MPLS Working Group
Internet-Draft
Intended status: Standards Track
Expires: August 21, 2017

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February 17, 2017

MPLS Transport Profile Linear Protection MIB
draft-ietf-mpls-tp-linear-protection-mib-12

Abstract

This memo defines a portion of the Management Information Base (MIB) for use with network management protocols. In particular it defines objects for managing Multiprotocol Label Switching-Transport Profile (MPLS-TP) Linear Protection.

Status of This Memo

This Internet-Draft is submitted in full conformance with the provisions of BCP 78 and BCP 79.

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This Internet-Draft will expire on August 21, 2017.

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1. Introduction

This memo defines a portion of the Management Information Base (MIB) for use with network management protocols. In particular it defines objects for managing Multiprotocol Label Switching-Transport Profile (MPLS-TP) Linear Protection.

This MIB module should be used for configuring and managing the MPLS-TP linear protection for MPLS-TP Label Switched Paths (LSPs).

At the time of writing, Simple Network Management Protocol (SNMP) SET is no longer recommended as a way to configure Multiprotocol Label Switching (MPLS) networks as was described in RFC 3812 [RFC3812]. However, since the MIB module specified in this document is intended to work in parallel with the MIB module for MPLS specified in [RFC3812] and the MIB module for MPLS-TP Operations, Administration, and Maintenance (OAM) identifiers in RFC 7697 [RFC7697], certain

objects defined here are specified with MAX-ACCESS of read-write or read-create so that specifications of the base tables in [RFC3812] and [RFC7697] and the new MIB module in this document are consistent.

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 MIB. MIB objects are generally accessed through the 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. Conventions

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 BCP 14, RFC 2119 [RFC2119].

4. Overview

RFC 6378 [RFC6378] defines the protocol to provide a linear protection switching mechanism for MPLS-TP for a point-to-point LSP within the protection domain bounded by the end points of the LSP. RFC 7271 [RFC7271] describes alternative mechanisms to perform some of the functions defined in [RFC6378], and also defines additional mechanisms, in order to provide operator control and experience that more closely models the behavior of linear protection seen in other transport networks. Two modes are defined for MPLS-TP linear protection switching: Protection State Coordination (PSC) mode and Automatic Protection Switching (APS) mode as specified in [RFC6378] and [RFC7271], respectively. The detailed protocol specification of MPLS transport profile linear protection is described in [RFC6378] and [RFC7271].

This document specifies a MIB module for the Label Edge Router (LER) that supports MPLS-TP linear protection as described in [RFC6378] and [RFC7271]. Objects defined in the document are generally applied to both PSC and APS modes. If an object is valid for a particular mode only, it is noted in the description for the object.

5. Structure of the MIB Module

5.1. Textual Conventions

The following new textual conventions are defined in this document:

- MplsLpsReq: This textual convention describes an object that stores the PSC Request field of the PSC control packet.

- MplsLpsFpathPath: This textual convention describes an object that stores the Fault Path (FPath) field and Data Path (Path) field of the PSC control packet.

- MplsLpsCommand: This textual convention describes an object that allows a user to perform any action over a protection domain.

- MplsLpsState: This textual convention describes an object that stores the current state of the PSC state machine.

5.2. The MPLS-TP Linear Protection Subtree

MPLS-LPS-MIB is the MIB module defined in this document, and it is put under mplsStdMIB [RFC3811].

5.3. The Notifications Subtree

Notifications are defined to inform the management station about switchover, provisioning mismatches, and protocol failures of the linear protection domain. The following notifications are defined for this purpose:

- The notification, mplsLpsEventSwitchover is to inform the management station about the switchover of the active path.

- The notification, mplsLpsEventRevertiveMismatch is to inform the management station about the provisioning mismatch in the revertive mode across the end point of the protection domain.

- The notification, mplsLpsEventProtecTypeMismatch is to inform the management station about the provisioning mismatch in protection type, representing both bridge and switching types, across the end point of the protection domain.

- The notification, mplsLpsEventCapabilitiesMismatch is to inform the management station about the provisioning mismatch in Capabilities TLVs across the end point of the protection domain.

- The notification, mplsLpsEventPathConfigMismatch is to inform the management station about the provisioning mismatch in the protection path configuration for PSC communication.

- The notification, mplsLpsEventFopNoResponse is to inform the management station about the failure of protocol due to a lack of response to a traffic switchover request in 50 ms.

- The notification, mplsLpsEventFopTimeout is to inform the management station about the failure of protocol due to no protocol message received during at least 3.5 times the long PSC message interval.

5.4. The Table Structures

The MPLS-TP linear protection MIB module has four tables. The tables are as follows

- mplsLpsConfigTable

  This table is used to configure MPLS-TP linear protection domains. An MPLS-TP linear protection domain (or a protection domain) is identified by mplsLpsConfigDomainIndex. A protection domain consists of two LERs and the working and protection paths that connect the two LERs. The objects in this table are used to configure properties that are specific to the protection domain. Two Maintenance Entities (MEs) MUST be defined for each protection domain: one for the working path and the other for the protection path. Therefore, two entries of the mplsLpsMeConfigTable, which is for configuring the MEs used in protection switching, are associated to one entry in this table.

- mplsLpsStatusTable

  This table provides the current status information of MPLS-TP linear protection domains that have been configured on the system. The entries of mplsLpsStatusTable have an AUGMENTS relationship with the entries of mplsLpsConfigTable. When a protection domain is configured or deleted in the mplsLpsConfigTable, then the corresponding row of that session in the mplsLpsStatusTable is, respectively, automatically created or deleted.

- mplsLpsMeConfigTable

  This table is used to associate MEs to the protection domain. Each protection domain requires two MEs. One entry in the mplsLpsConfigTable is associated with two entries in this table: one for the working path and the other for the protection path of

the protection domain. The mplsLpsMeConfigPath object in this table indicates that the path is either working or protection. The ME is identified by mplsOamIdMegIndex, mplsOamIdMeIndex and mplsOamIdMeMpIndex, which are the same index values as the entry in the mplsOamIdMeTable defined in [RFC7697]. The relationship with the mplsOamIdMeTable is described in Section 6.1.

- mplsLpsMeStatusTable

  This table provides the current information about protection status of MEs that have been configured on the system. When an ME configured or deleted in the mplsLpsMeConfigTable, then the corresponding row of that session in the mplsLpsMeStatusTable is, respectively, automatically created or deleted.

6. Relationship to Other MIB Modules

6.1. Relationship to the MPLS OAM Identifiers MIB Module

Entries in the mplsOamIdMeTable [RFC7697] are extended by entries in the mplsLpsMeConfigTable. Note that the nature of the 'extends' relationship is a sparse augmentation so that the entry in the mplsLpsMeConfigTable has the same index values as the entry in the mplsOamIdMeTable. Each time that an entry is created in the mplsOamIdMeTable for which the LER supports MPLS-TP linear protection, a row is created automatically in the mplsLpsMeConfigTable.

When a point-to-point transport path needs to be monitored, one ME is needed for the path and one entry in the mplsOamIdMeTable will be created. But, the ME entry in the mplsOamIdMeTable may or may not participate in protection switching. If an ME participates in protection switching, an entry in mplsLpsMeConfigTable MUST be created, and the objects in the entry indicates which protection domain this ME belongs to and whether this ME is for either working path or protection path. If the ME does not participate in protection switching, an entry in mplsLpsMeConfigTable does not need to be created.

7. Example of Protection Switching Configuration

This example considers the protection domain configuration on an LER to provide protection for a co-routed bidirectional MPLS tunnel. For the working and protection paths of the protection domain, two Maintenance Entity Groups (MEGs) need to be configured and each MEG contains one ME for a point-to-point transport path. For more information on mplsOamIdMegTable and mplsOamIdMeTable, see [RFC7697].

