Definitions of Managed Objects for the Multiprotocol Label Switching, Label Distribution Protocol (LDP)

<draft-ietf-mpls-ldp-mib-14.txt>

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Abstract

This memo defines a portion of the Management Information Base (MIB) for use with network management protocols in the Internet community. In particular, it describes managed objects for the Multiprotocol Label Switching, Label Distribution Protocol (LDP).
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1. Introduction

This document defines 4 MIB Modules which together support the configuration and monitoring of the Label Distribution Protocol (LDP). The Label Distribution Protocol (LDP) [RFC3036] is one type of Multiprotocol Label Switching (MPLS) protocols described in [RFC3031] and [RFC3032]. Utilizing all 4 MIB Modules allows an operator to configure LDP sessions using 3 different Layer 2 media. The Layer 2 media supported by the MIB Modules are Ethernet, ATM and Frame Relay as described in [RFC3036], [RFC3034] and [RFC3035].

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

2. The Internet-Standard Management Framework

For a detailed overview of the documents that describe the current Internet-Standard Management Framework, please refer to section 7 of RFC 3410 [RFC3410].

Managed objects are accessed via a virtual information store, termed the Management Information Base or MIB. MIB objects are generally accessed through the Simple Network Management Protocol (SNMP). Objects in the MIB are defined using the mechanisms defined in the Structure of Management Information (SMI). This memo specifies a MIB module that is compliant to the SMIv2, which is described in STD 58, RFC 2578 [RFC2578], STD 58, RFC 2579 [RFC2579] and STD 58, RFC 2580 [RFC2580].
3. Structure of the MIB Modules

This section describes the structure of the LDP MIB Modules.

3.1. Overview

There are 4 MIB Modules in this document. These MIB Modules are the MPLS-LDP-STD-MIB, the MPLS-LDP GENERIC-STD-MIB, the MPLS-LDP ATM-STD-MIB and the MPLS-LDP FRAME-RELAY-STD-MIB. The MPLS-LDP-STD-MIB defines objects which are common to all LDP implementations. The MPLS-LDP GENERIC-STD-MIB defines Layer 2 Per Platform Label Space objects for use with the MPLS-LDP-STD-MIB. The MPLS-LDP-ATM-STD-MIB defines Layer 2 Asynchronous Transfer Mode (ATM) objects for use with the MPLS-LDP-STD-MIB. The MPLS-LDP FRAME-RELAY-STD-MIB defines Layer 2 FRAME-RELAY objects for use with the MPLS-LDP-STD-MIB.

The MPLS-LDP-STD-MIB Module MUST be implemented and at least one of the Layer 2 MIB Modules MUST be implemented by an Agent developer on an Label Switching Router (LSR) or Label Edge Router (LER). As an example, if an Label Switching Router (LSR) or Label Edge Router (LER) implementation intends to support LDP utilizing a Layer 2 of Ethernet, then the MPLS-LDP-STD-MIB and the MPLS-LDP GENERIC-STD-MIB Modules MUST implemented. If an LSR/LER implementation intends to support LDP utilizing a Layer 2 of ATM, then the MPLS-LDP-STD-MIB Module and the MPLS-LDP-ATM-MIB Module MUST be implemented. If an LSR/LER implementation intends to support LDP utilizing a Layer 2 of FRAME-RELAY, then the MPLS-LDP-STD-MIB Module and the MPLS-LDP FRAME-RELAY-STD-MIB Module MUST be implemented. An LDP implementation that utilizes all three Layer 2 media (Ethernet, Frame-Relay, ATM) MUST support all 4 MIB Modules. Each of the Modules will be discussed in detail in the following sections.

There are 2 compliance statements for each MIB Module. One compliance statement is for full compliance which allows both configuration and monitoring via SNMP. The other compliance statement is for read-only compliance which allows only monitoring via SNMP.

3.2. Future Considerations

The LDP Specification [RFC3036] does not specify the use of VPNs or multicast for LDP, and thus, objects related to these areas have not been included.
[RFC2684] does not describe VP merge capability and so this feature has not been included.

These areas need to be specified in the LDP Specification or other specifications prior to being added in this or any other MIB document.

3.3. Interface Indexing

Interface Indexes as specified in [RFC2863] are used in these MIB Modules. The descriptions of the ifIndexes denote which ifIndex is being used. The use of ifIndex is for actual existing connections.

3.4. Differences from the LDP Specification

Currently, there are 3 differences between this specification and the LDP Specification. As described in the Introduction, this document is almost entirely based on the LDP specification. The differences are documented here.

The first difference is that the LDP Entity Table contains some DEFVAL clauses which are not specified explicitly in the LDP Specification. These values, although not documented in the LDP Specification, are widely used by existing LDP MIB implementations and thus, have been adopted within this MPLS-LDP-STD-MIB module. Please note, they can certainly be changed during row creation or a subsequent SET request.

A second difference is the mplsLdpEntityConfGenericLRTable in the MPLS-LDP-GENERIC-STD-MIB Module. This table, although provided as a way to reserve a range of generic labels, does not exist in the LDP Specification. It was added to the MIB due to a request from the working group and because this table was considered useful for reserving a range of generic labels.

The third difference is documented by the TEXTUAL-CONVENTION, MplsAtmVcIdentifier which is in the MPLS-TC-STD-MIB [MPLSTCMIB]. This TC was added to restrict vci values to be greater than 31 as described in RFC 3035 [RFC3035].
3.5. The MPLS-LDP-STD-MIB Module

This MIB Module contains objects which are common to all LDP implementations. This MIB Module MUST always be implemented along with one or more of the Layer 2 MIB Modules.

This table allows the Label Edge Router (LER) or the Label Switching Router (LSR) to initiate and/or receive requests to establish LDP sessions. As the LDP protocol distributes labels and establishes sessions with Peers most of the tables in this module are populated by the agent as instructed by the LDP protocol. The exception is the mplsFecTable and the mplsLdpLspFecTable which can be configured by the operator to specify Forwarding Equivalence Class information for an LSP.

Some scalars and each table in the MPLS-LDP-STD-MIB Module is described in the following subsections.

3.5.1. LDP Scalar Objects

There are several scalar objects in the LDP MIB module. The mplsLdpLsrId is a read-only scalar object which reports Label Switching Router’s (LSR’s) Identifier. This MUST be a globally unique value, such as the 32-bit router ID assigned to the LSR.

The mplsLdpLsrLoopDetectionCapable scalar object denotes whether the LSR is capable of supporting loop detection and if so, which form of loop detection.

There are two LastChange scalar objects, mplsLdpEntityLastChange and mplsLdpPeerLastChange. These objects give an indication of there was a change in the number of entries in the table, or if any of the values in the respective tables changed. Please see the object’s description for more details.

The mplsLdpEntityIndexNext scalar object is described in the next section.

3.5.2. The LDP Entity Table

The MPLS-LDP-STD-MIB provides objects to configure/set-up potential LDP sessions on a specific LSR/LER. The mplsLdpEntityTable is used to configure information which is used by the LDP protocol to setup potential LDP Sessions.
Each entry/row in this table represents a single LDP Entity. There is no maximum number of LDP Entities specified. However, there is an mplsLdpEntityIndexNext object which should be retrieved by the command generator prior to creating an LDP Entity. If the mplsLdpEntityIndexNext object is zero, this indicates that the LSR/LER is not able to create another LDP Entity at that time.

3.5.2.1. Changing Values After Session Establishment

One way to manually modify a session’s parameters is by using SNMP to change the MIB objects related to that session. Please note, special care should be taken if MIB objects which are used in the MPLS LDP Session Initialization need to be modified. If the modification of any of these MIB variables takes place anytime after the start of session initialization, then the entire session must be halted. Any information learned by that session must be discarded. The objects should then be modified, and session initialization started. Assuming that the configuration was done correctly, then a new session will be created.

For example, assume that an operator wishes to change the configuration of a Label Range which is used by a Session that has already been established. The operator should change the mplsLdpEntityAdminStatus to "disable(2)". Setting the mplsLdpEntityAdminStatus to "disable(2)" will cause the session to be torn down (i.e. this will signal to LDP that it should send out tear down messages for that session). Also, all information related to that session should be removed from this MIB by the Agent. This includes Peer information (i.e. relevant row in the mplsPeerTable) and Session statistics (i.e. relevant row in the mplsLdpSessionTable). Also, if the MPLS-LSR-STD-MIB module [LSRMIB] is implemented and the optional Mapping Table objects are implemented, then all information related to the LSPs in this session should be removed from these MIB modules. [For more information please see the section on "The Mapping Tables".] At this point, the operator could modify the Label Range. Lastly, the operator should set the mplsLdpEntityAdminStatus to "enable(1)". At this point session initialization should occur. The LDP Entity goes through the Session Initialization in order to communicate the new Label Ranges to the Peer and establish new LSPs.
3.5.3. The LDP Entity Statistics Table

The mplsLpdEntityStatsTable is a read-only table which contains statistical information related to failed attempts to establish sessions. Each row in this table AUGMENTS an mplsLdpEntityEntry. This table could be used to give insight into how to reconfigure values so that a session could be successfully established. For example, if the mplsLdpEntityStatsSessionRejectedLRErrors Counter object was increasing, then this would indicate that the Label Range (LR) may need to be adjusted.

3.5.4. The LDP Peer Table

The mplsLdpPeerTable is a read-only table which contains information about LDP Peers known to LDP Entities. In other words, the Peer information is learned by LDP through initialization or discovery. This table should be populated by the agent as directed by the LDP protocol.

A row in this table is related to one or more rows in the Hello Adjacency Table and related to a single row in the Session Table. The values in the Peer table are specific to a Peer and may or may not be the same values used in the session. The reason is that the Peer and Entity negotiate certain values. The Entity’s values are configured in the mplsLdpEntityTable and the Peer’s values are learned (and placed into the mplsLdpPeerTable). The mplsLdpSessionTable shows the values used in establishing the session.

One example, of when the Peer’s values and the Session’s values may differ is with the Peer’s Path Limit information. The Peer’s Path Limit information is learned from the session initialization phase. The actual value for the Path Vector Limit is the Peer’s value and may not be the same value that appears in the session. There could be a mismatch in this value between the Entity and the Peer. In the event of a mismatch, then the session will use the Path Limit set by the Entity (and not the Peer).

The Peer Table information was placed in a separate table from the Session information to allow for a more comprehensive and coherent MIB model.
3.5.5. The LDP Session Table

The LDP Session Table is a read-only table. Each entry in this table represents a single session between an LDP Entity and a Peer. The mplsLdpSessionEntry AUGMENTS the mplsLdpPeerEntry.

The information in this table is learned during session establishment. NOTE: rows in this table will appear during session initialization.

3.5.6. The LDP Session Statistics Table

The mplsLdpSessionStatsTable is a read-only table which contains statistical information on sessions. This table AUGMENTS the mplsLdpPeerTable.

3.5.7. The LDP Hello Adjacency Table

This is a table of all adjacencies between all LDP Entities and all LDP Peers. A Session may have one or more adjacencies. A session should not have zero adjacencies, because this indicates that the session has lost contact with the Peer. A session which has zero Hello Adjacencies should be removed.

3.5.8. The LDP LSP Table

The Label Information Base (LIB) contains information about labels learned by the LSR. The LIB for LDP, CR-LDP and MPLS-RSVP (i.e. all currently defined MPLS protocols) is represented in the LSR MIB [LSRMIB]. The LIB is represented by the LSR MIB’s mplsXCTable (mpls Cross Connect Table), mplsInSegmentTable (mpls In Segment Table) and the mplsOutSegmentTable (mpls Out Segment Table). The mplsXCTable models the cross-connection of the incoming label with a specific outgoing label. The mplsInSegmentTable stores the incoming label’s information, and the mplsOutSegmentTable stores the outgoing label’s information.

The LDP Session that created the LSP and the LSP’s (incoming label, outgoing label) pair along with other information is contained in the MPLS-LSR-STD-MIB module’s mplsXCTable, the mplsInSegmentTable and the mplsOutSegmentTable.

In order to utilize the MPLS-LSR-STD-MIB module’s mplsXCTable,
mplsInSegmentTable and mplsOutSegmentTable for LDP LSPs, there needs to be a mechanism to associate LDP sessions with LDP LSPs created as a result of those LDP sessions. The mplsInSegmentLdpLspTable and mplsOutSegmentLdpLspTable in this MIB contain information to find the LDP LSP entries in the mplsInSegmentTable, mplsOutSegmentTable and the mplsXCTable.

These two tables, the mplsInSegmentLdpLspTable and mplsOutSegmentLdpLspTable, have been made optional in the conformance section of the MIB. They only need to be supported if the LSR MIBs mplsInSegmentTable, mplsOutSegmentTable and mplsXCTable are implemented.

As discussed in the section, "Changing Values after Session Establishment", if a session is torn down, then all the information related to this session, must be removed from the both LDP MIB and, if implemented, from the LSR MIB.

3.5.9. The FEC Table

The FEC Table is a table which contains FEC (Forwarding Equivalence Class) information. Each entry/row represents a single FEC Element. There is also an LDP LSP FEC Table, mplsLdpLspFecTable, which associates FECs with the LSPs.

3.5.10. The LDP Session Peer Address Table

The MPLS LDP Session Peer Address Table is a table which extends the mplsLdpSessionTable. This table is a read-only table which stores Addresses learned after session initialization via Address Message advertisement.

3.6. LDP Notifications

Currently, there are several notifications which are specific for LDP. These are described in this section. There are no objects which enable or disable notifications from being generated. RFC 3413 [RFC3413] contains MIB modules which can be implemented that will enable or disable these notifications from being generated.

The mplsLdpInitSessionThresholdExceeded notification indicates to the operator that there may be a misconfigured mplsLdpEntityEntry because the session associated with this Entity is not being established, and
the Entity keeps trying to establish the session. A side effect of this situation is that a row in the mplsLdpSessionTable may not be reaching the operational state as indicated by the mplsLdpSessionState object. If the value of mplsLdpEntityInitSessionThreshold is 0 (zero) then this is equal to specifying the value of infinity for the threshold, and the mplsLdpInitSessionThresholdExceeded notification will never be sent.

The mplsLdpPathVectorLimitMismatch notification is generated when there is a mismatch in the Path Vector Limits between the Entity and Peer during session initialization. The session uses the value which is configured as the Entity’s Path Vector Limit. However, a notification should be generated to indicate that a mismatch occurred. For further details, please see Section 3.5.3 of the LDP Specification [RFC3036].

The mplsLdpSessionUp and mplsLdpSessionDown notifications are generated when there is an appropriate change in the mplsLdpSessionState object, e.g. when sessions change state (Up to Down for the mplsLdpSessionDown notification, or Down to Up for the mplsLdpSessionUp notification). There was discussion about combining these two notifications into a single notification, however, some NMS applications can utilize two different notifications, rather than having to parse the varbind list of a single notification. For example, the SessionDown is matched to a SessionUp notification more easily by some NMS applications, than having to parse a Varbind list in a SessionChange type of notification.

3.7. LDP Notification Frequency

LDP Notifications are expected to be few in number when LDP is ubiquitously deployed in a relatively stable network. A notification receiver, e.g. an NMS, that receives these notifications should not be overwhelmed by the frequency of LDP notifications. If this assertion proves to be inaccurate, then a throttling object to throttle these notifications may be added to future versions of the MPLS-LDP-STD-MIB.

4. MPLS Label Distribution Protocol MIB Definitions

MPLS-LDP-STD-MIB DEFINITIONS ::= BEGIN

IMPORTS

OBJECT-TYPE, MODULE-IDENTITY, NOTIFICATION-TYPE,
Internet32, Counter32, Unsigned32
FROM SNMPv2-SMI
MODULE-COMPLIANCE, OBJECT-GROUP, NOTIFICATION-GROUP
FROM SNMPv2-CONF

RowStatus, TimeInterval, TruthValue,
TimeStamp, StorageType
FROM SNMPv2-TC

InetAddressPrefixLength,
InetAddressType,
InetAddress,
InetPortNumber
FROM INET-ADDRESS-MIB

IndexInteger,
IndexIntegerNextFree
FROM DIFFSERV-MIB

mplsStdMIB,
MplsLabelDistributionMethod,
MplsLdpIdentifier,
MplsLdpTokenType,
MplsLspType,
MplsLsrIdentifier,
MplsRetentionMode
FROM MPLS-TC-STD-MIB

MplsIndexType
FROM MPLS-LSR-STD-MIB;

mplsLdpStdMIB MODULE-IDENTITY
LAST-UPDATED "200311181200Z"  -- 18 November 2003
ORGANIZATION "Multiprotocol Label Switching (mpls)
Working Group"

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DESCRIPTION
"Copyright (C) The Internet Society (2003). This version of this MIB module is part of RFCXXX; see the RFC itself for full legal notices.

This MIB contains managed object definitions for the 'Multiprotocol Label Switching, Label Distribution Protocol, LDP' document."

REVISION "200311181200Z" -- 18 November 2003
DESCRIPTION
"Initial version published as part of RFC XXXX."

-- Please see the IANA Considerations Section.
-- The requested mplsStdMIB subId is 4, e.g.
-- := { mplsStdMIB 4 }:

:= { mplsStdMIB XXX } -- to be assigned by IANA

--****************************************************************
mplsLdpNotifications OBJECT IDENTIFIER ::= { mplsLdpStdMIB 0 }
mplsLdpObjects OBJECT IDENTIFIER ::= { mplsLdpStdMIB 1 }
mplsLdpConformance OBJECT IDENTIFIER ::= { mplsLdpStdMIB 2 }
--****************************************************************
-- MPLS LDP Objects
--******************************************************************

mplsLdpLsrObjects OBJECT IDENTIFIER ::= { mplsLdpObjects 1 }

mplsLdpEntityObjects OBJECT IDENTIFIER ::= { mplsLdpObjects 2 }

--
-- The MPLS Label Distribution Protocol’s
-- Label Switching Router Objects
--
mplsLdpLsrId OBJECT-TYPE
SYNTAX      MplsLsrIdentifier
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION  "The Label Switching Router’s Identifier."
 ::= { mplsLdpLsrObjects 1 }

mplsLdpLsrLoopDetectionCapable OBJECT-TYPE
SYNTAX      INTEGER {
            none(1),
            other(2),
            hopCount(3),
            pathVector(4),
            hopCountAndPathVector(5)
            }
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION  "A indication of whether this
Label Switching Router supports
loop detection.

            none(1) -- Loop Detection is not supported
            on this LSR.

            other(2) -- Loop Detection is supported but
            by a method other than those
            listed below.

            hopCount(3) -- Loop Detection is supported by
            Hop Count only.

            pathVector(4) -- Loop Detection is supported by
            Path Vector only.

            hopCountAndPathVector(5) -- Loop Detection is
            supported by both Hop Count
            And Path Vector.

Since Loop Detection is determined during
Session Initialization, an individual session
may not be running with loop detection. This
object simply gives an indication of whether or not the
LSR has the ability to support Loop Detection and
which types."
::= { mplsLdpLsrObjects 2 }

--
-- The MPLS Label Distribution Protocol Entity Objects
--

mplsLdpEntityLastChange OBJECT-TYPE
SYNTAX TimeStamp
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"The value of sysUpTime at the time of the most recent addition or deletion of an entry to/from the mplsLdpEntityTable/mplsLdpEntityStatsTable, or the most recent change in value of any objects in the mplsLdpEntityTable. If no such changes have occurred since the last re-initialization of the local management subsystem, then this object contains a zero value."
::= { mplsLdpEntityObjects 1 }

mplsLdpEntityIndexNext OBJECT-TYPE
SYNTAX IndexIntegerNextFree
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"This object contains an appropriate value to be used for mplsLdpEntityIndex when creating entries in the mplsLdpEntityTable. The value 0 indicates that no unassigned entries are available."
::= { mplsLdpEntityObjects 2 }

mplsLdpEntityTable OBJECT-TYPE
SYNTAX SEQUENCE OF MplsLdpEntityEntry
MAX-ACCESS not-accessible
STATUS current
DESCRIPTION
"This table contains information about the MPLS Label Distribution Protocol Entities which exist on this Label Switching Router (LSR) or Label Edge Router (LER)."
::= { mplsLdpEntityObjects 3 }

mplsLdpEntityEntry OBJECT-TYPE
SYNTAX      MplsLdpEntityEntry
MAX-ACCESS  not-accessible
STATUS      current
DESCRIPTION  "An entry in this table represents an LDP entity. An entry can be created by a network administrator or by an SNMP agent as instructed by LDP."
INDEX       { mplsLdpEntityLdpId, mplsLdpEntityIndex }
::= { mplsLdpEntityTable 1 }

MplsLdpEntityEntry ::= SEQUENCE {
  mplsLdpEntityLdpId                MplsLdpIdentifier,
  mplsLdpEntityIndex                IndexInteger,
  mplsLdpEntityProtocolVersion      Unsigned32,
  mplsLdpEntityAdminStatus          INTEGER,
  mplsLdpEntityOperStatus           INTEGER,
  mplsLdpEntityTcpDscPort           InetPortNumber,
  mplsLdpEntityUdpDscPort           InetPortNumber,
  mplsLdpEntityMaxPduLength         Unsigned32,
  mplsLdpEntityKeepAliveHoldTimer   Unsigned32,
  mplsLdpEntityHelloHoldTimer       Unsigned32,
  mplsLdpEntityInitSessionThreshold Integer32,
  mplsLdpEntityLabelDistMethod      MplsLabelDistributionMethod,
  mplsLdpEntityLabelRetentionMode   MplsRetentionMode,
  mplsLdpEntityPathVectorLimit      Integer32,
  mplsLdpEntityHopCountLimit        Integer32,
  mplsLdpEntityTransportAddrKind    INTEGER,
  mplsLdpEntityTargetPeer           TruthValue,
  mplsLdpEntityTargetPeerAddrType   InetAddressType,
  mplsLdpEntityTargetPeerAddr       InetAddress,
  mplsLdpEntityLabelType            MplsLdpLabelType,
  mplsLdpEntityDiscontinuityTime    TimeStamp,
  mplsLdpEntityStorageType          StorageType,
  mplsLdpEntityRowStatus            RowStatus
}

mplsLdpEntityLdpId OBJECT-TYPE
SYNTAX      MplsLdpIdentifier
MAX-ACCESS  not-accessible
STATUS      current
DESCRIPTION  "The LDP identifier."
REFERENCE
"RFC3036, LDP Specification, Section on LDP Identifiers."

```text
::= { mplsLdpEntityEntry 1 }
```

<table>
<thead>
<tr>
<th>mplsLdpEntityIndex OBJECT-TYPE</th>
</tr>
</thead>
<tbody>
<tr>
<td>SYNTAX</td>
</tr>
<tr>
<td>MAX-ACCESS</td>
</tr>
<tr>
<td>STATUS</td>
</tr>
</tbody>
</table>

DESCRIPTION
"This index is used as a secondary index to uniquely identify this row. Before creating a row in this table, the 'mplsLdpEntityIndexNext' object should be retrieved. That value should be used for the value of this index when creating a row in this table. NOTE: if a value of zero (0) is retrieved, that indicates that no rows can be created in this table at this time.

