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        Link Management Protocol (LMP) Management Information Base (MIB)

Status of This Memo

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Abstract

   This document provides minor corrections to and obsoletes RFC 4327.

   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 the Link
   Management Protocol (LMP).

Table of Contents

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

   Current work is under way in the IETF to specify a suite of protocols
   to be used as a common control plane and a separate common
   measurement plane. Generalized MPLS (GMPLS) [RFC3471] and the Link
   Management Protocol [RFC4204] are key components of this
   standardization activity. The primary purpose of LMP is to manage
   traffic engineering (TE) links. Primary goals of LMP are the
   maintenance of the control channel connectivity, correlation of link
   properties, verification of data-bearing links, and detection and
   isolation of link faults.

   We describe in this document a MIB module that can be used to manage
   LMP implementations. This MIB module covers both configuration and
   performance-monitoring aspects of LMP.

   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 document describing the Link
   Management Protocol [RFC4204]. An "LMP adjacency" is formed between
   two nodes that support the same capabilities, and LMP messages are
   exchanged between the node pair over control channels that form this
   adjacency. Several control channels can be active at the same time.
   With the exception of messages related to control channel management,
   anytime an LMP message needs to be transferred to a neighbor node, it
   can be sent on any of the active control channels. The control
   channels can also be used to exchange MPLS control plane information
   or routing information.

LMP is designed to support aggregation of one or more data-bearing
links into a traffic-engineering (TE) link. The data-bearing links
can be either component links or ports, depending on their
multiplexing capability (see [RFC4204] for the distinction between
port and component link).

Each TE link is associated with an LMP adjacency, and one or more
control channels are used to exchange LMP messages for a particular
adjacency. In turn, control channels are used to manage the TE links
associated with the LMP adjacency.

4. Feature Checklist

   The Link Management Protocol MIB module (LMP-MIB) is designed to
   satisfy the following requirements and constraints:

   - The MIB module supports the enabling and disabling of LMP
      capability on LMP-capable interfaces of a photonic switch, optical
      cross-connect, or router.

   - The MIB module is used to provide information about LMP
      adjacencies.

   - Support is provided for configuration of the keep-alive and link
      verification parameters.

   - The MIB module is used to express the mapping between local and
      remote TE links, as well as local and remote interface identifiers
      for port or component link.

   - Performance counters are provided for measuring LMP performance on
      a per-control channel basis. Performance counters are also
      provided for measuring LMP performance on the data-bearing links.

   Note that the LMP MIB module goes hand-in-hand with the TE Link (TE-
   LINK-STD-MIB) MIB module [RFC4220]. The TE link table, which is used
   to associate data-bearing links to TE links, is defined in the TE
   Link MIB. The TE link table in the LMP MIB module contains TE link
   information specific to LMP.

5. Outline

   Configuring LMP through an optical device involves the following
   steps:

   - Enabling LMP on LMP-capable interfaces through control channel
      configuration.

    - Optionally, specifying link verification parameters.

    - Configuring the data-bearing links and associating them to the
       appropriate TE link (this association is stored in the
       ifStackTable of the Interfaces Group MIB).

    TE links are managed by the control channels that run between the
    same pair of nodes (LMP adjacency).

6. Brief Description of MIB Objects

    Sections 6.1 - 6.8 describe objects pertaining to LMP. The MIB
    objects were derived from the LMP document [RFC4204].

6.1. lmpNbrTable

    The remote node table is used to identify the pair of nodes that
    exchange LMP messages over control channels.

6.2. lmpControlChannelTable

    The control channel table is used for enabling the LMP protocol on
    LMP-capable interfaces. A photonic switch, optical cross-connect, or
    router creates an entry in this table for every LMP-capable interface
    in that device.

6.3. lmpControlChannelPerfTable

    The control channel performance table is used for collecting LMP
    performance counts on a per-control channel basis. Each entry in the
    lmpControlChannelTable has a corresponding entry in the
    lmpControlChannelPerfTable.

6.4. lmpTeLinkTable

    The TE link table is used for specifying LMP information associated
    with TE links.

6.5. lmpLinkVerificationTable

    The link verification table is used for configuring the LMP link
    verification parameters of TE links. For every TE link entry in the
    lmpTeLinkTable that supports the link verification procedure, there
    is a corresponding entry in the lmpLinkVerificationTable.

6.6. lmpTeLinkPerfTable

   The TE link performance table is used for collecting LMP performance
   counts on a per-TE link basis. Each entry in the lmpTeLinkTable has
   a corresponding entry in the lmpTeLinkPerfTable.

6.7. lmpDataLinkTable

   The data-bearing link table is used to specify the data-bearing links
   that are associated with TE links.

