Multiprotocol Label Switching (MPLS) Label-Controlled ATM and Frame-Relay Management Interface Definition

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Abstract

   This memo defines two MIB modules and corresponding MIB Object
   Definitions that describe how label switching controlled
   Frame-Relay and ATM interfaces can be managed given the
   interface stacking as defined in the MPLS-LSR-STD-MIB and
   MPLS-TE-STD-MIB.

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1. Introduction

This memo defines how label switching controlled Frame-Relay
[RFC3034] and ATM [RFC3035] interfaces can be realized given
the interface stacking as defined in the MPLS-LSR-STD [RFC3813]
and MPLS-TE-STD [RFC3812] MIBs. This document also contains a
MIB module that sparsely extends the MPLS-LSR-STD MIB's
mplsInterfaceConfTable in such a way as to identify which
MPLS-type interfaces have LC-ATM or LC-FR capabilities.
Comments should be made directly to the MPLS mailing list at
mpls@uu.net.

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
RFC 2119, reference [RFC2119].

2. Terminology

This document uses terminology from the document describing the
MPLS architecture [RFC3031], as well as RFC3035 and RFC3034.
Specifically, the following terms will be used in this document.

LC-FR   RFC3034 defines a label switching controlled Frame Relay
         (LC-FR) interface a Frame-Relay interface controlled by the
         label switching control component. Packets traversing
         such an interface carry labels in the DLCI field

LC-ATM RFC3035 defines a label switching controlled ATM (LC-ATM)
       interface as an ATM interface controlled by the label
       switching control component. When a packet traversing such
       an interface is received, it is treated as a labeled packet.
       The packet's top label is inferred either from the contents

          of the VCI field or the combined contents of the VPI and VCI
          fields. Any two LDP peers which are connected via an LC-ATM
          interface will use LDP negotiations to determine which of
          these cases is applicable to that interface.
          Static configuration of labels is also possible.

   When LDP is used to distribute labels for use on label-controlled
   interfaces, label configuration information may be available in the
   MPLS-LDP-ATM-STD-MIB [RFC3815] when LC-ATM interfaces are used, or
   the MPLS-LDP-FRAME-RELAY-STD-MIB [RFC3815] when LC-FR interfaces
   are used. Specifically,

3. The SNMP 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].

4. Interface Stacking of LC-ATM

   Since LC-ATM interfaces [RFC2863] can carry labeled MPLS
   traffic, they too are considered MPLS subinterfaces with
   ifType = mpls(166). They differ slightly in their capability
   from a packet-oriented MPLS interface in that they may
   carry ATM or Frame-Relay encapsulated traffic. It is
   thus beneficial to identify them as such. To identify
   them as such, two tables are defined which extend the
   MPLS-LSR-STD MIB's mplsInterfaceTable (see section 5 for
   LC-ATM or 6 for LC-FR).

5. Structure of the MPLS-LC-ATM-STD-MIB module

   The MPLS-LC-ATM-STD-MIB module is structured simply
   as a table of entries which sparesely extend those
   found in the interfaces table. In particular, the
   entries in the mplsLcAtmStdInterfaceConfTable
   extend those interfaces capable of supporting
   MPLS, as is defined in [RFC3813] to include those
   entries which also support LC-ATM (and their unique

attributes). Therefore, the module can be
visualized as follows. Note that the ifTable
comes from [RFC2863], mplsInterfaceTable from
[RFC3813] and mplsLcAtmStdInterfaceConfTable from
the MPLS-LC-ATM-STD-MIB module described below.

ifTable mplsInterfaceTable mplsLcAtmStdInterfaceConfTable
.1
.2   .2
.3
.4   .4   .4
.5

In the example shown above, five interfaces exist on the
device in question. Of those interfaces, those with
ifIndex = .2 and .4 are of ifType = mpls(166) indicating
that they are capable of MPLS. Of those two, the entry
with index .4 is capable of MPLS LC-ATM operations.

