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# MPLS-TP Operations, Administration, and Management (OAM) Identifiers Management Information Base (MIB) draft-ietf-mpls-tp-oam-id-mib-01

## Abstract

This memo defines a portion of the Management Information Base (MIB) for use with network management protocols in the Internet community. In particular, it describes Operations, Administration, and Management (OAM) identifiers related managed objects for Multiprotocol Label Switching (MPLS) based Transport Profile (TP).

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Table of Contents

1 Introduction . . . . . 3
2. The Internet-Standard Management Framework . . . . . 3
3. Overview . . . . . 3
3.1 Conventions used in this document . . . . . 3
3.2 Terminology . . . . . 3
3.3 Acronyms . . . . . 3
4. Feature List . . . . . 4
5. Brief description of MIB Objects . . . . . 4
5.1. mplsOamIdMegTable . . . . . 4
5.2. mplsOamIdMeTable . . . . . 4
6. Example of MPLS OAM identifier configuration for MPLS tunnel . 5
7. MPLS OAM Identifiers MIB definitions . . . . . 6
8. Security Consideration . . . . . 23
9. IANA Considerations . . . . . 24
10. References . . . . . 24
10.1 Normative References . . . . . 24
10.2 Informative References . . . . . 25
11. Acknowledgments . . . . . 25
12. Authors' Addresses . . . . . 26

# 1 Introduction

This memo defines a portion of the Management Information Base (MIB) for use with network management protocols in the Internet community. In particular, it describes managed objects for modeling a Multiprotocol Label Switching (MPLS) [RFC3031] based transport profile.

This MIB module should be used for performing the OAM operations for MPLS LSPs, Pseudowires and Sections.

# 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 RFC3410 [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, RFC2578, STD 58, RFC2579 and STD58, RFC2580.

# 3. Overview

## 3.1 Conventions used in this document

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

## 3.2 Terminology

This document uses terminology from the MPLS architecture document [RFC3031], MPLS Traffic Engineering Management information [RFC3812], MPLS Label Switch Router MIB [RFC3813], MPLS-TP OAM Framework document [RFC6371] and MPLS-TP Identifiers document [RFC6370].

## 3.3 Acronyms

ICC: ITU Carrier Code
IP: Internet Protocol

LSP: Label Switching Path
LSR: Label Switching Router

MIB: Management Information Base
ME: Maintenance Entity
MEG: Maintenance Entity Group
MEP: Maintenance Entity Group End Point
MIP: Maintenance Intermediate Point
MPLS: Multi-Protocol Label Switching
MPLS-TP: MPLS Transport Profile
PW: Pseudowire
TE: Traffic Engineering
TP: Transport Profile

## 4. Feature List

The MPLS transport profile OAM identifiers MIB module is designed to satisfy the following requirements and constraints:

- The MIB module supports configuration of OAM identifiers for point-to-point, co-routed bidirectional, associated bidirectional MPLS tunnels and MPLS Pseudowires.

## 5. Brief description of MIB Objects

The objects described in this section support the functionality described in documents [RFC5654] and [RFC6370]. The tables support both IP compatible and ICC based OAM identifiers configurations for MPLS Tunnels and Pseudowires.

### 5.1. mplsOamIdMegTable

The mplsOamIdMegTable is used to manage one or more Maintenance Entities (MEs) that belongs to the same transport path.

When a new entry is created with mplsOamIdMegOperatorType set to ipCompatible (1), then as per [RFC6370] (MEG_ID for LSP is LSP_ID and MEG_ID for PW is PW_Path_ID), MEP_ID can be automatically formed.

For ICC based transport path, the user is expected to configure the ICC identifier explicitly in this table for MPLS tunnel and pseudowires.

### 5.2. mplsOamIdMeTable

The mplsOamIdMeTable defines a relationship between two points

(source and sink) of a transport path to which maintenance and monitoring operations apply. The two points that define a maintenance entity are called Maintenance Entity Group End Points (MEPs).

In between MEPs, there are zero or more intermediate points, called Maintenance Entity Group Intermediate Points (MIPs). MEPs and MIPs are associated with the MEG and can be shared by more than one ME in a MEG.

## 6. Example of MPLS OAM identifier configuration for MPLS tunnel

In this section, we provide an example of the OAM identifier configuration for MPLS co-routed bidirectional tunnel.

This example provides usage of a MEG and ME tables for management and monitoring operations of MPLS tunnel.

This example considers the OAM identifiers configuration on a head-end LSR to manage and monitor a MPLS tunnel.
Only relevant objects which are applicable for IP based OAM identifiers of co-routed MPLS tunnel are illustrated here.

