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Traffic Engineering Database Management Information Base in support of MPLS-TE/GMPLS

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Status of this Memo

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Abstract

This memo defines the Management Information Base (MIB) objects in order to manage traffic engineering database (TED) information with extension in support of Multi-Protocol Label Switching (MPLS) with traffic engineering (TE) as well as Generalized MPLS (GMPLS) for use with network management protocols.

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1. The Internet-Standard Management Framework

For a detailed overview of the documents that describe the current Internet-Standard Management Framework, please refer to section 7 of RFC 3410 [RFC3410].

Managed objects are accessed via a virtual information store, termed the Management Information Base or MIB. MIB objects are generally accessed through the Simple Network Management Protocol (SNMP). Objects in the MIB are defined using the mechanisms defined in the Structure of Management Information (SMI). This memo specifies a MIB module that is compliant to the SMIv2, which is described in STD 58, RFC 2578 [RFC2578], STD 58, RFC 2579 [RFC2579] and STD 58, RFC 2580 [RFC2580].

2. Introduction

The OSPF MIB was originally defined for OSPF version2 in support of IPv4 [RFC4750] and extended to support the Internet Protocol version6(IPv6) as OSPF version3 MIB [RFC5643]. The ISIS MIB is also defined as [RFC4444]. On the other side, MPLS/GMPLS based traffic engineering has so far extended OSPF/ISIS routing protocol with TE functionality [RFC4202], [RFC3630], [RFC5329], [RFC5307], [RFC5305]. To manage such MPLS-TE/GMPLS networks effectively, routing information associated with MPLS/GMPLS TE parameters (TED) is preferred for the network management, however, there is no clear definition of MPLS/GMPLS TE information in existing MIBs related to OSPF(v2 and v3)/ISIS.

This memo defines the Management Information Base (MIB) objects for managing TED in support of MPLS-TE/GMPLS for use with network management protocols.

This MIB module should be used in conjunction with OSPFv2 MIB, OSPF v3 MIB and ISIS MIB as well as other MIBs defined in [RFC3812], [RFC3813], [RFC4802], [RFC4803] for the management of MPLS/GMPLS based traffic engineering information.

3. Overview

3.1 Conventions used in this document

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "NOT RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in RFC-2119 [RFC2119].

3.2 Terminology

Definitions of key terms for MPLS OAM and GMPLS are found in [RFC4377] and [RFC3945], and the reader is assumed to be familiar with those definitions which are not repeated here.

3.3 Acronyms

FSC: Fiber switch capable
GMPLS: Generalized Multi-Protocol Label Switching
ISIS: Intermediate System to Intermediate System
LDP: Label Distribution Protocol
LSA: Link state advertisement
LSC: Lambda switch capable
LSP: Label Switching Path
LSR: Label Switching Router
MIB: Management Information Base
OAM: Operations and Management
OA&M: Operations, Administration and Maintenance.
OSPF: Open Shortest Path First
PSC: Packet switch capable
RSVP: Resource reSerVation Protocol
SRLG: Shared risk link group
TE: Traffic Engineering
TED: Traffic Engineering Database
TDM: Time Division Multiplexing

4. Motivations

The existing OSPFv2, OSPFv3, ISIS, MPLS and GMPLS MIBs do not provide for the management interface to retrieve topology information of MPLS and GMPLS networks.

5. Brief description of MIB Objects

The objects described in this section support the management of TED described in [RFC4202], [RFC4203] and [RFC5307] for GMPLS extensions as well as in [RFC3630] and [RFC5305] for MPLS/GMPLS.

5.1 tedTable

The tedTable is basically used to indicate TED information of OSPF-TE or ISIS-TE. However, this table does not contain information for Local/Remote interface IP address, Interface Switching Capability Descriptor and Shared Risk Link Group information within the sub-TLVs for the Link-TLV.

5.2 tedLocalIfAddrTable

The tedLocalIfAddrTable is identical to the Local interface IP address information in a sub-TLV for the Link-TLV. This is independently defined, because the Interface IP Address sub-TLV may appear more than once within the same Link-TLV.

5.3 tedRemoteIfAddrTable

The tedRemoteIfAddrTable is identical to the Remote interface IP address information in a sub-TLV of the Link-TLV. Also, this is

utilized independently because one or more local interface IP address sub TLVs may exist in the same Link-TLV.

5.4 tedSwCapTable

The tedSwCapTable represents Interface Switching Capability Descriptor information. This is independently defined due to the possibility of multiple appearances of the sub TLV within the same Link-TLV.

5.5 tedSrlgTable

The tedSrlgTable contains the Sub-TLV information of Shared Risk Link Group (SRLG) information. This is separately defined, because more than one sub TLVs may appear in the same Link-TLV.

6.Example of the TED MIB Module Usage

In this section, we provide an example of the TED MIB module usage. The following indicates the information of a numbered TE link originated in a GMPLS controlled node. When TE link information is retrieved in a MPLS network, GMPLS specific objects such as tedLocalIfAddrTable, tedRemoteIfAddrTable, tedSwCapTable and tedSrlgTable are not supported.

Note that the TED MIB modules are only limited to "read-only" access except for tedCreatedDeletedNotificationMaxRate and tedStatusChangeNotificationMaxRate. The TED MIB is designed to be independent of OSPF or ISIS MIBs, however each TE link information belongs to a node or a link which is managed by the routing protocol.