A secondary index (this object) is meaningful to some but not all, LDP implementations. For example an LDP implementation which uses PPP would use this index to differentiate PPP sub-links.

Another way to use this index is to give this the value of ifIndex. However, this is dependant on the implementation."

```text
::= { mplsLdpEntityEntry 2 }
```

<table>
<thead>
<tr>
<th>mplsLdpEntityProtocolVersion OBJECT-TYPE</th>
</tr>
</thead>
<tbody>
<tr>
<td>SYNTAX</td>
</tr>
<tr>
<td>MAX-ACCESS</td>
</tr>
<tr>
<td>STATUS</td>
</tr>
</tbody>
</table>

DESCRIPTION
"The version number of the LDP protocol which will be used in the session initialization message.

Section 3.5.3 in the LDP Specification specifies that the version of the LDP protocol is negotiated during session establishment. The value of this object represents the value that is sent in the initialization message."

REFERENCE
"RFC3036, LDP Specification, Section 3.5.3 Initialization Message."

DEFVAL { 1 }

```text
::= { mplsLdpEntityEntry 3 }
```
mplsLdpEntityAdminStatus OBJECT-TYPE
SYNTAX INTEGER {
   enable(1),
   disable(2)
}
MAX-ACCESS read-create
STATUS current
DESCRIPTION
"The administrative status of this LDP Entity. If this object is changed from 'enable' to 'disable' and this entity has already attempted to establish contact with a Peer, then all contact with that Peer is lost and all information from that Peer needs to be removed from the MIB. (This implies that the network management subsystem should clean up any related entry in the mplsLdpPeerTable. This further implies that a 'tear-down' for that session is issued and the session and all information related to that session cease to exist). At this point the operator is able to change values which are related to this entity. When the admin status is set back to 'enable', then this Entity will attempt to establish a new session with the Peer."
DEFVAL { enable }
::= { mplsLdpEntityEntry 4 }

mplsLdpEntityOperStatus OBJECT-TYPE
SYNTAX INTEGER {
   unknown(1),
   enabled(2),
   disabled(3)
}
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"The operational status of this LDP Entity. The value of unknown(1) indicates that the operational status cannot be determined at this time. The value of unknown should be a transient condition before changing to enabled(2) or disabled(3)."
::= { mplsLdpEntityEntry 5 }

mplsLdpEntityTcpDscPort OBJECT-TYPE
SYNTAX     InetPortNumber
MAX-ACCESS read-create
STATUS     current
DESCRIPTION "The TCP Discovery Port for LDP. The default value is the well-known value of this port."
REFERENCE "RFc3036, LDP Specification, Section 2.4.1, Basic Discovery Mechanism, Section 2.4.2, Extended Discovery Mechanism, Section 3.10, Well-known Numbers, and Section 3.10.1. UDP and TCP Ports."
DEFVAL { 646 }
::= { mplsLdpEntityEntry 6 }

mplsLdpEntityUdpDscPort OBJECT-TYPE
SYNTAX     InetPortNumber
MAX-ACCESS read-create
STATUS     current
DESCRIPTION "The UDP Discovery Port for LDP. The default value is the well-known value for this port."
REFERENCE "RFC3036, LDP Specification, Section 2.4.1, Basic Discovery Mechanism, Section 2.4.2, Extended Discovery Mechanism, Section 3.10, Well-known Numbers, and Section 3.10.1. UDP and TCP Ports."
DEFVAL { 646 }
::= { mplsLdpEntityEntry 7 }

mplsLdpEntityMaxPduLength OBJECT-TYPE
SYNTAX     Unsigned32 (256..65535)
UNIT "octets"
MAX-ACCESS read-create
STATUS     current
DESCRIPTION "The maximum PDU Length that is sent in the Common Session Parameters of an Initialization Message. According to the LDP Specification [RFC3036] a value of 255 or less specifies the..."
default maximum length of 4096 octets, this is why
the value of this object starts at 256. The operator
should explicitly choose the default value (i.e. 4096),
or some other value.

The receiving LSR MUST calculate the maximum PDU
length for the session by using the smaller of its and
its peer's proposals for Max PDU Length.

REFERENCE
"RFC3036, LDP Specification, Section 3.5.3.
Initialization Message."
DEFVAL { 4096 }
 ::= { mplsLdpEntityEntry 8 }

mplsLdpEntityKeepAliveHoldTimer OBJECT-TYPE
SYNTAX       Unsigned32 (1..65535)
UNITS        "seconds"
MAX-ACCESS   read-create
STATUS       current
DESCRIPTION
 "The 16-bit integer value which is the proposed keep
 alive hold timer for this LDP Entity."
DEFVAL { 40 }
 ::= { mplsLdpEntityEntry 9 }

mplsLdpEntityHelloHoldTimer OBJECT-TYPE
SYNTAX       Unsigned32 (0..65535)
UNITS        "seconds"
MAX-ACCESS   read-create
STATUS       current
DESCRIPTION
 "The 16-bit integer value which is the proposed Hello
 hold timer for this LDP Entity. The Hello Hold time
 in seconds.

An LSR maintains a record of Hellos received
from potential peers. This object represents
the Hold Time in the Common Hello Parameters TLV of
the Hello Message.

A value of 0 is a default value and should be
interpreted in conjunction with the
mplsLdpEntityTargetPeer object.

If the value of this object is 0; if the value of the
mplsLdpEntityTargetPeer object is false(2), then this
specifies that the Hold Time’s actual default value is 15 seconds (i.e. the default Hold time for Link Hellos is 15 seconds). Otherwise if the value of the mplsLdpEntityTargetPeer object is true(1), then this specifies that the Hold Time’s actual default value is 45 seconds (i.e. the default Hold time for Targeted Hellos is 45 seconds).

A value of 65535 means infinite (i.e. wait forever).

All other values represent the amount of time in seconds to wait for a Hello Message. Setting the hold time to a value smaller than 15 is not recommended, although not forbidden according to RFC3036.

REFERENCE

"RFC3036, LDP Specification, Section 3.5.2., Hello Message."

DEFVAL { 0 }
::= { mplsLdpEntityEntry 10 }

mplsLdpEntityInitSessionThreshold OBJECT-TYPE
SYNTAX      Integer32(0..100)
MAX-ACCESS  read-create
STATUS      current
DESCRIPTION
"When attempting to establish a session with a given Peer, the given LDP Entity should send out the SNMP notification, 'mplsLdpInitSessionThresholdExceeded', when the number of Session Initialization messages sent exceeds this threshold.

The notification is used to notify an operator when this Entity and its Peer are possibly engaged in an endless sequence of messages as each NAKs the other’s Initialization messages with Error Notification messages. Setting this threshold which triggers the notification is one way to notify the operator. The notification should be generated each time this threshold is exceeded and for every subsequent Initialization message which is NAK’d with an Error Notification message after this threshold is exceeded."
A value of 0 (zero) for this object indicates that the threshold is infinity, thus the SNMP notification will never be generated.

REFERENCE
"RFC3036, LDP Specification, Section 2.5.3 Session Initialization."

DEFVAL { 8 }
::= { mplsLdpEntityEntry 11 }

mplsLdpEntityLabelDistMethod OBJECT-TYPE
SYNTAX MplsLabelDistributionMethod
MAX-ACCESS read-create
STATUS current
DESCRIPTION
"For any given LDP session, the method of label distribution must be specified."
::= { mplsLdpEntityEntry 12 }

mplsLdpEntityLabelRetentionMode OBJECT-TYPE
SYNTAX MplsRetentionMode
MAX-ACCESS read-create
STATUS current
DESCRIPTION
"The LDP Entity can be configured to use either conservative or liberal label retention mode.

If the value of this object is conservative(1) then advertised label mappings are retained only if they will be used to forward packets, i.e. if label came from a valid next hop.

If the value of this object is liberal(2) then all advertised label mappings are retained whether they are from a valid next hop or not."
::= { mplsLdpEntityEntry 13 }

mplsLdpEntityPathVectorLimit OBJECT-TYPE
SYNTAX Integer32 (0..255)
MAX-ACCESS read-create
STATUS current
DESCRIPTION
"If the value of this object is 0 (zero) then Loop Detection for Path Vectors is disabled.

Otherwise, if this object has a value greater than"
zero, then Loop Detection for Path Vectors is enabled, and the Path Vector Limit is this value. Also, the value of the object, ‘mplsLdpLsrLoopDetectionCapable’, must be set to either ‘pathVector(4)’ or ‘hopCountAndPathVector(5)’, if this object has a value greater than 0 (zero), otherwise it is ignored."

REFERENCE
"RFC3036, LDP Specification, Section 2.8 Loop Detection, Section 3.4.5 Path Vector TLV."

::= { mplsLdpEntityEntry 14 }

mplsLdpEntityHopCountLimit OBJECT-TYPE
SYNTAX       Integer32 (0..255)
MAX-ACCESS   read-create
STATUS       current
DESCRIPTION
"If the value of this object is 0 (zero), then Loop Detection using Hop Counters is disabled. If the value of this object is greater than 0 (zero) then Loop Detection using Hop Counters is enabled, and this object specifies this Entity’s maximum allowable value for the Hop Count. Also, the value of the object mplsLdpLsrLoopDetectionCapable must be set to either ‘hopCount(3)’ or ‘hopCountAndPathVector(5)’ if this object has a value greater than 0 (zero), otherwise it is ignored."
DEFVAL { 0 }
::= { mplsLdpEntityEntry 15 }

mplsLdpEntityTransportAddrKind OBJECT-TYPE
SYNTAX     INTEGER {
            interface(1),
            loopback(2)
        }
MAX-ACCESS read-create
STATUS     current
DESCRIPTION
"This specifies whether the loopback or interface address is to be used as the transport address in the transport address TLV of the
hello message.

If the value is interface(1), then the IP address of the interface from which hello messages are sent is used as the transport address in the hello message.

Otherwise, if the value is loopback(2), then the IP address of the loopback interface is used as the transport address in the hello message.

DEFVAL { loopback }
 ::= ( mplsLdpEntityEntry 16 )

mplsLdpEntityTargetPeer OBJECT-TYPE
 SYNTAX   TruthValue
 MAX-ACCESS read-create
 STATUS    current
 DESCRIPTION
   "If this LDP entity uses targeted peer then set this to true."
 DEFVAL { false }
 ::= ( mplsLdpEntityEntry 17 )

mplsLdpEntityTargetPeerAddrType OBJECT-TYPE
 SYNTAX   InetAddressType
 MAX-ACCESS read-create
 STATUS    current
 DESCRIPTION
   "The type of the internetwork layer address used for the Extended Discovery. This object indicates how the value of mplsLdpEntityTargetPeerAddr is to be interpreted."
 ::= ( mplsLdpEntityEntry 18 )

mplsLdpEntityTargetPeerAddr OBJECT-TYPE
 SYNTAX   InetAddress
 MAX-ACCESS read-create
 STATUS    current
 DESCRIPTION
   "The value of the internetwork layer address used for the Extended Discovery. The value of mplsLdpEntityTargetPeerAddrType specifies how this address is to be interpreted."
 ::= ( mplsLdpEntityEntry 19 )

mplsLdpEntityLabelType OBJECT-TYPE
SYNTAX MplsLdpLabelType
MAX-ACCESS read-create
STATUS current
DESCRIPTION
"Specifies the optional parameters for the LDP Initialization Message.

If the value is generic(1) then no optional parameters will be sent in the LDP Initialization message associated with this Entity.

If the value is atmParameters(2) then a row must be created in the mplsLdpEntityAtmTable, which corresponds to this entry.

If the value is frameRelayParameters(3) then a row must be created in the mplsLdpEntityFrameRelayTable, which corresponds to this entry."
REFERENCE
"RFC3036, LDP Specification, Section 3.5.3., Initialization Message."
 ::= ( mplsLdpEntityEntry 20 )

mplsLdpEntityDiscontinuityTime OBJECT-TYPE
SYNTAX TimeStamp
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"The value of sysUpTime on the most recent occasion at which any one or more of this entity’s counters suffered a discontinuity. The relevant counters are the specific instances associated with this entity of any Counter32 object contained in the ‘mplsLdpEntityStatsTable’. If no such discontinuities have occurred since the last re-initialization of the local management subsystem, then this object contains a zero value."
 ::= ( mplsLdpEntityEntry 21 )

mplsLdpEntityStorageType OBJECT-TYPE
SYNTAX StorageType

Expires May 2004
MAX-ACCESS  read-create
STATUS      current
DESCRIPTION  
  "The storage type for this conceptual row.
  Conceptual rows having the value ‘permanent(4)’
  need not allow write-access to any columnar
  objects in the row."
DEFVAL{ nonVolatile }
::= { mplsLdpEntityEntry 22 }

mplsLdpEntityRowStatus OBJECT-TYPE
SYNTAX      RowStatus
MAX-ACCESS  read-create
STATUS      current
DESCRIPTION  
  "The status of this conceptual row. All writable
  objects in this row may be modified at any
  time, however, as described in detail in
  the section entitled, ‘Changing Values After
  Session Establishment’, and again described
  in the DESCRIPTION clause of the
  mplsLdpEntityAdminStatus object, if a session
  has been initiated with a Peer, changing objects
  in this table will wreak havoc with the session
  and interrupt traffic. To repeat again:
  the recommended procedure is to
  set the mplsLdpEntityAdminStatus to down, thereby
  explicitly causing a session to be torn down. Then,
  change objects in this entry, then set
  the mplsLdpEntityAdminStatus to enable,
  which enables a new session to be initiated."
::= { mplsLdpEntityEntry 23 }

--  The MPLS LDP Entity Statistics Table
--

mplsLdpEntityStatsTable OBJECT-TYPE
SYNTAX      SEQUENCE OF MplsLdpEntityStatsEntry
MAX-ACCESS  not-accessible
STATUS      current
DESCRIPTION  
  "This table is a read-only table which augments
  the mplsLdpEntityTable. The purpose of this
  table is to keep statistical information about
the LDP Entities on the LSR.
::= { mplsLdpEntityObjects 4 }

mplsLdpEntityStatsEntry OBJECT-TYPE
SYNTAX MplsLdpEntityStatsEntry
MAX-ACCESS not-accessible
STATUS current
DESCRIPTION
"A row in this table contains statistical information about an LDP Entity. Some counters contained in a row are for fatal errors received during a former LDP Session associated with this entry. For example, an LDP PDU received on a TCP connection during an LDP Session contains a fatal error. That error is counted here, because the session is terminated.

If the error is NOT fatal (i.e. the Session remains), then the error is counted in the mplsLdpSessionStatsEntry."
AUGMENTS { mplsLdpEntityEntry } ::= { mplsLdpEntityStatsTable 1 }

MplsLdpEntityStatsEntry ::= SEQUENCE {
    mplsLdpEntityStatsSessionAttempts Counter32,
    mplsLdpEntityStatsSessionRejectedNoHelloErrors Counter32,
    mplsLdpEntityStatsSessionRejectedAdErrors Counter32,
    mplsLdpEntityStatsSessionRejectedMaxPduErrors Counter32,
    mplsLdpEntityStatsSessionRejectedLRErrors Counter32,
    mplsLdpEntityStatsBadLdpIdentifierErrors Counter32,
    mplsLdpEntityStatsBadPduLengthErrors Counter32,
    mplsLdpEntityStatsBadMessageLengthErrors Counter32,
    mplsLdpEntityStatsBadTlvLengthErrors Counter32,
    mplsLdpEntityStatsMalformedTlvValueErrors Counter32,
    mplsLdpEntityStatsKeepAliveTimerExpErrors Counter32,
    mplsLdpEntityStatsShutdownReceivedNotifications Counter32,
    mplsLdpEntityStatsShutdownSentNotifications Counter32
}

mplsLdpEntityStatsSessionAttempts OBJECT-TYPE
SYNTAX Counter32
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"A count of the Session Initialization messages which were sent or received by this LDP Entity and
were NAK’d. In other words, this counter counts the number of session initializations that failed.

Discontinuities in the value of this counter can occur at re-initialization of the management system, and at other times as indicated by the value of mplsLdpEntityDiscontinuityTime."

::= { mplsLdpEntityStatsEntry 1 }

mplsLdpEntityStatsSessionRejectedNoHelloErrors OBJECT-TYPE
SYNTAX Counter32
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"A count of the Session Rejected/No Hello Error Notification Messages sent or received by this LDP Entity.

Discontinuities in the value of this counter can occur at re-initialization of the management system, and at other times as indicated by the value of mplsLdpEntityDiscontinuityTime."

::= { mplsLdpEntityStatsEntry 2 }

mplsLdpEntityStatsSessionRejectedAdErrors OBJECT-TYPE
SYNTAX Counter32
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"A count of the Session Rejected/Parameters Advertisement Mode Error Notification Messages sent or received by this LDP Entity.

Discontinuities in the value of this counter can occur at re-initialization of the management system, and at other times as indicated by the value of mplsLdpEntityDiscontinuityTime."

::= { mplsLdpEntityStatsEntry 3 }

mplsLdpEntityStatsSessionRejectedMaxPduErrors OBJECT-TYPE
SYNTAX Counter32
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"A count of the Session Rejected/Parameters
Max Pdu Length Error Notification Messages sent or received by this LDP Entity.

Discontinuities in the value of this counter can occur at re-initialization of the management system, and at other times as indicated by the value of mplsLdpEntityDiscontinuityTime.

::= { mplsLdpEntityStatsEntry 4 }

mplsLdpEntityStatsSessionRejectedLRErrors OBJECT-TYPE
SYNTAX Counter32
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"A count of the Session Rejected/Parameters Label Range Notification Messages sent or received by this LDP Entity.

Discontinuities in the value of this counter can occur at re-initialization of the management system, and at other times as indicated by the value of mplsLdpEntityDiscontinuityTime."

::= { mplsLdpEntityStatsEntry 5 }

mplsLdpEntityStatsBadLdpIdentifierErrors OBJECT-TYPE
SYNTAX Counter32
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"This object counts the number of Bad LDP Identifier Fatal Errors detected by the session(s) (past and present) associated with this LDP Entity.

Discontinuities in the value of this counter can occur at re-initialization of the management system, and at other times as indicated by the value of mplsLdpEntityDiscontinuityTime."

REFERENCE
"RFC3036, LDP Specification, Section 3.5.1.2."
::= { mplsLdpEntityStatsEntry 6 }

mplsLdpEntityStatsBadPduLengthErrors OBJECT-TYPE
SYNTAX Counter32
MAX-ACCESS read-only
STATUS current
DESCRIPTION

"This object counts the number of Bad PDU Length Fatal Errors detected by the session(s) (past and present) associated with this LDP Entity.

Discontinuities in the value of this counter can occur at re-initialization of the management system, and at other times as indicated by the value of mplsLdpEntityDiscontinuityTime."

REFERENCE

"RFC3036, LDP Specification, Section 3.5.1.2."
::= { mplsLdpEntityStatsEntry 7 }

mplsLdpEntityStatsBadMessageLengthErrors OBJECT-TYPE
SYNTAX Counter32
MAX-ACCESS read-only
STATUS current
DESCRIPTION

"This object counts the number of Bad Message Length Fatal Errors detected by the session(s) (past and present) associated with this LDP Entity.

Discontinuities in the value of this counter can occur at re-initialization of the management system, and at other times as indicated by the value of mplsLdpEntityDiscontinuityTime."

REFERENCE

"RFC3036, LDP Specification, Section 3.5.1.2."
::= { mplsLdpEntityStatsEntry 8 }

mplsLdpEntityStatsBadTlvLengthErrors OBJECT-TYPE
SYNTAX Counter32
MAX-ACCESS read-only
STATUS current
DESCRIPTION

"This object counts the number of Bad TLV Length Fatal Errors detected by the session(s) (past and present) associated with this LDP Entity.

Discontinuities in the value of this counter can occur at re-initialization of the management system, and at other times as indicated by the value of mplsLdpEntityDiscontinuityTime."

REFERENCE

"RFC3036, LDP Specification, Section 3.5.1.2."
::= { mplsLdpEntityStatsEntry 9 }
mplsLdpEntityStatsMalformedTlvValueErrors OBJECT-TYPE
SYNTAX      Counter32
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION
"This object counts the number of Malformed TLV Value Fatal Errors detected by the session(s) (past and present) associated with this LDP Entity.

Discontinuities in the value of this counter can occur at re-initialization of the management system, and at other times as indicated by the value of mplsLdpEntityDiscontinuityTime."
REFERENCE
"RFC3036, LDP Specification, Section 3.5.1.2."
::= { mplsLdpEntityStatsEntry 10 }

mplsLdpEntityStatsKeepAliveTimerExpErrors OBJECT-TYPE
SYNTAX      Counter32
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION
"This object counts the number of Session Keep Alive Timer Expired Errors detected by the session(s) (past and present) associated with this LDP Entity.

Discontinuities in the value of this counter can occur at re-initialization of the management system, and at other times as indicated by the value of mplsLdpEntityDiscontinuityTime."
REFERENCE
"RFC3036, LDP Specification, Section 3.5.1.2."
::= { mplsLdpEntityStatsEntry 11 }

mplsLdpEntityStatsShutdownReceivedNotifications OBJECT-TYPE
SYNTAX      Counter32
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION
"This object counts the number of Shutdown Notifications received related to session(s) (past and present) associated with this LDP Entity.

Discontinuities in the value of this counter can occur at re-initialization of the management system, and at
other times as indicated by the value of
mplsLdpEntityDiscontinuityTime."
::= { mplsLdpEntityStatsEntry 12 }

mplsLdpEntityStatsShutdownSentNotifications OBJECT-TYPE
SYNTAX Counter32
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"This object counts the number of Shutdown Notfications
sent related to session(s) (past and present) associated
with this LDP Entity.

Discontinuities in the value of this counter can occur
at re-initialization of the management system, and at
other times as indicated by the value of
mplsLdpEntityDiscontinuityTime."
::= { mplsLdpEntityStatsEntry 13 }

--
-- The MPLS LDP Peer Table
--

mplsLdpSessionObjects OBJECT IDENTIFIER ::= { mplsLdpObjects 3 }

mplsLdpPeerLastChange OBJECT-TYPE
SYNTAX TimeStamp
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"The value of sysUpTime at the time of the most
recent addition or deletion to/from the
mplsLdpPeerTable/mlplsLdpSessionTable."
::= { mplsLdpSessionObjects 1 }

mplsLdpPeerTable OBJECT-TYPE
SYNTAX SEQUENCE OF MplsLdpPeerEntry
MAX-ACCESS not-accessible
STATUS current
DESCRIPTION
"Information about LDP peers known by Entities in
the mplsLdpEntityTable. The information in this table
is based on information from the Entity-Peer interaction
during session initialization but is not appropriate
for the mplsLdpSessionTable, because objects in this
table may or may not be used in session establishment.

