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Thomas D. Nadeau, Ed.  
CA Technologies  
Agrahara S Kiran Koushik, Ed.  
Cisco Systems, Inc.  
Riza Cetin, Ed.  
Alcatel  
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Multiprotocol Label Switching (MPLS) Traffic Engineering Management  
Information Base for Fast Reroute  
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## Abstract

This memo defines a portion of the Management Information Base for use with network management protocols in the Internet community. In particular, it describes managed objects used to support two fast reroute (FRR) methods for Multiprotocol Label Switching (MPLS) based traffic engineering (TE). The two methods are one-to-one backup method and facility backup method.

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## [1. Introduction](#)

This memo defines a portion of the Management Information Base (MIB) containing objects used to manage Multiprotocol Label Switching (MPLS)-based fast rerouting features on MPLS Label Switching Routers as defined in [[RFC4090](#)]. This MIB module should be used in conjunction with [[RFC3811](#)], [[RFC3812](#)] and [[RFC3813](#)]. Comments should be made directly to the MPLS mailing list at [mpls@ietf.org](mailto:mpls@ietf.org).

### [1.1. Conventions Used in This Document](#)

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](#) [[RFC2119](#)].

## [2. Terminology](#)

This document uses terminology from the document describing the Multiprotocol Label Switching Architecture [[RFC3031](#)] and from the document describing Fast Reroute Extensions to RSVP-TE for LSP Tunnels [[RFC4090](#)].

## [3. 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 module 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. Overview of the MIB Modules

The specification [[RFC4090](#)] stipulates two different approaches to implementing MPLS TE fast reroute: one-to-one and facility backup.

We define three MIB modules to represent the respective components: general, one-to-one and facility backup.

They are:

- MPLS-FRR-GENERAL-STD-MIB: Contains objects that apply to any MPLS LSR(Label Switching Router) implementing MPLS TE fast reroute functionality.
- MPLS-FRR-ONE2ONE-STD-MIB: Contains objects that apply to one-to-one backup method.
- MPLS-FRR-FACILITY-STD-MIB: Contains objects that apply to facility backup method.

Although [[RFC4090](#)] specifies that a node is able to support both fast reroute methods simultaneously, common practice has shown that operators choose to configure either one-to-one backup method or facility backup at any given time. So by dividing the MIB modules into three, we allow the developers to choose the MIB modules they want to implement depending on the method supported on that node.

##### 4.1. MPLS-FRR-GENERAL-STD-MIB

This MIB module MUST be implemented if either of the fast reroute methods is implemented.

###### 4.1.1 mplsFrrConstraintsTable

This table contains objects that apply to all LSRs implementing MPLS TE fast reroute functions. In particular, this table defines fast reroute constraints such as bandwidth for a tunnel instance to be protected by using backup LSPs (detour LSPs or bypass tunnels).

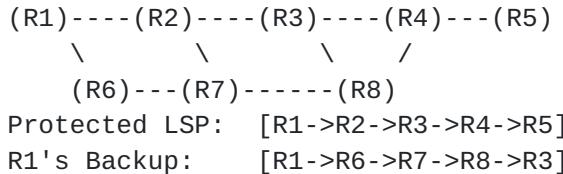
This table MUST be implemented at the ingress node of the protected TE tunnel instance to configure backup LSP setup

constraints.

#### **4.1.2 mplsFrrTunnelARHopTable**

This table extends `mplsTunnelARHopTable` (defined in the MPLS-TE-STD-MIB [[RFC3812](#)]) with fast-reroute objects which specify the local protection type or types of availability, as well as what type or types are actually in-use for each tunnel hop traversed by a protected TE tunnel.

#### **4.1.3 Example of relationship between various tables of MPLS-FRR-GENERAL-STD-MIB**



In the above topology the various tables will be populated as below on R1.

```

mplsFrrGeneralConstraintsTable
{
  mplsFrrGeneralConstraintsIfIndexOrZero = 10, -- Interface to protect
  mplsFrrGeneralConstraintsTunnelIndex = 1, -- Protecting tunnel
  mplsFrrGeneralConstraintsTunnelInstance = 0, -- Use any instance
  mplsFrrGeneralConstraintsProtectionType = 1, -- linkProtection
  mplsFrrGeneralConstraintsSetupPrio = 0,
  mplsFrrGeneralConstraintsHoldingPrio = 0,
  mplsFrrGeneralConstraintsInclAnyAffinity = 0,
  mplsFrrGeneralConstraintsInclAllAffinity = 0,
  mplsFrrGeneralConstraintsExclAnyAffinity = 0,
  mplsFrrGeneralConstraintsHopLimit = 0,
  mplsFrrGeneralConstraintsBandwidth = 0, -- best effort
  mplsFrrGeneralConstraintsStorageType = 2, -- volatile
  mplsFrrGeneralConstraintsRowStatus = 1, -- active
};

mplsFrrGeneralTunnelARHopEntry
{
  mplsFrrGeneralTunnelARHopSessionAttributeFlags = 5,
  -- SEStyleDesired | LocalProtectionDesired
}

```

```

mplsFrrGeneralTunnelARHopRROSubObjectFlags = 2
    -- LocalProtectionInUse
};

```

#### **4.2. MPLS-FRR-ONE2ONE-STD-MIB**

**This MIB module MUST be implemented if one-to-one backup fastreroute method is implemented.**

##### **4.2.1 mplsFrrOne2OnePlrTable**

The **mplsFrrOne2OnePlrTable** contains information about Points of Local Repair (PLR) that initiated detour LSPs to protect tunnel instances. This table MUST be supported for LSRs implementing the one-to-one backup method. In these cases, the detour LSPs are reflected in the **mplsFrrOne2OneDetourTable**.

##### **4.2.2 mplsFrrOne2OneDetourTable**

The **mplsFrrOne2OneDetourTable** shows the detour LSPs in each node (ingress, transit and egress nodes). An entry of this table represents a detour LSP.

Each detour is identified by the following indexes:

- **mplsTunnelIndex** [[RFC3812](#)]:  
set to the tunnel-id of an LSP protected by a detour.
- **mplsTunnelInstance** [[RFC3812](#)]: consists of two parts
  - 1) the higher 16 bits: - protected TE tunnel instance  
- uniquely identifies a protected LSP within a tunnel.
  - 2) the lower 16 bits: - detour instance  
- uniquely identifies a detour LSP of a protected TE tunnel instance.  
Multiple detours of the same protected LSP may go through the same node. In this case, the higher 16 bits of the tunnel instance object is used as a detour instance.
- ingress node's LSR ID (**mplsFrrOne2OnePlrTunnelIngressLSRId**):  
set to the ingress node of an LSP protected by a detour.
- egress node's LSR ID (**mplsFrrOne2OnePlrTunnelEgressLSRId**):

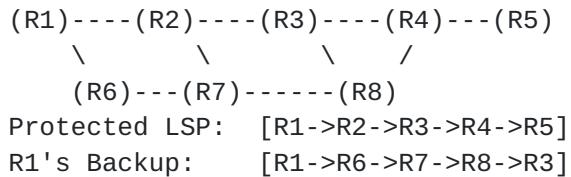
set to the egress node of an LSP protected by a detour. A detour LSP is also considered as an instance of a protected TE tunnel. Therefore, each detour LSP SHOULD have an entry in the mplsTunnelTable (defined in the MPLS-TE-STD-MIB[RFC3812]). The mplsTunnelTable entries are indexed using mplsTunnelIndex, mplsTunnelInstance, mplsTunnelIngressLSRId, and mplsTunnelEgressLSRId.

Entries where the higher 16 bits of mplsTunnelInstance are set to zero represent detour TE tunnel instances. All other values of the higher 16 bits represent protected tunnel instances.

This table MUST be supported if one-to-one backup method is used.

#### **4.2.3 Example of relationship between mplsFrrOne2OnePlrTable, mplsFrrOne2OneDetourTable and mplsTunnelTable**

This section contains an example depicting the inter relationship between the mplsFrrOne2OnePlrTable, mplsFrrOne2OneDetourTable and mplsTunnelTable tables.



In the above topology the various tables will be populated as below.

In mplsFrrOne2OnePlrTable:

```
{
    mplsFrrOne2OnePlrTunnelIndex          = 1,
    mplsFrrOne2OnePlrTunnelDetourInstance = 6553601,
    --
    -- (100 << 16 | 1) = 6553601
    -- 100 is the tunnel instance of the protected tunnel.
    --
    mplsFrrOne2OnePlrTunnelIngressLSRId   = 192.0.2.1, --R1
    mplsFrrOne2OnePlrTunnelEgressLSRId     = 192.0.2.5, --R5
    mplsFrrOne2OnePlrId                   = 192.0.2.1, --
                                                -- R1 is PLR
    mplsFrrOne2OnePlrSenderAddrType       = ipv4(1),
}
```

```

mplsFrrOne2OnePlrSenderAddr          = "192.0.2.1", -- R1
mplsFrrOne2OnePlrAvoidNodeAddrType   = ipv4(1),
mplsFrrOne2OnePlrAvoidNodeAddr       = "192.0.2.2",
                                         -- R1-R2(Avoid)
}

In mplsFrrOne2OneDetourTable:
{
    mplsFrrOne2OnePlrTunnelIndex        = 1,
    mplsFrrOne2OnePlrTunnelDetourInstance = 6553601,
    --
    -- (100 << 16 | 1) == 6553601
    --
    -- 1 is mplsTunnelInstance for the detour lsp
    -- from mplsTunnelTable. Marked by AAA below.
    -- Shift 16 to put this into the high order bits
    --
    -- 100 is mplsTunnelInstance for the protected tunnel
    -- from the mplsTunnelTable. Marked by BBB below.
    -- Need to OR the index value into low order bits)
    -- To get all detour lps of a protected tunnel(of instance 100)
    -- we could do a snmpwalk of the mplsFrrOne2OneDetourEntry
    -- where mplsFrrOne2OnePlrTunnelIndex == 1
    -- mplsFrrOne2OnePlrTunnelDetourInstance == 6553600
    -- The first value would be:
    --             mplsFrrOne2OneDetourActive.1.6553601
    mplsFrrOne2OnePlrTunnelIngressLSRID = 192.0.2.1, --R1
    mplsFrrOne2OnePlrTunnelEgressLSRID = 192.0.2.3, --R3
    mplsFrrOne2OneDetourActive         = false(2),
    mplsFrrOne2OneDetourMergedStatus   = notMerged(1),
    mplsFrrOne2OneDetourMergedDetourInst = 0,
}

In mplsTunnelTable(protected tunnel entry):
{
    mplsTunnelIndex          = 1,
    mplsTunnelInstance        = 100,-- Indicating protected tunnel
                                -- AAA
    mplsTunnelIngressLSRID   = 192.0.2.1,
    mplsTunnelEgressLSRID    = 192.0.2.5,
    mplsTunnelName           = "R1-R5",
    mplsTunnelDescr          = "R1-R5",
    mplsTunnelIsIf            = true (1),
    mplsTunnelXCPointer      = 0.0,
}