In tedTable:

```
{
tedLinkInformationData.3232235777.3232235778.2.16777264 zeroDotZero
tedLinkType.3232235777.3232235778.2.16777264          pointToPoint(1)
tedLinkState.3232235777.3232235778.2.16777264         up(1)
tedAreaId.3232235777.3232235778.2.16777264            0
tedRouterIdAddrType.3232235777.3232235778.2.16777264 ipv4(1)
tedRouterIdAddr.3232235777.3232235778.2.16777264      192.0.2.1
tedLinkIdAddrType.3232235777.3232235778.2.16777264    ipv4(1)
tedLinkIdAddr.3232235777.3232235778.2.16777264        192.0.2.10
tedMetric.3232235777.3232235778.2.16777264            1
tedMaxBandwidth.3232235777.3232235778.2.16777264      4d9450c0
tedMaxReservableBandwidth.3232235777.3232235778.2.16777264 4d9450c0
tedUnreservedBandwidthPri0.3232235777.3232235778.2.16777264 4d9450c0
tedUnreservedBandwidthPri1.3232235777.3232235778.2.16777264 4d9450c0
tedUnreservedBandwidthPri2.3232235777.3232235778.2.16777264 4d9450c0
tedUnreservedBandwidthPri3.3232235777.3232235778.2.16777264 4d9450c0
tedUnreservedBandwidthPri4.3232235777.3232235778.2.16777264 4d9450c0
```

```
tedUnreservedBandwidthPri5.3232235777.3232235778.2.16777264 4d9450c0
tedUnreservedBandwidthPri6.3232235777.3232235778.2.16777264 4d9450c0
tedUnreservedBandwidthPri7.3232235777.3232235778.2.16777264 4d9450c0
tedAdministrativeGroup.3232235777.3232235778.2.16777264      0
```

```
tedLocalId.3232235777.3232235778.2.16777264  0
tedRemoteId.3232235777.3232235778.2.16777264 0
tedLinkProtectionType.3232235777.3232235778.2.16777264 01 00 00 00 7

In tedLocalIfAddrTable:
{
tedLocalIfAddrType.16777264.192.0.2.21       ipv4(1)
}

In tedRemoteIfAddrTable:
{
tedRemoteIfAddrType.16777264.192.0.2.22      ipv4(1)
}

In tedSwCapTable:
{
tedSwCapType.16777264.1      lsc(150)
tedSwCapEncoding.16777264.1  ethernet(2)
tedSwCapMaxLspBandwidthPri0.16777264.1       4d9450c0
tedSwCapMaxLspBandwidthPri1.16777264.1       4d9450c0
tedSwCapMaxLspBandwidthPri2.16777264.1       4d9450c0
tedSwCapMaxLspBandwidthPri3.16777264.1       4d9450c0
tedSwCapMaxLspBandwidthPri4.16777264.1       4d9450c0
tedSwCapMaxLspBandwidthPri5.16777264.1       4d9450c0
tedSwCapMaxLspBandwidthPri6.16777264.1       4d9450c0
tedSwCapMaxLspBandwidthPri7.16777264.1       4d9450c0
tedSwCapMinLspBandwidth.16777264.1   0
tedSwCapIfMtu.16777264.1     0
tedSwCapIndication.16777264.1 standard(0)
}

In tedSrlgTable:
{
tedSrlg.16777264.1   0
}
```

