

Network Working Group
INTERNET-DRAFT
Intended Status: Standards Track
Expires: December 08, 2012

Sam Aldrin
Huawei Technologies
M.Venkatesan
Dell Inc.
Kannan KV Sampath
Aricent Group
Thomas D. Nadeau
Juniper Networks
Sami Boutros
Cisco Systems
Ping Pan
Infinera

June 06, 2012

**MPLS-TP Operations, Administration, and Management (OAM) Identifiers
Management Information Base (MIB)
draft-vkst-mpls-tp-oam-id-mib-03**

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).

Status of this Memo

This Internet-Draft is submitted to IETF in full conformance with the provisions of [BCP 78](#) and [BCP 79](#).

Internet-Drafts are working documents of the Internet Engineering Task Force (IETF), its areas, and its working groups. Note that other groups may also distribute working documents as Internet-Drafts.

Internet-Drafts are draft documents valid for a maximum of six months and may be updated, replaced, or obsoleted by other documents at any time. It is inappropriate to use Internet-Drafts as reference material or to cite them other than as "work in progress."

The list of current Internet-Drafts can be accessed at <http://www.ietf.org/ietf/1id-abstracts.txt>.

The list of Internet-Draft Shadow Directories can be accessed at

<http://www.ietf.org/shadow.html>.

This Internet-Draft will expire on December 08, 2012.

Copyright and License Notice

Copyright (c) 2012 IETF Trust and the persons identified as the document authors. All rights reserved.

This document is subject to [BCP 78](#) and the IETF Trust's Legal Provisions Relating to IETF Documents (<http://trustee.ietf.org/license-info>) in effect on the date of publication of this document. Please review these documents carefully, as they describe your rights and restrictions with respect to this document. Code Components extracted from this document must include Simplified BSD License text as described in Section 4.e of the Trust Legal Provisions and are provided without warranty as described in the Simplified BSD License.

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 [21](#)
- [9](#). IANA Considerations [22](#)
- [10](#). References [22](#)
 - [10.1](#) Normative References [22](#)
 - [10.2](#) Informative References [22](#)
- [11](#). Acknowledgments [23](#)
- [12](#). Authors' Addresses [23](#)

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 bi-directional, associated bi-directional 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)
}
```

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
```

```
"201206030000Z" -- June 03, 2012
```

```
ORGANIZATION
```

```
"Multiprotocol Label Switching (MPLS) Working Group"
```

```
CONTACT-INFO
```

```
"
```

```
Sam Aldrin
```

```
Huawei Technologies, co.
```


2330 Central Express Way,
Santa Clara, CA 95051, USA
Email: aldrin.ietf@gmail.com

Thomas D. Nadeau
Juniper Networks
10 Technology Park Drive,
Westford, MA 01886
Email: tnadeau@juniper.net

Venkatesan Mahalingam
Dell Inc.
350 Holger way, San Jose, CA, USA
Email: venkat.mahalingams@gmail.com

Kannan KV Sampath
Aricent
India
Email: Kannan.Sampath@aricent.com

Ping Pan
Infinera
Email: ppan@infinera.com

Sami Boutros
Cisco Systems, Inc.
3750 Cisco Way
San Jose, California 95134
USA
Email: sboutros@cisco.com

"

DESCRIPTION

"Copyright (c) 2012 IETF Trust and the persons identified as the document authors. All rights reserved.

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

-- Revision history.

REVISION

"201206030000Z" -- June 03, 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
}
```

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 }

-- 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.

        In case of associated bi-directional point-to-point
        transport paths, two independent unidirectional
```


Maintenance Entities are defined to independently monitor each direction. 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 bi-directional 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."

```

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."
```

DEFVAL { 0 }

::= { mplsOamIdMeEntry 9 }

```
mplsOamIdMeProactiveOamPhbTCValue OBJECT-TYPE
SYNTAX          INTEGER {
                ef1 (1),
                ef2 (2),
                af1 (3),
                af2 (4),
                af3 (5),
                be (6)
                }
MAX-ACCESS      read-create
STATUS          current
DESCRIPTION
  "Indicates the Per-hop Behavior (PHB) value for this source
   MEP generated proactive traffic."
```

