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

draft-ietf-mpls-ldp-mib-04.txt

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Abstract

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

This 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) [18].

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 [22].

2. The SNMP Management Framework

The SNMP Management Framework presently consists of five major components:

- An overall architecture, described in RFC 2571 [RFC2571].

- Mechanisms for describing and naming objects and events for the purpose of management. The first version of this Structure of Management Information (SMI) is called SMIv1 and described in STD 16, RFC 1155 [RFC1155], STD 16, RFC 1212 [RFC1212] and RFC 1215 [RFC1215]. The second version, called SMIv2, is described in STD 58, RFC 2578 [RFC2578], STD 58, RFC 2579 [RFC2579] and STD 58, RFC 2580 [RFC2580].

- Message protocols for transferring management information. The first version of the SNMP message protocol is called SNMPv1 and described in STD 15, RFC 1157 [RFC1157]. A second version of the SNMP message protocol, which is not an Internet standards track protocol, is called SNMPv2c and described in RFC 1901 [RFC1901] and RFC 1906 [RFC1906]. The third version of the message protocol is called SNMPv3 and described in RFC 1906 [RFC1906], RFC 2572 [RFC2572] and RFC 2574 [RFC2574].

- Protocol operations for accessing management information. The first set of protocol operations and associated PDU formats is described in STD 15, RFC 1157 [RFC1157]. A second set of protocol operations and associated PDU formats is described in RFC 1905 [RFC1905].

- A set of fundamental applications described in RFC 2573 [RFC2573] and the view-based access control mechanism described in RFC 2575 [RFC2575].

A more detailed introduction to the current SNMP Management Framework can be found in RFC 2570 [RFC2570].

Managed objects are accessed via a virtual information store, termed
the Management Information Base or MIB. Objects in the MIB are defined using the mechanisms defined in the SMI.

This memo specifies a MIB module that is compliant to the SMIv2. A MIB conforming to the SMIv1 can be produced through the appropriate translations. The resulting translated MIB must be semantically equivalent, except where objects or events are omitted because no translation is possible (use of Counter64). Some machine readable information in SMIv2 will be converted into textual descriptions in SMIv1 during the translation process. However, this loss of machine readable information is not considered to change the semantics of the MIB.
3. Structure of the MIB

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) as defined in [18].

3.1. Overview

The MIB provides objects to configure/set-up potential LDP sessions on a specific LSR. A table is used to configure potential LDP Sessions, where each row in the table initiates an LDP Session. This is the mplsLdpEntityTable.

Another table, the mplsLdpPeerTable, is a read-only table which records information learned via discovery. Each row in the Peer Table represents a peer.

A third table is used to show the actual sessions which have been, or are in the process of being established. Each row represents a specific session between an Entity (on this LSR) and a peer. The following figure demonstrates these relationships:

```
Entity                          Peer
------------------           --------------
|            |                       |           |
------------------           --------------
|            |          ----------        |           |
------------------  ----->  |            |  <-----   ----------
      ----------  |            |  ----------
      Session     |            |
```

3.2. Interface Indexing

Interface Indexes as specified in [29] are used in the MIB. The descriptions of the ifIndexes denote which ifIndex is being used.

NOTE: the use of ifIndex is for actual existing connections.

3.3. Future Considerations

The following aspects are not addressed in this document: VPN issues (i.e. potential MIB objects such as the VPN Identifier are not included at this time), and lastly, multicast issues are not discussed.

Some of these issues need further clarification before adding to the
3.4. Discussion of MIB Groups

Currently, there are four groups: the MPLS LDP General Group, the MPLS LDP ATM Group, the MPLS LDP Frame Relay Group and the MPLS LDP Notifications Group. The MPLS LDP General Group and the MPLS LDP Notifications Group should always be supported. The MPLS LDP ATM Group is specific to ATM and should be supported only if LDP is using ATM. Likewise, the MPLS LDP Frame Relay group is specific to Frame Relay and should be supported only if LDP is using Frame Relay.

3.5. The MPLS LDP General Group

This group contains information about the specific LDP Entities which are associated with this agent. Each LSR must have one LDP Entity.

3.5.1. The Label Distribution Protocol’s Entity Table

The LDP Entity Table provides a way to configure the LSR for using LDP. There must be at least one LDP Entity for the LSR to support LDP.

Each entry/row in this table represents a single LDP Entity.

3.5.2. The Label Distribution Protocol’s Entity ATM Objects

There exists two tables to configure LDP for using ATM. These tables are the mplsLdpEntityAtmParmsTable and the mplsLdpEntityConfAtmLabelRangeTable.

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

The mplsLdpEntityConfAtmLabelRangeTable provides a way to configure information which would be contained in the ‘ATM Label Range Components’ portion of an LDP PDU Initialization Message.

3.5.3. The Label Distribution Protocol’s Entity Frame Relay Objects

There exists two tables to configure LDP for using Frame Relay. These tables are the mplsLdpEntityFrameRelayParmsTable and the mplsLdpEntityConfFrLabelRangeTable.

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

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

3.5.4. The Label Distribution Protocol’s Entity Statistics Table

The LDP Entity Statistics Table will maintain counters related to an LDP Entity. This Table should be a read-only table which contains statistical information.

Each row in this table will be related to a single LDP Entity.

3.5.5. The LDP Peer Table

The LDP Peer Table is a read-only table which contains information about LDP Peers and their associated Hello Adjacencies. Each row in this table represents a Hello Adjacency.

3.5.6. The LDP Session Table

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

3.5.7. The LDP ATM Session Table

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

3.5.8. The LDP Frame Relay Session Table

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

3.5.9. The LDP Session Statistics Table

The MPLS LDP Session Stats Table is a read-only table which contains statistical information on sessions.
3.5.10. The LDP Session Peer Address Table

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

3.5.11. The LDP Adjacencies Table

This is a table of all adjacencies between all LPD Entities and all LDP Peers. A Session may have one or more adjacencies.

3.5.12. The LDP Label Information Base (LIB) Table

The MPLS LDP LIB Table is a read-only table which contains information stored in the LIB. This table is indexed by a unique number which could be used to represent the LSP segment related to this LIB entry. The Lsp number corresponds to a FEC entry in the FEC Table which is described next.

3.5.13. The LDP FEC Table

The FEC Table is a read-only table which contains FEC (Forwarding Equivalence Class) information. Each entry/row represents a single FEC Element.

3.6. The LDP Notifications Group

3.6.1. LDP Notifications

Currently, there is one notification which will be sent when an LDP attempts to initialize the same session beyond the configured threshold.

4. MPLS Label Distribution Protocol MIB Definitions

MPLS-LDP-MIB DEFINITIONS ::= BEGIN

IMPORTS
    OBJECT-TYPE, MODULE-IDENTITY, NOTIFICATION-TYPE,
            experimental,
    Integer32, Counter32, Unsigned32
    FROM SNMPv2-SMI

Expires July 2000
MODULE-COMPLIANCE, OBJECT-GROUP, NOTIFICATION-GROUP
FROM SNMPv2-CONF

TEXTUAL-CONVENTION, RowStatus, TimeInterval, TruthValue,
TimeStamp
FROM SNMPv2-TC
InterfaceIndex
FROM IF-MIB
-- AtmInterfaceType,
AtmVcIdentifier, AtmVpIdentifier
FROM ATM-TC-MIB
AddressFamilyNumbers
FROM IANA-ADDRESS-FAMILY-NUMBERS-MIB

mplsLdpMIB MODULE-IDENTITY
LAST-UPDATED "0001281200Z"  -- January 28, 2000
ORGANIZATION "Multiprotocol Label Switching (mpls) Working
Group"
CONTACT-INFO
"Joan Cucchiara (jcucchiara@brixnet.com)
Brix Networks

Hans Sjostrand (hans.sjostrand@etx.ericsson.se)
Ericsson

James V. Luciani (jluciani@nortelnetworks.com)
Nortel Networks"
DESCRIPTION
"This MIB contains managed object definitions for the
Multiprotocol Label Switching, Label Distribution
Protocol, LDP, as defined in draft-ietf-mpls-ldp-06.txt."
 ::= { experimental XXXX} -- to be assigned

-------------- mplsLdpMIB ---------------------------------------------

-- MPLS LDP Textual Conventions

-------------- mplsLsrIdentifier -----------------------------------------

MplsLsrIdentifier ::= TEXTUAL-CONVENTION
STATUS current
DESCRIPTION
"The Label Switch Router (LSR) identifier
is the first 4 bytes or the IP Address component
of the Label Distribution Protocol (LDP) identifier."
SYNTAX OCTET STRING (SIZE (4))

--
-- A similar TC is also used in RFC2677.txt, perhaps
-- this should be made general and not MPLS specific.
--
MplsLdpGenAddr ::= TEXTUAL-CONVENTION
  STATUS current
  DESCRIPTION "The value of an network layer or data link layer address."
  SYNTAX OCTET STRING (SIZE (0..64))

-- following label is taken from the draft-ietf-mpls-lsr-mib-00.txt
-- It is reproduced here.

