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Management Information Base for MPLS LDP Multi Topology
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Abstract

This memo defines an portion of the Management Information Base (MIB) for use with network management protocols in the Internet community. In particular, it describes a MIB module for Multi-Topology Networks over Multi-protocol Label Switching(MPLS) Label Switching Routers(LSRs).

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[1. Introduction](#)

There are increasing requirements to support multi-topology in MPLS network. For example, service providers want to assign different level of service(s) to different topologies so that the service separation can be achieved. It is also possible to have an in-band management network on top of the original MPLS topology, or maintain separate routing and MPLS domains for isolated multicast or IPv6 islands within the backbone, or force a subset of an address space to follow a different MPLS topology for the purpose of security, QoS or simplified management and/or operations.

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For a detailed overview of the multi topology, please refer to I-D [.ietf-mpls-ldp-multi-topology](#).

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. Overview of MPLS-LDP-MT-STD-MIB objects

The following subsections describe the purpose of each of the objects contained in the MPLS-LDP-MT-STD-MIB.

3.1. MPLS LDP MT Entity Table

The mplsLdpEntityTable specified in [\[RFC3815\]](#) is used to configure information which is used by the LDP protocol to setup potential LDP Sessions. The mplsLdpMtEntityTable can be considered as an extension to mplsLdpEntityTable to setup potential LDP MT Sessions.

Each entry/row in this table represents a single LDP MT Entity. There is no maximum number of LDP MT Entities specified. However, there is an mplsLdpMtEntityIndexNext object which should be retrieved by the command generator prior to creating an LDP MT Entity. If the mplsLdpMtEntityIndexNext object is zero, this indicates that the LSR/LER is not able to create another LDP MT Entity at that time.

3.2. MPLS LDP MT Entity Statistics Table

This table provides MPLS Multi Topology performance information on a per-interface basis.

3.3. MPLS LDP MT Session Table

Since all the MT related label messages can be advertised by LDP Sessions in default topology, there is no need to create extra tcp connection for Multi Topology.

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The `mplsLdpMtSessionTable` is a read-only table. Each entry in this table represents an MT Session which is related to one or more LDP MT Entities and only one LDP Session in default topology.

3.4. MPLS LDP MT In-segment Tables

The `mplsLdpMtInSegmentTable` contains information about the MPLS Label Distribution Protocol Multi Topology In-Segments which exist on this Label Switching Router (LSR) or Label Edge Router (LER).

The `mplsLdpMtInSegmentStatsTable` contains statistical information for LDP MT in-segments.

3.5. MPLS LDP MT Out-segment Tables

This table contains information about the MPLS Label Distribution Protocol Multi Topology Out-Segments which exist on this Label Switching Router (LSR) or Label Edge Router (LER).

The `mplsLdpMtOutSegmentStatsTable` contains statistical information for LDP MT out-segments.

3.6. MPLS LDP MT LSP Table

This table specifies MT LIB label switching information. Entries in this table define LIB label switching entries associated with the specified FEC of the specified topology.

3.7. MPLS LDP MT Notifications

The `mplsLdpMtLspUp` and `mplsLdpMtLspDown` notifications are generated when there is an appropriate change in the `mplsLdpMtLspOperStatus` object, e.g., when the LSP changes state (Up to Down for the `mplsLdpMtLspDown` notification, or Down to Up for the `mplsLdpMtLspUp` notification).

4. MPLS-LDP-MT-STD-MIB Module Definitions

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

```
IMPORTS
```

```
    IndexIntegerNextFree, IndexInteger
        FROM DIFFSERV-MIB
    InetAddress, InetAddressPrefixLength
        FROM INET-ADDRESS-MIB
    MplsIndexType
        FROM MPLS-LSR-STD-MIB
    MplsLdpLabelType, MplsLspType, MplsLdpIdentifier
```

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```
    FROM MPLS-TC-STD-MIB
OBJECT-GROUP, MODULE-COMPLIANCE, NOTIFICATION-GROUP
    FROM SNMPv2-CONF
transmission, TimeTicks, Integer32, Unsigned32, Counter32,
Counter64, OBJECT-TYPE, MODULE-IDENTITY, NOTIFICATION-TYPE
    FROM SNMPv2-SMI
QoSService      FROM INTEGRATED-SERVICES-MIB
TimeStamp, StorageType, RowStatus
    FROM SNMPv2-TC;
```