```

```

mplsTunnelSignallingProto      = none (1),
mplsTunnelSetupPrio           = 0,
mplsTunnelHoldingPrio         = 0,
mplsTunnelSessionAttributes   = 0,
mplsTunnelLocalProtectInUse  = true(1),
mplsTunnelResourcePointer     = mplsTunnelResourceMaxRate.5,
mplsTunnelInstancePriority    = 1,
mplsTunnelHopTableIndex       = 1,
mplsTunnelIncludeAnyAffinity  = 0,
mplsTunnelIncludeAllAffinity  = 0,
mplsTunnelExcludeAnyAffinity  = 0,
mplsTunnelPathInUse          = 1,
mplsTunnelRole                = head (1),
}
In mplsTunnelTable(detour lsp entry):
{
    mplsTunnelIndex              = 1,
    mplsTunnelInstance            = 1,
        -- Indicating detour lsp(higher 16 bits)
        -- BBB
    mplsTunnelIngressLSRId       = 192.0.2.1,
    mplsTunnelEgressLSRId        = 192.0.2.3,
    mplsTunnelName               = "R1-R3",
    mplsTunnelDescr              = "R1-R3",
    mplsTunnelIsIf                = true (1),
    mplsTunnelXCPPointer         = 0.0,
    mplsTunnelSignallingProto    = none (1),
    mplsTunnelSetupPrio          = 0,
    mplsTunnelHoldingPrio        = 0,
    mplsTunnelSessionAttributes  = 0,
    mplsTunnelLocalProtectInUse  = false (0),
    mplsTunnelResourcePointer    = mplsTunnelResourceMaxRate.6,
    mplsTunnelInstancePriority   = 1,
    mplsTunnelHopTableIndex      = 1,
    mplsTunnelIncludeAnyAffinity = 0,
    mplsTunnelIncludeAllAffinity = 0,
    mplsTunnelExcludeAnyAffinity = 0,
    mplsTunnelPathInUse          = 1,
    mplsTunnelRole                = head (1),
}

```

#### [4.3 MPLS-FRR-FACILITY-STD-MIB](#)

This MIB module **MUST** be implemented if facility backup  
fastreroute method is implemented.

#### [4.3.1 mplsFrrFacilityDBTable](#)

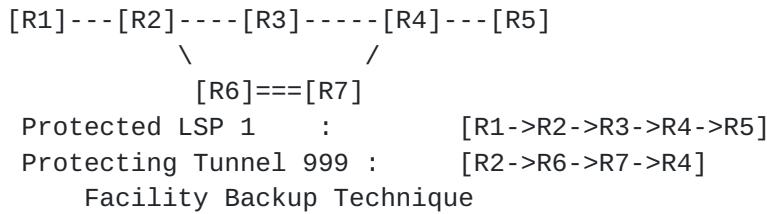
The **mplsFrrFacilityDBTable** provides information about the fast reroute database for facility-based fast reroute.

An entry is created in this table for each tunnel being protected by a backup tunnel. Backup tunnels are defined to protect the tunnels traversing an interface.

The protecting tunnel will exist on the PLR as per [[RFC4090](#)]. Protected tunnels are the LSPs that traverse the protected link.

#### [4.3.2 Example of relationship between various tables of](#)

##### MPLS-FRR-FACILITY-STD-MIB



In the above topology, the following tables are populated at R2:

```

mplsFrrFacilityDBEntry
{
    mplsFrrFacilityProtectedIfIndex      = 10,
    mplsFrrFacilityProtectingTunnelIndex = 999,
    mplsFrrFacilityBackupTunnelIndex     = 1,
    mplsFrrFacilityBackupTunnelInstance  = 0,
    mplsFrrFacilityBackupTunnelIngressLSRID =
    mplsFrrFacilityBackupTunnelEgressLSRID =
    mplsFrrFacilityDBNumProtectingTunnelOnIf = 1,
    mplsFrrFacilityDBNumProtectedLspOnIf   = 1,
    mplsFrrFacilityDBNumProtectedTunnels   = 1,
    mplsFrrFacilityDBProtectingTunnelStatus = 1, -- active
    mplsFrrFacilityDBProtectingTunnelResvBw = 0,
};

In mplsTunnelTable(protecting tunnel entry):
{
    mplsTunnelIndex          = 999, -- protecting tunnel index
    mplsTunnelInstance        = 0,   -- head
```

```

mplsTunnelIngressLSRID      = 192.0.2.2,
mplsTunnelEgressLSRID       = 192.0.2.4,
mplsTunnelName              = "R2-R4",
mplsTunnelDescr             = "R2-R4",
mplsTunnelIsIf               = true (1),
mplsTunnelXCPointer         = 0.0,
mplsTunnelSignallingProto   = none (1),
mplsTunnelSetupPrio          = 0,
mplsTunnelHoldingPrio        = 0,
mplsTunnelSessionAttributes  = 0,
mplsTunnelLocalProtectInUse = false(1),
mplsTunnelResourcePointer    = mplsTunnelResourceMaxRate.5,
mplsTunnelInstancePriority   = 1,
mplsTunnelHopTableIndex      = 1,
mplsTunnelIncludeAnyAffinity = 0,
mplsTunnelIncludeAllAffinity = 0,
mplsTunnelExcludeAnyAffinity = 0,
mplsTunnelPathInUse          = 1,
mplsTunnelRole                = head (1),
}

In mplsTunnelTable( Protected LSP ):
{
    mplsTunnelIndex           = 1, -- protected lsp tunnel index
    mplsTunnelInstance          = 100,-- Specific instance protected
    mplsTunnelIngressLSRID     = 192.0.2.1,
    mplsTunnelEgressLSRID      = 192.0.2.5,
    mplsTunnelName              = "R1-R5",
    mplsTunnelDescr             = "R1-R5",
    mplsTunnelIsIf               = false (2),
    mplsTunnelXCPointer         = 0.0,
    mplsTunnelSignallingProto   = none (1),
    mplsTunnelSetupPrio          = 0,
    mplsTunnelHoldingPrio        = 0,
    mplsTunnelSessionAttributes  = 0,
    mplsTunnelLocalProtectInUse = true (1),
    mplsTunnelResourcePointer    = mplsTunnelResourceMaxRate.6,
    mplsTunnelInstancePriority   = 1,
    mplsTunnelHopTableIndex      = 1,
    mplsTunnelIncludeAnyAffinity = 0,
    mplsTunnelIncludeAllAffinity = 0,
    mplsTunnelExcludeAnyAffinity = 0,
    mplsTunnelPathInUse          = 1,
    mplsTunnelRole                = transit (2),
}

```

## [5. Handling IPv6 Tunnels](#)

As described in [[RFC4990](#)], in order to support IPv6 MPLS tunnels in the mplsTunnelTable [[RFC3812](#)] all LSRs in the network MUST have a 32-bit LSR ID that can be used to identify the LSR with the existing mplsTunnelIngressLSRId and mplsTunnelEgressLSRId objects which are 32-bit long.

In this MIB, the following objects which refer to ingress/egress LSRs will have then the 32-bit LSR ID to support IPv6 tunnels:

- mplsFrrOne2OnePlrTunnelIngressLSRId and
- mplsFrrOne2OnePlrTunnelEgressLSRId objects of the mplsFrrOne2OnePlrTable,
- mplsFrrOne2OnePlrTunnelIngressLSRId and
- mplsFrrOne2OnePlrTunnelEgressLSRId objects of the mplsFrrOne2OneDetourTable
- mplsFrrFacilityBackupTunnelIngressLSRId and
- mplsFrrFacilityBackupTunnelEgressLSRId objects of the mplsFrrFacilityDBTable

## **6. MIB Module Definitions**

### **6.1. MPLS-FRR-GENERAL-STD-MIB Module:**

```
-- Start of MPLS-FRR-GENERAL-STD-MIB
MPLS-FRR-GENERAL-STD-MIB DEFINITIONS ::= BEGIN
    IMPORTS
        MODULE-IDENTITY, OBJECT-TYPE, mib-2,
        Unsigned32,
        Counter32
            FROM SNMPv2-SMI                                -- [RFC2578]
        MODULE-COMPLIANCE, OBJECT-GROUP
            FROM SNMPv2-CONF                               -- [RFC2580]
        RowStatus, StorageType
            FROM SNMPv2-TC                                -- [RFC2579]
        InterfaceIndexOrZero,
        ifGeneralInformationGroup,
        ifCounterDiscontinuityGroup
            FROM IF-MIB                                    -- [RFC2863]
        MplsTunnelIndex, MplsTunnelInstanceIndex,
        MplsBitRate,
        MplsTunnelAffinity
            FROM MPLS-TC-STD-MIB                          -- [RFC3811]
        mplsTunnelGroup, mplsTunnelScalarGroup,
        mplsTunnelARHopListIndex, mplsTunnelARHopIndex
            FROM MPLS-TE-STD-MIB                          -- [RFC3812]
;
```

```
mplsFrrGeneralMIB MODULE-IDENTITY
LAST-UPDATED
    "201106141200Z" -- 14 Jun 2011 12:00:00 GMT
ORGANIZATION
    "Multiprotocol Label Switching (MPLS) Working Group"
CONTACT-INFO
    "
        Riza Cetin
        Email: riza.cetin@alcatel.be
        Thomas D. Nadeau
        Email: tnadeau@lucidvision.com
        A S Kiran Koushik
        Email: kkoushik@cisco.com
        Stefaan De Cnodder
        Email: Stefaan.de_cnodder@alcatel.be
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        Email: dhg@juniper.net
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     of this MIB module is part of RFC xxxx; See the RFC itself
     for full legal notices.
-- RFC EDITOR: please replace xxxx with actual number
-- and remove this note.
    This MIB module contains generic object definitions for
    MPLS Traffic Engineering Fast Reroute as defined in
    RFC4090."
-- Revision history.
REVISION
    "201106141200Z" -- 14 Jun 2011 12:00:00 GMT
DESCRIPTION
    "Initial version. Published as RFC xxxx."
        -- RFC-editor pls fill in xxxx
::= { mib-2 XXX }      -- RFC-editor please fill in
                        -- yyy with value assigned by IANA,
                        -- see section 8.1 for details
-- Top level components of this MIB module.
mplsFrrGeneralObjects
    OBJECT IDENTIFIER ::= { mplsFrrGeneralMIB 1 }
```

```

mplsFrrGeneralConformance
    OBJECT IDENTIFIER ::= { mplsFrrGeneralMIB 2 }
-- MPLS Fast Reroute generic scalars.
mplsFrrGeneralProtectionMethod OBJECT-TYPE
    SYNTAX      INTEGER {
                    unknown(1),
                    oneToOneBackup(2),
                    facilityBackup(3)
                }
    MAX-ACCESS  read-write
    STATUS      current
    DESCRIPTION
        "Indicates which protection method is to be used for fast
         reroute on this device. Some devices may require a reboot
         if this variable is to take affect after being modified."
        ::= { mplsFrrGeneralObjects 1 }

mplsFrrGeneralIngressTunnelInstances OBJECT-TYPE
    SYNTAX      Counter32
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "The number of tunnel instances for either detour LSPs or
         bypass tunnels for which this LSR is the ingress."
        ::= { mplsFrrGeneralObjects 2 }

-- General FRR Table Section
-- These tables apply to both types of FRR
-- and should be implemented by all LSRs supporting
-- FRR.
-- MPLS Fast Reroute Constraints table
mplsFrrGeneralConstraintsTable OBJECT-TYPE
    SYNTAX      SEQUENCE OF MplsFrrGeneralConstraintsEntry
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "This table shows detour LSP or bypass tunnel setup
         constraints."
        ::= { mplsFrrGeneralObjects 3 }

mplsFrrGeneralConstraintsEntry OBJECT-TYPE
    SYNTAX      MplsFrrGeneralConstraintsEntry
    MAX-ACCESS  not-accessible
    STATUS      current

