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

Status of this Memo

   This document specifies an Internet standards track protocol for the
   Internet community, and requests discussion and suggestions for
   improvements. Please refer to the current edition of the "Internet
   Official Protocol Standards" (STD 1) for the standardization state
   and status of this protocol. Distribution of this memo is unlimited.

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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).

Table of Contents

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].

For an introduction to the concepts of MPLS, see [RFC3031]. For
further on LDP refer to [RFC3037] and [RFC3215].

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 a 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 mplsLdpEntityGenericLRTable 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 [RFC3811]. 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 MIB Module IMPORTS
   IndexInteger and IndexIntegerNextFree TEXTUAL-CONVENTIONs from
   [RFC3289], and IMPORTS InetAddressPrefixLength, InetAddressType,
   InetAddressInetPortNumber TEXTUAL-CONVENTIONs from [RFC3291].

   The mplsLdpEntityTable 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 are
   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 intialization, 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 [RFC3813]
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 mplsLdpSessionTable 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
   intialization.

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 Tables

   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
   [RFC3813]. 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 Tables

The mplsLdpFecTable 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 mplsLdpSessionPeerAddrTable 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,
        Integer32, Counter32, Unsigned32
            FROM SNMPv2-SMI   -- [RFC2578]

        MODULE-COMPLIANCE, OBJECT-GROUP, NOTIFICATION-GROUP
            FROM SNMPv2-CONF   -- [RFC2580]

        RowStatus, TimeInterval, TruthValue,
        TimeStamp, StorageType

```
            FROM SNMPv2-TC                                -- [RFC2579]


        InetAddressPrefixLength,
        InetAddressType,
        InetAddress,
        InetPortNumber
            FROM INET-ADDRESS-MIB                         -- [RFC3291]


        IndexInteger,
        IndexIntegerNextFree
            FROM DIFFSERV-MIB                             -- [RFC3289]


        mplsStdMIB,
        MplsLabelDistributionMethod,
        MplsLdpIdentifier,
        MplsLdpLabelType,
        MplsLspType,
        MplsLsrIdentifier,
        MplsRetentionMode
            FROM MPLS-TC-STD-MIB                          -- [RFC3811]


        MplsIndexType
            FROM MPLS-LSR-STD-MIB;                        -- [RFC3813]

    mplsLdpStdMIB MODULE-IDENTITY
        LAST-UPDATED "200406030000Z"  -- June 3, 2004
        ORGANIZATION "Multiprotocol Label Switching (mpls)
                     Working Group"
        CONTACT-INFO

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

        DESCRIPTION
            "Copyright (C) The Internet Society (2004). The
            initial version of this MIB module was published
```

            in RFC 3815. For full legal notices see the RFC
            itself or see:
            http://www.ietf.org/copyrights/ianamib.html

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

        REVISION "200406030000Z" -- June 3, 2004
        DESCRIPTION
           "Initial version published as part of RFC 3815."

        ::= { mplsStdMIB 4 }

     --**

     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,
        mplsLdpEntityTcpPort   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."
       ::= { mplsLdpEntityEntry 1 }

   mplsLdpEntityIndex OBJECT-TYPE
       SYNTAX       IndexInteger
       MAX-ACCESS   not-accessible
       STATUS       current
       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."
    ::= { mplsLdpEntityEntry 2 }

mplsLdpEntityProtocolVersion OBJECT-TYPE
    SYNTAX      Unsigned32(1..65535)
    MAX-ACCESS  read-create
    STATUS      current
    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 }
    ::= { 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 }

    mplsLdpEntityTcpPort OBJECT-TYPE
        SYNTAX      InetPortNumber
        MAX-ACCESS  read-create
        STATUS      current
        DESCRIPTION
            "The TCP Port for
            LDP.  The default value is the well-known
            value of this port."
        REFERENCE
            "RFC3036, LDP Specification, 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)
     UNITS       "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
interpretted 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 advertized 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 advertized 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 Dection 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 Dection,
            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
           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/mplsLdpSessionTable."
         ::= { 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
       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 UPD 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 }

     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
            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
            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 }

    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,
    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 interpretted 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 mplsInSegmentLdpLspIndex.