```
mplsLdpMtStdMIB MODULE-IDENTITY
LAST-UPDATED "201206131436Z"          -- June 13, 2012 at 14:36
```

GMT

ORGANIZATION

"Multiprotocol Label Switching (mpls) Working Group"

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DESCRIPTION

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

::= { mplsStdMIB 1 }

--
-- Node definitions
--

-- 1.3.6.1.2.1.10.1.1

mplsStdMIB OBJECT IDENTIFIER ::= { transmission 166 }

mplsLdpMtNotifications OBJECT IDENTIFIER ::= { mplsLdpMtStdMIB 0 }

mplsLdpMtLspUp NOTIFICATION-TYPE

OBJECTS { mplsLdpMtLspOperStatus, -- start of range
 mplsLdpMtLspOperStatus -- end of range
 }

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STATUS current
 DESCRIPTION
 "This notification is generated when the
 mplsLdpMtLspOperStatus object for one or more contiguous
 entries in mplsLdpMtLspTable are about to enter the up(1)
 state from some other state. The included values of
 mplsLdpMtLspOperStatus MUST both be set equal to this new
 state (i.e: up(1)). The two instances of
 mplsLdpMtLspOperStatus in this notification indicate the
 range
 of indexes that are affected. Note that all the indexes of
 the two ends of the range can be derived from the instance
 identifiers of these two objects. For cases where a
 contiguous
 range of cross-connects have transitioned into the up(1)
 state
 at roughly the same time, the device SHOULD issue a single
 notification for each range of contiguous indexes in an
 effort
 to minimize the emission of a large number of notifications.
 If a notification has to be issued for just a single
 cross-connect entry, then the instance identifier (and
 values)
 of the two mplsLdpMtLspOperStatus objects MUST be the
 identical."
 ::= { mplsLdpMtNotifications 1 }

mplsLdpMtLspDown NOTIFICATION-TYPE
 OBJECTS { mplsLdpMtLspOperStatus, -- start of range
 mplsLdpMtLspOperStatus -- end of range
 }
 STATUS current
 DESCRIPTION
 "This notification is generated when the
 mplsLdpMtLspOperStatus object for one or more contiguous
 entries in mplsLdpMtLspTable are about to enter the down(2)
 state from some other state. The included values of
 mplsLdpMtLspOperStatus MUST both be set equal to this
 down(2)
 state. The two instances of mplsLdpMtLspOperStatus in this
 notification indicate the range of indexes that are
 affected.
 Note that all the indexes of the two ends of the range can
 be
 derived from the instance identifiers of these two objects.
 For cases where a contiguous range of cross-connects have
 transitioned into the down(2) state at roughly the same time,

the device SHOULD issue a single notification for each range of contiguous indexes in an effort to minimize the emission of a large number of notifications. If a notification has to be issued for just a single cross-connect entry, then the instance identifier (and values) of the two mplsLdpMtLspOperStatus objects MUST be identical."

```
 ::= { mplsLdpMtNotifications 2 }
```

```
mplsLdpMtObjects OBJECT IDENTIFIER ::= { mplsLdpMtStdMIB 1 }

mplsLdpMtEntityObjects OBJECT IDENTIFIER ::= { mplsLdpMtObjects 1 }

mplsLpMtEntityLastChange 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 mplsLdpMtEntityTable, or
     the most recent change in value of any objects in the
     mplsLdpMtEntityTable.

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

mplsLdpMtEntityIndexNext 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."
 ::= { mplsLdpMtEntityObjects 2 }

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

mplsLdpMtEntityEntry OBJECT-TYPE
  SYNTAX MplsLdpMtEntityEntry
         MAX-ACCESS not-accessible
  STATUS current
  DESCRIPTION
    "An entry in this table represents an LDP MT entity.
     An entry can be created by a network administrator
     or by an SNMP agent as instructed by LDP."
  INDEX { mplsLdpMtEntityLdpId, mplsLdpMtEntityMtId,
           mplsLdpMtEntityIndex }
  ::= { mplsLdpMtEntityTable 1 }

MplsLdpMtEntityEntry ::= 
SEQUENCE {
  mplsLdpMtEntityLdpId
    MplsLdpIdentifier,
  mplsLdpMtEntityMtId
    Unsigned32,
  mplsLdpMtEntityIndex
    IndexInteger,
  mplsLdpMtEntityAdminStatus
    INTEGER,
  mplsLdpMtEntityStorageType
    StorageType,
  mplsLdpMtEntityRowStatus
    RowStatus
}
}

mplsLdpMtEntityLdpId OBJECT-TYPE
  SYNTAX MplsLdpIdentifier
         MAX-ACCESS not-accessible
  STATUS current
  DESCRIPTION
    "The LDP identifier."
  REFERENCE
    "RFC 5036, LDP Specification, Section on LDP Identifiers."
  ::= { mplsLdpMtEntityEntry 1 }

