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Traffic Engineering Link Management Information Base

Status of This Memo

This document specifies an Internet standards track protocol for the Internet community, and requests discussion and suggestions for improvements. Please refer to the current edition of the "Internet Official Protocol Standards" (STD 1) for the standardization state and status of this protocol. Distribution of this memo is unlimited.

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Abstract

This memo defines a portion of the Management Information Base (MIB) for use with network management protocols in the Internet community. In particular, it describes managed objects for modeling TE links as described in the Link Bundling in MPLS Traffic Engineering (TE) document.

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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

OSPF [RFC3630], Generalized MPLS (GMPLS) [RFC3471], and the Link Management Protocol (LMP) [RFC4204] use the concept of traffic engineering (TE) links to abstract link properties. The effect of this approach is a reduction in the amount of routing information exchanged in the network, which improves routing scalability. In addition, the use of TE links allows the implementation of new capabilities such as link protection.

In this document, we present a MIB module that can be used to manage TE links and their extension, the bundled link. This MIB module enables both the configuration and the performance monitoring of TE links and the bundled link.

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

3. Terminology

This document uses terminology from the documents describing link bundling [RFC4201] and GMPLS [RFC3945].

The link bundling feature is designed to aggregate one or more similar entities between a node pair into a bundled link [RFC4201]. In RFC 4201, those entities are referred to as TE links. A TE link is a subinterface capable of carrying MPLS traffic engineered traffic. A TE Link may be comprised of only one underlying component link. In cases where more than one component links are to be combined, multiple component links should be created with differing priorities to indicate hot-standby or parallel utilization.

A bundled link is another kind of Traffic Engineering (TE) link (see [RFC4203]). A link bundle is a subinterface that binds the traffic of a group of one or more TE links. There should be more than one TE Link in a link bundle, but this is not a requirement. Furthermore, if there are more than one TE links in a link bundle at some time, and at some point later, all but one of the links are deleted, the agent may choose to either delete the link bundle, or it may choose to leave it intact. Traffic counters on a link bundle are cumulative for all subinterfaces that it binds together.

4. Feature Checklist

The TE Link MIB module (TE-LINK-STD-MIB) is designed to satisfy the following requirements and constraints:

- The MIB module supports the management of TE links, including bundled links.

- Support is provided for configuration of traffic engineering parameters associated with TE links.

- The MIB module is used to monitor the priority-based component link and TE link bandwidth values.

5. Outline

Configuring bundled links involves the following steps:

- Creating a bundled link.

- Creating TE links.

- Optionally specifying the shared risk link groups associated with the TE links.

- Configuring the component links including the bandwidth parameters and associating the component links with the appropriate TE link.

- Associating the TE links with the appropriate bundled link.

6. Brief Description of MIB Objects

Sections 6.1 - 6.4 describe objects pertaining to TE links while Sections 6.5 - 6.7 describe objects pertaining to component links. The MIB objects were derived from the link bundling document [RFC4201].

6.1. teLinkTable

This table represents the TE links, including bundled links, and their generic traffic engineering parameters.

6.2. teLinkDescriptorTable

This table represents the TE link interface switching capability descriptors.

6.3. teLinkSrlgTable

This table represents the shared risk link groups (SRLGs) associated with TE links.

6.4. teLinkBandwidthTable

This table specifies the priority-based bandwidth traffic engineering parameters associated with TE links.

6.5. componentLinkTable

This table enumerates the component links and their generic traffic engineering parameters.

6.6. componentLinkDescriptorTable

This table enumerates the interface switching capability descriptors that each component link supports.

6.7. componentLinkBandwidthTable

The component link bandwidth table specifies the priority-based bandwidth values associated with the component links.

Component links that belong to the same TE link must be compatible. If these two tables are managed independently, mechanisms should be put in place to ensure consistency between the two tables. TE links that form a bundled link must have compatible traffic engineering parameters (resource class, link metric, and protection type).

The link descriptors of the teLinkDescriptorTable can be derived from the link descriptors of the componentLinkDescrTable.

Some of the bandwidth parameters of the teLinkTable, teLinkDescriptorTable, teLinkBandwidthTable are derived from the bandwidth parameters of the componentLinkTable, componentLinkDescriptorTable, and componentLinkBandwidthTable (maximum reservable bandwidth, minimum LSP bandwidth, maximum LSP bandwidth at specified priority, and unreserved bandwidth).

7. Example of Bundled Link Setup

In this section, we provide a brief example of using the MIB objects described in section 10 to set up a bundled link. While this example is not meant to illustrate every nuance of the MIB module, it is intended as an aid to understanding some of the key concepts. It is meant to be read after going through the MIB module itself. Section

8.2 provides more details on the use of the ifStackTable to establish relationships between bundled links, TE links, and component links.

Suppose that one would like to manually create a bundled link out of two 1:1 TE links, as depicted in the figure in Section 8.2. Assume that the bundled link is associated with SRLGs 10 and 50. Finally, let the component links be port entity interfaces (lambdas). The following example illustrates which rows and corresponding objects might be created to accomplish this.

First, a bundled link entry is created. An ifEntry with the same ifIndex and with ifType teLink needs to be created beforehand.

```
In teLinkTable:
{
   ifIndex                        = 2,
   teLinkAddressType              = unknown(0),
   teLinkLocalIpAddr              = ''H,
   teLinkRemoteIpAddr             = ''H,
   teLinkMetric                   = 5,
   teLinkProtectionType           = dedicated1For1(4),
   teLinkWorkingPriority          = 7,
   teLinkResourceClass            = 3,
   teLinkIncomingIfId             = 0,
   teLinkOutgoingIfId             = 2,
   teLinkRowStatus                = createAndGo(4),
   teLinkStorageType              = nonVolatile(3)
}

In ifStackTable:
{
   ifStackHigherLayer             = 0,
   ifStackLowerLayer              = 2,
   ifStackStatus                  = createAndGo(4)
}
```

Next, the two TE links are created.

```
In teLinkTable:
{
   ifIndex                        = 3,
   teLinkAddressType              = unknown(0),
   teLinkLocalIpAddr              = ''H,
   teLinkRemoteIpAddr             = ''H,
   teLinkMetric                   = 5,
   teLinkProtectionType           = unprotected(2),
   teLinkWorkingPriority          = 7,
   teLinkResourceClass            = 3,
```

```
         teLinkIncomingIfId             = 0,
         teLinkOutgoingIfId             = 3,
         teLinkRowStatus                = createAndGo(4),
         teLinkStorageType              = nonVolatile(3)
      }

      In ifStackTable:
      {
         ifStackHigherLayer             = 2,
         ifStackLowerLayer              = 3,
         ifStackStatus                  = createAndGo(4)
      }

      In teLinkTable:
      {
         ifIndex                        = 4,
         teLinkAddressType              = unknown(0),
         teLinkLocalIpAddr              = ''H,
         teLinkRemoteIpAddr             = ''H,
         teLinkMetric                   = 5,
         teLinkProtectionType           = unprotected(2),
         teLinkWorkingPriority          = 7,
         teLinkResourceClass            = 3,
         teLinkIncomingIfId             = 0,
         teLinkOutgoingIfId             = 4,
         teLinkRowStatus                = createAndGo(4),
         teLinkStorageType              = nonVolatile(3)
      }

      In ifStackTable:
      {
         ifStackHigherLayer             = 2,
         ifStackLowerLayer              = 4,
         ifStackStatus                  = createAndGo(4)
      }
```

We assign SRLGs to the TE links.

```
      In the teLinkSrlgTable:
      {
         ifIndex                        = 3,
         teLinkSrlg                     = 10,
         teLinkSrlgRowStatus            = createAndGo(4),
         teLinkSrlgStorageType          = nonVolatile(3)
      }

      In the teLinkSrlgTable:
      {
```

```
      ifIndex                        = 4,
      teLinkSrlg                     = 50,
      teLinkSrlgRowStatus            = createAndGo(4),
      teLinkSrlgStorageType          = nonVolatile(3)
   }
```

The bundled link inherits the SRLG properties from the associated TE links.

Next, for each unbundled TE link, a component link is created. An ifEntry with the same ifIndex needs to be created beforehand.

```
   In componentLinkTable:
   {
      ifIndex                          = 5,
      componentLinkPreferredProtection = primary(1),
      componentLinkRowStatus           = createAndGo(4),
      componentLinkStorageType         = nonVolatile(3)
   }

   In ifStackTable:
   {
      ifStackHigherLayer             = 3,
      ifStackLowerLayer              = 5,
      ifStackStatus                  = createAndGo(4)
   }

   In componentLinkTable:
   {
      ifIndex                          = 6,
      componentLinkPreferredProtection = secondary(2),
      componentLinkRowStatus           = createAndGo(4)
      componentLinkStorageType         = nonVolatile(3)
   }

   In ifStackTable:
   {
      ifStackHigherLayer             = 4,
      ifStackLowerLayer              = 6,
      ifStackStatus                  = createAndGo(4)
   }
```

In this example, once a component link is added to the componentLinkTable, the associated link descriptors are implicitly added to the componentLinkDescriptorTable.

TE link link descriptors are derived from their component link descriptors.

Note that the bandwidth attributes in teLinkDescriptorTable, componentLinkDescriptorTable, teLinkBandwidthTable, and componentLinkBandwidthTable are maintained by the device according to LSP creation/deletion at different priorities. The values in the teLinkBandwidthTable are an aggregation of the values for the component links of the TE links and the TE links of the bundled link.

8. Application of the Interfaces Group to TE Links

The Interfaces Group [RFC2863] defines generic managed objects for managing interfaces. This memo contains the media-specific extensions to the Interfaces Group for managing TE Link interfaces as logical interfaces.