7. TED MIB Definitions in support of GMPLS

```
TED-MIB DEFINITIONS ::= BEGIN

IMPORTS
   MODULE-IDENTITY, OBJECT-TYPE, Integer32, Unsigned32, transmission,
   NOTIFICATION-TYPE
     FROM SNMPv2-SMI                           -- RFC2578
   MODULE-COMPLIANCE, OBJECT-GROUP, NOTIFICATION-GROUP
     FROM SNMPv2-CONF                          -- RFC2580
   TEXTUAL-CONVENTION, RowPointer
     FROM SNMPv2-TC                            -- RFC2579
```

```
      IANAGmplsLSPEncodingTypeTC, IANAGmplsSwitchingTypeTC
        FROM IANA-GMPLS-TC-MIB                    -- RFC4802
       InetAddress, InetAddressType
        FROM INET-ADDRESS-MIB                     -- RFC4001
       Float32TC
```

```
     FROM FLOAT-TC-MIB                          -- RFC6340
   ;

tedMIB MODULE-IDENTITY
   LAST-UPDATED "201205070000Z"  -- 7 May 2012 00:00:00 GMT
   ORGANIZATION "IETF CCAMP Working Group."
   CONTACT-INFO
      "          Tomohiro Otani
                 otani@kddilabs.jp

                 Masanori Miyazawa
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                 Thomas D. Nadeau
                 tnadeau@lucidvision.com

                 Kenji Kumaki
                 ke-kumaki@kddilabs.jp

                 Comments and discussion to ccamp@ietf.org"
   DESCRIPTION
        "This MIB contains managed object definitions for TED in
        support of MPLS/GMPLS TE Database.

        Copyright (C) 2011 The IETF Trust. This version of this MIB
        module is part of RFC xxx; see the RFC itself for full legal
        notices."
-- Revision history.
   REVISION
     "201205070000Z"  -- 7 May 2012 00:00:00 GMT
   DESCRIPTION
     "Initial version. Published as RFC xxx."
  -- RFC-editor pls fill in yyy
   ::= { transmission yyy }
  -- assigned by IANA, see section 9.1 for details

-- Textual Conventions.

TedAreaIdTC ::= TEXTUAL-CONVENTION
       STATUS       current
       DESCRIPTION
          "The area identifier of the IGP. If OSPF is used to
advertise LSA, this represents an ospfArea. If ISIS is used, this
represents an area address."
       SYNTAX       OCTET STRING (SIZE (0..20))

TedRouterIdTC ::= TEXTUAL-CONVENTION
       STATUS       current
       DESCRIPTION
          " The router identifier. If OSPF is used to advertise LSA,
```

```
   this represents a Router ID. If ISIS is used, this represents a
   System ID."
          SYNTAX       OCTET STRING (SIZE (0..6))
```

```
TedLinkIndexTC ::= TEXTUAL-CONVENTION
       STATUS       current
       DESCRIPTION
          " The link identifier. If OSPF is used, this represents an
ospfLsdbID. If ISIS is used, this represents an isisLSPID. If a
locally configured link is used, this object represents an arbitrary
value which is locally defined in a router"
       SYNTAX       OCTET STRING (SIZE (0..8))

-- Top level components of this MIB.

tedNotifications OBJECT IDENTIFIER ::= { tedMIB 0 }
tedObjects       OBJECT IDENTIFIER ::= { tedMIB 1 }
tedConformance   OBJECT IDENTIFIER ::= { tedMIB 2 }

--

--  TED Table
--

tedTable OBJECT-TYPE
   SYNTAX       SEQUENCE OF TedEntry
   MAX-ACCESS   not-accessible
   STATUS       current
   DESCRIPTION
     "This table indicates multiple TED information which has been
supported by [RFC3630]."
::= { tedObjects 1 }

tedEntry OBJECT-TYPE
    SYNTAX       TedEntry
    MAX-ACCESS   not-accessible
    STATUS       current
    DESCRIPTION
    "This entry contains TED information commonly utilized in both
MPLS and GMPLS."
   INDEX { tedLocalRouterId, tedRemoteRouterId,
tedLinkInformationSource, tedLinkIndex }
::= { tedTable 1 }

TedEntry ::= SEQUENCE {
    tedLinkInformationSource     INTEGER,
    tedLocalRouterId             TedRouterIdTC,
    tedRemoteRouterId            TedRouterIdTC,
    tedLinkIndex                 TedLinkIndexTC,
    tedLinkInformationData       RowPointer,
    tedLinkState                 INTEGER,
    tedAreaId                    TedAreaIdTC,
    tedLinkType                  INTEGER,
```

```
        tedRouterIdAddrType          InetAddressType,
        tedRouterIdAddr              InetAddress,
        tedLinkIdAddrType            InetAddressType,
        tedLinkIdAddr                InetAddress,
        tedMetric                    Integer32,
```

```
    tedMaxBandwidth              Float32TC,
    tedMaxReservableBandwidth    Float32TC,
    tedUnreservedBandwidthPri0   Float32TC,
    tedUnreservedBandwidthPri1   Float32TC,
    tedUnreservedBandwidthPri2   Float32TC,
    tedUnreservedBandwidthPri3   Float32TC,
    tedUnreservedBandwidthPri4   Float32TC,
    tedUnreservedBandwidthPri5   Float32TC,
    tedUnreservedBandwidthPri6   Float32TC,
    tedUnreservedBandwidthPri7   Float32TC,
    tedAdministrativeGroup       Integer32,
    tedLocalId                   Integer32,
    tedRemoteId                  Integer32,
    tedLinkProtectionType        BITS
    }

tedLinkInformationSource OBJECT-TYPE
    SYNTAX       INTEGER {
                 unknown(0),
                 locallyConfigured(1),
                 ospfv2(2),
                 ospfv3(3),
                 isis(4),
                 other(5)
                 }
    MAX-ACCESS   not-accessible
    STATUS       current
    DESCRIPTION
      "This object indicates the source of the information about the
TE link."
  ::= { tedEntry 1 }

tedLocalRouterId OBJECT-TYPE
    SYNTAX       TedRouterIdTC
    MAX-ACCESS   not-accessible
    STATUS       current
    DESCRIPTION
      "This object represents the router ID of the router originating
the LSA. If OSPF is used to advertise LSA, this represents a Router
ID. If ISIS is used, this represents a System ID. Otherwise, this
represents zero."
    REFERENCE
      " OSPF Version 2, [RFC2328], C.1
        OSPF for IPv6, [RFC5340], C.1
        [ISO10589], Section 7.1 "
::= { tedEntry 2 }

tedRemoteRouterId OBJECT-TYPE
    SYNTAX       TedRouterIdTC
```

```
        MAX-ACCESS   not-accessible
        STATUS       current
        DESCRIPTION
          "This object indicates the router at the remote end of the link
     from the originating router. If OSPF is used to advertise LSA, this
```

```
represents a Link ID in the Link TLV. If ISIS is used, this
represents a neighbor system ID defined in [RFC5305]. Otherwise, this
represents zero."
    REFERENCE
      " OSPF Version 2, [RFC2328], C.1
        OSPF for IPv6, [RFC5340], C.1
        [ISO10589], Section 7.1
        IS-IS extensions for TE [RFC5305], C.3"
::= { tedEntry 3 }

tedLinkIndex OBJECT-TYPE
    SYNTAX       TedLinkIndexTC
    MAX-ACCESS   not-accessible
    STATUS       current
    DESCRIPTION
      "This object indicates the link state identifier. If OSPF is
used, this represents an ospfLsdbID. If ISIS is used, this represents
an isisLSPID. Otherwise, this represents a unique identifier within a
node."
    REFERENCE
      "OSPF Version 2, [RFC2328], A.4.1,
       OSPF for IPv6, [RFC5340], A.4.2
       [ISO10589], Section 9.8 "
::= { tedEntry 4 }

tedLinkInformationData OBJECT-TYPE
    SYNTAX       RowPointer
    MAX-ACCESS   read-only
    STATUS       current
    DESCRIPTION
    "This object cross-references the source of the information
    about this TE link and should be interpretted in the context of
    tedLinkInformationSource.
       If tedLinkInformationSource has the value unknown(0), this
    object SHOULD contain a value of zeroDotZero.
       If tedLinkInformationSource has the value
    locallyConfigured(1), this object MAY contain the identifier of
    the corresponding row entry in the teLinkTable of TE-LINK-STD-
    MIB[RFC4220], the identifier of the corresponding row in a local
    proprietary TE link MIB module, or the value of zeroDotZero
    otherwise.
       If tedLinkInformationSource has the value ospfv2(2)and
    ospfv3(3), this object MAY contain the identifier of the
    corresponding row entry in the ospfLocalLsdbTable of OSPFv2-
    MIB[RFC4750] and the ospfv3AreaLsdbTable of OSPFv3-MIB[RFC5643],
    or the value of zeroDotZero otherwise.
       If tedLinkInformationSource has the value isis(4) this object
    MAY contain the identifier of the corresponding row entry in the
    isisAreaAddr of ISIS-MIB [RFC4444], or the value of zeroDotZero
```

otherwise.