mplsLdpMtEntityMtId OBJECT-TYPE
  SYNTAX Unsigned32 (0..65535)
         MAX-ACCESS read-create
  STATUS current
  DESCRIPTION
    "The Multi Topology identifier of this LDP MT Entity."
  REFERENCE
    "draft-ietf-mpls-ldp-multi-topology, LDP Extensions for

```

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```
Topology Routing, Section on Multi-Topology ID."
 ::= { mplsLdpMtEntityEntry 2 }

mplsLdpMtEntityIndex 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
   'mplsLdpMtEntityIndexNext' 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."
 ::= { mplsLdpMtEntityEntry 3 }

mplsLdpMtEntityAdminStatus OBJECT-TYPE
 SYNTAX INTEGER
 {
   enable(1),
   disable(2)
 }
     MAX-ACCESS read-create
 STATUS current
 DESCRIPTION
   "The administrative status of this LDP MT Entity. If this
object is changed from 'enable' to 'disable' and this entity
has already attempted to establish contact with a MT
Session,
   then all contact with that MT Session is lost and all
information from that MT Session needs to be removed from
the
   MIB. (This implies that the network management subsystem
should clean up any related entry in the
   mplsLdpMtSessionTable.). 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 MT Entity
will
   attempt to establish a new MT Session."
DEFVAL { enable }
 ::= { mplsLdpMtEntityEntry 4 }
```

```
mplsLdpMtEntityStorageType 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."
 ::= { mplsLdpMtEntityEntry 5 }

mplsLdpMtEntityRowStatus 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
session


|         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|---------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|         | clause of the mplsLdpMtEntityAdminStatus object, if a                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|         | has been initiated with a Peer, changing objects in this                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|         | will wreak havoc with the session and interrupt traffic. To                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|         | repeat again: the recommended procedure is to set the                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|         | mplsLdpMtEntityAdminStatus to down, thereby explicitly                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| causing | a session to be torn down. Then, change objects in this                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| entry,  | then set the mplsLdpMtEntityAdminStatus to enable, which                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| enables | a new session to be initiated."  ::= { mplsLdpMtEntityEntry 6 }  -- mplsLdpMtEntityStatsTable mplsLdpMtEntityStatsTable OBJECT-TYPE     SYNTAX SEQUENCE OF MplsLdpMtEntityStatsEntry         MAX-ACCESS not-accessible     STATUS current     DESCRIPTION         "This table contains statistical information for         LDP MT entities to an LSR."  ::= { mplsLdpMtEntityObjects 4 }  mplsLdpMtEntityStatsEntry OBJECT-TYPE     SYNTAX MplsLdpMtEntityStatsEntry         MAX-ACCESS not-accessible     STATUS current     DESCRIPTION |


```

"An entry in this table is created by the LSR for every interface capable of supporting MPLS LDP Multi Topology. It is an extension to the mplsLdpMtEntityEntry table. Note that the discontinuity behavior of entries in this table
MUST be based on the corresponding ifEntry's ifDiscontinuityTime."

```
AUGMENTS { mplsLdpMtEntityEntry }
 ::= { mplsLdpMtEntityStatsTable 1 }
```

```
MplsLdpMtEntityStatsEntry ::=

SEQUENCE {
    mplsLdpMtEntityStatsOctets
        Counter32,
    mplsLdpMtEntityStatsPackets
        Counter32,
    mplsLdpMtEntityStatsErrors
        Counter32,
    mplsLdpMtEntityStatsDiscards
        Counter32,
    mplsLdpMtEntityStatsHCOctets
        Counter64,
    mplsLdpMtEntityStatsDiscontinuityTime
        TimeTicks
}
```

```
mplsLdpMtEntityStatsOctets OBJECT-TYPE
SYNTAX Counter32
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"This value represents the total number of octets received
by this MT interface. It MUST be equal to the least
significant 32 bits of mplsLdpMtEntityStatsHCOctets if
mplsLdpMtEntityStatsHCOctets is supported according to
the rules spelled out in RFC2863."
 ::= { mplsLdpMtEntityStatsEntry 1 }
```

```
mplsLdpMtEntityStatsPackets OBJECT-TYPE
SYNTAX Counter32
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"Total number of packets received by this MT interface."
 ::= { mplsLdpMtEntityStatsEntry 2 }
```

```
mplsLdpMtEntityStatsErrors OBJECT-TYPE
SYNTAX Counter32
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"The number of error packets received on this MT interface."
```

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```
 ::= { mplsLdpMtEntityStatsEntry 3 }

mplsLdpMtEntityStatsDiscards OBJECT-TYPE
  SYNTAX Counter32
  MAX-ACCESS read-only
  STATUS current
  DESCRIPTION
    "The number of labeled packets received on this MT
interface,
    which were chosen to be discarded even though no errors had
    been detected to prevent their being transmitted.
    One possible reason for discarding such a labeled packet
    could be to free up buffer space."
 ::= { mplsLdpMtEntityStatsEntry 4 }

mplsLdpMtEntityStatsHCOctets OBJECT-TYPE
  SYNTAX Counter64
  MAX-ACCESS read-only
  STATUS current
  DESCRIPTION
    "The total number of octets received. This is the 64 bit
    version of mplsLdpMtEntityStatsOctets, if
    mplsLdpMtEntityStatsHCOctets is supported according to the
    rules spelled out in RFC2863."
 ::= { mplsLdpMtEntityStatsEntry 5 }

mplsLdpMtEntityStatsDiscontinuityTime OBJECT-TYPE
  SYNTAX TimeTicks
  MAX-ACCESS read-only
  STATUS current
  DESCRIPTION
    "The value of sysUpTime on the most recent occasion at which
any one or more of this MT interface's Counter32 or
Counter64
    suffered a discontinuity. If no such discontinuities have
occurred since the last re-initialization of the local
management subsystem, then this object contains a zero
value."
 ::= { mplsLdpMtEntityStatsEntry 6 }

