

INTERNET-DRAFT
Intended status: Proposed Standard
Expires: April 5, 2013

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November 6, 2012

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

[draft-ietf-ccamp-gmpls-ted-mib-15.txt](#)

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T. Otani et al.

Expires Apr. 2013

[Page 1]

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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.

Table of Contents

Status of this Memo	1
Abstract	2
1. The Internet-Standard Management Framework	3
2. Introduction	3
3. Overview	3
3.1 Conventions used in this document	3
3.2 Terminology	4
3.3 Acronyms	4
4. Motivations	4
5. Brief Description of MIB Modules	4
5.1 tedTable	4
5.2 tedLocalIfAddrTable	4
5.3 tedRemoteIfAddrTable	4
5.4 tedSwCapTable	5
5.5 tedSrlgTable	5
6. Example of the TED MIB Module Usage	5
7. TED MIB Module Definitions in support of GMPLS	6
8. Security Consideration	29
9. IANA Considerations	30
9.1 IANA Considerations for TED-MIB	30
10. References	30
10.1 Normative References	30
10.2 Informative References	30
11. Acknowledgment	32
12. Authors' Addresses	33

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](#)] and [[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](#)] and [[RFC4803](#)] for the management of MPLS/GMPLS based traffic engineering information. By implementing such MIB modules, it is helpful to simultaneously understand entire MPLS/GMPLS network such as routing information as well as LSP information using a management system. But, note that this MIB module is able to be implemented and performed without implementation of other MIB modules when the management system, for example, only comprehends MPLS/GMPLS topology information such as TE link 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

GMPLS: Generalized Multi-Protocol Label Switching
ISIS: Intermediate System to Intermediate System
LSA: Link state advertisement
LSP: Label Switching Path
LSR: Label Switching Router
MIB: Management Information Base
OSPF: Open Shortest Path First
PSC: Packet Switch Capable
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 Modules

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. This is independently defined, because the Interface IP Address sub-TLV may appear more than once with the same Link-TLV.

[5.4](#) tedSwCapTable

The tedSwCapTable is identical to the Interface Switching Capability Descriptor information in a sub-TLV of Link-TLV. This is independently defined, because the Interface Switching Capability Descriptor sub-TLV may appear more than once with same Link-TLV.

[5.5](#) tedSrlgTable

The tedSrlgTable is identical to the Shared Risk Link Group information in a sub-TLV of Link-TLV. This is independently defined, because the Shared Risk Link Group sub-TLV may appear more than once with 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.

By retrieval of such information periodically, the management system can comprehend the detailed topology information related to MPLS/GMPLS networks. In particular, the basic TED information can be collected by tedTable, local/remote interface IP address information related to MPLS/GMPLS network are collected by tedLocalIfAddrTable and tedRemoteIfAddrTable. And the attribute information related to GMPLS TE link can be retrieved by tedSwCapTable and tedSrlgTable. Regarding a fault management, there is no functionality to notify network failures in this MIB module. But, if network topologies are changed, the module can notify the change information to the management system by using tedStatusChange, tedEntryCreated and tedEntryDeleted.

Note that the TED MIB modules are only limited to "read-only" access except for tedCreatedDeletedNotificationMaxRate and tedStatusChangeNotificationMaxRate. The TED MIB module 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.2.3232235777.3232235778.16777264 zeroDotZero
tedLinkType.2.3232235777.3232235778.16777264      pointToPoint(1)
tedLinkState.2.3232235777.3232235778.16777264    up(1)
tedAreaId.2.3232235777.3232235778.16777264      0
```

```
tedTeRouterIdAddrType.2.3232235777.3232235778.16777264 ipv4(1)
tedTeRouterIdAddr.2.3232235777.3232235778.16777264 192.0.2.1
tedLinkIdAddrType.2.3232235777.3232235778.16777264 ipv4(1)
tedLinkIdAddr.2.3232235777.3232235778.16777264 192.0.2.10
```