In mplsOamIdMegTable:

```
{
  -- MEG index (Index to the table)
  mplsOamIdMegIndex                = 1,
  mplsOamIdMegName                 = "MEG1",
  mplsOamIdMegOperatorType         = ipCompatible (1),
  mplsOamIdMegServiceType          = lsp (1),
  mplsOamIdMegMpLocation           = perNode(1),
-- Mandatory parameters needed to activate the row go here
  mplsOamIdMegRowStatus            = createAndGo (4),
  mplsOamIdMegPathFlow
                       = coRoutedBidirectionalPointToPoint (2)
}
```

This will create an entry in the mplsOamIdMegTable to manage and monitor the MPLS tunnel.

The following ME table is used to associate the path information to a MEG.

In mplsOamIdMeTable:

```
{
-- ME index (Index to the table)
```

```
       mplsOamIdMeIndex                 = 1,

      -- MP index (Index to the table)
       mplsOamIdMeMpIndex               = 1,
       mplsOamIdMeName                  = "ME1",
       mplsOamIdMeMpIfIndex             = 0,
       -- Source MEP id is derived from the IP compatible MPLS tunnel
       mplsOamIdMeSourceMepIndex        = 0,
       -- Source MEP id is derived from the IP compatible MPLS tunnel
       mplsOamIdMeSinkMepIndex          = 0,
       mplsOamIdMeMpType                = mep (1),
       mplsOamIdMeMepDirection          = down (2),
       mplsOamIdMeProactiveOamPhbTCValue = 0,
       mplsOamIdMeOnDemandOamPhbTCValue  = 0,
      --  RowPointer MUST point to the first accessible column of an
      --  MPLS tunnel
       mplsOamIdMeServicePointer        = mplsTunnelName.1.1.10.20,
      -- Mandatory parameters needed to activate the row go here
       mplsOamIdMeRowStatus             = createAndGo (4)
      }
```

## 7. MPLS OAM Identifiers MIB definitions

```
   MPLS-OAM-ID-STD-MIB DEFINITIONS ::= BEGIN

       IMPORTS
          MODULE-IDENTITY, OBJECT-TYPE, NOTIFICATION-TYPE,
          Unsigned32, zeroDotZero
             FROM SNMPv2-SMI                   -- [RFC2578]
          MODULE-COMPLIANCE, OBJECT-GROUP, NOTIFICATION-GROUP
             FROM SNMPv2-CONF                  -- [RFC2580]
          RowStatus, RowPointer, StorageType
             FROM SNMPv2-TC                    -- [RFC2579]
          SnmpAdminString
             FROM SNMP-FRAMEWORK-MIB           -- [RFC3411]
          mplsStdMIB
             FROM MPLS-TC-STD-MIB              -- [RFC3811]
          InterfaceIndexOrZero, ifGeneralInformationGroup,
          ifCounterDiscontinuityGroup
             FROM IF-MIB;                      -- [RFC2863]

      mplsOamIdStdMIB MODULE-IDENTITY
         LAST-UPDATED
            "201210080000Z" -- October 08, 2012
         ORGANIZATION
            "Multiprotocol Label Switching (MPLS) Working Group"
         CONTACT-INFO
            "
```

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"

DESCRIPTION
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This MIB module contains generic object definitions for MPLS OAM maintenance identifiers in MPLS based transport networks."

-- Revision history.

