Definitions of Textual Conventions (TCs) for Multiprotocol Label Switching (MPLS) Management
draft-manral-mpls-rfc3811bis-04

Abstract

   This memo defines a Management Information Base (MIB) module which
   contains Textual Conventions to represent commonly used Multiprotocol
   Label Switching (MPLS) management information. The intent is that
   these TEXTUAL CONVENTIONS (TCs) will be imported and used in MPLS
   related MIB modules that would otherwise define their own
   representations.

   This document obsoletes RFC3811 as it addresses the need to support
   IPv6 extended TunnelID's by defining a new TC-
   MplsNewExtendedTunnelID which suggests using an IPv4(for dual stack
   network) / IPv6 (for IPv6-only network) address of the ingress or
   egress LSR for the tunnel for dual stack network or an IPv6-only
   network. This document also fixed the confusing part of MplsLSPID.
   Changes from RFC3811 and the effect of the new TC to other related
   documents are summarized in Section 4 and 5, respectively.

Status of This Memo

This Internet-Draft will expire on March 9, 2015.

Table of Contents

1. Introduction

   This document defines a MIB module which contains Textual Conventions
   (TCs) for Multiprotocol Label Switching (MPLS) networks. These
   Textual Conventions should be imported by MIB modules which manage
   MPLS networks. The need to support IPv6 extended TunnelID's is
   addressed by defining a new TC-MplsNewExtendedTunnelID which may
   represent an IPv4(for dual stack network) / IPv6 (for IPv6-only
   network) address of the ingress or egress LSR for the tunnel for an
   for dual stack network or an IPv6-only network.

   The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT",
   "SHOULD", "SHOULD NOT", "RECOMMENDED", "MAY", and "OPTIONAL" in this
   document are to be interpreted as described in [RFC2119].

   For an introduction to the concepts of MPLS, see [RFC3031].

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
   [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
   ([RFC2578], [RFC2579], and [RFC2580]).

3. MPLS Textual Conventions MIB Definitions

```
   MPLS-TC-STD-MIB DEFINITIONS ::= BEGIN

   IMPORTS

   MODULE-IDENTITY,
   Unsigned32, Integer32,
   transmission          FROM SNMPv2-SMI          -- [RFC2578]

   TEXTUAL-CONVENTION
   FROM SNMPv2-TC;                                 -- [RFC2579]

   mplsTCStdMIB MODULE-IDENTITY
   LAST-UPDATED "200406030000Z" -- June 3, 2004
   ORGANIZATION
   "IETF Multiprotocol Label Switching (MPLS) Working
```

Group."
CONTACT-INFO
"   Vishwas Manral
           Hewlett-Packard Corp.

Email comments to the MPLS WG Mailing List at
mpls@uu.net."
DESCRIPTION
"Copyright (C) The Internet Society (2008). The
initial version of this MIB module was published
in Internet Draft. For full legal notices see the RFC
itself or see:
http://www.ietf.org/copyrights/ianamib.html

This MIB module defines TEXTUAL-CONVENTIONs
for concepts used in Multiprotocol Label
Switching (MPLS) networks.

Changes from RFC3811 - MplsExtendedTunnelId"

REVISION "200809080000Z" -- 8 September, 2008
DESCRIPTION
"Initial version published as part of Internet Draft. To be
published as RFC XXXX"
-- RFC Ed.: RFC-editor pleases fill in XXXX
::= { mplsStdMIB 1 }

mplsStdMIB OBJECT IDENTIFIER

::= { transmission 166 }

MplsAtmVcIdentifier ::= TEXTUAL-CONVENTION
DISPLAY-HINT "d"
STATUS current
DESCRIPTION
"A Label Switching Router (LSR) that
creates LDP sessions on ATM interfaces
uses the VCI or VPI/VCI field to hold the
LDP Label.

VCI values MUST NOT be in the 0-31 range.
The values 0 to 31 are reserved for other uses
by the ITU and ATM Forum. The value
of 32 can only be used for the Control VC,
although values greater than 32 could be
configured for the Control VC.