mplsLdpMtSessionObjects OBJECT IDENTIFIER
 ::= { mplsLdpMtObjects 2 }

mplsLdpMtSessionLastChange OBJECT-TYPE
```

SYNTAX TimeStamp
MAX-ACCESS read-only

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```

STATUS current
DESCRIPTION
  "The value of sysUpTime at the time of the most
  recent addition or deletion to/from the
  mplsLdpMtSessionTable."
 ::= { mplsLdpMtSessionObjects 1 }

-- mplsLdpMtSessionTable
mplsLdpMtSessionTable OBJECT-TYPE
  SYNTAX SEQUENCE OF MplsLdpMtSessionEntry
    MAX-ACCESS not-accessible
  STATUS current
  DESCRIPTION
    "A table of MT Sessions between the LDP MT Entities.  Each
row
  in this table represents a single MT session."
 ::= { mplsLdpMtSessionObjects 2 }

MplsLdpMtSessionEntry OBJECT-TYPE
  SYNTAX MplsLdpMtSessionEntry
    MAX-ACCESS not-accessible
  STATUS current
  DESCRIPTION
    "An entry in this table represents information on a single
MT
  session.  The information contained in a row is read-only."
INDEX { mplsLdpMtEntityLdpId, mplsLdpMtEntityMtId,
mplsLdpMtEntityIndex, mplsLdpMtSessionPeerId }
 ::= { mplsLdpMtSessionTable 1 }

MplsLdpMtSessionEntry ::=
SEQUENCE {
  mplsLdpMtSessionPeerId
    MplsLdpIdentifier,
  mplsLdpMtSessionState
    INTEGER,
  mplsLdpMtSessionStateLastChange
    TimeStamp
}

mplsLdpMtSessionPeerId OBJECT-TYPE
  SYNTAX MplsLdpIdentifier
    MAX-ACCESS not-accessible
  STATUS current
  DESCRIPTION

```

```
"The LDP identifier of this LDP MT Peer."  
 ::= { mplsLdpMtSessionEntry 1 }
```

```

mplsLdpMtSessionState OBJECT-TYPE
    SYNTAX INTEGER
        {
        initialized(1),
        operational(2)
        }
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
        "The current state of the MT Session. When the tcp
connection
        in default topology is established, and both ends have the
        capability of the given MT-ID, the state can change from
        initialized to operational."
    ::= { mplsLdpMtSessionEntry 2 }

mplsLdpMtSessionStateLastChange OBJECT-TYPE
    SYNTAX TimeStamp
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
        "The value of sysUpTime at the time this MT Session was
        created."
    ::= { mplsLdpMtSessionEntry 3 }

mplsLdpMtLspObjects OBJECT IDENTIFIER ::= { mplsLdpMtObjects 3 }

-- mplsLdpMtInSegmentTable
mplsLdpMtInSegmentTable OBJECT-TYPE
    SYNTAX SEQUENCE OF MplsLdpMtInSegmentEntry
        MAX-ACCESS not-accessible
    STATUS current
    DESCRIPTION
        "This table contains information about the MPLS Label
        Distribution Protocol Multi Topology
        In-Segments which exist on this Label Switching Router (LSR)
        or Label Edge Router (LER)."
    ::= { mplsLdpMtLspObjects 1 }

mplsLdpMtInSegmentEntry OBJECT-TYPE
    SYNTAX MplsLdpMtInSegmentEntry
        MAX-ACCESS not-accessible
    STATUS current
    DESCRIPTION
        "An entry in this table represents information on a single

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LDP MT LSP which is represented by a MT session's index combination (mplsLdpMtEntityLdpId, mplsLdpMtEntityMtId, mplsLdpMtEntityIndex, mplsLdpMtSessionPeerId).

The information contained in a row is read-only."

```
INDEX { mplsLdpMtEntityLdpId, mplsLdpMtEntityMtId,
mplsLdpMtEntityIndex, mplsLdpMtSessionPeerId }
 ::= { mplsLdpMtInSegmentTable 1 }
```

```
MplsLdpMtInSegmentEntry ::=

SEQUENCE {
    mplsLdpMtInSegmentIndex
        MplsIndexType,
    mplsLdpMtInSegmentLabelType
        MplsLdpLabelType,
    mplsLdpMtInSegmentLspType
        MplsLspType
}
```

