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## MPLS Transport Profile Linear Protection MIB

### 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 is an Internet Standards Track document.

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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 MPLS-TP linear protection for MPLS-TP Label Switched Paths (LSPs).

At the time of this writing, Simple Network Management Protocol (SNMP) SET is no longer recommended as a way to configure MPLS networks as 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 a MAX-ACCESS clause 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 Management Information Base or MIB. MIB objects are generally accessed through the Simple Network Management Protocol (SNMP). Objects in the MIB are defined using the mechanisms defined in the Structure of Management Information (SMI). This memo specifies a MIB module that is compliant to the SMIV2, which is described in STD 58, RFC 2578 [RFC2578], STD 58, RFC 2579 [RFC2579] and STD 58, RFC 2580 [RFC2580].

## 3. Conventions

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

This document specifies a MIB module for Label Edge Routers (LERs) that support MPLS-TP linear protection as described in [RFC6378] and [RFC7271]. Objects defined in this document are generally applied to both the PSC mode and the APS mode. 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:

- o MplsLpsReq: This textual convention describes an object that stores the PSC Request field of the PSC control packet.
- o MplsLpsFpathPath: This textual convention describes an object that stores the Fault Path (FPath) field and Data Path (Path) field of the PSC control packet.
- o MplsLpsCommand: This textual convention describes an object that allows a user to perform any action over a protection domain.
- o MplsLpsState: This textual convention describes an object that stores the current state of the PSC state machine.

### 5.2. The MPLS-TP Linear Protection Switching Subtree

MPLS-LPS-MIB is the MIB module defined in this document. It is rooted under the mplsStdMIB subtree per [RFC3811]. "LPS" as used in this document means "Linear Protection Switching".

### 5.3. The Notifications Subtree

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

- o The notification `mplsLpsEventSwitchover` informs the management station about the switchover of the active path.
- o The notification `mplsLpsEventRevertiveMismatch` informs the management station about a provisioning mismatch in the revertive mode across the endpoint of the protection domain.
- o The notification `mplsLpsEventProtectTypeMismatch` informs the management station about a provisioning mismatch in the protection type, representing both the bridge type and the switching type, across the endpoint of the protection domain.
- o The notification `mplsLpsEventCapabilitiesMismatch` informs the management station about a provisioning mismatch in Capabilities TLVs across the endpoint of the protection domain.
- o The notification `mplsLpsEventPathConfigMismatch` informs the management station about a provisioning mismatch in the protection path configuration for PSC communication.
- o The notification `mplsLpsEventFopNoResponse` informs the management station that protocol failure has occurred due to a lack of response to a traffic switchover request in 50 ms.
- o The notification `mplsLpsEventFopTimeout` informs the management station that protocol failure has occurred because no protocol message was received during at least 3.5 times the long PSC message interval [RFC7271].

### 5.4. The Table Structures

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

- o `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, as well as the working path and protection path 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 in the `mplsLpsMeConfigTable`, which is for configuring the MEs used in protection switching, are associated to one entry in this table.

- o `mplsLpsStatusTable`

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

- o `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 the working path or the protection path. The ME is identified by `mpls0amIdMegIndex`, `mpls0amIdMeIndex`, and `mpls0amIdMeMpIndex`, which are the same index values as the entry in the `mpls0amIdMeTable` defined in [RFC7697]. The relationship to the `mpls0amIdMeTable` is described in Section 6.1.

- o `mplsLpsMeStatusTable`

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

## 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 the `mplsLpsMeConfigTable` MUST be created, and the objects in the entry indicate which protection domain this ME belongs to and whether this ME is for the working path or the protection path. If the ME does not participate in protection switching, an entry in the `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 path and protection path 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 the `mplsOamIdMegTable` and the `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 the 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 the mplsLpsMeConfigTable:

MplsLpsMeConfigEntry ::= SEQUENCE

```
{
  -- MEG index (index to the table)
  mplsOamIdMegIndex = 1,
  -- ME index (index to the table)
  mplsOamIdMeIndex = 1,
  -- Maintenance Point (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

mpls0amIdMegIndex, mpls0amIdMeIndex, mpls0amIdMeMpIndex  
FROM MPLS-OAM-ID-STD-MIB; -- RFC 7697

### mplsLpsMIB MODULE-IDENTITY

LAST-UPDATED "201704040000Z" -- April 4, 2017

ORGANIZATION "Multiprotocol Label Switching (MPLS) Working Group"

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#### DESCRIPTION

"This MIB module supports the configuration and management of MPLS-TP linear protection domains.

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#### REVISION

"201704040000Z" -- April 4, 2017

#### DESCRIPTION

"MPLS-TP protection domain objects for LSP MEG End Points (MEPs)."

::= { mplsStdMIB 22 }

```
-- 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 RFC 6378 and Section 8 of RFC 7271"

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 the FPath field are 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 the Path field are 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

"Sections 4.2.5 and 4.2.6 of RFC 6378"

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 a request of equal or higher priority is in effect, an inconsistentValue error is returned.

The command values are as follows:

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 RFC 6378 and Sections 4.3 and 6 of RFC 7271"

**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.

**unavL0local**

Unavailable state due to local L0 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.

**unavSFPreremote**

Unavailable state due to remote SF-P message.

**unavSDPreremote**

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.

**switadmMSPreremote**

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

"Sections 3 and 11 of RFC 7271"

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
        the number of unassigned entries has been exhausted.
        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, 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 that 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 the MPLS-TP linear protection mechanism. This can be either 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.

If this value is changed at one LER during operation, the LER will generate PSC packets with a new Capabilities TLV value. This will result in mplsLpsEventCapabilitiesMismatch notifications at both LERs."

REFERENCE

"Sections 9.2 and 10 of RFC 7271"

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 object represents both the bridge type, which can be either a permanent bridge (1+1) or a selector bridge (1:1); and the 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 path and the protection path. The traffic on the working path and protection path is transmitted simultaneously to the sink of the protection domain, where selection between the working path and the protection path is performed.

**1:1**

In the 1:1 protection scheme, a protection path is allocated to protect against a defect, failure, or degradation on 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 the bidirectional protection scheme, both directions will be switched simultaneously even if the fault applies to only one direction of the path.

**unidirectional**

In the 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 RFC 6378"

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 the protection mechanism may be either revertive or non-revertive.

## nonrevertive

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

## revertive

In the 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 RFC 6378"

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 ITU-T Recommendation G.8121/Y.1381 and  
Table 8-1 of ITU-T Recommendation G.8151/Y.1374"

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 ITU-T Recommendation G.8121/Y.1381 and  
Table 8-1 of ITU-T Recommendation G.8151/Y.1374"

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 an SD defect.

After an SD defect occurs on a path, if the number of  
consecutive Good Seconds reaches this value for the  
degraded path, the clearance of the 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 ITU-T Recommendation G.8121/Y.1381 and  
Table 8-1 of ITU-T Recommendation G.8151/Y.1374"

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 intervals between 5 and  
12 minutes.

The WTR timer is used to delay the reversion of the PSC state  
to the 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 RFC 6378"

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 intervals of 100 milliseconds.

When a new defect or a more severe defect occurs on  
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 RFC 6378"

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 PSC 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 RFC 6378"

DEFVAL { 5 }

::= { mplsLpsConfigEntry 11 }

`mplsLpsConfigRapidTxInterval` OBJECT-TYPE

SYNTAX Unsigned32 (1000..20000)

UNITS "microseconds"

MAX-ACCESS read-create

STATUS current

## DESCRIPTION

"The Rapid Tx interval in microseconds. Represents the time interval to send the PSC packet to the other end, when there is a change in the state of the linear protection domain due to local input. The default value is 3.3 milliseconds (3300 microseconds).

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

## REFERENCE

"Section 4.1 of RFC 6378"

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 RFC 6378 and Sections 4.3 and 6 of RFC 7271"

**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 object 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 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,

mplsLpsStatusProtectTypeMismatch

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 RFC 7271"
    ::= { 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 RFC 6378"
    ::= { 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 RFC 6378"
    ::= { 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 RFC 6378"
    ::= { 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 RFC 6378"

::= { mplsLpsStatusEntry 5 }

**mplsLpsStatusRevertiveMismatch OBJECT-TYPE****SYNTAX** TruthValue**MAX-ACCESS** read-only**STATUS** current**DESCRIPTION**

"This object indicates a provisioning mismatch in the revertive mode across the protection domain endpoints. The value of this object becomes true when a PSC message with an incompatible Revertive field is received or false when a PSC message with a compatible Revertive field is received."