If a value from 0 to 31 is used for a VCI,

        the management entity controlling the LDP
        subsystem should reject this with an
        inconsistentValue error. Also, if
        the value of 32 is used for a VC which is
        NOT the Control VC, this should
        result in an inconsistentValue error."
        REFERENCE
        "MPLS using LDP and ATM VC Switching, RFC3035."
        SYNTAX Integer32 (32..65535)

        MplsBitRate ::= TEXTUAL-CONVENTION
        DISPLAY-HINT "d"
        STATUS   current
        DESCRIPTION
        "If the value of this object is greater than zero,
        then this represents the bandwidth of this MPLS
        interface (or Label Switched Path) in units of
        '1,000 bits per second'.

        The value, when greater than zero, represents the
        bandwidth of this MPLS interface (rounded to the
        nearest 1,000) in units of 1,000 bits per second.
        If the bandwidth of the MPLS interface is between
        ((n * 1000) - 500) and ((n * 1000) + 499), the value
        of this object is n, such that n > 0.

        If the value of this object is 0 (zero), this
        means that the traffic over this MPLS interface is
        considered to be best effort."
        SYNTAX Unsigned32 (0|1..4294967295)

        MplsBurstSize ::= TEXTUAL-CONVENTION
        DISPLAY-HINT "d"
        STATUS   current
        DESCRIPTION
        "The number of octets of MPLS data that the stream
        may send back-to-back without concern for policing.
        The value of zero indicates that an implementation
        does not support Burst Size."
        SYNTAX Unsigned32 (0..4294967295)

        MplsExtendedTunnelId ::= TEXTUAL-CONVENTION
        STATUS   obsolete
        DESCRIPTION
        "A unique identifier for an MPLS Tunnel. This may
        represent an IPv4 address of the ingress or egress
        LSR for the tunnel. This value is derived from the
        Extended Tunnel Id in RSVP or the Ingress Router ID

           for CR-LDP."
           REFERENCE
           "RSVP-TE: Extensions to RSVP for LSP Tunnels,
           [RFC3209].

           Constraint-Based LSP Setup using LDP, [RFC3212]."
           SYNTAX Unsigned32(0..4294967295)

           MplsLabel ::= TEXTUAL-CONVENTION
           STATUS   current
           DESCRIPTION
           "This value represents an MPLS label as defined in
           [RFC3031], [RFC3032], [RFC3034], [RFC3035] and
           [RFC3471].

           The label contents are specific to the label being
           represented, such as:

           * The label carried in an MPLS shim header
             (for LDP this is the Generic Label) is a 20-bit
             number represented by 4 octets. Bits 0-19 contain
             a label or a reserved label value. Bits 20-31
             MUST be zero.

           The following is quoted directly from [RFC3032].
           There are several reserved label values:

           i.   A value of 0 represents the
                'IPv4 Explicit NULL Label'. This label
                value is only legal at the bottom of the
                label stack. It indicates that the label
                stack must be popped, and the forwarding
                of the packet must then be based on the
                IPv4 header.

           ii. A value of 1 represents the
                'Router Alert Label'. This label value is
                legal anywhere in the label stack except at
                the bottom. When a received packet
                contains this label value at the top of
                the label stack, it is delivered to a
                local software module for processing.
                The actual forwarding of the packet
                is determined by the label beneath it
                in the stack. However, if the packet is
                forwarded further, the Router Alert Label
                should be pushed back onto the label stack
                before forwarding. The use of this label

         is analogous to the use of the
         'Router Alert Option' in IP packets
         [RFC2113]. Since this label
         cannot occur at the bottom of the stack,
         it is not associated with a
         particular network layer protocol.

    iii. A value of 2 represents the
         'IPv6 Explicit NULL Label'. This label
         value is only legal at the bottom of the
         label stack. It indicates that the label
         stack must be popped, and the forwarding
         of the packet must then be based on the
         IPv6 header.

    iv. A value of 3 represents the
         'Implicit NULL Label'.
         This is a label that an LSR may assign and
         distribute, but which never actually
         appears in the encapsulation. When an
         LSR would otherwise replace the label
         at the top of the stack with a new label,
         but the new label is 'Implicit NULL',
         the LSR will pop the stack instead of
         doing the replacement. Although
         this value may never appear in the
         encapsulation, it needs to be specified in
         the Label Distribution Protocol, so a value
         is reserved.

    v.   Values 4-15 are reserved.