Although the example described in this section shows a way to configure linear protection for MPLS-TP tunnels, this also indicates how the MIB values would be returned if they had been configured by alternative means.

The following table configures a protection domain.

```
In mplsLpsConfigTable:
mplsLpsConfigEntry ::= SEQUENCE
{
   -- Protection Domain index (Index to the table)
   mplsLpsConfigDomainIndex  = 3,
   -- Protection Domain name
   mplsLpsConfigDomainName   = "LPDomain3",
   mplsLpsConfigMode         = psc (1),
   mplsLpsConfigProtectionType = oneColonOneBidirectional (2),
   -- Mandatory parameters needed to activate the row go here
   mplsLpsConfigRowStatus   = createAndGo (4)
}
```

The following table associates the MEs with the protection domain.

```
In mplsLpsMeConfigTable:
MplsLpsMeConfigEntry ::= SEQUENCE
{
   -- MEG index (Index to the table)
   mplsOamIdMegIndex                = 1,
   -- ME index (Index to the table)
   mplsOamIdMeIndex                 = 1,
   -- MP index (Index to the table)
   mplsOamIdMeMpIndex               = 1,
   -- Protection Domain this ME belongs to
   mplsLpsMeConfigDomain            = 3,
   -- Configuration state
   mplsLpsMeConfigPath              = working(1)
}
{
   -- MEG index (Index to the table)
   mplsOamIdMegIndex                = 2,
   -- ME index (Index to the table)
   mplsOamIdMeIndex                 = 2,
   -- MP index (Index to the table)
   mplsOamIdMeMpIndex               = 2,
   -- Protection Domain this ME belongs to
   mplsLpsMeConfigDomain            = 3,
   -- Configuration state
   mplsLpsMeConfigPath              = protection(2)
}
```

8. Definitions

This MIB module makes reference to the following documents:
[RFC2578], [RFC2579], [RFC2580], [RFC3289], [RFC3411], [RFC3811],
[RFC6378], [RFC7271], [RFC7697], [G8121], and [G8151].

```
MPLS-LPS-MIB DEFINITIONS ::= BEGIN

IMPORTS
   MODULE-IDENTITY, NOTIFICATION-TYPE, OBJECT-TYPE,
   Counter32, Unsigned32
      FROM SNMPv2-SMI              -- RFC 2578

   MODULE-COMPLIANCE, OBJECT-GROUP, NOTIFICATION-GROUP
      FROM SNMPv2-CONF             -- RFC 2580

   TEXTUAL-CONVENTION, RowStatus, TimeStamp, StorageType, TruthValue
      FROM SNMPv2-TC               -- RFC 2579

   SnmpAdminString
      FROM SNMP-FRAMEWORK-MIB      -- RFC 3411

   IndexIntegerNextFree
      FROM DIFFSERV-MIB            -- RFC 3289

   mplsStdMIB
       FROM MPLS-TC-STD-MIB        -- RFC 3811

   mplsOamIdMegIndex, mplsOamIdMeIndex, mplsOamIdMeMpIndex
       FROM MPLS-OAM-ID-STD-MIB;   -- RFC 7697

mplsLpsMIB MODULE-IDENTITY
   LAST-UPDATED  "201702170000Z"  -- February 17, 2017
   ORGANIZATION  "Multiprotocol Label Switching (MPLS) Working Group"
   CONTACT-INFO
      "
      Kingston Smiler Selvaraj
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"

```
   DESCRIPTION
      "This management information module supports the
       configuration and management of MPLS-TP linear
       protection domains. "
   REVISION
      "201702170000Z"  -- February 17, 2017
      DESCRIPTION
         "MPLS-TP Protection Switching Domain objects for LSP
          MEPs"

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

      -- Top level components of this MIB module.
      -- Notifications
      mplsLpsNotifications
         OBJECT IDENTIFIER ::= { mplsLpsMIB 0 }

      -- tables, scalars
      mplsLpsObjects
         OBJECT IDENTIFIER ::= { mplsLpsMIB 1 }

      -- conformance
      mplsLpsConformance
         OBJECT IDENTIFIER ::= { mplsLpsMIB 2 }

   MplsLpsReq ::= TEXTUAL-CONVENTION
      STATUS current
      DESCRIPTION
```

```
          "This Textual Convention describes an object that stores
           the PSC Request field of the PSC control packet. The values
           are as follows:

           noRequest
           No Request

           doNotRevert
           Do Not Revert

           reverseRequest
           Reverse Request

           exercise
           Exercise

           waitToRestore
           Wait-to-Restore

           manualSwitch
           Manual Switch

           signalDegrade
           Signal Degrade (SD)

           signalFail
           Signal Fail (SF)

           forcedSwitch
           Forced Switch

           lockoutOfProtection
           Lockout of Protection"
       REFERENCE
          "Section 4.2.2 of RFC6378 and Section 8 of RFC7271"
       SYNTAX  INTEGER {
                  noRequest (0),
                  doNotRevert (1),
                  reverseRequest (2),
                  exercise (3),
                  waitToRestore (4),
                  manualSwitch (5),
                  signalDegrade (7),
                  signalFail (10),
                  forcedSwitch (12),
                  lockoutOfProtection (14)
               }
```

```
   MplsLpsFpathPath ::= TEXTUAL-CONVENTION
      DISPLAY-HINT "1x:"
      STATUS current
      DESCRIPTION
         "This Textual Convention describes an object that stores
          the Fault Path (FPath) field and Data Path (Path) field of
          the PSC control packet.

          FPath is located in the first octet and Path is
          located in the second octet.

          The value and the interpretation of FPath field is as follows:

          2-255
          for future extensions

          1
          the anomaly condition is on the working path

          0
          the anomaly condition is on the protection path

          The value and the interpretation of Path field is as follows:

          2-255
          for future extensions

          1
          protection path is transporting user data traffic

          0
          protection path is not transporting user data traffic "
      REFERENCE
         "Section 4.2.5 and 4.2.6 of RFC6378"
      SYNTAX      OCTET STRING (SIZE (2))

   MplsLpsCommand ::= TEXTUAL-CONVENTION
      STATUS current
      DESCRIPTION
         "This command allows a user to perform any action over a
          protection domain. If the protection command cannot be
          executed because an equal or higher priority request is
          in effect, an inconsistentValue error is returned.

          The command values are:

          noCmd
          This value should be returned by a read request when no
```

```
            command has been written to the object in question since
            initialization. This value may not be used in a write
            operation. If noCmd is used in a write operation a
            wrongValue error is returned.

            clear
            Clears all of the commands listed below for the protection
            domain.

            lockoutOfProtection
            Prevents switching traffic to the protection path.

            forcedSwitch
            Switches traffic from the working path to the protection path.

            manualSwitchToWork
            Switches traffic from the protection path to the working path.

            manualSwitchToProtect
            Switches traffic from the working path to the protection path.

            exercise
            Used to verify the correct operation of the PSC communication
            and the integrity of the protection path. This command is not
            applicable to the PSC mode.

            freeze
            This command freezes the protection state and is a local
            command that is not signaled to the remote node.
            This command is not applicable to the PSC mode.

            clearfreeze
            Clears the local freeze. This command is not applicable to
            the PSC mode. "
        REFERENCE
           "Sections 3.1 and 3.2 of RFC6378 and Sections 4.3 and 6 of
            RFC7271"
        SYNTAX   INTEGER {
                    noCmd(1),
                    clear(2),
                    lockoutOfProtection(3),
                    forcedSwitch(4),
                    manualSwitchToWork(5),
                    manualSwitchToProtect(6),
                    exercise(7),
                    freeze(8),
                    clearfreeze(9)
                 }
```