It should be noted that the label partition model
utilized by the authors of this document reflects widespread
implementation, and is seen by the MPLS working group as
sufficiently flexible to meet the operational needs, even
if it is more restrictive than [RFC3035] allows. To this
end, we have limited the control and unlabeled VPI and
VCI to single values. It should be noted
mplsLcAtmStdUnlabTrafVci and mplsLcAtmStdCtrlVci MUST
not be equal, nor should mplsLcAtmStdCtrlVpi or
mplsLcAtmStdUnlabTrafVpi be equal.

6. Structure of the MPLS-LC-FR-STD-MIB module

The MPLS-LC-FR-STD-MIB module is structured simply
as a table of entries which sparesely extend those
found in the interfaces table. In particular, the
entries in the mplsLcFrStdInterfaceConfTable
extend those interfaces capable of supporting
MPLS, as is defined in [RFC3813] to include those
entries which also support LC-Frame Relay (and their
unique attributes). Therefore, the module can be
visualized as follows. Note that the ifTable
comes from [RFC2863], mplsInterfaceTable from
[RFC3813] and mplsLcAtmStdInterfaceConfTable from
the MPLS-LC-FR-STD-MIB module described below.

ifTable mplsInterfaceTable mplsLcFrStdInterfaceConfTable
.1

```
.2      .2
.3
.4      .4              .4
.5
```

In the example shown above, five interfaces exist on the
device in question. Of those interfaces, those with
ifIndex = .2 and .4 are of ifType = mpls(166) indicating
that they are capable of MPLS. Of those two, the entry
with index .4 is capable of MPLS LC-Frame Relay operations.

It should be noted that even though the architecture as
described in [RFC3034] calls for supporting mixed labeled
and unlabeled traffic, this MIB does not support that
as this capability does not seem to be used operationally.
It should be noted that the DLCI ranges represented by
mplsLcFrStdTrafficMinDlci and mplsLcFrStdTrafficMaxDlci
mplsLcFrStdCtrlMinDlci and mplsLcFrStdCtrlMaxDlci MUST
not overlap.

7. MPLS Label Controlled ATM MIB Definitions

The following MIB module imports from [RFC2514],
[RFC3811], [RFC3813].

```
MPLS-LC-ATM-STD-MIB DEFINITIONS ::= BEGIN
IMPORTS
   MODULE-IDENTITY, OBJECT-TYPE
      FROM SNMPv2-SMI
   MODULE-COMPLIANCE, OBJECT-GROUP
      FROM SNMPv2-CONF
   RowStatus, StorageType, TruthValue
      FROM SNMPv2-TC
   AtmVpIdentifier
      FROM ATM-TC-MIB
   mplsStdMIB, MplsAtmVcIdentifier
      FROM MPLS-TC-STD-MIB
   mplsInterfaceIndex
      FROM MPLS-LSR-STD-MIB
   ;

mplsLcAtmStdMIB MODULE-IDENTITY
   LAST-UPDATED "200506171200Z"  -- 17 June 2005 12:00:00 GMT
   ORGANIZATION "Multiprotocol Label Switching (MPLS) Working Group"
   CONTACT-INFO
       "        Thomas D. Nadeau
         Postal: Cisco Systems, Inc.
```

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                  Chelmsford, MA 01824
           Tel: +1-978-244-3051
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           Postal: Cisco Systems, Inc.
                  225 East Tazman Drive
           Tel: +1-408-525-6562
           Email: subrah@cisco.com
           General comments should be sent to mpls@uu.net
          "
     DESCRIPTION
         "This MIB module contains managed object definitions for
          MPLS Label Controlled ATM interfaces as defined in
          [RFC3035].

          Copyright (C) The Internet Society (2005). This
          version of this MIB module is part of RFCXXXX; see
          the RFC itself for full legal notices."
         -- RFC Editor please fill in XXXX

     -- Revision history.
     REVISION
         "200506171200Z" -- 17 June 2005 12:00:00 GMT
     DESCRIPTION
         "Initial revision, published as part of RFC XXXX."
     ::= { mplsStdMIB XXX } -- To Be Assigned by IANA

-- Top level components of this MIB module.