If tedLinkInformationSource has the value other(5) this object MAY contain the identifier of the corresponding row entry a local proprietary MIB module, or the value of zeroDotZero otherwise."

```
::= { tedEntry 5 }

tedLinkState OBJECT-TYPE
    SYNTAX       INTEGER {
                 unknown (0),
                 up (1),
                 down (2)
                 }
    MAX-ACCESS   read-only
    STATUS       current
    DESCRIPTION
      " This object represents the actual operational state of this
TE link. For instance, if a row is created in the tedTable, but the
actual TE link is not available for some reason (e.g. when there is
not yet physical link or manually disable), then the object would be
down(2) state. In contrast, if a row is added and the TE link is
available, this would be operationally up(1)."
::= { tedEntry 6 }

tedAreaId OBJECT-TYPE
    SYNTAX       TedAreaIdTC
    MAX-ACCESS   read-only
    STATUS       current
    DESCRIPTION
      "This object indicates the area identifier of the IGP. If OSPF
is used to advertise LSA, this represents an ospfArea. If ISIS is
used, this represents an area address. Otherwise, this represents
zero."
    REFERENCE
      " OSPF Version 2, [RFC2328], C.2
        OSPF for IPv6, [RFC5340], C.2
        [ISO10589], Section 9.8 "
::= { tedEntry 7 }

tedLinkType OBJECT-TYPE
    SYNTAX       INTEGER {
                 pointToPoint (1),
                 multiAccess (2)
                 }
    MAX-ACCESS   read-only
    STATUS       current
    DESCRIPTION
      "This indicates the type of the link such as point-to-point or
multi-access."
    REFERENCE
      " Traffic Engineering (TE) Extensions to OSPF Version 2, [RFC
3630], 2.5.1"
::= { tedEntry 8 }
```

```
   tedRouterIdAddrType OBJECT-TYPE
       SYNTAX       InetAddressType
       MAX-ACCESS   read-only
       STATUS       current
       DESCRIPTION
```

```
      " This object indicates the TE-Router ID address type. Only
values unknown(0), ipv4(1) or ipv6(2) must be supported. "
::= { tedEntry 9 }

tedRouterIdAddr OBJECT-TYPE
    SYNTAX       InetAddress
    MAX-ACCESS   read-only
    STATUS       current
    DESCRIPTION
        "This object indicates the TE-Router ID."
    REFERENCE
      " Traffic Engineering (TE) Extensions to OSPF Version 2, RFC
3630, 2.4.1"
::= { tedEntry 10 }

tedLinkIdAddrType OBJECT-TYPE
    SYNTAX       InetAddressType
    MAX-ACCESS   read-only
    STATUS       current
    DESCRIPTION
      " This object indicates the address type of the TE Link ID.
Only values unknown(0), ipv4(1) or ipv6(2) must be supported."
::= { tedEntry 11 }

tedLinkIdAddr OBJECT-TYPE
    SYNTAX       InetAddress
    MAX-ACCESS   read-only
    STATUS       current
    DESCRIPTION
      "This indicates the Router ID of the neighbor in the case of
point-to-point links.  This also indicates the interface address of
the designated router in the case of multi-access links."
    REFERENCE
      " Traffic Engineering (TE) Extensions to OSPF Version 2, [RFC
3630], 2.5.2"
::= { tedEntry 12 }

tedMetric OBJECT-TYPE
    SYNTAX       Integer32
    MAX-ACCESS   read-only
    STATUS       current
    DESCRIPTION
      "This indicates the traffic engineering metric value of the TE
link."
    REFERENCE
      " Traffic Engineering (TE) Extensions to OSPF Version 2, [RFC
3630], 2.5.5"
::= { tedEntry 13 }
```

```
   tedMaxBandwidth OBJECT-TYPE
       SYNTAX       Float32TC
       UNITS        "Byte per second"
       MAX-ACCESS   read-only
       STATUS       current
```

```
    DESCRIPTION
      "This indicates the maximum bandwidth that can be used on this
link in this direction."
    REFERENCE
      " Traffic Engineering (TE) Extensions to OSPF Version 2, [RFC
3630], 2.5.6"
::= { tedEntry 14 }

tedMaxReservableBandwidth OBJECT-TYPE
    SYNTAX       Float32TC
    UNITS        "Byte per second"
    MAX-ACCESS   read-only
    STATUS       current
    DESCRIPTION
      "This indicates the maximum bandwidth that may be reserved on
this link in this direction."
    REFERENCE
      " Traffic Engineering (TE) Extensions to OSPF Version 2, [RFC
3630], 2.5.7"
::= { tedEntry 15 }

tedUnreservedBandwidthPri0 OBJECT-TYPE
    SYNTAX       Float32TC
    UNITS        "Byte per second"
    MAX-ACCESS   read-only
    STATUS       current
    DESCRIPTION
      "This indicates the amount of bandwidth not yet reserved at the
priority 0."
    REFERENCE
      " Traffic Engineering (TE) Extensions to OSPF Version 2, [RFC
3630], 2.5.8"
::= { tedEntry 16 }

tedUnreservedBandwidthPri1 OBJECT-TYPE
    SYNTAX       Float32TC
    UNITS        "Byte per second"
    MAX-ACCESS   read-only
    STATUS       current
    DESCRIPTION
      "This indicates the amount of bandwidth not yet reserved at the
priority 1."
    REFERENCE
      " Traffic Engineering (TE) Extensions to OSPF Version 2, [RFC
3630], 2.5.8"
::= { tedEntry 17 }

tedUnreservedBandwidthPri2 OBJECT-TYPE
    SYNTAX       Float32TC
```

```
        UNITS        "Byte per second"
        MAX-ACCESS   read-only
        STATUS       current
        DESCRIPTION
```

```
      "This indicates the amount of bandwidth not yet reserved at the
priority 2."
    REFERENCE
      " Traffic Engineering (TE) Extensions to OSPF Version 2, [RFC
3630], 2.5.8"
::= { tedEntry 18 }

tedUnreservedBandwidthPri3 OBJECT-TYPE
    SYNTAX       Float32TC
    UNITS        "Byte per second"
    MAX-ACCESS   read-only
    STATUS       current
    DESCRIPTION
      "This indicates the amount of bandwidth not yet reserved at the
priority 3."
    REFERENCE
      " Traffic Engineering (TE) Extensions to OSPF Version 2, [RFC
3630], 2.5.8"
::= { tedEntry 19 }

tedUnreservedBandwidthPri4 OBJECT-TYPE
    SYNTAX       Float32TC
    UNITS        "Byte per second"
    MAX-ACCESS   read-only
    STATUS       current
    DESCRIPTION
      "This indicates the amount of bandwidth not yet reserved at the
priority 4."
    REFERENCE
      " Traffic Engineering (TE) Extensions to OSPF Version 2, [RFC
3630], 2.5.8"
::= { tedEntry 20 }

tedUnreservedBandwidthPri5 OBJECT-TYPE