```
   MplsLpsState ::= TEXTUAL-CONVENTION
      STATUS current
      DESCRIPTION
         "This Textual Convention describes an object that stores
          the current state of the PSC state machine. The values
          are as follows:

          normal
          normal state

          unavLOlocal
          Unavailable state due to local LO command.

          unavSFPlocal
          Unavailable state due to local SF-P.

          unavSDPlocal
          Unavailable state due to local SD-P.

          unavLOremote
          Unavailable state due to remote LO message.

          unavSFPremote
          Unavailable state due to remote SF-P message.

          unavSDPremote
          Unavailable state due to remote SD-P message.

          protfailSFWlocal
          Protecting Failure state due to local SF-W.

          protfailSDWlocal
          Protecting Failure state due to local SD-W.

          protfailSFWremote
          Protecting Failure state due to remote SF-W message.

          protfailSDWremote
          Protecting Failure state due to remote SD-W message.

          switadmFSlocal
          Switching Administrative state due to local FS command.
          Same as Protecting administrative state due to local FS
          command in the PSC mode.

          switadmMSWlocal
          Switching Administrative state due to local MS-W command
```

```
        switadmMSPlocal
        Switching Administrative state due to local MS-P command.
        Same as Protecting administrative state due to local MS
        command in the PSC mode

        switadmFSremote
        Switching Administrative state due to remote FS message.
        Same as Protecting administrative state due to remote FS
        message in the PSC mode.

        switadmMSWremote
        Switching Administrative state due to remote MS-W message

        switadmMSPremote
        Switching Administrative state due to remote MS-P message.
        Same as Protecting administrative state due to remote MS
        message in the PSC mode.

        wtr
        Wait-to-Restore state

        dnr
        Do-not-Revert state

        exerLocal
        Exercise state due to local EXER command.

        exerRemote
        Exercise state due to remote EXER message."
    REFERENCE
       "Section 11 of RFC7271"

    SYNTAX   INTEGER {
                normal (1),
                unavLOlocal (2),
                unavSFPlocal (3),
                unavSDPlocal (4),
                unavLOremote (5),
                unavSFPremote (6),
                unavSDPremote (7),
                protfailSFWlocal (8),
                protfailSDWlocal (9),
                protfailSFWremote (10),
                protfailSDWremote (11),
                switadmFSlocal (12),
                switadmMSWlocal (13),
                switadmMSPlocal (14),
                switadmFSremote (15),
```

```
                switadmMSWremote (16),
                switadmMSPremote (17),
                wtr (18),
                dnr (19),
                exerLocal (20),
                exerRemote (21)
                }

   -- Start of
   -- MPLS-TP Linear Protection Switching Configuration Table.
   -- This table supports the addition, configuration and deletion
   -- of MPLS-TP linear protection domains.

   mplsLpsConfigDomainIndexNext OBJECT-TYPE
      SYNTAX      IndexIntegerNextFree (0..4294967295)
      MAX-ACCESS  read-only
      STATUS      current
      DESCRIPTION
         "This object contains an unused value for
          mplsLpsConfigDomainIndex, or a zero to indicate
          that none exist.  Negative values are not allowed,
          as they do not correspond to valid values of
          mplsLpsConfigDomainIndex."
      ::= { mplsLpsObjects 1 }

   mplsLpsConfigTable OBJECT-TYPE
      SYNTAX      SEQUENCE OF MplsLpsConfigEntry
      MAX-ACCESS  not-accessible
      STATUS      current
      DESCRIPTION
         "This table lists the MPLS-TP linear protection domains that
          have been configured on the system.
          An entry is created by a network operator who wants to run
          the MPLS-TP linear protection protocol for the protection
          domain."
      ::= { mplsLpsObjects 2 }

   mplsLpsConfigEntry OBJECT-TYPE
      SYNTAX      MplsLpsConfigEntry
      MAX-ACCESS  not-accessible
      STATUS      current
      DESCRIPTION
         "A conceptual row in the mplsLpsConfigTable."
      INDEX { mplsLpsConfigDomainIndex }
      ::= { mplsLpsConfigTable  1 }

   MplsLpsConfigEntry ::= SEQUENCE {
      mplsLpsConfigDomainIndex         Unsigned32,
```

```
      mplsLpsConfigDomainName          SnmpAdminString,
      mplsLpsConfigMode                INTEGER,
      mplsLpsConfigProtectionType      INTEGER,
      mplsLpsConfigRevertive           INTEGER,
      mplsLpsConfigSdThreshold         Unsigned32,
      mplsLpsConfigSdBadSeconds        Unsigned32,
      mplsLpsConfigSdGoodSeconds       Unsigned32,
      mplsLpsConfigWaitToRestore       Unsigned32,
      mplsLpsConfigHoldOff             Unsigned32,
      mplsLpsConfigContinualTxInterval Unsigned32,
      mplsLpsConfigRapidTxInterval     Unsigned32,
      mplsLpsConfigCommand             MplsLpsCommand,
      mplsLpsConfigCreationTime        TimeStamp,
      mplsLpsConfigRowStatus           RowStatus,
      mplsLpsConfigStorageType         StorageType
   }

   mplsLpsConfigDomainIndex OBJECT-TYPE
      SYNTAX        Unsigned32 (1..4294967295)
      MAX-ACCESS    not-accessible
      STATUS        current
      DESCRIPTION
         "Index for the conceptual row identifying a protection domain.
          Operators should obtain new values for row creation in this
          table by reading mplsLpsConfigDomainIndexNext.

          When the value of this object is the same as the value of
          mplsLpsMeConfigDomain, that means that the
          mplsLpsMeConfigDomain is defined as either the working path
          or the protection path for this protection domain."
      ::= { mplsLpsConfigEntry 1 }

   mplsLpsConfigDomainName OBJECT-TYPE
      SYNTAX      SnmpAdminString (SIZE (0..32))
      MAX-ACCESS  read-create
      STATUS      current
      DESCRIPTION
         "Textual name represents the MPLS-TP linear protection domain.
          It facilitates easy administrative identification of
          each protection domain."
      DEFVAL {""}
      ::= { mplsLpsConfigEntry 2 }

   mplsLpsConfigMode OBJECT-TYPE
      SYNTAX INTEGER {
                psc(1),
                aps(2)
                }
```

```
      MAX-ACCESS read-create
      STATUS current
      DESCRIPTION
         "The mode of MPLS-TP linear protection mechanism. This can
          either be PSC or APS as follows:

          PSC
          The Protection State Coordination mode as described in
          RFC 6378.

          APS
          The Automatic Protection Switching mode as described in
          RFC 7271.

          This object may not be modified if the associated
          mplsLpsConfigRowStatus object is equal to active(1).

          The value of this object is not supposed to be changed
          during operation. When the value should be changed,
          the protection processes in both LERs MUST be
          restarted with the same new value.

          In case that this value is changed at one LER during
          operation, the LER will generate PSC packets with a new
          Capabilities TLV value. As a consequence, this will
          result in mplsLpsEventCapabilitiesMismatch notification
          at both LERs. "
      REFERENCE
         "Sections 9.2 and 10 of RFC7271"
      DEFVAL {psc}
      ::= { mplsLpsConfigEntry 3 }

   mplsLpsConfigProtectionType OBJECT-TYPE
      SYNTAX INTEGER {
                onePlusOneUnidirectional (1),
                oneColonOneBidirectional (2),
                onePlusOneBidirectional (3)
                }
      MAX-ACCESS  read-create
      STATUS      current
      DESCRIPTION
         "The protection architecture type of the Protection domain.
          This represents both bridge type, which can be
          either permanent bridge (1+1) or selector bridge (1:1),
          and switching scheme, which can be
          either unidirectional or bidirectional.