           Otherwise, if the value of this object is
```

```
            outSegment(2),  then this
            indicates that following index,
            mplsLdpLspFecSegmentIndex, contains the same
            value as the mplsOutSegmentLdpLspIndex."
       ::= { mplsLdpLspFecEntry 1 }

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

          If the mplsLdpLspFecSegment is inSegment(1),
          then this index has the same value as
          mplsInSegmentLdpLspIndex.

          If the mplsLdpLspFecSegment is outSegment(2),
          then this index has the same value as
          mplsOutSegmentLdpLspIndex."
       ::= { mplsLdpLspFecEntry 2 }

    mplsLdpLspFecIndex   OBJECT-TYPE
       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  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 }
       ::= { mplsLdpLspFecEntry 4 }
```

```
    mplsLdpLspFecRowStatus  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.

             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)
             is 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"
         ::= { mplsLdpSessionPeerAddrEntry 3 }

    ---
    --- Notifications
    ---

    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
            the 'operational(5)' state."
         ::= { mplsLdpNotifications 3 }

     mplsLdpSessionDown NOTIFICATION-TYPE
         OBJECTS        {
                         mplsLdpSessionState,
                         mplsLdpSessionDiscontinuityTime,
                         mplsLdpSessionStatsUnknownMesTypeErrors,
                         mplsLdpSessionStatsUnknownTlvErrors


                        }
         STATUS        current
         DESCRIPTION
            "This notification is sent when 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
                                  }
         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        mplsLdpEntityTcpPort
        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."

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

        OBJECT          mplsLdpEntityTargetPeerAddrType
        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          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,
        mplsLdpEntityTcpPort,
        mplsLdpEntityUdpDscPort,
        mplsLdpEntityMaxPduLength,
        mplsLdpEntityKeepAliveHoldTimer,
        mplsLdpEntityHelloHoldTimer,
        mplsLdpEntityInitSessionThreshold,
        mplsLdpEntityLabelDistMethod,
        mplsLdpEntityLabelRetentionMode,
        mplsLdpEntityPathVectorLimit,
        mplsLdpEntityHopCountLimit,
        mplsLdpEntityTransportAddrKind,
        mplsLdpEntityTargetPeer,
        mplsLdpEntityTargetPeerAddrType,
        mplsLdpEntityTargetPeerAddr,
        mplsLdpEntityLabelType,
```

```
        mplsLdpEntityDiscontinuityTime,
        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."
       ::= { mplsLdpGroups 3 }

   END
```

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. This
   MIB Module IMPORTS the AtmVpIdentifier TEXTUAL-CONVENTION from
   [RFC2514].

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 Intialization 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.

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

   IMPORTS
       OBJECT-TYPE, MODULE-IDENTITY,
       Unsigned32
           FROM SNMPv2-SMI   -- [RFC2578]
       MODULE-COMPLIANCE, OBJECT-GROUP
           FROM SNMPv2-CONF   -- [RFC2580]
       RowStatus,
       StorageType
           FROM SNMPv2-TC   -- [RFC2579]

       InterfaceIndexOrZero
           FROM IF-MIB   -- [RFC2020]

       AtmVpIdentifier
           FROM ATM-TC-MIB   -- [RFC2514]

       mplsStdMIB,
       MplsAtmVcIdentifier
           FROM MPLS-TC-STD-MIB   -- [RFC3811]

       mplsLdpEntityLdpId,
       mplsLdpEntityIndex,
       mplsLdpPeerLdpId
           FROM MPLS-LDP-STD-MIB   -- [RFC3813]

       ;

   mplsLdpAtmStdMIB MODULE-IDENTITY
       LAST-UPDATED "200406030000Z" -- June 3, 2004

          ORGANIZATION "Multiprotocol Label Switching (mpls)
                        Working Group"
          CONTACT-INFO
              "Joan Cucchiara (jcucchiara@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
              "
          DESCRIPTION
              "Copyright (C) The Internet Society (2004). The
               initial version of this MIB module was published
               in RFC 3815. For full legal notices see the RFC
               itself or see:
               http://www.ietf.org/copyrights/ianamib.html

               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 "200406030000Z" -- June 3, 2004
          DESCRIPTION
              "Initial version published as part of RFC 3815."

          ::= { mplsStdMIB 5 }

     --***

   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."
        ::= { 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:

                   Value           Meaning

                    0              Merge not supported
                    1              VP Merge supported
                    2              VC Merge supported
                    3              VP & VC Merge supported
```

