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
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"
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
}
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
 mplslLdpMtLspOperStatus    -- 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 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 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 clause of the mplsLdpMtEntityAdminStatus object, if a session has been initiated with a Peer, changing objects in this table will wreak havoc with the session and interrupt traffic. To repeat again: the recommended procedure is to set the 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."
::= { 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 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 }

definitions

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 }

definitions

mplsLdpMtInSegmentEntry OBJECT-TYPE
SYNTAX MplsLdpMtInSegmentEntry
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 }
::= { 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
        Counter32,
  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
"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 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 }
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 }
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 OCTET OCTET
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)’"
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
"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

"Multiprotocol Label Switching (MPLS) Label Switching
Router (LSR) Management Information Base (MIB)", RFC 3813,


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