```

**DESCRIPTION**

"An entry in this table represents detour LSP or bypass tunnel setup constraints for an interface or link to be protected by detour LSPs or a bypass tunnel. Once the LSP or tunnel instance to be protected is identified in the mplsTunnelTable, the corresponding mplsTunnelIfIndex value of that tunnel can be used to get the ifIndex of the underlying physical interface using the ifStackTable. That ifIndex of the underlying physical interface will be used as mplsFrrGeneralConstraintsIfIndexOrZero in this table to protect the LSPs or tunnel instances determined earlier.

It is recommended that ifIndex persistence be enabled across re-initializations.

If persistence is not implemented then the value of mplsFrrGeneralConstraintsIfIndexOrZero in this table cannot be guaranteed across restarts and all entries in this table MUST NOT be persistent, or the values of mplsFrrGeneralConstraintsIfIndexOrZero MUST be reconstructed on restart.

SNMP Engines must only allow entries in this table to be created for tunnel instances that require fast-reroute as indicated by the presence of the FAST\_REROUTE Object in the signaling for the LSP in question.

An entry in this table can be created only if a corresponding entry in mplsTunnelTable exists with the same mplsTunnelIndex as mplsFrrGeneralConstraintsTunnelIndex.

Entries in this table are deleted when the corresponding entries in mplsTunnelTable are deleted.

It is recommended that entries in this table be persisted across reboots.

Entries indexed with mplsFrrGeneralConstraintsIfIndexOrZero set to 0 apply to all interfaces on this device for which the FRR feature can operate.

If the mplsTunnelInstance object is set to a value of 0, it indicates that the mplsTunnelEntry contains a tunnel ingress. This is typically how configuration of this feature is performed on devices where the actual protection LSP used is left up to the protecting tunnel. However, in cases where static configuration is possible, any valid tunnel instance is possible; however, it is STRONGLY RECOMMENDED that the instance index SHOULD use the following convention to identify backup LSPs:

- lower 16 bits : protected tunnel instance

- higher 16 bits: must be all zeros

"

REFERENCE "[Section 4.1 of RFC4090](#) and [Section 6.1 from RFC 3812](#)."

INDEX { mplsFrrGeneralConstraintsIfIndexOrZero,  
           mplsFrrGeneralConstraintsTunnelIndex,  
           mplsFrrGeneralConstraintsTunnelInstance }

}

::= { mplsFrrGeneralConstraintsTable 1 }

MplsFrrGeneralConstraintsEntry ::= SEQUENCE {

mplsFrrGeneralConstraintsIfIndexOrZero	InterfaceIndexOrZero,
mplsFrrGeneralConstraintsTunnelIndex	MplsTunnelIndex,
mplsFrrGeneralConstraintsTunnelInstance	MplsTunnelInstanceId,
mplsFrrGeneralConstraintsProtectionType	INTEGER,
mplsFrrGeneralConstraintsSetupPrio	Unsigned32,
mplsFrrGeneralConstraintsHoldingPrio	Unsigned32,
mplsFrrGeneralConstraintsInclAnyAffinity	MplsTunnelAffinity,
mplsFrrGeneralConstraintsInclAllAffinity	MplsTunnelAffinity,
mplsFrrGeneralConstraintsExclAnyAffinity	MplsTunnelAffinity,
mplsFrrGeneralConstraintsHopLimit	Unsigned32,
mplsFrrGeneralConstraintsBandwidth	MplsBitRate,
mplsFrrGeneralConstraintsStorageType	StorageType,
mplsFrrGeneralConstraintsRowStatus	RowStatus

}

mplsFrrGeneralConstraintsIfIndexOrZero OBJECT-TYPE

SYNTAX	InterfaceIndexOrZero
MAX-ACCESS	not-accessible
STATUS	current

#### DESCRIPTION

"Uniquely identifies an interface which a fast reroute protection tunnel is configured to potentially protect in the event of a fault. Entries with this index set to 0 indicates that the protection tunnel configured protects all interfaces on this device (i.e.: node protection)."

::= { mplsFrrGeneralConstraintsEntry 1 }

mplsFrrGeneralConstraintsTunnelIndex OBJECT-TYPE

SYNTAX	MplsTunnelIndex
MAX-ACCESS	not-accessible
STATUS	current

#### DESCRIPTION

"Uniquely identifies a tunnel in the mplsTunnelTable which is configured to possibly protect the interface(s) specified by mplsFrrGeneralConstraintsIfIndexOrZero in the event of a fault."

REFERENCE "mplsTunnelTable from [RFC3812](#)."

::= { mplsFrrGeneralConstraintsEntry 2 }

mplsFrrGeneralConstraintsTunnelInstance OBJECT-TYPE

SYNTAX	MplsTunnelInstanceId
MAX-ACCESS	not-accessible
STATUS	current

**DESCRIPTION**

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"Uniquely identifies an existing instance of this tunnel for which fast reroute is requested. Note that a value of 0 indicates that the configuration points at a tunnel head (as specified in [RFC3812](#)). This is typically how configuration of this feature is performed on devices where the actual protection LSP used is left up to the protecting tunnel. However, in cases where static configuration is possible, any valid tunnel instance is permissible. In these cases, it is recommended that the instance index follow the following convention as to make identification of backup LSPs easier:

- lower 16 bits : protected tunnel instance
- higher 16 bits: must be all zeros"

**::= { mplsFrrGeneralConstraintsEntry 3 }**

**mplsFrrGeneralConstraintsProtectionType OBJECT-TYPE**

SYNTAX        INTEGER { linkProtection(1),  
                  nodeProtection(2)

}

MAX-ACCESS    read-create

STATUS        current

**DESCRIPTION**

"Indicates type of the resource protection:  
linkProtection(1) indicates that this tunnel is  
setup to protect a particular link's resources.  
nodeProtection(2) indicates that this tunnel is  
setup to protect an entire node from failure.

"

REFERENCE "[Section 3 in RFC4090](#)."

DEFVAL { nodeProtection }

**::= { mplsFrrGeneralConstraintsEntry 4 }**

**mplsFrrGeneralConstraintsSetupPrio OBJECT-TYPE**

SYNTAX        Unsigned32 (0..7)

MAX-ACCESS    read-create

STATUS        current

**DESCRIPTION**

"Indicates the setup priority of the detour LSP  
or bypass tunnel."

**REFERENCE**

"[Section 4.7 in RFC 3209](#)"

DEFVAL { 7 }

**::= { mplsFrrGeneralConstraintsEntry 5 }**

mplsFrrGeneralConstraintsHoldingPrio OBJECT-TYPE

SYNTAX Unsigned32 (0..7)

MAX-ACCESS read-create

STATUS current

DESCRIPTION

"Indicates the holding priority for detour LSP  
or bypass tunnel."

REFERENCE

["Section 4.7 RFC 3209"](#)

DEFVAL { 0 }

::= { mplsFrrGeneralConstraintsEntry 6 }

mplsFrrGeneralConstraintsInclAnyAffinity OBJECT-TYPE

SYNTAX MplsTunnelAffinity

MAX-ACCESS read-create

STATUS current

DESCRIPTION

"Indicates the include-any link constraint for the  
detour LSP or bypass tunnel. A link satisfies the  
include-any constraint if and only if the constraint  
is zero, or the link and the constraint have a  
resource class in common."

REFERENCE

["Section 4.7 in RFC 3209"](#)

DEFVAL { 0 }

::= { mplsFrrGeneralConstraintsEntry 7 }

mplsFrrGeneralConstraintsInclAllAffinity OBJECT-TYPE

SYNTAX MplsTunnelAffinity

MAX-ACCESS read-create

STATUS current

DESCRIPTION

"Indicates the include-all link constraint for the  
detour LSP or bypass tunnel. A link satisfies the  
include-all constraint if and only if the link contains  
all of the administrative groups specified in the  
constraint."

REFERENCE

["Section 4.7 in RFC 3209"](#)

DEFVAL { 0 }

::= { mplsFrrGeneralConstraintsEntry 8 }

mplsFrrGeneralConstraintsExclAnyAffinity OBJECT-TYPE

SYNTAX MplsTunnelAffinity

MAX-ACCESS read-create

STATUS current

DESCRIPTION

"Indicates the exclude-any link constraint for the  
detour LSP or bypass tunnel. A link satisfies the  
exclude-any constraint if and only if the link contains  
none of the administrative groups specified in the

constraint."

REFERENCE

["Section 4.7 in RFC 3209"](#)

DEFVAL { 0 }

::= { mplsFrrGeneralConstraintsEntry 9 }

mplsFrrGeneralConstraintsHopLimit OBJECT-TYPE

SYNTAX Unsigned32(0..255)

MAX-ACCESS read-create

STATUS current

DESCRIPTION

"The maximum number of hops that the detour LSP or bypass tunnel may traverse."