This memo assumes the interpretation of the Interfaces Group to be in accordance with [RFC2863], which states that the interfaces table (ifTable) contains information on the managed resource's interfaces and that each sub-layer below the internetwork layer of a network interface is considered an interface. Thus, the TE Link interface is represented as an entry in the ifTable. The interrelation of entries in the ifTable is defined by Interfaces Stack Group, as defined in [RFC2863].

When using TE Link interfaces, the interface stack table might appear as follows:

```
+----------------------------------------+
| TE link-interface ifType = teLink(200) +
+----------------------------------------+
| Underlying Layer...                    +
+----------------------------------------+
```

In the above diagram, "Underlying Layer..." refers to the ifIndex of any interface type, which has been defined for TE Link interworking. Examples include ATM, Frame Relay, Ethernet, etc.

8.1. Support of the TE Link Layer by ifTable

Some specific interpretations of ifTable for the TE Link layer follow.

Object	Use for the TE Link layer
ifIndex	Each TE Link interface is represented by an ifEntry.
ifDescr	Description of the TE Link interface.

ifType The value that is allocated for TE Link is 200 [IANAifType].

ifSpeed The total bandwidth in bits per second for use by the TE Link layer.

ifPhysAddress Unused.

ifAdminStatus This variable indicates the administrator's intent as to whether TE Link should be enabled, disabled, or running in some diagnostic testing mode on this interface. Also see [RFC2863].

ifOperStatus This value reflects the actual or operational status of the TE Link on this interface.

ifLastChange See [RFC2863].

ifInOctets The number of received octets over the interface, i.e., the number of received octets in all component links associated with the interface.

ifOutOctets The number of transmitted octets over the interface, i.e., the number of octets transmitted over all component links associated with the interface.

ifInErrors The number of packets dropped due to uncorrectable errors.

ifInUnknownProtos
The number of received packets discarded during packet header validation.

ifOutErrors See [RFC2863].

ifName Textual name (unique on this system) of the interface, or an octet string of zero length.

ifLinkUpDownTrapEnable
Default is disabled (2).

ifConnectorPresent
Set to false (2).

ifHighSpeed See [RFC2863].

ifHCInOctets The 64-bit version of ifInOctets; supported if required by the compliance statements in [RFC2863].

ifHCOutOctets The 64-bit version of ifOutOctets; supported if required by the compliance statements in [RFC2863].

ifAlias The non-volatile 'alias' name for the interface, as specified by a network manager.

ifCounterDiscontinuityTime
See [RFC2863].

Support for ifInOctets, ifOutOctets, ifInErrors, ifInUnknownProtos, ifOutErrors, ifHCInOctets, and ifHCOutOctets objects is not required if the encoding type is clear. For other encoding types, traffic counters on a TE link are cumulative for all subinterfaces that it binds together.

8.2. Using ifStackTable

This section describes, by example, how to use the ifStackTable to represent the relationship of TE links with underlying TE-enabled interfaces. Implementors of the stack table for TE link interfaces should look at the appropriate RFC for the service being stacked on TE links. The examples given below are for illustration purposes only.

Example: MPLS is being carried on a bundled TE link. The bundled TE link represents a 1:1 optical transport interface.

In this example, the component link is a TE link. The two component links/TE links are grouped in a bundled link.

```
+-------------------------------------------------------------------+
| MPLS interface ifType = mpls(166)                                 |
| ifIndex = 1                                                       |
+-------------------------------------------------------------------+
| TE link (bundled link) ifType = teLink(200)                       |
| ifIndex = 2                                                       |
+--------------------------------+-+--------------------------------+
| TE link ifType = teLink(200)   | | TE link ifType = teLink(200)   |
| ifIndex = 3                    | | ifIndex = 4                    |
+--------------------------------+ +--------------------------------+
| Component link                 | | Component link                 |
| ifType = opticalTransport(196) | | ifType = opticalTransport(196) |
| ifIndex = 5                    | | ifIndex = 6                    |
+--------------------------------+ +--------------------------------+
```

The assignment of the index values could, for example, be:

```
ifIndex  Description
1        mpls             (type 166)
2        teLink           (type 200)
3        teLink           (type 200)
4        teLink           (type 200)
5        opticalTransport (type 196)
6        opticalTransport (type 196)
```

The ifStackTable is then used to show the relationships between the various interfaces.

```
ifStackTable Entries

HigherLayer   LowerLayer
0             1
1             2
2             3
2             4
3             5
4             6
5             0
6             0
```

In the case where MPLS is using a single TE link, then the upper TE link layer (link bundle) is not required.

```
+-----------------------------------+
| MPLS interface ifType = mpls(166) |
+-----------------------------------+
| TE link ifType = teLink(200)      |
+-----------------------------------+
| Component link                    |
| ifType = opticalTransport(196)    |
+-----------------------------------+
```

The assignment of the index values could for example be:

```
ifIndex  Description
1        mpls             (type 166)
2        teLink           (type 200)
3        opticalTransport (type 196)
```

The ifStackTable is then used to show the relationships between the various interfaces.

```
ifStackTable Entries

HigherLayer   LowerLayer
0             1
1             2
2             3
3             0
```

8.3. Applicability of ifRcvAddressTable

TE link interfaces are logical interfaces with no media-level addresses. As such, the ifRcvAddressTable is not applicable to these interfaces.