          1+1
```

```
          In the 1+1 protection scheme, a fully dedicated protection
          path is allocated. Data traffic is copied and fed
          at the source to both the working and the protection path.
          The traffic on the working and the protection paths is
          transmitted simultaneously to the sink of the protection
          domain, where selection between the working and protection
          paths is performed

          1:1
          In the 1:1 scheme, a protection path is allocated to
          protect against a defect, failure, or a degradation in the
          working path. In normal conditions, data traffic is
          transmitted over the working path, while the protection path
          functions in the idle state. If there is a defect on the
          working path or a specific administrative request,
          traffic is switched to the protection path.

          bidirectional
          In bidirectional protection scheme, both the directions
          will be switched simultaneously even if the fault applies
          to only one direction of the path.

          unidirectional
          In unidirectional protection scheme protection switching
          will be performed independently for each direction of a
          bidirectional transport path.

          This object may not be modified if the associated
          mplsLpsConfigRowStatus object is equal to active(1). "
      REFERENCE
         "Section 4.2.3 of RFC6378"
      DEFVAL {oneColonOneBidirectional}
      ::= { mplsLpsConfigEntry 4 }

   mplsLpsConfigRevertive OBJECT-TYPE
      SYNTAX      INTEGER { nonrevertive(1), revertive(2) }
      MAX-ACCESS  read-create
      STATUS      current
      DESCRIPTION
         "This object represents the reversion mode of the linear
          protection domain. The reversion mode of protection
          mechanism may be either revertive or non-revertive.

          nonrevertive
          In non-revertive mode, after a service has been recovered,
          traffic will be forwarded on the protection path.

          revertive
```

```
            In revertive mode, after a service has been recovered,
            traffic will be redirected back onto the original working
            path.

            This object may not be modified if the associated
            mplsLpsConfigRowStatus object is equal to active(1). "
        REFERENCE
           "Section 4.2.4 of RFC6378"
        DEFVAL { revertive }
        ::= { mplsLpsConfigEntry 5 }

    mplsLpsConfigSdThreshold OBJECT-TYPE
        SYNTAX      Unsigned32 (0..100)
        MAX-ACCESS  read-create
        STATUS      current
        DESCRIPTION
           "This object holds the threshold value of the Signal Degrade
            (SD) defect in percent. In order to detect the SD defect,
            the MPLS-TP packet loss measurement (LM) is performed
            every second.

            If either the packet loss is negative (i.e., there are more
            packets received than transmitted) or the packet loss ratio
            (lost packets/transmitted packets) in percent is greater than
            this threshold value, a Bad Second is declared.
            Otherwise, a Good Second is declared.

            The SD defect is detected if there are
            mplsLpsConfigSdBadSeconds consecutive Bad Seconds
            and cleared if there are
            mplsLpsConfigSdGoodSeconds consecutive Good Seconds.

            This object may be modified if the associated
            mplsLpsConfigRowStatus object is equal to active(1)."
        REFERENCE
           "Clause 6.1.3.3 of [G8121] and Table 8-1 of [G8151]"
        DEFVAL { 30 }
        ::= { mplsLpsConfigEntry 6 }

    mplsLpsConfigSdBadSeconds OBJECT-TYPE
        SYNTAX      Unsigned32 (2..10)
        UNITS       "seconds"
        MAX-ACCESS  read-create
        STATUS      current
        DESCRIPTION
           "This object holds the number of Bad Seconds to detect the SD.

            If the number of consecutive Bad Seconds reaches this value,
```

```
          the SD defect is detected and used as an input to
          the protection switching process.

          This object may be modified if the associated
          mplsLpsConfigRowStatus object is equal to active(1). "
       REFERENCE
          "Clause 6.1.3.3 of [G8121] and Table 8-1 of [G8151]"
       DEFVAL { 10 }
       ::= { mplsLpsConfigEntry 7 }

   mplsLpsConfigSdGoodSeconds OBJECT-TYPE
       SYNTAX      Unsigned32 (2..10)
       UNITS       "seconds"
       MAX-ACCESS  read-create
       STATUS      current
       DESCRIPTION
          "This object holds the number of Good Seconds to declare
          the clearance of SD defect.

          After an SD defect occurs at a path, if the number of
          consecutive Good Seconds reaches this value for the
          degraded path, the clearance of SD defect is declared and
          used as an input to the protection switching process.

          This object may be modified if the associated
          mplsLpsConfigRowStatus object is equal to active(1)."
       REFERENCE
          "Clause 6.1.3.3 of [G8121] and Table 8-1 of [G8151]"
       DEFVAL { 10 }
       ::= { mplsLpsConfigEntry 8 }

   mplsLpsConfigWaitToRestore OBJECT-TYPE
       SYNTAX      Unsigned32 (5..12)
       UNITS       "minutes"
       MAX-ACCESS  read-create
       STATUS      current
       DESCRIPTION
          "This object holds the Wait To Restore timer value in minutes,
          and can be configured in 1 minute steps between 5 and
          12 minutes.

          The WTR timer is used to delay reversion of PSC state
          to Normal state when recovering from a failure
          condition on the working path when the protection
          domain is configured for revertive behavior

          This object may not be modified if the associated
          mplsLpsConfigRowStatus object is equal to active(1)."
```

```
      REFERENCE
         "Section 3.5 of RFC6378"
      DEFVAL { 5 }
      ::= { mplsLpsConfigEntry 9 }

   mplsLpsConfigHoldOff   OBJECT-TYPE
      SYNTAX     Unsigned32 (0..100)
      UNITS      "deciseconds"
      MAX-ACCESS read-create
      STATUS     current
      DESCRIPTION
         "The hold-off time in deciseconds. Represents the time
          between SF/SD condition detection and declaration of
          an SF/SD request to the protection switching logic.
          It is intended to avoid unnecessary switching when a lower-
          layer protection mechanism is in place.
          Can be configured in steps of 100 milli-seconds.

          When a new defect or more severe defect occurs at
          the active path (the path from which the selector selects
          the user data traffic) and this value is non-zero,
          the hold-off timer will be started. A defect on the standby
          path (the path from which the selector does not select the
          user data traffic) does not trigger the start of the hold-off
          timer as there is no need for a traffic switchover.

          This object may not be modified if the associated
          mplsLpsConfigRowStatus object is equal to active(1). "
      REFERENCE
         "Section 3.1 of RFC6378"
      DEFVAL { 0 }
      ::= { mplsLpsConfigEntry 10 }

   mplsLpsConfigContinualTxInterval OBJECT-TYPE
      SYNTAX      Unsigned32 (1..20)
      UNITS       "seconds"
      MAX-ACCESS  read-create
      STATUS      current
      DESCRIPTION
         "The Continual Tx Time in Seconds. Represents the time
          interval to send the continual LPS packet to the other
          end based on the current state.

          This object may not be modified if the associated
          mplsLpsConfigRowStatus object is equal to active(1). "
      REFERENCE
         "Section 4.1 of RFC6378"
      DEFVAL { 5 }
```

```
      ::= { mplsLpsConfigEntry 11 }

   mplsLpsConfigRapidTxInterval OBJECT-TYPE
      SYNTAX      Unsigned32 (1000..20000)
      UNITS       "micro-seconds"
      MAX-ACCESS  read-create
      STATUS      current
      DESCRIPTION
         "The Rapid Tx interval in micro-Seconds. Represents the time
          interval to send the LPS packet to the other end, when
          there is a change in state of linear protection domain due
          to local input. The default value is 3.3 milli-seconds
          which is 3300 micro-seconds

          This object may not be modified if the associated
          mplsLpsConfigRowStatus object is equal to active(1). "
      REFERENCE
         "Section 4.1 of RFC6378"
      DEFVAL { 3300 }
      ::= { mplsLpsConfigEntry 12 }

   mplsLpsConfigCommand OBJECT-TYPE
      SYNTAX      MplsLpsCommand
      MAX-ACCESS  read-create
      STATUS      current
      DESCRIPTION
         "Allows the initiation of an operator command on
          the protection domain.