6.8. lmpDataLinkPerfTable

   The data-bearing link performance table is used for collecting LMP
   performance counts on data-bearing links.

7. Example of LMP Control Channel Setup

   In this section, we provide a brief example of using the MIB objects
   described in Section 9 to set up an LMP control channel. This
   example is not meant to illustrate every nuance of the MIB module,
   but it is intended as an aid to understanding some of the key
   concepts. It is meant to be read after one goes through the MIB
   itself.

   Suppose that one would like to form an LMP adjacency between two
   nodes using two control channels. Suppose also that there are three
   data-bearing links. We also assume that the data-bearing links are
   ports (lambdas) and that the link verification procedure is not
   enabled. The following example illustrates which rows and
   corresponding objects might be created to accomplish this.

   First, LMP must be enabled between the pair of nodes.

   In lmpNbrTable:
   {
       lmpNbrNodeId   = 'c0000201'H, -- 192.0.2.1
       lmpNbrAdminStatus   = up(1),
       lmpNbrRowStatus   = createAndGo(4),
       lmpNbrStorageType   = nonVolatile(3)
   }

   Then, the control channels must be set up. These are created in
   the lmpControlChannelTable.

   In lmpControlChannelTable:
   {
       lmpCcId   = 1,

```
       lmpCcUnderlyingIfIndex          = 1,
       lmpCcIsIf                       = false(2),
       lmpCcAuthentication             = false(2),
       lmpCcHelloInterval              = 15,
       lmpCcHelloIntervalMin           = 15,
       lmpCcHelloIntervalMax           = 1000,
       lmpCcHelloDeadInterval          = 45,
       lmpCcHelloDeadIntervalMin       = 45,
       lmpCcHelloDeadIntervalMax       = 1000,
       lmpCcAdminStatus                = up(1),
       lmpCcRowStatus                  = createAndGo(4),
       lmpCcStorageType                = nonVolatile(3)
    }

    {
       lmpCcId                         = 2,
       lmpCcUnderlyingIfIndex          = 2,
       lmpCcIsIf                       = false(2),
       lmpCcAuthentication             = false(2),
       lmpCcHelloInterval              = 15,
       lmpCcHelloIntervalMin           = 15,
       lmpCcHelloIntervalMax           = 1000,
       lmpCcHelloDeadInterval          = 45,
       lmpCcHelloDeadIntervalMin       = 45,
       lmpCcHelloDeadIntervalMax       = 1000,
       lmpCcAdminStatus                = up(1),
       lmpCcRowStatus                  = createAndGo(4),
       lmpCcStorageType                = nonVolatile(3)
    }
```

   Next, the three data-bearing links are created. For each data-
   bearing link, an ifEntry with the same ifIndex needs to be created
   beforehand.

```
    In lmpDataLinkTable:
    {
       ifIndex                     = 41,
       lmpDataLinkAddressType      = unknown(0),
       lmpDataLinkIpAddr           = ''H,
       lmpDataLinkRemoteIpAddress  = ''H,
       lmpDataLinkRemoteIfId       = 47,
       lmpDataLinkRowStatus        = createAndGo(4),
       lmpDataLinkStorageType      = nonVolatile(3)
    }

    {
       ifIndex                     = 43,
       lmpDataLinkAddressType      = unknown(0),
```

```
      lmpDataLinkIpAddr                 = ''H,
      lmpDataLinkRemoteIpAddress        = ''H,
      lmpDataLinkRemoteIfId             = 42,
      lmpDataLinkRowStatus              = createAndGo(4),
      lmpDataLinkStorageType            = nonVolatile(3)
   }
   {
      ifIndex                           = 44,
      lmpDataLinkAddressType            = unknown(0),
      lmpDataLinkIpAddr                 = ''H,
      lmpDataLinkRemoteIpAddress        = ''H,
      lmpDataLinkRemoteIfId             = 48,
      lmpDataLinkRowStatus              = createAndGo(4),
      lmpDataLinkStorageType            = nonVolatile(3)
   }
```

   Note that the data-bearing link type (lmpDataLinkType) does not need
   to be provisioned, as it is automatically populated by the node. The
   definition of the protection role (primary or secondary) for the
   data-bearing links is stored in the componentLinkTable of the TE Link
   MIB module [RFC4220].

   Then, a TE link is created as an ifEntry with ifType teLink in the
   ifTable.