9. TE Link MIB Module Definitions

```
TE-LINK-STD-MIB DEFINITIONS ::= BEGIN

IMPORTS
   MODULE-IDENTITY, OBJECT-TYPE, transmission, Integer32, Unsigned32
      FROM SNMPv2-SMI

   MODULE-COMPLIANCE, OBJECT-GROUP
      FROM SNMPv2-CONF

   TEXTUAL-CONVENTION, RowStatus, StorageType
      FROM SNMPv2-TC

   InterfaceIndexOrZero, ifIndex
      FROM IF-MIB

   InetAddressType, InetAddress
      FROM INET-ADDRESS-MIB;


teLinkStdMIB MODULE-IDENTITY
   LAST-UPDATED "200510110000Z"  -- 11 October 2005
   ORGANIZATION "Multiprotocol Label Switching (MPLS) Working Group"
   CONTACT-INFO
       "        Martin Dubuc
        Email:  mdubuc@ncf.ca

                Thomas D. Nadeau
        Email:  tnadeau@cisco.com
```

```
                 Jonathan P. Lang
          Email: jplang@ieee.org

          Comments about this document should be emailed directly to
          the MPLS working group mailing list at mpls@uu.net."

      DESCRIPTION
          "Copyright (C) 2005 The Internet Society.  This version of
           this MIB module is part of RFC 4220; see the RFC
           itself for full legal notices.

           This MIB module contains managed object definitions for
           MPLS traffic engineering links as defined in
           'Link Bundling in MPLS Traffic Engineering (TE)'."

      -- Revision history.
      REVISION
          "200510110000Z"  -- 11 October 2005
      DESCRIPTION
          "Initial version published as RFC 4220."
      ::= { transmission 200 }

   -- Textual Conventions

   TeLinkBandwidth ::= TEXTUAL-CONVENTION
      STATUS       current
      DESCRIPTION
          "This type is used to represent link bandwidth in bps.  This
           value is represented using a 4 octet IEEE floating point
           format [IEEE].  The floating point representation is not
           used to represent fractional value but rather to allow
           specification of large numbers that cannot be expressed
           with 32-bit integers."
      REFERENCE
          "IEEE Standard for Binary Floating-Point Arithmetic,
           Standard 754-1985"
      SYNTAX       OCTET STRING (SIZE(4))

   TeLinkPriority ::= TEXTUAL-CONVENTION
      DISPLAY-HINT "d"
      STATUS       current
      DESCRIPTION
          "This type is used to represent a priority.  Each connection
           is assigned a priority.  This priority is used when
           accounting for bandwidth on TE links or component
           links, for resource allocation and for rerouting purposes.
           Value 0 is the highest priority.  Value 7 is the lowest
           priority."
```

```
      SYNTAX       Unsigned32 (0..7)

   TeLinkProtection ::= TEXTUAL-CONVENTION
      STATUS       current
      DESCRIPTION
          "Link protection."
      SYNTAX       INTEGER {
                       primary(1),
                       secondary(2)
                   }

   TeLinkSwitchingCapability ::= TEXTUAL-CONVENTION
      STATUS       current
      DESCRIPTION
          "Switching capability as specified in the 'OSPF Extensions in
           Support of Generalized Multi-Protocol Label Switching
           (GMPLS)' document.  The values specified in this document
           are not contiguous."
      SYNTAX       INTEGER {
                       packetSwitch1(1),
                       packetSwitch2(2),
                       packetSwitch3(3),
                       packetSwitch4(4),
                       layer2Switch(51),
                       tdm(100),
                       lambdaSwitch(150),
                       fiberSwitch(200)
                   }

   TeLinkEncodingType ::= TEXTUAL-CONVENTION
      STATUS       current
      DESCRIPTION
          "Link encoding type as specified in 'Generalized
           Multi-Protocol Label Switching (GMPLS) Signaling
           Functional Description' document.  The values
           specified in this document are not contiguous."
      SYNTAX       INTEGER {
                       packet(1),
                       ethernet(2),
                       ansiEtsiPdh(3),
                       sdhItuSonetAnsi(5),
                       digitalWrapper(7),
                       lambda(8),
                       fiber(9),
                       fiberChannel(11)
                   }

   TeLinkSonetSdhIndication ::= TEXTUAL-CONVENTION
```

```
      STATUS       current
      DESCRIPTION
          "This convention is used to indicate whether the interface
           supports Standard or Arbitrary SONET/SDH.  To simplify the
           mapping process, the values used in this textual convention
           match the values specified in the interface switching
           capability specific information field, i.e., 0 for Standard
           SONET/SDH and 1 for Arbitrary SONET/SDH."
      REFERENCE
          "OSPF Extensions in Support of Generalized Multi-Protocol
           Label Switching (GMPLS), RFC 4203"
      SYNTAX       INTEGER {
                       standard(0),
                       arbitrary(1)
                   }

   -- Top level components of this MIB module

   -- Notifications
   teLinkNotifications OBJECT IDENTIFIER ::= { teLinkStdMIB 0 }
   -- Tables, Scalars
   teLinkObjects       OBJECT IDENTIFIER ::= { teLinkStdMIB 1 }
   -- Conformance
   teLinkConformance   OBJECT IDENTIFIER ::= { teLinkStdMIB 2 }

   -- TE Link Table

   teLinkTable OBJECT-TYPE
      SYNTAX        SEQUENCE OF TeLinkEntry
      MAX-ACCESS    not-accessible
      STATUS        current
      DESCRIPTION
          "This table specifies the grouping of component links into
           TE links and the grouping of TE links into bundled links."
      ::= { teLinkObjects 1 }

   teLinkEntry OBJECT-TYPE
      SYNTAX        TeLinkEntry
      MAX-ACCESS    not-accessible
      STATUS        current
      DESCRIPTION
          "An entry in this table exists for each ifEntry with an
           ifType of teLink(200), i.e., for every TE link.  An ifEntry
           in the ifTable must exist before a teLinkEntry is created
           with the corresponding ifIndex.  If a TE link entry in the
           ifTable is destroyed, then so is the corresponding entry
           in the teLinkTable.  The administrative and operational
           status values are controlled from the ifEntry."
```

```
    INDEX         { ifIndex }
    ::= { teLinkTable 1 }

TeLinkEntry ::= SEQUENCE {
  teLinkAddressType                 InetAddressType,
  teLinkLocalIpAddr                 InetAddress,
  teLinkRemoteIpAddr                InetAddress,
  teLinkMetric                      Unsigned32,
  teLinkMaximumReservableBandwidth  TeLinkBandwidth,
  teLinkProtectionType              INTEGER,
  teLinkWorkingPriority             TeLinkPriority,
  teLinkResourceClass               Unsigned32,
  teLinkIncomingIfId                Integer32,
  teLinkOutgoingIfId                InterfaceIndexOrZero,
  teLinkRowStatus                   RowStatus,
  teLinkStorageType                 StorageType
}

teLinkAddressType OBJECT-TYPE
    SYNTAX        InetAddressType
    MAX-ACCESS    read-create
    STATUS        current
    DESCRIPTION
        "The type of Internet address for the TE link."
    ::= { teLinkEntry 1 }

teLinkLocalIpAddr OBJECT-TYPE
    SYNTAX        InetAddress
    MAX-ACCESS    read-create
    STATUS        current
    DESCRIPTION
        "The local Internet address for numbered links.  The type of
         this address is determined by the value of the
         teLinkAddressType object.

         For IPv4 and IPv6 numbered links, this object represents the
         local IP address associated with the TE link.  For an
         unnumbered link, the local address is of type unknown, this
         object is set to the zero length string, and the
         teLinkOutgoingIfId object then identifies the unnumbered
         address.

         If the TE link is a Forwarding Adjacency (FA), the local
         IP address is set to the head-end address of the FA-LSP.

         If ipAddrTable is implemented, this object must have the
         same value as the ipAdEntAddr object that belongs to the
         row in ipAddrTable where ipAdEntIfIndex is equal to
```

```
          ifIndex."
      ::= { teLinkEntry 2 }

   teLinkRemoteIpAddr OBJECT-TYPE
      SYNTAX        InetAddress
      MAX-ACCESS    read-create
      STATUS        current
      DESCRIPTION
          "The remote Internet address for numbered links.  The type of
           this address is determined by the value of the
           teLinkAddressType object.

           The remote IP address associated with the TE link (IPv4 and
           IPv6 numbered links).  For an unnumbered link, the remote
           address is of type unknown, this object is set to the
           zero length string, and the teLinkIncomingIfId object then
           identifies the unnumbered address.

           If the TE link is a Forwarding Adjacency, the remote IP
           address is set to the tail-end address of the FA-LSP."
      ::= { teLinkEntry 3 }

   teLinkMetric OBJECT-TYPE
      SYNTAX        Unsigned32
      MAX-ACCESS    read-create
      STATUS        current
      DESCRIPTION
          "The traffic engineering metric for the TE link is
           derived from its component links.  All component links
           within the TE link must have the same traffic
           engineering metric."
      REFERENCE
          "Link Bundling in MPLS Traffic Engineering (TE), RFC 4201"
      ::= { teLinkEntry 4 }

   teLinkMaximumReservableBandwidth OBJECT-TYPE
      SYNTAX        TeLinkBandwidth
      UNITS         "bps"
      MAX-ACCESS    read-only
      STATUS        current
      DESCRIPTION
          "This attribute specifies the maximum reservable bandwidth on
           the TE link.  This is the union of the maximum reservable
           bandwidth of all the component links within the
           TE link that can be used to carry live traffic."
      REFERENCE
          "OSPF Extensions in Support of Generalized Multi-Protocol
           Label Switching (GMPLS), RFC 4203"
```

```
      ::= { teLinkEntry 5 }

   teLinkProtectionType OBJECT-TYPE
      SYNTAX        INTEGER {
                        extraTraffic(1),
                        unprotected(2),
                        shared(3),
                        dedicated1For1(4),
                        dedicated1Plus1(5),
                        enhanced(6)
                    }
      MAX-ACCESS    read-create
      STATUS        current
      DESCRIPTION
