

Network Working Group
Internet Draft
Category: Standards Track
Expires: November 2004

Martin Dubuc
Sudheer Dharanikota
Thomas D. Nadeau
Cisco Systems

Jonathan P. Lang
Rincon Networks

May 2004

Traffic Engineering Link Management Information Base

[draft-ietf-mpls-telink-mib-07.txt](#)

Status of this Memo

This document is an Internet-Draft and is in full conformance with all provisions of [Section 10 of RFC 2026](#).

Internet-Drafts are working documents of the Internet Engineering Task Force (IETF), its areas, and its working groups. Note that other groups may also distribute working documents as Internet-Drafts.

Internet-Drafts are draft documents valid for a maximum of six months and may be updated, replaced, or obsoleted by other documents at any time. It is inappropriate to use Internet-Drafts as reference material or to cite them other than as "work in progress."

The list of current Internet-Drafts can be accessed at
<http://www.ietf.org/ietf/1id-abstracts.txt>.

The list of Internet-Draft Shadow Directories can be accessed at
<http://www.ietf.org/shadow.html>.

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 document.

Table of Contents

| | |
|--|----|
| 1. The Internet-Standard Management Framework | 2 |
| 2. Introduction | 2 |
| 3. Terminology | 3 |
| 4. Feature Checklist | 3 |
| 5. Outline | 4 |
| 6. Brief Description of MIB Objects | 4 |
| 6.1. teLinkTable | 4 |
| 6.2. teLinkDescriptorTable | 4 |
| 6.3. teLinkSrlgTable | 4 |
| 6.4. teLinkBandwidthTable | 4 |
| 6.5. componentLinkTable | 5 |
| 6.6. componentLinkDescriptorTable | 5 |
| 6.7. componentLinkBandwidthTable | 5 |
| 7. Example of Bundled Link Setup | 5 |
| 8. Application of the Interfaces Group to TE Links | 9 |
| 8.1 Support of the TE Link Layer by ifTable | 9 |
| 8.2 Using ifStackTable | 11 |
| 8.3 Applicability of ifRcvAddressTable | 13 |
| 9. TE Link MIB Module Definitions | 13 |
| 10. Intellectual Property Considerations | 50 |
| 11. Security Considerations | 51 |
| 12. Acknowledgments | 52 |
| 13. IANA Considerations | 52 |
| 13.1 IANA Considerations for TE-LINK-STD-MIB | 52 |
| 14. References | 52 |
| 14.1 Normative References | 53 |
| 14.2 Informative References | 54 |
| 15. Authors' Addresses | 54 |
| 16. Full Copyright Statement | 55 |

[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 \[RFC2580\]](#).

Dubuc et al.

Expires November 2004

[Page 2]

2. Introduction

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

We present in this document 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 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](#), reference [[RFC2119](#)].

3. Terminology

This document uses terminology from the documents describing link bundling [[BUNDLING](#)] and G-MPLS [[GMPLS-ARCH](#)].

The link bundling feature is designed to aggregate one or more similar entities between a node pair into a bundled link [[BUNDLING](#)]. In the document, 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 just another kind of Traffic Engineering (TE) link (see [[GMPLS-OSPF](#)]). A link bundle is a subinterface which bounds 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 link 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 which it binds together.

4. Feature Checklist

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

Dubuc et al.

Expires November 2004

[Page 3]

- 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 [[BUNDLING](#)].

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. More details on the use of the ifStackTable to establish relationship between bundled links, TE links and component links are given in [Section 8.2](#).

Suppose that one would like to manually create a bundled link

Dubuc et al.

Expires November 2004

[Page 5]

out of two 1:1 TE links as depicted on 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)
```

Dubuc et al.

Expires November 2004

[Page 6]

```
}

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)
```

Dubuc et al.

Expires November 2004

[Page 7]