    SYNTAX       Float32TC
    UNITS        "Byte per second"
    MAX-ACCESS   read-only
    STATUS       current
    DESCRIPTION
      "This indicates the amount of bandwidth not yet reserved at the
priority 5."
    REFERENCE
      " Traffic Engineering (TE) Extensions to OSPF Version 2, [RFC
3630], 2.5.8"
::= { tedEntry 21 }

tedUnreservedBandwidthPri6 OBJECT-TYPE
    SYNTAX       Float32TC
    UNITS        "Byte per second"
```

```
        MAX-ACCESS   read-only
        STATUS       current
        DESCRIPTION
          "This indicates the amount of bandwidth not yet reserved at the
      priority 6."
```

```
    REFERENCE
      " Traffic Engineering (TE) Extensions to OSPF Version 2, [RFC
3630], 2.5.8"
::= { tedEntry 22 }

tedUnreservedBandwidthPri7 OBJECT-TYPE
    SYNTAX       Float32TC
    UNITS        "Byte per second"
    MAX-ACCESS   read-only
    STATUS       current
    DESCRIPTION
      "This indicates the amount of bandwidth not yet reserved at the
priority 7."
    REFERENCE
      " Traffic Engineering (TE) Extensions to OSPF Version 2, [RFC
3630], 2.5.8"
::= { tedEntry 23 }

tedAdministrativeGroup OBJECT-TYPE
    SYNTAX       Integer32
    MAX-ACCESS   read-only
    STATUS       current
    DESCRIPTION
      "This indicates the Administrative Group which the link belong
to.  Since the value is a bit mask, the link can belong to multiple
groups.  This is also called Resource Class/Color."
    REFERENCE
      " Traffic Engineering (TE) Extensions to OSPF Version 2, [RFC
3630], 2.5.9"
::= { tedEntry 24 }

tedLocalId OBJECT-TYPE
    SYNTAX       Integer32
    MAX-ACCESS   read-only
    STATUS       current
    DESCRIPTION
      "This indicates the Link local identifier of an unnumbered
link."
    REFERENCE
      " OSPF Extensions in Support of GMPLS, [RFC4203], 1.1"
::= { tedEntry 25 }

tedRemoteId OBJECT-TYPE
    SYNTAX       Integer32
    MAX-ACCESS   read-only
    STATUS       current
    DESCRIPTION
      "This indicates the Link remote identifier of an unnumbered
link."
```

```
        REFERENCE
          " OSPF Extensions in Support of GMPLS, [RFC4203], 1.1"
    ::= { tedEntry 26 }

    tedLinkProtectionType OBJECT-TYPE
```

```
    SYNTAX       BITS {
                 extraTraffic(0),
                 unprotected(1),
                 shared (2),
                 dedicatedOneToOne (3),
                 dedicatedOnePlusOne(4),
                 enhanced(5)
                 }
    MAX-ACCESS   read-only
    STATUS       current
    DESCRIPTION
      "This object indicates the protection type of the TE link."
    REFERENCE
      " OSPF Extensions in Support of GMPLS, [RFC4203], 1.2"
::= { tedEntry 27 }

--
--  TED Local Interface IP Address Table
--

tedLocalIfAddrTable OBJECT-TYPE
    SYNTAX       SEQUENCE OF TedLocalIfAddrEntry
    MAX-ACCESS   not-accessible
    STATUS       current
    DESCRIPTION
      "This table contains the IP address information of a local TE
link."
::= { tedObjects 2 }

tedLocalIfAddrEntry OBJECT-TYPE
    SYNTAX       TedLocalIfAddrEntry
    MAX-ACCESS   not-accessible
    STATUS       current
    DESCRIPTION
      "This entry contains the IP address information of the local TE
link."
    INDEX { tedLinkIndex, tedLocalIfAddr }
::= { tedLocalIfAddrTable 1 }

TedLocalIfAddrEntry ::= SEQUENCE {
    tedLocalIfAddrType    InetAddressType,
    tedLocalIfAddr        InetAddress

    }

tedLocalIfAddrType OBJECT-TYPE
    SYNTAX       InetAddressType
    MAX-ACCESS   read-only
    STATUS       current
```

```
    DESCRIPTION
     "This object indicates the address type of the local TE link.
   Only values unknown(0), ipv4(1) or ipv6(2) have to be supported."
   ::= { tedLocalIfAddrEntry 1 }
```

```
tedLocalIfAddr OBJECT-TYPE
    SYNTAX       InetAddress
    MAX-ACCESS   not-accessible
    STATUS       current
    DESCRIPTION
     "This object indicates the address of the local TE link."
    REFERENCE
      " Traffic Engineering (TE) Extensions to OSPF Version 2, [RFC
3630], 2.5.3,
        Traffic Engineering Extensions to OSPF Version3, RFC5329,
4.3"
::= { tedLocalIfAddrEntry 2 }


--
--  TED Remote Interface IP Address Table
--

tedRemoteIfAddrTable OBJECT-TYPE
    SYNTAX       SEQUENCE OF TedRemoteIfAddrEntry
    MAX-ACCESS   not-accessible
    STATUS       current
    DESCRIPTION
      "This table contains the IP address information of a remote TE
link."
::= { tedObjects 3 }

tedRemoteIfAddrEntry OBJECT-TYPE
    SYNTAX       TedRemoteIfAddrEntry
    MAX-ACCESS   not-accessible
    STATUS       current
    DESCRIPTION
      "This entry contains the IP address information of the remote
TE link."
INDEX { tedLinkIndex, tedRemoteIfAddr }
    ::= { tedRemoteIfAddrTable 1 }

TedRemoteIfAddrEntry ::= SEQUENCE {
    tedRemoteIfAddrType    InetAddressType,
    tedRemoteIfAddr        InetAddress
    }

tedRemoteIfAddrType OBJECT-TYPE
    SYNTAX       InetAddressType
    MAX-ACCESS   read-only
    STATUS       current
    DESCRIPTION
      "This object indicates the address type of the remote TE link."
::= { tedRemoteIfAddrEntry 1 }
```

```
   tedRemoteIfAddr OBJECT-TYPE
       SYNTAX       InetAddress
       MAX-ACCESS   not-accessible
       STATUS       current
```

```
    DESCRIPTION
      "This object indicates the address of the remote TE link."
    REFERENCE
      " Traffic Engineering (TE) Extensions to OSPF Version 2, [RFC
3630], 2.5.4,
        Traffic Engineering Extensions to OSPF Version3, [RFC5329],
4.4"
::= { tedRemoteIfAddrEntry 2 }

--
--  TED Switching Capability Table
--

tedSwCapTable OBJECT-TYPE
    SYNTAX       SEQUENCE OF TedSwCapEntry
    MAX-ACCESS   not-accessible
    STATUS       current
    DESCRIPTION
      "This table contains the GMPLS TED switching capability
information."
::= { tedObjects 4 }

tedSwCapEntry OBJECT-TYPE
    SYNTAX       TedSwCapEntry
    MAX-ACCESS   not-accessible
    STATUS       current
    DESCRIPTION
      "This entry relates each TE link with its GMPLS TE switching
capability information. IF the MIB deals with only OSPF-TE
information, the value of each object related with GMPLS TE