          "This attribute specifies the link protection type of the
           TE link.  Descriptions of the different protection types can
           be found in the 'Routing Extensions in Support of
           Generalized Multi-Protocol Label Switching (GMPLS)'
           document."
      REFERENCE
          "OSPF Extensions in Support of Generalized Multi-Protocol
           Label Switching (GMPLS), RFC 4203 and
           Routing Extensions in Support of Generalized Multi-Protocol
           Label Switching (GMPLS), RFC 4202"
      ::= { teLinkEntry 6 }

   teLinkWorkingPriority OBJECT-TYPE
      SYNTAX        TeLinkPriority
      MAX-ACCESS    read-create
      STATUS        current
      DESCRIPTION
          "This object represents a priority value such that a new
           connection with a higher priority, i.e., numerically lower
           than this value, is guaranteed to be setup on a primary
           link and not on a secondary link."
      REFERENCE
          "OSPF Extensions in Support of Generalized Multi-Protocol
           Label Switching (GMPLS), RFC 4203"
      ::= { teLinkEntry 7 }

   teLinkResourceClass OBJECT-TYPE
      SYNTAX        Unsigned32
      MAX-ACCESS    read-create
      STATUS        current
      DESCRIPTION
          "This attribute specifies the TE link resource class.
           The resource class is a 32 bit bitfield.  The resource class
           for a link bundle is derived from the resource class of its
```

```
          TE links.  All TE links within a link bundle must have the
          same resource class.  Encoding of the resource class is
          described in the 'Traffic Engineering (TE) Extensions to
          OSPF Version 2' document."
      REFERENCE
          "Link Bundling in MPLS Traffic Engineering (TE), RFC 4201
           and Traffic Engineering (TE) Extensions to OSPF Version 2,
           RFC 3630"
      ::= { teLinkEntry 8 }

   teLinkIncomingIfId OBJECT-TYPE
      SYNTAX        Integer32 (0..2147483647)
      MAX-ACCESS    read-create
      STATUS        current
      DESCRIPTION
          "For unnumbered links, the incoming interface is set to the
           outgoing interface identifier chosen by the neighboring LSR
           for the reverse link corresponding to this TE link.  If the
           link is numbered, the value of this object is 0 and the
           address is stored in the teLinkRemoteIpAddr instead."
      REFERENCE
          "Link Bundling in MPLS Traffic Engineering (TE), RFC 4201"
      ::= { teLinkEntry 9 }

   teLinkOutgoingIfId OBJECT-TYPE
      SYNTAX        InterfaceIndexOrZero
      MAX-ACCESS    read-create
      STATUS        current
      DESCRIPTION
          "If the link is unnumbered, the outgoing interface identifier
           is set to the outgoing interface identifier chosen for the
           TE link by the advertising LSR.  If the link is numbered, the
           value of this object is 0 and the address is stored in the
           teLinkLocalIpAddr instead."
      REFERENCE
          "Link Bundling in MPLS Traffic Engineering (TE), RFC 4201"
      ::= { teLinkEntry 10 }

   teLinkRowStatus OBJECT-TYPE
      SYNTAX        RowStatus
      MAX-ACCESS    read-create
      STATUS        current
      DESCRIPTION
          "This variable is used to create, modify, and/or
           delete a row in this table.  None of the writable objects in
           a row can be changed if status is active(1)."
      ::= { teLinkEntry 11 }
```

```
teLinkStorageType OBJECT-TYPE
   SYNTAX        StorageType
   MAX-ACCESS    read-create
   STATUS        current
   DESCRIPTION
       "The storage type for this conceptual row in the
        teLinkTable.  Conceptual rows having the value
        'permanent' need not allow write-access to any
        columnar object in the row."
   ::= { teLinkEntry 12 }

-- End of teLinkTable


-- TE Link Descriptor Table

teLinkDescriptorTable OBJECT-TYPE
   SYNTAX        SEQUENCE OF TeLinkDescriptorEntry
   MAX-ACCESS    not-accessible
   STATUS        current
   DESCRIPTION
       "This table specifies the interface switching capability
        descriptors associated with the TE links."
   ::= { teLinkObjects 2 }

teLinkDescriptorEntry OBJECT-TYPE
   SYNTAX        TeLinkDescriptorEntry
   MAX-ACCESS    not-accessible
   STATUS        current
   DESCRIPTION
       "An entry in this table is created for every TE link interface
        switching capability descriptor.  An ifEntry in the ifTable
        must exist before a teLinkDescriptorEntry using the same
        ifIndex is created.  ifType of ifEntry must be teLink(200).
        If a TE link entry in the ifTable is destroyed, then so are
        all of the entries in the teLinkDescriptorTable that use the
        ifIndex of this TE link."
   INDEX         { ifIndex, teLinkDescriptorId }
   ::= { teLinkDescriptorTable 1 }

TeLinkDescriptorEntry ::= SEQUENCE {
  teLinkDescriptorId               Unsigned32,
  teLinkDescrSwitchingCapability   TeLinkSwitchingCapability,
  teLinkDescrEncodingType          TeLinkEncodingType,
  teLinkDescrMinLspBandwidth       TeLinkBandwidth,
  teLinkDescrMaxLspBandwidthPrio0  TeLinkBandwidth,
  teLinkDescrMaxLspBandwidthPrio1  TeLinkBandwidth,
  teLinkDescrMaxLspBandwidthPrio2  TeLinkBandwidth,
```

```
    teLinkDescrMaxLspBandwidthPrio3  TeLinkBandwidth,
    teLinkDescrMaxLspBandwidthPrio4  TeLinkBandwidth,
    teLinkDescrMaxLspBandwidthPrio5  TeLinkBandwidth,
    teLinkDescrMaxLspBandwidthPrio6  TeLinkBandwidth,
    teLinkDescrMaxLspBandwidthPrio7  TeLinkBandwidth,
    teLinkDescrInterfaceMtu          Unsigned32,
    teLinkDescrIndication            TeLinkSonetSdhIndication,
    teLinkDescrRowStatus             RowStatus,
    teLinkDescrStorageType           StorageType
  }

  teLinkDescriptorId OBJECT-TYPE
     SYNTAX        Unsigned32 (1..4294967295)
     MAX-ACCESS    not-accessible
     STATUS        current
     DESCRIPTION
         "This object specifies the link descriptor identifier."
     ::= { teLinkDescriptorEntry 1 }

  teLinkDescrSwitchingCapability OBJECT-TYPE
     SYNTAX        TeLinkSwitchingCapability
     MAX-ACCESS    read-create
     STATUS        current
     DESCRIPTION
         "This attribute specifies interface switching capability of
          the TE link, which is derived from its component links."
     REFERENCE
         "OSPF Extensions in Support of Generalized Multi-Protocol
          Label Switching (GMPLS), RFC 4203"
     ::= { teLinkDescriptorEntry 2 }

  teLinkDescrEncodingType OBJECT-TYPE
     SYNTAX        TeLinkEncodingType
     MAX-ACCESS    read-create
     STATUS        current
     DESCRIPTION
         "This attribute specifies the TE link encoding type."
     REFERENCE
         "Generalized Multi-Protocol Label Switching (GMPLS)
          Signaling Functional Description, RFC 3471"
     ::= { teLinkDescriptorEntry 3 }

  teLinkDescrMinLspBandwidth OBJECT-TYPE
     SYNTAX        TeLinkBandwidth
     UNITS         "bps"
     MAX-ACCESS    read-create
     STATUS        current
     DESCRIPTION
```

```
        "This attribute specifies the minimum LSP bandwidth on
         the TE link.  This is derived from the union of the
         minimum LSP bandwidth of all the component links
         associated with the TE link that can be used to carry
         live traffic."
    REFERENCE
        "OSPF Extensions in Support of Generalized Multi-Protocol
         Label Switching (GMPLS), RFC 4203"
    ::= { teLinkDescriptorEntry 4 }

teLinkDescrMaxLspBandwidthPrio0 OBJECT-TYPE
    SYNTAX        TeLinkBandwidth
    UNITS         "bps"
    MAX-ACCESS    read-create
    STATUS        current
    DESCRIPTION
        "This attribute specifies the maximum LSP bandwidth at
         priority 0 on the TE link.  This is the union of the maximum
         LSP bandwidth at priority 0 of all the component links within
         the TE link that can be used to carry live traffic."
    REFERENCE
        "OSPF Extensions in Support of Generalized Multi-Protocol
         Label Switching (GMPLS), RFC 4203"
    ::= { teLinkDescriptorEntry 5 }

teLinkDescrMaxLspBandwidthPrio1 OBJECT-TYPE
    SYNTAX        TeLinkBandwidth
    UNITS         "bps"
    MAX-ACCESS    read-create
    STATUS        current
    DESCRIPTION
        "This attribute specifies the maximum LSP bandwidth at
         priority 1 on the TE link.  This is the union of the maximum
         LSP bandwidth at priority 1 of all the component links within
         the TE link that can be used to carry live traffic."
    REFERENCE
        "OSPF Extensions in Support of Generalized Multi-Protocol
         Label Switching (GMPLS), RFC 4203"
    ::= { teLinkDescriptorEntry 6 }

teLinkDescrMaxLspBandwidthPrio2 OBJECT-TYPE
    SYNTAX        TeLinkBandwidth
    UNITS         "bps"
    MAX-ACCESS    read-create
    STATUS        current
    DESCRIPTION
        "This attribute specifies the maximum LSP bandwidth at
         priority 2 on the TE link.  This is the union of the maximum
```

```
          LSP bandwidth at priority 2 of all the component links within
          the TE link that can be used to carry live traffic."
      REFERENCE
          "OSPF Extensions in Support of Generalized Multi-Protocol
          Label Switching (GMPLS), RFC 4203"
      ::= { teLinkDescriptorEntry 7 }

   teLinkDescrMaxLspBandwidthPrio3 OBJECT-TYPE
      SYNTAX        TeLinkBandwidth
      UNITS         "bps"
      MAX-ACCESS    read-create
      STATUS        current
      DESCRIPTION
          "This attribute specifies the maximum LSP bandwidth at
          priority 3 on the TE link.  This is the union of the maximum
          LSP bandwidth at priority 3 of all the component links within
          the TE link that can be used to carry live traffic."
      REFERENCE
          "OSPF Extensions in Support of Generalized Multi-Protocol
          Label Switching (GMPLS), RFC 4203"
      ::= { teLinkDescriptorEntry 8 }

   teLinkDescrMaxLspBandwidthPrio4 OBJECT-TYPE
      SYNTAX        TeLinkBandwidth
      UNITS         "bps"
      MAX-ACCESS    read-create
      STATUS        current
      DESCRIPTION
          "This attribute specifies the maximum LSP bandwidth at
          priority 4 on the TE link.  This is the union of the maximum
          LSP bandwidth at priority 4 of all the component links within
          the TE link that can be used to carry live traffic."
      REFERENCE
          "OSPF Extensions in Support of Generalized Multi-Protocol
          Label Switching (GMPLS), RFC 4203"