   Once the TE link is created in the ifTable, a TE link entry is
   created in the LMP MIB module to specify TE link information specific
   to LMP.

```
      In lmpTeLinkTable:
   {
      ifIndex                  = 20,
      lmpTeLinkVerification    = true(1),
      lmpTeLinkFaultManagement = true(1),
      lmpTeLinkDwdm            = false(2),
      lmpTeLinkRowStatus       = createAndGo(4),
      lmpTeLinkStorageType     = nonVolatile(3)
   }
```

   and in lmpLinkVerificationTable:
```
   {
      ifIndex                          = 20,
      lmpLinkVerifyInterval            = 100,
      lmpLinkVerifyDeadInterval        = 300,
      lmpLinkVerifyTransportMechanism = j0Trace(3),
      lmpLinkVerifyAllLinks            = true(1),
      lmpLinkVerifyTransmissionRate    = 100000,
      lmpLinkVerifyWavelength          = 0,
```

```
   lmpLinkVerifyRowStatus            = createAndGo(4),
   lmpLinkVerifyStorageType          = nonVolatile(3)
}
```

The association between the data-bearing links and the TE links is
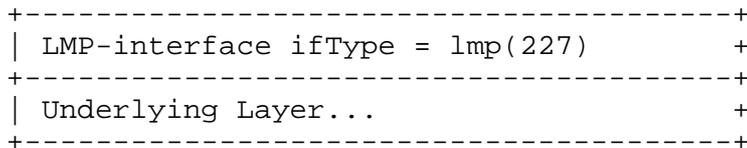stored in the ifStackTable [RFC2863].

In parallel with the entry created in the lmpTeLinkTable, an entry
may be created in the teLinkTable of the TE Link MIB module
[RFC4220].

8. Application of the Interfaces Group to LMP

The Interfaces Group [RFC2863] defines generic managed objects for
managing interfaces. This memo contains the media-specific
extensions to the Interfaces Group for managing LMP control channels
that are modeled as interfaces. If the control channel as defined in
the lmpControlChannelTable is modeled as an ifEntry, then the
following definition applies. An lmpControlChannelTable entry is
designated as being represented as an Interfaces MIB ifEntry if the
lmpControlChannelEntry object lmpCcIsIf is set to true (1). In this
case, the control channel SHOULD be modeled as an ifEntry and provide
appropriate interface stacking, as defined below.

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. Since the LMP interface only
carries control traffic, it is considered to be below the
internetwork layer. Thus, the LMP interface may be represented as an
entry in the ifTable. The interrelation of entries in the ifTable is
defined by Interfaces Stack Group defined in [RFC2863].

When LMP control channels are modeled as interfaces, the interface
stack table must appear as follows for the LMP control channel
interfaces:

```
    +----------------------------------------+
    | LMP-interface ifType = lmp(227)        +
    +----------------------------------------+
    | Underlying Layer...                    +
    +----------------------------------------+
```

In the above diagram, "Underlying Layer..." refers to the ifIndex of
any interface type over which the LMP interface will transmit its
traffic. Note that if the underlying layer provides multiple access

to its media (i.e., Ethernet), then it is possible to stack multiple
LMP interfaces on top of this interface in parallel.

Note that it is not a requirement that LMP control channels be
modeled as interfaces. It is acceptable that control channels simply
exist as logical connections between adjacent LMP-capable nodes. In
this case, lmpCcIsIf is set to false(2), and no corresponding entry
is made in the ifTable.

8.1. Support of the LMP Layer by ifTable

Some specific interpretations of ifTable for the LMP layer follow.

Object   Use for the LMP layer.

ifIndex   Each LMP interface may be represented by an ifEntry.

ifDescr   Description of the LMP interface.

ifType   The value that is allocated for LMP is 227. This
                number has been assigned by the IANA.

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

ifPhysAddress   Unused.

ifAdminStatus   This variable indicates the administrator's intent as
                to whether LMP 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
                LMP on this interface.

ifLastChange   See [RFC2863].

ifInOctets   The number of received octets over the interface; i.e.,
                the number of octets received as LMP packets.

ifOutOctets   The number of transmitted octets over the interface;
                i.e., the number of octets transmitted as LMP packets.

ifInErrors   The number of LMP packets dropped due to uncorrectable
                errors.

    ifInUnknownProtos
                The number of received packets discarded during packet
                header validation, including packets with unrecognized
                label values.

    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 nonvolatile 'alias' name for the interface, as
                  specified by a network manager.

    ifCounterDiscontinuityTime
                See [RFC2863].

9. LMP MIB Module Definitions

    This MIB module IMPORTs objects from [RFC2578], [RFC2579], [RFC2580],
    [RFC2863], [RFC4001], and [RFC4220], and it has REFERENCE clauses to
    [RFC4204], [RFC4207], [RFC4209], [RFC3471], and [RFC2914].