```
mplsLdpMtInSegmentIndex OBJECT-TYPE
SYNTAX MplsIndexType
MAX-ACCESS read-only
STATUS current
DESCRIPTION
    "The index for this MT in-segment. The string containing
    the single octet 0x00 MUST not be used as an index."
 ::= { mplsLdpMtInSegmentEntry 1 }
```

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

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

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```
-- mplsLdpMtInSegmentStatsTable
  mplsLdpMtInSegmentStatsTable OBJECT-TYPE
    SYNTAX SEQUENCE OF MplsLdpMtInSegmentStatsEntry
      MAX-ACCESS not-accessible
    STATUS current
    DESCRIPTION
      "This table contains statistical information for LDP MT
       in-segments to an LSR."
 ::= { mplsLdpMtLspObjects 2 }

  mplsLdpMtInSegmentStatsEntry OBJECT-TYPE
    SYNTAX MplsLdpMtInSegmentStatsEntry
      MAX-ACCESS not-accessible
    STATUS current
    DESCRIPTION
      "An entry in this table contains statistical information
about
      one incoming MT segment which is configured in the
      mplsLdpMtInSegmentTable. The counters in this entry should
      behave in a manner similar to that of the MT interface.
      mplsLdpMtInSegmentStatsDiscontinuityTime indicates the time
      of the last discontinuity in all of these objects."
AUGMENTS { mplsLdpMtInSegmentEntry }
 ::= { mplsLdpMtInSegmentStatsTable 1 }

MplsLdpMtInSegmentStatsEntry ::=
SEQUENCE {
  mplsLdpMtInSegmentStatsOctets
    Counter32,
  mplsLdpMtInSegmentStatsPackets
    Counter32,
  mplsLdpMtInSegmentStatsErrors
    Counter32,
  mplsLdpMtInSegmentStatsDiscards
    Counter32,
  mplsLdpMtInSegmentStatsHCOctets
    Counter64,
  mplsLdpMtInSegmentStatsDiscontinuityTime
    TimeTicks
}

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

"This value represents the total number of octets received

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significant by this MT segment. It MUST be equal to the least
32 bits of mplsLdpMtInSegmentStatsHCOctets if
mplsLdpMtInSegmentStatsHCOctets is supported according to
the rules spelled out in [RFC2863](#).
 ::= { mplsLdpMtInSegmentStatsEntry 1 }

mplsLdpMtInSegmentStatsPackets OBJECT-TYPE
SYNTAX Counter32
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"Total number of packets received by this MT segment."
 ::= { mplsLdpMtInSegmentStatsEntry 2 }

mplsLdpMtInSegmentStatsErrors OBJECT-TYPE
SYNTAX Counter32
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"The number of error packets received on this MT segment."
 ::= { mplsLdpMtInSegmentStatsEntry 3 }

mplsLdpMtInSegmentStatsDiscards OBJECT-TYPE
SYNTAX Counter32
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"The number of labeled packets received on this MT in-
segment,
which were chosen to be discarded even though no errors had
been detected to prevent their being transmitted.
One possible reason for discarding such a labeled packet
could be to free up buffer space."
 ::= { mplsLdpMtInSegmentStatsEntry 4 }

mplsLdpMtInSegmentStatsHCOctets OBJECT-TYPE
SYNTAX Counter64
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"The total number of octets received. This is the 64 bit
version of mplsLdpMtInSegmentStatsOctets, if
mplsLdpMtInSegmentStatsHCOctets is supported according to
the

rules spelled out in [RFC2863](#)."
 ::= { mplsLdpMtInSegmentStatsEntry 5 }

```

mplsLdpMtInSegmentStatsDiscontinuityTime OBJECT-TYPE
    SYNTAX TimeTicks
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
        "The value of sysUpTime on the most recent occasion at which
         any one or more of this MT segment's Counter32 or Counter64
         suffered a discontinuity. If no such discontinuities have
         occurred since the last re-initialization of the local
         management subsystem, then this object contains a zero
         value."
 ::= { mplsLdpMtInSegmentStatsEntry 6 }

-- mplsLdpMtOutSegmentTable
mplsLdpMtOutSegmentTable OBJECT-TYPE
    SYNTAX SEQUENCE OF MplsLdpMtOutSegmentEntry
        MAX-ACCESS not-accessible
    STATUS current
    DESCRIPTION
        "This table contains information about the MPLS Label
         Distribution Protocol Multi Topology Out-Segments which
         exist on this Label Switching Router (LSR) or Label
         Edge Router (LER)."
 ::= { mplsLdpMtLspObjects 3 }

mplsLdpMtOutSegmentEntry OBJECT-TYPE
    SYNTAX MplsLdpMtOutSegmentEntry
        MAX-ACCESS not-accessible
    STATUS current
    DESCRIPTION
        "An entry in this table represents information on a single
         LDP MT LSP which is represented by a MT session's index
         combination (mplsLdpMtEntityLdpId, mplsLdpMtEntityMtId,
         mplsLdpMtEntityIndex, mplsLdpMtSessionPeerId).