```
tedMetric.2.3232235777.3232235778.16777264      1
tedMaxBandwidth.2.3232235777.3232235778.16777264  4d9450c0
tedMaxReservableBandwidth.2.3232235777.3232235778.16777264  4d9450c0
tedUnreservedBandwidthPri0.2.3232235777.3232235778.16777264  4d9450c0
tedUnreservedBandwidthPri1.2.3232235777.3232235778.16777264  4d9450c0
tedUnreservedBandwidthPri2.2.3232235777.3232235778.16777264  4d9450c0
tedUnreservedBandwidthPri3.2.3232235777.3232235778.16777264  4d9450c0
tedUnreservedBandwidthPri4.2.3232235777.3232235778.16777264  4d9450c0
tedUnreservedBandwidthPri5.2.3232235777.3232235778.16777264  4d9450c0
tedUnreservedBandwidthPri6.2.3232235777.3232235778.16777264  4d9450c0
tedUnreservedBandwidthPri7.2.3232235777.3232235778.16777264  4d9450c0
tedAdministrativeGroup.2.3232235777.3232235778.16777264      0
tedLocalId.2.3232235777.3232235778.16777264      0
tedRemoteId.2.3232235777.3232235778.16777264      0
tedLinkProtectionType.2.3232235777.3232235778.16777264  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

This MIB module makes references to the follows documents.

T. Otani et al.

Expires Apr. 2013

[Page 6]

[[RFC2328](#)], [[RFC2578](#)], [[RFC2580](#)], [[RFC3630](#)], [[RFC4001](#)], [[RFC4203](#)],
[[RFC4220](#)], [[RFC4444](#)], [[RFC4801](#)], [[RFC4802](#)], [[RFC5305](#)], [[RFC5307](#)],
[[RFC5329](#)], [[RFC5340](#)], [[RFC6340](#)] and [[ISO10589](#)].

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](#)
IANA GmplsLSPEncodingTypeTC, IANA GmplsSwitchingTypeTC
FROM IANA-GMPLS-TC-MIB -- [RFC4802](#)
InetAddress, InetAddressType
FROM INET-ADDRESS-MIB -- [RFC4001](#)
Float32TC
FROM FLOAT-TC-MIB -- [RFC6340](#)
;

tedMIB MODULE-IDENTITY

LAST-UPDATED "201211060000Z" -- 6 Nov. 2012 00:00:00 GMT
ORGANIZATION "IETF CCAMP Working Group."
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Comments and discussion to ccamp@ietf.org"

DESCRIPTION

"This MIB module contains managed object definitions for TED in support of MPLS/GMPLS TE Database.

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-- Revision history.

REVISION

"201211060000Z" -- 6 Nov. 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

T. Otani et al.

Expires Apr. 2013

[Page 7]

-- 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 module.

```
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 and RFC5305."
    ::= { 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,  
    tedTeRouterIdAddrType       InetAddressType,  
    tedTeRouterIdAddr           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](#)"

::= { 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

"If tedLinkInformationSource has the value unknown(0), this object MUST contain a value of zeroDotZero.
If tedLinkInformationSource has the value locallyConfigured(1),

an implementation can use this object to supply the identifier of the corresponding row entry in the teLinkTable of TE-LINK-STD-MIB ([RFC 4220](#)), the identifier of the corresponding row in a local proprietary TE link MIB module, or the value of zeroDotZero.

If tedLinkInformationSource has the value ospfv2(2) and ospfv3(3), an implementation can use this object to supply the identifier of the corresponding row entry in the ospfLocalLsdbTable (OSPFv2-MIB) and the ospfv3AreaLsdbTable (OSPFv3-MIB), or the value of zeroDotZero.

If tedLinkInformationSource has the value isis(4), an implementation can use this object to supply the identifier of the corresponding row entry in the isisAreaAddr of ISIS-MIB ([RFC4444](#)), or the value of zeroDotZero.

If tedLinkInformationSource has the value other(5), an implementation can use this object to supply the identifier of the corresponding row entry in the local proprietary MIB module, or the value of zeroDotZero."

::= { 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 }

tedTeRouterIdAddrType 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) are supported. "
    ::= { tedEntry 9 }

tedTeRouterIdAddr 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
        IS-IS extensions for TE, RFC5305, 4.3"
    ::= { 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) are 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
IS-IS extensions for TE, [RFC5305](#), 4.3"
::= { 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

IS-IS extensions for TE, [RFC5305](#), 3.7"

::= { 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

IS-IS extensions for TE, [RFC5305](#), 3.4"

::= { 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

IS-IS extensions for TE, [RFC5305](#), 3.5"

::= { 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
IS-IS extensions for TE, [RFC5305](#), 3.6"
::= { 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

IS-IS extensions for TE, [RFC5305](#), 3.6"

::= { 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

IS-IS extensions for TE, [RFC5305](#), 3.6"

::= { 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

IS-IS extensions for TE, [RFC5305](#), 3.6"

::= { 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

IS-IS extensions for TE, [RFC5305](#), 3.6"
::= { 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

IS-IS extensions for TE, [RFC5305](#), 3.6"

::= { 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

IS-IS extensions for TE, [RFC5305](#), 3.6"

::= { 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

IS-IS extensions for TE, [RFC5305](#), 3.6"

::= { 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

T. Otani et al.

Expires Apr. 2013

[Page 15]