REVISION
"201210080000Z" -- October 08, 2012

```
         DESCRIPTION
              "MPLS OAM Identifiers mib objects for LSPs and
               Pseudowires"

         ::= { mplsStdMIB xxx } -- xxx to be replaced with correct value

      -- Top level components of this MIB module.

      -- notifications
      mplsOamIdNotifications
                  OBJECT IDENTIFIER ::= { mplsOamIdStdMIB 0 }
      -- tables, scalars
      mplsOamIdObjects  OBJECT IDENTIFIER ::= { mplsOamIdStdMIB 1 }
      -- conformance
      mplsOamIdConformance
                  OBJECT IDENTIFIER ::= { mplsOamIdStdMIB 2 }

       -- Start of MPLS Transport Profile MEG table

       mplsOamIdMegTable OBJECT-TYPE
        SYNTAX        SEQUENCE OF MplsOamIdMegEntry
        MAX-ACCESS    not-accessible
        STATUS        current
        DESCRIPTION
              "This table contains information about the Maintenance
               Entity Groups (MEG).

               MEG as mentioned in MPLS-TP OAM framework defines a set
               of one or more maintenance entities (ME).
               Maintenance Entities define a relationship between any
               two points of a transport path in an OAM domain to which
               maintenance and monitoring operations apply."
        ::= { mplsOamIdObjects 1 }

       mplsOamIdMegEntry OBJECT-TYPE
        SYNTAX        MplsOamIdMegEntry
        MAX-ACCESS    not-accessible
        STATUS        current
        DESCRIPTION
              "An entry in this table represents MPLS-TP MEG.
               An entry can be created by a network administrator
               or by an SNMP agent as instructed by an MPLS-TP OAM
               Framework.

               When a new entry is created with
               mplsOamIdMegOperatorType set to ipCompatible (1),
               then as per [RFC6370] (MEG_ID for LSP is LSP_ID and
               MEG_ID for PW is PW_Path_ID), MEP_ID can be
```

```
            automatically formed.

            For co-routed bidirectional LSP, MEG_ID is
            A1-{Global_ID::Node_ID::Tunnel_Num}::Z9-{Global_ID::
            Node_ID::Tunnel_Num}::LSP_Num.

            For associated bidirectional LSP, MEG_ID is A1-
            {Global_ID::Node_ID::Tunnel_Num::LSP_Num}:: Z9-
            {Global_ID::Node_ID::Tunnel_Num::LSP_Num}

            For LSP, MEP_ID is formed using,
            Global_ID::Node_ID::Tunnel_Num::LSP_Num

            For PW, MEG_ID is formed using AGI::A1-
            {Global_ID::Node_ID::AC_ID}:: Z9-
            {Global_ID::Node_ID::AC_ID}.

            For PW, MEP_ID is formed using
            AGI::Global_ID::Node_ID::AC_ID

            MEP_ID is retrieved from the mplsOamIdMegServicePointer
            object based on the mplsOamIdMegServiceType value.
            ICC MEG_ID for LSP and PW is formed using the objects
            mplsOamIdMegIdIcc and mplsOamIdMegIdUmc.

            MEP_ID can be formed using MEG_ID::MEP_Index."
        REFERENCE
            "1. RFC 5860, Requirements for OAM in MPLS Transport
                Networks, May 2010.
             2. RFC 6371, Operations, Administration, and Maintenance
                Framework for MPLS-Based Transport Networks,
                September 2011.
             3. RFC 6370, MPLS Transport Profile (MPLS-TP) Identifiers.
             4. MPLS-TP Identifiers Following ITU-T Conventions
                [TP-ITUIDS]."
        INDEX { mplsOamIdMegIndex }
        ::= { mplsOamIdMegTable 1 }

        MplsOamIdMegEntry ::= SEQUENCE {
             mplsOamIdMegIndex            Unsigned32,
             mplsOamIdMegName             SnmpAdminString,
             mplsOamIdMegOperatorType     INTEGER,
             mplsOamIdMegIdIcc            SnmpAdminString,
             mplsOamIdMegIdUmc            SnmpAdminString,
             mplsOamIdMegServiceType      INTEGER,
             mplsOamIdMegMpLocation       INTEGER,
             mplsOamIdMegRowStatus        RowStatus,
             mplsOamIdMegStorageType      StorageType,
```

```
            mplsOamIdMegPathFlow         INTEGER
        }

        mplsOamIdMegIndex  OBJECT-TYPE
           SYNTAX        Unsigned32
           MAX-ACCESS    not-accessible
           STATUS        current
           DESCRIPTION
               "Index for the conceptual row identifying a MEG within

                this MEG table."
           ::= { mplsOamIdMegEntry 1 }

        mplsOamIdMegName  OBJECT-TYPE
           SYNTAX        SnmpAdminString (SIZE(1..48))
           MAX-ACCESS    read-create
           STATUS        current
           DESCRIPTION
               "Each Maintenance Entity Group has unique name amongst
                all those used or available to a service provider or
                operator. It facilitates easy identification of
                administrative responsibility for each MEG."
           ::= { mplsOamIdMegEntry 2 }

        mplsOamIdMegOperatorType OBJECT-TYPE
           SYNTAX        INTEGER {
                             ipCompatible (1),