```
}
```

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

Dubuc et al.

Expires November 2004

[Page 8]

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 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]. |

Dubuc et al.

Expires November 2004

[Page 9]

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 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 encoding type is clear. For other encoding types, traffic counters on a TE link are cumulative for all subinterfaces which it binds together.

[8.2. Using ifStackTable](#)

This section describes by example how to use `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. Examples given below are for illustration purposes only.

Example: MPLS is being carried on a bundled TE links.

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 interface |
| 2 | Bundled TE link |
| 3 | Component TE link 1 |
| 4 | Component TE link 2 |
| 5 | Optical Transport 1 |
| 6 | Optical Transport 2 |

Dubuc et al.

Expires November 2004

[Page 11]

| | | |
|---|------------------|------------|
| 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 |
|-------------|------------|
|-------------|------------|

Dubuc et al.

Expires November 2004

[Page 12]

| | |
|---|---|
| 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 "200405141200Z" -- 14 May 2004 12:00:00 EST

ORGANIZATION "Multiprotocol Label Switching (MPLS) Working Group"

CONTACT-INFO

" Martin Dubuc
Email: mdubuc@ncf.ca

Sudheer Dharanikota
Email: sudheer@ieee.org

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) 2004 The Internet Society. This version of this MIB module is part of RFC XXXX; 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'."

-- Revision history.

REVISION

"200405141200Z" -- 14 May 2004 12:00:00 EST

DESCRIPTION

"Initial version published as RFC xxxx (to be assigned by RFC Editor)"

::= { transmission xxx } -- To be assigned by IANA.
-- Request to assign 200 which is
-- ifType value for teLink.

-- 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. 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."

Dubuc et al.

Expires November 2004

[Page 14]

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 MPLS' 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 'GMPLS Signaling Functional Description' document. The values specified in this document are not contiguous."

SYNTAX INTEGER {
 packet(1),
 ethernet(2),
 ansiEtsiPdh(3),
 sdhItuSonetAns(5),
 digitalWrapper(7),
 lambda(8),
 fiber(9),
 fiberChannel(11)
}

TeLinkSonetSdhIndication ::= TEXTUAL-CONVENTION

STATUS current

DESCRIPTION

Dubuc et al.

Expires November 2004

[Page 15]

"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 MPLS, RFC xxxx"
-- RFC Editor to fill in RFC number that will be assigned to
-- [[GMPLS-OSPF](#)]

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 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 }

Dubuc et al.

Expires November 2004

[Page 16]

```

 ::= { 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 and 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."

```

Dubuc et al.

Expires November 2004

[Page 17]

```
::= { 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 and 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, RFC xxxx"

-- RFC Editor to fill in RFC number that will be assigned to

-- [[BUNDLING](#)]

```
::= { 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 MPLS, RFC xxxx"

Dubuc et al.

Expires November 2004

[Page 18]

```
-- RFC Editor to fill in RFC number that will be assigned to
-- [GMPLS-OSPF]
 ::= { 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 link protection type of the
TE link. Description of the different protection types can be
found in the 'Routing Extensions in Support of Generalized
MPLS' document."
REFERENCE
"OSPF Extensions in Support of Generalized MPLS, RFC xxxx and
Routing Extensions in Support of Generalized MPLS, RFC xxxx"
-- RFC Editor to fill in RFC number that will be assigned to
-- [GMPLS-OSPF] and [ROUTING]
 ::= { 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 MPLS, RFC xxxx"
-- RFC Editor to fill in RFC number that will be assigned to
-- [GMPLS-OSPF]
 ::= { teLinkEntry 7 }

teLinkResourceClass OBJECT-TYPE
SYNTAX      Unsigned32
MAX-ACCESS  read-create
STATUS      current
DESCRIPTION
"This attribute specifies the TE link resource class."
```

Dubuc et al.

Expires November 2004

[Page 19]

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 Extensions to OSPF Version 2' document."

REFERENCE

"Link Bundling in MPLS Traffic Engineering, RFC xxxx and Traffic Engineering (TE) Extensions to OSPF Version 2,
[RFC 3630](#)"
-- RFC Editor to fill in RFC number that will be assigned to
-- [\[BUNDLING\]](#)
 ::= { 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, RFC xxxx"
-- RFC Editor to fill in RFC number that will be assigned to
-- [\[BUNDLING\]](#)
 ::= { 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, RFC xxxx"
-- RFC Editor to fill in RFC number that will be assigned to
-- [\[BUNDLING\]](#)
 ::= { teLinkEntry 10 }

teLinkRowStatus OBJECT-TYPE

SYNTAX RowStatus

Dubuc et al.

Expires November 2004

[Page 20]

```
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
  entries in the teLinkDescriptorTable that use the ifIndex of
  this TE link."
INDEX         { ifIndex, teLinkDescriptorId }
 ::= { teLinkDescriptorTable 1 }
```

Dubuc et al.

Expires November 2004

[Page 21]

```

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 MPLS, RFC xxxx"
 -- RFC Editor to fill in RFC number that will be assigned to
 -- [[GMPLS-OSPF](#)]
 ::= { teLinkDescriptorEntry 2 }

teLinkDescrEncodingType OBJECT-TYPE
 SYNTAX TeLinkEncodingType
 MAX-ACCESS read-create
 STATUS current
 DESCRIPTION
 "This attribute specifies the TE link encoding type."
 REFERENCE
 "Generalized MPLS Signaling Functional Description, [RFC 3471](#)"

Dubuc et al.