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

    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 3 }

    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
        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
                        }
           ::= { mplsLdpAtmSessionTable 1 }

       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    {
                            mplsLdpAtmGroup
                          }


       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
           "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
          "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. This MIB Module
   IMPORTS the DLCI TEXTUAL-CONVENTION from [RFC2115].

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 Intialization Message, see
   [RFC3034] and [RFC3036].

4.2.3. The LDP Frame Relay Session Table

   The mplsLdpFrameRelaySessionTable is a 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   -- [RFC2578]
       MODULE-COMPLIANCE,
       OBJECT-GROUP
           FROM SNMPv2-CONF   -- [RFC2580]

       RowStatus,
       StorageType
```

```
        FROM SNMPv2-TC                                 -- [RFC2579]

    DLCI
        FROM FRAME-RELAY-DTE-MIB                        -- [RFC2115]

    InterfaceIndexOrZero
        FROM IF-MIB                                     -- [RFC2020]

    mplsStdMIB
        FROM MPLS-TC-STD-MIB                            -- [RFC3811]

    mplsLdpEntityLdpId,
    mplsLdpEntityIndex,
    mplsLdpPeerLdpId
        FROM MPLS-LDP-STD-MIB                           -- [RFC3813]
        ;

 mplsLdpFrameRelayStdMIB MODULE-IDENTITY
     LAST-UPDATED "200406030000Z"  -- June 3, 2004
     ORGANIZATION "Multiprotocol Label Switching (mpls)
                  Working Group"
     CONTACT-INFO
        "Joan Cucchiara (jcucchiara@mindspring.com)
         Marconi Communications, Inc.

         Hans Sjostrand (hans@ipunplugged.com)
         ipUnplugged

         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 (year). The
         initial version of this MIB module was published
         in RFC 3815. For full legal notices see the RFC
         itself or see:
         http://www.ietf.org/copyrights/ianamib.html

         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 "200406030000Z"  -- June 6, 2004
         DESCRIPTION
             "Initial version published as part of RFC 3815."

         ::= { mplsStdMIB 6 }

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

     mplsLdpFrameRelayObjects  OBJECT IDENTIFIER
                             ::= { mplsLdpFrameRelayStdMIB 1 }

     mplsLdpFrameRelayConformance   OBJECT IDENTIFIER
                             ::= { mplsLdpFrameRelayStdMIB 2 }

     --****************************************************************
     -- MPLS LDP Frame Relay Objects
     --****************************************************************

     --
     -- Ldp Entity Objects for Frame Relay
     --

     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
             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            RowStatus
    }

    mplsLdpEntityFrameRelayIfIndexOrZero OBJECT-TYPE
        SYNTAX      InterfaceIndexOrZero
        MAX-ACCESS  read-create
        STATUS      current
        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
        STATUS      current
        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:

           Value   Meaning

             0   Merge not supported
             1   Merge supported

   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),
                               unidirection(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
       MAX-ACCESS  not-accessible
       STATUS        current
       DESCRIPTION
           "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
        the label."
    REFERENCE
        "RFC3034, Use of Label Switching on Frame Relay
        Networks Specification."
    ::= { mplsLdpEntityFrameRelayLREntry 1 }
```