      ::= { teLinkDescriptorEntry 9 }

   teLinkDescrMaxLspBandwidthPrio5 OBJECT-TYPE
      SYNTAX        TeLinkBandwidth
      UNITS         "bps"
      MAX-ACCESS    read-create
      STATUS        current
      DESCRIPTION
          "This attribute specifies the maximum LSP bandwidth at
          priority 5 on the TE link.  This is the union of the maximum
          LSP bandwidth at priority 5 of all the component links within
          the TE link that can be used to carry live traffic."
      REFERENCE
```

```
        "OSPF Extensions in Support of Generalized Multi-Protocol
         Label Switching (GMPLS), RFC 4203"
    ::= { teLinkDescriptorEntry 10 }

teLinkDescrMaxLspBandwidthPrio6 OBJECT-TYPE
    SYNTAX        TeLinkBandwidth
    UNITS         "bps"
    MAX-ACCESS    read-create
    STATUS        current
    DESCRIPTION
        "This attribute specifies the maximum LSP bandwidth at
         priority 6 on the TE link.  This is the union of the maximum
         LSP bandwidth at priority 6 of all the component links within
         the TE link that can be used to carry live traffic."
    REFERENCE
        "OSPF Extensions in Support of Generalized Multi-Protocol
         Label Switching (GMPLS), RFC 4203"
    ::= { teLinkDescriptorEntry 11 }

teLinkDescrMaxLspBandwidthPrio7 OBJECT-TYPE
    SYNTAX        TeLinkBandwidth
    UNITS         "bps"
    MAX-ACCESS    read-create
    STATUS        current
    DESCRIPTION
        "This attribute specifies the maximum LSP bandwidth at
         priority 7 on the TE link.  This is the union of the maximum
         LSP bandwidth at priority 7 of all the component links within
         the TE link that can be used to carry live traffic."
    REFERENCE
        "OSPF Extensions in Support of Generalized Multi-Protocol
         Label Switching (GMPLS), RFC 4203"
    ::= { teLinkDescriptorEntry 12 }

teLinkDescrInterfaceMtu OBJECT-TYPE
    SYNTAX        Unsigned32 (1..65535)
    MAX-ACCESS    read-create
    STATUS        current
    DESCRIPTION
        "This attribute specifies the interface MTU for the TE
         link descriptor."
    REFERENCE
        "OSPF Extensions in Support of Generalized Multi-Protocol
         Label Switching (GMPLS), RFC 4203"
    ::= { teLinkDescriptorEntry 13 }

teLinkDescrIndication OBJECT-TYPE
    SYNTAX        TeLinkSonetSdhIndication
```

```
      MAX-ACCESS    read-create
      STATUS        current
      DESCRIPTION
          "This attribute specifies whether this interface supports
           Standard or Arbitrary SONET/SDH."
      REFERENCE
          "OSPF Extensions in Support of Generalized Multi-Protocol
           Label Switching (GMPLS), RFC 4203"
      ::= { teLinkDescriptorEntry 14 }

   teLinkDescrRowStatus OBJECT-TYPE
      SYNTAX        RowStatus
      MAX-ACCESS    read-create
      STATUS        current
      DESCRIPTION
          "This variable is used to create, modify, and/or
           delete a row in this table.  No read-create object
           can be changed if teLinkDescrRowStatus is in the active(1)
           state."
      ::= { teLinkDescriptorEntry 15 }

   teLinkDescrStorageType OBJECT-TYPE
      SYNTAX        StorageType
      MAX-ACCESS    read-create
      STATUS        current
      DESCRIPTION
          "The storage type for this conceptual row in the
           teLinkDescriptorTable.  Conceptual rows having the value
           'permanent' need not allow write-access to any
           columnar object in the row."
      ::= { teLinkDescriptorEntry 16 }

   -- End of teLinkDescriptorTable


   -- TE Link Shared Risk Link Group Table

   teLinkSrlgTable OBJECT-TYPE
      SYNTAX        SEQUENCE OF TeLinkSrlgEntry
      MAX-ACCESS    not-accessible
      STATUS        current
      DESCRIPTION
          "This table specifies the SRLGs associated with TE links."
      ::= { teLinkObjects 3 }

   teLinkSrlgEntry OBJECT-TYPE
      SYNTAX        TeLinkSrlgEntry
      MAX-ACCESS    not-accessible
```

```
      STATUS        current
      DESCRIPTION
          "An entry in this table contains information about an
           SRLG associated with a TE link.
           An ifEntry in the ifTable must exist before a
           teLinkSrlgEntry using the same ifIndex is created.
           The ifType of ifEntry must be teLink(200).
           If a TE link entry in the ifTable is destroyed, then so
           are all of the entries in the teLinkSrlgTable that use the
           ifIndex of this TE link."
      INDEX         { ifIndex, teLinkSrlg }
      ::= { teLinkSrlgTable 1 }

   TeLinkSrlgEntry ::= SEQUENCE {
     teLinkSrlg            Unsigned32,
     teLinkSrlgRowStatus   RowStatus,
     teLinkSrlgStorageType StorageType
   }

   teLinkSrlg OBJECT-TYPE
      SYNTAX        Unsigned32 (0..4294967295)
      MAX-ACCESS    not-accessible
      STATUS        current
      DESCRIPTION
          "This identifies an SRLG supported by the TE link.  An SRLG is
           identified with a 32-bit number that is unique within an IGP
           domain.  Zero is a valid SRLG number."
      REFERENCE
          "OSPF Extensions in Support of Generalized Multi-Protocol
           Label Switching (GMPLS), RFC 4203"
      ::= { teLinkSrlgEntry 1 }

   teLinkSrlgRowStatus OBJECT-TYPE
      SYNTAX        RowStatus
      MAX-ACCESS    read-create
      STATUS        current
      DESCRIPTION
          "This variable is used to create, modify, and/or
           delete a row in this table.  No read-create object can
           be modified if teLinkSrlgRowStatus is active(1)."
      ::= { teLinkSrlgEntry 2 }

   teLinkSrlgStorageType OBJECT-TYPE
      SYNTAX        StorageType
      MAX-ACCESS    read-create
      STATUS        current
      DESCRIPTION
          "The storage type for this conceptual row in the
```

```
         teLinkSrlgTable.  Conceptual rows having the value
         'permanent' need not allow write-access to any
         columnar object in the row."
      ::= { teLinkSrlgEntry 3 }

   -- End of teLinkSrlgTable


   -- TE Link Bandwidth Table

   teLinkBandwidthTable OBJECT-TYPE
      SYNTAX        SEQUENCE OF TeLinkBandwidthEntry
      MAX-ACCESS    not-accessible
      STATUS        current
      DESCRIPTION
          "This table specifies the priority-based bandwidth table
           for TE links."
      ::= { teLinkObjects 4 }

   teLinkBandwidthEntry OBJECT-TYPE
      SYNTAX        TeLinkBandwidthEntry
      MAX-ACCESS    not-accessible
      STATUS        current
      DESCRIPTION
          "An entry in this table contains information about
           the priority-based bandwidth of TE links.  An ifEntry in the
           ifTable must exist before a teLinkBandwidthEntry using the
           same ifIndex is created.  The ifType of ifEntry must be
           teLink(200).  If a TE link entry in the ifTable is destroyed,
           then so are all of the entries in the teLinkBandwidthTable
           that use the ifIndex of this TE link."
      INDEX         { ifIndex, teLinkBandwidthPriority }
      ::= { teLinkBandwidthTable 1 }

   TeLinkBandwidthEntry ::= SEQUENCE {
     teLinkBandwidthPriority    TeLinkPriority,
     teLinkBandwidthUnreserved  TeLinkBandwidth,
     teLinkBandwidthRowStatus   RowStatus,
     teLinkBandwidthStorageType StorageType
   }

   teLinkBandwidthPriority OBJECT-TYPE
      SYNTAX        TeLinkPriority
      MAX-ACCESS    not-accessible
      STATUS        current
      DESCRIPTION
          "This attribute specifies the priority.  A value of 0 is valid
           as specified in the 'Traffic Engineering (TE) Extensions to
```

```
         OSPF Version 2' document."
   REFERENCE
       "OSPF Extensions in Support of Generalized Multi-Protocol
        Label Switching (GMPLS), RFC 4203 and
        Traffic Engineering (TE) Extensions to OSPF Version 2,
        RFC 3630"
   ::= { teLinkBandwidthEntry 1 }

teLinkBandwidthUnreserved OBJECT-TYPE
   SYNTAX        TeLinkBandwidth
   UNITS         "bps"
   MAX-ACCESS    read-only
   STATUS        current
   DESCRIPTION
       "This attribute specifies the TE link unreserved
        bandwidth at priority p.  It is the sum of the unreserved
        bandwidths at priority p of all component links associated
        with the TE link (excluding all links that are strictly
        used as protecting links)."
   REFERENCE
       "Link Bundling in MPLS Traffic Engineering (TE), RFC 4201"
   ::= { teLinkBandwidthEntry 2 }

teLinkBandwidthRowStatus OBJECT-TYPE
   SYNTAX        RowStatus
   MAX-ACCESS    read-create
   STATUS        current
   DESCRIPTION
       "This variable is used to create, modify, and/or
        delete a row in this table.  No read-create object
        can be modified when teLinkBandwidthRowStatus is active(1)."
   ::= { teLinkBandwidthEntry 3 }

teLinkBandwidthStorageType OBJECT-TYPE
   SYNTAX        StorageType
   MAX-ACCESS    read-create
   STATUS        current
   DESCRIPTION
       "The storage type for this conceptual row in the
        teLinkBandwidthTable.  Conceptual rows having the value
        'permanent' need not allow write-access to any
        columnar object in the row."
   ::= { teLinkBandwidthEntry 4 }

-- End of teLinkBandwidthTable


-- Component Link Table
```

```
componentLinkTable  OBJECT-TYPE
   SYNTAX        SEQUENCE OF ComponentLinkEntry
   MAX-ACCESS    not-accessible
   STATUS        current
   DESCRIPTION
       "This table specifies the component link parameters."
   ::= { teLinkObjects 5 }

componentLinkEntry  OBJECT-TYPE
   SYNTAX        ComponentLinkEntry
   MAX-ACCESS    not-accessible
   STATUS        current
   DESCRIPTION
       "An entry in this table exists for each ifEntry that
        represents a component link.  An ifEntry must exist in
        the ifTable before a componentLinkEntry is created with
        the corresponding ifIndex.  ifEntry's ifType can be
        of any interface type that has been defined for TE Link
        interworking.  Examples include ATM, Frame Relay, Ethernet,
        etc.  If an entry representing a component link is destroyed
        in the ifTable, then so is the corresponding entry in the
        componentLinkTable.  The administrative and operational
        status values are controlled from the ifEntry."
   INDEX         { ifIndex }
   ::= { componentLinkTable 1 }

ComponentLinkEntry ::= SEQUENCE {
  componentLinkMaxResBandwidth     TeLinkBandwidth,
  componentLinkPreferredProtection TeLinkProtection,
  componentLinkCurrentProtection   TeLinkProtection,