::= { mplsLdpSessionObjects 2 }

mplsLdpPeerEntry OBJECT-TYPE
SYNTAX      MplsLdpPeerEntry
MAX-ACCESS  not-accessible
STATUS      current
DESCRIPTION
"Information about a single Peer which is related
to a Session. This table is augmented by
the mplsLdpSessionTable."
INDEX       { mplsLdpEntityLdpId,
mplsLdpEntityIndex,
mplsLdpPeerLdpId }

::= { mplsLdpPeerTable 1 }

MplsLdpPeerEntry ::= SEQUENCE {
  mplsLdpPeerLdpId                MplsLdpIdentifier,
mplsLdpPeerLabelDistMethod      MplsLabelDistributionMethod,
mplsLdpPeerPathVectorLimit      Integer32,
mplsLdpPeerTransportAddrType    InetAddressType,
mplsLdpPeerTransportAddr        InetAddress
}

mplsLdpPeerLdpId OBJECT-TYPE
SYNTAX      MplsLdpIdentifier
MAX-ACCESS  not-accessible
STATUS      current
DESCRIPTION
"The LDP identifier of this LDP Peer."

::= { mplsLdpPeerEntry 1 }

mplsLdpPeerLabelDistMethod OBJECT-TYPE
SYNTAX      MplsLabelDistributionMethod
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION
"For any given LDP session, the method of
label distribution must be specified."

::= { mplsLdpPeerEntry 2 }

mplsLdpPeerPathVectorLimit OBJECT-TYPE
SYNTAX      Integer32 (0..255)
MAX-ACCESS  read-only
STATUS      current

Expires May 2004
DESCRIPTION

"If the value of this object is 0 (zero) then
Loop Dection for Path Vectors for this Peer
is disabled.
Otherwise, if this object has a value greater than
zero, then Loop Dection for Path Vectors for this
Peer is enabled and the Path Vector Limit is this value."

REFERENCE

"RFC3036, LDP Specification, Section 2.8 Loop Dection,
Section 3.4.5 Path Vector TLV."

::= { mplsLdpPeerEntry 3 }

mplsLdpPeerTransportAddrType OBJECT-TYPE
SYNTAX      InetAddressType
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION

"The type of the Internet address for the
mplsLdpPeerTransportAddr object. The LDP
specification describes this as being either
an IPv4 Transport Address or IPv6 Transport
Address which is used in opening the LDP session’s
TCP connection, or if the optional TLV is not
present, then this is the IPv4/IPv6 source
address for the UDP packet carrying the Hellos.

This object specifies how the value of the
mplsLdpPeerTransportAddr object should be
interpreted."

REFERENCE

"RFC3036, LDP Specification, Section 2.5.2
Transport Connection Establishment and
Section 3.5.2.1 Hello Message Procedures."
::= { mplsLdpPeerEntry 4 }

mplsLdpPeerTransportAddr OBJECT-TYPE
SYNTAX      InetAddress
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION

"The Internet address advertised by the peer
in the Hello Message or the Hello source address.

The type of this address is specified by the

value of the mplsLdpPeerTransportAddrType object.

REFERENCE
"RFC3036, LDP Specification, Section 2.5.2 Transport Connection Establishment and Section 3.5.2.1 Hello Message Procedures."

::= { mplsLdpPeerEntry 5 }

-- The MPLS LDP Sessions Table
--

mplsLdpSessionTable OBJECT-TYPE
SYNTAX      SEQUENCE OF MplsLdpSessionEntry
MAX-ACCESS  not-accessible
STATUS      current
DESCRIPTION
"A table of Sessions between the LDP Entities and LDP Peers. This table AUGMENTS the mplsLdpPeerTable. Each row in this table represents a single session."

::= { mplsLdpSessionObjects 3 }

mplsLdpSessionEntry OBJECT-TYPE
SYNTAX      MplsLdpSessionEntry
MAX-ACCESS  not-accessible
STATUS      current
DESCRIPTION
"An entry in this table represents information on a single session between an LDP Entity and LDP Peer. The information contained in a row is read-only.

Please note: the Path Vector Limit for the Session is the value which is configured in the corresponding mplsLdpEntityEntry. The Peer's Path Vector Limit is in the mplsLdpPeerPathVectorLimit object in the mplsLdpPeerTable.

Values which may differ from those configured are noted in the objects of this table, the mplsLdpAtmSessionTable and the mplsLdpFrameRelaySessionTable. A value will differ if it was negotiated between the Entity and the Peer. Values may or may not
be negotiated. For example, if the values are the same then no negotiation takes place. If they are negotiated, then they may differ."

AUGMENTS { mplsLdpPeerEntry }
 ::= { mplsLdpSessionTable 1 }

MplsLdpSessionEntry ::= SEQUENCE {
    mplsLdpSessionStateLastChange       TimeStamp,
    mplsLdpSessionState                 INTEGER,
    mplsLdpSessionRole                  INTEGER,
    mplsLdpSessionProtocolVersion       Unsigned32,
    mplsLdpSessionKeepAliveHoldTimeRem  TimeInterval,
    mplsLdpSessionKeepAliveTime         Unsigned32,
    mplsLdpSessionMaxPduLength          Unsigned32,
    mplsLdpSessionDiscontinuityTime     TimeStamp
}

mplsLdpSessionStateLastChange OBJECT-TYPE
 SYNTAX TimeStamp
 MAX-ACCESS read-only
 STATUS current
 DESCRIPTION
 "The value of sysUpTime at the time this Session entered its current state as denoted by the mplsLdpSessionState object."
 ::= { mplsLdpSessionEntry 1 }

mplsLdpSessionState OBJECT-TYPE
 SYNTAX INTEGER {
    nonexistent(1),
    initialized(2),
    openrec(3),
    opensent(4),
    operational(5)
 } MAX-ACCESS read-only
 STATUS current
 DESCRIPTION
 "The current state of the session, all of the states 1 to 5 are based on the state machine for session negotiation behavior."

REFERENCE
 "RFC3036, LDP Specification, Section 2.5.4, Initialization State Machine."
 ::= { mplsLdpSessionEntry 2 }

Expires May 2004
mplsLdpSessionRole OBJECT-TYPE
SYNTAX      INTEGER {
    unknown(1),
    active(2),
    passive(3)
}
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION
"During session establishment the LSR/LER takes either
the active role or the passive role based on address
comparisons. This object indicates whether this LSR/LER
was behaving in an active role or passive role during
this session’s establishment.

The value of unknown(1), indicates that the role is not
able to be determined at the present time."
REFERENCE
"RFC3036, LDP Specification, Section 2.5.3.,
Session Initialization"
::= { mplsLdpSessionEntry 3 }

mplsLdpSessionProtocolVersion OBJECT-TYPE
SYNTAX      Unsigned32(1..65535)
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION
"The version of the LDP Protocol which
this session is using. This is the version of
the LDP protocol which has been negotiated
during session initialization."
REFERENCE
"RFC3036, LDP Specification, Section 3.5.3,
Initialization Message."
::= { mplsLdpSessionEntry 4 }

mplsLdpSessionKeepAliveHoldTimeRem OBJECT-TYPE
SYNTAX      TimeInterval
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION
"The keep alive hold time remaining for
this session."
::= { mplsLdpSessionEntry 5 }
mplsLdpSessionKeepAliveTime OBJECT-TYPE
SYNTAX      Unsigned32 (1..65535)
UNITS       "seconds"
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION
"The negotiated KeepAlive Time which represents the amount of seconds between keep alive messages. The mplsLdpEntityKeepAliveHoldTimer related to this Session is the value that was proposed as the KeepAlive Time for this session. This value is negotiated during session initialization between the entity’s proposed value (i.e. the value configured in mplsLdpEntityKeepAliveHoldTimer) and the peer’s proposed KeepAlive Hold Timer value. This value is the smaller of the two proposed values."
REFERENCE
"RFC3036, LDP Specification, Section 3.5.3, Initialization Message."
 ::= { mplsLdpSessionEntry 6 }

mplsLdpSessionMaxPduLength OBJECT-TYPE
SYNTAX      Unsigned32 (1..65535)
UNITS       "octets"
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION
"The value of maximum allowable length for LDP PDUs for this session. This value may have been negotiated during the Session Initialization. This object is related to the mplsLdpEntityMaxPduLength object. The mplsLdpEntityMaxPduLength object specifies the requested LDP PDU length, and this object reflects the negotiated LDP PDU length between the Entity and the Peer."
REFERENCE
"RFC3036, LDP Specification, Section 3.5.3, Initialization Message."
 ::= { mplsLdpSessionEntry 7 }
mplsLdpSessionDiscontinuityTime OBJECT-TYPE
SYNTAX      TimeStamp
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION
 "The value of sysUpTime on the most recent occasion
 at which any one or more of this session’s counters
 suffered a discontinuity. The relevant counters are
 the specific instances associated with this session
 of any Counter32 object contained in the
 mplsLdpSessionStatsTable.

 The initial value of this object is the value of
 sysUpTime when the entry was created in this table.

 Also, a command generator can distinguish when a session
 between a given Entity and Peer goes away and a new
 session is established. This value would change and
 thus indicate to the command generator that this is a
 different session."
 ::= { mplsLdpSessionEntry 8 }

--
-- The MPLS LDP Session Statistics Table
--

mplsLdpSessionStatsTable OBJECT-TYPE
SYNTAX      SEQUENCE OF MplsLdpSessionStatsEntry
MAX-ACCESS  not-accessible
STATUS      current
DESCRIPTION
 "A table of statistics for Sessions between
 LDP Entities and LDP Peers. This table AUGMENTS
 the mplsLdpPeerTable."
 ::= { mplsLdpSessionObjects 4 }

mplsLdpSessionStatsEntry OBJECT-TYPE
SYNTAX      MplsLdpSessionStatsEntry
MAX-ACCESS  not-accessible
STATUS      current
DESCRIPTION
 "An entry in this table represents statistical
 information on a single session between an LDP
 Entity and LDP Peer."
AUGMENTS       { mplsLdpPeerEntry }
::= { mplsLdpSessionStatsTable 1 }

MplsLdpSessionStatsEntry ::= SEQUENCE {
    mplsLdpSessionStatsUnknownMesTypeErrors  Counter32,
    mplsLdpSessionStatsUnknownTlvErrors     Counter32
}

mplsLdpSessionStatsUnknownMesTypeErrors OBJECT-TYPE
SYNTAX      Counter32
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION
"This object counts the number of Unknown Message Type Errors detected by this LSR/LER during this session.

Discontinuities in the value of this counter can occur at re-initialization of the management system, and at other times as indicated by the value of mplsLdpSessionDiscontinuityTime."
::= { mplsLdpSessionStatsEntry 1 }

mplsLdpSessionStatsUnknownTlvErrors OBJECT-TYPE
SYNTAX      Counter32
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION
"This object counts the number of Unknown TLV Errors detected by this LSR/LER during this session.

Discontinuities in the value of this counter can occur at re-initialization of the management system, and at other times as indicated by the value of mplsLdpSessionDiscontinuityTime."
::= { mplsLdpSessionStatsEntry 2 }

--
-- The MPLS LDP Hello Adjacency Table
--

mplsLdpHelloAdjacencyObjects OBJECT IDENTIFIER ::= { mplsLdpSessionObjects 5 }

mplsLdpHelloAdjacencyTable OBJECT-TYPE
SYNTAX      SEQUENCE OF MplsLdpHelloAdjacencyEntry
MAX-ACCESS  not-accessible
STATUS      current
DESCRIPTION
 "A table of Hello Adjacencies for Sessions."
 ::= { mplsLdpHelloAdjacencyObjects 1 }  

mplsLdpHelloAdjacencyEntry OBJECT-TYPE
SYNTAX      MplsLdpHelloAdjacencyEntry
MAX-ACCESS  not-accessible
STATUS      current
DESCRIPTION
 "Each row represents a single LDP Hello Adjacency.  
 An LDP Session can have one or more Hello  
 Adjacencies."
INDEX       { mplsLdpEntityLdpId,  
              mplsLdpEntityIndex,  
              mplsLdpPeerLdpId,  
              mplsLdpHelloAdjacencyIndex }  
 ::= { mplsLdpHelloAdjacencyTable 1 }  

MplsLdpHelloAdjacencyEntry ::= SEQUENCE {
   mplsLdpHelloAdjacencyIndex         Unsigned32,
   mplsLdpHelloAdjacencyHoldTimeRem   TimeInterval,
   mplsLdpHelloAdjacencyHoldTime      Unsigned32,
   mplsLdpHelloAdjacencyType          INTEGER
}

mplsLdpHelloAdjacencyIndex OBJECT-TYPE
SYNTAX      Unsigned32 (1..4294967295)
MAX-ACCESS  not-accessible
STATUS      current
DESCRIPTION
 "An identifier for this specific adjacency."
 ::= { mplsLdpHelloAdjacencyEntry 1 }  

mplsLdpHelloAdjacencyHoldTimeRem OBJECT-TYPE
SYNTAX      TimeInterval
UNITS       "seconds"
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION
 "If the value of this object is 65535,  
 this means that the hold time is infinite  
 (i.e. wait forever).

Otherwise, the time remaining for
this Hello Adjacency to receive its
next Hello Message.

This interval will change when the 'next'
Hello Message which corresponds to this
Hello Adjacency is received unless it
is infinite.

::= { mplsLdpHelloAdjacencyEntry 2 }

mplsLdpHelloAdjacencyHoldTime OBJECT-TYPE
SYNTAX Unsigned32 (0..65535)
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"The Hello hold time which is negotiated between
the Entity and the Peer. The entity associated
with this Hello Adjacency issues a proposed
Hello Hold Time value in the
mplsLdpEntityHelloHoldTimer object. The peer
also proposes a value and this object represents
the negotiated value.

A value of 0 means the default,
which is 15 seconds for Link Hellos
and 45 seconds for Targeted Hellos.
A value of 65535 indicates an
infinite hold time."
REFERENCE
"RFC3036, LDP Specification, Section 3.5.2 Hello Message"
::= { mplsLdpHelloAdjacencyEntry 3 }

mplsLdpHelloAdjacencyType OBJECT-TYPE
SYNTAX INTEGER {
    link(1),
    targeted(2)
}
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"This adjacency is the result of a 'link'
hello if the value of this object is link(1).
Otherwise, it is a result of a 'targeted'
hello, targeted(2)."
::= { mplsLdpHelloAdjacencyEntry 4 }
Session Label (LSP) Mapping to LSR MIB’s
In Segment LIB Information.

NOTE: the next 2 tables map to the
MPLS-LSR-STD-MIB’s MplsInSegmentTable
and MplsOutSegmentTable. The
cross-connect (XC) information is not
represented here as it can be gleaned
from the MPLS-LSR-STD-MIB.

mplsInSegmentLdpLspTable OBJECT-TYPE
   SYNTAX      SEQUENCE OF MplsInSegmentLdpLspEntry
   MAX-ACCESS  not-accessible
   STATUS      current
   DESCRIPTION
          "A table of LDP LSP’s which
   map to the mplsInSegmentTable in the
   the MPLS-LSR-STD-MIB module."
   ::= { mplsLdpSessionObjects 6 }

mplsInSegmentLdpLspEntry OBJECT-TYPE
   SYNTAX      MplsInSegmentLdpLspEntry
   MAX-ACCESS  not-accessible
   STATUS      current
   DESCRIPTION
          "An entry in this table represents information
   on a single LDP LSP which is represented by
   a session’s index triple (mplsLdpEntityLdpId,
   mplsLdpEntityIndex, mplsLdpPeerLdpId) AND the
   index for the mplsInSegmentTable
   (mplsInSegmentLdpLspLabelIndex) from the
   MPLS-LSR-STD-MIB.
   The information contained in a row is read-only."
   INDEX       { mplsLdpEntityLdpId,
                mplsLdpEntityIndex,
                mplsLdpPeerLdpId,
                mplsInSegmentLdpLspIndex
           }
   ::= { mplsInSegmentLdpLspTable 1 }
MplsInSegmentLdpLspEntry ::= SEQUENCE {
    mplsInSegmentLdpLspIndex            MplsIndexType,
    mplsInSegmentLdpLspLabelType        MplsLdpLabelType,
    mplsInSegmentLdpLspType             MplsLspType
}

mplsInSegmentLdpLspIndex OBJECT-TYPE
SYNTAX        MplsIndexType
MAX-ACCESS    not-accessible
STATUS        current
DESCRIPTION
    "This contains the same value as the
mplsInSegmentIndex in the
    MPLS-LSR-STD-MIB’s mplsInSegmentTable."
 ::= { mplsInSegmentLdpLspEntry 1 }

mplsInSegmentLdpLspLabelType  OBJECT-TYPE
SYNTAX        MplsLdpLabelType
MAX-ACCESS    read-only
STATUS        current
DESCRIPTION
    "The Layer 2 Label Type."
 ::= { mplsInSegmentLdpLspEntry 2 }

mplsInSegmentLdpLspType OBJECT-TYPE
SYNTAX        MplsLspType
MAX-ACCESS    read-only
STATUS        current
DESCRIPTION
    "The type of LSP connection."
 ::= { mplsInSegmentLdpLspEntry 3 }

--
-- Session Label (LSP) Mapping to LSR MIB’s
-- Out Segment LIB Information.
--

mplsOutSegmentLdpLspTable OBJECT-TYPE
SYNTAX      SEQUENCE OF MplsOutSegmentLdpLspEntry
MAX-ACCESS  not-accessible
STATUS      current
DESCRIPTION
    "A table of LDP LSP’s which
map to the mplsOutSegmentTable in the
the MPLS-LSR-STD-MIB."
::= { mplsLdpSessionObjects 7 }

mplsOutSegmentLdpLspEntry OBJECT-TYPE
SYNTAX MplsOutSegmentLdpLspEntry
MAX-ACCESS not-accessible
STATUS current
DESCRIPTION
"An entry in this table represents information on a single LDP LSP which is represented by a session’s index triple (mplsLdpEntityLdpId, mplsLdpEntityIndex, mplsLdpPeerLdpId) AND the index (mplsOutSegmentLdpLspIndex) for the mplsOutSegmentTable. The information contained in a row is read-only."
INDEX { mplsLdpEntityLdpId, mplsLdpEntityIndex, mplsLdpPeerLdpId, mplsOutSegmentLdpLspIndex }
::= { mplsOutSegmentLdpLspTable 1 }

MplsOutSegmentLdpLspEntry ::= SEQUENCE {
    mplsOutSegmentLdpLspIndex                MplsIndexType,
    mplsOutSegmentLdpLspLabelType             MplsLdpLabelType,
    mplsOutSegmentLdpLspType                  MplsLspType
}

mplsOutSegmentLdpLspIndex OBJECT-TYPE
SYNTAX MplsIndexType
MAX-ACCESS not-accessible
STATUS current
DESCRIPTION
"This contains the same value as the mplsOutSegmentIndex in the MPLS-LSR-STD-MIB’s mplsOutSegmentTable."
::= { mplsOutSegmentLdpLspEntry 1 }

mplsOutSegmentLdpLspLabelType OBJECT-TYPE
SYNTAX MplsLdpLabelType
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"The Layer 2 Label Type."
::= { mplsOutSegmentLdpLspEntry 2 }

Expires May 2004
mplsOutSegmentLdpLspType OBJECT-TYPE
SYNTAX MplsLspType
MAX-ACCESS read-only
STATUS current
DESCRIPTION "The type of LSP connection."
::= { mplsOutSegmentLdpLspEntry 3 }

--
-- Mpls FEC Table
--

mplsFecObjects OBJECT IDENTIFIER ::= 
   { mplsLdpSessionObjects 8 }

mplsFecLastChange OBJECT-TYPE
SYNTAX TimeStamp
MAX-ACCESS read-only
STATUS current
DESCRIPTION "The value of sysUpTime at the time of the most recent addition/deletion of an entry to/from the mplsLdpFectTable or the most recent change in values to any objects in the mplsLdpFecTable.

If no such changes have occurred since the last re-initialization of the local management subsystem, then this object contains a zero value."
::= { mplsFecObjects 1 }

mplsFecIndexNext OBJECT-TYPE
SYNTAX IndexIntegerNextFree
MAX-ACCESS read-only
STATUS current
DESCRIPTION "This object contains an appropriate value to be used for mplsFecIndex when creating entries in the mplsFecTable. The value 0 indicates that no unassigned entries are available."
::= { mplsFecObjects 2 }
mplsFecTable OBJECT-TYPE
SYNTAX      SEQUENCE OF MplsFecEntry
MAX-ACCESS  not-accessible
STATUS      current
DESCRIPTION
 "This table represents the FEC
 (Forwarding Equivalence Class)
 Information associated with an LSP."
 ::= { mplsFecObjects 3 }

mplsFecEntry OBJECT-TYPE
SYNTAX      MplsFecEntry
MAX-ACCESS  not-accessible
STATUS      current
DESCRIPTION
 "Each row represents a single FEC Element."
INDEX       { mplsFecIndex }
 ::= { mplsFecTable 1 }

MplsFecEntry ::= SEQUENCE {
 mplsFecIndex               IndexInteger,
 mplsFecType                INTEGER, {prefix(1), hostAddress(2)},
 mplsFecAddrType            InetAddressType,
 mplsFecAddr                InetAddress,
 mplsFecAddrPrefixLength    InetAddressPrefixLength,
 mplsFecStorageType         StorageType,
 mplsFecRowStatus           RowStatus
}

mplsFecIndex OBJECT-TYPE
SYNTAX      IndexInteger
MAX-ACCESS  not-accessible
STATUS      current
DESCRIPTION
 "The index which uniquely identifies this entry."
 ::= { mplsFecEntry 1 }

mplsFecType  OBJECT-TYPE
SYNTAX      INTEGER {
 prefix(1),
 hostAddress(2)
 }
MAX-ACCESS  read-create
STATUS      current
DESCRIPTION
 "The type of the FEC. If the value of this object
is ‘prefix(1)’ then the FEC type described by this row is an address prefix.

If the value of this object is ‘hostAddress(2)’ then the FEC type described by this row is a host address.

REFERENCE

"RFC3036, Section 3.4.1. FEC TLV."

::= { mplsFecEntry 2 }

mplsFecAddrType OBJECT-TYPE
SYNTAX InetAddressType
MAX-ACCESS read-create
STATUS current
DESCRIPTION
"The value of this object is the type of the Internet address. The value of this object, decides how the value of the mplsFecAddr object is interpreted."

REFERENCE

"RFC3036, Section 3.4.1. FEC TLV."

::= { mplsFecEntry 4 }

mplsFecAddr OBJECT-TYPE
SYNTAX InetAddress
MAX-ACCESS read-create
STATUS current
DESCRIPTION
"The value of this object is interpreted based on the value of the ‘mplsFecAddrType’ object. This address is then further interpreted as an being used with the address prefix, or as the host address. This further interpretation is indicated by the ‘mplsFecType’ object. In other words, the FEC element is populated according to the Prefix FEC Element value encoding, or the Host Address FEC Element encoding."

REFERENCE

"RFC3036, Section 3.4.1 FEC TLV."

::= { mplsFecEntry 5 }

mplsFecAddrPrefixLength OBJECT-TYPE
SYNTAX InetAddressPrefixLength
MAX-ACCESS read-create
STATUS current
DESCRIPTION
"If the value of the 'mplsFecType' is 'hostAddress(2)' then this object is undefined.

If the value of 'mplsFecType' is 'prefix(1)' then the value of this object is the length in bits of the address prefix represented by 'mplsFecAddr', or zero. If the value of this object is zero, this indicates that the prefix matches all addresses. In this case the address prefix MUST also be zero (i.e. 'mplsFecAddr' should have the value of zero.)"