          When read this object returns the last command written
          or noCmd if no command has been written
          since initialization. The return of the last command
          written does not imply that this command is currently in
          effect.  This request may have been preempted by a higher
          priority local or remote request.

          This object may be modified if the associated
          mplsLpsConfigRowStatus object is equal to active(1). "
      REFERENCE
         "Sections 3.1 and 3.2 of RFC6378 and Sections 4.3 and 6 of
          RFC7271"
      DEFVAL { noCmd }
      ::= { mplsLpsConfigEntry 13 }

   mplsLpsConfigCreationTime OBJECT-TYPE
      SYNTAX      TimeStamp
      MAX-ACCESS  read-only
      STATUS      current
```

```
      DESCRIPTION
         "The value of sysUpTime at the time the row was created."
      ::= { mplsLpsConfigEntry 14 }

   mplsLpsConfigRowStatus OBJECT-TYPE
      SYNTAX      RowStatus
      MAX-ACCESS  read-create
      STATUS      current
      DESCRIPTION
         "This represents the status of the MPLS-TP linear
          protection domain entry. This variable is used to
          create, modify, and/or delete a row in this table."
      ::= { mplsLpsConfigEntry 15 }

   mplsLpsConfigStorageType OBJECT-TYPE
      SYNTAX      StorageType
      MAX-ACCESS  read-create
      STATUS      current
      DESCRIPTION
         "The storage type for this conceptual row.
          Conceptual rows having the value 'permanent' need not
          allow write-access to any columnar objects in the row."
      DEFVAL      { nonVolatile }
      ::= { mplsLpsConfigEntry 16 }

   --
   -- MPLS-TP Linear Protection Switching Status Table
   -- This table provides Protection Switching domain statistics.
   --

   mplsLpsStatusTable OBJECT-TYPE
      SYNTAX      SEQUENCE OF MplsLpsStatusEntry
      MAX-ACCESS  not-accessible
      STATUS      current
      DESCRIPTION
         "This table provides status information about MPLS-TP
          linear protection domains that have been configured
          on the system."
      ::= { mplsLpsObjects 3 }

   mplsLpsStatusEntry OBJECT-TYPE
      SYNTAX      MplsLpsStatusEntry
      MAX-ACCESS  not-accessible
      STATUS      current
      DESCRIPTION
         "A conceptual row in the mplsLpsStatusTable."
      AUGMENTS { mplsLpsConfigEntry }
      ::= { mplsLpsStatusTable  1 }
```

```
   MplsLpsStatusEntry ::= SEQUENCE {
      mplsLpsStatusState                MplsLpsState,
      mplsLpsStatusReqRcv               MplsLpsReq,
      mplsLpsStatusReqSent              MplsLpsReq,
      mplsLpsStatusFpathPathRcv         MplsLpsFpathPath,
      mplsLpsStatusFpathPathSent        MplsLpsFpathPath,
      mplsLpsStatusRevertiveMismatch    TruthValue,
      mplsLpsStatusProtecTypeMismatch   TruthValue,
      mplsLpsStatusCapabilitiesMismatch TruthValue,
      mplsLpsStatusPathConfigMismatch   TruthValue,
      mplsLpsStatusFopNoResponses       Counter32,
      mplsLpsStatusFopTimeouts          Counter32
   }

   mplsLpsStatusState OBJECT-TYPE
      SYNTAX      MplsLpsState
      MAX-ACCESS  read-only
      STATUS      current
      DESCRIPTION
         "The current state of the PSC state machine."
      REFERENCE
         "Section 11 of RFC7271"
      ::= { mplsLpsStatusEntry 1 }

   mplsLpsStatusReqRcv OBJECT-TYPE
      SYNTAX      MplsLpsReq
      MAX-ACCESS  read-only
      STATUS      current
      DESCRIPTION
         "The current value of the PSC Request field received on
          the most recent PSC packet."
      REFERENCE
         "Section 4.2 of RFC6378"
      ::= { mplsLpsStatusEntry 2 }

   mplsLpsStatusReqSent OBJECT-TYPE
      SYNTAX      MplsLpsReq
      MAX-ACCESS  read-only
      STATUS      current
      DESCRIPTION
         "The current value of the PSC Request field sent on the
          most recent PSC packet."
      REFERENCE
         "Section 4.2 of RFC6378"
      ::= { mplsLpsStatusEntry 3 }

   mplsLpsStatusFpathPathRcv OBJECT-TYPE
      SYNTAX      MplsLpsFpathPath
```

```
      MAX-ACCESS  read-only
      STATUS      current
      DESCRIPTION
         "The current value of the FPath and Path fields received
          on the most recent PSC packet."
      REFERENCE
         "Section 4.2 of RFC6378"
      ::= { mplsLpsStatusEntry 4 }

   mplsLpsStatusFpathPathSent OBJECT-TYPE
      SYNTAX      MplsLpsFpathPath
      MAX-ACCESS  read-only
      STATUS      current
      DESCRIPTION
         "The current value of the FPath and Path fields sent
          on the most recent PSC packet."
      REFERENCE
         "Section 4.2 of RFC6378"
      ::= { mplsLpsStatusEntry 5 }

   mplsLpsStatusRevertiveMismatch OBJECT-TYPE
      SYNTAX     TruthValue
      MAX-ACCESS read-only
      STATUS     current
      DESCRIPTION
         "This object indicates the provisioning mismatch in
          revertive mode across the protection domain end points.
          The value of this object becomes true when a PSC message with
          incompatible Revertive field is received, or false
          when a PSC message with compatible Revertive field is
          received. "
      REFERENCE
         "Section 12 of RFC7271"
      ::= { mplsLpsStatusEntry 6 }

   mplsLpsStatusProtecTypeMismatch OBJECT-TYPE
      SYNTAX     TruthValue
      MAX-ACCESS read-only
      STATUS     current
      DESCRIPTION
         "This object indicates the provisioning mismatch in
          protection type, representing both bridge and switching types,
          across the protection domain end points.
          The value of this object becomes true when a PSC message with
          incompatible PT field is received, or false
          when a PSC message with compatible PT field is received. "
      REFERENCE
         "Section 12 of RFC7271"
```

```
      ::= { mplsLpsStatusEntry 7 }

   mplsLpsStatusCapabilitiesMismatch OBJECT-TYPE
      SYNTAX     TruthValue
      MAX-ACCESS read-only
      STATUS     current
      DESCRIPTION
         "This object indicates the provisioning mismatch in
          Capabilities TLVs across the protection domain end points.
          The value of this object becomes true when a PSC message with
          incompatible Capabilities TLV field is received, or false
          when a PSC message with compatible Capabilities TLV field is
          received.

          The Capabilities TLV with 0xF8000000 indicates that the APS
          mode is used for MPLS-TP linear protection mechanism,
          whereas PSC mode uses either the Capabilities TLV with Ox0
          or no existence of the Capabilities TLV."
      REFERENCE
         "Section 12 of RFC7271"
      ::= { mplsLpsStatusEntry 8 }

   mplsLpsStatusPathConfigMismatch OBJECT-TYPE
      SYNTAX     TruthValue
      MAX-ACCESS read-only
      STATUS     current
      DESCRIPTION
         "This object indicates the provisioning mismatch in the
          protection path configuration for PSC communication across
          the protection domain end points.