        The information contained in a row is read-only."
INDEX { mplsLdpMtEntityLdpId, mplsLdpMtEntityMtId,
        mplsLdpMtEntityIndex, mplsLdpMtSessionPeerId }
 ::= { mplsLdpMtOutSegmentTable 1 }

MplsLdpMtOutSegmentEntry ::= 
SEQUENCE {
    mplsLdpMtOutSegmentIndex
        MplsIndexType,
    mplsLdpMtOutSegmentLabelType
}

```

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```
mplsLdpMtOutSegmentLspType
    MplsLspType
}

mplsLdpMtOutSegmentIndex OBJECT-TYPE
    SYNTAX MplsIndexType
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
        "The index for this MT out-segment. The string containing
        the single octet 0x00 MUST not be used as an index."
    ::= { mplsLdpMtOutSegmentEntry 1 }

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

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

-- mplsLdpMtOutSegmentStatsTable
mplsLdpMtOutSegmentStatsTable OBJECT-TYPE
    SYNTAX SEQUENCE OF MplsLdpMtOutSegmentStatsEntry
        MAX-ACCESS not-accessible
    STATUS current
    DESCRIPTION
        "This table contains statistical information for LDP MT
        out-segments to an LSR."
    ::= { mplsLdpMtLspObjects 4 }

mplsLdpMtOutSegmentStatsEntry OBJECT-TYPE
    SYNTAX MplsLdpMtOutSegmentStatsEntry
        MAX-ACCESS not-accessible
    STATUS current
    DESCRIPTION
```

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"An entry in this table contains statistical information about one incoming MT segment which is configured in the mplsLdpMtOutSegmentTable. The counters in this entry should behave in a manner similar to that of the MT interface.

`mplsLdpMtOutSegmentStatsDiscontinuityTime` indicates the time of the last discontinuity in all of these objects."

AUGMENTS { `mplsLdpMtOutSegmentEntry` }
`::= { mplsLdpMtOutSegmentStatsTable 1 }`

```
MplsLdpMtOutSegmentStatsEntry ::=  

SEQUENCE {  

    mplsLdpMtOutSegmentStatsOctets  

        Counter32,  

    mplsLdpMtOutSegmentStatsPackets  

        Counter32,  

    mplsLdpMtOutSegmentStatsErrors  

        Counter32,  

    mplsLdpMtOutSegmentStatsDiscards  

        Counter32,  

    mplsLdpMtOutSegmentStatsHCOctets  

        Counter64,  

    mplsLdpMtOutSegmentStatsDiscontinuityTime  

        TimeTicks  

}
```

```
mplsLdpMtOutSegmentStatsOctets OBJECT-TYPE  

SYNTAX Counter32  

MAX-ACCESS read-only  

STATUS current  

DESCRIPTION  

    "This value represents the total number of octets received  

    by this MT segment. It MUST be equal to the least  

significant  

    32 bits of mplsLdpMtOutSegmentStatsHCOctets if  

mplsLdpMtOutSegmentStatsHCOctets is supported according to  

the rules spelled out in RFC2863."  

::= { mplsLdpMtOutSegmentStatsEntry 1 }
```

```
mplsLdpMtOutSegmentStatsPackets OBJECT-TYPE  

SYNTAX Counter32  

MAX-ACCESS read-only  

STATUS current  

DESCRIPTION  

    "Total number of packets received by this MT segment."  

::= { mplsLdpMtOutSegmentStatsEntry 2 }
```

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```
mplsLdpMtOutSegmentStatsErrors OBJECT-TYPE
  SYNTAX Counter32
  MAX-ACCESS read-only
  STATUS current
  DESCRIPTION
    "The number of error packets received on this MT segment."
 ::= { mplsLdpMtOutSegmentStatsEntry 3 }
```

```
mplsLdpMtOutSegmentStatsDiscards OBJECT-TYPE
  SYNTAX Counter32
  MAX-ACCESS read-only
  STATUS current
  DESCRIPTION
    "The number of labeled packets received on this MT out-
segment,
  which were chosen to be discarded even though no errors had
  been detected to prevent their being transmitted.
  One possible reason for discarding such a labeled packet
  could be to free up buffer space."
 ::= { mplsLdpMtOutSegmentStatsEntry 4 }
```

```
mplsLdpMtOutSegmentStatsHCOctets OBJECT-TYPE
  SYNTAX Counter64
  MAX-ACCESS read-only
  STATUS current
  DESCRIPTION
    "The total number of octets received. This is the 64 bit
  version of mplsLdpMtOutSegmentStatsOctets, if
  mplsLdpMtOutSegmentStatsHCOctets is supported according to
  the rules spelled out in RFC2863."
 ::= { mplsLdpMtOutSegmentStatsEntry 5 }
```