REFERENCE
"RFC3036, Section 3.4.1. FEC TLV."

DEFVAL { 0 }
::= { mplsFecEntry 3 }

mplsFecStorageType OBJECT-TYPE
SYNTAX StorageType
MAX-ACCESS read-create
STATUS current
DESCRIPTION
"The storage type for this conceptual row. Conceptual rows having the value 'permanent(4)' need not allow write-access to any columnar objects in the row."

DEFVAL { nonVolatile }
::= { mplsFecEntry 6 }

mplsFecRowStatus OBJECT-TYPE
SYNTAX RowStatus
MAX-ACCESS read-create
STATUS current
DESCRIPTION
"The status of this conceptual row. If the value of this object is 'active(1)', then none of the writable objects of this entry can be modified, except to set this object to 'destroy(6)'.

NOTE: if this row is being referenced by any entry in the mplsLdpLspFecTable, then a request to destroy this row, will result in an inconsistentValue error."

::= { mplsFecEntry 7 }
-- LDP LSP FEC Table

mplsLdpLspFecLastChange OBJECT-TYPE
SYNTAX TimeStamp
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"The value of sysUpTime at the time of the most recent addition/deletion of an entry to/from the mplsLdpLspFecTable or the most recent change in values to any objects in the mplsLdpLspFecTable.

If no such changes have occurred since the last re-initialization of the local management subsystem, then this object contains a zero value."
::= { mplsLdpSessionObjects 9 }

mplsLdpLspFecTable OBJECT-TYPE
SYNTAX SEQUENCE OF MplsLdpLspFecEntry
MAX-ACCESS not-accessible
STATUS current
DESCRIPTION
"A table which shows the relationship between LDP LSPs and FECs. Each row represents a single LDP LSP to FEC association."
::= { mplsLdpSessionObjects 10 }

mplsLdpLspFecEntry OBJECT-TYPE
SYNTAX MplsLdpLspFecEntry
MAX-ACCESS not-accessible
STATUS current
DESCRIPTION
"An entry represents a LDP LSP to FEC association."
INDEX { mplsLdpEntityLdpId,
mplsLdpEntityIndex,
mplsLdpPeerLdpId,
mplsLdpLspFecSegment,
mplsLdpLspFecSegmentIndex,
mplsLdpLspFecIndex }
::= { mplsLdpLspFecTable 1 }
MplsLdpLspFecEntry ::= SEQUENCE {
  mplsLdpLspFecSegment INTEGER,
  mplsLdpLspFecSegmentIndex MplsIndexType,
  mplsLdpLspFecIndex IndexInteger,
  mplsLdpLspFecStorageType StorageType,
  mplsLdpLspFecRowStatus RowStatus
}

mplsLdpLspFecSegment OBJECT-TYPE
SYNTAX INTEGER {
  inSegment(1),
  outSegment(2)
}
MAX-ACCESS  not-accessible
STATUS      current
DESCRIPTION
  "If the value is inSegment(1), then this indicates that the following index,
  mplsLdpLspFecSegmentIndex, contains the same value as the mplsLdpLspIndex.
  
  Otherwise, if the value of this object is outSegment(2), then this indicates that following index,
  mplsLdpLspFecSegmentIndex, contains the same value as the mplsLdpLspIndex."
 ::= { mplsLdpLspFecEntry 1 }

mplsLdpLspFecSegmentIndex OBJECT-TYPE
SYNTAX    MplsIndexType
MAX-ACCESS not-accessible
STATUS    current
DESCRIPTION
  "This index is interpreted by using the value of the mplsLdpLspFecSegment.

  If the mplsLdpLspFecSegment is inSegment(1), then this index has the same value as
  mplsLdpLspIndex.
  
  If the mplsLdpLspFecSegment is outSegment(2), then this index has the same value as
  mplsLdpLspIndex."
 ::= { mplsLdpLspFecEntry 2 }
mplsLdpLspFecIndex(objectType)

SYNTAX IndexInteger
MAX-ACCESS not-accessible
STATUS current

DESCRIPTION
"This index identifies the FEC entry in the mplsFecTable associated with this session. In other words, the value of this index is the same as the value of the mplsFecIndex that denotes the FEC associated with this Session."

::= { mplsLdpLspFecEntry 3 }

mplsLdpLspFecStorageType(objectType)

SYNTAX StorageType
MAX-ACCESS read-create
STATUS current

DESCRIPTION
"The storage type for this conceptual row. Conceptual rows having the value 'permanent(4)' need not allow write-access to any columnar objects in the row."

DEFVAL { nonVolatile } ::= { mplsLdpLspFecEntry 4 }

mplsLdpLspFecRowStatus(objectType)

SYNTAX RowStatus
MAX-ACCESS read-create
STATUS current

DESCRIPTION
"The status of this conceptual row. If the value of this object is 'active(1)', then none of the writable objects of this entry can be modified.

The Agent should delete this row when the session ceases to exist. If an operator wants to associate the session with a different FEC, the recommended procedure is (as described in detail in the section entitled, 'Changing Values After Session Establishment', and again described in the DESCRIPTION clause of the mplsLdpEntityAdminStatus object) to set the mplsLdpEntityAdminStatus to
down, thereby explicitly causing a session
to be torn down. This will also
cause this entry to be deleted.

Then, set the mplsLdpEntityAdminStatus
to enable which enables a new session to be initiated.
Once the session is initiated, an entry may be
added to this table to associate the new session
with a FEC."

::= { mplsLdpLspFecEntry 5 }

--
-- Address Message/Address Withdraw Message Information
--
-- This information is associated with a specific Session
-- because Label Address Messages are sent after session
-- initialization has taken place.
--

mplsLdpSessionPeerAddrTable OBJECT-TYPE
SYNTAX      SEQUENCE OF MplsLdpSessionPeerAddrEntry
MAX-ACCESS  not-accessible
STATUS      current
DESCRIPTION
 "This table ‘extends’ the mplsLdpSessionTable.
This table is used to store Label Address Information
from Label Address Messages received by this LSR from
Peers. This table is read-only and should be updated
when Label Withdraw Address Messages are received, i.e.
Rows should be deleted as appropriate.

NOTE: since more than one address may be contained
in a Label Address Message, this table ‘sparse augments’,
the mplsLdpSessionTable’s information."
::= { mplsLdpSessionObjects 11 }

mplsLdpSessionPeerAddrEntry OBJECT-TYPE
SYNTAX      MplsLdpSessionPeerAddrEntry
MAX-ACCESS  not-accessible
STATUS      current
DESCRIPTION
 "An entry in this table represents information on
a session’s single next hop address which was
advertised in an Address Message from the LDP peer.
The information contained in a row is read-only.

INDEX  

{ mplsLdpEntityLdpId,
  mplsLdpEntityIndex,
  mplsLdpPeerLdpId,
  mplsLdpSessionPeerAddrIndex
}  

::= { mplsLdpSessionPeerAddrTable 1 }

MplsLdpSessionPeerAddrEntry ::= SEQUENCE {

  mplsLdpSessionPeerAddrIndex       Unsigned32,
  mplsLdpSessionPeerNextHopAddrType InetAddressType,
  mplsLdpSessionPeerNextHopAddr     InetAddress

}

mplsLdpSessionPeerAddrIndex OBJECT-TYPE
SYNTAX  Unsigned32 (1..4294967295)
MAX-ACCESS  not-accessible
STATUS      current
DESCRIPTION
  "An index which uniquely identifies this entry within a given session."
::= { mplsLdpSessionPeerAddrEntry 1 }

mplsLdpSessionPeerNextHopAddrType OBJECT-TYPE
SYNTAX  InetAddressType
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION
  "The internetwork layer address type of this Next Hop Address as specified in the Label Address Message associated with this Session. The value of this object indicates how to interpret the value of mplsLdpSessionPeerNextHopAddr."
::= { mplsLdpSessionPeerAddrEntry 2 }

mplsLdpSessionPeerNextHopAddr OBJECT-TYPE
SYNTAX  InetAddress
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION
  "The next hop address. The type of this address is specified by the value of the mplsLdpSessionPeerNextHopAddrType."
REFERENCE
  "RFC3036, Section 2.7. LDP Identifiers and Next Hop Addresses"

Expires May 2004
mplsLdpInitSessionThresholdExceeded NOTIFICATION-TYPE
    OBJECTS
    
    mplsLdpEntityInitSessionThreshold
    
    STATUS      current
    DESCRIPTION
    "This notification is generated when the value of
    the 'mplsLdpEntityInitSessionThreshold' object
    is not zero, and the number of Session
    Initialization messages exceeds the value
    of the 'mplsLdpEntityInitSessionThreshold' object."
::= { mplsLdpNotifications 1 }

mplsLdpPathVectorLimitMismatch NOTIFICATION-TYPE
    OBJECTS
    
    mplsLdpEntityPathVectorLimit,
    mplsLdpPeerPathVectorLimit
    
    STATUS      current
    DESCRIPTION
    "This notification is sent when the
    'mplsLdpEntityPathVectorLimit' does NOT match
    the value of the 'mplsLdpPeerPathVectorLimit' for
    a specific Entity."
REFERENCE
"RFC3036, LDP Specification, Section 3.5.3."
::= { mplsLdpNotifications 2 }

mplsLdpSessionUp NOTIFICATION-TYPE
    OBJECTS
    
    mplsLdpSessionState,
    mplsLdpSessionDiscontinuityTime,
    mplsLdpSessionStatsUnknownMesTypeErrors,
    mplsLdpSessionStatsUnknownTlvErrors
    
    STATUS      current
    DESCRIPTION
    "If this notification is sent when the
    value of 'mplsLdpSessionState' enters

Expires May 2004
[Page 56]
the 'operational(5)' state.
 ::= { mplsLdpNotifications 3 }

mplsLdpSessionDown NOTIFICATION-TYPE
OBJECTS
  { mplsLdpSessionState,
    mplsLdpSessionDiscontinuityTime,
    mplsLdpSessionStatsUnknownMesTypeErrors,
    mplsLdpSessionStatsUnknownTlvErrors
  }
STATUS current
DESCRIPTION
  "This notification is sent when the
  the value of 'mplsLdpSessionState' leaves
  the 'operational(5)' state."
 ::= { mplsLdpNotifications 4 }

-- Module Conformance Statement
--****************************************************************

mplsLdpGroups
  OBJECT IDENTIFIER ::= { mplsLdpConformance 1 }

mplsLdpCompliances
  OBJECT IDENTIFIER ::= { mplsLdpConformance 2 }
--
-- Full Compliance
--

mplsLdpModuleFullCompliance MODULE-COMPLIANCE
STATUS current
DESCRIPTION
  "The Module is implemented with support
  for read-create and read-write. In other
  words, both monitoring and configuration
  are available when using this MODULE-COMPLIANCE."

    MODULE -- this module
    MANDATORY-GROUPS
        { mplsLdpGeneralGroup,
          mplsLdpNotificationsGroup
        }

Expires May 2004
GROUP mplsLdpLspGroup
DESCRIPTION
"This group must be supported if the LSR MIB is implemented, specifically the mplsInSegmentTable, the mplsOutSegmentTable or the mplsXCTable."

OBJECT mplsLdpEntityTargetPeerAddrType
SYNTAX InetAddressType { unknown(0), ipv4(1), ipv6(2) }
DESCRIPTION
"An implementation is only required to support 'unknown(0)', IPv4 and globally unique IPv6 addresses."

OBJECT mplsLdpEntityTargetPeerAddr
SYNTAX InetAddress (SIZE(0|4|16))
DESCRIPTION
"An implementation is only required to support IPv4 and globally unique IPv6 addresses."

OBJECT mplsLdpEntityRowStatus
SYNTAX RowStatus { active(1) }
WRITE-SYNTAX RowStatus { createAndGo(4), destroy(6) }
DESCRIPTION
"Support for createAndWait and notInService is not required."

OBJECT mplsFecAddrType
SYNTAX InetAddressType { unknown(0), ipv4(1), ipv6(2) }
DESCRIPTION
"An implementation is only required to support 'unknown(0)', IPv4 and globally unique IPv6 addresses."

OBJECT mplsFecAddr
SYNTAX InetAddress (SIZE(0|4|16))
DESCRIPTION
"An implementation is only required to support IPv4 and globally unique IPv6 addresses."

OBJECT mplsFecRowStatus
SYNTAX RowStatus { active(1) }
WRITE-SYNTAX RowStatus { createAndGo(4), destroy(6) }
DESCRIPTION
"Support for createAndWait and notInService is not required."

OBJECT mplsLdpLspFecRowStatus
SYNTAX RowStatus { active(1) }
WRITE-SYNTAX RowStatus { createAndGo(4), destroy(6) }
DESCRIPTION
"Support for createAndWait and notInService is not required."

OBJECT mplsLdpSessionPeerNextHopAddrType
SYNTAX InetAddressType { unknown(0), ipv4(1), ipv6(2) }
DESCRIPTION
"An implementation is only required to support 'unknown(0)', IPv4 and globally unique IPv6 addresses."

OBJECT mplsLdpSessionPeerNextHopAddr
SYNTAX InetAddress (SIZE(0|4|16))
DESCRIPTION
"An implementation is only required to support IPv4 and globally unique IPv6 addresses."

::= { mplsLdpCompliances 1 }

--
-- Read-Only Compliance
--

mplsLdpModuleReadOnlyCompliance MODULE-COMPLIANCE
STATUS current
DESCRIPTION
"The Module is implemented with support for read-only. In other words, only monitoring is available by implementing this MODULE-COMPLIANCE."

MODULE -- this module
MANDATORY-GROUPS { mplsLdpGeneralGroup,
                   mplsLdpNotificationsGroup
                   }

GROUP mplsLdpLspGroup
DESCRIPTION
"This group must be supported if the LSR MIB is implemented, specifically the mplsInSegmentTable, the mplsOutSegmentTable or the mplsXCTable."

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

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

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

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

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

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

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

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

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

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

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

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

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

An implementation is only required to support
 'unknown(0)', IPv4 and globally unique IPv6 addresses."

OBJECT       mplsLdpEntityTargetPeerAddr
SYNTAX       InetAddress (SIZE(0|4|16))
MIN-ACCESS   read-only
DESCRIPTION
  "Write access is not required. An implementation is only required to support IPv4 and globally unique IPv6 addresses."

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

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

OBJECT  mplsLdpEntityRowStatus
SYNTAX   RowStatus { active(1) }
MIN-ACCESS  read-only
DESCRIPTION
"Write access is not required, and active is the only status that needs to be supported."

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

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

OBJECT  mplsFecAddrType
SYNTAX   InetAddressType { unknown(0), ipv4(1), ipv6(2) }
MIN-ACCESS  read-only
DESCRIPTION
"Write access is not required. An implementation is only required to support 'unknown(0)', IPv4 and globally unique IPv6 addresses."

OBJECT  mplsFecAddr
SYNTAX   InetAddress (SIZE(0|4|16))
MIN-ACCESS  read-only
DESCRIPTION
"Write access is not required. An implementation is only required to support IPv4 and globally unique IPv6 addresses."

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

OBJECT  mplsFecRowStatus
SYNTAX   RowStatus { active(1) }
MIN-ACCESS  read-only
DESCRIPTION
"Write access is not required, and active is the only status that needs to be supported."

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

OBJECT mplsLdpLspFecRowStatus
SYNTAX RowStatus { active(1) }
MIN-ACCESS read-only
DESCRIPTION
"Write access is not required, and active is the only status that needs to be supported."

OBJECT mplsLdpSessionPeerNextHopAddrType
SYNTAX InetAddressType { unknown(0), ipv4(1), ipv6(2) }
DESCRIPTION
"An implementation is only required to support 'unknown(0)', IPv4 and globally unique IPv6 addresses."

OBJECT mplsLdpSessionPeerNextHopAddr
SYNTAX InetAddress (SIZE(0|4|16))
DESCRIPTION
"An implementation is only required to support IPv4 and globally unique IPv6 addresses."

::= { mplsLdpCompliances 2 }

-- units of conformance

mplsLdpGeneralGroup OBJECT-GROUP
OBJECTS {
  mplsLdpLsrId,
  mplsLdpLsrLoopDetectionCapable,
  mplsLdpEntityLastChange,
  mplsLdpEntityIndexNext,
  mplsLdpEntityProtocolVersion,
  mplsLdpEntityAdminStatus,
  mplsLdpEntityOperStatus,
  mplsLdpEntityTcpDscPort,
  mplsLdpEntityUdpDscPort,
  mplsLdpEntityMaxPduLength,
mplsLdpEntityKeepAliveHoldTimer,
mplsLdpEntityHelloHoldTimer,
mplsLdpEntityInitSessionThreshold,
mplsLdpEntityLabelDistMethod,
mplsLdpEntityLabelRetentionMode,
mplsLdpEntityPathVectorLimit,
mplsLdpEntityHopCountLimit,
mplsLdpEntityTransportAddrKind,
mplsLdpEntityTargetPeer,
mplsLdpEntityTargetPeerAddrType,
mplsLdpEntityTargetPeerAddr,
mplsLdpEntityLabelType,
mplsLdpEntityPathVectorLimit,
mplsLdpEntityStorageType,
mplsLdpEntityRowStatus,
mplsLdpEntityStatsSessionAttempts,
mplsLdpEntityStatsSessionRejectedNoHelloErrors,
mplsLdpEntityStatsSessionRejectedAdErrors,
mplsLdpEntityStatsSessionRejectedMaxPduErrors,
mplsLdpEntityStatsSessionRejectedLRErrors,
mplsLdpEntityStatsBadLdpIdentifierErrors,
mplsLdpEntityStatsBadPduLengthErrors,
mplsLdpEntityStatsBadMessageLengthErrors,
mplsLdpEntityStatsBadTlvLengthErrors,
mplsLdpEntityStatsMalformedTlvValueErrors,
mplsLdpEntityStatsKeepAliveTimerExpErrors,
mplsLdpEntityStatsShutdownReceivedNotifications,
mplsLdpEntityStatsShutdownSentNotifications,
mplsLdpPeerLastChange,
mplsLdpPeerLabelDistMethod,
mplsLdpPeerPathVectorLimit,
mplsLdpPeerTransportAddrType,
mplsLdpPeerTransportAddr,
mplsLdpHelloAdjacencyHoldTimeRem,
mplsLdpHelloAdjacencyHoldTime,
mplsLdpHelloAdjacencyType,
mplsLdpSessionStateLastChange,
mplsLdpSessionState,
mplsLdpSessionRole,
mplsLdpSessionProtocolVersion,
mplsLdpSessionKeepAliveHoldTimeRem,
mplsLdpSessionKeepAliveTime,
mplsLdpSessionMaxPduLength,
mplsLdpSessionDiscontinuityTime,
mplsLdpSessionStatsUnknownMesTypeErrors,
mplsLdpSessionStatsUnknownTlvErrors,
mplsLdpSessionPeerNextHopAddrType,
mplsLdpSessionPeerNextHopAddr,
mplsFecLastChange,
mplsFecIndexNext,
mplsFecType,
mplsFecAddrType,
mplsFecAddr,
mplsFecAddrPrefixLength,
mplsFecStorageType,
mplsFecRowStatus
}
STATUS current
DESCRIPTION
"Objects that apply to all MPLS LDP implementations."
::= { mplsLdpGroups 1 }

mplsLdpLspGroup OBJECT-GROUP
OBJECTS {
mplsInSegmentLdpLspLabelType,
mplsInSegmentLdpLspType,
mplsOutSegmentLdpLspLabelType,
mplsOutSegmentLdpLspType,
mplsLdpLspFecLastChange,
mplsLdpLspFecStorageType,
mplsLdpLspFecRowStatus
}
STATUS current
DESCRIPTION
"These objects are for LDP implementations which interface to the Label Information Base (LIB) in the MPLS-LSR-STD-MIB. The LIB is represented in the mplsInSegmentTable, mplsOutSegmentTable and mplsXCTable."
::= { mplsLdpGroups 2 }

mplsLdpNotificationsGroup NOTIFICATION-GROUP
NOTIFICATIONS { mplsLdpInitSessionThresholdExceeded,
mplsLdpPathVectorLimitMismatch,
mplsLdpSessionUp,
mplsLdpSessionDown
}
STATUS current
DESCRIPTION
"The notification for an MPLS LDP implementation."
4.1. The MPLS-LDP-ATM-STD-MIB Module

This MIB Module MUST be supported if LDP uses ATM as the Layer 2 medium. There are three tables in this MIB Module. Two tables are for configuring LDP to use ATM. These tables are the mplsLdpEntityAtmTable and the mplsLdpEntityAtmLRTable. The third table is the mplsLdpAtmSessionTable which is a read-only table.

4.1.1. The LDP Entity ATM Table

The mplsLdpEntityAtmTable provides a way to configure information which would be contained in the "Optional Parameter" portion of an LDP PDU Initialization Message.

4.1.2. The LDP Entity ATM Label Range Table

The mplsLdpEntityAtmLRTable provides a way to configure information which would be contained in the "ATM Label Range Components" portion of an LDP PDU Initialization Message, see [RFC3035] and [RFC3036].

4.1.3. The LDP ATM Session Table

The MPLS LDP ATM Session Table is a read-only table which contains session information specific to ATM.
mplsLdpAtmStdMIB MODULE-IDENTITY
LAST-UPDATED "200311181200Z" -- 18 November 2003
ORGANIZATION "Multiprotocol Label Switching (mpls) Working Group"
CONTACT-INFO
"Joan Cucchiara (jcucchiara@artel.com)
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James V. Luciani (james_luciani@mindspring.com)
Marconi Communications, Inc.

Working Group Chairs:
George Swallow,   email: swallow@cisco.com
Loa Andersson,   email: loa@pi.se

MPLS Working Group, email: mpls@uu.net"

DESCRIPTION
"Copyright (C) The Internet Society (2003). This version of this MIB module is part of RFCXXX; see the RFC itself for full legal notices."
This MIB contains managed object definitions for configuring and monitoring the Multiprotocol Label Switching (MPLS), Label Distribution Protocol (LDP), utilizing Asynchronous Transfer Mode (ATM) as the Layer 2 media.

REVISION "200311181200Z" -- 18 November 2003
DESCRIPTION
"Initial version published as part of RFC XXXX."

-- Please see the IANA Considerations Section
-- the suggested mplsStdMIB subId is 5, e.g.
-- ::= { mplsStdMIB 5 }

::= { mplsStdMIB XXX } -- to be assigned by IANA

--****************************************************************

mplsLdpAtmObjects OBJECT IDENTIFIER ::= { mplsLdpAtmStdMIB 1 }

mplsLdpAtmConformance OBJECT IDENTIFIER ::= { mplsLdpAtmStdMIB 2 }

--****************************************************************

-- MPLS LDP ATM Objects
--****************************************************************

-- Ldp Entity Objects for ATM
--

mplsLdpEntityAtmObjects OBJECT IDENTIFIER ::= { mplsLdpAtmObjects 1 }

mplsLdpEntityAtmTable OBJECT-TYPE
SYNTAX  SEQUENCE OF MplsLdpEntityAtmEntry
MAX-ACCESS not-accessible
STATUS current
DESCRIPTION
"This table contains ATM specific information which could be used in the 'Optional Parameters’ and other ATM specific information.