MplsLabel ::= TEXTUAL-CONVENTION
  STATUS current
  DESCRIPTION "Represents an MPLS label. Note that the contents of a label field are interpreted in an interface-type specific fashion. For example, the label carried in the MPLS shim header is 20 bits wide and the top 12 bits must be zero. The frame relay label can be either 10, 17 or 23 bits wide depending on the size of the DLCI field size and the top 22, 15, or 9 bits must be zero, respectively. For an ATM interface, the lowermost 16 bits are interpreted as the VCI, the next 8 bits as the VPI and the remaining bits must be zero. Also note the permissible label values are also a function of the interface type. For example, the value 3 has special semantics in the control plane for an MPLS shim header label and is not a valid label value in the datapath."
  REFERENCE
  SYNTAX Integer32

MplsLdpIdentifier ::= TEXTUAL-CONVENTION
  STATUS current
  DESCRIPTION "The LDP identifier is a six octet quantity which is used to identify an Label Switch Router (LSR) label space.

  The first four octets encode an IP address assigned to the LSR, and the last two octets identify a specific label space within the LSR."
  SYNTAX OCTET STRING (SIZE (6))

MplsLdpLabelTypes ::= TEXTUAL-CONVENTION
  STATUS current

Expires July 2000
DESCRIPTION
"The Layer 2 label types which are defined for
MPLS LDP are generic(1), atm(2), or frameRelay(3)."
SYNTAX    INTEGER(1..3)

-- Top-level structure of the MIB (the following is proposed)
mls
    OBJECT IDENTIFIER ::= { mplsProtocols }

mplsProtocols
    OBJECT IDENTIFIER ::= { mplsLdpObjects }
-- under mplsProtocols will be LDP, CR-LDP,
-- and other MPLS "Protocols".

mplsLdpObjects
    OBJECT IDENTIFIER ::= { mplsLdpMIB 1 }

mplsLdpNotifications
    OBJECT IDENTIFIER ::= { mplsLdpMIB 2 }

mplsLdpConformance
    OBJECT IDENTIFIER ::= { mplsLdpMIB 3 }

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

mplsLdpLsrObjects
    OBJECT IDENTIFIER ::= { mplsLdpObjects 1 }

mplsLdpEntityObjects
    OBJECT IDENTIFIER ::= { mplsLdpObjects 2 }

--
-- The MPLS Label Distribution Protocol Label Switch Router Objects
--

mplsLdpLsrId
    OBJECT-TYPE
    SYNTAX    MplsLsrIdentifier
    MAX-ACCESS read-only
    STATUS    current
    DESCRIPTION
        "The LSR's Identifier."
    ::= { mplsLdpLsrObjects 1 }

mplsLdpLsrLabelRetentionMode
    OBJECT-TYPE
    SYNTAX    INTEGER {
                conservative(1),
                liberal(2)
                }
    MAX-ACCESS read-write
    STATUS    current
    DESCRIPTION
        "The LSR 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 advertised label mappings are retained whether they are from a valid next hop or not.

::= { mplsLdpLsrObjects 2 }

mplsLdpLsrLoopDetectionCapable OBJECT-TYPE
SYNTAX TruthValue
MAX-ACCESS read-only
STATUS current
DESCRIPTION "A indication of whether this LSR supports loop detection. A value of 'true' indicates this LSR does support loop detection. A value of 'false' indicates this LSR does not support loop detection. Since Loop Detection is determined during Session Initialization, an individual session may not be running with loop detection enabled. This object simply gives an indication of whether or not the LSR has the ability to support Loop Detection."
::= { mplsLdpLsrObjects 3 }

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

mplsLdpEntityIndexNext OBJECT-TYPE
SYNTAX Unsigned32 (1..4294967295)
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. To obtain the mplsLdpEntityIndex value for a new entry, the manager issues a management protocol retrieval operation to obtain the current value of this object. After each retrieval, the agent should modify the value to the next unassigned index."
::= { mplsLdpEntityObjects 1 }

mplsLdpEntityTable OBJECT-TYPE
SYNTAX SEQUENCE OF MplsLdpEntityEntry
MAX-ACCESS not-accessible
INTERNET-DRAFT                MPLS LDP MIB                  January 2000

STATUS      current
DESCRIPTION
"This table contains information about the
MPLS Label Distribution Protocol Entities which
exist on this Label Switch Router (LSR)."
::= { mplsLdpEntityObjects 2 }

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 Unsigned32,
  mplsLdpEntityProtocolVersion Integer32,
  mplsLdpEntityAdminStatus INTEGER,
  mplsLdpEntityOperStatus INTEGER,
  mplsLdpEntityWellKnownDiscoveryPort Unsigned32,
  mplsLdpEntityMtu Integer32,
  mplsLdpEntityKeepAliveHoldTimer Integer32,
  mplsLdpEntityHelloHoldTimer Integer32,
  mplsLdpEntityFailedInitSessionThreshold Integer32,
  mplsLdpEntityControlMethod INTEGER,
  mplsLdpEntityLabelDistributionMethod INTEGER,
  mplsLdpEntityLoopDetectionForPV INTEGER,
  mplsLdpEntityPathVectorLimit Integer32,
  mplsLdpEntityTargetedPeer TruthValue,
  mplsLdpEntityTargetedPeerAddrType AddressFamilyNumbers,
  mplsLdpEntityTargetedPeerAddr MplsLdpGenAddr,
  mplsLdpEntityOptionalParameters MplsLdpLabelTypes,
  mplsLdpEntityRowStatus RowStatus
}

mplsLdpEntityLdpId OBJECT-TYPE
SYNTAX      MplsLdpIdentifier
MAX-ACCESS  not-accessible
STATUS      current
DESCRIPTION
"The LDP identifier.
The first four octets encode an IP address
assigned to the LSR, and the last two octets
identify a specific label space within the
LSR."
REFERENCE
"LDP Specification, Section on LDP Identifiers."
::= { mplsLdpEntityEntry 1 }

mplsLdpEntityIndex OBJECT-TYPE
SYNTAX      Unsigned32 (1..4294967295)
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."
::= { mplsLdpEntityEntry 2 }

mplsLdpEntityProtocolVersion OBJECT-TYPE
SYNTAX      Integer32
MAX-ACCESS  read-create
STATUS      current
DESCRIPTION
"The version number of the protocol. The value of 0 on a
read indicates that the version of the protocol is unknown.
Otherwise, the value of this object represents the version
of the LDP protocol."
::= { 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."
DEFVAL  { enable }
::= { mplsLdpEntityEntry 4 }

mplsLdpEntityOperStatus OBJECT-TYPE
SYNTAX      INTEGER {
    unknown(0),
    enabled(1),
    disabled(2)
}
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION
  "The operational status of this LDP Entity."
 ::= { mplsLdpEntityEntry 5 }