                             iccBased (2)
                         }
           MAX-ACCESS    read-create
           STATUS        current
           DESCRIPTION
               "Indicates the operator type for MEG. Conceptual rows
                having 'iccBased' as operator type, should have valid
                values for the objects mplsOamIdMegIdIcc and
                mplsOamIdMegIdUmc while making the row status active."
           REFERENCE
               "1. RFC 6370, MPLS Transport Profile (MPLS-TP)
                   Identifiers.
                2. MPLS-TP Identifiers Following ITU-T Conventions
                   [TP-ITUIDS]."
           DEFVAL { ipCompatible }
           ::= { mplsOamIdMegEntry 3 }

        mplsOamIdMegIdIcc OBJECT-TYPE
           SYNTAX      SnmpAdminString (SIZE(1..6))
           MAX-ACCESS  read-write
```

```
          STATUS      current
          DESCRIPTION
            "Unique code assigned to Network Operator or Service
             Provider maintained by ITU-T. The ITU Carrier Code
             used to form MEGID.

             This object contains non-null ICC value if
             the MplsOamIdMegOperatorType value is iccBased(2),
             otherwise null ICC value should be assigned."
          REFERENCE

             "MPLS-TP Identifiers Following ITU-T Conventions
              [TP-ITUIDS]."
          DEFVAL {""}
          ::= { mplsOamIdMegEntry 4 }

       mplsOamIdMegIdUmc OBJECT-TYPE
          SYNTAX      SnmpAdminString (SIZE(1..7))
          MAX-ACCESS  read-write
          STATUS      current
          DESCRIPTION
            "Unique code assigned by Network Operator or Service
             Provider and is appended to mplsOamIdMegIdIcc to form
             the MEGID.
             This object contains non-null ICC value if
             the MplsOamIdMegOperatorType value is iccBased(2),
             otherwise null ICC value should be assigned."
          REFERENCE
             "MPLS-TP Identifiers Following ITU-T Conventions
            [TP-ITUIDS]."
          DEFVAL {""}
          ::= { mplsOamIdMegEntry 5 }

       mplsOamIdMegServiceType OBJECT-TYPE

          SYNTAX        INTEGER {
                            lsp (1),
                            pseudowire (2),
                            section (3)
                        }
          MAX-ACCESS    read-create
          STATUS        current
          DESCRIPTION
            "Indicates the service type for which the MEG is created.

             If the service type indicates lsp, the service pointer
             in mplsOamIdMeTable points to the TE tunnel table entry.
```

```
            If the value is pseudowire service type, the service
            pointer in mplsOamIdMeTable points to the pseudowire
            table entry.

            If the value is section service type, the service
            pointer in mplsOamIdMeTable points to a section entry."
         DEFVAL { lsp }
         ::= { mplsOamIdMegEntry 6 }

      mplsOamIdMegMpLocation OBJECT-TYPE
         SYNTAX        INTEGER {

                           perNode (1),
                           perInterface (2)
                       }
         MAX-ACCESS    read-create
         STATUS        current
         DESCRIPTION
           "Indicates the MP location type for this MEG.

            If the value is perNode, then the MEG in the LSR supports
            only perNode MEP/MIP, i.e., only one MEP/MIP in an LSR.

            If the value is perInterface, then the MEG in the LSR
            supports perInterface MEPs/MIPs, i.e., two MEPs/MIPs in
            an LSR."
         REFERENCE
           "RFC 6371, Operations, Administration, and Maintenance
            Framework for MPLS-Based Transport Networks,
            September 2011."
         DEFVAL { perNode }
         ::= { mplsOamIdMegEntry 7 }

      mplsOamIdMegRowStatus OBJECT-TYPE
         SYNTAX        RowStatus
         MAX-ACCESS    read-create
         STATUS        current
         DESCRIPTION

            "This variable is used to create, modify, and/or delete
             a row in this table. When a row in this table is in
             active(1) state, no objects in that row can be modified
             by the agent except mplsOamIdMegRowStatus."
         ::= { mplsOamIdMegEntry 8 }

      mplsOamIdMegStorageType OBJECT-TYPE
          SYNTAX        StorageType
          MAX-ACCESS    read-create
```

```
        STATUS       current
        DESCRIPTION
          "This variable indicates the storage type for this
           object.
           Conceptual rows having the value 'permanent'
           need not allow write-access to any columnar
           objects in the row."
         DEFVAL { volatile }
         ::= { mplsOamIdMegEntry 9 }

    mplsOamIdMegPathFlow OBJECT-TYPE
       SYNTAX        INTEGER {
                       unidirectionalPointToPoint (1),
                       coRoutedBidirectionalPointToPoint (2),
                       associatedBidirectionalPointToPoint (3),