```
   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:

                   Len    DLCI bits

                   0       10
                   2       23

               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
   --

   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
       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     {
                                    mplsLdpFrameRelayGroup
                                }

       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     {
                                mplsLdpFrameRelayGroup
                             }

    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
       OBJECT-TYPE,
       MODULE-IDENTITY,
       Unsigned32
           FROM SNMPv2-SMI   -- [RFC2578]

       MODULE-COMPLIANCE,
       OBJECT-GROUP
           FROM SNMPv2-CONF   -- [RFC2580]

       RowStatus,
       StorageType
           FROM SNMPv2-TC   -- [RFC2579]

       InterfaceIndexOrZero
           FROM IF-MIB   -- [RFC2020]

       mplsStdMIB
           FROM MPLS-TC-STD-MIB   -- [RFC3811]

       mplsLdpEntityLdpId,
       mplsLdpEntityIndex
           FROM MPLS-LDP-STD-MIB   -- [RFC3813]
       ;

   mplsLdpGenericStdMIB MODULE-IDENTITY
       LAST-UPDATED "200406030000Z" -- June 6, 2004
       ORGANIZATION "Multiprotocol Label Switching (mpls)
                     Working Group"
       CONTACT-INFO
           "Joan Cucchiara (jcucchiara@mindspring.com)
            Marconi Communications, Inc.

            Hans Sjostrand (hans@ipunplugged.com)
            ipUnplugged

                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 (year). The
             initial version of this MIB module was published
             in RFC 3815. For full legal notices see the RFC
             itself or see:
             http://www.ietf.org/copyrights/ianamib.html

             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."
         REVISION "200406030000Z" -- June 6, 2004
         DESCRIPTION
             "Initial version published as part of RFC 3815."

         ::= { mplsStdMIB 7 }

    --***

    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
    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 configurating 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    InterfaceIndexOrZero,
         mplsLdpEntityGenericLRStorageType    StorageType,
         mplsLdpEntityGenericLRRowStatus      RowStatus
    }

    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 }

    mplsLdpEntityGenericIfIndexOrZero OBJECT-TYPE
        SYNTAX      InterfaceIndexOrZero
        MAX-ACCESS  read-create
        STATUS      current
        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
   --

   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    {
```

```
                                 mplsLdpGenericGroup
                            }