mplsLdpEntityWellKnownDiscoveryPort OBJECT-TYPE
SYNTAX     Unsigned32
MAX-ACCESS read-create
STATUS     current
DESCRIPTION
  "The well known LDP Discovery Port."
 ::= { mplsLdpEntityEntry 6 }

mplsLdpEntityMtu OBJECT-TYPE
SYNTAX     Integer32 (0..65535)
MAX-ACCESS read-create
STATUS     current
DESCRIPTION
  "The maximum transmission unit (MTU) that was configured
  for this entity."
 ::= { mplsLdpEntityEntry 7 }

mplsLdpEntityKeepAliveHoldTimer OBJECT-TYPE
SYNTAX     Integer32 (1..65535)
UNITS      "seconds"
MAX-ACCESS read-create
STATUS     current
DESCRIPTION
  "The two octet value which is the proposed keep alive hold
  timer for this LDP Entity."
 ::= { mplsLdpEntityEntry 8 }

mplsLdpEntityHelloHoldTimer OBJECT-TYPE
SYNTAX     Integer32 (0..65535)
UNITS      "seconds"
MAX-ACCESS read-create
STATUS     current
DESCRIPTION
  "The two octet value which is the proposed Hello hold
timer for this LDP Entity. A value of 0 means use the
default,
  which is 15 seconds for Link Hellos and 45 seconds for
Targeted
  Hellos. A value of 65535 means infinite."
DEFVAL { 0 }
 ::= { mplsLdpEntityEntry 9 }

mplsLdpEntityFailedInitSessionThreshold OBJECT-TYPE
SYNTAX     Integer32
MAX-ACCESS read-create
STATUS     current
DESCRIPTION
"When attempting to establish a session with a
given Peer, the given LDP Entity should
send out a notification when exceeding this threshold.
A value of 0 (zero) for this object
indicates that the threshold is infinity.
In other words, a notification will not
be sent if the value of this object is 0 (zero)."
::= { mplsLdpEntityEntry 10 }

mplsLdpEntityControlMethod OBJECT-TYPE
SYNTAX INTEGER {
  independent(1),
  ordered(2)
}
MAX-ACCESS read-create
STATUS current
DESCRIPTION
"This object indicates whether the LSR is operating
with independent or ordered LSP control."
::= { mplsLdpEntityEntry 11 }

mplsLdpEntityLabelDistributionMethod OBJECT-TYPE
SYNTAX INTEGER {
  downstreamOnDemand(1),
  downstreamUnsolicited(2)
}
MAX-ACCESS read-create
STATUS current
DESCRIPTION
"For any given LDP session, the method of
label distribution must be specified."
::= { mplsLdpEntityEntry 12 }

mplsLdpEntityLoopDetectionForPV OBJECT-TYPE
SYNTAX INTEGER {
  disabled(0),
  enabled(1)
}
MAX-ACCESS read-create
STATUS current
DESCRIPTION
"An indication of whether loop detection based on path
vectors is

disabled or enabled for this Entity.
If this object has a value of disabled(0),
then loop detection is disabled. Otherwise, if this object
has
a value of enabled(1), then loop detection based on path
vectors
is enabled."
::= {mplsLdpEntityEntry 13}

mplsLdpEntityPathVectorLimit OBJECT-TYPE
SYNTAX Integer32 (0..255)
MAX-ACCESS read-create
STATUS current
DESCRIPTION "If the value of 'mplsLdpEntityLoopDetectionForPV' for this entry is 'enabled(1)', the this object represents that Path Vector Limit for this Entity.
If the value of 'mplsLdpEntityLoopDetectionForPV' for this entry is 'disabled(0)', then this value should be 0 (zero)."
::= {mplsLdpEntityEntry 14}

mplsLdpEntityTargetedPeer 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 15}

mplsLdpEntityTargetedPeerAddrType OBJECT-TYPE
SYNTAX AddressFamilyNumbers
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 mplsLdpEntityTargetedPeerAddr is to be interpreted."
::= {mplsLdpEntityEntry 16}

mplsLdpEntityTargetedPeerAddr OBJECT-TYPE
SYNTAX MplsLdpGenAddr
MAX-ACCESS read-create
STATUS current
DESCRIPTION "The value of the internetwork layer address used for the Extended Discovery."
::= {mplsLdpEntityEntry 17}

mplsLdpEntityOptionalParameters OBJECT-TYPE
SYNTAX MplsLdpLabelTypes
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 mplsLdpEntityAtmParms
Table, which corresponds to this entry.

If the value is frameRelayParameters(3) then
a row must be created in the mplsLdpEntityFrameRelayParms
Table, which corresponds to this entry.

::= { mplsLdpEntityEntry 18 }

mplsLdpEntityRowStatus OBJECT-TYPE
SYNTAX RowStatus
MAX-ACCESS read-create
STATUS current
DESCRIPTION
"An object that allows entries in this table to
be created and deleted using the
RowStatus convention."

::= { mplsLdpEntityEntry 19 }

--
-- Ldp Entity Objects for ATM
--

mplsLdpEntityAtmObjects  OBJECT IDENTIFIER ::= {
mplsLdpEntityObjects 3 }

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

::= { mplsLdpEntityAtmObjects 1 }

mplsLdpEntityAtmParmsEntry OBJECT-TYPE
SYNTAX MplsLdpEntityAtmParmsEntry
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 }

::= { mplsLdpEntityAtmParmsTable 1 }
MplsLdpEntityAtmParmsEntry ::= SEQUENCE {
    mplsLdpEntityAtmMergeCap INTEGER,
    mplsLdpEntityAtmLabelRangeComponents Unsigned32,
    mplsLdpEntityAtmVcDirectionality INTEGER,
    mplsLdpEntityAtmLsrConnectivity INTEGER,
    mplsLdpEntityDefaultControlVpi AtmVpIdentifier,
    mplsLdpEntityDefaultControlVci AtmVcIdentifier,
    mplsLdpEntityUnlabTrafVpi AtmVpIdentifier,
    mplsLdpEntityUnlabTrafVci AtmVcIdentifier,
    mplsLdpEntityAtmRowStatus RowStatus
}

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."
::= { mplsLdpEntityAtmParmsEntry 1 }

mplsLdpEntityAtmLabelRangeComponents OBJECT-TYPE
SYNTAX Unsigned32 (1..65535)
MAX-ACCESS read-create
STATUS current
DESCRIPTION 
"Number of LabelRange Components in the Initialization message. This also represents the number of entries in the mplsLdpLabelRangeComponentsTable which correspond to this entry."
::= { mplsLdpEntityAtmParmsEntry 2 }

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

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

::= { mplsLdpEntityAtmParmsEntry 3 }

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."
REFERENCE
"draft-ietf-mpls-atm-02.txt, Section 7"
DEFVAL { direct }

::= { mplsLdpEntityAtmParmsEntry 4 }

mplsLdpEntityDefaultControlVpi 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."
REFERENCE
"draft-ietf-mpls-atm-02.txt, Section 7.1"
DEFVAL
{ 0 }

::= { mplsLdpEntityAtmParmsEntry 5 }

mplsLdpEntityDefaultControlVci OBJECT-TYPE
SYNTAX AtmVcIdentifier
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."
REFERENCE
"draft-ietf-mpls-atm-02.txt, Section 7.1"
DEFVAL
{ 32 }