          The value of this object becomes true when a PSC message is
          received from the working path, or false when a PSC message
          is received from the protection path."
      REFERENCE
         "Section 12 of RFC7271"
      ::= { mplsLpsStatusEntry 9 }

   mplsLpsStatusFopNoResponses OBJECT-TYPE
      SYNTAX     Counter32
      MAX-ACCESS read-only
      STATUS     current
      DESCRIPTION
         "This object holds the number of occurrences of the failure
          of protocol due to a lack of response to a traffic switchover
          request within in 50 ms.

          When there is a traffic switchover due to a local request,
```

```
          a 50 ms timer is started to detect the failure of protocol
          due to no response. If there is no PSC message is received
          with the same Path value as in the transmitted PSC message
          until the 50 ms timer expires, the failure of protocol due to
          no response occurs."
      REFERENCE
         "Section 12 of RFC7271"
      ::= { mplsLpsStatusEntry 10 }

   mplsLpsStatusFopTimeouts OBJECT-TYPE
      SYNTAX     Counter32
      MAX-ACCESS read-only
      STATUS     current
      DESCRIPTION
         "This object holds the number of occurrences of the failure
          of protocol due to no PSC message received during at least
          3.5 times the long PSC message interval.

          When no PSC message is received on the protection path during
          at least 3.5 times the long PSC message interval and there
          is no defect on the protection path, the failure of protocol
          due to no PSC message occurs."
      REFERENCE
         "Section 12 of RFC7271"
      ::= { mplsLpsStatusEntry 11 }

   -- MPLS-TP Linear Protection ME Association Configuration Table
   -- This table supports the addition, configuration and deletion
   -- of MPLS-TP Linear Protection Maintenance Entities in protection
   -- domains.

   mplsLpsMeConfigTable OBJECT-TYPE
      SYNTAX      SEQUENCE OF MplsLpsMeConfigEntry
      MAX-ACCESS  not-accessible
      STATUS      current
      DESCRIPTION
         "This table lists Maintenance Association that have been
          configured in Protection domains."
      ::= { mplsLpsObjects 4 }

   mplsLpsMeConfigEntry OBJECT-TYPE
      SYNTAX      MplsLpsMeConfigEntry
      MAX-ACCESS  not-accessible
      STATUS      current
      DESCRIPTION
        "A conceptual row in the mplsLpsMeConfigTable. There is
         a sparse relationship between the conceptual rows of
         this table and mplsOamIdMeTable.
```

```
        Each time that an entry is created in the mplsOamIdMeTable
        for which the LER supports MPLS-TP linear protection,
        a row is created automatically in the mplsLpsMeConfigTable.

        An entry of this table is related to a single entry in
        mplsOamIdMeTable.  When a point-to-point transport path
        needs to be monitored, one ME is needed for the path
        and one entry in the mplsOamIdMeTable will be created.
        But, the ME entry in the mplsOamIdMeTable may or may not
        participate in protection switching.

        If an ME participates in protection switching,
        an entry in mplsLpsMeConfigTable MUST be created,
        and the objects in the entry indicates
        which protection domain this ME belongs to and
        whether this ME is for either working path or protection path.

        If the ME does not participate in protection switching,
        an entry in mplsLpsMeConfigTable does not need to be created. "
     INDEX {mplsOamIdMegIndex, mplsOamIdMeIndex, mplsOamIdMeMpIndex}
     ::= { mplsLpsMeConfigTable  1 }

  MplsLpsMeConfigEntry ::= SEQUENCE {
     mplsLpsMeConfigDomain               Unsigned32,
     mplsLpsMeConfigPath                 INTEGER
  }

  mplsLpsMeConfigDomain  OBJECT-TYPE
     SYNTAX        Unsigned32 (0..4294967295)
     MAX-ACCESS    read-create
     STATUS        current
     DESCRIPTION
        "This object holds the value of protection domain index wherein
         this ME is included. If this ME is not part of any
         protection domain then this object contains value 0.

         When the value of this object is the same as the value of
         mplsLpsConfigDomainIndex, that means that the object is
         defined as either the working path or the protection path
         of the protection domain corresponding to
         mplsLpsConfigDomainIndex."
     DEFVAL { 0 }
     ::= { mplsLpsMeConfigEntry 1 }

  mplsLpsMeConfigPath OBJECT-TYPE
     SYNTAX      INTEGER { working(1), protection(2) }
     MAX-ACCESS  read-create
     STATUS      current
```

```
      DESCRIPTION
         "This object represents whether the ME is configured
          as either the working path or the protection path"
      REFERENCE
         "Section 4.3 of RFC6378"
      ::= { mplsLpsMeConfigEntry 2 }

   --
   -- MPLS Linear Protection ME Status Table
   -- This table provides Protection Switching ME statistics.
   --

   mplsLpsMeStatusTable OBJECT-TYPE
      SYNTAX      SEQUENCE OF MplsLpsMeStatusEntry
      MAX-ACCESS  not-accessible
      STATUS      current
      DESCRIPTION
         "This table contains status information of all the MEs
          that are included in MPLS-TP linear protection domains."
      ::= { mplsLpsObjects 5 }

   mplsLpsMeStatusEntry OBJECT-TYPE
      SYNTAX      MplsLpsMeStatusEntry
      MAX-ACCESS  not-accessible
      STATUS      current
      DESCRIPTION
         "A conceptual row in the mplsLpsMeStatusTable."
      AUGMENTS { mplsLpsMeConfigEntry }
      ::= { mplsLpsMeStatusTable  1 }

   MplsLpsMeStatusEntry ::= SEQUENCE {
      mplsLpsMeStatusCurrent               BITS,
      mplsLpsMeStatusSignalDegrades        Counter32,
      mplsLpsMeStatusSignalFailures        Counter32,
      mplsLpsMeStatusSwitchovers           Counter32,
      mplsLpsMeStatusLastSwitchover        TimeStamp,
      mplsLpsMeStatusSwitchoverSeconds     Counter32
   }

   mplsLpsMeStatusCurrent OBJECT-TYPE
      SYNTAX   BITS {
               localSelectTraffic(0),
               localSD(1),
               localSF(2)
               }
      MAX-ACCESS read-only
      STATUS     current
      DESCRIPTION
```

```
        "Indicates the current state of the ME.

         localSelectTraffic
         This bit indicates that traffic is being selected from
         this ME.

         localSD
         This bit implies that local signal degrade condition is
         in effect on this ME / path.

         localSF
         This bit implies that local signal failure condition is
         in effect on this ME / path."
      REFERENCE
         "Section 4.3 of RFC6378 and Section 7 of RFC7271"
      ::= { mplsLpsMeStatusEntry 1 }

   mplsLpsMeStatusSignalDegrades OBJECT-TYPE
      SYNTAX     Counter32
      MAX-ACCESS read-only
      STATUS     current
      DESCRIPTION
         "Represents the count of Signal Degrade conditions.
          For the detection and clearance of Signal Degrade,
          see the description of mplsLpsConfigSdThreshold."
      REFERENCE
         "Section 7 of RFC7271"
      ::= { mplsLpsMeStatusEntry 2 }

   mplsLpsMeStatusSignalFailures OBJECT-TYPE
      SYNTAX     Counter32
      MAX-ACCESS read-only
      STATUS     current
      DESCRIPTION
         "Represents the count of Signal failure conditions.
          This condition occurs when the OAM running on this ME
          detects the Signal Fail event."
      REFERENCE
         "Section 4.3 of RFC6378"
      ::= { mplsLpsMeStatusEntry 3 }

   mplsLpsMeStatusSwitchovers OBJECT-TYPE
      SYNTAX     Counter32
      MAX-ACCESS read-only
      STATUS     current
      DESCRIPTION
         "Represents the count of SwitchOvers happened in this ME.
```

```
            When the mplsLpsMeConfigPath is working, this object will
            return the number of times that traffic has been switched
            from this working path to the protection path.