DEFVAL { ef1 }

::= { mplsOamIdMeEntry 10 }

```
mplsOamIdMeOnDemandOamPhbTCValue OBJECT-TYPE
SYNTAX          INTEGER {
                ef1 (1),
                ef2 (2),
                af1 (3),
                af2 (4),
                af3 (5),
                be (6)
                }
```



```
MAX-ACCESS      read-create
STATUS          current
DESCRIPTION
  "Indicates the Per-hop Behavior (PHB) value for this
   source MEP generated on-demand traffic."
DEFVAL { ef1 }

 ::= { 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
}

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

10.1 Normative References

- [RFC2119] Bradner, S., "Key words for use in RFCs to Indicate Requirement Levels", [BCP 14](#), [RFC 2119](#), March 1997.
- [RFC2578] McCloghrie, K., Perkins, D., and J. Schoenwaelder, "Structure of Management Information Version 2 (SMIV2)", STD 58, [RFC 2578](#), April 1999.
- [RFC2579] McCloghrie, K., Perkins, D., and J. Schoenwaelder, "Textual Conventions for SMIV2", STD 58, [RFC 2579](#), April 1999.
- [RFC2580] McCloghrie, K., Perkins, D., and J. Schoenwaelder, "Conformance Statements for SMIV2", STD 58, [RFC 2580](#), April 1999.
- [RFC2863] McCloghrie, K. and F. Kastenholtz, "The Interfaces Group

MIB ", [RFC 2863](#), June 2000

- [RFC3031] Rosen, E., Viswanathan, A., and R. Callon, "Multiprotocol Label Switching Architecture", [RFC 3031](#), January 2001.
- [RFC3411] Harrington, D., Presuhn, R., and B. Wijnen, "An Architecture for Describing Simple Network Management Protocol (SNMP) Management Frameworks", STD 62, [RFC 3411](#), December 2002.

10.2 Informative References

- [RFC3812] Srinivasan, C., Viswanathan, A., and T. Nadeau, "Multiprotocol Label Switching (MPLS) Traffic Engineering (TE) Management Information Base (MIB)", [RFC 3812](#), June 2004.
- [RFC3813] Srinivasan, C., Viswanathan, A., and T. Nadeau, "Multiprotocol Label Switching (MPLS) Label Switching (LSR) Router Management Information Base (MIB)", [RFC 3813](#), June 2004.
- [RFC3410] J. Case, R. Mundy, D. pertain, B.Stewart, "Introduction and Applicability Statement for Internet Standard Management Framework", [RFC 3410](#), December 2002.
- [RFC3811] Nadeau, T., Ed., and J. Cucchiara, Ed., "Definitions of Textual Conventions (TCs) for Multiprotocol Label Switching (MPLS) Management", [RFC 3811](#), June 2004.
- [RFC5654] Niven-Jenkins, B., Ed., Brungard, D., Ed., Betts, M., Ed., Sprecher, N., and S. Ueno, "Requirements of an MPLS Transport Profile", [RFC 5654](#), September 2009.
- [TP-ITUIDS] R. Winter, Ed, E. Gray, Ed., H. van Helvoort, and M. Betts, "MPLS-TP Identifiers Following ITU-T Conventions", ID [draft-ietf-mpls-tp-itu-t-identifiers-03](#), March 2012.
- [RFC6370] Bocci, M., Swallow, G., and E. Gray, "MPLS-TP Identifiers", [RFC 6370](#), September 2011.
- [RFC6371] Busi, I., Niven-Jenkins, B., and D. Allan, "MPLS-TP OAM Framework and Overview", [RFC 6371](#), September 2011.

11. Acknowledgments

We wish to thank Muly Ilan, Adrian Farrel and Joan Cucchiara for their valuable comments on this document.

12. Authors' Addresses

Sam Aldrin
Huawei Technologies, co.
2330 Central Express Way,
Santa Clara, CA 95051, USA
Email: aldrin.ietf@gmail.com

Thomas D. Nadeau
Juniper Networks
10 Technology Park Drive, Westford, MA 01886
Email: tnadeau@juniper.net

Venkatesan Mahalingam
Dell Inc.
350 Holger way, San Jose, CA, USA
Email: venkat.mahalingams@gmail.com

Kannan KV Sampath
Aricent
India
Email: Kannan.Sampath@aricent.com

Ping Pan
Infinera
Email: ppan@infinera.com

Sami Boutros
Cisco Systems, Inc.
3750 Cisco Way
San Jose, California 95134
USA
Email: sboutros@cisco.com