extensions should be null."
    INDEX { tedLinkIndex, tedSwCapIndex }
::= { tedSwCapTable 1 }

TedSwCapEntry ::= SEQUENCE {
    tedSwCapIndex                Unsigned32,
    tedSwCapType         IANAGmplsSwitchingTypeTC,
    tedSwCapEncoding             IANAGmplsLSPEncodingTypeTC,
    tedSwCapMaxLspBandwidthPri0  Float32TC,
    tedSwCapMaxLspBandwidthPri1  Float32TC,
    tedSwCapMaxLspBandwidthPri2  Float32TC,
    tedSwCapMaxLspBandwidthPri3  Float32TC,
    tedSwCapMaxLspBandwidthPri4  Float32TC,
    tedSwCapMaxLspBandwidthPri5  Float32TC,
    tedSwCapMaxLspBandwidthPri6  Float32TC,
    tedSwCapMaxLspBandwidthPri7  Float32TC,
    tedSwCapMinLspBandwidth      Float32TC,
    tedSwCapIfMtu                Integer32,
    tedSwCapIndication           INTEGER
```

```
    }

tedSwCapIndex OBJECT-TYPE
    SYNTAX       Unsigned32 (1..255)
    MAX-ACCESS   not-accessible
```

```
    STATUS       current
    DESCRIPTION
      "This index is utilized to identify multiple switching
functions on a local or remote TE link according to definitions of
textual conventions of GMPLS [RFC4801]."
::= { tedSwCapEntry 1 }

tedSwCapType OBJECT-TYPE
    SYNTAX       IANAGmplsSwitchingTypeTC
    MAX-ACCESS   read-only
    STATUS       current
    DESCRIPTION
      "This object indicates the GMPLS switching capability assigned
to the TE link according to definitions of textual conventions of
GMPLS [RFC4801]."
    REFERENCE
      " OSPF Extensions in Support of GMPLS, [RFC4203], 1.4"
::= { tedSwCapEntry 2 }

tedSwCapEncoding OBJECT-TYPE
    SYNTAX       IANAGmplsLSPEncodingTypeTC
    MAX-ACCESS   read-only
    STATUS       current
    DESCRIPTION
      "This object indicates the GMPLS encoding type assigned to the
TE link."
    REFERENCE
      " OSPF Extensions in Support of GMPLS, [RFC4203], 1.4"
::= { tedSwCapEntry 3 }

tedSwCapMaxLspBandwidthPri0 OBJECT-TYPE
    SYNTAX       Float32TC
    UNITS        "Byte per second"
    MAX-ACCESS   read-only
    STATUS       current
    DESCRIPTION
      "This object indicates the maximum bandwidth of the TE link at
the priority 0 for GMPLS LSP creation."
    REFERENCE
      " OSPF Extensions in Support of GMPLS, [RFC4203], 1.4"
::= { tedSwCapEntry 4 }

tedSwCapMaxLspBandwidthPri1 OBJECT-TYPE
    SYNTAX       Float32TC
    UNITS        "Byte per second"
    MAX-ACCESS   read-only
    STATUS       current
    DESCRIPTION
      "This object indicates the maximum bandwidth of the TE link at
```

```
   the priority 1 for GMPLS LSP creation."
       REFERENCE
         " OSPF Extensions in Support of GMPLS, [RFC4203], 1.4"
   ::= { tedSwCapEntry 5 }
```

```
tedSwCapMaxLspBandwidthPri2  OBJECT-TYPE
    SYNTAX       Float32TC
    UNITS        "Byte per second"
    MAX-ACCESS   read-only
    STATUS       current
    DESCRIPTION
      "This object indicates the maximum bandwidth of the TE link at
the priority 2 for GMPLS LSP creation."
    REFERENCE
      " OSPF Extensions in Support of GMPLS, [RFC4203], 1.4"
::= { tedSwCapEntry 6 }

tedSwCapMaxLspBandwidthPri3 OBJECT-TYPE
    SYNTAX       Float32TC
    UNITS        "Byte per second"
    MAX-ACCESS   read-only
    STATUS       current
    DESCRIPTION
      "This object indicates the maximum bandwidth of the TE link at
the priority 3 for GMPLS LSP creation."
    REFERENCE
      " OSPF Extensions in Support of GMPLS, [RFC4203], 1.4"
::= { tedSwCapEntry 7 }

tedSwCapMaxLspBandwidthPri4 OBJECT-TYPE
    SYNTAX       Float32TC
    UNITS        "Byte per second"
    MAX-ACCESS   read-only
    STATUS       current
    DESCRIPTION
      "This object indicates the maximum bandwidth of the TE link at
the priority 4 for GMPLS LSP creation."
    REFERENCE
      " OSPF Extensions in Support of GMPLS, [RFC4203], 1.4"
::= { tedSwCapEntry 8 }

tedSwCapMaxLspBandwidthPri5  OBJECT-TYPE
    SYNTAX       Float32TC
    UNITS        "Byte per second"
    MAX-ACCESS   read-only
    STATUS       current
    DESCRIPTION
      "This object indicates the maximum bandwidth of the TE link at
the priority 5 for GMPLS LSP creation."
    REFERENCE
      " OSPF Extensions in Support of GMPLS, [RFC4203], 1.4"
::= { tedSwCapEntry 9 }

tedSwCapMaxLspBandwidthPri6 OBJECT-TYPE
```

```
        SYNTAX       Float32TC
        UNITS        "Byte per second"
        MAX-ACCESS   read-only
        STATUS       current
        DESCRIPTION
```

```
      "This object indicates the maximum bandwidth of the TE link at
the priority 6 for GMPLS LSP creation."
    REFERENCE
      " OSPF Extensions in Support of GMPLS, [RFC4203], 1.4"
::= { tedSwCapEntry 10 }

tedSwCapMaxLspBandwidthPri7 OBJECT-TYPE
    SYNTAX       Float32TC
    UNITS        "Byte per second"
    MAX-ACCESS   read-only
    STATUS       current
    DESCRIPTION
      "This object indicates the maximum bandwidth of the TE link at
the priority 7 for GMPLS LSP creation."
    REFERENCE
      " OSPF Extensions in Support of GMPLS, [RFC4203], 1.4"
::= { tedSwCapEntry 11 }

tedSwCapMinLspBandwidth OBJECT-TYPE
    SYNTAX       Float32TC
    UNITS        "Byte per second"
    MAX-ACCESS   read-only
    STATUS       current
    DESCRIPTION
      "This object indicates the minimum bandwidth of the TE link for
GMPLS LSP creation if the switching capability field is TDM, PSC-1,
PSC-2, PSC-3, or PSC-4."
    REFERENCE
      " OSPF Extensions in Support of GMPLS, [RFC4203], 1.4"
::= { tedSwCapEntry 12 }

tedSwCapIfMtu OBJECT-TYPE
    SYNTAX       Integer32
    MAX-ACCESS   read-only
    STATUS       current
    DESCRIPTION
      "This object indicates the MTU of the local or remote TE link."
    REFERENCE
      " OSPF Extensions in Support of GMPLS, [RFC4203], 1.4"
::= { tedSwCapEntry 13 }

tedSwCapIndication OBJECT-TYPE
    SYNTAX       INTEGER {
                 standard (0),
                 arbitrary (1)
                 }
    MAX-ACCESS   read-only
    STATUS       current
    DESCRIPTION
```

```
      "This object indicates whether the interface supports Standard
   or Arbitrary SONET SDH."
    REFERENCE
      " OSPF Extensions in Support of GMPLS, [RFC4203], 1.4"