-- Tables, Scalars, Notifications, Conformance

mplsLcAtmStdNotifications OBJECT IDENTIFIER ::= { mplsLcAtmStdMIB 0 }

mplsLcAtmStdObjects   OBJECT IDENTIFIER ::= { mplsLcAtmStdMIB 1 }

mplsLcAtmStdConformance   OBJECT IDENTIFIER ::= { mplsLcAtmStdMIB 2 }

-- MPLS LC-ATM Interface Configuration Table.
mplsLcAtmStdInterfaceConfTable OBJECT-TYPE
    SYNTAX   SEQUENCE OF MplsLcAtmStdInterfaceConfEntry
    MAX-ACCESS   not-accessible
    STATUS   current
    DESCRIPTION
        "This table specifies per-interface MPLS LC-ATM
         capability and associated information. In particular,
         this table sparsely extends the MPLS-LSR-STD-MIB's
         mplsInterfaceConfTable."

        ::= { mplsLcAtmStdObjects 1 }

mplsLcAtmStdInterfaceConfEntry OBJECT-TYPE
    SYNTAX   MplsLcAtmStdInterfaceConfEntry
    MAX-ACCESS   not-accessible
    STATUS   current
    DESCRIPTION
        "An entry in this table is created by an LSR for
         every interface capable of supporting MPLS LC-ATM.
         Each entry in this table will exist only if a
         corresponding entry in ifTable and mplsInterfaceConfTable
         exist. If the associated entries in ifTable and
         mplsInterfaceConfTable are deleted, the corresponding
         entry in this table must also be deleted shortly
         thereafter. "
    INDEX   { mplsInterfaceIndex }
       ::= { mplsLcAtmStdInterfaceConfTable 1 }

MplsLcAtmStdInterfaceConfEntry ::= SEQUENCE {
    mplsLcAtmStdCtrlVpi   AtmVpIdentifier,
    mplsLcAtmStdCtrlVci   MplsAtmVcIdentifier,
    mplsLcAtmStdUnlabTrafVpi   AtmVpIdentifier,
    mplsLcAtmStdUnlabTrafVci   MplsAtmVcIdentifier,
    mplsLcAtmStdVcMerge   TruthValue,
    mplsLcAtmVcDirectlyConnected   TruthValue,
    mplsLcAtmLcAtmVPI   AtmVpIdentifier,
    mplsLcAtmStdIfConfRowStatus   RowStatus,
    mplsLcAtmStdIfConfStorageType   StorageType
}

mplsLcAtmStdCtrlVpi OBJECT-TYPE
    SYNTAX   AtmVpIdentifier
    MAX-ACCESS   read-create
    STATUS   current
    DESCRIPTION
        "This is the VPI value over which this
         LSR is willing to accept control traffic on
         this interface."
    ::= { mplsLcAtmStdInterfaceConfEntry 1 }

mplsLcAtmStdCtrlVci OBJECT-TYPE
    SYNTAX   MplsAtmVcIdentifier
    MAX-ACCESS   read-create
    STATUS   current
    DESCRIPTION
        "This is the VCI value over which this
         LSR is willing to accept control traffic

on this interface."

    ::= { mplsLcAtmStdInterfaceConfEntry 2 }

mplsLcAtmStdUnlabTrafVpi OBJECT-TYPE
    SYNTAX   AtmVpIdentifier
    MAX-ACCESS   read-create
    STATUS   current
    DESCRIPTION
        "This is the VPI value over which this
         LSR is willing to accept unlabeled traffic
         on this interface."
    ::= { mplsLcAtmStdInterfaceConfEntry 3 }

mplsLcAtmStdUnlabTrafVci OBJECT-TYPE
    SYNTAX   MplsAtmVcIdentifier
    MAX-ACCESS   read-create
    STATUS   current
    DESCRIPTION
        "This is the VCI value over which this
         LSR is willing to accept unlabled traffic
         on this interface."
    ::= { mplsLcAtmStdInterfaceConfEntry 4 }

mplsLcAtmStdVcMerge OBJECT-TYPE
    SYNTAX   TruthValue
    MAX-ACCESS read-create
    STATUS   current
    DESCRIPTION
        "If set to true(1), indicates that this interface
         is capabile of ATM VC merge, otherwise it MUST
         be set to false(2)."
    DEFVAL   { false }
    ::= { mplsLcAtmStdInterfaceConfEntry 5 }