  componentLinkRowStatus           RowStatus,
  componentLinkStorageType         StorageType
}

componentLinkMaxResBandwidth OBJECT-TYPE
   SYNTAX        TeLinkBandwidth
   UNITS         "bps"
   MAX-ACCESS    read-create
   STATUS        current
   DESCRIPTION
       "This attribute specifies the maximum reservable bandwidth on
        the component link."
   REFERENCE
       "OSPF Extensions in Support of Generalized Multi-Protocol
        Label Switching (GMPLS), RFC 4203"
   ::= { componentLinkEntry 1 }

componentLinkPreferredProtection OBJECT-TYPE
```

```
      SYNTAX        TeLinkProtection
      MAX-ACCESS    read-create
      STATUS        current
      DESCRIPTION
          "This attribute specifies whether this component link is
           a primary or secondary entity."
      ::= { componentLinkEntry 2 }

   componentLinkCurrentProtection OBJECT-TYPE
      SYNTAX        TeLinkProtection
      MAX-ACCESS    read-only
      STATUS        current
      DESCRIPTION
          "This attribute specifies whether this component link is
           currently used as primary or secondary link."
      ::= { componentLinkEntry 3 }

   componentLinkRowStatus OBJECT-TYPE
      SYNTAX        RowStatus
      MAX-ACCESS    read-create
      STATUS        current
      DESCRIPTION
          "This variable is used to create, modify, and/or
           delete a row in this table.  No read-create object
           can be modified when componentLinkRowStatus is active(1)."
      ::= { componentLinkEntry 4 }

   componentLinkStorageType OBJECT-TYPE
      SYNTAX        StorageType
      MAX-ACCESS    read-create
      STATUS        current
      DESCRIPTION
          "The storage type for this conceptual row in the
           componentLinkTable.  Conceptual rows having the value
           'permanent' need not allow write-access to any
           columnar object in the row."
      ::= { componentLinkEntry 5 }

   -- End of componentLinkTable


   -- Component Link Descriptor Table

   componentLinkDescriptorTable OBJECT-TYPE
      SYNTAX        SEQUENCE OF ComponentLinkDescriptorEntry
      MAX-ACCESS    not-accessible
      STATUS        current
      DESCRIPTION
```

```
        "This table specifies the interface switching capability
         descriptors associated with the component links."
   ::= { teLinkObjects 6 }

componentLinkDescriptorEntry OBJECT-TYPE
   SYNTAX        ComponentLinkDescriptorEntry
   MAX-ACCESS    not-accessible
   STATUS        current
   DESCRIPTION
        "An entry in this table is created for every component link
         descriptor.  An ifEntry in the ifTable must exist before a
         componentLinkDescriptorEntry using the same ifIndex is
         created.  ifEntry's ifType can be of any interface type that
         has been defined for TE Link interworking.  Examples include
         ATM, Frame Relay, Ethernet, etc.  If a component link entry
         in the ifTable is destroyed, then so are all entries in the
         componentLinkDescriptorTable that use the ifIndex of this
         component link."
   INDEX         { ifIndex, componentLinkDescrId }
   ::= { componentLinkDescriptorTable 1 }

ComponentLinkDescriptorEntry ::= SEQUENCE {
  componentLinkDescrId                    Unsigned32,
  componentLinkDescrSwitchingCapability   TeLinkSwitchingCapability,
  componentLinkDescrEncodingType          TeLinkEncodingType,
  componentLinkDescrMinLspBandwidth       TeLinkBandwidth,
  componentLinkDescrMaxLspBandwidthPrio0  TeLinkBandwidth,
  componentLinkDescrMaxLspBandwidthPrio1  TeLinkBandwidth,
  componentLinkDescrMaxLspBandwidthPrio2  TeLinkBandwidth,
  componentLinkDescrMaxLspBandwidthPrio3  TeLinkBandwidth,
  componentLinkDescrMaxLspBandwidthPrio4  TeLinkBandwidth,
  componentLinkDescrMaxLspBandwidthPrio5  TeLinkBandwidth,
  componentLinkDescrMaxLspBandwidthPrio6  TeLinkBandwidth,
  componentLinkDescrMaxLspBandwidthPrio7  TeLinkBandwidth,
  componentLinkDescrInterfaceMtu          Unsigned32,
  componentLinkDescrIndication            TeLinkSonetSdhIndication,
  componentLinkDescrRowStatus             RowStatus,
  componentLinkDescrStorageType           StorageType
}

componentLinkDescrId OBJECT-TYPE
   SYNTAX        Unsigned32 (1..4294967295)
   MAX-ACCESS    not-accessible
   STATUS        current
   DESCRIPTION
        "This object specifies the link descriptor identifier."
   ::= { componentLinkDescriptorEntry 1 }
```

```
componentLinkDescrSwitchingCapability OBJECT-TYPE
   SYNTAX        TeLinkSwitchingCapability
   MAX-ACCESS    read-create
   STATUS        current
   DESCRIPTION
       "This attribute specifies link multiplexing capabilities of
        the component link."
   REFERENCE
       "OSPF Extensions in Support of Generalized Multi-Protocol
        Label Switching (GMPLS), RFC 4203"
   ::= { componentLinkDescriptorEntry 2 }

componentLinkDescrEncodingType OBJECT-TYPE
   SYNTAX        TeLinkEncodingType
   MAX-ACCESS    read-create
   STATUS        current
   DESCRIPTION
       "This attribute specifies the component link encoding type."
   REFERENCE
       "Generalized Multi-Protocol Label Switching (GMPLS) Signaling
        Functional Description, RFC 3471"
   ::= { componentLinkDescriptorEntry 3 }

componentLinkDescrMinLspBandwidth OBJECT-TYPE
   SYNTAX        TeLinkBandwidth
   UNITS         "bps"
   MAX-ACCESS    read-create
   STATUS        current
   DESCRIPTION
       "This attribute specifies the minimum LSP bandwidth on
        the component link."
   REFERENCE
       "OSPF Extensions in Support of Generalized Multi-Protocol
        Label Switching (GMPLS), RFC 4203"
   ::= { componentLinkDescriptorEntry 4 }

componentLinkDescrMaxLspBandwidthPrio0 OBJECT-TYPE
   SYNTAX        TeLinkBandwidth
   UNITS         "bps"
   MAX-ACCESS    read-create
   STATUS        current
   DESCRIPTION
       "This attribute specifies the maximum LSP bandwidth at
        priority 0 on the component link."
   REFERENCE
       "OSPF Extensions in Support of Generalized Multi-Protocol
        Label Switching (GMPLS), RFC 4203"
   ::= { componentLinkDescriptorEntry 5 }
```

```
componentLinkDescrMaxLspBandwidthPrio1 OBJECT-TYPE
   SYNTAX        TeLinkBandwidth
   UNITS         "bps"
   MAX-ACCESS    read-create
   STATUS        current
   DESCRIPTION
       "This attribute specifies the maximum LSP bandwidth at
        priority 1 on the component link."
   REFERENCE
       "OSPF Extensions in Support of Generalized Multi-Protocol
        Label Switching (GMPLS), RFC 4203"
   ::= { componentLinkDescriptorEntry 6 }

componentLinkDescrMaxLspBandwidthPrio2 OBJECT-TYPE
   SYNTAX        TeLinkBandwidth
   UNITS         "bps"
   MAX-ACCESS    read-create
   STATUS        current
   DESCRIPTION
       "This attribute specifies the maximum LSP bandwidth at
        priority 2 on the component link."
   REFERENCE
       "OSPF Extensions in Support of Generalized Multi-Protocol
        Label Switching (GMPLS), RFC 4203"
   ::= { componentLinkDescriptorEntry 7 }

componentLinkDescrMaxLspBandwidthPrio3 OBJECT-TYPE
   SYNTAX        TeLinkBandwidth
   UNITS         "bps"
   MAX-ACCESS    read-create
   STATUS        current
   DESCRIPTION
       "This attribute specifies the maximum LSP bandwidth at
        priority 3 on the component link."
   REFERENCE
       "OSPF Extensions in Support of Generalized Multi-Protocol
        Label Switching (GMPLS), RFC 4203"
   ::= { componentLinkDescriptorEntry 8 }

componentLinkDescrMaxLspBandwidthPrio4 OBJECT-TYPE
   SYNTAX        TeLinkBandwidth
   UNITS         "bps"
   MAX-ACCESS    read-create
   STATUS        current
   DESCRIPTION
       "This attribute specifies the maximum LSP bandwidth at
        priority 4 on the component link."
   REFERENCE
```

```
        "OSPF Extensions in Support of Generalized Multi-Protocol
         Label Switching (GMPLS), RFC 4203"
    ::= { componentLinkDescriptorEntry 9 }

componentLinkDescrMaxLspBandwidthPrio5 OBJECT-TYPE
    SYNTAX        TeLinkBandwidth
    UNITS         "thousand bps"
    MAX-ACCESS    read-create
    STATUS        current
    DESCRIPTION
        "This attribute specifies the maximum LSP bandwidth at
         priority 5 on the component link."
    REFERENCE
        "OSPF Extensions in Support of Generalized Multi-Protocol
         Label Switching (GMPLS), RFC 4203"
    ::= { componentLinkDescriptorEntry 10 }

componentLinkDescrMaxLspBandwidthPrio6 OBJECT-TYPE
    SYNTAX        TeLinkBandwidth
    UNITS         "bps"
    MAX-ACCESS    read-create
    STATUS        current
    DESCRIPTION
        "This attribute specifies the maximum LSP bandwidth at
         priority 6 on the component link."
    REFERENCE
        "OSPF Extensions in Support of Generalized Multi-Protocol
         Label Switching (GMPLS), RFC 4203"
    ::= { componentLinkDescriptorEntry 11 }

componentLinkDescrMaxLspBandwidthPrio7 OBJECT-TYPE
    SYNTAX        TeLinkBandwidth
    UNITS         "bps"
    MAX-ACCESS    read-create
    STATUS        current
    DESCRIPTION
        "This attribute specifies the maximum LSP bandwidth at
         priority 7 on the component link."
    REFERENCE
        "OSPF Extensions in Support of Generalized Multi-Protocol
         Label Switching (GMPLS), RFC 4203"
    ::= { componentLinkDescriptorEntry 12 }

componentLinkDescrInterfaceMtu OBJECT-TYPE
    SYNTAX        Unsigned32 (1..65535)
    MAX-ACCESS    read-create
    STATUS        current
    DESCRIPTION
```

```
        "This attribute specifies the interface MTU for the component
         link descriptor."
    REFERENCE
        "OSPF Extensions in Support of Generalized Multi-Protocol
         Label Switching (GMPLS), RFC 4203"
    ::= { componentLinkDescriptorEntry 13 }

componentLinkDescrIndication OBJECT-TYPE
    SYNTAX        TeLinkSonetSdhIndication
    MAX-ACCESS    read-create
    STATUS        current
    DESCRIPTION
        "This attribute specifies whether this interface supports
         Standard or Arbitrary SONET/SDH."
    REFERENCE
        "OSPF Extensions in Support of Generalized Multi-Protocol
         Label Switching (GMPLS), RFC 4203"
    ::= { componentLinkDescriptorEntry 14 }

componentLinkDescrRowStatus OBJECT-TYPE
    SYNTAX        RowStatus
    MAX-ACCESS    read-create
    STATUS        current
    DESCRIPTION
        "This variable is used to create, modify, and/or
         delete a row in this table.  No read-create object
         can be modified when componentLinkDescrRowStatus
         is active(1)."
    ::= { componentLinkDescriptorEntry 15 }