**REFERENCE**

"Section 12 of RFC 7271"

::= { mplsLpsStatusEntry 6 }

**mplsLpsStatusProtectTypeMismatch OBJECT-TYPE****SYNTAX** TruthValue**MAX-ACCESS** read-only**STATUS** current**DESCRIPTION**

"This object indicates a provisioning mismatch in the protection type, representing both the bridge type and the switching type, across the protection domain endpoints. The value of this object becomes true when a PSC message with an incompatible Protection Type (PT) field is received or false when a PSC message with a compatible PT field is received."

**REFERENCE**

"Section 12 of RFC 7271"

::= { mplsLpsStatusEntry 7 }

**mplsLpsStatusCapabilitiesMismatch OBJECT-TYPE****SYNTAX** TruthValue**MAX-ACCESS** read-only**STATUS** current**DESCRIPTION**

"This object indicates a provisioning mismatch in Capabilities TLVs across the protection domain endpoints. The value of this object becomes true when a PSC message with an incompatible Capabilities TLV field is received or false when a PSC message with a compatible Capabilities TLV field is received.

The Capabilities TLV with 0xF8000000 indicates that the APS mode is used for the MPLS-TP linear protection mechanism, whereas the PSC mode either (1) uses the Capabilities TLV with a value of 0x0 or (2) does not use the Capabilities TLV because the TLV does not exist."

**REFERENCE**

"Section 12 of RFC 7271"

::= { mplsLpsStatusEntry 8 }

**mplsLpsStatusPathConfigMismatch OBJECT-TYPE****SYNTAX** TruthValue**MAX-ACCESS** read-only**STATUS** current**DESCRIPTION**

"This object indicates a provisioning mismatch in the protection path configuration for PSC communication across the protection domain endpoints.

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 RFC 7271"

::= { mplsLpsStatusEntry 9 }

**mplsLpsStatusFopNoResponses OBJECT-TYPE**

SYNTAX Counter32

MAX-ACCESS read-only

STATUS current

## DESCRIPTION

"This object holds the number of occurrences of protocol failure due to a lack of response to a traffic switchover request within 50 ms.

When there is a traffic switchover due to a local request, a 50 ms timer is started to detect protocol failure due to no response. If there is no PSC message received with the same Path value as the Path value in the transmitted PSC message until the 50 ms timer expires, protocol failure due to no response occurs."

## REFERENCE

"Section 12 of RFC 7271"

::= { mplsLpsStatusEntry 10 }

**mplsLpsStatusFopTimeouts OBJECT-TYPE**

SYNTAX Counter32

MAX-ACCESS read-only

STATUS current

## DESCRIPTION

"This object holds the number of occurrences of protocol failure due to no PSC message being 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, protocol failure due to no PSC message occurs."

## REFERENCE

"Section 12 of RFC 7271"

::= { mplsLpsStatusEntry 11 }

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

**mplsLpsMeConfigTable OBJECT-TYPE**

SYNTAX SEQUENCE OF MplsLpsMeConfigEntry

MAX-ACCESS not-accessible

STATUS current

## DESCRIPTION

"This table lists ME associations that have been configured in protection domains."

::= { mplsLpsObjects 4 }



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

        When the value of this object is the same as the value of
        mplsLpsConfigDomainIndex, 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 the working path or the protection path."
    REFERENCE
        "Section 4.3 of RFC 6378"
    ::= { 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 a local Signal Degrade condition is
        in effect on this ME/path.

        localSF
        This bit implies that a local Signal Fail condition is
        in effect on this ME/path."
    REFERENCE
        "Section 4.3 of RFC 6378 and Section 7 of RFC 7271"
    ::= { 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 RFC 7271"

::= { mplsLpsMeStatusEntry 2 }

**mplsLpsMeStatusSignalFailures OBJECT-TYPE**

SYNTAX Counter32

MAX-ACCESS read-only

STATUS current

## DESCRIPTION

"Represents the count of Signal Fail conditions.  
This condition occurs when the OAM running on this ME  
detects the Signal Fail event."