    * The frame relay label can be either 10-bits or
      23-bits depending on the DLCI field size and the
      upper 22-bits or upper 9-bits must be zero,
      respectively.

    * For an ATM label the lower 16-bits represents the
      VCI, the next 12-bits represents the VPI and the
      remaining bits MUST be zero.

    * The Generalized-MPLS (GMPLS) label contains a
      value greater than 2^24-1 and used in GMPLS
      as defined in [RFC3471]."
      REFERENCE
      "Multiprotocol Label Switching Architecture,
      [RFC3031].

MPLS Label Stack Encoding, [RFC3032].

Use of Label Switching on Frame Relay Networks,
[RFC3034].

MPLS using LDP and ATM VC Switching, [RFC3035].
Generalized Multiprotocol Label Switching
(GMPLS) Architecture, [RFC3471]."
SYNTAX Unsigned32 (0..4294967295)

MplsLabelDistributionMethod ::= TEXTUAL-CONVENTION
STATUS current
DESCRIPTION
"The label distribution method which is also called
the label advertisement mode [RFC3036].
Each interface on an LSR is configured to operate
in either Downstream Unsolicited or Downstream
on Demand."
REFERENCE
"Multiprotocol Label Switching Architecture,
[RFC3031].

LDP Specification, RFC3036, Section 2.6.3."
SYNTAX INTEGER {
downstreamOnDemand(1),
downstreamUnsolicited(2)
}

MplsLdpIdentifier ::= TEXTUAL-CONVENTION
DISPLAY-HINT "1d.1d.1d.1d:2d"
STATUS   current
DESCRIPTION
"The LDP identifier is a six octet
quantity which is used to identify a
Label Switching Router (LSR) label space.

The first four octets identify the LSR and
must be a globally unique value, such as a
32-bit router ID assigned to the LSR, and the
last two octets identify a specific label
space within the LSR."
SYNTAX OCTET STRING (SIZE (6))

MplsLsrIdentifier ::= TEXTUAL-CONVENTION
STATUS   current
DESCRIPTION
"The Label Switching Router (LSR) identifier is the
first 4 bytes of the Label Distribution Protocol

(LDP) identifier."
SYNTAX OCTET STRING (SIZE (4))
MplsLdpLabelType ::= TEXTUAL-CONVENTION
STATUS   current
DESCRIPTION
"The Layer 2 label types which are defined for MPLS
LDP and/or CR-LDP are generic(1), atm(2), or
frameRelay(3)."
SYNTAX INTEGER {
generic(1),
atm(2),
frameRelay(3)
}

MplsLSPID ::= TEXTUAL-CONVENTION
STATUS   current
DESCRIPTION
"A unique identifier within an MPLS network that is
assigned to each LSP. This is assigned at the head
end of the LSP and can be used by all LSRs
to identify this LSP. This value is piggybacked by
the signaling protocol when this LSP is signaled
within the network. This identifier can then be
used at each LSR to identify which labels are
being swapped to other labels for this LSP. This
object can also be used to disambiguate LSPs that
share the same RSVP sessions between the same
source and destination.

For LSPs established using CR-LDP, the LSPID is
composed of the ingress LSR Router ID (or any of
its own IPv4 addresses) and a locally unique
CR-LSP ID to that LSR. The first two bytes carry
the CR-LSPID, and the remaining 4 bytes carry
the Router ID. The LSPID is useful in network
management, in CR-LSP repair, and in using
an already established CR-LSP as a hop in
an ER-TLV.