Expires November 2004

[Page 22]

```
::= { 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 MPLS, RFC xxxx"

-- RFC Editor to fill in RFC number that will be assigned to

-- [[GMPLS-OSPF](#)]

```
::= { 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 MPLS, RFC xxxx"

-- RFC Editor to fill in RFC number that will be assigned to

-- [[GMPLS-OSPF](#)]

```
::= { 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 MPLS, RFC xxxx"

-- RFC Editor to fill in RFC number that will be assigned to

Dubuc et al.

Expires November 2004

[Page 23]

```
-- [GMPLS-OSPF]
 ::= { 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 MPLS, RFC xxxx"
  -- RFC Editor to fill in RFC number that will be assigned to
  -- [GMPLS-OSPF]
 ::= { 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 MPLS, RFC xxxx"
  -- RFC Editor to fill in RFC number that will be assigned to
  -- [GMPLS-OSPF]
 ::= { 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 MPLS, RFC xxxx"
  -- RFC Editor to fill in RFC number that will be assigned to
```

Dubuc et al.

Expires November 2004

[Page 24]

```
-- [GMPLS-OSPF]
 ::= { 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 MPLS, RFC xxxx"
  -- RFC Editor to fill in RFC number that will be assigned to
  -- [GMPLS-OSPF]
 ::= { 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 MPLS, RFC xxxx"
  -- RFC Editor to fill in RFC number that will be assigned to
  -- [GMPLS-OSPF]
 ::= { 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 MPLS, RFC xxxx"
  -- RFC Editor to fill in RFC number that will be assigned to
```

Dubuc et al.

Expires November 2004

[Page 25]

```
-- [GMPLS-OSPF]
 ::= { 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 MPLS, RFC xxxx"
        -- RFC Editor to fill in RFC number that will be assigned to
        -- [GMPLS-OSPF]
 ::= { 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 MPLS, RFC xxxx"
        -- RFC Editor to fill in RFC number that will be assigned to
        -- [GMPLS-OSPF]
 ::= { 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 changed if teLinkDescrRowStatus is in 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."
```

Dubuc et al.

Expires November 2004

[Page 26]

```
 ::= { 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 a
     SRLG associated with a TE link.
    An ifEntry in the ifTable must exist before a
     teLinkSrlgEntry 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
     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 a 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 MPLS, RFC xxxx"
    -- RFC Editor to fill in RFC number that will be assigned to
```



```
-- [GMPLS-OSPF]
 ::= { 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. ifType of ifEntry must be teLink(200).
    If a TE link entry in the ifTable is destroyed, then so are
```


all 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 Extensions to OSPF Version 2' document."

REFERENCE

"OSPF Extensions in Support of Generalized MPLS, RFC xxxx and Traffic Engineering (TE) Extensions to OSPF Version 2,
[RFC 3630](#)"

-- RFC Editor to fill in RFC number that will be assigned to
-- [[GMPLS-OSPF](#)]

::= { 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 (excludes all links that are strictly used as protecting links)."

REFERENCE

"Link Bundling in MPLS Traffic Engineering, RFC xxxx"
-- RFC Editor to fill in RFC number that will be assigned to
-- [[BUNDLING](#)]

::= { teLinkBandwidthEntry 2 }

teLinkBandwidthRowStatus OBJECT-TYPE

SYNTAX RowStatus
 MAX-ACCESS read-create

Dubuc et al.

Expires November 2004

[Page 29]

```
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 which 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 }
```

Dubuc et al.

Expires November 2004

[Page 30]

```
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 MPLS, RFC xxxx"
        -- RFC Editor to fill in RFC number that will be assigned to
        -- [GMPLS-OSPF]
    ::= { 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)."
```

Dubuc et al.

Expires November 2004

[Page 31]