This table ‘sparse augments’ the mplsLdpEntityTable when ATM is the Layer 2 medium."

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::= { mplsLdpEntityAtmObjects 1 }

mplsLdpEntityAtmEntry OBJECT-TYPE
SYNTAX MplsLdpEntityAtmEntry
MAX-ACCESS not-accessible
STATUS current
DESCRIPTION
"An entry in this table represents the ATM parameters and ATM information for this LDP entity."
INDEX { mplsLdpEntityLdpId,
    mplsLdpEntityIndex
}
::= { mplsLdpEntityAtmTable 1 }

MplsLdpEntityAtmEntry ::= SEQUENCE {
  mplsLdpEntityAtmIfIndexOrZero        InterfaceIndexOrZero,
  mplsLdpEntityAtmMergeCap             INTEGER,
  mplsLdpEntityAtmLRComponents         Unsigned32,
  mplsLdpEntityAtmVcDirectionality     INTEGER,
  mplsLdpEntityAtmLsrConnectivity      INTEGER,
  mplsLdpEntityAtmDefaultControlVpi    AtmVpIdentifier,
  mplsLdpEntityAtmDefaultControlVci    MplsAtmVcIdentifier,
  mplsLdpEntityAtmUnlabTrafVpi         AtmVpIdentifier,
  mplsLdpEntityAtmUnlabTrafVci         MplsAtmVcIdentifier,
  mplsLdpEntityAtmStorageType          StorageType,
  mplsLdpEntityAtmRowStatus            RowStatus
}

mplsLdpEntityAtmIfIndexOrZero OBJECT-TYPE
SYNTAX InterfaceIndexOrZero
MAX-ACCESS read-create
STATUS current
DESCRIPTION
"This value represents either the InterfaceIndex or 0 (zero). The value of zero means that the InterfaceIndex is not known.

However, if the InterfaceIndex is known, then it must be represented by this value.

If an InterfaceIndex becomes known, then the network management entity (e.g. SNMP agent) responsible for this object MUST change the value from 0 (zero) to the value of the InterfaceIndex. If an ATM Label is
being used in forwarding data, then the value of this object MUST be the InterfaceIndex."
::= { mplsLdpEntityAtmEntry 1 }

mplsLdpEntityAtmMergeCap OBJECT-TYPE
SYNTAX INTEGER {
   notSupported(0),
   vpMerge(1),
   vcMerge(2),
   vpAndVcMerge(3)
}
MAX-ACCESS read-create
STATUS current
DESCRIPTION
"Denotes the Merge Capability of this Entity. This is the EXACT value for the ATM Session Parameter, field M (for ATM Merge Capabilities). The ATM Session Parameter is an optional parameter in the Initialization Message.

The description from rfc3036.txt is:

'M, ATM Merge Capabilities
Specifies the merge capabilities of an ATM switch. The following values are supported in this version of the specification:

<table>
<thead>
<tr>
<th>Value</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Merge not supported</td>
</tr>
<tr>
<td>1</td>
<td>VP Merge supported</td>
</tr>
<tr>
<td>2</td>
<td>VC Merge supported</td>
</tr>
<tr>
<td>3</td>
<td>VP &amp; VC Merge supported</td>
</tr>
</tbody>
</table>

If the merge capabilities of the LSRs differ, then:
- Non-merge and VC-merge LSRs may freely interoperate.
- The interoperability of VP-merge-capable switches with non-VP-merge-capable switches is a subject for future study. When the LSRs differ on the use of VP-merge, the session is established, but VP merge is not used.’

Please refer to the following reference for a complete description of this feature."
mplsLdpEntityAtmLRComponents OBJECT-TYPE
SYNTAX      Unsigned32 (1..65535)
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION
 "Number of Label Range Components in the Initialization message. This also represents the number of entries in the mplsLdpEntityAtmLRTable which correspond to this entry.

This is the EXACT value for the ATM Session Parameter, field N (for Number of label range components). The ATM Session Parameter is an optional parameter in the Initialization Message.

The description from rfc3036.txt is:

‘N, Number of label range components
  Specifies the number of ATM Label Range Components included in the TLV.’

Please refer to the following reference for a complete description of this feature."
REFERENCE
 "RFC3036, LDP Specification, Section 3.5.3
  Initialization Message."
 ::= { mplsLdpEntityAtmEntry 2 }

mplsLdpEntityAtmVcDirectionality OBJECT-TYPE
SYNTAX       INTEGER {
               bidirectional(0),
               unidirectional(1)
             }
MAX-ACCESS   read-create
STATUS       current
DESCRIPTION
 "If the value of this object is ‘bidirectional(0)’, a given VCI, within a given VPI, is used as a label for both directions independently.

If the value of this object is ‘unidirectional(1)’,
a given VCI within a VPI designates one direction.

This is the EXACT value for the ATM Session Parameter, field D (for VC Directionality). The ATM Session Parameter is an optional parameter in the Initialization Message.

The description from rfc3036.txt is:

'D, VC Directionality
A value of 0 specifies bidirectional VC capability, meaning the LSR can (within a given VPI) support the use of a given VCI as a label for both link directions independently. A value of 1 specifies unidirectional VC capability, meaning (within a given VPI) a given VCI may appear in a label mapping for one direction on the link only. When either or both of the peers specifies unidirectional VC capability, both LSRs use unidirectional VC label assignment for the link as follows. The LSRs compare their LDP Identifiers as unsigned integers. The LSR with the larger LDP Identifier may assign only odd-numbered VCIs in the VPI/VCI range as labels. The system with the smaller LDP Identifier may assign only even-numbered VCIs in the VPI/VCI range as labels.'

Please refer to the following reference for a complete description of this feature."

REFERENCE
"RFC3036, LDP Specification, Section 3.5.3 Initialization Message."
::= { mplsLdpEntityAtmEntry 4 }

mplsLdpEntityAtmLsrConnectivity OBJECT-TYPE
SYNTAX INTEGER {
  direct(1),
  indirect(2)
}
MAX-ACCESS read-create
STATUS current
DESCRIPTION "The peer LSR may be connected indirectly by means of an ATM VP so that the VPI values may be different"
on either endpoint so the label MUST be encoded
entirely within the VCI field."
DEFVAL { direct }
::= { mplsLdpEntityAtmEntry 5 }

mplsLdpEntityAtmDefaultControlVpi OBJECT-TYPE
SYNTAX       AtmVpIdentifier
MAX-ACCESS   read-create
STATUS       current
DESCRIPTION
"The default VPI value for the non-MPLS connection. The
default value of this is 0 (zero) but other values may
be configured. This object allows a different value
to be configured."
DEFVAL { 0 }
::= { mplsLdpEntityAtmEntry 6 }

mplsLdpEntityAtmDefaultControlVci OBJECT-TYPE
SYNTAX       MplsAtmVcIdentifier
MAX-ACCESS   read-create
STATUS       current
DESCRIPTION
"The Default VCI value for a non-MPLS connection. The
default value of this is 32 but other values may be
configured. This object allows a different value to
be configured."
DEFVAL { 32 }
::= { mplsLdpEntityAtmEntry 7 }

mplsLdpEntityAtmUnlabTrafVpi OBJECT-TYPE
SYNTAX       AtmVpIdentifier
MAX-ACCESS   read-create
STATUS       current
DESCRIPTION
"VPI value of the VCC supporting unlabeled traffic. This
non-MPLS connection is used to carry unlabeled (IP)
packets. The default value is the same as the default
value of the 'mplsLdpEntityAtmDefaultControlVpi', however
another value may be configured."
DEFVAL { 0 }
::= { mplsLdpEntityAtmEntry 8 }

mplsLdpEntityAtmUnlabTrafVci OBJECT-TYPE
SYNTAX       MplsAtmVcIdentifier
MAX-ACCESS   read-create
STATUS       current

Expires May 2004
DESCRIPTION
"VCI value of the VCC supporting unlabeled traffic.
This non-MPLS connection is used to carry unlabeled (IP)
packets. The default value is the same as the default
value of the 'mplsLdpEntityAtmDefaultControlVci', however
another value may be configured."
DEFVAL { 32 }
 ::= { mplsLdpEntityAtmEntry 9 }

mplsLdpEntityAtmStorageType  OBJECT-TYPE
SYNTAX     StorageType
MAX-ACCESS read-create
STATUS      current
DESCRIPTION
"The storage type for this conceptual row.
Conceptual rows having the value 'permanent(4)'
need not allow write-access to any columnar
objects in the row."
DEFVAL { nonVolatile }
 ::= { mplsLdpEntityAtmEntry 10 }

mplsLdpEntityAtmRowStatus OBJECT-TYPE
SYNTAX     RowStatus
MAX-ACCESS read-create
STATUS      current
DESCRIPTION
"The status of this conceptual row. All writable
objects in this row may be modified at any time,
however, as described in detail in the section
entitled, 'Changing Values After Session
Establishment', and again described in the
DESCRIPTION clause of the mplsLdpEntityAdminStatus
object, if a session has been initiated with a Peer,
changing objects in this table will wreak havoc
with the session and interrupt traffic. To repeat again:
the recommended procedure is to set the
mplsLdpEntityAdminStatus to down, thereby explicitly
causing a session to be torn down. Then,
change objects in this entry, then set the
mplsLdpEntityAdminStatus to enable
which enables a new session to be initiated."
 ::= { mplsLdpEntityAtmEntry 11 }

--
-- The MPLS LDP Entity ATM Label Range Table
--
mplsLdpEntityAtmLRTable OBJECT-TYPE
SYNTAX SEQUENCE OF MplsLdpEntityAtmLREntry
MAX-ACCESS not-accessible
STATUS current
DESCRIPTION
"The MPLS LDP Entity ATM Label Range (LR) Table. The purpose of this table is to provide a mechanism for configuring a contiguous range of vpi’s with a contiguous range of vci’s, or a ‘label range’ for LDP Entities.

LDP Entities which use ATM must have at least one entry in this table.

There must exist at least one entry in this table for every LDP Entity that has ‘mplsLdpEntityOptionalParameters’ object with a value of ‘atmSessionParameters’." ::= { mplsLdpEntityAtmObjects 2 }

mplsLdpEntityAtmLREntry OBJECT-TYPE
SYNTAX MplsLdpEntityAtmLREntry
MAX-ACCESS not-accessible
STATUS current
DESCRIPTION
"A row in the LDP Entity ATM Label Range Table. One entry in this table contains information on a single range of labels represented by the configured Upper and Lower Bounds VPI/VCI pairs. These are the same data used in the Initialization Message.

NOTE: The ranges for a specific LDP Entity are UNIQUE and non-overlapping. For example, for a specific LDP Entity index, there could be one entry having LowerBound vpi/vci == 0/32, and UpperBound vpi/vci == 0/100, and a second entry for this same interface with LowerBound vpi/vci == 0/101 and UpperBound vpi/vci == 0/200. However, there could not be a third entry with LowerBound vpi/vci == 0/200 and UpperBound vpi/vci == 0/300 because this label range overlaps with the second entry (i.e. both entries now have 0/200).

A row will not become active unless a unique and
non-overlapping range is specified.

At least one label range entry for a specific LDP Entity MUST include the default VPI/VCI values denoted in the LDP Entity Table.

A request to create a row with an overlapping range should result in an inconsistentValue error."

INDEX
   { mplsLdpEntityLdpId,
     mplsLdpEntityIndex,
     mplsLdpEntityAtmLRMinVpi,
     mplsLdpEntityAtmLRMinVci
   }
::= { mplsLdpEntityAtmLRTable 1 }

MplsLdpEntityAtmLREntry ::= SEQUENCE {
   mplsLdpEntityAtmLRMinVpi       AtmVpIdentifier,
   mplsLdpEntityAtmLRMinVci       MplsAtmVcIdentifier,
   mplsLdpEntityAtmLRMaxVpi       AtmVpIdentifier,
   mplsLdpEntityAtmLRMaxVci       MplsAtmVcIdentifier,
   mplsLdpEntityAtmLRStorageType  StorageType,
   mplsLdpEntityAtmLRRowStatus    RowStatus
}

mplsLdpEntityAtmLRMinVpi OBJECT-TYPE
SYNTAX AtmVpIdentifier
MAX-ACCESS not-accessible
STATUS current
DESCRIPTION "The minimum VPI number configured for this range. The value of zero is a valid value for the VPI portion of the label."
::= { mplsLdpEntityAtmLREntry 1 }

mplsLdpEntityAtmLRMinVci OBJECT-TYPE
SYNTAX MplsAtmVcIdentifier
MAX-ACCESS not-accessible
STATUS current
DESCRIPTION "The minimum VCI number configured for this range."
::= { mplsLdpEntityAtmLREntry 2 }

mplsLdpEntityAtmLRMaxVpi OBJECT-TYPE
SYNTAX AtmVpIdentifier
MAX-ACCESS read-create
STATUS current
DESCRIPTION
"The maximum VPI number configured for this range."
::= { mplsLdpEntityAtmLREntry 3 }

mplsLdpEntityAtmLRMaxVci OBJECT-TYPE
SYNTAX MplsAtmVcIdentifier
MAX-ACCESS read-create
STATUS current
DESCRIPTION
"The maximum VCI number configured for this range."
::= { mplsLdpEntityAtmLREntry 4 }

mplsLdpEntityAtmLRStorageType OBJECT-TYPE
SYNTAX StorageType
MAX-ACCESS read-create
STATUS current
DESCRIPTION
"The storage type for this conceptual row. Conceptual rows having the value ‘permanent(4)’ need not allow write-access to any columnar objects in the row."
DEFVAL { nonVolatile }
::= { mplsLdpEntityAtmLREntry 5 }

mplsLdpEntityAtmLRRowStatus OBJECT-TYPE
SYNTAX RowStatus
MAX-ACCESS read-create
STATUS current
DESCRIPTION
"The status of this conceptual row. All writable objects in this row may be modified at any time, however, as described in detail in the section entitled, ‘Changing Values After Session Establishment’, and again described in the DESCRIPTION clause of the mplsLdpEntityAdminStatus object, if a session has been initiated with a Peer, changing objects in this table will wreak havoc with the session and interrupt traffic. To repeat again: the recommended procedure is to set the mplsLdpEntityAdminStatus to down, thereby explicitly causing a session to be torn down. Then, change objects in this entry, then set the mplsLdpEntityAdminStatus
to enable which enables a new session
to be initiated."
 ::= { mplsLdpEntityAtmLREntry 6 }

--
-- MPLS LDP ATM Session Information
--

mplsLdpAtmSessionObjects OBJECT IDENTIFIER ::=  
{ mplsLdpAtmObjects 2 }

mplsLdpAtmSessionTable OBJECT-TYPE  
SYNTAX      SEQUENCE OF MplsLdpAtmSessionEntry  
MAX-ACCESS  not-accessible  
STATUS      current  
DESCRIPTION
 "A table which relates sessions in the
 'mplsLdpSessionTable' and their label
 range intersections. There could be one
 or more label range intersections between an
 LDP Entity and LDP Peer using ATM as the
 underlying media. Each row represents
 a single label range intersection.

 This table cannot use the 'AUGMENTS'
 clause because there is not necessarily
 a one-to-one mapping between this table
 and the mplsLdpSessionTable."
 ::= { mplsLdpAtmSessionObjects 1 }

mplsLdpAtmSessionEntry OBJECT-TYPE  
SYNTAX      MplsLdpAtmSessionEntry  
MAX-ACCESS  not-accessible  
STATUS      current  
DESCRIPTION
 "An entry in this table represents information on a
 single label range intersection between an LDP Entity
 and LDP Peer.

 The information contained in a row is read-only."
 INDEX
 { mplsLdpEntityLdpId,  
   mplsLdpEntityIndex,  
   mplsLdpPeerLdpId,  
   mplsLdpSessionAtmLRLowerBoundVpi,  
   mplsLdpSessionAtmLRLowerBoundVci  
}
MplsLdpAtmSessionEntry ::= SEQUENCE {
    mplsLdpSessionAtmLRLowerBoundVpi     AtmVpIdentifier,
    mplsLdpSessionAtmLRLowerBoundVci     MplsAtmVcIdentifier,
    mplsLdpSessionAtmLRUpperBoundVpi     AtmVpIdentifier,
    mplsLdpSessionAtmLRUpperBoundVci     MplsAtmVcIdentifier
}

mplsLdpSessionAtmLRLowerBoundVpi OBJECT-TYPE
SYNTAX AtmVpIdentifier
MAX-ACCESS not-accessible
STATUS current
DESCRIPTION
"The minimum VPI number for this range."
::= { mplsLdpAtmSessionEntry 1 }

mplsLdpSessionAtmLRLowerBoundVci OBJECT-TYPE
SYNTAX MplsAtmVcIdentifier
MAX-ACCESS not-accessible
STATUS current
DESCRIPTION
"The minimum VCI number for this range."
::= { mplsLdpAtmSessionEntry 2 }

mplsLdpSessionAtmLRUpperBoundVpi OBJECT-TYPE
SYNTAX AtmVpIdentifier
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"The maximum VPI number for this range."
::= { mplsLdpAtmSessionEntry 3 }

mplsLdpSessionAtmLRUpperBoundVci OBJECT-TYPE
SYNTAX MplsAtmVcIdentifier
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"The maximum VCI number for this range."
::= { mplsLdpAtmSessionEntry 4 }

--***************************************************************
-- Module Conformance Statement
--***************************************************************
mplsLdpAtmGroups
   OBJECT IDENTIFIER ::= { mplsLdpAtmConformance 1 }

mplsLdpAtmCompliances
   OBJECT IDENTIFIER ::= { mplsLdpAtmConformance 2 }

--
-- Full Compliance
--

mplsLdpAtmModuleFullCompliance MODULE-COMPLIANCE
   STATUS current
   DESCRIPTION
      "The Module is implemented with support for
       read-create and read-write. In other words,
       both monitoring and configuration
       are available when using this MODULE-COMPLIANCE."
   MODULE -- this module
   MANDATORY-GROUPS { mplslpAtmGroup }

   OBJECT       mplsLdpEntityAtmRowStatus
   SYNTAX       RowStatus { active(1) }
   WRITE-SYNTAX RowStatus { createAndGo(4), destroy(6) }
   DESCRIPTION
      "Support for createAndWait and notInService is not required."

   OBJECT       mplsLdpEntityAtmLRRowStatus
   SYNTAX       RowStatus { active(1) }
   WRITE-SYNTAX RowStatus { createAndGo(4), destroy(6) }
   DESCRIPTION
      "Support for createAndWait and notInService is not required."

::= { mplsLdpAtmCompliances 1 }

--
-- Read-Only Compliance
--

mplsLdpAtmModuleReadOnlyCompliance MODULE-COMPLIANCE
   STATUS current
   DESCRIPTION

Expires May 2004
"The Module is implemented with support for read-only. In other words, only monitoring is available by implementing this MODULE-COMPLIANCE."

MODULE -- this module

MANDATORY-GROUPS {
    mplsLdpAtmGroup
}

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

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

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

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

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

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

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

OBJECT mplsLdpEntityAtmUnlabTrafVci
MIN-ACCESS read-only
DESCRIPTION

Expires May 2004

[Page 81]
"Write access is not required."

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

OBJECT  mplsLdpEntityAtmRowStatus
SYNTAX       RowStatus { active(1) }
MIN-ACCESS  read-only
DESCRIPTION
 "Write access is not required, and active is the only status that needs to be supported."

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

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

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

OBJECT  mplsLdpEntityAtmLRRowStatus
SYNTAX       RowStatus { active(1) }
MIN-ACCESS  read-only
DESCRIPTION
 "Write access is not required, and active is the only status that needs to be supported."

::= { mplsLdpAtmCompliances 2 }

--
-- units of conformance
--

mplsLdpAtmGroup OBJECT-GROUP
OBJECTS {
  mplsLdpEntityAtmIfIndexOrZero,
mplsLdpEntityAtmMergeCap,
mplsLdpEntityAtmLrComponents,
mplsLdpEntityAtmVcDirectionality,
mplsLdpEntityAtmLsrConnectivity,
mplsLdpEntityAtmDefaultControlVpi,
mplsLdpEntityAtmDefaultControlVci,
mplsLdpEntityAtmUnlabTrafVpi,
mplsLdpEntityAtmUnlabTrafVci,
mplsLdpEntityAtmStorageType,
mplsLdpEntityAtmRowStatus,
mplsLdpEntityAtmLrMaxVpi,
mplsLdpEntityAtmLrMaxVci,
mplsLdpEntityAtmLrStorageType,
mplsLdpEntityAtmLrRowStatus,
mplsLdpSessionAtmLrUpperBoundVpi,
mplsLdpSessionAtmLrUpperBoundVci
)

STATUS    current
DESCRIPTION
"Objects that apply to all MPLS LDP implementations
using ATM as the Layer 2."
 ::= { mplsLdpAtmGroups 1 }

END

4.2. The MPLS-LDP-FRAME-RELAY-STD-MIB Module

This MIB Module MUST be supported if LDP uses FRAME RELAY as the
Layer 2 medium. There are three tables in this MIB Module. Two
tables are to configure LDP for using Frame Relay. These tables are
the mplsLdpEntityFrameRelayTable and the
mplsLdpEntityFrameRelayLrTable. The third table,
mplsLdpFrameRelaySessionTable, is a read-only table.

4.2.1. The LDP Entity Frame Relay Table

The mplsLdpEntityFrameRelayTable provides a way to configure
information which would be contained in the "Optional Parameter"
portion of an LDP PDU Initialization Message.
4.2.2. The LDP Entity Frame Relay Label Range Table

The mplsLdpEntityFrameRelayLRTable provides a way to configure information which would be contained in the "Frame Relay Label Range Components" portion of an LDP PDU Initialization Message, see [RFC3034] and [RFC3036].

4.2.3. The LDP Frame Relay Session Table

The MPLS LDP Frame Relay Session Table is a read-only table which contains session information specific to Frame Relay.

MPLS-LDP-FRAME-RELAY-STD-MIB DEFINITIONS ::= BEGIN

IMPORTS
  OBJECT-TYPE,
  MODULE-IDENTITY,
  Unsigned32
    FROM SNMPv2-SMI
  MODULE-COMPLIANCE,
  OBJECT-GROUP
    FROM SNMPv2-CONF

  RowStatus,
  StorageType
    FROM SNMPv2-TC

  DLCI
    FROM FRAME-RELAY-DTE-MIB

  InterfaceIndexOrZero
    FROM IF-MIB

mplsStdMIB
  FROM MPLS-TC-STD-MIB

mplsLdpEntityLdpId,
mplsLdpEntityIndex,
mplsLdpPeerLdpId
  FROM MPLS-LDP-STD-MIB
;

Expires May 2004
mplsLdpFrameRelayStdMIB MODULE-IDENTITY
LAST-UPDATED "200311181200Z" -- 18 November 2003
ORGANIZATION "Multiprotocol Label Switching (mpls) Working Group"

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George Swallow, email: swallow@cisco.com
Loa Andersson, email: loa@pi.se

MPLS Working Group, email: mpls@uu.net
"

DESCRIPTION
"Copyright (C) The Internet Society (2003). This version of this MIB module is part of RFCXXX; see the RFC itself for full legal notices.