For LSPs signaled using RSVP-TE, the LSP_ID is a local
number defined as a 16-bit (2 byte) identifier used
in the SENDER_TEMPLATE and the FILTER_SPEC that can be
changed to allow a sender to share resources with itself.
The LSP_ID is only unique within the context of the
SESSION and it cannot be used as network identifier. RSVP-TE
signaling use a 5-tuple to uniquely identify an LSP within an
operator's network. This tuple is composed of a
Tunnel End-point Address, Tunnel_ID, Extended Tunnel ID,

       Tunnel Sender Address, and LSP_ID.

       The length of this object should only be 2 or 6 bytes.
       If the length of this octet string is 2 bytes, then it
       must identify an RSVP-TE LSP_ID, or it is 6 bytes, it must
       contain a CR-LDP LSPID."
       REFERENCE
       "RSVP-TE: Extensions to RSVP for LSP Tunnels,
       [RFC3209].

       Constraint-Based LSP Setup using LDP,
       [RFC3212]."
       SYNTAX OCTET STRING (SIZE (2|6))

       MplsLspType ::= TEXTUAL-CONVENTION
       STATUS current
       DESCRIPTION
       "Types of Label Switch Paths (LSPs)
       on a Label Switching Router (LSR) or a
       Label Edge Router (LER) are:

       unknown(1)   -- if the LSP is not known
       to be one of the following.

       terminatingLsp(2) -- if the LSP terminates
       on the LSR/LER, then this
       is an egressing LSP
       which ends on the LSR/LER,

       originatingLsp(3) -- if the LSP originates
       from this LSR/LER, then
       this is an ingressing LSP
       which is the head-end of
       the LSP,

       crossConnectingLsp(4) -- if the LSP ingresses
       and egresses on the LSR, then it is
       cross-connecting on that LSR."
       SYNTAX INTEGER {
       unknown(1),
       terminatingLsp(2),
       originatingLsp(3),
       crossConnectingLsp(4)
       }

       MplsOwner ::= TEXTUAL-CONVENTION
       STATUS   current
       DESCRIPTION

"This object indicates the local network
management subsystem that originally created
the object(s) in question. The values of
this enumeration are defined as follows:

unknown(1) - the local network management
subsystem cannot discern which
component created the object.

other(2) - the local network management
subsystem is able to discern which component
created the object, but the component is not
listed within the following choices,
e.g., command line interface (cli).

snmp(3) - The Simple Network Management Protocol
was used to configure this object initially.

ldp(4) - The Label Distribution Protocol was
used to configure this object initially.

crldp(5) - The Constraint-Based Label Distribution
Protocol was used to configure this object
initially.

rsvpTe(6) - The Resource Reservation Protocol was
used to configure this object initially.

policyAgent(7) - A policy agent (perhaps in
combination with one of the above protocols) was
used to configure this object initially.

An object created by any of the above choices
MAY be modified or destroyed by the same or a
different choice."
SYNTAX   INTEGER {
unknown(1),
other(2),
snmp(3),
ldp(4),
crldp(5),
rsvpTe(6),
policyAgent(7)
}

MplsPathIndexOrZero ::= TEXTUAL-CONVENTION
STATUS current
DESCRIPTION

"A unique identifier used to identify a specific
path used by a tunnel. A value of 0 (zero) means
that no path is in use."
SYNTAX Unsigned32(0..4294967295)

MplsPathIndex ::= TEXTUAL-CONVENTION
STATUS   current
DESCRIPTION
"A unique value to index (by Path number) an
entry in a table."
SYNTAX Unsigned32(1..4294967295)

MplsRetentionMode ::= TEXTUAL-CONVENTION
STATUS   current
DESCRIPTION
"The label retention mode which specifies whether
an LSR maintains a label binding for a FEC
learned from a neighbor that is not its next hop
for the FEC.

If the value is conservative(1) then advertised
label mappings are retained only if they will be
used to forward packets, i.e., if label came from
a valid next hop.

If the value is liberal(2) then all advertised
label mappings are retained whether they are from
a valid next hop or not."
REFERENCE
"Multiprotocol Label Switching Architecture,
[RFC3031].