::= { mplsLdpEntityAtmParmsEntry 6 }
mplsLdpEntityUnlabTrafVpi OBJECT-TYPE
SYNTAX       AtmVpIdentifier
MAX-ACCESS   read-create
STATUS       current
DESCRIPTION  "VPI value of the VCC supporting unlabelled traffic. This non-MPLS connection is used to carry unlabelled (IP) packets."
DEFVAL  { 0 }
 ::= { mplsLdpEntityAtmParmsEntry 7 }

mplsLdpEntityUnlabTrafVci OBJECT-TYPE
SYNTAX       AtmVcIdentifier
MAX-ACCESS   read-create
STATUS       current
DESCRIPTION  "VCI value of the VCC supporting unlabelled traffic. This non-MPLS connection is used to carry unlabelled (IP) packets."
DEFVAL  { 32 }
 ::= { mplsLdpEntityAtmParmsEntry 8 }

mplsLdpEntityAtmRowStatus OBJECT-TYPE
SYNTAX       RowStatus
MAX-ACCESS   read-create
STATUS       current
DESCRIPTION  "An object that allows entries in this table to be created and deleted using the RowStatus convention."
 ::= { mplsLdpEntityAtmParmsEntry 9 }

--
-- The MPLS LDP Entity Configurable ATM Label Range Table
--

mplsLdpEntityConfAtmLabelRangeTable OBJECT-TYPE
SYNTAX       SEQUENCE OF MplsLdpEntityConfAtmLabelRangeEntry
MAX-ACCESS   not-accessible
STATUS       current
DESCRIPTION  "The MPLS LDP Entity Configurable ATM Label Range Table. The purpose of this table is to provide a mechanism for specifying 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."
 ::= { mplsLdpEntityAtmObjects 2 }

mplsLdpEntityConfAtmLabelRangeEntry OBJECT-TYPE
A row in the LDP Entity Configurable 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 ConfLowerBound vpi/vci == 0/32, and ConfUpperBound vpi/vci == 0/100, and a second entry for this same interface with ConfLowerBound vpi/vci == 0/101 and ConfUpperBound vpi/vci == 0/200. However, there could not be a third entry with ConfLowerBound vpi/vci == 0/200 and ConfUpperBound 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 be created unless a unique and non-overlapping range is specified. Thus, row creation implies a one-shot row creation of LDP EntityID and ConfLowerBound vpi/vci and ConfUpperBound vpi/vci. At least one label range entry for a specific LDP Entity MUST include the default VPI/VCI values denoted in the LDP Entity Table.

INDEX

\[
\{ \text{mplsLdpEntityLdpId}, \\
\text{mplsLdpEntityIndex}, \\
\text{mplsLdpEntityConfAtmLabelRangeMinimumVpi}, \\
\text{mplsLdpEntityConfAtmLabelRangeMinimumVci} \\
\}
\]

\[
\text{mplsLdpEntityConfAtmLabelRangeTable} 1
\]

mplsLdpEntityConfAtmLabelRangeEntry ::= SEQUENCE {
  mplsLdpEntityConfAtmLabelRangeMinimumVpi  AtmVpIdentifier,
  mplsLdpEntityConfAtmLabelRangeMinimumVci  AtmVcIdentifier,
  mplsLdpEntityConfAtmLabelRangeMaximumVpi  AtmVpIdentifier,
  mplsLdpEntityConfAtmLabelRangeMaximumVci  AtmVcIdentifier,
  mplsLdpEntityConfAtmLabelRangeRowStatus   RowStatus
}

mplsLdpEntityConfAtmLabelRangeMinimumVpi OBJECT-TYPE
SYNTAX AtmVpIdentifier
MAX-ACCESS not-accessible
STATUS current
DESCRIPTION

"The minimum VPI number configured for this range."

 ::= ( mplsLdpEntityConfAtmLabelRangeEntry 1 )
mplsLdpEntityConfAtmLabelRangeMinimumVci OBJECT-TYPE
SYNTAX AtmVcIdentifier
MAX-ACCESS not-accessible
STATUS current
DESCRIPTION
"The minimum VCI number configured for this range."
::= { mplsLdpEntityConfAtmLabelRangeEntry 2 }

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

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

mplsLdpEntityConfAtmLabelRangeRowStatus OBJECT-TYPE
SYNTAX RowStatus
MAX-ACCESS read-create
STATUS current
DESCRIPTION
"An object that allows entries in this table to be created and deleted using the RowStatus convention.

There must exist at least one entry in this table for every LDP Entity that has 'mplsLdpEntityOptionalParameters' object with a value of 'atmSessionParameters'."
::= { mplsLdpEntityConfAtmLabelRangeEntry 5 }

-- Ldp Entity Objects for Frame Relay
--

mplsLdpEntityFrameRelayObjects OBJECT IDENTIFIER ::= 
{ mplsLdpEntityObjects 4 }

mplsLdpEntityFrameRelayParmsTable OBJECT-TYPE
SYNTAX SEQUENCE OF MplsLdpEntityFrameRelayParmsEntry
MAX-ACCESS not-accessible
This table contains information about the Optional Parameters to specify what this Entity is going to specify for Frame Relay specific LDP Initialization Messages.

::= { mplsLdpEntityFrameRelayObjects 1 }

mplsLdpEntityFrameRelayParmsEntry OBJECT-TYPE
SYNTAX MplsLdpEntityFrameRelayParmsEntry
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 }
::= { mplsLdpEntityFrameRelayParmsTable 1 }

MplsLdpEntityFrameRelayParmsEntry ::= SEQUENCE {
    mplsLdpEntityFrMergeCap INTEGER,
    mplsLdpEntityFrLabelRangeComponents Unsigned32,
    mplsLdpEntityFrVcDirectionality INTEGER,
    mplsLdpEntityFrParmsRowStatus RowStatus
}

mplsLdpEntityFrMergeCap OBJECT-TYPE
SYNTAX INTEGER {
    notSupported(0),
    supported(1)
}
MAX-ACCESS read-create
STATUS current
DESCRIPTION "This represents whether or not Frame Relay merge capability is supported."
::= { mplsLdpEntityFrameRelayParmsEntry 1 }

mplsLdpEntityFrLabelRangeComponents OBJECT-TYPE
SYNTAX Unsigned32 (1..65535)
MAX-ACCESS read-create
STATUS current
DESCRIPTION "Number of LabelRange Components in the Initialization message. This also represents the number of entries in the mplsLdpEntityConfFrLabelRangeTable which correspond to this entry."
::= { mplsLdpEntityFrameRelayParmsEntry 2 }

mplsLdpEntityFrVcDirectionality OBJECT-TYPE
SYNTAX INTEGER {

bidirectional(0),
unidirectional(1)
}
MAX-ACCESS read-create
STATUS current
DESCRIPTION
"If the value of this object is ‘bidirectional(0)’, then
the LSR supports the use of a given DLCI as a label for
both directions independently. If the value of this object
is ‘unidirectional(1)’, then the LSR uses the given DLCI
as a label in only one direction."
::= { mplsLdpEntityFrameRelayParmsEntry 3 }

mplsLdpEntityFrParmsRowStatus OBJECT-TYPE
SYNTAX RowStatus
MAX-ACCESS read-create
STATUS current
DESCRIPTION
"An object that allows entries in this table to
be created and deleted using the
RowStatus convention."
::= { mplsLdpEntityFrameRelayParmsEntry 4 }

--
-- Frame Relay Label Range Components
--

mplsLdpEntityConfFrLabelRangeTable OBJECT-TYPE
SYNTAX SEQUENCE OF MplsLdpEntityConfFrLabelRangeEntry
MAX-ACCESS not-accessible
STATUS current
DESCRIPTION
"This table contains information about the
Optional Parameters to specify what this Entity is
going to specify for Frame Relay specific
LDP Initialization Messages."
::= { mplsLdpEntityFrameRelayObjects 2 }

mplsLdpEntityConfFrLabelRangeEntry OBJECT-TYPE
SYNTAX MplsLdpEntityConfFrLabelRangeEntry
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,
mplsLdpConfFrMinimumDlci }
::= {mplsLdpEntityConfFrLabelRangeTable 1 }