REFERENCE

["Section 4.1 in RFC4090."](#)

DEFVAL { 32 }

::= { mplsFrrGeneralConstraintsEntry 10 }

mplsFrrGeneralConstraintsBandwidth OBJECT-TYPE

SYNTAX MplsBitRate

UNITS "kilobits per second"

MAX-ACCESS read-create

STATUS current

DESCRIPTION

"The maximum bandwidth specifically reserved for a detour LSP or bypass tunnel, in units of thousands of bits per second (Kbps). Note that setting this value to 0 indicates best-effort treatment."

DEFVAL { 0 }

::= { mplsFrrGeneralConstraintsEntry 11 }

mplsFrrGeneralConstraintsStorageType OBJECT-TYPE

SYNTAX StorageType

MAX-ACCESS read-create

STATUS current

DESCRIPTION

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

DEFVAL { volatile }

::= { mplsFrrGeneralConstraintsEntry 12 }

mplsFrrGeneralConstraintsRowStatus OBJECT-TYPE

SYNTAX RowStatus

MAX-ACCESS read-create

STATUS current

DESCRIPTION

"This object is used to create, modify, and/or delete a row in this table. When a row in this table is in active(1) state, no objects in that row can be modified except mplsFrrGeneralConstraintsRowStatus and mplsFrrGeneralConstraintsStorageType."



-- MPLS Fast Reroute Tunnel Actual Route Hop table

**mplsFrrGeneralTunnelARHopTable** OBJECT-TYPE

SYNTAX                   SEQUENCE OF **MplsFrrGeneralTunnelARHopEntry**

MAX-ACCESS               not-accessible

STATUS                   current

DESCRIPTION

"This table sparsely extends **mplsTunnelARHopTable** defined in the MPLS-TE-STD-MIB MIB module with fast-reroute objects. These objects specify the status of local protection including availability and active use, on a per-hop basis, of hops traversed by a protected tunnel."

**::= { mplsFrrGeneralObjects 4 }**

**mplsFrrGeneralTunnelARHopEntry** OBJECT-TYPE

SYNTAX                   **MplsFrrGeneralTunnelARHopEntry**

MAX-ACCESS               not-accessible

STATUS                   current

DESCRIPTION

"This entry contains fast-reroute protection status of a single protected tunnel hop."

INDEX {

**mplsTunnelARHopListIndex**,

**mplsTunnelARHopIndex**

}

**::= { mplsFrrGeneralTunnelARHopTable 1 }**

**MplsFrrGeneralTunnelARHopEntry**   **::= SEQUENCE {**

**mplsFrrGeneralTunnelARHopSessionAttributeFlags**   BITS,

**mplsFrrGeneralTunnelARHopRROSubObjectFlags**   BITS

**}**

**mplsFrrGeneralTunnelARHopSessionAttributeFlags** OBJECT-TYPE

SYNTAX                   BITS { **ARHopSessionAttrFlagsUnsupported(0)**,

**LocalProtectionDesired(1)**,

**LabelRecordingDesired(2)**,

**SEStyleDesired(3)**,

**BandwidthProtectionDesired(4)**,

**NodeProtectionDesired(5)**

}

MAX-ACCESS               read-only

STATUS                   current

DESCRIPTION

"This object indicates the desired values for the associated SESSION\_ATTRIBUTE flags. Note that since this object is a BITS type, the bits may be set to indicate various desired combinations of the SESSION ATTRIBUTE flags.

If SESSION\_ATTRIBUTE flags are not supported, then this object contains the value of **ARHopSessionAttrFlagsUnsupported(0)**."

REFERENCE

```

MPLS Fast-reroute MIB                               Sep 1, 2011
"See section 4.3 of RFC4090 for SESSION_ATTRIBUTE
flags."
 ::= { mplsFrrGeneralTunnelARHopEntry 1 }
mplsFrrGeneralTunnelARHopRROSubObjectFlags OBJECT-TYPE
SYNTAX          BITS { ARHopRROSubObjectFlagsUnsupported(0),
                      LocalProtectionAvailable(1),
                      LocalProtectionInUse(2),
                      BandwidthProtection(3),
                      NodeProtection(4)
}
MAX-ACCESS      read-only
STATUS          current
DESCRIPTION
"This object indicates the flags that are
currently in use by the associated RRO sub-object.
Note that since this object is a BITS type,
the bits may be set to indicate various combinations of
the flags.
If RRO sub-object is not supported, then this object
contains the value of
ARHopRROSubObjectFlagsUnsupported(0)."
REFERENCE
"See section 4.4 of RFC4090."
 ::= { mplsFrrGeneralTunnelARHopEntry 2 }
-- Notifications
-- Module Conformance Statement
mplsFrrGeneralCompliances
OBJECT IDENTIFIER ::= {mplsFrrGeneralConformance 1 }
mplsFrrGeneralGroups
OBJECT IDENTIFIER ::= {mplsFrrGeneralConformance 2 }
mplsFrrGeneralModuleFullCompliance MODULE-COMPLIANCE
STATUS current
DESCRIPTION
"Compliance statements for SNMP Engines that support
the MPLS-FRR-GENERAL-STD-MIB MIB module."
MODULE IF-MIB -- The Interfaces Group MIB module, RFC 2863.
MANDATORY-GROUPS {
    ifGeneralInformationGroup,
    ifCounterDiscontinuityGroup
}
MODULE MPLS-TE-STD-MIB   -- The MPLS Traffic Engineering
                         -- MIB module, RFC 3812
MANDATORY-GROUPS {
    mplsTunnelGroup,
    mplsTunnelScalarGroup
}

```

```

}

MODULE -- this module
MANDATORY-GROUPS {
    mplsFrrGeneralScalarGroup,
    mplsFrrGeneralTunnelARHopGroup,
    mplsFrrGeneralConstraintsGroup
}
OBJECT      mplsFrrGeneralConstraintsRowStatus
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."
 ::= { mplsFrrGeneralCompliances 1 }
mplsFrrGeneralModuleReadOnlyCompliance MODULE-COMPLIANCE
STATUS current
DESCRIPTION
    "Compliance statements for SNMP Engines that support
     the MPLS-FRR-GENERAL-STD-MIB MIB module."
MODULE
MANDATORY-GROUPS {
    mplsFrrGeneralScalarGroup,
    mplsFrrGeneralTunnelARHopGroup,
    mplsFrrGeneralConstraintsGroup
}
-- Scalars
OBJECT      mplsFrrGeneralProtectionMethod
MIN-ACCESS  read-only
DESCRIPTION
    "Write access is not required."
-- mplsFrrGeneralConstraintsTable
OBJECT      mplsFrrGeneralConstraintsSetupPrio
MIN-ACCESS  read-only
DESCRIPTION
    "Write access is not required."
OBJECT      mplsFrrGeneralConstraintsHoldingPrio
MIN-ACCESS  read-only
DESCRIPTION

```

```
    "Write access is not required."
OBJECT      mplsFrrGeneralConstraintsInclAnyAffinity
MIN-ACCESS  read-only
DESCRIPTION
    "Write access is not required."
OBJECT      mplsFrrGeneralConstraintsInclAllAffinity
MIN-ACCESS  read-only
DESCRIPTION
    "Write access is not required."
OBJECT      mplsFrrGeneralConstraintsExclAnyAffinity
MIN-ACCESS  read-only
DESCRIPTION
    "Write access is not required."
OBJECT      mplsFrrGeneralConstraintsBandwidth
MIN-ACCESS  read-only
DESCRIPTION
    "Write access is not required."
OBJECT      mplsFrrGeneralConstraintsProtectionType
MIN-ACCESS  read-only
DESCRIPTION
    "Write access is not required."
OBJECT      mplsFrrGeneralConstraintsHopLimit
MIN-ACCESS  read-only
DESCRIPTION
    "Write access is not required."
OBJECT      mplsFrrGeneralConstraintsStorageType
MIN-ACCESS  read-only
DESCRIPTION
    "Write access is not required."
OBJECT      mplsFrrGeneralConstraintsRowStatus
SYNTAX     RowStatus { active(1) }
MIN-ACCESS  read-only
DESCRIPTION
    "Write access is not required."
 ::= { mplsFrrGeneralCompliances 2 }
-- Units of conformance
mplsFrrGeneralScalarGroup OBJECT-GROUP
OBJECTS {
```

```
        mplsFrrGeneralIngressTunnelInstances,
        mplsFrrGeneralProtectionMethod
    }
STATUS      current
DESCRIPTION
    "Objects that are required to display general fast reroute
     information."
 ::= { mplsFrrGeneralGroups 1 }
mplsFrrGeneralConstraintsGroup OBJECT-GROUP
OBJECTS {
    mplsFrrGeneralConstraintsProtectionType,
    mplsFrrGeneralConstraintsSetupPrio,
    mplsFrrGeneralConstraintsHoldingPrio,
    mplsFrrGeneralConstraintsInclAnyAffinity,
    mplsFrrGeneralConstraintsInclAllAffinity,
    mplsFrrGeneralConstraintsExclAnyAffinity,
    mplsFrrGeneralConstraintsHopLimit,
    mplsFrrGeneralConstraintsBandwidth,
    mplsFrrGeneralConstraintsStorageType,
    mplsFrrGeneralConstraintsRowStatus
}
STATUS      current
DESCRIPTION
    "Objects that are required to configure fast reroute
     constraints at the ingress LSR of the tunnel that requires
     fast reroute service."
 ::= { mplsFrrGeneralGroups 2 }
mplsFrrGeneralTunnelARHopGroup          OBJECT-GROUP
OBJECTS {
    mplsFrrGeneralTunnelARHopSessionAttributeFlags,
    mplsFrrGeneralTunnelARHopRROSubObjectFlags
}
STATUS      current
DESCRIPTION
    "Objects that are required to present per hop fast-reroute
     protection status."
 ::= { mplsFrrGeneralGroups 3}
END
-- End of MPLS-FRR-GENERAL-STD-MIB
6.2. MPLS-FRR-ONE2ONE-STD-MIB
-- Start of MPLS-FRR-ONE2ONE-STD-MIB
```