            When the mplsLpsMeConfigPath is protection, this object
            will return the number of times that traffic has been
            switched back to the working path from this protection path."
        REFERENCE
           "Section 4.3 of RFC6378"
        ::= { mplsLpsMeStatusEntry 4 }

    mplsLpsMeStatusLastSwitchover OBJECT-TYPE
        SYNTAX     TimeStamp
        MAX-ACCESS read-only
        STATUS     current
        DESCRIPTION
           "This object holds the value of sysUpTime wherein the
            last switchover happened.

            When the mplsLpsMeConfigPath is working, this object
            will return the value of sysUpTime when traffic was switched
            from this path to the protection path.

            If traffic has never switched to the protection path, the
            value 0 will be returned.

            When the mplsLpsMeConfigPath is protection, this object
            will return the value of sysUpTime the last time that
            traffic was switched back to the working path from this path.
            If no traffic has ever switched back to the working path from
            this protection path, the value 0 will be returned."
        REFERENCE
           "Section 4.3 of RFC6378"
        ::= { mplsLpsMeStatusEntry 5 }

    mplsLpsMeStatusSwitchoverSeconds OBJECT-TYPE
        SYNTAX     Counter32
        UNITS      "seconds"
        MAX-ACCESS read-only
        STATUS     current
        DESCRIPTION
           "The cumulative Protection Switching Duration (PSD) time
            in seconds.

            For the working path, this is the cumulative number of
            seconds that traffic was selected from the protection path.

            For the protection path, this is the cumulative number
```

```
          of seconds that the working path has been used to
          select traffic."
       REFERENCE
          "Section 4.3 of RFC6378"
       ::= { mplsLpsMeStatusEntry 6 }


   mplsLpsNotificationEnable OBJECT-TYPE
       SYNTAX     BITS {
                  switchover(0),
                  revertiveMismatch(1),
                  protecTypeMismatch(2),
                  capabilitiesMismatch(3),
                  pathConfigMismatch(4),
                  fopNoResponse(5),
                  fopTimeout(6)
                  }
       MAX-ACCESS read-write
       STATUS     current
       DESCRIPTION
          "Provides the ability to enable and disable notifications
           defined in this MIB module.

           switchover
           Indicates mplsLpsEventSwitchover notifications should be
           generated.

           revertiveMismatch
           Indicates mplsLpsEventRevertiveMismatch notifications
           should be generated.

           protecTypeMismatch
           Indicates mplsLpsEventProtecTypeMismatch notifications
           should be generated.

           capabilitiesMismatch
           Indicates mplsLpsEventCapabilitiesMismatch notifications
           should be generated.

           pathConfigMismatch
           Indicates mplsLpsEventPathConfigMismatch notifications
           should be generated.

           fopNoResponse
           Indicates mplsLpsEventFopNoResponse notifications
           should be generated.

           fopTimeout
```

```
            Indicates mplsLpsEventFopTimeout notifications
            should be generated."
        REFERENCE
           "Section 12 of RFC7271"
        DEFVAL { { } }
        ::= { mplsLpsObjects 6 }

    -- MPLS Linear Protection EVENTS

    mplsLpsEventSwitchover NOTIFICATION-TYPE
        OBJECTS { mplsLpsMeStatusSwitchovers, mplsLpsMeStatusCurrent }
        STATUS  current
        DESCRIPTION
           "An mplsLpsEventSwitchover notification is sent when the
            value of an instance of mplsLpsMeStatusSwitchovers
            increments."
        ::= { mplsLpsNotifications 1 }

    mplsLpsEventRevertiveMismatch NOTIFICATION-TYPE
        OBJECTS { mplsLpsStatusRevertiveMismatch }
        STATUS  current
        DESCRIPTION
           "An mplsLpsEventRevertiveMismatch notification is sent when
            the value of mplsLpsStatusRevertiveMismatch changes."
        ::= { mplsLpsNotifications 2 }

    mplsLpsEventProtecTypeMismatch NOTIFICATION-TYPE
        OBJECTS { mplsLpsStatusProtecTypeMismatch }
        STATUS  current
        DESCRIPTION
           "An mplsLpsEventProtecTypeMismatch notification is sent
            when the value of mplsLpsStatusProtecTypeMismatch changes."
        ::= { mplsLpsNotifications 3 }

    mplsLpsEventCapabilitiesMismatch NOTIFICATION-TYPE
        OBJECTS { mplsLpsStatusCapabilitiesMismatch }
        STATUS  current
        DESCRIPTION
           "An mplsLpsEventCapabilitiesMismatch notification is sent
            when the value of mplsLpsStatusCapabilitiesMismatch changes."
        ::= { mplsLpsNotifications 4 }

    mplsLpsEventPathConfigMismatch NOTIFICATION-TYPE
        OBJECTS { mplsLpsStatusPathConfigMismatch }
        STATUS  current
        DESCRIPTION
           "An mplsLpsEventPathConfigMismatch notification is sent
            when the value of mplsLpsStatusPathConfigMismatch changes."
```

```
      ::= { mplsLpsNotifications 5 }

   mplsLpsEventFopNoResponse NOTIFICATION-TYPE
      OBJECTS { mplsLpsStatusFopNoResponses }
      STATUS  current
      DESCRIPTION
         "An mplsLpsEventFopNoResponse notification is sent when the
          value of mplsLpsStatusFopNoResponses increments."
      ::= { mplsLpsNotifications 6 }

   mplsLpsEventFopTimeout NOTIFICATION-TYPE
      OBJECTS { mplsLpsStatusFopTimeouts }
      STATUS  current
      DESCRIPTION
         "An mplsLpsEventFopTimeout notification is sent when the
          value of mplsLpsStatusFopTimeouts increments."
      ::= { mplsLpsNotifications 7 }

   -- End of Notifications.

   -- Module Compliance.

   mplsLpsCompliances
      OBJECT IDENTIFIER ::= { mplsLpsConformance 1 }

   mplsLpsGroups
      OBJECT IDENTIFIER ::= { mplsLpsConformance 2 }

   -- Compliance requirement for fully compliant implementations.

   mplsLpsModuleFullCompliance MODULE-COMPLIANCE
      STATUS       current
      DESCRIPTION
         "Compliance statement for agents that provide full
          support for MPLS-LPS-MIB. Such devices can
          provide linear protection and also be configured using
          this MIB module."
      MODULE -- This module.
      MANDATORY-GROUPS {
         mplsLpsScalarGroup,
         mplsLpsTableGroup,
         mplsLpsMeTableGroup
      }
      GROUP        mplsLpsNotificationGroup
      DESCRIPTION
         "This group is only mandatory for those
          implementations which can efficiently implement
          the notifications contained in this group."
```

```
      ::= { mplsLpsCompliances 1 }

   -- Compliance requirement for read-only implementations

   mplsLpsModuleReadOnlyCompliance MODULE-COMPLIANCE
      STATUS current
      DESCRIPTION
         "Compliance statement for agents that only provide
          read-only support for the MPLS-LPS-MIB module."

      MODULE -- this module

      MANDATORY-GROUPS    {
         mplsLpsScalarGroup,
         mplsLpsTableGroup,
         mplsLpsMeTableGroup
      }
      GROUP        mplsLpsNotificationGroup
      DESCRIPTION
         "This group is only mandatory for those
          implementations which can efficiently implement
          the notifications contained in this group."

      -- mplsLpsConfigTable

      OBJECT      mplsLpsConfigMode
      MIN-ACCESS  read-only
      DESCRIPTION
            "Write access is not required."