mplsLcAtmVcDirectlyConnected OBJECT-TYPE
    SYNTAX   TruthValue
    MAX-ACCESS read-create
    STATUS   current
    DESCRIPTION
      "This value indicates whether an LC-ATM is directly
       or indirectly (by means of a VP) connected. If set to
       true(1), indicates that this interface is directly
       connected LC-ATM, otherwise it MUST be set to
       false(2). It should be noted that although
       it can be intimated from RFC 3057 that multiple
       VPs maybe used, that in practice only a single
       one is used, and therefore the authors of
       this MIB module have chosen to model it as such."

```
     DEFVAL      { true }
```

    ::= { mplsLcAtmStdInterfaceConfEntry 6 }

mplsLcAtmLcAtmVPI OBJECT-TYPE
    SYNTAX   AtmVpIdentifier
    MAX-ACCESS   read-create
    STATUS   current
    DESCRIPTION
      "This is the VPI value used for indirectly
       connected LC-ATM interfaces. For these
       interfaces, the VPI field is not
       available to MPLS, and the label MUST be
       encoded entirely within the VCI field.
       (see [RFC3035]). If the interface is directly
       connected, this value MUST be set to zero."
    DEFVAL { 0 }
    ::= { mplsLcAtmStdInterfaceConfEntry 7 }

mplsLcAtmStdIfConfRowStatus OBJECT-TYPE
    SYNTAX   RowStatus
    MAX-ACCESS   read-create
    STATUS   current
    DESCRIPTION
        "This is object is used to create and
         delete entries in this table. When configuring
         entries in this table, the corresponding
         ifEntry and mplsInterfaceConfEntry
         MUST exist before hand. If an entry is attempted
         to be created by a manager for a corresponding
         mplsInterfaceConfEntry that does not support LC-ATM,
         the agent MUST return an inconsistentValue error.
         If this table is implemented read-only, then the
         agent must set this object to active(1) when this
         row is made active. If this table is implemented
         writable, then an agent MUST not allow modification
         to its objects once this value is set to active(1)
         except mplsLcAtmStdIfConfRowStatus and
         mplsLcAtmStdIfConfStorageType."
    ::= { mplsLcAtmStdInterfaceConfEntry 8 }

 mplsLcAtmStdIfConfStorageType 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."

```
    DEFVAL { nonVolatile }
    ::= { mplsLcAtmStdInterfaceConfEntry 9 }

-- End of mplsLcAtmStdInterfaceConfTable

-- Module compliance.

mplsLcAtmStdCompliances
    OBJECT IDENTIFIER ::= { mplsLcAtmStdConformance 1 }

mplsLcAtmStdGroups
    OBJECT IDENTIFIER ::= { mplsLcAtmStdConformance 2 }

-- Compliance requirement for full compliance

mplsLcAtmStdModuleFullCompliance MODULE-COMPLIANCE
    STATUS current
    DESCRIPTION
        "Compliance statement for agents that provide
         full support for MPLS-LC-ATM-STD-MIB. Such
         devices can be monitored and also be configured
         using this MIB module."
    MODULE -- this module
       MANDATORY-GROUPS {
          mplsLcAtmStdIfGroup
       }

       OBJECT        mplsLcAtmStdIfConfRowStatus
       SYNTAX        RowStatus { active(1), notInService(2) }
       WRITE-SYNTAX RowStatus { active(1), notInService(2),
                                createAndGo(4), destroy(6)
                              }
       DESCRIPTION "Support for createAndWait and notReady is
                    not required."

    ::= { mplsLcAtmStdCompliances 1 }

-- Compliance requirement for read-only implementations.

mplsLcAtmStdModuleReadOnlyCompliance MODULE-COMPLIANCE
    STATUS current
    DESCRIPTION
        "Compliance requirement for implementations that only
         provide read-only support for MPLS-LC-ATM-STD-MIB.
         Such devices can be monitored but cannot be configured
         using this MIB module.
        "
```

```
MODULE -- this module
   MANDATORY-GROUPS {
       mplsLcAtmStdIfGroup
   }

   -- mplsLcAtmStdInterfaceConfTable

   OBJECT       mplsLcAtmStdCtrlVpi
   MIN-ACCESS   read-only
   DESCRIPTION
       "Write access is not required."

   OBJECT       mplsLcAtmStdCtrlVci
   MIN-ACCESS   read-only
   DESCRIPTION
       "Write access is not required."

   OBJECT       mplsLcAtmStdUnlabTrafVpi
   MIN-ACCESS   read-only
   DESCRIPTION
       "Write access is not required."

   OBJECT       mplsLcAtmStdUnlabTrafVci
   MIN-ACCESS   read-only
   DESCRIPTION
       "Write access is not required."

   OBJECT       mplsLcAtmStdVcMerge
   MIN-ACCESS   read-only
   DESCRIPTION
       "Write access is not required."

   OBJECT       mplsLcAtmStdIfConfRowStatus
   SYNTAX       RowStatus { active(1) }
   MIN-ACCESS   read-only
   DESCRIPTION "Write access is not required."

   OBJECT       mplsLcAtmVcDirectlyConnected
   MIN-ACCESS   read-only
   DESCRIPTION
       "Write access is not required."

   OBJECT       mplsLcAtmLcAtmVPI
   MIN-ACCESS   read-only
   DESCRIPTION
       "Write access is not required."

   OBJECT       mplsLcAtmStdIfConfStorageType
```