LDP Specification, [RFC3036], Section 2.6.2."
SYNTAX INTEGER {
conservative(1),
liberal(2)
}

MplsTunnelAffinity ::= TEXTUAL-CONVENTION
STATUS   current
DESCRIPTION
"Describes the configured 32-bit Include-any,
include-all, or exclude-all constraint for
constraint-based link selection."
REFERENCE
"RSVP-TE: Extensions to RSVP for LSP Tunnels,
[RFC3209], Section 4.7.4."
SYNTAX Unsigned32(0..4294967295)

```
MplsTunnelIndex ::= TEXTUAL-CONVENTION
STATUS        current
DESCRIPTION
"A unique index into mplsTunnelTable.
For tunnels signaled using RSVP, this value
should correspond to the RSVP Tunnel ID
used for the RSVP-TE session."
SYNTAX  Unsigned32 (0..65535)

MplsTunnelInstanceIndex ::= TEXTUAL-CONVENTION
STATUS        current
DESCRIPTION
"The tunnel entry with instance index 0
should refer to the configured tunnel
interface (if one exists).

Values greater than 0, but less than or
equal to 65535, should be used to indicate
signaled (or backup) tunnel LSP instances.
For tunnel LSPs signaled using RSVP,
this value should correspond to the
RSVP LSP ID used for the RSVP-TE
LSP.

Values greater than 65535 apply to FRR
detour instances."
SYNTAX  Unsigned32(0|1..65535|65536..4294967295)

TeHopAddressType ::= TEXTUAL-CONVENTION
STATUS      current
DESCRIPTION
"A value that represents a type of address for a
Traffic Engineered (TE) Tunnel hop.

unknown(0)   An unknown address type.  This value
MUST be used if the value of the
corresponding TeHopAddress object is a
zero-length string.  It may also be
used to indicate a TeHopAddress which
is not in one of the formats defined
below.

ipv4(1)       An IPv4 network address as defined by
the InetAddressIPv4 TEXTUAL-CONVENTION
[RFC3291].

ipv6(2)       A global IPv6 address as defined by
the InetAddressIPv6 TEXTUAL-CONVENTION
```

[RFC3291].

asnumber(3) An Autonomous System (AS) number as
defined by the TeHopAddressAS
TEXTUAL-CONVENTION.

unnum(4)   An unnumbered interface index as
defined by the TeHopAddressUnnum
TEXTUAL-CONVENTION.

lspid(5)   An LSP ID for TE Tunnels
(RFC3212) as defined by the
MplsLSPID TEXTUAL-CONVENTION.

Each definition of a concrete TeHopAddressType
value must be accompanied by a definition
of a TEXTUAL-CONVENTION for use with that
TeHopAddress.

To support future extensions, the TeHopAddressType
TEXTUAL-CONVENTION SHOULD NOT be sub-typed in
object type definitions. It MAY be sub-typed in
compliance statements in order to require only a
subset of these address types for a compliant
implementation.

Implementations must ensure that TeHopAddressType
objects and any dependent objects
(e.g., TeHopAddress objects) are consistent.
An inconsistentValue error must be generated
if an attempt to change a TeHopAddressType
object would, for example, lead to an
undefined TeHopAddress value that is
not defined herein. In particular,
TeHopAddressType/TeHopAddress pairs
must be changed together if the address
type changes (e.g., from ipv6(2) to ipv4(1))."
REFERENCE
"TEXTUAL-CONVENTIONs for Internet Network
Addresses, [RFC3291].