                       unidirectionalPointToMultiPoint (4)
                   }
    MAX-ACCESS    read-create
    STATUS        current
    DESCRIPTION
      "Indicates the transport path flow for this MEG.
       In case of a unidirectional point-to-point transport path,
       a single unidirectional Maintenance Entity is defined to
       monitor it.
       In case of associated bidirectional point-to-point transport
       paths, two independent unidirectional Maintenance Entities are
       defined to independently monitor each direction.
       In case of co-routed bidirectional point-to-point transport
       paths, a single bidirectional Maintenance Entity is defined to
       monitor both directions congruently.
       In case of unidirectional point-to-multipoint transport paths,
       a single unidirectional Maintenance Entity for each leaf is
       defined to monitor the transport path from the root to
       that leaf."
    REFERENCE
      "RFC 6371, Operations, Administration, and Maintenance
       Framework for MPLS-Based Transport Networks,
       September 2011."
    DEFVAL { coRoutedBidirectionalPointToPoint }
    ::= { mplsOamIdMegEntry 10 }


    -- End of MPLS Transport Profile MEG table


    -- Start of MPLS Transport Profile ME table
    mplsOamIdMeTable OBJECT-TYPE
     SYNTAX        SEQUENCE OF MplsOamIdMeEntry
```

```
        MAX-ACCESS    not-accessible
        STATUS        current
        DESCRIPTION
              "This table contains MPLS-TP maintenance entity
               information.

               ME is some portion of a transport path that requires
               management bounded by two points (called MEPs), and the
               relationship between those points to which maintenance
               and monitoring operations apply.

               This table is generic enough to handle MEPs and MIPs
               information within a MEG."
        ::= { mplsOamIdObjects 2 }

      mplsOamIdMeEntry OBJECT-TYPE
        SYNTAX        MplsOamIdMeEntry
        MAX-ACCESS    not-accessible
        STATUS        current
        DESCRIPTION
             "An entry in this table represents MPLS-TP maintenance
              entity. This entry represents the ME if the source and
              sink MEPs are defined.

              A ME is a p2p entity. One ME has two such MEPs.
              A MEG is a group of one or more MEs. One MEG can have
              two or more MEPs.

              For P2P LSP, one MEG has one ME and this ME is associated
              two MEPs (source and sink MEPs) within a MEG.
              Each mplsOamIdMeIndex value denotes the ME within a MEG.

              In case of unidirectional point-to-point transport paths,
              a single unidirectional Maintenance Entity is defined to
              monitor it and mplsOamIdMeServicePointer points to
              unidirectional point-to-point path.

              In case of associated bidirectional point-to-point
              transport paths, two independent unidirectional
              Maintenance Entities are defined to independently monitor
              each direction and each mplsOamIdMeServicePointer MIB
              object points to unique unidirectional transport path.
              This has implications for transactions that terminate at
              or query a MIP, as a return path from MIP to source MEP
              does not necessarily exist within the MEG.

              In case of co-routed bidirectional point-to-point
              transport paths, a single bidirectional Maintenance Entity
```

```
            is defined to monitor both directions congruently and
            mplsOamIdMeServicePointer MIB object points to co-routed
            bidirectional point-to-point transport path.

            In case of unidirectional point-to-multipoint transport
            paths, a single unidirectional Maintenance entity for each
            leaf is defined to monitor the transport path from the
            root to that leaf and each leaf has different transport
            path information in mplsOamIdMeServicePointer MIB object."
            INDEX { mplsOamIdMegIndex,
                    mplsOamIdMeIndex,
                    mplsOamIdMeMpIndex
                  }
            ::= { mplsOamIdMeTable 1 }

        MplsOamIdMeEntry ::= SEQUENCE {
             mplsOamIdMeIndex                 Unsigned32,
             mplsOamIdMeMpIndex               Unsigned32,
             mplsOamIdMeName                  SnmpAdminString,
             mplsOamIdMeMpIfIndex             InterfaceIndexOrZero,
             mplsOamIdMeSourceMepIndex        Unsigned32,
             mplsOamIdMeSinkMepIndex          Unsigned32,
             mplsOamIdMeMpType                INTEGER,
             mplsOamIdMeMepDirection          INTEGER,
             mplsOamIdMeProactiveOamSessIndex Unsigned32,
             mplsOamIdMeProactiveOamPhbTCValue INTEGER,
             mplsOamIdMeOnDemandOamPhbTCValue INTEGER,