              MIN-ACCESS   read-only
              DESCRIPTION
                  "Write access is not required."
           ::= { mplsLcAtmStdCompliances 2 }

-- Units of conformance.

mplsLcAtmStdIfGroup OBJECT-GROUP
   OBJECTS {
              mplsLcAtmStdCtrlVpi,
              mplsLcAtmStdCtrlVci,
              mplsLcAtmStdUnlabTrafVpi,
              mplsLcAtmStdUnlabTrafVci,
              mplsLcAtmStdVcMerge,
              mplsLcAtmVcDirectlyConnected,
              mplsLcAtmLcAtmVPI,
              mplsLcAtmStdIfConfRowStatus,
              mplsLcAtmStdIfConfStorageType
    }
   STATUS current
   DESCRIPTION
           "Collection of objects needed for MPLS LC-ATM
            interface configuration."
   ::= { mplsLcAtmStdGroups 1 }
END

8. MPLS Label Controlled Frame Relay MIB Definitions

   The following MIB module imports from [RFC2115],
   [RFC3811], [RFC3813].

MPLS-LC-FR-STD-MIB DEFINITIONS ::= BEGIN
IMPORTS
   MODULE-IDENTITY, OBJECT-TYPE
      FROM SNMPv2-SMI
   MODULE-COMPLIANCE, OBJECT-GROUP
      FROM SNMPv2-CONF
   RowStatus, StorageType
      FROM SNMPv2-TC
   mplsInterfaceIndex
      FROM MPLS-LSR-STD-MIB
   DLCI
      FROM FRAME-RELAY-DTE-MIB
   mplsStdMIB
      FROM MPLS-TC-STD-MIB
   ;

mplsLcFrStdMIB MODULE-IDENTITY

        LAST-UPDATED "200506171200Z" -- 17 June 2005 12:00:00 GMT
        ORGANIZATION "Multiprotocol Label Switching (MPLS) Working Group"
        CONTACT-INFO
            "   Thomas D. Nadeau
                      Cisco Systems, Inc.
             Email: tnadeau@cisco.com

                      Subrahmanya Hegde
             Email: subrah@cisco.com

             General comments should be sent to mpls@uu.net
            "
        DESCRIPTION
            "This MIB module contains managed object definitions for
             MPLS Label Controlled Frame-Relay interfaces as defined
             in (RFC3034).