Constraint-Based LSP Setup using LDP,
[RFC3212]"

SYNTAX   INTEGER {
unknown(0),
ipv4(1),

```
ipv6(2),
asnumber(3),
unnum(4),
lspid(5)
}

TeHopAddress ::= TEXTUAL-CONVENTION
STATUS      current
DESCRIPTION
"Denotes a generic Tunnel hop address,
that is, the address of a node which
an LSP traverses, including the source
and destination nodes.  An address may be
very concrete, for example, an IPv4 host
address (i.e., with prefix length 32);
if this IPv4 address is an interface
address, then that particular interface
must be traversed.  An address may also
specify an 'abstract node', for example,
an IPv4 address with prefix length
less than 32, in which case, the LSP
can traverse any node whose address
falls in that range.  An address may
also specify an Autonomous System (AS),
in which  case the LSP can traverse any
node that falls within that AS.

A TeHopAddress value is always interpreted within
the context of an TeHopAddressType value.  Every
usage of the TeHopAddress TEXTUAL-CONVENTION
is required to specify the TeHopAddressType object
which provides the context.  It is suggested that
the TeHopAddressType object is logically registered
before the object(s) which use the TeHopAddress
TEXTUAL-CONVENTION if they appear in the
same logical row.

The value of a TeHopAddress object must always be
consistent with the value of the associated
TeHopAddressType object.  Attempts to set a
TeHopAddress object to a value which is
inconsistent with the associated TeHopAddressType
must fail with an inconsistentValue error."
SYNTAX      OCTET STRING (SIZE (0..32))

TeHopAddressAS ::= TEXTUAL-CONVENTION
STATUS      current
DESCRIPTION
```

    "Represents a two or four octet AS number.
    The AS number is represented in network byte
    order (MSB first). A two-octet AS number has
    the two MSB octets set to zero."
    REFERENCE
    "Textual Conventions for Internet Network
    Addresses, [RFC3291]. The
    InetAutonomousSystemsNumber TEXTUAL-CONVENTION
    has a SYNTAX of Unsigned32, whereas this TC
    has a SYNTAX of OCTET STRING (SIZE (4)).
    Both TCs represent an autonomous system number
    but use different syntaxes to do so."
    SYNTAX   OCTET STRING (SIZE (4))

    TeHopAddressUnnum ::= TEXTUAL-CONVENTION
    STATUS   current
    DESCRIPTION
    "Represents an unnumbered interface:

    octets   contents   encoding
    1-4   unnumbered interface   network-byte order

    The corresponding TeHopAddressType value is
    unnum(5)."
    SYNTAX   OCTET STRING(SIZE(4))

    MplsNewExtendedTunnelId ::= TEXTUAL-CONVENTION
    STATUS   current
    DESCRIPTION
    "A unique identifier for an MPLS Tunnel. This may
    represent an IPv4 address of the ingress or egress
    LSR for the tunnel for an IPv4 network. This represents an IPv4(for dual
stack network) / IPv6 (for IPv6-only network)
    address of the ingress or egress LSR for the tunnel
    for an dual stack network or IPv6-only network. This value is derived from
the
    Extended Tunnel Id in RSVP or the Ingress Router ID
    for CR-LDP."
    REFERENCE
    "RSVP-TE: Extensions to RSVP for LSP Tunnels,
    [RFC3209].

    Constraint-Based LSP Setup using LDP, [RFC3212]."
    SYNTAX OCTET STRING(SIZE(16))
    END

4. Changes from RFC3811

   Following is the list of technical changes and other fixes from
   RFC3811.

   Main purpose of this work is to address the need to support IPv6
   extended TunnelID's by defining a new TC-MplsNewExtendedTunnelID,
   resulting in the following changes:

   Old MplsExtendedTunnelId status is changed to obsolete.

   A new defined MplsNewExtendedTunnelId is added as below.

   MplsNewExtendedTunnelId ::= TEXTUAL-CONVENTION
   STATUS   current
   DESCRIPTION
   "A unique identifier for an MPLS Tunnel. This may
   represent an IPv4 address of the ingress or egress
   LSR for the tunnel for an IPv4 network. This represents an IPv4(for dual
stack network) / IPv6 (for IPv6-only network)
   address of the ingress or egress LSR for the tunnel
   an dual stack network or IPv6-only network. This value is derived from the
   Extended Tunnel Id in RSVP or the Ingress Router ID
   for CR-LDP."
   REFERENCE
   "RSVP-TE: Extensions to RSVP for LSP Tunnels,
   [RFC3209].