```
mplsLdpMtOutSegmentStatsDiscontinuityTime OBJECT-TYPE
  SYNTAX TimeTicks
  MAX-ACCESS read-only
  STATUS current
  DESCRIPTION
    "The value of sysUpTime on the most recent occasion at which
  any one or more of this MT segment's Counter32 or Counter64
  suffered a discontinuity. If no such discontinuities have
  occurred since the last re-initialization of the local
  management subsystem, then this object contains a zero
value."
 ::= { mplsLdpMtOutSegmentStatsEntry 6 }
```

`mplsLdpMtLspLastChange OBJECT-TYPE`

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```

SYNTAX TimeStamp
MAX-ACCESS read-only
STATUS current
DESCRIPTION
  "The value of sysUpTime at the time of the most recent
addition
the
most recent change in value of any objects in the
mplsLdpMtLspTable.

If no such changes have occurred since the last
re-initialization of the local management subsystem,
then this object contains a zero value."
 ::= { mplsLdpMtLspObjects 5 }

mplsLdpMtLspIndexNext OBJECT-TYPE
SYNTAX IndexIntegerNextFree
MAX-ACCESS read-only
STATUS current
DESCRIPTION
  "This object contains an appropriate value to be used for
  mplsLdpMtLspIndex when creating entries in the
  mplsLdpMtLspTable. The value 0 indicates that no unassigned
  entries are available."
 ::= { mplsLdpMtLspObjects 6 }

-- mplsLdpMtLspTable
mplsLdpMtLspTable OBJECT-TYPE
SYNTAX SEQUENCE OF MplsLdpMtLspEntry
  MAX-ACCESS not-accessible
STATUS current
DESCRIPTION
  "This table specifies MT LIB label switching information.
  Entries in this table define LIB label switching entries
  associated with the specified topology."
 ::= { mplsLdpMtLspObjects 7 }

mplsLdpMtLspEntry OBJECT-TYPE
SYNTAX MplsLdpMtLspEntry
  MAX-ACCESS not-accessible
STATUS current
DESCRIPTION
  "An entry in this table is created by an LSR for every label
  within the context of a specific topology capable of

```

supporting MT LDP LSP. The indexing provides an ordering of topologies per interface."

```
INDEX { mplsLdpMtEntityLdpId, mplsLdpMtEntityMtId,
mplsLdpMtEntityIndex, mplsLdpMtLspInSegmentIndex,
mplsLdpMtLspOutSegmentIndex, mplsLdpMtLspIndex }
::= { mplsLdpMtLspTable 1 }
```

```
MplsLdpMtLspEntry ::=  
SEQUENCE {  
    mplsLdpMtLspIndex  
        IndexInteger,  
    mplsLdpMtLspFecAddr  
        InetAddress,  
    mplsLdpMtLspFecAddrLength  
        InetAddressPrefixLength,  
    mplsLdpMtLspInSegmentIndex  
        MplsIndexType,  
    mplsLdpMtLspOutSegmentIndex  
        MplsIndexType,  
    mplsLdpMtLspRowStatus  
        Integer32,  
    mplsLdpMtLspStorageType  
        StorageType,  
    mplsLdpMtLspOperStatus  
        RowStatus,  
    mplsLdpMtLspService  
        QosService  
}
```

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

```
mplsLdpMtLspFecAddr OBJECT-TYPE  
SYNTAX InetAddress  
MAX-ACCESS read-only  
STATUS current  
DESCRIPTION  
    "The FEC address of this LDP MT LSP. Note that the  
    value of this object is interpreted as prefix address."  
REFERENCE  
    "RFC 5036, Section 3.4.1 FEC TLV."  
::= { mplsLdpMtLspEntry 2 }
```

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```
mplsLdpMtLspFecAddrLength OBJECT-TYPE
    SYNTAX InetAddressPrefixLength
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
        "The FEC prefix length of this LDP MT LSP."
    REFERENCE
        "RFC5036, Section 3.4.1. FEC TLV"
    ::= { mplsLdpMtLspEntry 3 }
```

```
mplsLdpMtLspInSegmentIndex OBJECT-TYPE
    SYNTAX MplsIndexType
        MAX-ACCESS not-accessible
    STATUS current
    DESCRIPTION
        "Index of in-segment for this LDP MT LSP."
    ::= { mplsLdpMtLspEntry 4 }
```

```
mplsLdpMtLspOutSegmentIndex OBJECT-TYPE
    SYNTAX MplsIndexType
        MAX-ACCESS not-accessible
    STATUS current
    DESCRIPTION
        "Index of out-segment for this LDP MT LSP."
    ::= { mplsLdpMtLspEntry 5 }
```

```
mplsLdpMtLspRowStatus OBJECT-TYPE
    SYNTAX Integer32
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
        "For creating, modifying, and deleting this row.
        When a row in this table has a row in the active(1)
        state, no objects in this row except this object
        and the mplsLdpMtLspStorageType can be modified."
    ::= { mplsLdpMtLspEntry 6 }
```

```
mplsLdpMtLspStorageType OBJECT-TYPE
    SYNTAX StorageType
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
        "The storage type for this conceptual row.
        Conceptual rows having the value 'permanent(4)'
```

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```
        need not allow write-access to any columnar
        objects in the row."
DEFVAL { nonVolatile }
 ::= { mplsLdpMtLspEntry 7 }

mplsLdpMtLspOperStatus OBJECT-TYPE
SYNTAX RowStatus
MAX-ACCESS read-only
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."
 ::= { mplsLdpMtLspEntry 8 }

mplsLdpMtLspService OBJECT-TYPE
SYNTAX QoSService
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"The QoS Service classification index for multiple
topology LSP."
 ::= { mplsLdpMtLspEntry 9 }

mplsLdpMtConformance OBJECT IDENTIFIER ::= { mplsLdpMtStdMIB 2 }

mplsLdpMtGroups OBJECT IDENTIFIER ::= { mplsLdpMtConformance 1 }

mplsLdpMtEntityGroup OBJECT-GROUP
OBJECTS { mplsLdpMtEntityLastChange, mplsLdpMtEntityIndexNext,
mplsLdpMtEntityMtId, mplsLdpMtEntityAdminStatus,
mplsLdpMtEntityStorageType, mplsLdpMtEntityRowStatus,
mplsLdpMtEntityStatsDiscontinuityTime,
mplsLdpMtEntityStatsHCOctets, mplsLdpMtEntityStatsDiscards,
mplsLdpMtEntityStatsErrors, mplsLdpMtEntityStatsPackets,
mplsLdpMtEntityStatsOctets }
STATUS current
DESCRIPTION
```