MPLS-FRR-ONE2ONE-STD-MIB DEFINITIONS ::= BEGIN  
IMPORTS  
    MODULE-IDENTITY, OBJECT-TYPE, mib-2,  
    Integer32, Gauge32  
        FROM SNMPv2-SMI -- [[RFC2578](#)]  
    MODULE-COMPLIANCE, OBJECT-GROUP  
        FROM SNMPv2-CONF -- [[RFC2580](#)]  
    TruthValue  
        FROM SNMPv2-TC -- [[RFC2579](#)]  
    MplsTunnelIndex, MplsTunnelInstanceIndex,  
    MplsLsrIdentifier  
        FROM MPLS-TC-STD-MIB -- [[RFC3811](#)]  
    InetAddressType, InetAddress  
        FROM INET-ADDRESS-MIB -- [[RFC4001](#)]  
    mplsFrrGeneralScalarGroup, mplsFrrGeneralTunnelARHopGroup,  
    mplsFrrGeneralConstraintsGroup  
        FROM MPLS-FRR-GENERAL-STD-MIB  
;  
mplsFrrOne2OneMIB MODULE-IDENTITY  
LAST-UPDATED  
    "201106141200Z" -- 14 Jun 2011 12:00:00 GMT  
ORGANIZATION  
    "Multiprotocol Label Switching (MPLS) Working Group"  
CONTACT-INFO  
    "  
        Riza Cetin  
        Email: riza.cetin@alcatel.be  
        Thomas D. Nadeau  
        Email: tom.nadeau@bt.com  
        A S Kiran Koushik  
        Email: kkoushik@cisco.com  
        Stefaan De Cnodder  
        Email: Stefaan.de\_cnodder@alcatel.be  
        Der-Hwa Gan  
        Email: dhg@juniper.net  
    "  
DESCRIPTION  
    "Copyright (c) 2011 IETF Trust and the persons identified  
    as the document authors. All rights reserved. This version  
    of this MIB module is part of RFC xxxx; See the RFC itself  
    for full legal notices.  
-- RFC EDITOR: please replace xxxx with actual number

```
-- and remove this note.  
    This MIB module contains object definitions for  
    MPLS Traffic Engineering one-to-one backup method for  
    Fast Reroute as defined in RFC4090."  
-- Revision history.  
REVISION  
    "201106141200Z" -- 14 Jun 2011 12:00:00 GMT  
DESCRIPTION  
    "Initial version. Published as RFC xxxx."  
                -- RFC-editor pls fill in xxxx  
 ::= { mib-2 YYY }      -- RFC-editor please fill in  
                -- yyy with value assigned by IANA,  
                -- see section 8.2 for details  
-- Top level components of this MIB module.  
mplsFrrOne2OneObjects OBJECT IDENTIFIER  
    ::= { mplsFrrOne2OneMIB 1 }  
mplsFrrOne2OneConformance OBJECT IDENTIFIER  
    ::= { mplsFrrOne2OneMIB 2 }  
-- Scalar objects defined for 1-to-1 style FRR  
mplsFrrIncomingDetourLSPs OBJECT-TYPE  
    SYNTAX      Integer32 (0..2147483647)  
    MAX-ACCESS  read-only  
    STATUS      current  
DESCRIPTION  
    "The number of detour LSPs entering the device."  
    ::= { mplsFrrOne2OneObjects 1 }  
mplsFrrOutgoingDetourLSPs OBJECT-TYPE  
    SYNTAX      Integer32 (0..2147483647)  
    MAX-ACCESS  read-only  
    STATUS      current  
DESCRIPTION  
    "The number of detour LSPs leaving the device."  
    ::= { mplsFrrOne2OneObjects 2 }  
mplsFrrOne2OneDetourOriginating OBJECT-TYPE  
    SYNTAX      Integer32(0..2147483647)  
    MAX-ACCESS  read-only  
    STATUS      current  
DESCRIPTION  
    "The number of detour LSPs originating at this PLR."  
    ::= { mplsFrrOne2OneObjects 3 }
```

```
mplsFrrActiveProtectedLSPs OBJECT-TYPE
    SYNTAX          Gauge32
    MAX-ACCESS     read-only
    STATUS         current
    DESCRIPTION
        "Indicates the number of LSPs currently protected by
         the FRR feature where this device acts as the PLR
         for those LSPs."
    ::= { mplsFrrOne2OneObjects 4 }

-- One-to-One Specific Tables
--

-- Tables in this section pertain only to the 1-1
-- style of FRR.
--

-- MPLS Fast Reroute Point of Local Repair table
mplsFrrOne2OnePlrTable OBJECT-TYPE
    SYNTAX          SEQUENCE OF MplsFrrOne2OnePlrEntry
    MAX-ACCESS     not-accessible
    STATUS         current
    DESCRIPTION
        "This table shows a list of protected TE tunnels with
         the corresponding protecting tunnel, as well as the PLR
         where the protecting tunnel that initiated the detour
         LSPs traverse this node."
    ::= { mplsFrrOne2OneObjects 5 }

mplsFrrOne2OnePlrEntry OBJECT-TYPE
    SYNTAX          MplsFrrOne2OnePlrEntry
    MAX-ACCESS     not-accessible
    STATUS         current
    DESCRIPTION
        "An entry in this table represents a protected tunnel LSP
         together with its detour tunnel instance. An entry in
         this table is only created by an SNMP engine as instructed
         by an MPLS signaling protocol.
         The entries of this table are present in all LSRs on the path
         of the detour LSP.
         The objects mplsFrrOne2OnePlrSenderAddrType and
         mplsFrrOne2OnePlrSenderAddr can be modified after the row
         is created.
         The objects mplsFrrOne2OnePlrTunnelIndex,
```

mplsFrrOne2OnePlrTunnelDetourInstance,  
 mplsFrrOne2OnePlrTunnelIngressLSRID  
 and mplsFrrOne2OnePlrTunnelEgressLSRID have the same values as  
 the objects mplsTunnelIndex, mplsTunnelInstance,  
 mplsTunnelIngressLSRID and mplsTunnelEgressLSRID of the detour  
 tunnel instance created in the mplsTunnelTable  
 (MPLS-TE-STD-MIB).  
 The entries in this table will be deleted when the  
 corresponding entries in the mplsTunnelTable are deleted."  
**INDEX** { mplsFrrOne2OnePlrTunnelIndex, -- from MPLS-TE-STD-MIB  
           mplsFrrOne2OnePlrTunnelDetourInstance, -- mplsTunnelTable  
           mplsFrrOne2OnePlrTunnelIngressLSRID, -- Tunnels must exist  
           mplsFrrOne2OnePlrTunnelEgressLSRID, -- a priori  
           mplsFrrOne2OnePlrId      }  
**::=** { mplsFrrOne2OnePlrTable 1 }  
**MplsFrrOne2OnePlrEntry ::= SEQUENCE {**  
   mplsFrrOne2OnePlrTunnelIndex          MplsTunnelIndex,  
   mplsFrrOne2OnePlrTunnelDetourInstance  MplsTunnelInstanceId,  
   mplsFrrOne2OnePlrTunnelIngressLSRID   MplsLsrIdentifier,  
   mplsFrrOne2OnePlrTunnelEgressLSRID    MplsLsrIdentifier,  
   mplsFrrOne2OnePlrId                    MplsLsrIdentifier,  
   mplsFrrOne2OnePlrSenderAddrType      InetAddressType,  
   mplsFrrOne2OnePlrSenderAddr        InetAddress,  
   mplsFrrOne2OnePlrAvoidNodeAddrType   InetAddressType,  
   mplsFrrOne2OnePlrAvoidNodeAddr      InetAddress  
**}**  
**mplsFrrOne2OnePlrTunnelIndex OBJECT-TYPE**  
  **SYNTAX**          MplsTunnelIndex  
  **MAX-ACCESS**     not-accessible  
  **STATUS**          current  
  **DESCRIPTION**  
    "Uniquely identifies a tunnel between a pair of LSRs  
    from the mplsTunnelEntry."  
**::=** { mplsFrrOne2OnePlrEntry 1 }  
**mplsFrrOne2OnePlrTunnelDetourInstance OBJECT-TYPE**  
  **SYNTAX**          MplsTunnelInstanceId  
  **MAX-ACCESS**     not-accessible  
  **STATUS**          current  
  **DESCRIPTION**  
    "Uniquely identifies a detour instance of a tunnel from  
    the mplsTunnelEntry.  
    - lower 16 bits : protected tunnel instance  
    - higher 16 bits: detour instance"  
**::=** { mplsFrrOne2OnePlrEntry 2 }

```

mplsFrrOne2OnePlrTunnelIngressLSRId OBJECT-TYPE
    SYNTAX      MplsLsrIdentifier
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "The purpose of this object is to uniquely identify a
         tunnel within a network. When the MPLS signalling
         protocol is rsvp(2) this object SHOULD contain the
         same value as the Extended Tunnel Id field in the
         SESSION object. When the MPLS signalling protocol
         is crldp(3) this object SHOULD contain the same
         value as the Ingress LSR Router ID field in the
         LSPID TLV object.

        This value represents the head-end of the protected
        tunnel instance."
    REFERENCE
        "Sectopn 4.7 in RFC3209"
        ::= { mplsFrrOne2OnePlrEntry 3 }

mplsFrrOne2OnePlrTunnelEgressLSRId OBJECT-TYPE
    SYNTAX      MplsLsrIdentifier
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "Specifies the egress LSR ID of the protected tunnel instance."
        ::= { mplsFrrOne2OnePlrEntry 4 }

mplsFrrOne2OnePlrId OBJECT-TYPE
    SYNTAX      MplsLsrIdentifier
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "This value represents the PLR that has initiated a detour LSP
         to protect a tunnel instance.

        This value is signalled via the DETOUR object defined in MPLS
         RSVP protocol."
    REFERENCE
        "Section 4.2 of RFC4090"
        ::= { mplsFrrOne2OnePlrEntry 5 }

mplsFrrOne2OnePlrSenderAddrType OBJECT-TYPE
    SYNTAX      InetAddressType
    MAX-ACCESS  read-write
    STATUS      current
    DESCRIPTION
        "Denotes the address type of this detour instance's sender
         address."