MplsLdpEntityConfFrLabelRangeEntry ::= SEQUENCE {
    mplsLdpConfFrMinimumDlci                  Integer32,
    mplsLdpConfFrMaximumDlci                  Integer32,
    mplsLdpConfFrLen                          INTEGER,
    mplsLdpConfFrRowStatus                    RowStatus
}

mplsLdpConfFrMinimumDlci OBJECT-TYPE
SYNTAX      Integer32(0..4194303)
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."
::= {mplsLdpEntityConfFrLabelRangeEntry 1 }

mplsLdpConfFrMaximumDlci OBJECT-TYPE
SYNTAX      Integer32 (0..4194303)
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."
::= {mplsLdpEntityConfFrLabelRangeEntry 2 }

mplsLdpConfFrLen OBJECT-TYPE
SYNTAX      INTEGER {
    tenDlciBits(0),
    seventeenDlciBits(1),
    twentyThreeDlciBits(2)
}
MAX-ACCESS  read-create
STATUS      current
DESCRIPTION
  "This object specifies the DLCI bits."
::= {mplsLdpEntityConfFrLabelRangeEntry 3 }

mplsLdpConfFrRowStatus OBJECT-TYPE
SYNTAX      RowStatus
MAX-ACCESS  read-create
STATUS      current
DESCRIPTION
  "An object that allows entries in this table to be created and deleted using the RowStatus convention."
If the value of the object
‘mplsLdpEntityOptionalParameters’
contains the value of
‘frameReleaySessionParameters(3)’ then
there must be at least one corresponding entry in this
table."
::= { mplsLdpEntityConfFrLabelRangeEntry 4 }

-- 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 5 }

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 for an
LDP Session which contains a fatal error is counted
here, because the session is terminated.
If the error is NOT fatal (i.e. and the Session
remains), then the error is counted in the
mplsLdpSessionStatsEntry."
AUGMENTS       { mplsLdpEntityEntry }
::= { mplsLdpEntityStatsTable 1 }

MplsLdpEntityStatsEntry ::= SEQUENCE {
  mplsLdpAttemptedSessions                  Counter32,
  mplsLdpSessionRejectedNoHelloErrors       Counter32,
  mplsLdpSessionRejectedAdvertisementErrors Counter32,
  mplsLdpSessionRejectedMaxPduErrors        Counter32,
  mplsLdpSessionRejectedLabelRangeErrors    Counter32,
  mplsLdpBadLdpIdentifierErrors             Counter32,
  mplsLdpBadPduLengthErrors                 Counter32,
  mplsLdpBadMessageLengthErrors             Counter32,
  mplsLdpBadTlvLengthErrors                 Counter32,
  mplsLdpMalformedTlvValueErrors            Counter32,
  mplsLdpKeepAliveTimerExpiredErrors        Counter32,
mplsLdpShutdownNotifReceived Counter32,
mplsLdpShutdownNotifSent Counter32

mplsLdpAttemptedSessions OBJECT-TYPE
SYNTAX Counter32
MAX-ACCESS read-only
STATUS current
DESCRIPTION
  "A count of the total attempted sessions for this LDP Entity."
::= { mplsLdpEntityStatsEntry 1 }

mplsLdpSessionRejectedNoHelloErrors 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."
::= { mplsLdpEntityStatsEntry 2 }

mplsLdpSessionRejectedAdvertisementErrors 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."
::= { mplsLdpEntityStatsEntry 3 }

mplsLdpSessionRejectedMaxPduErrors 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."
::= { mplsLdpEntityStatsEntry 4 }

mplsLdpSessionRejectedLabelRangeErrors OBJECT-TYPE
SYNTAX Counter32
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"A count of the Session Rejected/Parameters
Label Range Notification Notification Messages sent
or received by this LDP Entity."
::= { mplsLdpEntityStatsEntry 5 }

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

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

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

mplsLdpBadTlvLengthErrors 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."
REFERENCE
   "LDP Specification, Section 3.5.1.2."
::= { mplsLdpEntityStatsEntry 9 }

mplsLdpMalformedTlvValueErrors 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."
REFERENCE
   "LDP Specification, Section 3.5.1.2."
::= { mplsLdpEntityStatsEntry 10 }

mplsLdpKeepAliveTimerExpiredErrors 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."
REFERENCE
   "LDP Specification, Section 3.5.1.2."
::= { mplsLdpEntityStatsEntry 11 }

mplsLdpShutdownNotifReceived 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."
::= { mplsLdpEntityStatsEntry 12 }

mplsLdpShutdownNotifSent OBJECT-TYPE
SYNTAX Counter32
MAX-ACCESS read-only
STATUS current
DESCRIPTION
   "This object counts the number of Shutdown Notifications sent related to session(s) (past and present) associated with this LDP Entity."
::= { mplsLdpEntityStatsEntry 13 }

--
-- The MPLS LDP Peer Table
--

mplsLdpPeerObjects OBJECT IDENTIFIER ::= { mplsLdpObjects 3 }

mplsLdpPeerTable OBJECT-TYPE
SYNTAX      SEQUENCE OF MplsLdpPeerEntry
MAX-ACCESS  not-accessible
STATUS      current
DESCRIPTION
"Information about LDP peers. This information is
gathered either by the Discovery messages and/or by
Session Initialization Messages."
::= { mplsLdpPeerObjects 1 }

mplsLdpPeerEntry OBJECT-TYPE
SYNTAX      MplsLdpPeerEntry
MAX-ACCESS  not-accessible
STATUS      current
DESCRIPTION
"Information about a single Peer."
INDEX       { mplsLdpPeerLdpId }
::= { mplsLdpPeerTable 1 }

MplsLdpPeerEntry ::= SEQUENCE {
    mplsLdpPeerLdpId                      MplsLdpIdentifier,
    mplsLdpPeerLabelDistributionMethod    INTEGER,
    mplsLdpPeerLoopDetectionForPV         INTEGER,
    mplsLdpPeerPathVectorLimit            Integer32
}

mplsLdpPeerLdpId OBJECT-TYPE
SYNTAX      MplsLdpIdentifier
MAX-ACCESS  not-accessible
STATUS      current
DESCRIPTION
"The LDP identifier of this LDP Peer."
::= { mplsLdpPeerEntry 1 }

mplsLdpPeerLabelDistributionMethod OBJECT-TYPE
SYNTAX      INTEGER {
    downstreamOnDemand(1),
    downstreamUnsolicited(2)
}
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION
"For any given LDP session, the method of
label distribution must be specified."
REFERENCE

Expires July 2000
mplsLdpPeerLoopDetectionForPV OBJECT-TYPE
SYNTAX INTEGER {
    disabled(0),
    enabled(1)
}
MAX-ACCESS read-only
STATUS current
DESCRIPTION "An indication of whether loop detection based on path vectors is disabled or enabled for this Peer.

If this object has a value of disabled(0), then loop detection is disabled. Otherwise, if this object has a value of enabled(1), then loop detection based on path vectors is enabled."

mplsLdpPathVectorLimit OBJECT-TYPE
SYNTAX Integer32 (0..255)
MAX-ACCESS read-only
STATUS current
DESCRIPTION "If the value of 'mplsLdpPeerLoopDetectionForPV' for this entry is 'enabled(1)', the this object represents that Path Vector Limit for this peer.