## REFERENCE

"Section 4.3 of RFC 6378"

::= { mplsLpsMeStatusEntry 3 }

**mplsLpsMeStatusSwitchovers OBJECT-TYPE**

SYNTAX Counter32

MAX-ACCESS read-only

STATUS current

## DESCRIPTION

"Represents the count of switchovers that happened in this ME.

When the mplsLpsMeConfigPath value 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 value 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 RFC 6378"

::= { mplsLpsMeStatusEntry 4 }

**mplsLpsMeStatusLastSwitchover OBJECT-TYPE**

SYNTAX           TimeStamp

MAX-ACCESS   read-only

STATUS        current

**DESCRIPTION**

"This object holds the value of sysUpTime at the time that the last switchover happened.

When the mplsLpsMeConfigPath value 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 value 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 RFC 6378"

::= { 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 RFC 6378"

::= { mplsLpsMeStatusEntry 6 }

**mplsLpsNotificationEnable OBJECT-TYPE**

**SYNTAX** BITS {  
     switchover(0),  
     revertiveMismatch(1),  
     protectTypeMismatch(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 that mplsLpsEventSwitchover notifications should be generated.

**revertiveMismatch**

Indicates that mplsLpsEventRevertiveMismatch notifications should be generated.

**protectTypeMismatch**

Indicates that mplsLpsEventProtectTypeMismatch notifications should be generated.

**capabilitiesMismatch**

Indicates that mplsLpsEventCapabilitiesMismatch notifications should be generated.

**pathConfigMismatch**

Indicates that mplsLpsEventPathConfigMismatch notifications should be generated.

**fopNoResponse**

Indicates that mplsLpsEventFopNoResponse notifications should be generated.

**fopTimeout**

Indicates that mplsLpsEventFopTimeout notifications should be generated."

**REFERENCE**

"Section 12 of RFC 7271"

**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 }

mplsLpsEventProtectTypeMismatch NOTIFICATION-TYPE
  OBJECTS { mplsLpsStatusProtectTypeMismatch }
  STATUS current
  DESCRIPTION
    "An mplsLpsEventProtectTypeMismatch notification is sent
     when the value of mplsLpsStatusProtectTypeMismatch 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
     the MPLS-LPS-MIB module. 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 that 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 that 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,
    mplsLpsStatusProtectTypeMismatch,
    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,
    mplsLpsEventProtectTypeMismatch,
    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 network environments. The support for SET operations in a non-secure environment without proper protection opens devices to attack. These are the tables and objects and their sensitivity/vulnerability:

- o The `mplsLpsConfigTable` is used to configure MPLS-TP linear protection domains. Improper manipulation of the objects in this table may result in different behaviors than what network operators 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 from network failure (`mplsLpsConfigWaitToRestore`), unexpected traffic switching (`mplsLpsConfigCommand`), or the discontinuance of the operation of a protection switching control process (`mplsLpsConfigMode`, `mplsLpsConfigProtectionType`).
- o The `mplsLpsMeConfigTable` is used to assign each ME to either the working path or the protection path. Improper manipulation of this object may result in the discontinuance of the operation of a protection switching control process.
- o The notification is controlled by the `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:

- o The `mplsLpsStatusTable` and the `mplsLpsMeStatusTable` collectively show the history and current status of the MPLS-TP linear protection domains. They can be used to estimate the performance and qualities of networks configured to use 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) [RFC3414] with the AES cipher algorithm [RFC3826]. Implementations MAY also provide support for the Transport Security Model (TSM) [RFC5591] in combination with a secure transport such as SSH [RFC5592] or TLS/DTLS [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 has assigned an OID of decimal 22 for the MPLS Linear Protection MIB module (MPLS-LPS-MIB) specified in this document in the "MIB Transmission Group - MPLS STD MIB" subregistry of the "Internet-standard MIB - Transmission Group" registry.

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