```

```

DEFVAL      { ipv4 }
 ::= { mplsFrrOne2OnePlrEntry 6 }
mplsFrrOne2OnePlrSenderAddr OBJECT-TYPE
SYNTAX      InetAddress
MAX-ACCESS   read-write
STATUS       current
DESCRIPTION
    "The IP address of the PLR which has initiated the detour LSP.
     The type of this address is determined by the value of the
     mplsFrrOne2OnePlrSenderAddrType object."
 ::= { mplsFrrOne2OnePlrEntry 7 }
mplsFrrOne2OnePlrAvoidNodeAddrType OBJECT-TYPE
SYNTAX      InetAddressType
MAX-ACCESS   read-only
STATUS       current
DESCRIPTION
    "Denotes the address type of the node that this PLR tries to
     avoid."
DEFVAL      { ipv4 }
 ::= { mplsFrrOne2OnePlrEntry 8 }
mplsFrrOne2OnePlrAvoidNodeAddr OBJECT-TYPE
SYNTAX      InetAddress
MAX-ACCESS   read-only
STATUS       current
DESCRIPTION
    "The IP address of the node that this PLR tries to avoid.
     The type of this address is determined by the value of the
     mplsFrrOne2OnePlrAvoidNodeAddrType object.
     This value is signalled via the DETOUR object defined in MPLS
     RSVP protocol."
REFERENCE
    "Section 4.2 of RFC4090"
 ::= { mplsFrrOne2OnePlrEntry 9 }
-- MPLS One-To-One Fast Reroute Detour table.
mplsFrrOne2OneDetourTable OBJECT-TYPE
SYNTAX      SEQUENCE OF MplsFrrOne2OneDetourEntry
MAX-ACCESS   not-accessible
STATUS       current
DESCRIPTION
    "This table shows detour LSPs."
 ::= { mplsFrrOne2OneObjects 6 }
mplsFrrOne2OneDetourEntry OBJECT-TYPE
SYNTAX      MplsFrrOne2OneDetourEntry

```

```

MAX-ACCESS    not-accessible
STATUS        current
DESCRIPTION
  "An entry in this table represents a detour. An entry in this
  table is only created by an SNMP engine as instructed by an
  MPLS signaling protocol. "
INDEX {
  mplsFrrOne2OnePlrTunnelIndex,      -- from MPLS-TE-STD-MIB
  mplsFrrOne2OnePlrTunnelDetourInstance, -- mplsTunnelTable
  mplsFrrOne2OnePlrTunnelIngressLSRId, -- Tunnels must exist
  mplsFrrOne2OnePlrTunnelEgressLSRId   -- a priori
}
 ::= { mplsFrrOne2OneDetourTable 1 }
MplsFrrOne2OneDetourEntry ::= SEQUENCE {
  mplsFrrOne2OneDetourActive          TruthValue,
  mplsFrrOne2OneDetourMergedStatus    INTEGER,
  mplsFrrOne2OneDetourMergedDetourInst MplsTunnelInstanceId
}
mplsFrrOne2OneDetourActive OBJECT-TYPE
  SYNTAX          TruthValue
  MAX-ACCESS     read-only
  STATUS         current
  DESCRIPTION
    "Indicates whether or not the main LSP has switched over to
    this detour LSP.
    If the value of this object is 'true', then it means that
    the main LSP has switched over to this detour LSP. Otherwise
    it contains a value of 'false'.
    This is only relevant for detours originated by this node."
 ::= { mplsFrrOne2OneDetourEntry 1 }
mplsFrrOne2OneDetourMergedStatus OBJECT-TYPE
  SYNTAX          INTEGER { notMerged(1),
                           mergedWithProtectedTunnel(2),
                           mergedWithDetour(3)
                         }
  MAX-ACCESS     read-only
  STATUS         current
  DESCRIPTION
    "This value represents whether or not this detour is merged.
    This value is set to notMerged(1) if this detour is not
    merged.
    This value is set to mergedWithProtectedTunnel(2) if
    this detour is merged with the protected tunnel. This value
    is mergedWithDetour(3) if this detour is merged
    with another detour protecting the same tunnel."

```

```

 ::= { mplsFrrOne2OneDetourEntry 2 }
mplsFrrOne2OneDetourMergedDetourInst OBJECT-TYPE
    SYNTAX      MplsTunnelInstanceIndex
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "This value represents the mplsTunnelInstance of the detour
         with which this detour is merged. This object is only valid
         when mplsFrrOne2OneDetourMergedStatus is set to
         mergedWithDetour(3).
        - lower 16 bits : protected tunnel instance
        - higher 16 bits: detour instance"
 ::= { mplsFrrOne2OneDetourEntry 3 }
-- Module Conformance Statement
mplsFrrOne2OneCompliances
    OBJECT IDENTIFIER ::= {mplsFrrOne2OneConformance 1 }
mplsFrrOne2OneGroups
    OBJECT IDENTIFIER ::= {mplsFrrOne2OneConformance 2 }
mplsFrrOne2OneModuleFullCompliance MODULE-COMPLIANCE
    STATUS current
    DESCRIPTION
        "Compliance statements for SNMP Engines that support the
         MPLS-FRR-ONE2ONE-STD-MIB MIB module."
MODULE MPLS-FRR-GENERAL-STD-MIB -- MPLS FRR Generic MIB
    MANDATORY-GROUPS {
        mplsFrrGeneralScalarGroup,
        mplsFrrGeneralTunnelARHopGroup,
        mplsFrrGeneralConstraintsGroup
    }
    MODULE -- this module
    MANDATORY-GROUPS {
        mplsFrrOne2OneScalarsGroup,
        mplsFrrOne2OnePLRDetourGroup,
        mplsFrrOne2OnePlrGroup
    }
 ::= { mplsFrrOne2OneCompliances 1 }
mplsFrrOne2OneModuleReadOnlyCompliance MODULE-COMPLIANCE
    STATUS current
    DESCRIPTION

```

```

"Compliance statements for SNMP Engines that support the
MPLS-FRR-ONE2ONE-STD-MIB MIB module."
MODULE
  MANDATORY-GROUPS {
    mplsFrrOne2OneScalarsGroup,
    mplsFrrOne2OnePLRDetourGroup,
    mplsFrrOne2OnePlrGroup
  }
-- mplsFrrOne2OnePlrTable
OBJECT      mplsFrrOne2OnePlrSenderAddrType
MIN-ACCESS   read-only
DESCRIPTION
  "Write access is not required."
OBJECT      mplsFrrOne2OnePlrSenderAddr
MIN-ACCESS   read-only
DESCRIPTION
  "Write access is not required."
 ::= { mplsFrrOne2OneCompliances 2 }
-- Units of conformance
mplsFrrOne2OneScalarsGroup OBJECT-GROUP
  OBJECTS {
    mplsFrrIncomingDetourLSPs,
    mplsFrrOutgoingDetourLSPs,
    mplsFrrOne2OneDetourOriginating,
    mplsFrrActiveProtectedLSPs
  }
  STATUS      current
  DESCRIPTION
    "Objects that are required for general One-2-One PLR
     information."
 ::= { mplsFrrOne2OneGroups 1 }
mplsFrrOne2OnePLRDetourGroup OBJECT-GROUP
  OBJECTS {
    mplsFrrOne2OneDetourActive,
    mplsFrrOne2OneDetourMergedStatus,
    mplsFrrOne2OneDetourMergedDetourInst
  }
  STATUS      current
  DESCRIPTION
    "Objects that are required to present the detour LSP
     information at the detour ingress, transit and egress LSRs."
 ::= { mplsFrrOne2OneGroups 2 }

```

```

mplsFrrOne2OnePlrGroup OBJECT-GROUP
OBJECTS {
    mplsFrrOne2OnePlrSenderAddrType,
    mplsFrrOne2OnePlrSenderAddr,
    mplsFrrOne2OnePlrAvoidNodeAddrType,
    mplsFrrOne2OnePlrAvoidNodeAddr
}
STATUS      current
DESCRIPTION
    "Objects that are required to represent the FRR
     One-2-One PLR information."
 ::= { mplsFrrOne2OneGroups 3 }
END
-- End of MPLS-FRR-ONE2ONE-STD-MIB
6.3. MPLS-FRR-FACILITY-STD-MIB
-- Start of MPLS-FRR-FACILITY-STD-MIB
MPLS-FRR-FACILITY-STD-MIB DEFINITIONS ::= BEGIN
IMPORTS
    MODULE-IDENTITY, OBJECT-TYPE, mib-2,
    Integer32,
    NOTIFICATION-TYPE, Gauge32
        FROM SNMPv2-SMI                                -- [RFC2578]
    MODULE-COMPLIANCE, OBJECT-GROUP,
    NOTIFICATION-GROUP
        FROM SNMPv2-CONF                             -- [RFC2580]
    TruthValue
        FROM SNMPv2-TC                               -- [RFC2579]
    InterfaceIndex
        FROM IF-MIB                                 -- [RFC2863]
    MplsTunnelIndex, MplsTunnelInstanceIndex,
    MplsLsrIdentifier, MplsBitRate
        FROM MPLS-TC-STD-MIB                         -- [RFC3811]
    mplsFrrGeneralScalarGroup, mplsFrrGeneralTunnelARHopGroup,
    mplsFrrGeneralConstraintsGroup
        FROM MPLS-FRR-GENERAL-STD-MIB
;
mplsFrrFacilityMIB MODULE-IDENTITY
LAST-UPDATED
    "201106141200Z" -- 14 Jun 2011 12:00:00 GMT
ORGANIZATION

```

"Multiprotocol Label Switching (MPLS) Working Group"

CONTACT-INFO

"

Riza Cetin

Email: riza.cetin@alcatel.be

Thomas D. Nadeau

Email: tom.nadeau@bt.com

A S Kiran Koushik

Email: kkoushik@cisco.com

Stefaan De Cnodder

Email: Stefaan.de\_cnodder@alcatel.be

Der-Hwa Gan

Email: dhg@juniper.net

"

DESCRIPTION

"Copyright (C) 2011 The IETF Trust. This version of this MIB module is part of RFC xxxx; See the RFC itself for full legal notices.

-- RFC EDITOR: please replace xxxx with actual number  
-- and remove this note.

This MIB module contains object definitions for  
MPLS Traffic Engineering facility backup method for  
Fast Reroute as defined in [RFC4090](#)."

-- Revision history.

REVISION

"201106141200Z" -- 14 Jun 2011 12:00:00 GMT

DESCRIPTION

"Initial version. Published as RFC xxxx."

