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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.

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.

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 `mplsLdpMtInSegmentStatsTable` 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 GM
```

```
    ORGANIZATION
```

```
        "Multiprotocol Label Switching (mpls) Working Group"
```

```
    CONTACT-INFO
```

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```

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Quintin Zhao (qzhao@huawei.com)
Huawei Technologies"

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
}

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 ran
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 contiguo
range of cross-connects have transitioned into the up(1) sta
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 }

mplsLdpMtEntityLastChange 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 }

```
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 Mult
```

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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
```

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```
    "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 DESCRIPTI
    clause of the mplsLdpMtEntityAdminStatus object, if a sessio
    has been initiated with a Peer, changing objects in this tab
    will wreak havoc with the session and interrupt traffic. To
    repeat again: the recommended procedure is to set the
    mplsLdpMtEntityAdminStatus to down, thereby explicitly causi
    a session to be torn down. Then, change objects in this ent
    then set the mplsLdpMtEntityAdminStatus to enable, which ena
    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."
```

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```
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."

::= { 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
```

```
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 r
```

```
        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 M
        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 connecti
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

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 }
```

```
-- 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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by this MT segment. It MUST be equal to the least significant
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 }

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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
      MplsLdpLabelType,
```

```
    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
```

```
"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 }

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

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 mplsLdpMtlSpTable, or 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,
mplsLdpMtEntityStatsHC0ctets, mplsLdpMtEntityStatsDiscards,
mplsLdpMtEntityStatsErrors, mplsLdpMtEntityStatsPackets,
mplsLdpMtEntityStats0ctets }
STATUS current
DESCRIPTION

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

mplsLdpMtSessionGroup OBJECT-GROUP

OBJECTS { mplsLdpMtSessionLastChange, mplsLdpMtSessionState,
mplsLdpMtSessionStateLastChange }
STATUS current
DESCRIPTION

"Objects that apply to all MPLS LDP MT Session implementation
::= { mplsLdpMtGroups 3 }

mplsLdpMtLspGroup OBJECT-GROUP

OBJECTS { mplsLdpMtLspLastChange, mplsLdpMtLspIndexNext,
mplsLdpMtLspFecAddr, mplsLdpMtLspFecAddrLength,
mplsLdpMtLspRowStatus, mplsLdpMtLspStorageType,
mplsLdpMtLspOperStatus, mplsLdpMtInSegmentIndex,
mplsLdpMtInSegmentLabelType, mplsLdpMtInSegmentLspType,
mplsLdpMtInSegmentStats0ctets, mplsLdpMtInSegmentStatsPackets,
mplsLdpMtInSegmentStatsErrors, mplsLdpMtInSegmentStatsDiscards,
mplsLdpMtInSegmentStatsHC0ctets,
mplsLdpMtInSegmentStatsDiscontinuityTime,
mplsLdpMtOutSegmentIndex, mplsLdpMtOutSegmentLabelType,
mplsLdpMtOutSegmentLspType, mplsLdpMtOutSegmentStats0ctets,
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
```

```
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, mplsLdpMtSessionGro  
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, mplsLdpMtSessionGro
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

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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.

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