This MIB contains managed object definitions for configuring and monitoring the Multiprotocol Label Switching (MPLS), Label Distribution Protocol (LDP), utilizing Frame Relay as the Layer 2 media."

REVISION "200311181200Z" -- 18 November 2003

DESCRIPTION
"Initial version published as part of RFC XXXX."

-- Please see the IANA Considerations Section.
-- The requested mplsStdMIB subId is 6, e.g.
-- ::= { mplsStdMIB 6 }

 ::= { mplsStdMIB XXX } -- to be assigned by IANA

-----------------------------------------------------------------------------------------------------------------------------------

mplsLdpFrameRelayObjects OBJECT IDENTIFIER
 ::= { mplsLdpFrameRelayStdMIB 1 }

mplsLdpFrameRelayConformance OBJECT IDENTIFIER

Expires May 2004
mplsLdpEntityFrameRelayObjects OBJECT IDENTIFIER ::= {
    mplsLdpFrameRelayObjects 1
}

mplsLdpEntityFrameRelayTable OBJECT-TYPE
SYNTAX      SEQUENCE OF MplsLdpEntityFrameRelayEntry
MAX-ACCESS  not-accessible
STATUS      current
DESCRIPTION
"This table contains Frame Relay specific
information which could be used in the
'Optional Parameters' and other Frame Relay
Relay specific information.

This table 'sparse augments' the mplsLdpEntityTable
when Frame Relay is the Layer 2 medium."
::= { mplsLdpEntityFrameRelayObjects 1 }

MplsLdpEntityFrameRelayEntry OBJECT-TYPE
SYNTAX      MplsLdpEntityFrameRelayEntry
MAX-ACCESS  not-accessible
STATUS      current
DESCRIPTION
"An entry in this table represents the Frame Relay
optional parameters associated with the LDP entity."
INDEX       { mplsLdpEntityLdpId,
                mplsLdpEntityIndex
}
::= { mplsLdpEntityFrameRelayTable 1 }

MplsLdpEntityFrameRelayEntry ::= SEQUENCE {
    mplsLdpEntityFrameRelayIfIndexOrZero    InterfaceIndexOrZero,
    mplsLdpEntityFrameRelayMergeCap         INTEGER,
    mplsLdpEntityFrameRelayLRComponents     Unsigned32,
    mplsLdpEntityFrameRelayVcDirectionality INTEGER,
    mplsLdpEntityFrameRelayStorageType      StorageType,
}
mplsLdpEntityFrameRelayRowStatus OBJECT-TYPE
SYNTAX             RowStatus
MAX-ACCESS         read-create
DESCRIPTION
"This value is defined for the rowStatus object, and is
available for RowStatus entries only.  For
mplsLdpEntityFrameRelayRowStatus the
RowStatus is not known.  For example, if the
RowStatus is not known, then it must be
represented by this value.

If an InterfaceIndex becomes known, then the
network management entity (e.g. SNMP agent) responsible
for this object MUST change the value from 0 (zero) to the
value of the InterfaceIndex. If an Frame Relay Label is
being used in forwarding data, then the value of this
object MUST be the InterfaceIndex."
::= { mplsLdpEntityFrameRelayEntry 1 }

mplsLdpEntityFrameRelayIfIndexOrZero OBJECT-TYPE
SYNTAX             InterfaceIndexOrZero
MAX-ACCESS         read-create
DESCRIPTION
"This value represents either the InterfaceIndex of
the 'ifLayer' where the Frame Relay Labels 'owned' by this
entry were created, or 0 (zero). The value of zero
means that the InterfaceIndex is not known. For example,
if the InterfaceIndex is created subsequent to the
Frame Relay Label’s creation, then it would not be known.
However, if the InterfaceIndex is known, then it must
be represented by this value.

If an InterfaceIndex becomes known, then the
network management entity (e.g. SNMP agent) responsible
for this object MUST change the value from 0 (zero) to the
value of the InterfaceIndex. If an Frame Relay Label is
being used in forwarding data, then the value of this
object MUST be the InterfaceIndex."
::= { mplsLdpEntityFrameRelayEntry 1 }

mplsLdpEntityFrameRelayMergeCap OBJECT-TYPE
SYNTAX             INTEGER {
                      notSupported(0),
                      supported(1)
                    }
MAX-ACCESS         read-create
DESCRIPTION
"This represents whether or not the Frame Relay merge
capability is supported. This is the EXACT value for the
Frame Relay Session Parameter, field M (for Frame Relay
Merge Capabilities). The Frame Relay Session Parameter
is an optional parameter in the Initialization Message.

The description from rfc3036.txt is:
'M, Frame Relay Merge Capabilities
  Specifies the merge capabilities of a Frame
  Relay switch. The following values are
  supported in this version of the
  specification:
<table>
<thead>
<tr>
<th>Value</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Merge not supported</td>
</tr>
<tr>
<td>1</td>
<td>Merge supported</td>
</tr>
</tbody>
</table>

Non-merge and merge Frame Relay LSRs may freely interoperate.

Please refer to the following reference for a complete description of this feature.

**REFERENCE**
"RFC3036, LDP Specification, Section 3.5.3 Initialization Message."
::= { mplsLdpEntityFrameRelayEntry 2 }

mplsLdpEntityFrameRelayLRComponents OBJECT-TYPE
SYNTAX        Unsigned32 (1..65535)
MAX-ACCESS    read-only
STATUS        current
DESCRIPTION   "Number of Label Range Components in the Initialization message. This also represents the number of entries in the mplsLdpEntityFrameRelayLRTable which correspond to this entry.

This is the EXACT value for the Frame Relay Session Parameter, field N (for Number of label range components). The Frame Relay Session Parameter is an optional parameter in the Initialization Message.

The description from rfc3036.txt is:

'N, Number of label range components
   Specifies the number of Frame Relay Label Range Components included in the TLV.'

Please refer to the following reference for a complete description of this feature.

**REFERENCE**
"RFC3036, LDP Specification, Section 3.5.3 Initialization Message."
::= { mplsLdpEntityFrameRelayEntry 3 }

mplsLdpEntityFrameRelayVcDirectionality OBJECT-TYPE
SYNTAX INTEGER {
    bidirectional(0),
    unidirectional(1)
}
MAX-ACCESS read-create
STATUS current
DESCRIPTION
"If the value of this object is ‘bidirectional(0)’, then
the LSR supports the use of a given DLCI as a label for
both directions independently. If the value of
this object is ‘unidirectional(1)’, then the LSR
uses the given DLCI as a label in only one direction.

This is the EXACT value for the Frame Relay Session
Parameter, field D (for VC Directionality). The
Frame Relay Session Parameter is an optional
parameter in the Initialization Message.

The description from rfc3036.txt is:

'D, VC Directionality
A value of 0 specifies bidirectional VC capability,
meaning the LSR can support the use of a given
DLCI as a label for both link directions
independently. A value of 1 specifies
unidirectional VC capability, meaning a given
DLCI may appear in a label mapping for one
direction on the link only. When either or both
of the peers specifies unidirectional VC
capability, both LSRs use unidirectional VC
label assignment for the link as follows. The
LSRs compare their LDP Identifiers as unsigned
integers. The LSR with the larger LDP
Identifier may assign only odd-numbered DLCIs
in the range as labels. The system with the
smaller LDP Identifier may assign only
even-numbered DLCIs in the range as labels.’

Please refer to the following reference for a
complete description of this feature."
REFERENCE
"RFC3036, LDP Specification, Section 3.5.3
Initialization Message."
::= { mplsLdpEntityFrameRelayEntry 4 }
mplsLdpEntityFrameRelayStorageType  OBJECT-TYPE
SYNTAX      StorageType
MAX-ACCESS  read-create
STATUS      current
DESCRIPTION
  "The storage type for this conceptual row.  
  Conceptual rows having the value 'permanent(4)' 
  need not allow write-access to any columnar 
  objects in the row."
DEFVAL { nonVolatile }
::= { mplsLdpEntityFrameRelayEntry 5 }

mplsLdpEntityFrameRelayRowStatus OBJECT-TYPE
SYNTAX      RowStatus
MAX-ACCESS  read-create
STATUS      current
DESCRIPTION
  "The status of this conceptual row. All writable 
  objects in this row may be modified at any time, 
  however, as described in detail in the section 
  entitled, 'Changing Values After Session 
  Establishment’, and again described in the 
  DESCRIPTION clause of the 
  mplsLdpEntityAdminStatus object, 
  if a session has been initiated with a Peer, 
  changing objects in this table will 
  wreak havoc with the session and interrupt 
  traffic. To repeat again: 
  the recommended procedure is to set the 
  mplsLdpEntityAdminStatus to 
  down, thereby explicitly causing a 
  session to be torn down. Then, 
  change objects in this entry, then set 
  the mplsLdpEntityAdminStatus 
  to enable which enables a new session 
  to be initiated."
::= { mplsLdpEntityFrameRelayEntry 6 }

--
-- Frame Relay Label Range Components
--

mplsLdpEntityFrameRelayLRTable  OBJECT-TYPE
SYNTAX      SEQUENCE OF MplsLdpEntityFrameRelayLREntry
This table contains information about the Optional Parameters for the Frame Relay Session in the LDP Initialization Message, specifically it contains information about the Frame Relay Label Range Components.

If the value of the object 'mplsLdpEntityOptionalParameters' contains the value of 'frameRelaySessionParameters(3)' then there must be at least one corresponding entry in this table.

::= { mplsLdpEntityFrameRelayObjects 2 }

mplsLdpEntityFrameRelayLREntry OBJECT-TYPE
SYNTAX MplsLdpEntityFrameRelayLREntry
MAX-ACCESS not-accessible
STATUS current
DESCRIPTION
"An entry in this table represents the Frame Relay Label Range Component associated with the LDP entity."
INDEX { mplsLdpEntityLdpId, mplsLdpEntityIndex, mplsLdpEntityFrameRelayLRMinDlci }
::= { mplsLdpEntityFrameRelayLRTable 1 }

MplsLdpEntityFrameRelayLREntry ::= SEQUENCE {
  mplsLdpEntityFrameRelayLRMinDlci              DLCI,
  mplsLdpEntityFrameRelayLRMaxDlci              DLCI,
  mplsLdpEntityFrameRelayLRLen                  INTEGER,
  mplsLdpEntityFrameRelayLRStorageType          StorageType,
  mplsLdpEntityFrameRelayLRRowStatus            RowStatus
}

mplsLdpEntityFrameRelayLRMinDlci OBJECT-TYPE
SYNTAX DLCI
MAX-ACCESS not-accessible
STATUS current
DESCRIPTION
"The lower bound which is supported. This value should be the same as that in the Frame Relay Label Range Component’s Minimum DLCI field. The value of zero is valid for the minimum DLCI field of..."
mplsLdpEntityFrameRelayLRMaxDlci OBJECT-TYPE
SYNTAX      DLCI
MAX-ACCESS  read-create
STATUS      current
DESCRIPTION
"The upper bound which is supported. This value
should be the same as that in the Frame Relay Label
Range Component’s Maximum DLCI field."
 ::= { mplsLdpEntityFrameRelayLREntry 2 }

mplsLdpEntityFrameRelayLRLen OBJECT-TYPE
SYNTAX      INTEGER {
    tenDlciBits(0),
    twentyThreeDlciBits(2)
}
MAX-ACCESS  read-create
STATUS      current
DESCRIPTION
"This object specifies the length of the DLCI bits.
This is the EXACT value for the Len field of the
Frame Relay Label Range Component.
The description from rfc3036.txt is:

'Len
This field specifies the number of bits of the DLCI.
The following values are supported:

<table>
<thead>
<tr>
<th>Len</th>
<th>DLCI bits</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>10</td>
</tr>
<tr>
<td>2</td>
<td>23</td>
</tr>
</tbody>
</table>

Len values 1 and 3 are reserved.’

Please refer to the following reference for a complete
description of this feature."
REFERENCE
"RFC3036, LDP Specification, Section 3.5.3"
Initialization Message.
::= { mplsLdpEntityFrameRelayLREntry 3 }

mplsLdpEntityFrameRelayLRStorageType OBJECT-TYPE
SYNTAX StorageType
MAX-ACCESS read-create
STATUS current
DESCRIPTION
"The storage type for this conceptual row. Conceptual rows having the value 'permanent(4)' need not allow write-access to any columnar objects in the row."
DEFVAL { nonVolatile }
::= { mplsLdpEntityFrameRelayLREntry 4 }

mplsLdpEntityFrameRelayLRRowStatus OBJECT-TYPE
SYNTAX RowStatus
MAX-ACCESS read-create
STATUS current
DESCRIPTION
"The status of this conceptual row. All writable objects in this row may be modified at any time, however, as described in detail in the section entitled, 'Changing Values After Session Establishment', and again described in the DESCRIPTION clause of the mplsLdpEntityAdminStatus object, if a session has been initiated with a Peer, changing objects in this table will wreak havoc with the session and interrupt traffic. To repeat again: the recommended procedure is to set the mplsLdpEntityAdminStatus to down, thereby explicitly causing a session to be torn down. Then, change objects in this entry, then set the mplsLdpEntityAdminStatus to enable which enables a new session to be initiated."
::= { mplsLdpEntityFrameRelayLREntry 5 }

--
-- MPLS LDP Frame Relay Session Information
--

Expires May 2004
mplsLdpFrameRelaySessionObjects OBJECT IDENTIFIER ::= 
    { mplsLdpFrameRelayObjects 2 }

mplsLdpFrameRelaySessionTable OBJECT-TYPE
SYNTAX      SEQUENCE OF MplsLdpFrameRelaySessionEntry
MAX-ACCESS  not-accessible
STATUS      current
DESCRIPTION
    "A table of Frame Relay label range intersections
    between the LDP Entities and LDP Peers.
    Each row represents a single label range intersection.

    NOTE: this table cannot use the ‘AUGMENTS’
    clause because there is not necessarily a one-to-one
    mapping between this table and the
    mplsLdpSessionTable."
 ::= { mplsLdpFrameRelaySessionObjects 1 }

mplsLdpFrameRelaySessionEntry OBJECT-TYPE
SYNTAX      MplsLdpFrameRelaySessionEntry
MAX-ACCESS  not-accessible
STATUS      current
DESCRIPTION
    "An entry in this table represents information on a
    single label range intersection between an
    LDP Entity and LDP Peer.

    The information contained in a row is read-only."
INDEX       { mplsLdpEntityLdpId, 
mplsLdpEntityIndex, 
mplsLdpPeerLdpId, 
mplsLdpFrameRelaySessionMinDlci 
} 
 ::= { mplsLdpFrameRelaySessionTable 1 }

MplsLdpFrameRelaySessionEntry ::= SEQUENCE {
    mplsLdpFrameRelaySessionMinDlci    DLCI,
    mplsLdpFrameRelaySessionMaxDlci    DLCI,
    mplsLdpFrameRelaySessionLen        INTEGER
}

mplsLdpFrameRelaySessionMinDlci OBJECT-TYPE
SYNTAX      DLCI
MAX-ACCESS  not-accessible
STATUS current
DESCRIPTION "The lower bound of DLCIs which are supported. The value of zero is a valid value for the minimum DLCI field of the label."
REFERENCE "RFC3034, Use of Label Switching on Frame Relay Networks Specification."
::= { mplsLdpFrameRelaySessionEntry 1 }

mplsLdpFrameRelaySessionMaxDlci OBJECT-TYPE
SYNTAX DLCI
MAX-ACCESS read-only
STATUS current
DESCRIPTION "The upper bound of DLCIs which are supported."
::= { mplsLdpFrameRelaySessionEntry 2 }

mplsLdpFrameRelaySessionLen OBJECT-TYPE
SYNTAX INTEGER {
  tenDlciBits(0),
  twentyThreeDlciBits(2)
}
MAX-ACCESS read-only
STATUS current
DESCRIPTION "This object specifies the DLCI bits."
::= { mplsLdpFrameRelaySessionEntry 3 }

--****************************************************************
-- Module Conformance Statement
--****************************************************************

mplsLdpFrameRelayGroups
OBJECT IDENTIFIER ::= { mplsLdpFrameRelayConformance 1 }

mplsLdpFrameRelayCompliances
OBJECT IDENTIFIER ::= { mplsLdpFrameRelayConformance 2 }

--
-- Full Compliance
--

mplsLdpFrameRelayModuleFullCompliance MODULE-COMPLIANCE

Expires May 2004
STATUS current
DESCRIPTION
"The Module is implemented with support for read-create and read-write. In other words, both monitoring and configuration are available when using this MODULE-COMPLIANCE."

MODULE -- this module
MANDATORY-GROUPS

OBJECT mplsLdpEntityFrameRelayRowStatus
SYNTAX RowStatus { active(1) }
WRITE-SYNTAX RowStatus { createAndGo(4), destroy(6) }
DESCRIPTION
"Support for createAndWait and notInService is not required."

OBJECT mplsLdpEntityFrameRelayLRRowStatus
SYNTAX RowStatus { active(1) }
WRITE-SYNTAX RowStatus { createAndGo(4), destroy(6) }
DESCRIPTION
"Support for createAndWait and notInService is not required."

::= { mplsLdpFrameRelayCompliances 1 }

--
-- Read-Only Compliance
--

mplsLdpFrameRelayModuleReadOnlyCompliance MODULE-COMPLIANCE
STATUS current
DESCRIPTION
"The Module is implemented with support for read-only. In other words, only monitoring is available by implementing this MODULE-COMPLIANCE."

MODULE -- this module
MANDATORY-GROUPS

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

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

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

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

OBJECT mplsLdpEntityFrameRelayRowStatus  
SYNTAX RowStatus { active(1) }  
MIN-ACCESS read-only  
DESCRIPTION "Write access is not required, and active is the only status that needs to be supported."

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

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

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

OBJECT mplsLdpEntityFrameRelayLRRowStatus  
SYNTAX RowStatus { active(1) }  
MIN-ACCESS read-only  
DESCRIPTION "Write access is not required, and active is the only status that needs to be supported."

::= { mplsLdpFrameRelayCompliances 2 }

--  
-- units of conformance
mplsLdpFrameRelayGroup OBJECT-GROUP
  OBJECTS {
    mplsLdpEntityFrameRelayIfIndexOrZero,
    mplsLdpEntityFrameRelayMergeCap,
    mplsLdpEntityFrameRelayLRComponents,
    mplsLdpEntityFrameRelayVcDirectionality,
    mplsLdpEntityFrameRelayStorageType,
    mplsLdpEntityFrameRelayRowStatus,
    mplsLdpEntityFrameRelayLRMaxDlci,
    mplsLdpEntityFrameRelayLRLen,
    mplsLdpEntityFrameRelayLRStorageType,
    mplsLdpEntityFrameRelayLRRowStatus,
    mplsLdpFrameRelaySessionMaxDlci,
    mplsLdpFrameRelaySessionLen
  }
  STATUS    current
  DESCRIPTION
    "Objects that apply to all MPLS LDP implementations
    using Frame Relay as the Layer 2."
  ::= { mplsLdpFrameRelayGroups 1 }

END

4.3. The MPLS-LDP-GENERIC-STD-MIB Module

This MIB Module MUST be supported if LDP uses a Per Platform Label
Space. This MIB Module contains a Label Range (LR) table for
configuring MPLS Generic Label Ranges. This table is
mplsLdpEntityGenericLRTable. Although the LDP Specification does not
provide a way for configuring Label Ranges for Generic Labels, the
MIB does provide a way to reserve a range of generic labels because
this was thought to be useful by the working group.

MPLS-LDP-GENERIC-STD-MIB DEFINITIONS ::= BEGIN

IMPORTS

Expires May 2004
INTERNET-DRAFT                MPLS LDP MIB                 November 2003

OBJECT-TYPE,
MODULE-IDENTITY,
Unsigned32
   FROM SNMPv2-SMI

MODULE-COMPLIANCE,
OBJECT-GROUP
   FROM SNMPv2-CONF

RowStatus,
StorageType
   FROM SNMPv2-TC

InterfaceIndexOrZero
   FROM IF-MIB

mplsStdMIB
   FROM MPLS-TC-STD-MIB

mplsLdpEntityLdpId,
mplsLdpEntityIndex
   FROM MPLS-LDP-STD-MIB

;

mplsLdpGenericStdMIB MODULE-IDENTITY
   LAST-UPDATED "200311181200Z"  -- 18 November 2003
   ORGANIZATION "Multiprotocol Label Switching (mpls) Working Group"
   CONTACT-INFO
      "Joan Cucchiara (jcucchiara@artel.com)
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      Hans Sjostrand (hans@ipunplugged.com)
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      James V. Luciani (james_luciani@mindspring.com)
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      Working Group Chairs:
         George Swallow,   email: swallow@cisco.com
         Loa Andersson,    email: loa@pi.se

         MPLS Working Group, email: mpls@uu.net

" DESCRIPTIO
"Copyright (C) The Internet Society (2003). This version of this MIB module is part of RFCXXX; see the RFC itself for full legal notices.

This MIB contains managed object definitions for configuring and monitoring the Multiprotocol Label Switching (MPLS), Label Distribution Protocol (LDP), utilizing ethernet as the Layer 2 media."

REVISON "200311181200Z" -- 18 November 2003

DESCRIPTION
"Initial version published as part of RFC XXXX."

-- Please see the IANA Considerations Section.
-- The requested mplsStdMIB subId is 7, e.g.
-- ::= { mplsStdMIB 7 }

::= { mplsStdMIB XXX } -- to be assigned by IANA

--****************************************************************

mplsLdpGenericObjects
OBJECT IDENTIFIER ::= { mplsLdpGenericStdMIB 1 }

mplsLdpGenericConformance
OBJECT IDENTIFIER ::= { mplsLdpGenericStdMIB 2 }

--****************************************************************

-- MPLS LDP GENERIC Objects
--****************************************************************

--
-- Ldp Entity Objects for Generic Labels
--

mplsLdpEntityGenericObjects OBJECT IDENTIFIER ::= { mplsLdpGenericObjects 1 }

--
-- The MPLS LDP Entity Generic Label Range Table
--

mplsLdpEntityGenericLRTable OBJECT-TYPE
SYNTAX SEQUENCE OF MplsLdpEntityGenericLREntry

Expires May 2004
MAX-ACCESS not-accessible
STATUS current
DESCRIPTION
"The MPLS LDP Entity Generic Label Range (LR) Table.

The purpose of this table is to provide a mechanism for configuring a contiguous range of generic labels, or a 'label range' for LDP Entities.

LDP Entities which use Generic Labels must have at least one entry in this table. In other words, this table 'extends' the mpldLdpEntityTable for Generic Labels."

::= { mplsLdpEntityGenericObjects 1 }

mplsLdpEntityGenericLREntry OBJECT-TYPE
SYNTAX MplsLdpEntityGenericLREntry
MAX-ACCESS not-accessible
STATUS current
DESCRIPTION
"A row in the LDP Entity Generic Label Range (LR) Table. One entry in this table contains information on a single range of labels represented by the configured Upper and Lower Bounds pairs. NOTE: there is NO corresponding LDP message which relates to the information in this table, however, this table does provide a way for a user to 'reserve' a generic label range.

NOTE: The ranges for a specific LDP Entity are UNIQUE and non-overlapping.