-- RFC-editor pls fill in xxxx

::= { mib-2 ZZZ } -- RFC-editor please fill in  
-- yyy with value assigned by IANA,  
-- see [section 8.3](#) for details

-- Top level components of this MIB module.

mplsFrrFacilityNotifications OBJECT IDENTIFIER  
::= { mplsFrrFacilityMIB 0 }

mplsFrrFacilityObjects OBJECT IDENTIFIER  
::= { mplsFrrFacilityMIB 1 }

mplsFrrFacilityConformance OBJECT IDENTIFIER  
::= { mplsFrrFacilityMIB 2 }

```
-- Scalar objects defined for Facility Backup style FRR
mplsFrrConfiguredInterfaces OBJECT-TYPE
    SYNTAX      Integer32(0..2147483647)
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "Indicates the number of MPLS interfaces configured for
         protection."
    DEFVAL { 0 }
    ::= { mplsFrrFacilityObjects 1 }

mplsFrrActiveInterfaces OBJECT-TYPE
    SYNTAX      Gauge32
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "Indicates the number of interfaces currently being
         protected. This value MUST be less than or equal
         to mplsFrrConfiguredInterfaces."
    DEFVAL { 0 }
    ::= { mplsFrrFacilityObjects 2 }

mplsFrrConfiguredBypassTunnels OBJECT-TYPE
    SYNTAX      Gauge32
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "Indicates the number of bypass tunnels configured to
         protect TE tunnels on this LSR."
    DEFVAL { 0 }
    ::= { mplsFrrFacilityObjects 3 }

mplsFrrActiveBypassTunnels OBJECT-TYPE
    SYNTAX      Gauge32
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "Indicates the number of bypass tunnels indicated in
         mplsFrrConfiguredBypassTunnels whose operStatus
         is up(1) indicating that they are currently protecting
         TE tunnels on this LSR."
    DEFVAL { 0 }
    ::= { mplsFrrFacilityObjects 4 }

mplsFrrFacilityNotificationsEnabled OBJECT-TYPE
```

```

SYNTAX          TruthValue
MAX-ACCESS      read-write
STATUS          current
DESCRIPTION
  "Enables or disables FRR notifications defined in this
  MIB module. Notifications are disabled by default.
  This object is needed to control the notifications
  emitted by this implementation."
DEFVAL { false }
 ::= { mplsFrrFacilityObjects 5 }
mplsFrrFacilityNotificationsMaxRate OBJECT-TYPE
  SYNTAX        Gauge32
  UNITS         "Notifications per Second"
  MAX-ACCESS    read-write
  STATUS        current
  DESCRIPTION
    "This variable indicates the maximum number of
    notifications issued per second. If events occur
    more rapidly, the implementation may simply fail to
    emit these notifications during that period, or may
    queue them until an appropriate time. In case the
    implementation chooses to drop the events during
    throttling instead of queuing them to be sent at a later
    time, it is assumed that there will be no indication
    that events are being thrown away.
    A value of 0 means no throttling is applied and
    events may be generated at the rate at which they occur."
DEFVAL      { 0 }
 ::= { mplsFrrFacilityObjects 6 }
--
-- Facility-based FRR-specific Tables
--
-- Tables in this section pertain only to the facility-
-- based style of FRR.
--
mplsFrrFacilityDBTable OBJECT-TYPE
  SYNTAX        SEQUENCE OF MplsFrrFacilityDBEntry
  MAX-ACCESS    not-accessible
  STATUS        current
  DESCRIPTION
    "The mplsFrrFacilityDBTable provides information about the
    fast reroute database. Each entry belongs to a protected
    interface, protecting backup tunnel and protected tunnel.
    MPLS interfaces defined on this node are protected by
    backup tunnels and are indicated by the index
    mplsFrrFacilityProtectedIfIndex. If the interface index is

```

set to 0, this indicates that the remaining indexes apply to all configured protected interfaces.

Note that all objects in this table are read-only and if new objects are added to this table, they should also be read-only.

It is recommended that ifIndex persistence be enabled across re-initializations.

If persistence is not implemented then the value of mplsFrrFacilityProtectedIfIndex in this table cannot be guaranteed across restarts and all entries in this table MUST NOT be persistent, or the values of mplsFrrFacilityProtectedIfIndex MUST be reconstructed on restart.

It is recommended that entries in this table be persisted across reboots.

The protecting tunnel is indicated by the index mplsFrrFacilityProtectingTunnelIndex and represents a valid mplsTunnelEntry. Note that the tunnel instance index of the protecting tunnel may be set to 0 which indicates the tunnel head interface for the protecting tunnel, as per [RFC3812](#), but it may also be defined using the following semantics:

- lower 16 bits : protected tunnel instance
- higher 16 bits: must be all zeros

"

::= { mplsFrrFacilityObjects 7 }

mplsFrrFacilityDBEntry OBJECT-TYPE

SYNTAX MplsFrrFacilityDBEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"An entry in the mplsFrrFacilityDBTable represents a single protected LSP, protected by a backup tunnel on a specific protected interface, or if the interface index is set to 0, on all interfaces. Note that for brevity, managers should consult the mplsTunnelTable present in the MPLS-TE-STD-MIB MIB module for additional information about the protecting and protected tunnels, and the ifEntry in the IF-MIB MIB module for the protected interface."

INDEX {

    mplsFrrFacilityProtectedIfIndex, -- protected ifIndex  
    mplsFrrFacilityProtectingTunnelIndex, -- protecting TE tun  
    mplsFrrFacilityBackupTunnelIndex, -- protected TE tun  
    mplsFrrFacilityBackupTunnelInstance, -- LSP  
    mplsFrrFacilityBackupTunnelIngressLSRId,  
    mplsFrrFacilityBackupTunnelEgressLSRId }

::= { mplsFrrFacilityDBTable 1 }

```

MplsFrrFacilityDBEntry ::= SEQUENCE {
    mplsFrrFacilityProtectedIfIndex          InterfaceIndex,
    mplsFrrFacilityProtectingTunnelIndex    MplsTunnelIndex,
    mplsFrrFacilityBackupTunnelIndex         MplsTunnelIndex,
    mplsFrrFacilityBackupTunnelInstance     MplsTunnelInstanceId,
    mplsFrrFacilityBackupTunnelIngressLSRID MplsLsrIdentifier,
    mplsFrrFacilityBackupTunnelEgressLSRID  MplsLsrIdentifier,
    mplsFrrFacilityDBNumProtectingTunnelOnIf Gauge32,
    mplsFrrFacilityDBNumProtectedLspOnIf    Gauge32,
    mplsFrrFacilityDBNumProtectedTunnels    Gauge32,
    mplsFrrFacilityDBProtectingTunnelStatus INTEGER,
    mplsFrrFacilityDBProtectingTunnelResvBw MplsBitRate
}

mplsFrrFacilityProtectedIfIndex OBJECT-TYPE
SYNTAX      InterfaceIndex
MAX-ACCESS  not-accessible
STATUS      current
DESCRIPTION
    "Uniquely identifies the interface configured for FRR
     protection. If this object is set to 0, this indicates
     that the remaining indexing combinations for this row
     apply to all interfaces on this device for which
     the FRR feature can operate."
::= { mplsFrrFacilityDBEntry 1 }

mplsFrrFacilityProtectingTunnelIndex OBJECT-TYPE
SYNTAX      MplsTunnelIndex
MAX-ACCESS  not-accessible
STATUS      current
DESCRIPTION
    "Uniquely identifies the mplsTunnelEntry primary index for
     the tunnel head interface designated to protect the
     interface as specified in the mplsFrrFacilityProtectedIfIndex
     (and all of the tunnels using this interface). Note
     that the corresponding mplsTunnelInstance MUST BE
     0 as per the indexing convention stipulated."
REFERENCE
    "Section 6.1 of RFC3812"
::= { mplsFrrFacilityDBEntry 2 }

mplsFrrFacilityBackupTunnelIndex OBJECT-TYPE
SYNTAX      MplsTunnelIndex
MAX-ACCESS  not-accessible
STATUS      current
DESCRIPTION
    "Uniquely identifies the mplsTunnelEntry primary index for
     the TE tunnel LSP being protected on the
     interface as specified by mplsFrrFacilityProtectedIfIndex."
::= { mplsFrrFacilityDBEntry 3 }

```

**mplsFrrFacilityBackupTunnelInstance** OBJECT-TYPE  
SYNTAX MplsTunnelInstanceIndex  
MAX-ACCESS not-accessible  
STATUS current  
**DESCRIPTION**  
"Uniquely identifies the mplsTunnelEntry secondary index  
for the TE tunnel LSP being protected on the  
interface as specified by mplsFrrFacilityProtectedIfIndex."  
 ::= { mplsFrrFacilityDBEntry 4 }

**mplsFrrFacilityBackupTunnelIngressLSRId** OBJECT-TYPE  
SYNTAX MplsLsrIdentifier  
MAX-ACCESS not-accessible  
STATUS current  
**DESCRIPTION**  
"Uniquely identifies the mplsTunnelEntry third index  
for the TE tunnel LSP being protected on the  
interface as specified by mplsFrrFacilityProtectedIfIndex."  
**REFERENCE**  
 "[Section 6.1 of RFC3812](#)"  
 ::= { mplsFrrFacilityDBEntry 5 }

**mplsFrrFacilityBackupTunnelEgressLSRId** OBJECT-TYPE  
SYNTAX MplsLsrIdentifier  
MAX-ACCESS not-accessible  
STATUS current  
**DESCRIPTION**  
"Uniquely identifies the mplsTunnelEntry fourth index  
for the TE tunnel LSP being protected on the  
interface as specified by mplsFrrFacilityProtectedIfIndex."  
 ::= { mplsFrrFacilityDBEntry 6 }

**mplsFrrFacilityDBNumProtectingTunnelOnIf** OBJECT-TYPE  
SYNTAX Gauge32  
MAX-ACCESS read-only  
STATUS current  
**DESCRIPTION**  
"The number of backup tunnels protecting the  
interface specified by mplsFrrFacilityProtectedIfIndex."  
 ::= { mplsFrrFacilityDBEntry 7 }

**mplsFrrFacilityDBNumProtectedLspOnIf** OBJECT-TYPE  
SYNTAX Gauge32  
MAX-ACCESS read-only  
STATUS current  
**DESCRIPTION**  
"The number of LSPs currently being protected on  
the interface specified by  
mplsFrrFacilityProtectedIfIndex."  
 ::= { mplsFrrFacilityDBEntry 8 }

```

mplsFrrFacilityDBNumProtectedTunnels OBJECT-TYPE
    SYNTAX            Gauge32
    MAX-ACCESS        read-only
    STATUS            current
    DESCRIPTION
        "The number of tunnels protected on the interface
         specified by mplsFrrFacilityProtectedIfIndex."
 ::= { mplsFrrFacilityDBEntry 9 }

mplsFrrFacilityDBProtectingTunnelStatus OBJECT-TYPE
    SYNTAX          INTEGER {
                      active(1),
                      ready(2),
                      partial(3)
                  }
    MAX-ACCESS        read-only
    STATUS            current
    DESCRIPTION
        "Specifies the state of the protecting tunnel as
         specified by mplsFrrFacilityProtectingTunnelIndex.
         active  This tunnel's label has been placed in the
                 LFIB and is ready to be applied to incoming
                 packets.
         ready - This tunnel's label entry has been created but is
                 not yet in the LFIB.
         partial - This tunnel's label entry has not been fully
                    created."
 ::= { mplsFrrFacilityDBEntry 10 }

mplsFrrFacilityDBProtectingTunnelResvBw OBJECT-TYPE
    SYNTAX            MplsBitRate
    UNITS             "kilobits per second"
    MAX-ACCESS        read-only
    STATUS            current
    DESCRIPTION
        "Specifies the amount of bandwidth in units
         of '1,000 bits per second', actually reserved by
         the protecting tunnel for facility backup purposes.
         This value is repeated here from the
         MPLS-TE-STD-MIB MIB module because the tunnel entry will
         reveal the bandwidth reserved by the signaling protocol,
         which is typically 0 for backup tunnels so as to not
         over-book bandwidth. However, internal reservations are
         typically made on the PLR, thus this value should be
         revealed here as it is often different from
         mplsTunnelResourceMeanRate found in the MPLS-TE-STD-MIB
         MIB module."