componentLinkDescrStorageType OBJECT-TYPE
    SYNTAX        StorageType
    MAX-ACCESS    read-create
    STATUS        current
    DESCRIPTION
        "The storage type for this conceptual row in the
         componentLinkDescriptorTable.  Conceptual rows
         having the value 'permanent' need not allow write-access
         to any columnar object in the row."
    ::= { componentLinkDescriptorEntry 16 }

-- End of componentLinkDescriptorTable


-- Component Link Bandwidth Table

componentLinkBandwidthTable OBJECT-TYPE
    SYNTAX        SEQUENCE OF ComponentLinkBandwidthEntry
```

```
      MAX-ACCESS    not-accessible
      STATUS        current
      DESCRIPTION
          "This table specifies the priority-based bandwidth
           for component links."
      ::= { teLinkObjects 7 }

   componentLinkBandwidthEntry OBJECT-TYPE
      SYNTAX        ComponentLinkBandwidthEntry
      MAX-ACCESS    not-accessible
      STATUS        current
      DESCRIPTION
          "An entry in this table contains information about
           the priority-based bandwidth on component links.
           An ifEntry in the ifTable must exist before a
           componentLinkBandwidthEntry using the same ifIndex is
           created.  ifEntry's ifType can be of any interface type that
           has been defined for TE Link interworking.  Examples
           include ATM, Frame Relay, Ethernet, etc.  If a component link
           entry in the ifTable is destroyed, then so are all entries
           in the componentLinkBandwidthTable that use the ifIndex of
           this component link."
      INDEX         { ifIndex, componentLinkBandwidthPriority }
      ::= { componentLinkBandwidthTable 1 }

   ComponentLinkBandwidthEntry ::= SEQUENCE {
     componentLinkBandwidthPriority    TeLinkPriority,
     componentLinkBandwidthUnreserved  TeLinkBandwidth,
     componentLinkBandwidthRowStatus   RowStatus,
     componentLinkBandwidthStorageType StorageType
   }

   componentLinkBandwidthPriority OBJECT-TYPE
      SYNTAX        TeLinkPriority
      MAX-ACCESS    not-accessible
      STATUS        current
      DESCRIPTION
          "This attribute specifies the priority.  A value of 0 is valid
           as specified in the 'Traffic Engineering (TE) Extensions to
            OSPF Version 2' document."
      REFERENCE
          "OSPF Extensions in Support of Generalized Multi-Protocol
           Label Switching (GMPLS), RFC 4203 and
           Traffic Engineering (TE) Extensions to OSPF Version 2,
           RFC 3630"
      ::= { componentLinkBandwidthEntry 1 }

   componentLinkBandwidthUnreserved OBJECT-TYPE
```

```
      SYNTAX        TeLinkBandwidth
      UNITS         "bps"
      MAX-ACCESS    read-only
      STATUS        current
      DESCRIPTION
          "This attribute specifies the component link unreserved
           bandwidth at priority p."
      REFERENCE
          "OSPF Extensions in Support of Generalized Multi-Protocol
           Label Switching (GMPLS), RFC 4203"
      ::= { componentLinkBandwidthEntry 2 }

   componentLinkBandwidthRowStatus OBJECT-TYPE
      SYNTAX        RowStatus
      MAX-ACCESS    read-create
      STATUS        current
      DESCRIPTION
          "This variable is used to create, modify, and/or
           delete a row in this table.  No read-create object can
           be modified when componentLinkBandwidthRowStatus is
           active(1)."
      ::= { componentLinkBandwidthEntry 3 }

   componentLinkBandwidthStorageType OBJECT-TYPE
      SYNTAX        StorageType
      MAX-ACCESS    read-create
      STATUS        current
      DESCRIPTION
          "The storage type for this conceptual row in the
           componentLinkBandwidthTable.  Conceptual rows
           having the value 'permanent' need not allow write-access
           to any columnar object in the row."
      ::= { componentLinkBandwidthEntry 4 }

   -- End of componentLinkBandwidthTable


   -- Module compliance

   teLinkCompliances
      OBJECT IDENTIFIER ::= { teLinkConformance 1 }

   teLinkGroups
      OBJECT IDENTIFIER ::= { teLinkConformance 2 }

   teLinkModuleFullCompliance MODULE-COMPLIANCE
      STATUS current
      DESCRIPTION
```

```
         "Compliance statement for agents that support read-create
          so that both configuration and monitoring of TE links can
          be accomplished via this MIB module."
      MODULE -- this module

         MANDATORY-GROUPS    { teLinkGroup,
                               teLinkBandwidthGroup,
                               componentLinkBandwidthGroup }

         GROUP teLinkSrlgGroup
         DESCRIPTION
             "This group is mandatory for GMPLS enabled devices."

         GROUP teLinkPscGroup
         DESCRIPTION
             "This group is mandatory for devices that support the
              packet switching capability."

         GROUP teLinkTdmGroup
         DESCRIPTION
             "This group is mandatory for devices that support the TDM
              switching capability."

         -- teLinkTable

         OBJECT      teLinkAddressType
         SYNTAX      INTEGER { unknown(0), ipv4(1), ipv6(2) }
         DESCRIPTION
             "Only ipv4(1) and ipv6(2) address types need to be
              supported for numbered links.  For unnumbered links, the
              unknown(0) address type needs to be supported."

         OBJECT      teLinkLocalIpAddr
         SYNTAX      InetAddress (SIZE(0|4|16))
         DESCRIPTION
             "Size of TE link IP address depends on type of TE link.
              TE link IP address size is zero if the link is unnumbered,
              four if the link IP address is IPv4, and sixteen if the
              link IP address is IPv6."

         OBJECT      teLinkRemoteIpAddr
         SYNTAX      InetAddress (SIZE(0|4|16))
         DESCRIPTION
             "Size of TE link IP address depends on type of TE link.
              TE link IP address size is zero if the link is unnumbered,
              four if the link IP address is IPv4, and sixteen if the
              link IP address is IPv6."
```

```
OBJECT      teLinkRowStatus
SYNTAX      RowStatus { active(1), notInService(2) }
WRITE-SYNTAX RowStatus { active(1), notInService(2),
                         createAndGo(4), destroy(6) }
DESCRIPTION
    "Support for notReady(3) and createAndWait(5) is
     not required."

-- teLinkDescriptorTable

OBJECT      teLinkDescrRowStatus
SYNTAX      RowStatus { active(1), notInService(2) }
WRITE-SYNTAX RowStatus { active(1), notInService(2),
                         createAndGo(4), destroy(6) }
DESCRIPTION
    "Support for notReady(3) and createAndWait(5) is
     not required."

-- teLinkSrlgTable

OBJECT      teLinkSrlgRowStatus
SYNTAX      RowStatus { active(1), notInService(2) }
WRITE-SYNTAX RowStatus { active(1), notInService(2),
                         createAndGo(4), destroy(6) }
DESCRIPTION
    "Support for notReady(3) and createAndWait(5) is
     not required."

-- teLinkBandwidthTable

OBJECT      teLinkBandwidthRowStatus
SYNTAX      RowStatus { active(1), notInService(2) }
WRITE-SYNTAX RowStatus { active(1), notInService(2),
                         createAndGo(4), destroy(6) }
DESCRIPTION
    "Support for notReady(3) and createAndWait(5) is
     not required."

-- componentLinkTable

OBJECT      componentLinkRowStatus
SYNTAX      RowStatus { active(1), notInService(2) }
WRITE-SYNTAX RowStatus { active(1), notInService(2),
                         createAndGo(4), destroy(6) }
DESCRIPTION
    "Support for notReady(3) and createAndWait(5) is
     not required."
```

```
        -- componentLinkDescriptorTable

        OBJECT      componentLinkDescrRowStatus
        SYNTAX      RowStatus { active(1), notInService(2) }
        WRITE-SYNTAX RowStatus { active(1), notInService(2),
                                 createAndGo(4), destroy(6) }
        DESCRIPTION
            "Support for notReady(3) and createAndWait(5) is
             not required."

        -- componentLinkBandwidthTable

        OBJECT      componentLinkBandwidthRowStatus
        SYNTAX      RowStatus { active(1), notInService(2) }
        WRITE-SYNTAX RowStatus { active(1), notInService(2),
                                 createAndGo(4), destroy(6) }
        DESCRIPTION
            "Support for notReady(3) and createAndWait(5) is
             not required."

    ::= { teLinkCompliances 1 }

teLinkModuleReadOnlyCompliance MODULE-COMPLIANCE
    STATUS current
    DESCRIPTION
        "Compliance statement for agents that support the
         monitoring of the TE link MIB module."
    MODULE -- this module

        MANDATORY-GROUPS    { teLinkGroup,
                              teLinkBandwidthGroup,
                              componentLinkBandwidthGroup }

        GROUP teLinkSrlgGroup
        DESCRIPTION
            "This group is mandatory for GMPLS enabled devices."

        GROUP teLinkPscGroup
        DESCRIPTION
            "This group is mandatory for devices that support the
             packet switching capability."

        GROUP teLinkTdmGroup
        DESCRIPTION
            "This group is mandatory for devices that support the TDM
             switching capability."

        -- teLinkTable
```

```
OBJECT      teLinkAddressType
SYNTAX      INTEGER { unknown(0), ipv4(1), ipv6(2) }
MIN-ACCESS  read-only
DESCRIPTION
    "Only ipv4(1) and ipv6(2) address types need to be
     supported for numbered links.  For unnumbered links, the
     unknown(0) address type needs to be supported."

OBJECT      teLinkLocalIpAddr
SYNTAX      InetAddress (SIZE(0|4|16))
MIN-ACCESS  read-only
DESCRIPTION
    "Size of TE link IP address depends on type of TE link.
     TE link IP address size is zero if the link is unnumbered,
     four if the link IP address is IPv4, and sixteen if the
     link IP address is IPv6."

OBJECT      teLinkRemoteIpAddr
SYNTAX      InetAddress (SIZE(0|4|16))
MIN-ACCESS  read-only
DESCRIPTION
    "Size of TE link IP address depends on type of TE link.
     TE link IP address size is zero if the link is unnumbered,
     four if the link IP address is IPv4, and sixteen if the
     link IP address is IPv6."

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

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

OBJECT      teLinkRowStatus
SYNTAX      RowStatus { active(1) }
MIN-ACCESS  read-only
DESCRIPTION
    "Write access is not required and active(1) is the
     only status that needs to be supported."

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