   Constraint-Based LSP Setup using LDP, [RFC3212]."
   SYNTAX OCTET STRING(SIZE(16))

   The confusing part of MplsLSPID is modified as below.

```
     MplsLSPID ::= TEXTUAL-CONVENTION
     STATUS       current
     DESCRIPTION
     "A unique identifier within an MPLS network that is
     assigned to each LSP.  This is assigned at the head
     end of the LSP and can be used by all LSRs
     to identify this LSP.  This value is piggybacked by
     the signaling protocol when this LSP is signaled
     within the network.  This identifier can then be
     used at each LSR to identify which labels are
     being swapped to other labels for this LSP.  This
     object  can also be used to disambiguate LSPs that
     share the same RSVP sessions between the same
     source and destination.

     For LSPs established using CR-LDP, the LSPID is
     composed of the ingress LSR Router ID (or any of
     its own IPv4 addresses) and a locally unique
     CR-LSP ID to that LSR.  The first two bytes carry
     the CR-LSPID, and the remaining 4 bytes carry
     the Router ID.  The LSPID is useful in network
     management, in CR-LSP repair, and in using
     an already established CR-LSP as a hop in
     an ER-TLV.

     For LSPs signaled using RSVP-TE, the LSP_ID is a local
     number defined as a 16-bit (2 byte) identifier used
     in the SENDER_TEMPLATE and the FILTER_SPEC that can be
     changed to allow a sender to share resources with itself.
     The LSP_ID is only unique within the context of the
     SESSION and it cannot be used as network identifier. RSVP-TE
     signaling use a 5-tuple to uniquely identify an LSP within an
     operator's network.  This tuple is composed of a
     Tunnel End-point Address, Tunnel_ID, Extended Tunnel ID,
     Tunnel Sender Address, and LSP_ID.

     The length of this object should only be 2 or 6 bytes.
     If the length of this octet string is 2 bytes, then it
     must identify an RSVP-TE LSP_ID, or it is 6 bytes, it must
     contain a CR-LDP LSPID."
     REFERENCE
     "RSVP-TE:  Extensions to RSVP for LSP Tunnels,
     [RFC3209].

     Constraint-Based LSP Setup using LDP,
     [RFC3212]."
     SYNTAX  OCTET STRING (SIZE (2|6))
```

5. Effect of the new TC

   The new TC definition for the MPLS Tunnel will have an effect on the
   MPLS-TE-MIB and MPLS-TC-STD-MIB. Also the following RFCs which use
   the MIB may have to be updated to accommodate the changed definition:
   [RFC3209], [RFC3812], [RFC3813], [RFC3212], [RFC4368], [RFC3814],
   [RFC3815], and [RFC6639].

6. Contributors

   This MIB fixes a small issue with the earlier version of this MIB as
   defined in RFC3811.The earlier document was created by combining
   TEXTUAL-CONVENTIONS from current MPLS MIBs and a TE-WG MIB. Co-
   authors on each of these MIBs contributed to the TEXTUAL-CONVENTIONS
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   detailed reviews. Bert's assistance and guidance is greatly
   appreciated.

8. Security Considerations

   This module does not define any management objects. Instead, it
   defines a set of textual conventions which may be used by other MPLS
   MIB modules to define management objects.

Meaningful security considerations can only be written in the MIB
modules that define management objects. Therefore, this document has
no impact on the security of the Internet.

9. IANA Considerations

IANA has made a MIB OID assignment under the transmission branch,
that is, assigned the mplsStdMIB under { transmission 166 }. This
sub-id is requested because 166 is the ifType for mpls(166) and is
available under transmission.

In the future, MPLS related standards track MIB modules should be
rooted under the mplsStdMIB subtree. The IANA is requested to manage
that namespace. New assignments can only be made via a Standards
Action as specified in [RFC2434].

The IANA has also assigned { mplsStdMIB 1 } to the MPLS-TC-STD-MIB
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