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**Management Information Base for MPLS LDP Multi Topology
draft-li-mpls-ldp-mt-mib-03**

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 `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
            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
        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"
        CONTACT-INFO
            "Chen Li (lichenyj@chinamobile.com)
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            China Mobile

            Emily Chen (emily.chenying@huawei.com)
            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 range of indexes
of
            that are affected. Note that all the indexes
the
            the two ends of the range can be derived from
            instance identifiers of these two objects. For
connects
            cases where a contiguous range of cross-
roughly
            have transitioned into the up(1) state at
            the same time, the device SHOULD issue a single
indexes
            notification for each range of contiguous
large
            in an effort to minimize the emission of a
            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 }

```

```

mplsLdpMtlLspDown NOTIFICATION-TYPE
    OBJECTS { mplsLdpMtlLspOperStatus,      -- start of
range
                                mplsLdpMtlLspOperStatus      -- end of range
    }
    STATUS current
    DESCRIPTION
        "This notification is generated when the
        mplsLdpMtlLspOperStatus object for one or more
        contiguous entries in mplsLdpMtlLspTable are
about
        to enter the down(2) state from some other
state.
        The included values of mplsLdpMtlLspOperStatus

```

this
 two
 instance
 where
 transitioned
 time, the
 each
 minimize
 notifications. If
 single
 identifier
 objects

MUST both be set equal to this down(2) state.
 The two instances of mplsLdpMtLspOperStatus in
 notification indicate the range of indexes that
 are affected. Note that all the indexes of the
 ends of the range can be derived from the
 identifiers of these two objects. For cases
 a contiguous range of cross-connects have
 into the down(2) state at roughly the same
 device SHOULD issue a single notification for
 range of contiguous indexes in an effort to
 the emission of a large number of
 a notification has to be issued for just a
 cross-connect entry, then the instance
 (and values) of the two mplsLdpMtLspOperStatus
 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.
  
```

subsystem,

If no such changes have occurred since the last
re-initialization of the local management

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
Multi 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

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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

the again described in the DESCRIPTION clause of
 has been initiated mplsLdpMtEntityAdminStatus object, if a session
 will wreak havoc with the with a Peer, changing objects in this table
 again: the recommended session and interrupt traffic. To repeat
 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

octets received
least significant
mplsLdpMtEntityStatsHCOctets

"This value represents the total number of
by this MT interface. It MUST be equal to the
32 bits of mplsLdpMtEntityStatsHCOctets if
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

```

    Counter32 or Counter64
    any one or more of this MT interface's
    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 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

Label
Segments which
Label

"This table contains information about the MPLS
Distribution Protocol Multi Topology In-
exist on this Label Switching Router (LSR) or
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
session's index
mplsLdpMtEntityMtId,
mplsLdpMtEntityIndex,
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."
```

```
::= { mpIsLdpMtInSegmentEntry 1 }
```

```
mplsLdpMtInSegmentLabelType OBJECT-TYPE
    SYNTAX MplsLdpLabelType
    MAX-ACCESS read-only
    STATUS current
    DESCRIPTION
```

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```
        "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
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

MT in-segment,
no errors had
transmitted. One possible
could be to free

"The number of labeled packets received on this
which were chosen to be discarded even though
been detected to prevent their being
reason for discarding such a labeled packet
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
index combination
mplsLdpMtEntityIndex,
(mplsLdpMtEntityLdpId, mplsLdpMtEntityMtId,
mplsLdpMtSessionPeerId).

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

octets received by
significant 32 bits
mplsLdpMtOutSegmentStatsHCOctets
in [RFC2863](#)."

"This value represents the total number of
this MT segment. It MUST be equal to the least
of mplsLdpMtOutSegmentStatsHCOctets if
is supported according to the rules spelled out
::= { mplsLdpMtOutSegmentStatsEntry 1 }

mplsLdpMtOutSegmentStatsPackets OBJECT-TYPE

SYNTAX Counter32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

segment."

::= { mplsLdpMtOutSegmentStatsEntry 2 }

mplsLdpMtOutSegmentStatsErrors OBJECT-TYPE

SYNTAX Counter32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

MT segment."

::= { mplsLdpMtOutSegmentStatsEntry 3 }

mplsLdpMtOutSegmentStatsDiscards OBJECT-TYPE

SYNTAX Counter32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

MT out-segment,
no errors had
transmitted. One possible
could be to free
up buffer space."

::= { mplsLdpMtOutSegmentStatsEntry 4 }

mplsLdpMtOutSegmentStatsHCOctets OBJECT-TYPE

SYNTAX Counter64

MAX-ACCESS read-only

STATUS current

DESCRIPTION

the 64 bit version
mplsLdpMtOutSegmentStatsHCOctets
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

information. Entries in
associated with the

"This table specifies MT LIB label switching
this table define LIB label switching entries
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
}
```

```
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-create
```

STATUS current

DESCRIPTION

the
address."
"The FEC address of this LDP MT LSP. Note that
value of this object is interpreted as prefix

REFERENCE

"[RFC 5036, Section 3.4.1](#) FEC TLV."

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```
::= { mplsLdpMtLspEntry 2 }
```

```
mplsLdpMtLspFecAddrLength OBJECT-TYPE
    SYNTAX InetAddressPrefixLength
    MAX-ACCESS read-create
    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-create
    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-create
STATUS current

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DESCRIPTION

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

DEFVAL { nonVolatile }
 ::= { mplsLdpMtLspEntry 7 }

mplsLdpMtLspOperStatus OBJECT-TYPE

SYNTAX RowStatus

MAX-ACCESS read-create

STATUS current

DESCRIPTION

"The status of this conceptual row. If the value of this object is 'active(1)', then none of the writable objects of this entry can be modified, except to set this object to 'destroy(6)'."

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

::= { mplsLdpMtLspEntry 8 }

mplsLdpMtConformance OBJECT IDENTIFIER ::= { mplsLdpMtStdMIB
 2 }

mplsLdpMtGroups OBJECT IDENTIFIER ::= { mplsLdpMtConformance
 1 }

mplsLdpMtEntityGroup OBJECT-GROUP

OBJECTS { mplsLpMtEntityLastChange,
 mplsLdpMtEntityIndexNext, mplsLdpMtEntityMtId,
 mplsLdpMtEntityAdminStatus,
 mplsLdpMtEntityStorageType,
 mplsLdpMtEntityRowStatus,
 mplsLdpMtEntityStatsDiscontinuityTime,
 mplsLdpMtEntityStatsHCOctets,
 mplsLdpMtEntityStatsDiscards,
 mplsLdpMtEntityStatsErrors,

```

mplsLdpMtEntityStatsPackets,
                                mplsLdpMtEntityStatsOctets }
STATUS current
DESCRIPTION
    "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
        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](#),
June 2004.
- [RFC3814] Nadeau, T., Srinivasan, C., and A. Viswanathan,
"Multiprotocol Label Switching (MPLS) Forwarding
Equivalence Class To Next Hop Label Forwarding Entry (FEC-
To-NHLFE) Management Information Base (MIB)", [RFC 3814](#),
June 2004.
- [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.

Li, et al.

Expires December 29, 2012

[Page 28]

[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 N. So, "LDP
Extensions for Multi Topology Routing",
[draft-ietf-mpls-ldp-multi-topology-03](#) (work in progress),
March 2012.

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