```
-- teLinkDescriptorTable

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

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

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

OBJECT      teLinkDescrMaxLspBandwidthPrio0
MIN-ACCESS  read-only
DESCRIPTION
    "Write access is not required."

OBJECT      teLinkDescrMaxLspBandwidthPrio1
MIN-ACCESS  read-only
DESCRIPTION
    "Write access is not required."

OBJECT      teLinkDescrMaxLspBandwidthPrio2
MIN-ACCESS  read-only
DESCRIPTION
    "Write access is not required."

OBJECT      teLinkDescrMaxLspBandwidthPrio3
MIN-ACCESS  read-only
DESCRIPTION
    "Write access is not required."

OBJECT      teLinkDescrMaxLspBandwidthPrio4
MIN-ACCESS  read-only
DESCRIPTION
    "Write access is not required."

OBJECT      teLinkDescrMaxLspBandwidthPrio5
MIN-ACCESS  read-only
DESCRIPTION
    "Write access is not required."

OBJECT      teLinkDescrMaxLspBandwidthPrio6
```

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

        OBJECT      teLinkDescrMaxLspBandwidthPrio7
        MIN-ACCESS  read-only
        DESCRIPTION
            "Write access is not required."

        OBJECT      teLinkDescrRowStatus
        SYNTAX      RowStatus { active(1) }
        MIN-ACCESS  read-only
        DESCRIPTION
            "Write access is not required and active(1) is the
             only status that needs to be supported."

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

        -- teLinkSrlgTable

        OBJECT      teLinkSrlgRowStatus
        SYNTAX      RowStatus { active(1) }
        MIN-ACCESS  read-only
        DESCRIPTION
            "Write access is not required and active(1) is the
             only status that needs to be supported."

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

        -- teLinkBandwidthTable

        OBJECT      teLinkBandwidthRowStatus
        SYNTAX      RowStatus { active(1) }
        MIN-ACCESS  read-only
        DESCRIPTION
            "Write access is not required and active(1) is the
             only status that needs to be supported."

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

```
-- componentLinkTable

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

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

OBJECT      componentLinkRowStatus
SYNTAX      RowStatus { active(1) }
MIN-ACCESS  read-only
DESCRIPTION
    "Write access is not required and active(1) is the
     only status that needs to be supported."

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

-- componentLinkDescriptorTable

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

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

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

OBJECT      componentLinkDescrMaxLspBandwidthPrio0
MIN-ACCESS  read-only
DESCRIPTION
    "Write access is not required."

OBJECT      componentLinkDescrMaxLspBandwidthPrio1
MIN-ACCESS  read-only
```

```
        DESCRIPTION
            "Write access is not required."

        OBJECT      componentLinkDescrMaxLspBandwidthPrio2
        MIN-ACCESS  read-only
        DESCRIPTION
            "Write access is not required."

        OBJECT      componentLinkDescrMaxLspBandwidthPrio3
        MIN-ACCESS  read-only
        DESCRIPTION
            "Write access is not required."

        OBJECT      componentLinkDescrMaxLspBandwidthPrio4
        MIN-ACCESS  read-only
        DESCRIPTION
            "Write access is not required."

        OBJECT      componentLinkDescrMaxLspBandwidthPrio5
        MIN-ACCESS  read-only
        DESCRIPTION
            "Write access is not required."

        OBJECT      componentLinkDescrMaxLspBandwidthPrio6
        MIN-ACCESS  read-only
        DESCRIPTION
            "Write access is not required."

        OBJECT      componentLinkDescrMaxLspBandwidthPrio7
        MIN-ACCESS  read-only
        DESCRIPTION
            "Write access is not required."

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

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

        OBJECT      componentLinkDescrRowStatus
        SYNTAX      RowStatus { active(1) }
        MIN-ACCESS  read-only
        DESCRIPTION
            "Write access is not required and active(1) is the
```

```
             only status that needs to be supported."

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

        -- componentLinkBandwidthTable

        OBJECT      componentLinkBandwidthRowStatus
        SYNTAX      RowStatus { active(1) }
        MIN-ACCESS  read-only
        DESCRIPTION
            "Write access is not required and active(1) is the
             only status that needs to be supported."

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

    ::= { teLinkCompliances 2 }

-- Units of conformance

teLinkGroup OBJECT-GROUP
    OBJECTS { teLinkAddressType,
              teLinkLocalIpAddr,
              teLinkRemoteIpAddr,
              teLinkMetric,
              teLinkProtectionType,
              teLinkWorkingPriority,
              teLinkResourceClass,
              teLinkIncomingIfId,
              teLinkOutgoingIfId,
              teLinkRowStatus,
              teLinkStorageType,
              teLinkDescrSwitchingCapability,
              teLinkDescrEncodingType,
              teLinkDescrRowStatus,
              teLinkDescrStorageType,
              componentLinkPreferredProtection,
              componentLinkCurrentProtection,
              componentLinkRowStatus,
              componentLinkStorageType,
              componentLinkDescrSwitchingCapability,
              componentLinkDescrEncodingType,
              componentLinkDescrRowStatus,
```

```
                 componentLinkDescrStorageType
                }

      STATUS  current
      DESCRIPTION
             "Collection of objects needed for the management of
              resources associated with TE links."
      ::= { teLinkGroups 1 }

   teLinkSrlgGroup OBJECT-GROUP
      OBJECTS { teLinkSrlgRowStatus,
                teLinkSrlgStorageType
                }

      STATUS  current
      DESCRIPTION
             "Collection of objects needed for the management of
              SRLG resources associated with TE links."
      ::= { teLinkGroups 2 }

   teLinkBandwidthGroup OBJECT-GROUP
      OBJECTS { teLinkMaximumReservableBandwidth,
                teLinkDescrMaxLspBandwidthPrio0,
                teLinkDescrMaxLspBandwidthPrio1,
                teLinkDescrMaxLspBandwidthPrio2,
                teLinkDescrMaxLspBandwidthPrio3,
                teLinkDescrMaxLspBandwidthPrio4,
                teLinkDescrMaxLspBandwidthPrio5,
                teLinkDescrMaxLspBandwidthPrio6,
                teLinkDescrMaxLspBandwidthPrio7,
                teLinkBandwidthUnreserved,
                teLinkBandwidthRowStatus,
                teLinkBandwidthStorageType
                }

      STATUS  current
      DESCRIPTION
             "Collection of objects needed for the management of
              the bandwidth resources associated with TE links and
              component links."
      ::= { teLinkGroups 3 }

   componentLinkBandwidthGroup OBJECT-GROUP
      OBJECTS { componentLinkMaxResBandwidth,
                componentLinkDescrMaxLspBandwidthPrio0,
                componentLinkDescrMaxLspBandwidthPrio1,
                componentLinkDescrMaxLspBandwidthPrio2,
                componentLinkDescrMaxLspBandwidthPrio3,
```

```
              componentLinkDescrMaxLspBandwidthPrio4,
              componentLinkDescrMaxLspBandwidthPrio5,
              componentLinkDescrMaxLspBandwidthPrio6,
              componentLinkDescrMaxLspBandwidthPrio7,
              componentLinkBandwidthUnreserved,
              componentLinkBandwidthRowStatus,
              componentLinkBandwidthStorageType
            }

   STATUS  current
   DESCRIPTION
          "Collection of objects needed for the management of the
           bandwidth parameters associated with component links."
   ::= { teLinkGroups 4 }

teLinkPscGroup OBJECT-GROUP
   OBJECTS { teLinkDescrMinLspBandwidth,
             teLinkDescrInterfaceMtu,
             componentLinkDescrMinLspBandwidth,
             componentLinkDescrInterfaceMtu
           }

   STATUS  current
   DESCRIPTION
          "Collection of objects needed for devices that are
           packet switch capable."
   ::= { teLinkGroups 5 }

teLinkTdmGroup OBJECT-GROUP
   OBJECTS { teLinkDescrMinLspBandwidth,
             teLinkDescrIndication,
             componentLinkDescrMinLspBandwidth,
             componentLinkDescrIndication
           }

   STATUS  current
   DESCRIPTION
          "Collection of objects needed for devices that are
           TDM switching capable."
   ::= { teLinkGroups 6 }

-- End of TE-LINK-STD-MIB
END
```

10. Security Considerations

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

- All the tables in this MIB module have routing information in them, so they all have the same security attributes. Unauthorized changes to attributes of these tables can disrupt resource allocation in the network.

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:

- IP address entries in the teLinkTable (teLinkLocalIpAddr and teLinkRemoteIpAddr) may reveal the internals of a network provider IP address space.

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

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

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

11. Contributors

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12. Acknowledgements

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13. IANA Considerations

The following "IANA Considerations" subsection requests IANA for a new assignment. New assignments can only be made via Standards Action as specified in [RFC2434].

13.1. IANA Considerations for the TE-LINK-STD-MIB

The TE-LINK-STD-MIB should be rooted under the transmission subtree. The IANA has assigned { transmission 200 } to the TE-LINK-STD-MIB module specified in this document.

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14.2. Informative References

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