LMP-MIB DEFINITIONS ::= BEGIN

IMPORTS
    MODULE-IDENTITY, OBJECT-TYPE, NOTIFICATION-TYPE,
    transmission, Unsigned32, Counter32, TimeTicks
       FROM SNMPv2-SMI   -- RFC 2578

    MODULE-COMPLIANCE, OBJECT-GROUP, NOTIFICATION-GROUP
       FROM SNMPv2-CONF   -- RFC 2580

    TEXTUAL-CONVENTION, TruthValue, RowStatus, StorageType,
    TimeStamp

```
      FROM SNMPv2-TC               -- RFC 2579

   InterfaceIndexOrZero, ifIndex
      FROM IF-MIB                  -- RFC 2863

   InetAddressType, InetAddress
      FROM INET-ADDRESS-MIB        -- RFC 4001

   teLinkRemoteIpAddr, teLinkIncomingIfId, TeLinkEncodingType
      FROM TE-LINK-STD-MIB;        -- RFC 4220

lmpMIB MODULE-IDENTITY
   LAST-UPDATED "200608140000Z"  -- 14 August 2006
   ORGANIZATION "Common Control and Measurement Protocols (CCAMP)
                 Working Group"
   CONTACT-INFO
       "        Martin Dubuc
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   DESCRIPTION
       "Copyright (C) 2006 The Internet Society.  This version of
        the MIB module is part of RFC 4631; see the RFC itself
        for full legal notices.

        This MIB module contains managed object definitions for
        the Link Management Protocol (LMP) as
        defined in 'Link Management Protocol'."

   -- Revision history.
   REVISION
       "200608140000Z"  -- 14 August 2006
   DESCRIPTION
       "Revised version:
        - Fixes textual descriptions of TruthValue settings such that
          True is always 1 and False is always 2.
        - Adds punctuation to REFERENCE clauses.
```

         This revision published as RFC 4631"
    REVISION
        "200601110000Z" -- 11 January 2006
    DESCRIPTION
        "Initial version published as RFC 4327"
    ::= { transmission 227 }

-- Textual Conventions

LmpInterval ::= TEXTUAL-CONVENTION
    DISPLAY-HINT "d"
    STATUS   current
    DESCRIPTION
        "The interval delay, in milliseconds."
    SYNTAX   Unsigned32 (1..65535)

LmpRetransmitInterval ::= TEXTUAL-CONVENTION
    DISPLAY-HINT "d"
    STATUS   current
    DESCRIPTION
        "The retransmission interval delay in milliseconds."
    SYNTAX   Unsigned32 (1..4294967295)

LmpNodeId ::= TEXTUAL-CONVENTION
    DISPLAY-HINT "1d.1d.1d.1d"
    STATUS   current
    DESCRIPTION
        "Represents a Node ID in network byte order. Node ID is an
         address of type IPv4."
    REFERENCE
        "Section 1.1 of Link Management Protocol, RFC 4204."
    SYNTAX   OCTET STRING(SIZE(4))

-- Top level components of this MIB

-- Notifications
lmpNotifications OBJECT IDENTIFIER ::= { lmpMIB 0 }
-- Tables, Scalars
lmpObjects   OBJECT IDENTIFIER ::= { lmpMIB 1 }
-- Conformance
lmpConformance   OBJECT IDENTIFIER ::= { lmpMIB 2 }

lmpAdminStatus OBJECT-TYPE
    SYNTAX   INTEGER { up(1), down(2) }
    MAX-ACCESS   read-write
    STATUS   current
    DESCRIPTION
        "The desired operational status of LMP on the node.

          Implementations should save the value of this object in
          persistent memory so that it survives restarts or reboot."

     DEFVAL   { up }
     ::= { lmpObjects 1 }

lmpOperStatus OBJECT-TYPE
     SYNTAX   INTEGER { up(1), down(2) }
     MAX-ACCESS   read-only
     STATUS   current
     DESCRIPTION
          "The actual operational status of LMP on the node."
     ::= { lmpObjects 2 }

-- LMP Neighbor Table

lmpNbrTable OBJECT-TYPE
     SYNTAX   SEQUENCE OF LmpNbrEntry
     MAX-ACCESS   not-accessible
     STATUS   current
     DESCRIPTION
          "This table specifies the neighbor node(s) to which control
           channels may be established."
     ::= { lmpObjects 3 }

lmpNbrEntry OBJECT-TYPE
     SYNTAX   LmpNbrEntry
     MAX-ACCESS   not-accessible
     STATUS   current
     DESCRIPTION
          "An entry in this table is created by a LMP-enabled device for
           every pair of nodes that can establish control channels."
     INDEX   { lmpNbrNodeId }
     ::= { lmpNbrTable 1 }

