's (2^32 - 1) and
            adds no useful information.
            "
          REFERENCE    "[802.3ah], 30.3.6.1.37 and 57.5.3.2."
          ::= { dot3OamEventLogEntry 9 }

        dot3OamEventLogValue      OBJECT-TYPE
          SYNTAX       CounterBasedGauge64
          MAX-ACCESS   read-only
          STATUS       current
          DESCRIPTION
            "If the event represents a threshold crossing event, this
            value indicates the value of the parameter within the given
            window that generated this event (for example, 11, when 11
            occurrences happened in 5 seconds while the threshold was 10).

            Otherwise, this value is returned as all F's
            (2^64 - 1) and adds no useful information.
            "
          REFERENCE    "[802.3ah], 30.3.6.1.37 and 57.5.3.2."
          ::= { dot3OamEventLogEntry 10 }

        dot3OamEventLogRunningTotal      OBJECT-TYPE
          SYNTAX       CounterBasedGauge64
          MAX-ACCESS   read-only
          STATUS       current
          DESCRIPTION
            "Each Event Notification TLV contains a running total of the
            number of times an event has occurred, as well as the number
            of times an Event Notification for the event has been
```

```
      transmitted.  For non-threshold crossing events, the number of
      events (dot3OamLogRunningTotal) and the number of resultant
      Event Notifications (dot3OamLogEventTotal) should be
      identical.

      For threshold crossing events, since multiple occurrences may
      be required to cross the threshold, these values are likely
      different.  This value represents the total number of times
      this event has happened since the last reset (for example,
      3253, when 3253 symbol errors have occurred since the last
      reset, which has resulted in 51 symbol error threshold
      crossing events since the last reset).
      "
    REFERENCE    "[802.3ah], 30.3.6.1.37 and 57.5.3.2."
    ::= { dot3OamEventLogEntry 11 }

  dot3OamEventLogEventTotal       OBJECT-TYPE
    SYNTAX       Unsigned32
    MAX-ACCESS   read-only
    STATUS       current
    DESCRIPTION
      "Each Event Notification TLV contains a running total of the
      number of times an event has occurred, as well as the number
      of times an Event Notification for the event has been
      transmitted.  For non-threshold crossing events, the number of
      events (dot3OamLogRunningTotal) and the number of resultant
      Event Notifications (dot3OamLogEventTotal) should be
      identical.

      For threshold crossing events, since multiple occurrences may
      be required to cross the threshold, these values are likely
      different.  This value represents the total number of times
      one or more of these occurrences have resulted in an Event
      Notification (for example, 51 when 3253 symbol errors have
      occurred since the last reset, which has resulted in 51 symbol
      error threshold crossing events since the last reset).
      "
    REFERENCE    "[802.3ah], 30.3.6.1.37 and 57.5.3.2."
    ::= { dot3OamEventLogEntry 12 }

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

  dot3OamThresholdEvent NOTIFICATION-TYPE
    OBJECTS { dot3OamEventLogTimestamp,
            dot3OamEventLogOui,
```

```
            dot3OamEventLogType,
            dot3OamEventLogLocation,
            dot3OamEventLogWindowHi,
            dot3OamEventLogWindowLo,
            dot3OamEventLogThresholdHi,
            dot3OamEventLogThresholdLo,
            dot3OamEventLogValue,
            dot3OamEventLogRunningTotal,
            dot3OamEventLogEventTotal
          }
      STATUS  current
      DESCRIPTION
        "A dot3OamThresholdEvent notification is sent when a local or
        remote threshold crossing event is detected.  A local
        threshold crossing event is detected by the local entity,
        while a remote threshold crossing event is detected by the
        reception of an Ethernet OAM Event Notification OAMPDU
        that indicates a threshold event.

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

        The OAM entity can be derived from extracting the ifIndex from
        the variable bindings.  The objects in the notification
        correspond to the values in a row instance in the
        dot3OamEventLogTable.

        The management entity should periodically check
        dot3OamEventLogTable to detect any missed events."
     ::= { dot3OamNotifications 1 }

   dot3OamNonThresholdEvent NOTIFICATION-TYPE
     OBJECTS { dot3OamEventLogTimestamp,
               dot3OamEventLogOui,
               dot3OamEventLogType,
               dot3OamEventLogLocation,
               dot3OamEventLogEventTotal
             }
     STATUS  current
     DESCRIPTION
        "A dot3OamNonThresholdEvent notification is sent when a local
        or remote non-threshold crossing event is detected.  A local
        event is detected by the local entity, while a remote event is
        detected by the reception of an Ethernet OAM Event
        Notification OAMPDU that indicates a non-threshold crossing
        event.

        This notification should not be sent more than once per
```

         second.

         The OAM entity can be derived from extracting the ifIndex from
         the variable bindings. The objects in the notification
         correspond to the values in a row instance of the
         dot3OamEventLogTable.

         The management entity should periodically check
         dot3OamEventLogTable to detect any missed events."
      ::= { dot3OamNotifications 2 }

      -- **
      --
      -- 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 OA
          implementations that support loopback functionality. "

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

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

        GROUP   dot3OamErrFrameEventGroup

```
        DESCRIPTION
          "This group is mandatory for all IEEE 802.3 OA
          implementations that support event functionality. "

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

        GROUP          dot3OamFlagEventGroup
        DESCRIPTION
          "This group is optional for all IEEE 802.3 OA
          implementations.  The ability to send critical events or dying
          gasp events is not required in any system."