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```
        "Objects that apply to all MPLS LDP MT Entity
implementations."
 ::= { mplsLdpMtGroups 2 }

mplsLdpMtSessionGroup OBJECT-GROUP
OBJECTS { mplsLdpMtSessionLastChange, mplsLdpMtSessionState,
mplsLdpMtSessionStateLastChange }
STATUS current
DESCRIPTION
        "Objects that apply to all MPLS LDP MT Session
implementations."
 ::= { mplsLdpMtGroups 3 }

mplsLdpMtLspGroup OBJECT-GROUP
OBJECTS { mplsLdpMtLspLastChange, mplsLdpMtLspIndexNext,
mplsLdpMtLspFecAddr, mplsLdpMtLspFecAddrLength,
mplsLdpMtLspRowStatus, mplsLdpMtLspStorageType,
mplsLdpMtLspOperStatus, mplsLdpMtInSegmentIndex,
mplsLdpMtInSegmentLabelType, mplsLdpMtInSegmentLspType,
mplsLdpMtInSegmentStatsOctets, mplsLdpMtInSegmentStatsPackets,
mplsLdpMtInSegmentStatsErrors, mplsLdpMtInSegmentStatsDiscards,
mplsLdpMtInSegmentStatsHCOctets,
mplsLdpMtInSegmentStatsDiscontinuityTime,
mplsLdpMtOutSegmentIndex, mplsLdpMtOutSegmentLabelType,
mplsLdpMtOutSegmentLspType, mplsLdpMtOutSegmentStatsOctets,
mplsLdpMtOutSegmentStatsPackets, mplsLdpMtOutSegmentStatsErrors,
mplsLdpMtOutSegmentStatsDiscards,
mplsLdpMtOutSegmentStatsHCOctets,
mplsLdpMtOutSegmentStatsDiscontinuityTime
}
STATUS current
DESCRIPTION
        "Objects that apply to all MPLS LDP MT LSP implementations."
 ::= { mplsLdpMtGroups 4 }

mplsLdpMtNotificationGroup NOTIFICATION-GROUP
NOTIFICATIONS { mplsLdpMtLspUp, mplsLdpMtLspDown }
STATUS current
DESCRIPTION
        "The notifications for an MPLS LDP MT implementation."
 ::= { mplsLdpMtGroups 5 }

mplsLdpMtCompliances OBJECT IDENTIFIER ::= { mplsLdpMtConformance
2 }
```

`mplsLdpMtModuleFullCompliance MODULE-COMPLIANCE`

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```
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 { mplsLdpMtEntityGroup,
mplsLdpMtSessionGroup,
  mplsLdpMtLspGroup, mplsLdpMtNotificationGroup }
 ::= { mplsLdpMtCompliances 1 }

mplsLdpMtModuleReadOnlyCompliance 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 { mplsLdpMtEntityGroup,
mplsLdpMtSessionGroup,
  mplsLdpMtLspGroup, mplsLdpMtNotificationGroup }
 ::= { mplsLdpMtCompliances 2 }
```

END

5. Security Considerations

It needs to be further identified.

6. IANA Considerations

There is no necessary to request new IANA code in the draft.

7. Normative References

- [RFC3813] Srinivasan, C., Viswanathan, A., and T. Nadeau,
"Multiprotocol Label Switching (MPLS) Label Switching
Router (LSR) Management Information Base (MIB)", [RFC 3813](#),
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- [RFC3815] Cucchiara, J., Sjostrand, H., and J. Luciani, "Definitions of Managed Objects for the Multiprotocol Label Switching (MPLS), Label Distribution Protocol (LDP)", [RFC 3815](#), June 2004.
- [RFC5036] Andersson, L., Minei, I., and B. Thomas, "LDP Specification", [RFC 5036](#), October 2007.
- [RFC3410] Case, J., Mundy, R., Partain, D., and B. Stewart, "Introduction and Applicability Statements for Internet-Standard Management Framework", [RFC 3410](#), December 2002.
- [I-D.ietf-mpls-ldp-multi-topology]
Zhao, Q., Fang, L., Zhou, C., Li, L., and K. Raza, "LDP Extensions for Multi Topology Routing", [draft-ietf-mpls-ldp-multi-topology-08](#) (work in progress), May 2013.

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