   ::= { tedSwCapEntry 14 }
```

```
--
--  TED SRLG Table
--

tedSrlgTable OBJECT-TYPE
    SYNTAX       SEQUENCE OF TedSrlgEntry
    MAX-ACCESS   not-accessible
    STATUS       current
    DESCRIPTION
      "This table contains the SRLG information of the TE link."
::= { tedObjects 5 }

tedSrlgEntry OBJECT-TYPE
    SYNTAX       TedSrlgEntry
    MAX-ACCESS   not-accessible
    STATUS       current
    DESCRIPTION
      "This entry relates each TE link with its SRLG information."
    INDEX { tedLinkIndex, tedSrlgIndex }
::= { tedSrlgTable 1 }

TedSrlgEntry ::= SEQUENCE {
    tedSrlgIndex   Unsigned32,
    tedSrlg        Integer32
    }

tedSrlgIndex OBJECT-TYPE
    SYNTAX       Unsigned32(1..255)
    MAX-ACCESS   not-accessible
    STATUS       current
    DESCRIPTION
      " This index is utilized to identify multiple SRLG values on a
local or remote TE link. This object represents an arbitrary value
which is locally defined in a router."
    REFERENCE
     " OSPF Extensions in support of GMPLS, [RFC4203], 1.3 "
::= { tedSrlgEntry 1 }

tedSrlg OBJECT-TYPE
    SYNTAX       Integer32
    MAX-ACCESS   read-only
    STATUS       current
    DESCRIPTION
      "This object indicate the SRLG value assigned to a local or
remote TE link"
    REFERENCE
      " OSPF Extensions in Support of GMPLS, [RFC4203], 1.3"
::= { tedSrlgEntry 2 }
```

```
--
-- Notification Configuration
--
```

```
tedStatusChangeNotificationMaxRate OBJECT-TYPE
    SYNTAX        Unsigned32
    MAX-ACCESS    read-write
    STATUS        current
    DESCRIPTION
      "A lot of notifications relating to the status change are
expected to generate in a node, especially when a network failure
occurs and might cause a performance degradation of the node itself.
To avoid such a defect, this object provides the maximum number of
notifications generated per minute.  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. A value of
0 means no throttling is applied and events may be notified at the
rate at which they occur."
    DEFVAL        {0}
::= { tedObjects 6 }

tedCreatedDeletedNotificationMaxRate OBJECT-TYPE
    SYNTAX        Unsigned32
    MAX-ACCESS    read-write
    STATUS        current
    DESCRIPTION
      "A lot of notifications relating to new registration in ted
table by receiving new TE link information or deletion of existing
entries in ted table are expected to generate in a node. This object
provides the maximum number of notifications generated per minute. "
    DEFVAL        {0}
::= { tedObjects 7 }

--
-- Notifications
--

tedStatusChange NOTIFICATION-TYPE
    OBJECTS  {
      tedLinkState
      }
    STATUS   current
    DESCRIPTION
      "This notification signifies that there has been change in TE
information of tedTable, tedLocalIfAddrTable, tedRemoteIfAddrTable,
tedSwCapTable and/or tedSrlgTable. For example, this should be
generated when tedUnreservedBandwidth is changed to create or delete
LSP using registered TE link. "
::= { tedNotifications 1 }

tedEntryCreated NOTIFICATION-TYPE
    OBJECTS  {
      tedLinkState
```

```
        }
      STATUS   current
      DESCRIPTION
        " This notification signifies that there has been new
   registration in ted table by receiving new TE link information. For
```

```
example, this should be generated when new index (tedLinkIndex) is
registered in TED table."
::= { tedNotifications 2 }

tedEntryDeleted NOTIFICATION-TYPE
    OBJECTS  {
      tedLinkState
      }
    STATUS      current
    DESCRIPTION
      "This notification signifies that there has been deletion of an
entry in the ted table. For example, this should be generated when
one of existing entries is deleted in TED table."
::= { tedNotifications 3 }

-- Conformance Statement

tedCompliances
    OBJECT IDENTIFIER ::= { tedConformance 1 }
tedGroups
    OBJECT IDENTIFIER ::= { tedConformance 2 }

-- Module Compliance

tedModuleFullCompliance MODULE-COMPLIANCE
    STATUS   current
    DESCRIPTION
      "Compliance statement for agents provides full support for the
TED MIB."
    MODULE -- this module
    MANDATORY-GROUPS   { tedMainGroup,
                         tedObjectsGroup,
                         tedNotificationGroup
                       }

GROUP tedUnnumberedLinkGroup
DESCRIPTION
     "This group is mandatory for TE links that supports the
unnumbered links."

GROUP tedNumberedLinkGroup
     DESCRIPTION
     "This group is mandatory for TE links that supports the numbered
links."

GROUP tedSwCapGroup
DESCRIPTION
     "This group is mandatory for TE links that supports GMPLS
switching capability."
```

```
   GROUP tedSwCapMinLspBandwidthGroup
   DESCRIPTION
        "This group is mandatory for TE links if the switching
   capability field is TDM, PSC-1, PSC-2, PSC-3, or PSC-4."
```

```
GROUP tedSwCapIfMtuGroup
DESCRIPTION
     "This group is mandatory for TE links that supports the MTU of
the local or remote TE link."

GROUP tedSwCapIndicationGroup
DESCRIPTION
     "This group is mandatory for TE links that supports Standard or
Arbitrary SONET/SDH."

GROUP tedSrlgGroup
DESCRIPTION
     "This group is mandatory for TE links that supports SRLG
information."

::= { tedCompliances 1 }

--
-- ReadOnly Compliance
--

tedModuleReadOnlyCompliance MODULE-COMPLIANCE
    STATUS current
    DESCRIPTION
      "Compliance requirement for implementations only provide read-
only support for TED. Such devices can then be monitored but cannot
be configured using this MIB module."
    MODULE -- this module
    MANDATORY-GROUPS   { tedMainGroup
                       }

GROUP tedUnnumberedLinkGroup
DESCRIPTION
     "This group is mandatory for TE links that supports the
unnumbered links."

GROUP tedNumberedLinkGroup
     DESCRIPTION
     "This group is mandatory for TE links that supports the numbered
links."

GROUP tedSwCapGroup
DESCRIPTION
     "This group is mandatory for TE links that supports some GMPLS
switching capabilities."

GROUP tedSwCapMinLspBandwidthGroup
DESCRIPTION
     "This group is mandatory for TE links if the switching
```