        GROUP         dot3OamEventLogGroup
        DESCRIPTION
          "This group is optional for all IEEE 802.3 OA
          implementations.  Entries in this table are dependent on what
          event functionality is supported in the local OA
          implementation.  At least one type of event must be supported
          for entries to appear in this table.  "

        GROUP         dot3OamNotificationGroup
        DESCRIPTION
          "This group is optional for all IEEE 802.3 OA
          implementations.  Since the information in the notifications
          is dependent on the dot3OamEventLogTable, that table must be
          implemented for notifications.  "

        ::= { dot3OamCompliances 1}

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

    dot3OamPeerGroup OBJECT-GROUP
        OBJECTS      {   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     {   dot3OamLoopbackStatus,
                        dot3OamLoopbackIgnoreRx
                    }
        STATUS      current
        DESCRIPTION
          "A collection of objects for controlling the OAM remote
```

```
         loopback function.  "
       ::= { dot3OamGroups 4 }

   dot3OamErrSymbolPeriodEventGroup OBJECT-GROUP
       OBJECTS     {   dot3OamErrSymPeriodWindowHi,
                       dot3OamErrSymPeriodWindowLo,
                       dot3OamErrSymPeriodThresholdHi,
                       dot3OamErrSymPeriodThresholdLo,
                       dot3OamErrSymPeriodEvNotifEnable
                   }
       STATUS      current
       DESCRIPTION
         "A collection of objects for configuring the thresholds for an
         Errored Symbol Period Event.

         Each [802.3ah] defined Event Notification TLV has its own
         conformance group because each event can be implemented
         independently of any other.  "
       ::= { dot3OamGroups 5 }

   dot3OamErrFramePeriodEventGroup OBJECT-GROUP
       OBJECTS     {   dot3OamErrFramePeriodWindow,
                       dot3OamErrFramePeriodThreshold,
                       dot3OamErrFramePeriodEvNotifEnable
                   }
       STATUS      current
       DESCRIPTION
         "A collection of objects for configuring the thresholds for an
         Errored Frame Period Event.

         Each [802.3ah] defined Event Notification TLV has its own
         conformance group because each event can be implemented
         independently of any other.  "
       ::= { dot3OamGroups 6 }

   dot3OamErrFrameEventGroup OBJECT-GROUP
       OBJECTS     {   dot3OamErrFrameWindow,
                       dot3OamErrFrameThreshold,
                       dot3OamErrFrameEvNotifEnable
                   }
       STATUS      current
       DESCRIPTION
         "A collection of objects for configuring the thresholds for an
         Errored Frame Event.

         Each [802.3ah] defined Event Notification TLV has its own
         conformance group because each event can be implemented
         independently of any other.  "
```

```
        ::= { dot3OamGroups 7 }

    dot3OamErrFrameSecsSummaryEventGroup OBJECT-GROUP
        OBJECTS      {    dot3OamErrFrameSecsSummaryWindow,
                          dot3OamErrFrameSecsSummaryThreshold,
                          dot3OamErrFrameSecsEvNotifEnable
                     }
        STATUS       current
        DESCRIPTION
          "A collection of objects for configuring the thresholds for an
          Errored Frame Seconds Summary Event.

          Each [802.3ah] defined Event Notification TLV has its own
          conformance group because each event can be implemented
          independently of any other.  "
        ::= { dot3OamGroups 8 }

    dot3OamFlagEventGroup OBJECT-GROUP
        OBJECTS      {    dot3OamDyingGaspEnable,
                          dot3OamCriticalEventEnable
                     }
        STATUS       current
        DESCRIPTION
          "A collection of objects for configuring the sending OAMPDUs
          with the critical event flag or dying gasp flag enabled.  "
        ::= { dot3OamGroups 9 }

    dot3OamEventLogGroup OBJECT-GROUP
      OBJECTS {   dot3OamEventLogTimestamp,
                  dot3OamEventLogOui,
                  dot3OamEventLogType,
                  dot3OamEventLogLocation,
                  dot3OamEventLogWindowHi,
                  dot3OamEventLogWindowLo,
                  dot3OamEventLogThresholdHi,
                  dot3OamEventLogThresholdLo,
                  dot3OamEventLogValue,
                  dot3OamEventLogRunningTotal,
                  dot3OamEventLogEventTotal
              }
      STATUS        current
      DESCRIPTION
        "A collection of objects for configuring the thresholds for an
        Errored Frame Seconds Summary Event and maintaining the event
        information.  "
       ::= { dot3OamGroups 10 }

    dot3OamNotificationGroup NOTIFICATION-GROUP
```

```
      NOTIFICATIONS {
                  dot3OamThresholdEvent,
                  dot3OamNonThresholdEvent
                  }
      STATUS       current
      DESCRIPTION
        "A collection of notifications used by Ethernet OAM to signal
        to a management entity that local or remote events have
        occurred on a specified Ethernet link. "
      ::= { 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 authentication 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 frequency of OAM PDUs on an Ethernet interface does not adversely
   affect data traffic, as OAM is a slow protocol with very limited
   bandwidth potential, and it is not required for normal link
   operation. And although there are a number of objects in this module
   with read-write or read-create MAX-ACCESS, they have limited effects
   on user data.

   The loopback capability of OAM can have potentially disruptive
   effects in that the 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.

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

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

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. IANA Considerations

   The Ethernet OAM MIB requires the allocation of a single object
   identifier for its MODULE-IDENTITY under the MIB-2 tree.

   The MIB module in this document uses the following IANA-assigned
   OBJECT IDENTIFIER values recorded in the SMI Numbers registry:

```
      Descriptor      OBJECT IDENTIFIER
      ----------      -----------------
      dot3OamMIB      { mib-2 158 }
```

9. References

9.1. Normative References

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                      2003.

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