      OBJECT      mplsLpsConfigProtectionType
      MIN-ACCESS  read-only
      DESCRIPTION
            "Write access is not required."

      OBJECT      mplsLpsConfigRevertive
      MIN-ACCESS  read-only
      DESCRIPTION
            "Write access is not required."

      OBJECT      mplsLpsConfigSdThreshold
      MIN-ACCESS  read-only
      DESCRIPTION
            "Write access is not required."

      OBJECT      mplsLpsConfigSdBadSeconds
      MIN-ACCESS  read-only
      DESCRIPTION
```

```
            "Write access is not required."

        OBJECT      mplsLpsConfigSdGoodSeconds
        MIN-ACCESS  read-only
        DESCRIPTION
            "Write access is not required."

        OBJECT      mplsLpsConfigWaitToRestore
        MIN-ACCESS  read-only
        DESCRIPTION
            "Write access is not required."

        OBJECT      mplsLpsConfigContinualTxInterval
        MIN-ACCESS  read-only
        DESCRIPTION
            "Write access is not required."

        OBJECT      mplsLpsConfigRapidTxInterval
        MIN-ACCESS  read-only
        DESCRIPTION
            "Write access is not required."

        OBJECT      mplsLpsConfigCommand
        MIN-ACCESS  read-only
        DESCRIPTION
            "Write access is not required."

        OBJECT      mplsLpsConfigRowStatus
        SYNTAX      RowStatus { active(1) }
        MIN-ACCESS  read-only
        DESCRIPTION
            "Write access is not required."

        OBJECT      mplsLpsConfigStorageType
        MIN-ACCESS  read-only
        DESCRIPTION
            "Write access is not required."

        -- mplsLpsMeConfigTable

        OBJECT      mplsLpsMeConfigDomain
        MIN-ACCESS  read-only
        DESCRIPTION
            "Write access is not required."

        OBJECT      mplsLpsMeConfigPath
        MIN-ACCESS  read-only
        DESCRIPTION
```

```
            "Write access is not required."

      ::= { mplsLpsCompliances 2 }

   -- Units of conformance.

   mplsLpsScalarGroup OBJECT-GROUP
      OBJECTS {
              mplsLpsConfigDomainIndexNext,
              mplsLpsNotificationEnable
              }
      STATUS  current
      DESCRIPTION
         "Collection of objects needed for MPLS Linear Protection."
      ::= { mplsLpsGroups 1 }

   mplsLpsTableGroup OBJECT-GROUP
      OBJECTS {
         mplsLpsConfigDomainName,
         mplsLpsConfigRowStatus,
         mplsLpsConfigMode,
         mplsLpsConfigProtectionType,
         mplsLpsConfigRevertive,
         mplsLpsConfigSdThreshold,
         mplsLpsConfigSdBadSeconds,
         mplsLpsConfigSdGoodSeconds,
         mplsLpsConfigWaitToRestore,
         mplsLpsConfigHoldOff,
         mplsLpsConfigContinualTxInterval,
         mplsLpsConfigRapidTxInterval,
         mplsLpsConfigCommand,
         mplsLpsConfigCreationTime,
         mplsLpsConfigStorageType,
         mplsLpsStatusState,
         mplsLpsStatusReqRcv,
         mplsLpsStatusReqSent,
         mplsLpsStatusFpathPathRcv,
         mplsLpsStatusFpathPathSent,
         mplsLpsStatusRevertiveMismatch,
         mplsLpsStatusProtecTypeMismatch,
         mplsLpsStatusCapabilitiesMismatch,
         mplsLpsStatusPathConfigMismatch,
         mplsLpsStatusFopNoResponses,
         mplsLpsStatusFopTimeouts
         }
      STATUS  current
      DESCRIPTION
         "Collection of objects needed for MPLS Linear Protection
```

```
          configuration and statistics."
      ::= { mplsLpsGroups 2 }

   mplsLpsMeTableGroup OBJECT-GROUP
      OBJECTS {
         mplsLpsMeConfigDomain,
         mplsLpsMeConfigPath,
         mplsLpsMeStatusCurrent,
         mplsLpsMeStatusSignalDegrades,
         mplsLpsMeStatusSignalFailures,
         mplsLpsMeStatusSwitchovers,
         mplsLpsMeStatusLastSwitchover,
         mplsLpsMeStatusSwitchoverSeconds
         }
      STATUS  current
      DESCRIPTION
         "Collection of objects needed for MPLS Linear Protection
          ME configuration and statistics."
      ::= { mplsLpsGroups 3 }

   mplsLpsNotificationGroup NOTIFICATION-GROUP
      NOTIFICATIONS {
         mplsLpsEventSwitchover,
         mplsLpsEventRevertiveMismatch,
         mplsLpsEventProtecTypeMismatch,
         mplsLpsEventCapabilitiesMismatch,
         mplsLpsEventPathConfigMismatch,
         mplsLpsEventFopNoResponse,
         mplsLpsEventFopTimeout
         }
      STATUS  current
      DESCRIPTION
             "Collection of objects needed to implement notifications."
      ::= { mplsLpsGroups 4 }

   -- MPLS-LPS-MIB module ends
   END
```

9. Security Considerations

There are a number of management objects defined in this MIB module with a MAX-ACCESS clause of read-write and/or read-create. Such objects may be considered sensitive or vulnerable in some networks in a non-secure environment without proper protection can have a negative effect on network operations. These are the tables and objects and their sensitivity/vulnerability:

- mplsLpsConfigTable is used to configure MPLS-TP linear protection domains. Improper manipulation of the objects in this table may result in different behaviors than network operators have originally intended, such as delaying traffic switching or causing a race condition with server layer protection after network failure (mplsLpsConfigHoldOff), delaying or speeding up reversion after recovering network failure (mplsLpsConfigWaitToRestore), unexpected traffic switching (mplsLpsConfigCommand), or discontinuance of operation of a protection switching control process (mplsLpsConfigMode, mplsLpsConfigProtectionType).

- mplsLpsMeConfigTable is used to assign each ME either working or protection path. Improper manipulation of this object may result in discontinuance of operation of a protection switching control process.

- The notification is controlled by mplsLpsNotificationEnable object. In the case of the discontinuance of a protection switching control process, network operators may not be notified if the mplsLpsNotificationEnable object is compromised.

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:

- mplsLpsStatusTable and mplsLpsMeStatusTable collectively show the history and current status of the MPLS-TP linear protection domains. They can be used to estimate the performances and qualities of the network being operated with the MPLS-TP linear protection. If an administrator does not want to reveal this information, then these tables should be considered sensitive/ vulnerable.

SNMP versions prior to SNMPv3 did not include adequate security. Even if the network itself is secure (for example by using IPsec), 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.

Implementations SHOULD provide the security features described by the SNMPv3 framework (see [RFC3410]), and implementations claiming compliance to the SNMPv3 standard MUST include full support for authentication and privacy via the User-based Security Model (USM) RFC 3414 [RFC3414] with the AES cipher algorithm RFC 3826 [RFC3826].

Implementations MAY also provide support for the Transport Security Model (TSM) RFC 5591 [RFC5591] in combination with a secure transport such as SSH RFC 5592 [RFC5592] or TLS/DTLS RFC 6353 [RFC6353].

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.

10. IANA Considerations

IANA is requested to assign an OID for the MIB module from the "MIB Transmission Group - MPLS STD" sub-registry of the "Internet-standard MIB - Transmission Group" registry for the MPLS Linear Protection MIB module specified in this document.

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12. Acknowledgments

The authors wish to thank Joan Cucchiara for her review as MIB Doctor. Joan's detailed comments were of great help for improving the quality of this document.

The authors would also like to thank Loa Andersson and Adrian Farrel for their valuable comments and suggestion on this document.

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