capability field is TDM, PSC-1, PSC-2, PSC-3, or PSC-4."

GROUP tedSwCapIfMtuGroup
DESCRIPTION

```
     "This group is mandatory for TE links that supports the MTU of
the local or remote TE link."

GROUP tedSwCapIndicationGroup
DESCRIPTION
     "This group is mandatory for TE links that supports Standard or
Arbitrary SONET/SDH."

GROUP tedSrlgGroup
DESCRIPTION
     "This group is mandatory for TE links that supports SRLG
information."

::= { tedCompliances 2 }

-- Units of conformance

tedMainGroup OBJECT-GROUP
    OBJECTS {
            tedLinkState                ,
            tedAreaId                   ,
            tedLinkType                 ,
            tedRouterIdAddrType         ,
            tedRouterIdAddr             ,
            tedLinkIdAddrType           ,
            tedLinkIdAddr               ,
            tedMetric                   ,
            tedMaxBandwidth             ,
            tedMaxReservableBandwidth   ,
            tedUnreservedBandwidthPri0  ,
            tedUnreservedBandwidthPri1  ,
            tedUnreservedBandwidthPri2  ,
            tedUnreservedBandwidthPri3  ,
            tedUnreservedBandwidthPri4  ,
            tedUnreservedBandwidthPri5  ,
            tedUnreservedBandwidthPri6  ,
            tedUnreservedBandwidthPri7  ,
            tedAdministrativeGroup      ,
            tedLinkProtectionType       ,
            tedLinkInformationData
            }
    STATUS   current
    DESCRIPTION
      "Collection of objects for TED management"
::= { tedGroups 1 }

tedObjectsGroup OBJECT-GROUP
    OBJECTS {
         tedStatusChangeNotificationMaxRate,
```

```
        tedCreatedDeletedNotificationMaxRate
    }
    STATUS  current
    DESCRIPTION
      "This objects needed to implement notification."
```

```
::= { tedGroups 2 }

tedNotificationGroup NOTIFICATION-GROUP
    NOTIFICATIONS {
         tedStatusChange,
         tedEntryCreated,
         tedEntryDeleted
         }
    STATUS  current
    DESCRIPTION
      " This group is mandatory for those implementations that can
implement the notifications contained in this group. "
::= { tedGroups 3 }

tedUnnumberedLinkGroup OBJECT-GROUP
    OBJECTS {
         tedLocalId,
         tedRemoteId
    }
    STATUS  current
    DESCRIPTION
      "This objects needed to implement the unnumbered links."
::= { tedGroups 4 }

tedNumberedLinkGroup OBJECT-GROUP
    OBJECTS {
         tedLocalIfAddrType,
         tedRemoteIfAddrType
    }
    STATUS  current
    DESCRIPTION
      "This objects needed to implement the numbered links."
::= { tedGroups 5 }

tedSwCapGroup OBJECT-GROUP
    OBJECTS {
         tedSwCapType,
         tedSwCapEncoding,
         tedSwCapMaxLspBandwidthPri0,
         tedSwCapMaxLspBandwidthPri1,
         tedSwCapMaxLspBandwidthPri2,
         tedSwCapMaxLspBandwidthPri3,
         tedSwCapMaxLspBandwidthPri4,
         tedSwCapMaxLspBandwidthPri5,
         tedSwCapMaxLspBandwidthPri6,
         tedSwCapMaxLspBandwidthPri7
    }
    STATUS  current
    DESCRIPTION
```

```
      "This objects needed to implement TE links with its GMPLS TE
   switching capability information."
   ::= { tedGroups 6 }

   tedSwCapMinLspBandwidthGroup OBJECT-GROUP
```

```
    OBJECTS {
         tedSwCapMinLspBandwidth
    }
    STATUS  current
    DESCRIPTION
      "This objects needed to implement the minimum bandwidth of the
TE link for GMPLS LSP creation."
::= { tedGroups 7 }

tedSwCapIfMtuGroup OBJECT-GROUP
    OBJECTS {
         tedSwCapIfMtu
    }
    STATUS  current
    DESCRIPTION
      "This objects needed to implement the MTU information of the
local or remote TE link."
::= { tedGroups 8 }

tedSwCapIndicationGroup OBJECT-GROUP
    OBJECTS {
         tedSwCapIndication
    }
    STATUS  current
    DESCRIPTION
      "This objects needed to implement the indication whether the
interface supports Standard or Arbitrary SONET/SDH."
::= { tedGroups 9 }

tedSrlgGroup OBJECT-GROUP
    OBJECTS {
         tedSrlg
    }
    STATUS  current
    DESCRIPTION
      "This objects needed to implement multiple SRLG values with
GMPLS TE information."
::= { tedGroups 10 }

END
```

8. Security Consideration

There is a number of management objects defined in this MIB module that has a MAX-ACCESS clause of read-write. 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.

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:

tedTable, tedLocalIfAddrTable, tedRemoteIfAddrTable, tedSwCapTable and tedSrlgTable contain topology information for the MPLS/GMPLS network. If an administrator does not want to reveal this information, then these tables should be considered sensitive/vulnerable.

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 supports 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 principles (users) that have legitimate rights to indeed GET or SET (change/create/delete) them.

9. IANA Considerations

The following "IANA Considerations" subsection requests IANA for a new assignment under the transmission subtree. New assignments can only be made via a Standards Action as specified in [RFC5226].

9.1 IANA Considerations for TED-MIB

The IANA is requested to assign {transmission XXX } to the TED-MIB module specified in this document.

10. References

10.1 Normative References

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10.2 Informative References

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11. Acknowledgment

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