      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 }

   END
```

5. Acknowledgments

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6. References

6.1. Normative References

   [RFC2115]   Brown, C. and F. Baker, "Management Information Base for
               Frame Relay DTEs Using SMIv2", RFC 2115, September 1997.

   [RFC2119]   Bradner, S., "Key words for use in RFCs to Indicate
               Requirement Levels", BCP 14, RFC 2119, March 1997.

   [RFC2434]   Narten, T. and H. Alvestrand, "Guidelines for Writing an
               IANA Considerations Section in RFCs", BCP: 26, RFC 2434,
               October 1998.

   [RFC2514]   Noto, M., Spiegel, E., and K. Tesink, editors,
               "Definition of Textual Conventions and OBJECT-IDENTITIES
               for ATM Management", RFC 2514, February 1999.

   [RFC2578]   McCloghrie, K., Perkins, D., and J. Schoenwaelder,
               "Structure of Management Information Version 2 (SMIv2)",
               STD 58, RFC 2578, April 1999.

   [RFC2579]   McCloghrie, K., Perkins, D., and J. Schoenwaelder,
                "Textual Conventions for SMIv2", STD 58, RFC 2579, April
                1999.

   [RFC2580]   McCloghrie, K., Perkins, D., and J. Schoenwaelder,
                "Conformance Statements for SMIv2", STD 58, RFC 2580,
                April 1999.

   [RFC2863]   McCloghrie, K. and F. Kastenholz, "The Interfaces Group
                MIB", RFC 2863, June 2000.

   [RFC3031]   Rosen, E., Viswananthan, A., and R. Callon,
                "Multiprotocol Label Switching Architecture", RFC 3031,
                January 2001.

   [RFC3032]   Rosen, E., Tappan, D., Fedorkow, G., Rekhter, Y.,
                Farinacci, D., Li, T., and A. Conta, "MPLS Label Stack
                Encoding", RFC 3032, January 2001.

   [RFC3034]   Conta, A., Doolan, P., and A. Malis, "Use of Label
                Switching on Frame Relay Networks Specification", RFC
                3034, January 2001.

   [RFC3035]   Davie, B., Lawrence, J., McCloghrie, K., Rosen, E.,
                Swallow, G., Rekhter, Y., and P. Doolan, "MPLS using LDP
                and ATM VC Switching", RFC 3035, January 2001.

   [RFC3036]   Andersson, L., Doolan, P., Feldman, N., Fredette, A., and
                B. Thomas, "LDP Specification", RFC 3036, January 2001.

   [RFC3037]   Thomas, B. and E. Gray, "LDP Applicability", RFC 3037,
                January 2001.

   [RFC3215]   Boscher, C., Cheval, P., Wu, L., and E. Gray, "LDP State
                Machine", RFC 3215, January 2002.

   [RFC3289]   Baker, F., Chan, K., and A. Smith, "Management
                Information Base for the Differentiated Services
                Architecture", RFC 3289, May 2002.

   [RFC3291]   Daniele, M., Haberman, B., Routhier, S., and J.
                Schoenwaelder, "Textual Coventions for Internet Network
                Addresses", RFC 3291, May 2002.

   [RFC3413]   Levi, D., Meyers, P. and B. Stewart, "Simple Network
                Management Protocol (SNMP) Applications", STD 62, RFC
                3413, December 2002.

   [RFC3811]   Nadeau, T. and J. Cucchiara, Editors "Definitions of
                Textual Conventions (TCs) for Multiprotocol Label
                Switching (MPLS) Management", RFC 3811, June 2004.

   [RFC3813]   Srinivansan, C., Viswanathan, A., and T. Nadeau,
                "Multiprotocol Label Switching (MPLS) Label Switching
                Router (LSR) Management Information Base (MIB)", RFC
                3813, June 2004

6.2. Informative References

   [MPLSMGMT] Nadeau, T., Srinivasan, C., and A. Farrel, "Multiprotocol
               Label Switching (MPLS) Management Overview", Work in
               Progress, September 2003.

   [RFC2684]   Grossman, D. and J. Heinanen, "Multiprotocol
               Encapsulation over ATM Adaptation Layer 5", RFC 2684,
               September 1999.

   [RFC3410]   Case, J., Mundy, R., Partain, D. and B. Stewart,
               "Introduction and Applicability Statements for Internet-
               Standard Management Framework", RFC 3410, December 2002.

7. Security Considerations

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

7.1. Security Considerations for MPLS-LDP-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:

   o   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:

  o   the mplsLdpEntityTable, mplsLdpPeerTable, mplsLdpSessionTable
       and mplsLdpSessionStatsTable 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.

7.2. Security Considerations for MPLS-LDP-ATM-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:

  o   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:

   o   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.

7.3. Security Considerations for MPLS-LDP-FRAME-RELAY-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:

   o   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:

   o   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.

7.4. 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:

   o   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:

   o   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.

7.5. 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.

8. 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 lists new IANA assignments under the
   mplsStdMIB subtree. New assignments can only be made via a Standards
   Action as specified in [RFC2434].

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

   The IANA has assigned { mplsStdMIB 4 } to the MPLS-LDP-STD-MIB module
   specified in this document.

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

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

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

   The IANA has assigned { mplsStdMIB 6 } to the MPLS-LDP-FRAME-RELAY-
   STD-MIB module specified in this document.

8.4. IANA Considerations for MPLS-LDP-GENERIC-STD-MIB

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

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