             Copyright (C) The Internet Society (2004). This
             version of this MIB module is part of RFCXXXX; see
             the RFC itself for full legal notices."
            -- RFC Editor please fill in XXXX

        -- Revision history.
        REVISION
             "200506171200Z" -- 17 June 2005 12:00:00 GMT
        DESCRIPTION
            "Initial draft revision."
        ::= { mplsStdMIB XXX } -- To Be Assigned by IANA

-- Top level components of this MIB module.
-- Tables, Scalars, Notifications, Conformance

mplsLcFrStdNotifications OBJECT IDENTIFIER ::= { mplsLcFrStdMIB 0 }
mplsLcFrStdObjects   OBJECT IDENTIFIER ::= { mplsLcFrStdMIB 1 }
mplsLcFrStdConformance   OBJECT IDENTIFIER ::= { mplsLcFrStdMIB 2 }

-- MPLS LC-FR Interface Configuration Table.
mplsLcFrStdInterfaceConfTable OBJECT-TYPE
    SYNTAX   SEQUENCE OF MplsLcFrStdInterfaceConfEntry
    MAX-ACCESS   not-accessible
    STATUS   current
    DESCRIPTION
        "This table specifies per-interface MPLS LC-FR
         capability and associated information. In particular,
         this table sparsely extends the MPLS-LSR-STD-MIB's
         mplsInterfaceConfTable."
    ::= { mplsLcFrStdObjects 1 }

```
mplsLcFrStdInterfaceConfEntry OBJECT-TYPE
   SYNTAX        MplsLcFrStdInterfaceConfEntry
   MAX-ACCESS    not-accessible
   STATUS        current
   DESCRIPTION
       "An entry in this table is created by an LSR for
        every interface capable of supporting MPLS LC-FR.
        Each entry in this table will exist only if a
        corresponding entry in ifTable and mplsInterfaceConfTable
        exist. If the associated entries in ifTable and
        mplsInterfaceConfTable are deleted, the corresponding
        entry in this table must also be deleted shortly
        thereafter. "
   INDEX        { mplsInterfaceIndex }
      ::= { mplsLcFrStdInterfaceConfTable 1 }

MplsLcFrStdInterfaceConfEntry ::= SEQUENCE {
   mplsLcFrStdTrafficMinDlci          DLCI,
   mplsLcFrStdTrafficMaxDlci          DLCI,
   mplsLcFrStdCtrlMinDlci             DLCI,
   mplsLcFrStdCtrlMaxDlci             DLCI,
   mplsLcFrStdInterfaceConfRowStatus    RowStatus,
   mplsLcFrStdInterfaceConfStorageType StorageType
}

mplsLcFrStdTrafficMinDlci OBJECT-TYPE
   SYNTAX        DLCI
   MAX-ACCESS    read-create
   STATUS        current
   DESCRIPTION
       "This is the minimum DLCI value over which this
        LSR is willing to accept traffic on this
        interface."
   ::= { mplsLcFrStdInterfaceConfEntry 1 }

mplsLcFrStdTrafficMaxDlci OBJECT-TYPE
   SYNTAX        DLCI
   MAX-ACCESS    read-create
   STATUS        current
   DESCRIPTION
       "This is the max DLCI value over which this
        LSR is willing to accept traffic on this
        interface."
   ::= { mplsLcFrStdInterfaceConfEntry 2 }

mplsLcFrStdCtrlMinDlci OBJECT-TYPE
   SYNTAX        DLCI
```

MAX-ACCESS   read-create

     STATUS   current
     DESCRIPTION
         "This is the min DLCI value over which this
          LSR is willing to accept control traffic
          on this interface."
     ::= { mplsLcFrStdInterfaceConfEntry 3 }

mplsLcFrStdCtrlMaxDlci OBJECT-TYPE
     SYNTAX   DLCI
     MAX-ACCESS   read-create
     STATUS   current
     DESCRIPTION
         "This is the max DLCI value over which this
          LSR is willing to accept control traffic
          on this interface."
     ::= { mplsLcFrStdInterfaceConfEntry 4 }