If the value of 'mplsLdpPeerLoopDetectionForPV' for this entry is 'disabled(0)', then this value should be 0 (zero)."

mplsLdpSessionObjects OBJECT IDENTIFIER ::= { mplsLdpObjects 4 }

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. Each row represents a single session."
mplsLdpSessionEntry OBJECT-TYPE

Expires July 2000
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."
INDEX      { mplsLdpEntityLdpId,
            mplsLdpEntityIndex,
            mplsLdpPeerLdpId } ::= { mplsLdpSessionTable 1 }

MplsLdpSessionEntry ::= SEQUENCE {
  mplsLdpSessionState                          INTEGER,
  mplsLdpSessionProtocolVersion                Integer32,
  mplsLdpSessionKeepAliveHoldTimeRemaining     TimeInterval,
  mplsLdpSessionMaxPduLength                   Integer32,
  mplsLdpSessionDiscontinuityTime              TimeStamp
}

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 - 5 are based on the state machine for session negotiation behavior."
 ::= { mplsLdpSessionEntry 1 }

mplsLdpSessionProtocolVersion OBJECT-TYPE
SYNTAX      Integer32(1..65535)
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION  "The version of the LDP Protocol which this session is using."
 ::= { mplsLdpSessionEntry 2 }

mplsLdpSessionKeepAliveHoldTimeRemaining OBJECT-TYPE
SYNTAX      TimeInterval
MAX-ACCESS  read-only
STATUS current
DESCRIPTION "The keep alive hold time remaining for this session."
::= ( mplsLdpSessionEntry 3 )

mplsLdpSessionMaxPduLength OBJECT-TYPE
SYNTAX Integer32 (0..65535)
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."
::= ( mplsLdpSessionEntry 4 )

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 or Counter64 object contained in the mplsLdpSessionStatsTable. If no such discontinuities have occurred since the last re-initialization of the local management subsystem, then this object contains a zero value.

Also, an NMS can distinguish when a session between a given Entity and Peer goes away and then is 're-established'. This value would change and thus indicate to the NMS that this is a different session."
::= ( mplsLdpSessionEntry 5 )

--
-- MPLS LDP ATM Session Information
--

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.

NOTE: this table cannot use the 'AUGMENTS' clause because there is not necessarily a one-to-one mapping between this table and the mplsLdpSessionTable.

::= { mplsLdpSessionObjects 2 }

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,
  mplsLdpSessionAtmLabelRangeLowerBoundVpi,
  mplsLdpSessionAtmLabelRangeLowerBoundVci

::= { mplsLdpAtmSessionTable 1 }

MplsLdpAtmSessionEntry ::= SEQUENCE {
  mplsLdpSessionAtmLabelRangeLowerBoundVpi     AtmVpIdentifier,
  mplsLdpSessionAtmLabelRangeLowerBoundVci     AtmVcIdentifier,
  mplsLdpSessionAtmLabelRangeUpperBoundVpi     AtmVpIdentifier,
  mplsLdpSessionAtmLabelRangeUpperBoundVci     AtmVcIdentifier
}

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

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

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

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

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

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."
::= { mplsLdpSessionObjects 3 }

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, mplsLdpFrSessionMinDlci }
::= { mplsLdpFrameRelaySessionTable 1 }
MplsLdpFrameRelaySessionEntry ::= SEQUENCE {
    mplsLdpFrSessionMinDlci   Integer32,
    mplsLdpFrSessionMaxDlci   Integer32,
    mplsLdpFrSessionLen       INTEGER
}

mplsLdpFrSessionMinDlci OBJECT-TYPE
SYNTAX     Integer32(0..4194303)
MAX-ACCESS not-accessible
STATUS     current
DESCRIPTION  "The lower bound of DLCIs which are supported."
 ::= { mplsLdpFrameRelaySessionEntry 1 }

mplsLdpFrSessionMaxDlci OBJECT-TYPE
SYNTAX     Integer32 (0..4194303)
MAX-ACCESS read-only
STATUS     current
DESCRIPTION  "The upper bound of DLCIs which are supported."
 ::= { mplsLdpFrameRelaySessionEntry 2 }

mplsLdpFrSessionLen OBJECT-TYPE
SYNTAX     INTEGER {
    tenDlciBits(0),
    seventeenDlciBits(1),
    twentyThreeDlciBits(2)
    }
MAX-ACCESS read-only
STATUS     current
DESCRIPTION  "This object specifies the DLCI bits."
 ::= { mplsLdpFrameRelaySessionEntry 3 }

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

mplsLdpSessionStatsTable OBJECT-TYPE
SYNTAX     SEQUENCE OF MplsLdpSessionStatsEntry
MAX-ACCESS not-accessible
STATUS     current
DESCRIPTION  "A table of Sessions between the LDP Entities and LDP Peers."
 ::= { 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 { mplsLdpSessionEntry }
::= { mplsLdpSessionStatsTable 1 }

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

mplsLdpSessionStatsUnknownMessageTypeErrors OBJECT-TYPE
SYNTAX Counter32
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"This object counts the number of Unknown Message Type
Errors detected 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 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 }

--
-- 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.
mplsLdpSessionPeerAddressTable OBJECT-TYPE
SYNTAX    SEQUENCE OF MplsLdpSessionPeerAddressEntry
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 'extends', rather than 'AUGMENTS' the mplsLdpSessionTable's information."
::= { mplsLdpSessionObjects 5 }

mplsLdpSessionPeerAddressEntry OBJECT-TYPE
SYNTAX    MplsLdpSessionPeerAddressEntry
MAX-ACCESS not-accessible
STATUS    current
DESCRIPTION
"An entry in this table represents information on session's for a 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,
             mplsLdpSessionPeerAddressIndex
 }
::= { mplsLdpSessionPeerAddressTable 1 }

MplsLdpSessionPeerAddressEntry ::= SEQUENCE {
              mplsLdpSessionPeerAddressIndex            Unsigned32,
              mplsLdpSessionPeerNextHopAddressType      AddressFamilyNumbers,
              mplsLdpSessionPeerNextHopAddress          MplsLdpGenAddr
}

mplsLdpSessionPeerAddressIndex OBJECT-TYPE
SYNTAX    Unsigned32 (1..4294967295)
MAX-ACCESS not-accessible
STATUS    current
DESCRIPTION
"An index which uniquely identifies this entry within a given session."
::= { mplsLdpSessionPeerAddressEntry 1 }
mplsLdpSessionPeerNextHopAddressType OBJECT-TYPE
SYNTAX AddressFamilyNumbers
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 mplsLdpSessionPeerNextHopAddress."
::= { mplsLdpSessionPeerAddressEntry 2 }

mplsLdpSessionPeerNextHopAddress OBJECT-TYPE
SYNTAX MplsLdpGenAddr
MAX-ACCESS read-only
STATUS current
DESCRIPTION "The value of the next hop address."
REFERENCE "LDP Specification [18] defines only IPv4 for LDP Protocol Version 1, see section 3.4.3."
::= { mplsLdpSessionPeerAddressEntry 3 }

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

mplsLdpHelloAdjacencyObjects OBJECT IDENTIFIER ::= { mplsLdpObjects 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,
  mplsLdpHelloAdjacencyHoldTimeRemaining TimeInterval,
  mplsLdpHelloAdjacencyType           INTEGER
}

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

mplsLdpHelloAdjacencyHoldTimeRemaining OBJECT-TYPE
SYNTAX      TimeInterval
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION
  "The time remaining for this Hello Adjacency. This interval will change when the 'next' Hello message which corresponds to this Hello Adjacency is received."
::= { mplsLdpHelloAdjacencyEntry 2 }

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 3 }

--
-- MPLS LDP LIB Table
--

mplsLdpLibObjects OBJECT IDENTIFIER ::= { mplsLdpObjects 6 }

mplsLdpLibTable OBJECT-TYPE
SYNTAX      SEQUENCE OF MplsLdpLibEntry
MAX-ACCESS  not-accessible
STATUS      current
DESCRIPTION

Expires July 2000
"This table represents LIB (Label Information Base) Information. The table is read-only."
::= { mplsLdpLibObjects 1 }

mplsLdpLibEntry OBJECT-TYPE
SYNTAX MplsLdpLibEntry
MAX-ACCESS not-accessible
STATUS current
DESCRIPTION "Each row represents a single LDP LIB entry."
INDEX { mplsLdpLibLspId }
::= { mplsLdpLibTable 1 }