```

```

 ::= { mplsFrrFacilityDBEntry 11 }
-- Notifications
mplsFrrFacilityInitialBackupTunnelInvoked NOTIFICATION-TYPE
OBJECTS { mplsFrrFacilityDBNumProtectingTunnelOnIf,
          mplsFrrFacilityDBNumProtectedLspOnIf,
          mplsFrrFacilityDBNumProtectedTunnels,
          mplsFrrFacilityDBProtectingTunnelStatus,
          mplsFrrFacilityDBProtectingTunnelResvBw
        }
STATUS      current
DESCRIPTION
"This notification is generated when a tunnel running over an
interface as specified in the mplsFrrConstraintsTable is
initially protected by the backup tunnel also specified in the
mplsFrrConstraintsTable. In some implementations there may be
a difference between when the control plane triggers
this notification and when the hardware is programmed to
utilize the protection path. Due to the urgency of this
operation, it is acceptable for the control plane to
either issue this notification before or after it programs
the hardware. In cases where it is the latter approach,
the notification MUST be sent immediately after the
data plane has been altered.

This notification should not be generated
for each subsequent tunnel that is backed up by the FRR feature
on this LSR, as this may result in potential scaling issues
with regard to LSR performance and network load. Note also
that notifications MUST be generated in accordance with the
mplsFrrNotificationsMaxRate."
 ::= { mplsFrrFacilityNotifications 1 }
mplsFrrFacilityFinalTunnelRestored NOTIFICATION-TYPE
OBJECTS { mplsFrrFacilityDBNumProtectingTunnelOnIf,
          mplsFrrFacilityDBNumProtectedLspOnIf,
          mplsFrrFacilityDBNumProtectedTunnels,
          mplsFrrFacilityDBProtectingTunnelStatus,
          mplsFrrFacilityDBProtectingTunnelResvBw
        }
STATUS      current
DESCRIPTION
"This notification is generated when the final tunnel that is
being protected by a backup tunnel as specified in the
mplsFrrConstraintsTable is restored to normal operation. This
notification should not be generated for each restored tunnel,
as this may result in potential scaling issues with regard to
LSR performance and network load. Note also that

```

```
notifications MUST be generated in accordance with the
mplsFrrNotificationsMaxRate."
 ::= { mplsFrrFacilityNotifications 2 }
-- Module Conformance Statement
mplsFrrFacilityCompliances
    OBJECT IDENTIFIER ::= {mplsFrrFacilityConformance 1 }
mplsFrrFacilityGroups
    OBJECT IDENTIFIER ::= {mplsFrrFacilityConformance 2 }
mplsFrrFacilityModuleFullCompliance MODULE-COMPLIANCE
    STATUS current
DESCRIPTION
    "Compliance statements for SNMP Engines that support the
    MPLS-FRR-FACILITY-STD-MIB MIB module."
MODULE MPLS-FRR-GENERAL-STD-MIB -- MPLS FRR Generic MIB
    MANDATORY-GROUPS {
        mplsFrrGeneralScalarGroup,
        mplsFrrGeneralTunnelARHopGroup,
        mplsFrrGeneralConstraintsGroup
    }
MODULE -- this module
    MANDATORY-GROUPS {
        mplsFrrFacilityScalarGroup,
        mplsFrrFacilityDBGroup,
        mplsFrrFacilityNotificationsGroup
    }
 ::= { mplsFrrFacilityCompliances 1 }
mplsFrrFacilityModuleReadOnlyCompliance MODULE-COMPLIANCE
    STATUS current
DESCRIPTION
    "Compliance statements for SNMP Engines that support
    MPLS-FRR-FACILITY-STD-MIB MIB module."
MODULE MPLS-FRR-GENERAL-STD-MIB -- MPLS FRR Generic MIB
    MANDATORY-GROUPS {
        mplsFrrGeneralScalarGroup,
        mplsFrrGeneralTunnelARHopGroup,
        mplsFrrGeneralConstraintsGroup
    }
MODULE -- this module
```

```
MANDATORY-GROUPS {
    mplsFrrFacilityScalarGroup,
    mplsFrrFacilityDBGroup,
    mplsFrrFacilityNotificationsGroup
}
 ::= { mplsFrrFacilityCompliances 2 }
-- Units of conformance
mplsFrrFacilityScalarGroup OBJECT-GROUP
    OBJECTS { mplsFrrConfiguredInterfaces,
        mplsFrrActiveInterfaces,
        mplsFrrConfiguredBypassTunnels,
        mplsFrrActiveBypassTunnels,
        mplsFrrFacilityNotificationsEnabled,
        mplsFrrFacilityNotificationsMaxRate
    }
STATUS      current
DESCRIPTION
    "Objects that are required to represent the FRR
     Facility Route Database information."
 ::= { mplsFrrFacilityGroups 1 }
mplsFrrFacilityDBGroup OBJECT-GROUP
    OBJECTS { mplsFrrFacilityDBNumProtectingTunnelOnIf,
        mplsFrrFacilityDBNumProtectedLspOnIf,
        mplsFrrFacilityDBNumProtectedTunnels,
        mplsFrrFacilityDBProtectingTunnelStatus,
        mplsFrrFacilityDBProtectingTunnelResvBw
    }
STATUS      current
DESCRIPTION
    "Objects that are required to represent the FRR
     Facility Route Database information."
 ::= { mplsFrrFacilityGroups 2 }
mplsFrrFacilityNotificationsGroup NOTIFICATION-GROUP
    NOTIFICATIONS { mplsFrrFacilityInitialBackupTunnelInvoked,
        mplsFrrFacilityFinalTunnelRestored
    }
STATUS      current
DESCRIPTION
    "Objects that are required to represent FRR notifications."
 ::= { mplsFrrFacilityGroups 3 }
END
```

-- End of MPLS-FRR-FACILITY-STD-MIB

## 7. Security Considerations

**It is clear that these MIB modules are potentially useful for monitoring of MPLS LSRs supporting fast reroute. This MIB module 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 these MIB modules 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 mplsFrrGeneralConstraintsTable(  
    mplsFrrGeneralConstraintsProtectionType,  
    mplsFrrGeneralConstraintsSetupPrio, etc.) and some objects in  
    the mplsFrrScalarGroup( mplsFrrGeneralProtectionMethod,  
    mplsFrrFacilityNotificationsEnabled, etc.) contain objects  
    which may be used to provision MPLS fast reroute features.  
    Unauthorized access to these objects could result in disruption  
    of traffic on the network.

Some of the readable objects in these MIB modules (i.e. objects with 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 mplsFrrOne2OnePlrTable (mplsFrrOne2OnePlrSenderAddr,  
    mplsFrrOne2OnePlrAvoidNodeAddr, etc.),  
    mplsFrrOne2OneDetourTable (mplsFrrOne2OneDetourActive,  
    mplsFrrOne2OneDetourMergedDetourInst, etc.), and  
    mplsFrrGeneralTunnelARHopTable(  
        mplsFrrGeneralTunnelARHopSessionAttributeFlags,  
        mplsFrrGeneralTunnelARHopRROSubObjectFlags, etc.)  
    tables and some objects contained in the mplsFrrScalarGroup(  
        mplsFrrGeneralProtectionMethod, mplsFrrActiveInterfaces, etc.)  
    collectively show the MPLS fast reroute interfaces, tunnels,  
    and other associated fast reroute feature configurations  
    as well as their linkages to other MPLS-related  
    configuration and/or performance 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 these MIB modules.

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 these MIB modules, 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.

## **8. IANA Considerations**

The MIB modules in this document uses the following IANA-assigned OBJECT IDENTIFIER values recorded in the SMI Numbers registry:

### **8.1. IANA Considerations for MPLS-FRR-GENERAL-STD-MIB**

The IANA is requested to assign { mib-2 XXX } to the MPLS-FRR-GENERAL-STD-MIB MIB module specified in this document.

### **8.2. IANA Considerations for MPLS-FRR-ONE2ONE-STD-MIB**

The IANA is requested to assign { mib-2 YYY } to the MPLS-FRR-ONE2ONE-STD-MIB MIB module specified in this document.

### **8.3. IANA Considerations for MPLS-FRR-FACILITY-STD-MIB**

The IANA is requested to assign { mib-2 ZZZ } to the MPLS-FRR-FACILITY-STD-MIB MIB module specified in this document. Editor's Note (to be removed prior to publication): the IANA is requested to assign a value for "XXX", "YYY" and "ZZZ" under the mib-2 subtree and to record the assignments in the SMI Numbers registry. When the assignments have been made, the RFC Editor is asked to replace "XXX", "YYY" and "ZZZ" (here and in the MIB modules) with the assigned values and to remove this note.

## 9. Acknowledgments

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## **11. Editors' Addresses**

**Riza Cetin**

Alcatel

Francis Wellesplein 1  
B-2018 Antwerp, Belgium  
Email: riza.cetin@alcatel.be  
Thomas D. Nadeau  
CA Technologies  
Email: thomas.nadeau@ca.com  
A S Kiran Koushik  
Cisco Systems, Inc.  
12515 Research Blvd, Bldg 4  
Austin, TX 78664  
Phone: +1-512-378-1482  
Email: kkoushik@cisco.com

## **12. Contributors' Addresses**

**Stefaan De Cnodder**

Alcatel

Francis Wellesplein 1  
B-2018 Antwerp, Belgium  
Email: stefaan.de\_cnodder@alcatel.be  
Der-Hwa Gan  
Juniper Networks, Inc.  
1194 N. Mathilda Avenue  
Sunnyvale, CA 94089  
Email: derhwagan@yahoo.com

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Nadeau, et al.

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