```
 ::= { 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 which 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,
```

Dubuc et al.

Expires November 2004

[Page 32]

```
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 MPLS, RFC xxxx"
        -- RFC Editor to fill in RFC number that will be assigned to
        -- [GMPLS-OSPF]
    ::= { componentLinkDescriptorEntry 2 }
```

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

```
componentLinkDescrMinLspBandwidth OBJECT-TYPE
    SYNTAX      TeLinkBandwidth
```

Dubuc et al.

Expires November 2004

[Page 33]

```
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 MPLS, RFC xxxx"
  -- RFC Editor to fill in RFC number that will be assigned to
  -- [GMPLS-OSPF]
 ::= { 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 MPLS, RFC xxxx"
  -- RFC Editor to fill in RFC number that will be assigned to
  -- [GMPLS-OSPF]
 ::= { 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 MPLS, RFC xxxx"
  -- RFC Editor to fill in RFC number that will be assigned to
  -- [GMPLS-OSPF]
 ::= { 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."
```

Dubuc et al.

Expires November 2004

[Page 34]

REFERENCE

"OSPF Extensions in Support of Generalized MPLS, RFC xxxx"
-- RFC Editor to fill in RFC number that will be assigned to
-- [[GMPLS-OSPF](#)]

::= { 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 MPLS, RFC xxxx"
-- RFC Editor to fill in RFC number that will be assigned to
-- [[GMPLS-OSPF](#)]

::= { 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 MPLS, RFC xxxx"
-- RFC Editor to fill in RFC number that will be assigned to
-- [[GMPLS-OSPF](#)]

::= { 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 MPLS, RFC xxxx"
-- RFC Editor to fill in RFC number that will be assigned to
-- [[GMPLS-OSPF](#)]

::= { componentLinkDescriptorEntry 10 }

Dubuc et al.

Expires November 2004

[Page 35]

```
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 MPLS, RFC xxxx"
        -- RFC Editor to fill in RFC number that will be assigned to
        -- [GMPLS-OSPF]
    ::= { 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 MPLS, RFC xxxx"
        -- RFC Editor to fill in RFC number that will be assigned to
        -- [GMPLS-OSPF]
    ::= { 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 MPLS, RFC xxxx"
        -- RFC Editor to fill in RFC number that will be assigned to
        -- [GMPLS-OSPF]
    ::= { 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."
```

Dubuc et al.

Expires November 2004

[Page 36]

REFERENCE

"OSPF Extensions in Support of Generalized MPLS, RFC xxxx"
-- RFC Editor to fill in RFC number that will be assigned to
-- [[GMPLS-OSPF](#)]

::= { 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 which
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 Extensions to OSPF
 Version 2' document."

REFERENCE
 "OSPF Extensions in Support of Generalized MPLS, RFC xxxx and
 Traffic Engineering (TE) Extensions to OSPF Version 2,
 [RFC 3630](#)"
 -- RFC Editor to fill in RFC number that will be assigned to
 -- [[GMPLS-OSPF](#)]
 ::= { 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 MPLS, RFC xxxx"
 -- RFC Editor to fill in RFC number that will be assigned to
 -- [[GMPLS-OSPF](#)]
 ::= { componentLinkBandwidthEntry 2 }

Dubuc et al.

Expires November 2004

[Page 38]

```
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 G-MPLS enabled devices."
```



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

GROUP teLinkTdmGroup
DESCRIPTION
  "This group is mandatory for devices that support 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 link is unnumbered,
  four if link IP address is IPv4 and sixteen if 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 link is unnumbered,
  four if link IP address is IPv4 and sixteen if 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
```

Dubuc et al.

Expires November 2004

[Page 41]

```
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 TE link MIB module."
MODULE -- this module

  MANDATORY-GROUPS { teLinkGroup,
                     teLinkBandwidthGroup,
                     componentLinkBandwidthGroup }

  GROUP teLinkSrlgGroup
  DESCRIPTION
    "This group is mandatory for G-MPLS enabled devices."

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

  GROUP teLinkTdmGroup
  DESCRIPTION
    "This group is mandatory for devices that support 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
```

Dubuc et al.