mplsLcFrStdInterfaceConfRowStatus OBJECT-TYPE
     SYNTAX   RowStatus
     MAX-ACCESS   read-create
     STATUS   current
     DESCRIPTION
         "This is object is used to create and
          delete entries in this table. When configuring
          entries in this table, the corresponding ifEntry and
          mplsInterfaceConfEntry MUST exist before hand. If an entry
          is attempted to be created by a manager for a corresponding
          mplsInterfaceConfEntry that does not support LC-FR,
          the agent MUST return an inconsistentValue error.
          If this table is implemented read-only, then the
          agent must set this object to active(1) when this
          row is made active. If this table is implemented
          writable, then an agent MUST not allow modification
          to its objects once this value is set to active(1)
          except mplsLcFrStdInterfaceConfRowStatus and
          mplsLcFrStdInterfaceConfStorageType."
     ::= { mplsLcFrStdInterfaceConfEntry 5 }

 mplsLcFrStdInterfaceConfStorageType 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."

```
   DEFVAL { nonVolatile }
```

```
    ::= { mplsLcFrStdInterfaceConfEntry 6 }

-- End of mplsLcFrStdInterfaceConfTable

-- Module compliance.

mplsLcFrStdCompliances
    OBJECT IDENTIFIER ::= { mplsLcFrStdConformance 1 }

mplsLcFrStdGroups
    OBJECT IDENTIFIER ::= { mplsLcFrStdConformance 2 }


-- Compliance requirement for full compliance

mplsLcFrStdModuleFullCompliance MODULE-COMPLIANCE
    STATUS current
    DESCRIPTION
        "Compliance statement for agents that provide
         full support for MPLS-LC-FR-STD-MIB. Such
         devices can be monitored and also be configured
         using this MIB module."
    MODULE -- this module
       MANDATORY-GROUPS {
          mplsLcFrStdIfGroup
       }

       OBJECT       mplsLcFrStdInterfaceConfRowStatus
       SYNTAX       RowStatus { active(1), notInService(2) }
       WRITE-SYNTAX RowStatus { active(1), notInService(2),
                               createAndGo(4), destroy(6)
                             }
       DESCRIPTION "Support for createAndWait and notReady is
                    not required."

    ::= { mplsLcFrStdCompliances 1 }


-- Compliance requirement for read-only implementations.

mplsLcFrStdModuleReadOnlyCompliance MODULE-COMPLIANCE
    STATUS current
    DESCRIPTION
        "Compliance requirement for implementations that only
         provide read-only support for MPLS-LC-FR-STD-MIB.
         Such devices can be monitored but cannot be configured
         using this MIB module.
        "
```

```
    MODULE -- this module
       MANDATORY-GROUPS {
          mplsLcFrStdIfGroup
       }

       -- mplsLcFrStdInterfaceConfTable

       OBJECT     mplsLcFrStdTrafficMinDlci
       MIN-ACCESS  read-only
       DESCRIPTION
           "Write access is not required."

       OBJECT     mplsLcFrStdTrafficMaxDlci
       MIN-ACCESS  read-only
       DESCRIPTION
           "Write access is not required."

       OBJECT      mplsLcFrStdCtrlMinDlci
       MIN-ACCESS  read-only
       DESCRIPTION
           "Write access is not required."

       OBJECT      mplsLcFrStdCtrlMaxDlci
       MIN-ACCESS  read-only
       DESCRIPTION
           "Write access is not required."

       OBJECT       mplsLcFrStdInterfaceConfRowStatus
       SYNTAX       RowStatus { active(1) }
       MIN-ACCESS   read-only
       DESCRIPTION "Write access is not required."

       OBJECT      mplsLcFrStdInterfaceConfStorageType
       MIN-ACCESS  read-only
       DESCRIPTION
           "Write access is not required."
    ::= { mplsLcFrStdCompliances 2 }

-- Units of conformance.

mplsLcFrStdIfGroup OBJECT-GROUP
   OBJECTS {
        mplsLcFrStdTrafficMinDlci,
        mplsLcFrStdTrafficMaxDlci,
        mplsLcFrStdCtrlMinDlci,
        mplsLcFrStdCtrlMaxDlci,
        mplsLcFrStdInterfaceConfRowStatus,
        mplsLcFrStdInterfaceConfStorageType
```

```
 }
STATUS  current

DESCRIPTION
       "Collection of objects needed for MPLS LC-FR
        interface configuration."
::= { mplsLcFrStdGroups 1 }
END
```