MplsLdpLibEntry ::= SEQUENCE {
  mplsLdpLibLspId                             Unsigned32,
  mplsLdpLibLabelInIfIndex                    InterfaceIndex,
  mplsLdpLibLabelOutIfIndex                   InterfaceIndex,
  mplsLdpLibLabelType                         MplsLdpLabelTypes,
  mplsLdpLibInLabel                           MplsLabel,
  mplsLdpLibOutLabel                          MplsLabel
}

mplsLdpLibLspId  OBJECT-TYPE
SYNTAX       Unsigned32 (1..4294967295)
MAX-ACCESS   not-accessible
STATUS       current
DESCRIPTION "This number is used to uniquely identify this row, since
this row is associated with a specific LSP, it may also be used
to describe a unique number for an LSP. This number is
used in the mplsLdpFecTable to identify which FECs or FEC is
associated with this LIB entry."
::= { mplsLdpLibEntry 1 }

mplsLdpLibLabelInIfIndex OBJECT-TYPE
SYNTAX       InterfaceIndex
MAX-ACCESS   read-only
STATUS       current
DESCRIPTION "The ifIndex of the 'mplsLdpInLabel'."
::= { mplsLdpLibEntry 2 }

mplsLdpLibLabelOutIfIndex OBJECT-TYPE
SYNTAX       InterfaceIndex
MAX-ACCESS   read-only
STATUS       current
DESCRIPTION "The ifIndex of the 'mplsLdpOutLabel'."
::= { mplsLdpLibEntry 3 }

Expires July 2000
mplsLdpLibLabelType  OBJECT-TYPE
SYNTAX          MplsLdpLabelTypes
MAX-ACCESS      read-only
STATUS          current
DESCRIPTION     "The Layer 2 Label Type for 'mplsLdpInLabel' and
                'mplsLdpOutLabel'."
 ::= { mplsLdpLibEntry 4 }

mplsLdpLibInLabel OBJECT-TYPE
SYNTAX          MplsLabel
MAX-ACCESS      read-only
STATUS          current
DESCRIPTION     "The incoming label of this LSP."
 ::= { mplsLdpLibEntry 5 }

mplsLdpLibOutLabel OBJECT-TYPE
SYNTAX          MplsLabel
MAX-ACCESS      read-only
STATUS          current
DESCRIPTION     "The outgoing label of this LSP."
 ::= { mplsLdpLibEntry 6 }

--
-- Mpls Ldp FEC Table
--

mplsLdpFecTable OBJECT-TYPE
SYNTAX          SEQUENCE OF MplsLdpFecEntry
MAX-ACCESS      not-accessible
STATUS          current
DESCRIPTION     "This table represents the FEC
                (Forwarding Equivalence Class)Information
                associated with an LSP.
                The table is read-only."
 ::= { mplsLdpLibObjects 2 }

mplsLdpFecEntry OBJECT-TYPE
SYNTAX          MplsLdpFecEntry
MAX-ACCESS      not-accessible
STATUS          current
DESCRIPTION     "Each row represents a single FEC Element."
INDEX           { mplsLdpFecType,
                    mplsLdpFecAddressFamily,
                    mplsLdpFecAddressLength,
                    mplsLdpFecAddress }
::= { mplsLdpFecTable 1 }

MplsLdpFecEntry ::= SEQUENCE {
  mplsLdpFecType INTEGER,
  mplsLdpFecAddressFamily AddressFamilyNumbers,
  mplsLdpFecAddressLength Integer32(0..255),
  mplsLdpFecAddress MplsLdpGenAddr,
  mplsLdpFecLspId Unsigned32
}

mplsLdpFecType OBJECT-TYPE
SYNTAX INTEGER {
  prefix(1),
  hostAddress(2)
}
MAX-ACCESS not-accessible
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 for address prefixes.

If the value of this object is 'hostAddress(2)' then the FEC type described by this row is a host address."
::= { mplsLdpFecEntry 1 }

mplsLdpFecAddressFamily OBJECT-TYPE
SYNTAX AddressFamilyNumbers
MAX-ACCESS not-accessible
STATUS current
DESCRIPTION
"The value of this object is from the Address Family Numbers."
::= { mplsLdpFecEntry 2 }

mplsLdpFecAddressLength OBJECT-TYPE
SYNTAX Integer32(0..255)
MAX-ACCESS not-accessible
STATUS current
DESCRIPTION
"If the value of 'mplsLdpFecType' is 'prefix(1)' then the value of this object is the length in bits of the address prefix represented by 'mplsLdpFecAddress', or if the length is zero then this is a special value which indicates that the prefix matches all addresses. In this case the prefix is also zero (i.e. 'mplsLdpFecAddress' will have the value of zero."
::= { mplsLdpFecEntry 3 }

Expires July 2000
mplsLdpFecAddress OBJECT-TYPE
SYNTAX MplsLdpGenAddr
MAX-ACCESS not-accessible
STATUS current
DESCRIPTION
"If the value of 'mplsLdpFecType' is 'prefix(1)'
then the value of this object is the address prefix.
If the value of the 'mplsLdpFecAddressLength'
is object is zero, then this object should also be
zero."
::= { mplsLdpFecEntry 4 }

mplsLdpFecLspId OBJECT-TYPE
SYNTAX Unsigned32 (1..4294967295)
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"This number represents the LSP which is related to
this FEC. The value of this object should correspond
to an entry in the MplsLdpLibTable, as denoted by
the 'mplsLdpLibLspId' object. In other words, this
object and the 'mplsLdpLibLspId' should have the same
value."
::= { mplsLdpFecEntry 5 }

---
--- Notifications
---

mplsLdpNotificationPrefix OBJECT IDENTIFIER ::= 
{ mplsLdpNotifications 0 } 

mplsLdpFailedInitSessionThresholdExceeded NOTIFICATION-TYPE
OBJECTS { 
  mplsLdpEntityFailedInitSessionThreshold 
}
STATUS current
DESCRIPTION
"This notification is generated whenever the value
of mplsLdpEntityFailedInitSessionThreshold is
exceeded."
::= { mplsLdpNotificationPrefix 1 }

mplsLdpPathVectorLimitMismatch NOTIFICATION-TYPE
OBJECTS { 
  mplsLdpEntityPathVectorLimit,
  mplsLdpPeerPathVectorLimit 
}
STATUS current
DESCRIPTION
"This notification is generated when the value of mplsLdpSessionPathVectorLimit does NOT match the value of the mplsLdpPeerPathVectorLimit for the corresponding mplsLdpPeerEntry."

REFERENCE
"LDP Specification, Section 3.5.3."
::= { mplsLdpNotificationPrefix 2 }

-- Module Conformance Statement

mplsLdpGroups
OBJECT IDENTIFIER ::= { mplsLdpConformance 1 }

mplsLdpCompliances
OBJECT IDENTIFIER ::= { mplsLdpConformance 2 }

-- Compliance Statements

mplsLdpModuleCompliance MODULE-COMPLIANCE
STATUS current
DESCRIPTION
"The basic implementation requirements for agents that support the MPLS LDP MIB."
MODULE -- this module
MANDATORY-GROUPS { mplsLdpGeneralGroup, mplsLdpNotificationsGroup }

GROUP mplsLdpAtmGroup
DESCRIPTION
"This group must be supported if ATM is used in the MPLS LDP implementation."