Expires November 2004

[Page 42]

"Size of TE link IP address depends on type of TE link.
TE link IP address size is zero if link is unnumbered,
four if link IP address is IPv4 and sixteen if 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 link is unnumbered,
four if link IP address is IPv4 and sixteen if 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
```

Dubuc et al.

Expires November 2004

[Page 44]

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."
```

Dubuc et al.

Expires November 2004

[Page 46]

```
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  
}
```

Dubuc et al.

Expires November 2004

[Page 48]

```
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 }
```

Dubuc et al.

Expires November 2004

[Page 49]

```
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. Intellectual Property Considerations

The IETF takes no position regarding the validity or scope of any intellectual property or other rights that might be claimed to pertain to the implementation or use of the technology described in this document or the extent to which any license under such rights might or might not be available; neither does it represent that it has made any effort to identify any such rights. Information on the IETF's procedures with respect to rights in standards-track and standards-related documentation can be found in [BCP-11](#). Copies of claims of rights made available for publication and any assurances of licenses to be made available, or the result of an attempt made to obtain a general license or permission for the use of such proprietary rights by implementers or users of this specification can be obtained from the IETF Secretariat.

The IETF invites any interested party to bring to its attention any copyrights, patents or patent applications, or other proprietary rights which may cover technology that may be required to practice

this standard. Please address the information to the IETF Executive Director.

By submitting this Internet Draft, we certify that any applicable patent or other IPR claims of which we are aware have been disclosed, and any of which we become aware will be disclosed, in accordance with [RFC 3668](#).

11. 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 and 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.

12. Acknowledgments

The authors would like to acknowledge the contribution of Dmitry Ryumkin.

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 TE-LINK-STD-MIB

TE-LINK-STD-MIB should be rooted under the transmission subtree. The IANA is requested to assign { transmission TBD } to the TE-LINK-STD-MIB module specified in this document. The IANA is requested to use same number as the telink ifType.

14. References

14.1. Normative References

- [IEEE] IEEE, "IEEE Standard for Binary Floating-Point Arithmetic", Standard 754-1985, 1985 (ISBN 1-5593-7653-8).
- [RFC2026] Bradner, S., "The Internet Standards Process - Revision 3", [RFC 2026](#), October 1996.
- [RFC2119] Bradner, S., "Key words for use in RFCs to Indicate Requirement Levels", [BCP 14](#), [RFC 2119](#), March 1997.
- [RFC2434] Narten, T., Alverstrand, H., "Guidelines for Writing an IANA Considerations Section in RFCs", [RFC 2434](#), October 1998.
- [RFC2578] McCloghrie, K., Perkins, D., Schoenwaelder, J., Case, J., Rose, M., and S. Waldbusser, "Structure of Management Information Version 2 (SMIV2)", STD 58, [RFC 2578](#), April 1999.

- [RFC2579] McCloghrie, K., Perkins, D., Schoenwaelder, J., Case, J., Rose, M., and S. Waldbusser, "Textual Conventions for SMIv2", STD 58, [RFC 2579](#), April 1999.
- [RFC2580] McCloghrie, K., Perkins, D., Schoenwaelder, J., Case, J., Rose, M., and Waldbusser, S., "Conformance Statements for SMIv2", STD 58, [RFC 2580](#), April 1999.
- [RFC2863] McCloghrie, K., and Kastenholtz, F., "The Interfaces Group MIB", [RFC 2863](#), June 2000.
- [RFC2914] Floyd, S., "Congestion Control Principles", [RFC 2914](#), September 2000.
- [RFC3291] Daniele, M., Haberman, B., Routhier, S., and Shoenwaelder, J., "Textual Conventions for Internet Network Addresses", [RFC 3291](#), May 2002.
- [RFC3471] Ashwood-Smith, P., Banarjee, A., Berger, L., Bernstein, G., Drake, J., Fan, Y., Kompella, K., Mannie, E., Lang, J., Rajagopalan, B., Rekhter, Y., Saha, D., Sharma, V., Swallow, G., and Tang, Z., "Generalized MPLS Signaling Functional Description", [RFC 3471](#), January 2003.