A row will not be created unless a unique and non-overlapping range is specified."

INDEX { mplsLdpEntityLdpId, mplsLdpEntityIndex, mplsLdpEntityGenericLRMin, mplsLdpEntityGenericLRMax }

::= { mplsLdpEntityGenericLRTable 1 }

MplsLdpEntityGenericLREntry ::= SEQUENCE {
  mplsLdpEntityGenericLRMin           Unsigned32,
  mplsLdpEntityGenericLRMax           Unsigned32,
  mplsLdpEntityGenericLabelSpace      INTEGER,

mplsLdpEntityGenericIfIndexOrZero OBJECT-TYPE
SYNTAX InterfaceIndexOrZero
MAX-ACCESS read-create
STATUS current
DESCRIPTION "Interface index or zero of this LDP entity."
DEFVAL { InterfaceIndexOrZero(0) }
::= { mplsLdpEntityGenericLREntry 1 }

mplsLdpEntityGenericLRStorageType OBJECT-TYPE
SYNTAX StorageType
MAX-ACCESS read-create
STATUS current
DESCRIPTION "Storage type of this LDP entity."
DEFVAL { StorageType(0) }
::= { mplsLdpEntityGenericLREntry 2 }

mplsLdpEntityGenericLRRowStatus OBJECT-TYPE
SYNTAX RowStatus
MAX-ACCESS read-create
STATUS current
DESCRIPTION "Row status of this LDP entity."
DEFVAL { RowStatus(0) }
::= { mplsLdpEntityGenericLREntry 3 }

mplsLdpEntityGenericLRMin OBJECT-TYPE
SYNTAX Unsigned32(0..1048575)
MAX-ACCESS not-accessible
STATUS current
DESCRIPTION "The minimum label configured for this range."
::= { mplsLdpEntityGenericLREntry 1 }

mplsLdpEntityGenericLRMax OBJECT-TYPE
SYNTAX Unsigned32(0..1048575)
MAX-ACCESS not-accessible
STATUS current
DESCRIPTION "The maximum label configured for this range."
::= { mplsLdpEntityGenericLREntry 2 }

mplsLdpEntityGenericLabelSpace OBJECT-TYPE
SYNTAX INTEGER {
   perPlatform(1),
   perInterface(2)
}
MAX-ACCESS read-create
STATUS current
DESCRIPTION "This value of this object is perPlatform(1), then
this means that the label space type is
per platform.

If this object is perInterface(2), then this
means that the label space type is per Interface."
REFERENCE
"RFC3036, LDP Specification, Section 2.2.1,
Label Spaces."
DEFVAL { perPlatform } 
::= { mplsLdpEntityGenericLREntry 3 }
DESCRIPTION

"This value represents either the InterfaceIndex of the 'ifLayer' where these Generic Label would be created, or 0 (zero). The value of zero means that the InterfaceIndex is not known.

However, if the InterfaceIndex is known, then it must be represented by this value.

If an InterfaceIndex becomes known, then the network management entity (e.g. SNMP agent) responsible for this object MUST change the value from 0 (zero) to the value of the InterfaceIndex."

::= { mplsLdpEntityGenericLREntry 4 }

mplsLdpEntityGenericLRStorageType OBJECT-TYPE
SYNTAX StorageType
MAX-ACCESS read-create
STATUS current
DESCRIPTION

"The storage type for this conceptual row. Conceptual rows having the value 'permanent(4)' need not allow write-access to any columnar objects in the row."

DEFVAL { nonVolatile }
::= { mplsLdpEntityGenericLREntry 5 }

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

"The status of this conceptual row. All writable objects in this row may be modified at any time, however, as described in detail in the section entitled, 'Changing Values After Session Establishment', and again described in the DESCRIPTION clause of the mplsLdpEntityAdminStatus object, if a session has been initiated with a Peer, changing objects in this table will wreak havoc with the session and interrupt traffic. To repeat again: the recommended procedure is to set the mplsLdpEntityAdminStatus to down, thereby explicitly causing a session to be torn down. Then, change objects in this entry, then set the mplsLdpEntityAdminStatus
to enable which enables a new session to be initiated.

There must exist at least one entry in this
table for every LDP Entity that has a
generic label configured."
 ::= { mplsLdpEntityGenericLREntry 6 }

--****************************************************************
-- Module Conformance Statement
--****************************************************************

mplsLdpGenericGroups
 OBJECT IDENTIFIER ::= { mplsLdpGenericConformance 1 }

mplsLdpGenericCompliances
 OBJECT IDENTIFIER ::= { mplsLdpGenericConformance 2 }

--
-- Full Compliance
--

mplsLdpGenericModuleFullCompliance MODULE-COMPLIANCE
 STATUS current
 DESCRIPTION
 "The Module is implemented with support for
 read-create and read-write. In other words,
 both monitoring and configuration
 are available when using this MODULE-COMPLIANCE."
 MODULE -- this module
 MANDATORY-GROUPS { mplsLdpGenericGroup }

 OBJECT mplsLdpEntityGenericLRRowStatus
 SYNTAX RowStatus { active(1) }
 WRITE-SYNTAX RowStatus { createAndGo(4), destroy(6) }
 DESCRIPTION
 "Support for createAndWait and notInService is not required."
 ::= { mplsLdpGenericCompliances 1 }

--
-- Read-Only Compliance
--

Expires May 2004
mplsLdpGenericModuleReadOnlyCompliance MODULE-COMPLIANCE
STATUS current
DESCRIPTION
"The Module is implemented with support for
read-only. In other words, only monitoring
is available by implementing this MODULE-COMPLIANCE."
MODULE -- this module
MANDATORY-GROUPS
{ mplsWithGenericGroup
}

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

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

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

OBJECT     mplsLdpEntityGenericLRRowStatus
SYNTAX     RowStatus { active(1) }
MIN-ACCESS read-only
DESCRIPTION
"Write access is not required, and active is the
only status that needs to be supported."
::= { mplsLdpGenericCompliances 2 }

--
-- units of conformance
--

mplsLdpGenericGroup OBJECT-GROUP
OBJECTS {
    mplsLdpEntityGenericLabelSpace,
mplsLdpEntityGenericIfIndexOrZero,
mplsLdpEntityGenericLRStorageType,
mplsLdpEntityGenericLRRowStatus
}
STATUS    current
DESCRIPTION
 "Objects that apply to all MPLS LDP implementations
      using Generic Labels as the Layer 2."
 ::= { mplsLdpGenericGroups 1 }
5. Revision History

NOTE TO RFC-Editor: before publishing this document as an RFC, please remove this Revision History (change log) section.

5.1. Changes from <draft-ietf-mpls-ldp-mib-13.txt>

Fix in the Full Compliance of the MPLS-LDP-STD-MIB module to remove MIN-ACCESS read-only from the mplsFecRowStatus and mplsLdpLspFecRowStatus objects. The DESCRIPTION clauses were also updated accordingly.

5.2. Changes from <draft-ietf-mpls-ldp-mib-12.txt>

These fixes were from the MIB Doctor Review.

- bottom of page 6
  s/MPLS-TC-MIB/MPLS-TC-STD-MIB/

- sect 3.6 first para
  change RFC2573 into RFC3413
  The citation [RFC2573] does not occur in the ref section either
  Neither doe RFC3413

  Fixed line lengths.

5.3. Changes from <draft-ietf-mpls-ldp-mib-11.txt>

Updated with comments from the 3rd Last Call for this MIB which took place, Thursday, June 12 to June 24, 2003.

Updated with last call comments from Adrian Farrel posted to the MPLS Working Group email list on June 12, 2003.

Updated the 2 outstanding issues from Bert’s email May 9th which was posted to the MPLS Working Group. These issues were not updated for version 10, so were addressed in version 11: 1) updated #3 from that email and 2) reviewed all the InetAddressType and InetAddress objects to make sure that descriptions were per rfc3291.
5.4. Changes from <draft-ietf-mpls-ldp-mib-10.txt>

Renamed the MIB module to include Std and also updated the IANA Considerations Section to use mplsStdMIB.

Updated per Bert’s email May 9th, with 2 exceptions: 1) did not yet update #3 from that email and 2) did not yet review all the InetAddressType and InetAddress objects to make sure that descriptions were per rfc3291.

Changed Ses to Session for clarity.

5.5. Changes from <draft-ietf-mpls-ldp-mib-09.txt>

Added the new MIB boiler plate and associated MIB reference changes.

Reworked the OID tree structure so that the Modules only have the mplsMIB subid dependency. This was discussed in mpls wg email (discussion was mostly between Bert, Tom and Joan).

Added IANA Considerations section. This contains 4 subsections, one per MIB module.

Updated and added new references as needed.

Changed mplsMIB subid values to agree with the latest "Multiprotocol Label Switching (MPLS) Management Overview" document, [MPLSMGMT].

Moved MIB modules around so that they would appear in subId order. The Generic MIB module is shown last, since the subid is 7 (which is the last (and largest) subid requested by IANA).

5.5.1. Changes based on MIB Doctor Review Comments

The following changes are based on comments from the MIB DR Review. The comments are from email to the mpls working group dated, Dec 6, 2002. These comments are quoted and prefaced by "REQ: comment goes here", and then followed by our resolution.

"REQ: - missing IPR section". RSP: it has been added.

"REQ: - Security considerations probably needs more work
Security ADs want you to explain what the vulnerabilities/risks
are and what to do against them.
Also for read only objects, pls list each (group of) object(s)
and explain what sensitivity attributes they have". RSP: Done. We
added subsections here since the Security template is MIB Module
based and it seemed to us more clear to do a subsection per MIB
Module.

"REQ: - pls do the consistency checking for descriptors and all
that". RSP: believe this to be done. Changed Gen to Generic
everywhere, changed Fr to FrameRelay, changed RO to ReadOnly.
Changed Sessions to Ses everywhere. Reviewed tables to make sure
they were prefixed consistently. Added more references, used more
TCs and other stuff.

"REQ: - sect 3.5 1st sentence, s/would be/are/ ??". RSP: done.

"REQ: - sect 3.5 2nd para first sentence  s/initiation/initiate/ ".
RSP: done.

"REQ: - section 3.5.2 s/mpsl/mpls/". RSP: done.

"REQ: - mplsXxxIndexNext
    See my comments on FTN MIB and LSR MIB on these type of objects
    Best to use something aka rfc3289 ". RSP: We have imported the
IndexInteger and IndexIntegerNextFree TCs (from rfc3289.txt). NOTE:
we do not like the names of these TCs because they use the term
Integer when the values are Unsigned32. Would prefer new TCs with
IndexUnsigned32 and IndexUnsigned32NextFree.

"REQ:- RowStatus and StorageType objects
    see my comments about similar objects in LSR MIB
    for StorageType might also want to add a DEFVAL ". RSP: Added
descriptive text to the RowStatus objects to specify which columns
can be changed when row is active. Added descriptive text to the
StorageType objects to specify what happens when the StorageType is
permanent. Also added DEFVALs for the StorageType objects.

"REQ: - mplsLdpNotifications ... ( mplsLdpMib 2 )
    why not ( mplsLdpMib 0) so that it is right away the prefix?
    I believe LSR MIB does it that way now. You may want to do
it consistently for all notifications.
    I can live with either way, but prefer them to be shorter OIDs.".
RSP: We changed this to follow what LSR MIB does (i.e.
mplsLdpNotifications 0) for shorter OIDs..PP "REQ: -
mplsXxxLastChange
does that time stamp only get changed if an addition/deletion takes
place? Not if something gets changed via a SNMP SET command?
   I think I'd prefer to also see changes (modifications) via SET.
   But in any event, be very explicit about if those are included or
   not.".  RSP: All Last change object DESCRIPTIONs have been
   updated to be very specific.

"REQ:- mplsLdpLspType
   All that stuff in the DESCRIPTION clause is just a repeat of the
   TC DESCRIPTION clause. Seems not needed to me. What if a value
   gets added later... how do you stay in sync?".  RSP: This has
   been fixed.

"REQ: - mplsFecAddrLength
   Should that be of SYNTAX InetAddressPrefixLength as per RFC3291?".
   RSP: yes, fixed.

"REQ: - mplsFecAddrFamily and mplsFecAddr
   These are strange. The DESCRIPTIONS are certainly not meeting the
   requirements as specified in RFC3291. At other places you do it
correct, so you do understand what is required I think.". RSP: changed to have a better descriptions. Should note that the TLVs in
   the LDP Specification use Address Family Numbers and are still
   referring to RFC1700.

"REQ: - mplsLdpLspFecTable claims to be a read-only table.
   Yet you have a read-create RowStatus object in it.".  RSP: fixed.

"REQ: - mplsLdpSessionUp and mplsLdpSessionDown
   Is it not better to just have one notification, namely a
   mplsLdpSessionStateChange and then the mplsLdpSesState object will
   explain what the change is?".  RSP: We prefer to leave it this
   way. There are some 3rd Party applications that try to resolve
   Notifications, so you see one for down, then resolve this by seeing
   another one for up. Granted, these 3rd party apps could be coded to
   parse the varbind within the trap, but then this requires coding
   whereas having 2 distinct notifications is easier on the developer.
   Granted, this maybe makes the MIB design more cumbersome. If this is
   a blocking issue, then we will change it.

"REQ:- COMPLIANCE section. I hope that INT ADs are OK with making
   IPv6
   addresses optional. Is that cause current LDP only supports IPv4?
   If so you may want to add that as an explanation.".  RSP: IPv6
   was made mandatory, also supported in MPLS LDP Spec (rfc3036.txt).

Continue with MIB Dr Comments for the MPLS-LDP-GENERIC-MIB.
"REQ:- same on mplsXXXIndexNext and RowStatus and STorageType objects". RSP: These descriptions have been updated. It should be noted, that these should be EXACTLY the same as the mplsLdpEntityTable since the Label Range Tables extend the Entity Table. "REQ:- this looks weird:

```pseudocode
::= { mplsMib 6 } -- to be assigned
use cc instead of 6 if you want IANA to assign, and do tell
-- to be assigned by IANA
and write something about it in an IANA Considerations Section if this is what you want.". RSP: Added more comments, and added an IANA Considerations Section. "REQ:- mplsGenModuleROCompliance
I would call it mplsGenModuleReadOnlyCompliance
You have used ReadOnly and Full in other places/mib modules and it is good to be clear and consistent". RSP: done.

MIB Doctor Review comments for ATM.

"REQ:- s/Moduel/Module/". RSP: done.

"REQ:- same on mplsXXXIndexNext and RowStatus and STorageType objects". RSP: done.

"REQ:- this looks weird:

```pseudocode
::= { mplsMib 4 } -- to be assigned
use cc instead of 4 if you want IANA to assign, and do tell
-- to be assigned by IANA
and write something about it in an IANA Considerations Section if this is what you want.". RSP: done.

"REQ:- See earlier remark on Notifications (use zero instead of 2 right away)". RSP: Removed this branch because there aren’t any notifications in this MIB module.

"REQ:- There are still some INTEGER enumerations that start with zero
It is not a BLOCKING problem... but if acceptable, pls make it start
at 1 (as you have done vor various others of these enumerations)". RSP: We would rather leave these enums starting with zero. (There are 2 of them in the ATM Module). The reason for leaving them is because the value zero is what the protocol uses. We have added REFERENCES to these objects and more info in the descriptions themselves. We believe it is in the best interest of developers to start enums at zero. The INET-ADDRESS-MIB uses the value zero, and since we are already required to use that MIB, there is precedence for zero in an enum where it makes sense. We believe the value of zero makes sense for where it is being used in this MIB module.
"REQ:- mplsXxxxROCompliance -> better mplsXxxxReadOnlyCompliance".  
RSP: done.

"REQ:- some formatting problems with DEFVAL lines being split on 2 
lines?".  RSP: fixed.

MIB Doctor Review comments for FrameRelay

"REQ:- consistency in descriptors (FrameRelay vs FR etc)".  RSP: 
done.  "REQ:- same on mplsXXXIndexNext and RowStatus and StorageType 
objects".  RSP: done.  "REQ:- this looks wierd:  
::= { mplsMib 5 } -- to be assigned  
use cc instead of 5 if you want IANA to assign, and do tell  
-- to be assigned by IANA  
and write something about it in an IANA Considerations Section if  
this is what you want.".  RSP: done.  "REQ:- See earlier remark 
on Notifications (use zero instead of 2 right away)".  RSP: Removed 
this branch because there aren’t any notifications in this MIB 
module.

"REQ:- There are still some INTEGER enumerations that start with zero  
It is not a BLOCKING problem... but if acceptable, pls make it 
start  
at 1 (as you have done vor various others of these enumerations)".  
RSP: We would rather leave these enums starting with zero.  (There are 
4 of them in the Frame Relay Module).  The reason for leaving them is 
because the value zero is what the protocol uses.  We have added 
REFERENCES to these objects and more info in the descriptions 
themselves.  We believe it is in the best interest of developers to 
start enums at zero.  The INET-ADDRESS-MIB uses the value zero, and 
since we are already required to use that MIB, there is precedence 
for zero in an enum where it makes sense.  We believe the value of 
zero makes sense for where it is being used in this MIB module.

"REQ:- mplsLdpEntityFrLRComponents OBJECT-TYPE  
SYNTAX Unsigned32 (1..65535)  
MAX-ACCESS read-create  
STATUS current  
DESCRIPTION  
"Number of Label Range Components in the Initialization 
message.  This also represents the number of entries  
in the mplsLdpEntityConfFrLRTable which correspond  
to this entry."  
Where is this mplsLdpEntityConfFrLRTable ??".  RSP: fixed.  
"REQ:- I see the xxxDlci index objects start at zero.  
Pls add to DESCRIPTION clauses why zero must be an index.".  RSP:
Since we are using DLCI and the value of zero is valid for a DLCI. A statement was added about this. Also, used the DLCI TC from rfc2115.txt to make this more clear. NOTE: the MPLS-LDP-ATM-MIB module uses an index of the VP which can also take on the value of zero. A statement was added to this Index also. "REQ: mplsXxxxROCompliance -> better mplsXxxxReadOnlyCompliance". RSP: done.

5.6. Changes from <draft-ietf-mpls-ldp-mib-08.txt>

The following changes are from the IESG MIB review.

Changed "Label Switch Router" to "Label Switching Router".

Spelling errors fixed (unlabelled, attemt, subsytem).

Changed some of the enums to start at 1, instead of zero: mplsLdpPeerLoopDetectionForPV and mplsLdpEntityOperStatus.

Added REFERENCE clauses.

Added a timestamp object for mplsLdpSesState changes.

Changed NMS to command generator as defined in RFC2571.

Added a lastChange objects: mplsLdpEntityLastChange and mplsLdpPeerLastChange.

Added TEXTUAL-CONVENTIONS for MplsLabelDistributionMethod and MplsRetentionMode. These TCs have been incorporated into draft-ietf-mpls-tc-mib-04.txt.

Divided up the one MIB MODULE into 3 additional modules for a total of 4 MIB MODULES: 1) mplsLdpMIB, 2) mplsLdpGenericMIB which includes objects pertaining to Ethernet as the L2, 3) mplsLdpAtmMIB which includes objects pertaining to ATM as the L2, and 4) mplsLdpFrameRelayMIB which includes objects pertaining to Frame Relay as the L2.

Also, reduced the number of objects by creating the mplsLdpLspTable and removing the Mapping tables.

In section 3.1 changed "where each row in the table initiates" to "where each row in the table represents".
Updated Reference Section and divided them into Normative vs. Informative.

Removed the MplsGenAddress TC and used the INET-ADDRESS-MIB’s InetAddress TC. Objects using this TC are: mplsLdpEntityTargetPeerAddr, mplsFecAddr, and mplsLdpSesPeerNextHopAddr and are noted in the conformance statements supporting: unknown(0), ipv4(1), and ipv6(2).

Removed AddressFamilyNumbers TC and used InetAddressType TC from the INET-ADDRESS-MIB. One of the MIB compilers as a warning because apparently one is expected to use InetAddressType and InetAddress together (although, think this restriction is too restrictive). Also, removed the reference for the Address Family Numbers MIB.

Changed the name TargPeer to TargetPeer.

Removed the Enable/Disable trap objects: mplsLdpEntityPVLMisTrapEnable, and mplsLdpSesUpDownTrapEnable. RFC 3413 should be used to enable/disable traps.

Removed the import for "transmission" and instead, imported "mplsMIB from the MPLS-TC-STD-MIB".

Changed mplsLdpEntityPVL to mplsLdpEntityPathVectorLimit and updated the DESCRIPTION clause. Also, the PVL abbreviation was expanded to PathVectorLimit for other objects.

Combined the objects: mplsLdpPeerLoopDectionForPV and mplsLdpPeerPVL into one object: mplsLdpPeerPathVectorLimit and updated the DESCRIPTION clause.

mplsLdpEntityTcpDscPort uses InetPortNumber TC from the INET-ADDRESS-MIB. Likewise, mplsLdpEntityUdpDscPort uses the InetPortNumber TC from the INET-ADDRESS-MIB. Also a REFERENCE clause was added.

The mplsLdpEntityMaxPduLength object has the SYNTAX range changed to start at 256. Also the DESCRIPTION clause was updated.

The mplsLdpSesMaxPduLen object’s name was changed to mplsLdpSesMaxPduLength and a UNITS clause was added, and the DESCRIPTION clause was updated. This object is related to the mplsLdpEntityMaxPduLength object.

The mplsLdpEntityKeepAliveHoldTimer and mplsLdpEntityHelloHoldTimer DESCRIPTION clause was changed from "The two octet value" to "The
16-bit integer value”.

The mplsLdpEntityHelloHoldTimer object’s DESCRIPTION clause was updated.

A range of Integer32(0..100) was added to the SYNTAX clause of the mplsLdpEntityInitSesThreshold object. Also, the DESCRIPTION clause of this object was updated.

The mplsLdpEntityOptionalParameters object was renamed to mplsLdpEntityLabelType.

Updated the mplsLdpEntityAdminStatus and mplsLdpEntityRowStatus objects. RowStatus now reflects the status of the row, and Admin status controls enabling/disabling the entry.

Updated the DESCRIPTION clauses for the objects in the mplsLdpEntityStatsTable to refer to the mplsLdpEntityDiscontinuityTime object.

Changed StorType to StorageType.

5.7. Changes from <draft-ietf-mpls-ldp-mib-07.txt>

There were three types of changes: the first change was that all the MPLS Textual Conventions from this MIB, the LSR and MPLS-TE MIBs were moved into a new document [MPLSTCMIB], "draft-ietf-mpls-tc-mib-00.txt". The Textual Conventions are now IMPORTED from [MPLSTCMIB]. The second type of change was updates based on comments from the IESG. These changes will be discussed below. The third type of changes were based on minor editorial changes from the co-authors.

The "Introduction" and "Structure of the MIB" sections were reworded since they were repetitive.

The "Overview" was rearranged.

References were added to "The LDP Entity ATM Objects" and "The LDP Entity Frame Relay Objects" Sections.

The Working Group mailing list and Chairs were added to the CONTACT-INFO.

Updated the DESCRIPTION clause for the "mplsLdpEntityLdpId" object.
Updated the mplsLdpEntityProtocolVersion to include a range (1..65535).

Updated the "References" Section.