GROUP mplsLdpFrameRelayGroup
DESCRIPTION
"This group must be supported if Frame Relay is used in the MPLS LDP implementation."
::= { mplsLdpCompliances 1 }

-- units of conformance

mplsLdpGeneralGroup OBJECT-GROUP
OBJECTS {
mplsLdpLsrId,
mplsLdpLsrLabelRetentionMode,
mplsLdpLsrLoopDetectionCapable,
mplsLdpEntityIndexNext,
mplsLdpEntityProtocolVersion,
mplsLdpEntityAdminStatus,
mplsLdpEntityOperStatus,
mplsLdpEntityWellKnownDiscoveryPort,
mplsLdpEntityMtu,
mplsLdpEntityKeepAliveHoldTimer,
mplsLdpEntityHelloHoldTimer,
mplsLdpEntityFailedInitSessionThreshold,
mplsLdpEntityControlMethod,
mplsLdpEntityLabelDistributionMethod,
mplsLdpEntityLoopDetectionForPV,
mplsLdpEntityPathVectorLimit,
mplsLdpEntityTargetedPeer,
mplsLdpEntityTargetedPeerAddrType,
mplsLdpEntityTargetedPeerAddr,
mplsLdpEntityOptionalParameters,
mplsLdpEntityRowStatus,
mplsLdpAttemptedSessions,
mplsLdpSessionRejectedNoHelloErrors,
mplsLdpSessionRejectedAdvertisementErrors,
mplsLdpSessionRejectedMaxPduErrors,
mplsLdpSessionRejectedLabelRangeErrors,
mplsLdpBadLdpIdentifierErrors,
mplsLdpBadPduLengthErrors,
mplsLdpBadMessageLengthErrors,
mplsLdpBadTlvLengthErrors,
mplsLdpMalformedTlvValueErrors,
mplsLdpKeepAliveTimerExpiredErrors,
mplsLdpShutdownNotifReceived,
mplsLdpShutdownNotifSent,
mplsLdpPeerLabelDistributionMethod,
mplsLdpPeerLoopDetectionForPV,
mplsLdpPeerPathVectorLimit,
mplsLdpSessionState,
mplsLdpSessionProtocolVersion,
mplsLdpSessionKeepAliveHoldTimeRemaining,
mplsLdpSessionMaxPduLength,
mplsLdpSessionDiscontinuityTime,
mplsLdpSessionStatsUnknownMessageTypeErrors,
mplsLdpSessionStatsUnknownTlvErrors,
mplsLdpSessionPeerNextHopAddressType,
mplsLdpSessionPeerNextHopAddress,
mplsLdpHelloAdjacencyHoldTimeRemaining,
mplsLdpHelloAdjacencyType,
mplsLdpLibLabelInIfIndex,
mplsLdpLibLabelOutIfIndex,
mplsLdpLibLabelType,
mplsLdpLibInLabel,
mplsLdpLibOutLabel,
mplsLdpFecLspId

}  
STATUS current
DESCRIPTION
"Objects that apply to all MPLS LDP implementations."
::= { mplsLdpGroups 1 }

mplsLdpAtmGroup OBJECT-GROUP
OBJECTS {
  mplsLdpEntityAtmMergeCap,
  mplsLdpEntityAtmLabelRangeComponents,
  mplsLdpEntityAtmVcDirectionality,
  mplsLdpEntityAtmLsrConnectivity,
  mplsLdpEntityDefaultControlVpi,
  mplsLdpEntityDefaultControlVci,
  mplsLdpEntityUnlabTrafVpi,
  mplsLdpEntityUnlabTrafVci,
  mplsLdpEntityAtmRowStatus,
  mplsLdpEntityConfAtmLabelRangeMaximumVpi,
  mplsLdpEntityConfAtmLabelRangeMaximumVci,
  mplsLdpEntityConfAtmLabelRangeRowStatus,
  mplsLdpSessionAtmLabelRangeUpperBoundVpi,
  mplsLdpSessionAtmLabelRangeUpperBoundVci
}
STATUS current
DESCRIPTION
"Objects that apply to all MPLS LDP implementations over
ATM."
::= { mplsLdpGroups 2 }

mplsLdpFrameRelayGroup OBJECT-GROUP
OBJECTS {
  mplsLdpEntityFrMergeCap,
  mplsLdpEntityFrLabelRangeComponents,
  mplsLdpEntityFrVcDirectionality,
  mplsLdpEntityFrParmsRowStatus,
  mplsLdpConfFrMaximumDlci,
  mplsLdpConfFrLen,
  mplsLdpConfFrRowStatus,
  mplsLdpFrSessionMaxDlci,
  mplsLdpFrSessionLen
}
STATUS current
DESCRIPTION
"Objects that apply to all MPLS LDP implementations over Frame Relay."
 ::= { mplsLdpGroups 3 }

mplsLdpNotificationsGroup NOTIFICATION-GROUP
   NOTIFICATIONS { mplsLdpFailedInitSessionThresholdExceeded,
                   mplsLdpPathVectorLimitMismatch }
 STATUS    current
 DESCRIPTION
   "The notification(s) which an MPLS LDP implementation
    is required to implement."
 ::= { mplsLdpGroups 4 }

END
5. Revision History

This section should be removed when this document is published as an RFC.

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

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

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

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

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

Removed the mplsLdpPeerIndex from the mplsLdpHelloAdjacencyTable.

Removed the "IANA Address Family Numbers MIB" section.

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

Updated the Security Section from the ops web page.

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

Expires July 2000
Removed mplsLdpSessionLabelAdvertisement, mplsLdpSessionLoopDetectionForPV, and mplsLdpSessionPathVectorLimit from the mplsLdpSessionTable.

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

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

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

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

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

Added Scalar Objects: mplsLdpLsrLoopDetectionPresent, and mplsLdpEntityIndexNext.

Added the following objects to the mplsLdpEntityTable: mplsLdpEntityProtocolVersion, mplsLdpEntityAdminStatus, mplsLdpEntityOperStatus, mplsLdpEntityTargetedPeer, mplsLdpEntityTargetedPeerAddrType, mplsLdpEntityTargetedPeerAddr, and mplsLdpEntityHelloHoldTimer.

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

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

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

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

The MIB was updated to correspond to draft-ietf-mpls-ldp-06.txt of the LDP Specification [18].

The front section was updated.

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

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

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

The following notifications were added: notification for Session removal.

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

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

The mplsLdpSessionStatsTable was added to count statics based on a per Session basis.
The mplLdpPeerConfAtmLabelRangeTable has been removed. There is no need to configure information for a Peer. All information for a peer is learned, thus peer information is read-only.

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

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

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

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

The mib hierarchy within the LDP MIB was also changed. A new branch, under mpls.mplsProtocols.mplsLdpMIB.mplsLdpObjects was added. This branch is mplsLdpLsrObjects. Currently, this contains several new scalar objects: mplsLdpLsrID, mplsLdpLsrLoopDetectionPresent, mplsLdpLsrLoopDetectionAdminStatus, mplsLdpLsrPathVectorLimit, mplsLdpLsrHopCountLimit, mplsLdpLsrLoopPreventionPresent, mplsLdpLsrLoopPreventionAdminStatus, and mplsLdpLsrLabelRetentionMode.

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

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

The following objects were added to the mplsLdpPeerEntityTable: mplsLdpPeerLabelDistributionMethod.

The following object was removed from the mplsLdpEntityStatsTable: mplsLdpEntityEstablishedSessions.

References were added and revised.

6. TO DO List

This section should be removed when this document is published as an RFC. This section outlines the next areas the authors intend to address in subsequent revisions.
7. Acknowledgments

The authors would like to thank the following people: Leigh McLellan, Geetha Brown, Geping Chen and Charlan Zhou from Nortel Networks, and Zoltan Takacs and Bo Augustsson from Ericsson.
8. References


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


2677, August 1999.


9. Security Considerations

There are a number of management objects defined in this MIB that have 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.

There are a number of managed objects in this MIB that may contain sensitive information. These are contained in the mplsLdpEntityTable. The objects contained in this table are responsible for setting up or tearing down LSPs.

It is thus important to control even GET access to these objects and possibly to even encrypt the values of these object when sending them over the network via SNMP. Not all versions of SNMP provide features for such a secure environment.

SNMPv1 by itself is not a secure environment. 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.

Expires July 2000
It is recommended that the implementers consider the security features as provided by the SNMPv3 framework. Specifically, the use of the User-based Security Model RFC 2574 [RFC2574] and the View-based Access Control Model RFC 2575 [RFC2575] is recommended.

It is then a customer/user responsibility to ensure that the SNMP entity giving access to an instance of this MIB, 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.

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