             mplsOamIdMeServicePointer        RowPointer,
             mplsOamIdMeRowStatus             RowStatus,
             mplsOamIdMeStorageType           StorageType
        }

        mplsOamIdMeIndex  OBJECT-TYPE
           SYNTAX        Unsigned32
           MAX-ACCESS    not-accessible
           STATUS        current
           DESCRIPTION
             "Uniquely identifies a maintenance entity index within
              a MEG."
           ::= { mplsOamIdMeEntry 1 }

        mplsOamIdMeMpIndex  OBJECT-TYPE

           SYNTAX        Unsigned32
           MAX-ACCESS    not-accessible
           STATUS        current
           DESCRIPTION
             "Indicates the maintenance point index, used to create
```

```
            multiple MEPs in a node of single ME. The value of this
            object can be MEP index or MIP index."

         ::= { mplsOamIdMeEntry 2 }

      mplsOamIdMeName  OBJECT-TYPE
         SYNTAX        SnmpAdminString (SIZE(1..48))
         MAX-ACCESS    read-create
         STATUS        current
         DESCRIPTION
             "This object denotes the ME name, each
              Maintenance Entity has unique name within MEG."
         ::= { mplsOamIdMeEntry 3 }

      mplsOamIdMeMpIfIndex OBJECT-TYPE
         SYNTAX        InterfaceIndexOrZero
         MAX-ACCESS    read-create
         STATUS        current
         DESCRIPTION
           "Indicates the maintenance point interface.
            If the mplsOamIdMegMpLocation object value
            is perNode (1), the MP interface index should point
            to incoming interface or outgoing interface or
            zero (indicates the MP OAM packets are initiated
            from forwarding engine).

            If the mplsOamIdMegMpLocation object value is
            perInterface (2), the MP interface index should point to
            incoming interface or outgoing interface."
         REFERENCE
           "RFC 6371, Operations, Administration, and Maintenance
            Framework for MPLS-Based Transport Networks,
            September 2011."
         DEFVAL { 0 }
         ::= { mplsOamIdMeEntry 4 }

      mplsOamIdMeSourceMepIndex  OBJECT-TYPE
         SYNTAX        Unsigned32
         MAX-ACCESS    read-create
         STATUS        current
         DESCRIPTION
           "Indicates the source MEP Index of the ME. This object
            should be configured if mplsOamIdMegOperatorType object
            in the mplsOamIdMegEntry is configured as iccBased (2).
            If the MEG is configured for IP based operator,
            the value of this object should be set zero and the MEP
            ID will be automatically derived from the service
            Identifiers(MPLS-TP LSP/PW Identifier)."
```

```
          DEFVAL { 0 }
          ::= { mplsOamIdMeEntry 5 }


       mplsOamIdMeSinkMepIndex  OBJECT-TYPE
          SYNTAX        Unsigned32
          MAX-ACCESS    read-create
          STATUS        current
          DESCRIPTION
            "Indicates the sink MEP Index of the ME. This object
             should be configured if mplsOamIdMegOperatorType object
             in the mplsOamIdMegEntry is configured as iccBased (2).
             If the MEG is configured for IP based operator,
             the value of this object should be set zero and the MEP
             ID will be automatically derived from the service
             Identifiers(MPLS-TP LSP/PW Identifier)."
          DEFVAL { 0 }
          ::= { mplsOamIdMeEntry 6 }

       mplsOamIdMeMpType OBJECT-TYPE
          SYNTAX        INTEGER {
                            mep (1),
                            mip (2)
                        }
          MAX-ACCESS    read-create
          STATUS        current
          DESCRIPTION
              "Indicates the maintenance point type within the MEG.

               The object should have the value mep (1),  only in the
               Ingress or Egress nodes of the transport path.

               The object can have the value mip (2),
               in the intermediate nodes and possibly in the end nodes
               of the transport path."
          DEFVAL { mep }
          ::= { mplsOamIdMeEntry 7 }

       mplsOamIdMeMepDirection OBJECT-TYPE
          SYNTAX        INTEGER {
                            up (1),
                            down (2)
                        }
          MAX-ACCESS    read-create
          STATUS        current
          DESCRIPTION
            "Indicates the direction of the MEP. This object
             should be configured if mplsOamIdMeMpType is
```

```
            configured as mep (1)."
         DEFVAL { down }
         ::= { mplsOamIdMeEntry 8 }

       mplsOamIdMeProactiveOamSessIndex  OBJECT-TYPE
         SYNTAX        Unsigned32
         MAX-ACCESS    read-only
         STATUS        current
         DESCRIPTION
           "Indicates the proactive OAM session index for this MP.
            When a proactive OAM session for this MP is established,
            the underlying proactive initiator has to update this