Running the MIB through the smilint MIB compiler showed that some object names were longer than 32 characters, these were shortened to 32 characters or fewer.

The following changes were from the co-authors.

Other minor editorial changes such as fixing typographical errors, and removing MIB comments which are no longer meaningful.

Page 17 (also page 46) the description was enhanced to describe the version field in the LDP header from RFC3036.

Removed WellKnown from the tcp and upd port names. It’s the ports that get set, and the default value is the well known (actually the registered) port number.

mplsLdpEntityInitSesTrapEnable object is useless and was removed since setting mplsLdpEntityInitSesThreshold=0 acheives the same thing. Also removed it from the descriptive text in section 3.

Page 47, mplsLdpSessionDiscontinuityTime The initial value of this was changed to be sysUpTime instead of zero. sysUpTime for when the session starts is more meaningful and was added to the Session Up/Down Traps also. Also, added the Session specific stats to the up/down traps.

5.8. Changes from <draft-ietf-mpls-ldp-mib-06.txt>

All changes were from the second last call which took place Thursday, July 20th, until Thursday, July 27th, 2000 and are described in the remainder of this section.

Remove the reference to the MPLS framework document.

Add an mplsFecIndexNext type of object.

Change the conformance of the FEC table objects to be part of the mplsLdpGeneralGroup.

The mplsLdpEntityConfGenericTable is no longer needed because the
functionality has been absorbed by the
mplsLdpEntityConfGenericLabelRangeTable. The
mplsLdpEntityConfGenericTable has been removed and the front section
was updated accordingly.

Other editorial issues, updating references, typos and so forth.

5.9. Changes from <draft-ietf-mpls-ldp-mib-05.txt>

The majority of changes in this revision are based on Last Call
comments which were received during the last call from Thursday,
March 9, 2000 to Friday, March 17, 2000, or slightly thereafter.
Also, changes were made to agree with the latest specifications.
These changes are described in this section.

Changes due to draft-ietf-mpls-ldp-07.txt and draft-ietf-mpls-
ldp-08.txt. Specifically, removing references to IPv4/IP and using
router id, as appropriate.

Removed vpMerge and vpAndVcMerge choices from the object,
mplsLdpEntityAtmMergeCap. VP Merge is not described in [RFC3036].

The LIB Table was removed and replaced by mapping tables to map LDP
LSPs created by LDP sessions to the mplsInSegment, mplsOutSegment and
mplsXC tables in the LSR MIB. The conformance section was updated
to include a Mapping Group which is to be implemented iff these LSR
MIB tables (mplsInSegmentTable, mplsOutSegmentTable and mplsXCTable)
are implemented.

The front section was updated to include information on the Generic
label table.

Added more in the front section on on Row
Creation/adminStatus/OperStatus in the LDP Entity and related tables.

Added a generic label range table. NOTE: there is NO corresponding
LDP message which relates to the information in this table, however,
this table does provide a way for a user to ‘reserve’ a generic label
range.

A new TEXTUAL-CONVENTION, MplsAtmVcIdentifier was added. This TC has
the same upper bounds as AtmVcIdentifier (from rfc2514) except that
the lower bound is 32 (and not 0). The lower bound is 32 since this
value is specified by [RFC3035].
Removed the scalar object mplsLsrLabelRetentionMode and added mplsLdpEntityLabelRetentionMode. The change was made to allow configuring the retention mode on a per LDP Entity basis, as opposed for the entire LSR.

Typo in section 3.5.2 was fixed.

Typo in the mplsLdpSessionUp notification description was fixed.

Section ‘LDP Notifications’ was expanded to cover both the ‘mplsLdpSessionUp’ and ‘mplsLdpSessionDown’ traps. Also, the objects which enable and disable these traps have been described in this Section:

The ‘mplsLdpEntityHopCountLoopDetection’ object and the ‘mplsLdpEntityHopCount’ object have been combined into the new object, ‘mplsLdpEntityHopCountLimit’.

MplsLabel has been updated to reflect the VPI value of 12 bits and not 8.

Added DEFVAL clause to the ‘mplsLdpEntityWellKnownDiscoveryPort’ object. The default value is 646.

Added UNITS and DEFVAL clauses to the ‘mplsLdpEntityMaxPduLength’ object. The default value is 4096 and the units is octets.

Added DEFVAL clause to ‘mplsLdpEntityProtocolVersion’ object. The default value is 1.

Added DEFVAL clause to ‘mplsLdpEntityKeepAliveHoldTimer’ of 40 seconds.

Added DEFVAL clause to ‘mplsLdpEntityInitSesThreshold’ object. The default value is 8.

The mplsLdpEntityWellKnownDiscoveryPort was changed into two objects, one for TCP and one for UDP. The names are

Typo in the description for the

The mplsLdpEntityPeerTable was (re-)named mplsLdpPeerTable. The mplsLdpSessionTable now AUGMENTS the mplsLdpPeerTable in order to show that these two tables are related. There has been wording added to the mplsLdpSessionEntry description and to the description for the mplsLdpPeerTable.
5.10. Changes from <draft-ietf-mpls-ldp-mib-04.txt>

Editorial changes, fixing typo’s, fixing wrapping lines, etc.

Updated references for latest drafts, and added [RFC3032] and [RFC3034] to Reference Section.

Added to the Acknowledgements Section.

Changed the SYNTAX and DESCRIPTION of the ‘mplsLdpLsrLoopDetectionCapable’ object, so that it will also support the loop detection by hop count.

Combined the ‘mplsLdpEntityLoopDetectionForPV’ and ‘mplsLdpEntityPVL’ objects. The functionality of the ‘mplsLdpEntityLoopDetectionForPV’ is now denoted by the value of 0 (zero) in the ‘mplsLdpEntityPVL’ object. This results in one less object ‘mplsLdpEntityLoopDetectionForPV’ but does not sacrifice functionality.

Changed ‘mplsLdpLibLabelType’ into two objects: ‘mplsLdpLibInLabelType’ and differ from the egress label type. The MIB now reflects this.

The following items were changed as a result of the Frame Relay Forum dropping support for 17-bit DLCIs: the MplsLabel TC description has been modified, and other Frame Relay Object descriptions were also modified (as specified in this section).

The MplsLabel TC was also modified and reference 3. was added to the REFERENCE Clause.

MplsLdpLabelTypes TC was modified to use an enum.

InterfaceIndex support was added to the Entity information. This was specifically requested by several members of the working group. An additional table, mplsLdpEntityConfGenericTable as a way to configure Generic Labels, and an object, ‘mplsLdpConfGenericIfIndexOrZero was added to map the InterfaceIndex used by Generic Labels. Objects were also added to the ‘mplsLdpEntityAtmParmsTable’ and the and ‘mplsLdpEntityFrIfIndex’, respectively.

Changed the name of the ‘mplsLdpEntityMtu’ object to be ‘mplsLdpEntityMaxPduLength’ which is more consistent with the LDP Specification. Also, the description and SYNTAX were changed.

Changed the SYNTAX of the ‘mplsLdpSessionMaxPduLength’ to unsigned32
and changed the Range from (0..65535) to (1..65535).

Added and improved the front section discussion on SNMP Notifications.

Also, modified the DESCRIPTION clause of the

Added objects to enable/disable the sending of traps:

Added an object to enable/disable sending traps for Sessions changing from Up to Down, or Down to Up.

Added notifications to generate traps from session changing from Up to Down, or Down to up.

Added a StorageType object to the Entity and associated tables which are configurable.

Added a Discontinuity Time object to the Entity Table,

Added discussion on row creation in the Entity and other associated Entity tables. This is a new Section in the Front part of the document called:

Removed the ‘mplsLdpEntityControlMethod’.

Made ‘mplsLdpFecLspId’ as part of the INDEX for the FEC table. This is to allow FECs to map to multiple LSPs. Also add a RowPointer to a row in the Session Table.

Added an operation status object, ‘mplsLdpLspOperStatus’ and a last Change object, ‘mplsLdpLspLastChangeto the LIB Table. This will be used to detect whether an LSP has changed its status.

Changed the name of the mplsLdpPeerTable to the mplsLdpEntityPeerTable. This table contains information relevant to Peers which are known to specific Entities. The indexing of this table has also changed to include the Row in the Entity Table that this Peer is known by. The mplsLdpHelloAdjacencyTable and the mplsLdpSessionTable have been moved under this table. Since Hello Adjacencies are related to Entity-Peer information and Sessions are related to Entity-Peer information this was seen as a comprehensive and coherent modelling. Associated descriptions in the front section and in the tables have been changed to reflect this change.

Moved the ‘mplsLdpConfFrLen’ object from the
'mplsLdpEntityConfFrLabelRangeTable' to the 'mplsLdpEntityFrameRelayParmsTable' since the Frame Relay interface/port can only use one header length at a time, i.e. a specific FR interface supports one address length for all VCs on that interface. Also, changed the object so that it only supports 10 and 23 bit DLCI lengths. (The 17 bit length was dropped by the Frame Relay Forum and thus, is no longer required.) The name of this object was changed from 'mplsLdpConfFrLen' to 'mplsLdpEntityFrLen' to fit in with the 'mplsLdpEntityFrameRelayParmsTable'.

Removed the seventeenDlciBits(1) value from the mplsLdpFrSessionLen object. (The 17 bit length was dropped by the Frame Relay Forum and thus, is no longer required.)

Corrected the range of the 'mplsLdpEntityIndexNext' object to include 0 (zero).

5.11. Changes from <draft-ietf-mpls-ldp-mib-03.txt>

Reworded the description of the mplsLdpAtmSessionTable to clarify that one or MORE label range intersection(s) is/are represented in this table.

Reworded the description of the mplsLdpFrameRelaySessionTable to clarify that one or MORE label range intersection(s) is/are represented in this table.

Added a new index, mplsLdpSessionPeerIndex, to the mplsLdpSessionPeerAddressTable. This new index uniquely identifies the entry within a given session. (Since adding mplsLdpSessionPeerNextHopAddressType, mplsLdpSessionPeerNextHopAddress to the INDEX clause of the mplsLdpSessionPeerAddressTable leaves a table with only indices and no objects, the work around was to add a new index which uniquely differentiates an entry within a given session.)

Quite a few changes to the mplsLdpPeerTable. First, removed the mplsLdpPeerIndex from the mplsLdpPeerTable and other tables. This index served no purpose, so was removed. Second, removed the objects: mplsLdpPeerInternetworkAddrType, and mplsLdpPeerInternetworkAddr. Third, reworded the description of this table to include information which is known during Session Initialization attempts, the specific information has to do with Loop Dection based on Path Vectors. Since Section 3.5.3 of the LDP Spec when describing the PVLim says: "Although knowledge of a peer’s path
vector limit will not change an LSR’s behavior, it does enable the LSR to alert an operator to a possible misconfiguration." and the object mplsLdpPeerPVL is sent as a varbind in the mplsLdpPVLMismatch notification.

Removed the mplsLdpPeerIndex from the mplsLdpHelloAdjacencyTable.

Removed the "IANA Address Family Numbers" MIB section.

Updated the boiler.me from the ops web page dated Weds., Dec 22, 1999.

Updated the Security Section from the ops web page.

Added the following objects to the mplsLdpEntityTable: mplsLdpEntityControlMethod, mplsLdpEntityLoopDetectionForPV, and mplsLdpEntityPathVectorLimit.

Removed mplsLdpSessionLabelAdvertisement, mplsLdpSessionLoopDetectionForPV, and mplsLdpSessionPathVectorLimit from the mplsLdpSessionTable.

Changed the mplsLdpPathVectorLimitMismatch Notification to send mplsLdpEntityPathVectorLimit (instead of mplsLdpSessionPathVectorLimit).

Copied the MplsLabel TC from draft-ietf-mpls-lsr-mib-00.txt and replaced the MplsLdpGenAddr for mplsLdpLibInLabel and mplsLdpLibOutLabel with MplsLabel.

The mplsLdpSessionIndex was removed throughout the MIB. This was replaced by the object mplsLdpSessionDiscontinuityTime. The motivation was to reduce the number of indices.

The descriptions for the objects in the mplsLdpSessionStatsTable, mplsLdpSessionStatsUnknownMessageTypeErrors and mplsLdpSessionStatsUnknownTlvErrors, have been updated to include a reference to the mplsLdpSessionDiscontinuityTime object.

5.12. Changes from <draft-ietf-mpls-ldp-mib-02.txt>

Added Scalar Objects: mplsLdpLsrLoopDetectionPresent, and mplsLdpEntityIndexNext.

Added the following objects to the mplsLdpEntityTable:

Changed the description of the mplsLdpEntityAtmParmsTable and added the following objects to this table: mplsLdpEntityAtmLsrConnectivity, mplsLdpEntityDefaultControlVpi, mplsLdpEntityDefaultControlVci, mplsLdpEntityUnlabTrafVpi, and mplsLdpEntityUnlabTrafVci. NOTE: the last four objects were in Version 01 of the MIB but were mistakenly omitted from Version 02. Now, they are back.

Changed the indexing of the mplsLdpEntityConfAtmLabelRangeTable to include the minimum VPI/VCI. This is to ensure that indices in this table are unique.

Changed the indexing of the mplsLdpEntityConfFrLabelRangeTable, to include the minimum DLCI value. This is to ensure that indices in this table are unique.

Added [RFC3036] to Reference Section.

5.13. Changes from <draft-ietf-mpls-ldp-mib-01.txt>

The MIB was updated to correspond to draft-ietf-mpls-ldp-06.txt of the LDP Specification [RFC3036].

The front section was updated.

The MIB was made to be less ATM-centric. Essentially, the ATM specific objects were removed from the tables and placed in ATM specific Tables. A type was added to the base tables and a row is to be created in the ATM/FR/etc. type table. Apropos compliance statements were added to reflect the separation of ATM and Frame Relay objects into their respective tables.

Objects for Loop Detection were removed from describing the LDP implementation (i.e. the scalars were removed) and Loop Detection objects were added to the Session Table. (Although as the LDP Specification indicates loop detection should be for an LSR within a domain.)

The following tables were added: mplsLdpEntityAtmParmsTable, mplsLdpEntityConfAtmLabelRangeTable, mplsLdpFrameRelayParmsTable, mplsLdpConfFrLabelRangeTable, mplsLdpAtmSessionTable,
mplsLdpFrameRelaySessionTable, mplsLdpSessionPeerAddressTable, mplsLdpLibTable, and the mplsLdpFecTable.

The following notifications were added: notification for Session removal.

The following objects were removed from the Session Table: mplsLdpSessionRole was removed (this can be determined by comparing LSR Ids and does not need to be explicitly in the MIB.) ATM specific objects (mplsLdpSessionAtmLabelRangeLowerBoundVpi, mplsLdpSessionAtmLabelRangeLowerBoundVci, mplsLdpSessionAtmLabelRangeUpperBoundVpi, mplsLdpSessionAtmLabelRangeUpperBoundVci) were removed and put into a separate table. Frame Relay objects were added in a separate table.

Hello Adjacency Table was updated.

The objects, mplsLdpSessionRejectedParamErrors, mplsLdpSessionRejectedNoHelloErrors, mplsLdpBadLdpIdentifierErrors, mplsLdpBadPduLengthErrors, mplsLdpBadMessageLengthErrors, mplsLdpBadTlvLengthErrors, mplsLdpMalformedTlvValueErrors, mplsLdpKeepAliveTimerExpiredErrors, mplsLdpShutdownNotifReceived, and mplsLdpShutdownNotifSent were added to the mplsLdpEntityStatsTable.

The mplsLdpSessionStatsTable was added to count statics based on a per Session basis.

The mplLdpPeerConfAtmLabelRangeTable has been removed. There is no need to configure information for a Peer. All information for a peer is learned, thus peer information is read-only.

(Editorial) References were updated to reflect the documents which this version was based on.

5.14. Changes from <draft-ietf-mpls-ldp-mib-00.txt>

Textual conventions were added for the LSR Identifier and the LDP Identifier.

Top-level mib structure was added. The LDP MIB falls under a proposed hierarchy of mpls.mplsProtocols.

The mib hierarchy within the LDP MIB was also changed. A new branch, under mpls.mplsProtocols.mplsLdpMIB.mplsLdpObjects was added. This branch is mplsLdpLsrObjects. Currently, this contains several new

mplsLdpEntityTable is now indexed by mplsLdpEntityIdentifier, which is the LDP Identifier used in Session establishment. mplsLdpEntityLoopDetection and mplsLdpEntityLoopPrevention objects were removed from this table.

The following objects were added to the mplsLdpEntityTable:
mplsLdpEntityLabelSpaceType, mplsLdpEntityUnlabTrafVpi, mplsLdpEntityUnlabTrafVci, mplsLdpEntityMergeCapability, mplsLdpEntityVcDirectionality, and mplsLdpEntityLabelDistributionMethod.

The following objects were added to the mplsLdpPeerEntityTable:
mplsLdpPeerLabelDistributionMethod.

The following object was removed from the mplsLdpEntityStatsTable:
mplsLdpEntityEstablishedSessions.

References were added and revised.

6. Acknowledgments

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7. Normative References


8. Informative References


9. Security Considerations

This Security Considerations section consists of 4 subsections, one for each of the MIB Modules in this document.


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 can have a negative effect on network operations. These are the tables and objects and their sensitivity/vulnerability:

- the mplsLdpEntityTable contains objects to provision potential LDP sessions on the Label Switching Router (LSR) or Label Edge Router (LER). The mplsLdpLspFecTable contains objects which associate an LSP with a FEC. Unauthorized access to objects in these tables, could result in disruption of traffic on the network. This is especially true if an LDP session has been established. The use of stronger mechanisms such as SNMPv3 security should be considered where possible. Specifically, SNMPv3 VACM and USM MUST be used with any v3 agent which implements this MIB. Administrators should consider whether read access to these objects should be allowed, since read access may be undesirable under certain circumstances.
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:

- the mplsLdpEntityTable, mplsLdpPeerTable, mplsLdpSesTable and mplsLdpSesStatsTable collectively show the LDP LSP network topology. If an Administrator does not want to reveal the LDP LSP topology of the network, then these tables should be considered sensitive/vulnerable.


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 can have a negative effect on network operations. These are the tables and objects and their sensitivity/vulnerability:

- the mplsLdpEntityAtmTable and mplsLdpEntityAtmLRTable contain objects to provision potential LDP sessions on the Label Switching Router (LSR) or Label Edge Router (LER) over Layer 2 of ATM. These tables extend the mplsLdpEntityTable in the MPLS-LDP-MIB. Unauthorized access to objects in these tables, could result in disruption of traffic on the network. This is especially true if an LDP session has been established. The use of stronger mechanisms such as SNMPv3 security should be considered where possible. Specifically, SNMPv3 VACM and USM MUST be used with any v3 agent which implements this MIB. Administrators should consider whether read access to these objects should be allowed, since read access may be undesirable under certain circumstances.

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:
the mplsLdpEntityAtmTable and mplsLdpEntityAtmLRTable show the Label Ranges for ATM. If an Administrator does not want to reveal this information then these tables should be considered sensitive/vulnerable and treated accordingly.


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 can have a negative effect on network operations. These are the tables and objects and their sensitivity/vulnerability:

the mplsLdpEntityFrameRelayTable and mplsLdpEntityFrameRelayLRTable contain objects to provision potential LDP sessions on the Label Switching Router (LSR) or Label Edge Router (LER) over Layer 2 of Frame Relay. These tables extend the mplsLdpEntityTable in the MPLS-LDP-MIB. Unauthorized access to objects in these tables, could result in disruption of traffic on the network. This is especially true if an LDP session has been established. The use of stronger mechanisms such as SNMPv3 security should be considered where possible. Specifically, SNMPv3 VACM and USM MUST be used with any v3 agent which implements this MIB. Administrators should consider whether read access to these objects should be allowed, since read access may be undesirable under certain circumstances.

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:

the mplsLdpEntityFrameRelayTable and mplsLdpEntityFrameRelayLRTable show the Label Ranges for Frame Relay. If an Administrator does not want to reveal this information then these tables should be considered sensitive/vulnerable and treated accordingly.
9.4. Security Considerations for MPLS-LDP-GENERIC-STD-MIB

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 can have a negative effect on network operations. These are the tables and objects and their sensitivity/vulnerability:

- the mplsLdpEntityGenericLRTable contains objects to provision potential LDP sessions on the Label Switching Router (LSR) or Label Edge Router (LER) over Layer 2 of Ethernet. This table extends the mplsLdpEntityTable in the MPLS-LDP-MIB. Unauthorized access to objects in these tables could result in disruption of traffic on the network. This is especially true if an LDP session has been established. The use of stronger mechanisms such as SNMPv3 security should be considered where possible. Specifically, SNMPv3 VACM and USM MUST be used with any v3 agent which implements this MIB. Administrators should consider whether read access to these objects should be allowed, since read access may be undesirable under certain circumstances.

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:

- the mplsLdpEntityGenericLRTable shows the Label Ranges for ethernet. If an Administrator does not want to reveal this information then these tables should be considered sensitive/vulnerable and treated accordingly.

9.5. Additional Security Considerations

The following paragraphs describe additional security considerations which are applicable to all 4 of the MIB Modules in this document.

SNMP versions prior to SNMPv3 did not include adequate security. Even if the network itself is secure "for example by using IPSec", even then, there is no control as to who on the secure network is
allowed to access and GET/SET "read/change/create/delete" the objects in this MIB module.

It is RECOMMENDED that implementers consider the security features as provided by the SNMPv3 framework "see [RFC3410], section 8", including full support for the SNMPv3 cryptographic mechanisms "for authentication and privacy".

Further, deployment of SNMP versions prior to SNMPv3 is NOT RECOMMENDED. Instead, it is RECOMMENDED to deploy SNMPv3 and to enable cryptographic security. It is then a customer/operator responsibility to ensure that the SNMP entity giving access to an instance of this MIB module, is properly configured to give access to the objects only to those principals "users" that have legitimate rights to indeed GET or SET "change/create/delete" them.

10. IANA Considerations

As described in [MPLSMGMT] and as requested in the MPLS-TC-STD-MIB [MPLSTCMIB], MPLS related standards track MIB modules should be rooted under the mplsStdMIB subtree. There are 4 MPLS MIB Modules contained in this document, each of the following "IANA Considerations" subsections requests IANA for a new assignment under the mplsStdMIB subtree. New assignments can only be made via a Standards Action as specified in [RFC2434].

10.1. IANA Considerations for MPLS-LDP-STD-MIB

The IANA is requested to assign { mplsStdMIB 4 } to the MPLS-LDP-STD-MIB module specified in this document.

10.2. IANA Considerations for MPLS-LDP-ATM-STD-MIB

The IANA is requested to assign { mplsStdMIB 5 } to the MPLS-LDP-ATM-STD-MIB module specified in this document.

10.3. IANA Considerations for MPLS-LDP-FRAME-RELAY-STD-MIB

The IANA is requested to assign { mplsStdMIB 6 } to the MPLS-LDP-FRAME-RELAY-STD-MIB module specified in this document.
10.4. IANA Considerations for MPLS-LDP-GENERIC-STD-MIB

The IANA is requested to assign { mplsStdMIB 7 } to the MPLS-LDP-GENERIC-STD-MIB module specified in this document.

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