9. Authors' Addresses

```
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10. Full Copyright Statement

11. Acknowledgments

We wish to thank Joan Cucchiara and Carlos Pignataro for
their comments on this document.

12. Security Considerations

It is clear that these MIB modules are potentially useful for
monitoring of MPLS LSRs supporting LC-ATM and/or LC-FR. These
MIB can also be used for configuration of certain objects, and
anything that can be configured can be incorrectly configured,
with potentially disastrous results.

There are a number of management objects defined in this MIB module

with a MAX-ACCESS clause of read-write and/or read-create. Such
objects may be considered sensitive or vulnerable in some network
environments. The support for SET operations in a non-secure
environment without proper protection can have a negative effect on
network operations. These are the tables and objects and their
sensitivity/vulnerability:

o   the MplsLcAtmStdInterfaceConfTable and
     mplsLcFrStdInterfaceConfTable collectively
     contain objects which may be used to provision MPLS LC or
     FR-enabled interfaces. Unauthorized access to objects in
     these tables, could result in disruption of traffic on the
     network. This is especially true if traffic has been
     established over these interfaces. The use of stronger
     mechanisms such as SNMPv3 security should be considered
     where possible. Specifically,SNMPv3 VACM and USM MUST be
     used with any v3 agent which implements this MIB module.
     Administrators should consider whether read access to
     these objects should be allowed, since read access may be
     undesirable under certain circumstances.

Some of the readable objects in this MIB module (i.e., objects with a
MAX-ACCESS other than not-accessible) may be considered sensitive or
vulnerable in some network environments. It is thus important to
control even GET and/or NOTIFY access to these objects and possibly
to even encrypt the values of these objects when sending them over
the network via SNMP. These are the tables and objects and their
sensitivity/vulnerability:

o   the MplsLcAtmStdInterfaceConfTable and
     mplsLcFrStdInterfaceConfTable collectively
     collectively show the LC-ATM and/or LC-FR interfaces,
     their associated configurations and their linkages to other
     MPLS-related configuration and/or performanc statistics.
     Administrators not wishing to reveal this information should
     consider these objects sensitive/vulnerable and take
     precautions so they are not revealed.

SNMP versions prior to SNMPv3 did not include adequate security.
Even if the network itself is secure (for example by using IPSec),
even then, there is no control as to who on the secure network is
allowed to access and GET/SET (read/change/create/delete) the objects
in this MIB module.

It is RECOMMENDED that implementers consider the security features as
provided by the SNMPv3 framework (see [RFC3410], section 8),
including full support for the SNMPv3 cryptographic mechanisms (for

authentication and privacy).

Further, deployment of SNMP versions prior to SNMPv3 is NOT
RECOMMENDED. Instead, it is RECOMMENDED to deploy SNMPv3 and to
enable cryptographic security. It is then a customer/operator
responsibility to ensure that the SNMP entity giving access to an
instance of this MIB module, is properly configured to give access
to the objects only to those principals (users) that have legitimate
rights to indeed GET or SET (change/create/delete) them.

13. **IANA Considerations**

As described in and as requested in the MPLS-TC-STD-MIB
[RFC3811], MPLS related standards track MIB modules should be
rooted under the mplsStdMIB subtree. There are 2 MPLS MIB modules
contained in this document, each of the following "IANA
Considerations" subsections requests IANA for a new assignment under
the mplsStdMIB subtree. New assignments can only be made via a
Standards Action as specified in [RFC2434].

13.1. **IANA Considerations for MPLS-LC-ATM-STD-MIB**

The IANA is requested to assign { mplsStdMIB 9 } to the
MPLS-LC-ATM-STD-MIB module specified in this document.

13.2. **IANA Considerations for MPLS-LC-FR-STD-MIB**

The IANA is requested to assign { mplsStdMIB 10 } to the
MPLS-LC-FR-STD-MIB module specified in this document.

14.   **References**

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14.2 Informative References

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