            object with the proactive OAM session index.
            Incase of bidirectional transport path, either one
            direction of proactive OAM transmission/reception failure
            results into complete path down."
         DEFVAL { 0 }
         ::= { mplsOamIdMeEntry 9 }

       mplsOamIdMeProactiveOamPhbTCValue  OBJECT-TYPE
         SYNTAX        INTEGER {
                         be (1),
                         af1 (2),
                         af2 (3),
                         af3 (4),
                         af4 (5),
                         ef (6),
                         cs6 (7),
                         cs7 (8)
                       }
         MAX-ACCESS    read-create
         STATUS        current
         DESCRIPTION
           "Indicates the Per-hop Behavior (PHB) value for this source
            MEP generated proactive traffic."
         DEFVAL { ef }
         ::= { mplsOamIdMeEntry 10 }

      mplsOamIdMeOnDemandOamPhbTCValue  OBJECT-TYPE
         SYNTAX        INTEGER {
                         be (1),
                        af1 (2),
                        af2 (3),
                        af3 (4),
                        af4 (5),
                        ef (6),
                        cs6 (7),
                        cs7 (8)
```

```
                  }
      MAX-ACCESS    read-create
      STATUS        current
      DESCRIPTION
        "Indicates the Per-hop Behavior (PHB) value for this
         source MEP generated on-demand traffic."
      DEFVAL { ef }

      ::= { mplsOamIdMeEntry 11 }

   mplsOamIdMeServicePointer OBJECT-TYPE

      SYNTAX        RowPointer
      MAX-ACCESS    read-create
      STATUS        current
      DESCRIPTION
        "This variable represents a pointer to the MPLS-TP
         transport path. This value may point at an entry in the
         mplsTunnelEntry if mplsOamIdMegServiceType is configured
         as lsp (1) or at an entry in the pwEntry if
         mplsOamIdMegServiceType is configured as pseudowire (2).

         Note: This service pointer object, is placed in ME table
         instead of MEG table, since it will be useful in case of
         point-to-multipoint, where each ME will point to different
         branches of a P2MP tree."
      DEFVAL { zeroDotZero }
      ::= { mplsOamIdMeEntry 12 }

   mplsOamIdMeRowStatus OBJECT-TYPE
      SYNTAX        RowStatus
      MAX-ACCESS    read-create
      STATUS        current
      DESCRIPTION
         "This variable is used to create, modify, and/or
          delete a row in this table.  When a row in this
          table is in active(1) state, no objects in that row
          can be modified by the agent except
          mplsOamIdMeRowStatus."
      ::= { mplsOamIdMeEntry 13 }

   mplsOamIdMeStorageType OBJECT-TYPE
       SYNTAX        StorageType
       MAX-ACCESS    read-create
       STATUS        current
       DESCRIPTION
         "This variable indicates the storage type for this
          object.
```

```
              Conceptual rows having the value 'permanent'
              need not allow write-access to any columnar
              objects in the row."
            DEFVAL { volatile }
            ::= { mplsOamIdMeEntry 14 }

      -- End of MPLS Transport Profile ME table

      -- End of MPLS-TP OAM Tables

   -- Notification Definitions of MPLS-TP identifiers


      mplsOamIdMegOperStatus OBJECT-TYPE
         SYNTAX       INTEGER {
                       up (1),
                       down (2)
                      }
         MAX-ACCESS   accessible-for-notify
         STATUS       current
         DESCRIPTION
             "This object specifies the operational status of the
              Maintenance Entity Group (MEG). This object is used to
              send the notification to the SNMP manager about the MEG.

              The value up (1) indicates that the MEG and its monitored
              path are operationally up. The value down (2) indicates
              that the MEG is operationally down."
       ::= {  mplsOamIdObjects 3 }

      mplsOamIdMegSubOperStatus OBJECT-TYPE
         SYNTAX       BITS {
                       megDown (0),
                       meDown (1),
                       oamAppDown (2),
                       pathDown (3)
                      }
         MAX-ACCESS   accessible-for-notify
         STATUS       current
         DESCRIPTION
             "This object specifies the reason why the MEG operational
              status as mentioned by the object mplsOamIdMegOperStatus
              is down. This object is used to send the notification to
              the SNMP manager about the MEG.

              The bit 0 (megDown) when set indicates the MEG is down.
              MEG table can be made down administratively.
              The bit 1 (meDown) when set indicates the ME table is
```

```
              down. ME can be made down administratively.
              The bit 2 (oamAppDown) when set indicates that the