```
"Traffic Engineering (TE) Extensions to OSPF Version 2, RFC
3630, 2.5.9
IS-IS extensions for TE, RFC5305, 3.1"
::= { 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
        IS-IS Extensions in Support of GMPLS, RFC5307, 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
        IS-IS Extensions in Support of GMPLS, RFC5307, 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
        IS-IS Extensions in Support of GMPLS, RFC5307, 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 (SIZE (1..20))
    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, RFC3630,
        2.5.3,
        Traffic Engineering Extensions to OSPF Version3, RFC5329, 4.3
        IS-IS extensions for TE, RFC5305, 3.4"
::= { 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(SIZE (1..20))
    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
        IS-IS extensions for TE, RFC5305, 3.3"
    ::= { 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 module 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

IS-IS Extensions in Support of GMPLS, [RFC5307](#), 1.3"

::= { 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

IS-IS Extensions in Support of GMPLS, [RFC5307](#), 1.3"
 ::= { 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

IS-IS Extensions in Support of GMPLS, [RFC5307](#), 1.3"

::= { 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

IS-IS Extensions in Support of GMPLS, [RFC5307](#), 1.3"

::= { 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

IS-IS Extensions in Support of GMPLS, [RFC5307](#), 1.3"

::= { 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

IS-IS Extensions in Support of GMPLS, [RFC5307](#), 1.3"

::= { 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

IS-IS Extensions in Support of GMPLS, [RFC5307](#), 1.3"

::= { 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

IS-IS Extensions in Support of GMPLS, [RFC5307](#), 1.3"

::= { 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

IS-IS Extensions in Support of GMPLS, [RFC5307](#), 1.3"

::= { 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
IS-IS Extensions in Support of GMPLS, [RFC5307](#), 1.3"
::= { 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
 IS-IS Extensions in Support of GMPLS, [RFC5307](#), 1.3"
::= { 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
 IS-IS Extensions in Support of GMPLS, [RFC5307](#), 1.3"
::= { 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
 IS-IS Extensions in Support of GMPLS, [RFC5307](#), 1.3"
::= { 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

T. Otani et al.

Expires Apr. 2013

[Page 22]

"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

IS-IS Extensions in Support of GMPLS, [RFC5307](#), 1.4"

::= { 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

IS-IS Extensions in Support of GMPLS, [RFC5307](#), 1.4"

::= { 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      {1}  
    ::= { 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 {1}

::= { 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

T. Otani et al.

Expires Apr. 2013

[Page 26]

```
OBJECTS {
    tedLinkState
    tedAreaId
    tedLinkType
    tedTeRouterIdAddrType
    tedTeRouterIdAddr
    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 }

T. Otani et al.

Expires Apr. 2013

[Page 28]

```
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 are several 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.

There are only two write-access objects in this MIB module: tedStatusChangeNotificationMaxRate and tedCreatedDeletedNotificationMaxRate. Malicious modification of these objects could cause the management agent, the network, or the router to become overloaded with Notifications in cases of high churn within the network.

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.

Implementations MUST provide the security features described by the SNMPv3 framework (see [\[RFC3410\]](#)), including full support for authentication and privacy via the User-based Security Model (USM) [\[RFC3414\]](#) with the AES cipher algorithm [\[RFC3826\]](#). Implementations MAY also provide support for the Transport Security Model (TSM) [\[RFC5591\]](#) in combination with a secure transport such as SSH [\[RFC5592\]](#) or TLS/DTLS [\[RFC6353\]](#).

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 yyy} to the TED-MIB module specified in this document.

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11. Acknowledgment

T. Otani et al.

Expires Apr. 2013

[Page 32]

The authors wish to acknowledge and thank the following individuals for their valuable comments to this document: Ken Nagami, Shuichi Okamoto, Adrian Farrel, Diego Caviglia and Acee Lindem.

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