- [RFC3630] Katz, D., Kompella, K., and Yeung, D., "Traffic Engineering (TE) Extensions to OSPF Version 2", [RFC 3630](#), September 2003.
- [RFC3667] Bradner, S., "IETF Rights in Contributions", [RFC 3667](#), February 2004.
- [RFC3668] Bradner, S., "Intellectual Property Rights in IETF Technology", [RFC 3668](#), February 2004.
- [BUNDLING] Kompella, K., Rekhter, Y., and Berger, L., "Link Bundling in MPLS Traffic Engineering", Internet Draft <[draft-ietf-mpls-bundle-04.txt](#)>, July 2002.
- [GMPLS-OSPF] Kompella, K., Rekhter, Y., Banerjee, A. et al, "OSPF Extensions in Support of Generalized MPLS", Internet Draft <[draft-ietf-ccamp-ospf-gmpls-extensions-12.txt](#)>, October 2003.
- [HIERARCHY] Kompella, K., Rekhter, Y., "LSP Hierarchy with Generalized MPLS TE", Internet Draft <[draft-ietf-mpls-lsp-hierarchy-08.txt](#)>,

September 2002.

- [IANAifType] "IANAifType MIB Module",
<http://www.iana.org/assignments/ianaiftype-mib>.
- [LMP] Lang, J., Mitra, K., Drake, J., Kompella, K., Rekhter, Y., Berger, L., Saha, D., Basak, D., Sandick, H., Zinin, A., Rajagopalan, B., and Ramamoorthi, S., "Link Management Protocol", Internet Draft <<draft-ietf-ccamp-lmp-10.txt>>, October 2003.
- [ROUTING] Kompella, K., Rekhter, Y., "Routing Extensions in Support of Generalized MPLS", Internet Draft <<draft-ietf-ccamp-gmpls-routing-09.txt>>, October 2003.

14.2. Informative References

- [RFC3410] Case, J., Mundy, R., Partain, D. and B. Stewart, "Introduction and Applicability Statements for Internet-Standard Management Framework", [RFC 3410](#), December 2002.
- [GMPLS-ARCH] Ashwood-Smith, P., Awdanche, D., Banarjee, A., Basak, D., Berger, L., Bernstein, G., Dharanikota, S., Drake, J., Fan, Y., Fedyk, D., Grammel, G., Guo, D., Kompella, K., Kullberg, A., Lang, J., Liaw, Mannie, E., F., Nadeau, T., Ong, L., Papadimitriou, D., Pendarakis, D., Rajagopalan, B., Rekhter, Y., Saha, D., Sandick, H., Sharma, V., Swallow, G., Tang, Z., Yates, J., Young, G., Yu, J., Zinin, A., "Generalized Multi-Protocol Label Switching (GMPLS) Architecture", Internet Draft <<draft-ietf-ccamp-gmpls-architecture-07.txt>>, May 2003.

15. Authors' Addresses

| | |
|--------------------------------------|---|
| Martin Dubuc Email: mdubuc@ncf.ca | Thomas D. Nadeau Cisco Systems, Inc. 300 Apollo Drive Chelmsford, MA 01824 Phone: +1-978-244-3051 Email: tnadeau@cisco.com |
|--------------------------------------|---|

Sudheer Dharanikota

Jonathan P. Lang

Email: sudheer@ieee.org

Rincon Networks, Inc.
110 El Paseo
Santa Barbara, CA 93101
Email: jplang@ieee.org

16. Full Copyright Statement

Copyright (C) The Internet Society (2004). This document is subject to the rights, licenses and restrictions contained in [BCP 78](#), and except as set forth therein, the authors retain all their rights.

This document and translations of it may be copied and furnished to others, and derivative works that comment on or otherwise explain it or assist in its implementation may be prepared, copied, published and distributed, in whole or in part, without restriction of any kind, provided that the above copyright notice and this paragraph are included on all such copies and derivative works. However, this document itself may not be modified in any way, such as by removing the copyright notice or references to the Internet Society or other Internet organizations, except as needed for the purpose of developing Internet standards in which case the procedures for copyrights defined in the Internet Standards process must be followed, or as required to translate it into languages other than English.

The limited permissions granted above are perpetual and will not be revoked by the Internet Society or its successors or assigns. This document and the information contained herein is provided on an "AS IS" basis and THE CONTRIBUTOR, THE ORGANIZATION HE/SHE REPRESENTS OR IS SPONSORED BY (IF ANY), THE INTERNET SOCIETY AND THE INTERNET ENGINEERING TASK FORCE DISCLAIM ALL WARRANTIES, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO ANY WARRANTY THAT THE USE OF THE INFORMATION HEREIN WILL NOT INFRINGE ANY RIGHTS OR ANY IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.