              OAM application has notified that the entity (LSP or PW)
              monitored by this MEG is down. Currently, BFD is the
              only supported OAM application.
              The bit 3 (pathDown) when set indicates that the
              underlying LSP or PW is down."
       ::= {  mplsOamIdObjects 4 }

     mplsOamIdDefectCondition NOTIFICATION-TYPE
      OBJECTS      {
                     mplsOamIdMegName,
                     mplsOamIdMeName,

                     mplsOamIdMegOperStatus,
                     mplsOamIdMegSubOperStatus
                   }
      STATUS       current
      DESCRIPTION
          "This notification signifies the operational status of MEG.

           The information that are carried in this notification are
           Meg Name, Me Name, MegOperStatus and
           MegSubOperStatus.
          "
      ::= { mplsOamIdNotifications 1 }

   -- End of Notifications.

   -- Module Compliance.

   mplsOamIdGroups
      OBJECT IDENTIFIER ::= { mplsOamIdConformance 1 }

   mplsOamIdCompliances
      OBJECT IDENTIFIER ::= { mplsOamIdConformance 2 }

   -- Compliance requirement for fully compliant implementations.

   mplsOamIdModuleFullCompliance MODULE-COMPLIANCE
      STATUS       current
      DESCRIPTION "Compliance statement for agents that provide full
                   support for MPLS-TP-OAM-STD-MIB. Such devices can
                   then be monitored and also be configured using
                   this MIB module."

      MODULE IF-MIB -- The Interfaces Group MIB, RFC 2863.
      MANDATORY-GROUPS {
```

```
        ifGeneralInformationGroup,
        ifCounterDiscontinuityGroup
    }

    MODULE -- This module.
    MANDATORY-GROUPS {
          mplsOamIdMegGroup,
          mplsOamIdMeGroup
    }

    GROUP        mplsOamIdNotificationObjectsGroup
    DESCRIPTION "This group is only mandatory for those
                 implementations which can efficiently implement
                 the notifications contained in this group."

    GROUP        mplsOamIdNotificationGroup
    DESCRIPTION "This group is only mandatory for those
                 implementations which can efficiently implement
                 the notifications contained in this group."

    ::= { mplsOamIdCompliances 1 }

-- Units of conformance.

mplsOamIdMegGroup OBJECT-GROUP
    OBJECTS {
       mplsOamIdMegName,
       mplsOamIdMegOperatorType,
       mplsOamIdMegIdIcc,
       mplsOamIdMegIdUmc,
       mplsOamIdMegServiceType,
       mplsOamIdMegMpLocation,
       mplsOamIdMegRowStatus,
       mplsOamIdMegStorageType,
       mplsOamIdMegPathFlow
    }

    STATUS  current
    DESCRIPTION
           "Collection of objects needed for MPLS MEG information."
    ::= { mplsOamIdGroups 1 }

mplsOamIdMeGroup  OBJECT-GROUP
    OBJECTS {
       mplsOamIdMeName,
       mplsOamIdMeMpIfIndex,
       mplsOamIdMeSourceMepIndex,
       mplsOamIdMeSinkMepIndex,
```

```
        mplsOamIdMeMpType,
        mplsOamIdMeMepDirection,
        mplsOamIdMeProactiveOamSessIndex,
        mplsOamIdMeProactiveOamPhbTCValue,
        mplsOamIdMeOnDemandOamPhbTCValue,
        mplsOamIdMeServicePointer,
        mplsOamIdMeRowStatus,
        mplsOamIdMeStorageType
    }
    STATUS  current
    DESCRIPTION
           "Collection of objects needed for MPLS ME information."
    ::= { mplsOamIdGroups 2 }

mplsOamIdNotificationObjectsGroup  OBJECT-GROUP
    OBJECTS {

        mplsOamIdMegOperStatus,

        mplsOamIdMegSubOperStatus
    }
    STATUS  current
    DESCRIPTION
           "Collection of objects needed to implement notifications."
    ::= { mplsOamIdGroups 3 }

mplsOamIdNotificationGroup NOTIFICATION-GROUP
    NOTIFICATIONS {
        mplsOamIdDefectCondition
    }
    STATUS  current
    DESCRIPTION
           "Set of notifications implemented in this module."
    ::= { mplsOamIdGroups 4 }

END
```

## 8. Security Consideration

There is a number of management objects defined in this MIB module that has a MAX-ACCESS clause of read-write.. Such objects may be considered sensitive or vulnerable in some network environments. The support for SET operations in a non-secure environment without proper protection can have a negative effect on network operations.

Some of the readable objects in this MIB module (i.e., objects with a MAX-ACCESS other than not-accessible) may be considered

sensitive or vulnerable in some network environments.
It is thus important to control even GET and/or NOTIFY access
to these objects and possibly to even encrypt the values of these
objects when sending them over the network via SNMP. These are
the tables and objects and their sensitivity/vulnerability:

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 supports 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 principles (users) that have legitimate
rights to indeed GET or SET (change/create/delete) them.

## 9. IANA Considerations

To be added in a later version of this document.

## 10. References

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