LmpNbrEntry ::= SEQUENCE {
  lmpNbrNodeId   LmpNodeId,
  lmpNbrRetransmitInterval LmpRetransmitInterval,
  lmpNbrRetryLimit   Unsigned32,
  lmpNbrRetransmitDelta   Unsigned32,
  lmpNbrAdminStatus   INTEGER,
  lmpNbrOperStatus   INTEGER,
  lmpNbrRowStatus   RowStatus,
  lmpNbrStorageType   StorageType
}

lmpNbrNodeId OBJECT-TYPE
     SYNTAX   LmpNodeId

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```
   MAX-ACCESS    not-accessible
   STATUS        current
   DESCRIPTION
       "This is a unique index for an entry in the LmpNbrTable.
        This value represents the remote Node ID."
   ::= { lmpNbrEntry 1 }

lmpNbrRetransmitInterval OBJECT-TYPE
   SYNTAX        LmpRetransmitInterval
   MAX-ACCESS    read-create
   STATUS        current
   DESCRIPTION
       "This object specifies the initial retransmission interval that
        is used for the retransmission of messages that require
        acknowledgement.  This object, along with lmpNbrRetryLimit,
        is used to implement the congestion-handling mechanism defined
        in Section 10 of the Link Management Protocol specification,
        which is based on RFC 2914."
   REFERENCE
       "Link Management Protocol, RFC 4204.

        Congestion Control Principles, RFC 2914."
   DEFVAL        { 500 }
   ::= { lmpNbrEntry 2 }

lmpNbrRetryLimit OBJECT-TYPE
   SYNTAX        Unsigned32
   MAX-ACCESS    read-create
   STATUS        current
   DESCRIPTION
       "This object specifies the maximum number of times a message
        is transmitted without being acknowledged.  A value of 0 is used
        to indicate that a node should never stop retransmission.
        This object, along with lmpNbrRetransmitInterval, is
        used to implement the congestion-handling mechanism as defined
        in Section 10 of the Link Management Protocol specification,
        which is based on RFC 2914."
   REFERENCE
       "Link Management Protocol, RFC 4204.
        Congestion Control Principles, RFC 2914."
   DEFVAL        { 3 }
   ::= { lmpNbrEntry 3 }

lmpNbrRetransmitDelta OBJECT-TYPE
   SYNTAX        Unsigned32
   MAX-ACCESS    read-create
   STATUS        current
   DESCRIPTION
```

```
            "This object governs the speed with which the sender increases
             the retransmission interval, as explained in Section 10 of the
             Link Management Protocol specification, which is based on
             RFC 2914.  This value is a power used to express the
             exponential backoff.  The ratio of two successive retransmission
             intervals is (1 + Delta)."
        REFERENCE
            "Link Management Protocol, RFC 4204.
             Congestion Control Principles, RFC 2914."
        DEFVAL          { 1 }
        ::= { lmpNbrEntry 4 }


lmpNbrAdminStatus OBJECT-TYPE
        SYNTAX          INTEGER { up(1), down(2) }
        MAX-ACCESS      read-create
        STATUS          current
        DESCRIPTION
            "The desired operational status of LMP to this remote node."
        ::= { lmpNbrEntry 5 }


lmpNbrOperStatus OBJECT-TYPE
        SYNTAX          INTEGER { up(1), down(2) }
        MAX-ACCESS      read-only
        STATUS          current
        DESCRIPTION
            "The actual operational status of LMP to this remote node."
        ::= { lmpNbrEntry 6 }


lmpNbrRowStatus 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 the status is active(1).
             All read-create objects must have valid and consistent
             values before the row can be activated."
        ::= { lmpNbrEntry 7 }


lmpNbrStorageType OBJECT-TYPE
        SYNTAX          StorageType
        MAX-ACCESS      read-create
        STATUS          current
        DESCRIPTION
            "The storage type for this conceptual row in the
             lmpNbrTable.  Conceptual rows having the value
             'permanent' need not allow write-access to any
```

```
         columnar object in the row."
    DEFVAL          { nonVolatile }
    ::= { lmpNbrEntry 8 }

-- End of lmpNbrTable

lmpCcHelloIntervalDefault OBJECT-TYPE
    SYNTAX          LmpInterval
    MAX-ACCESS      read-write
    STATUS          current
    DESCRIPTION
        "This object specifies the default value for the HelloInterval
         parameter used in the Hello protocol keep-alive phase.  It
         indicates how frequently LMP Hello messages will be sent.  It
         is used as the default value for lmpCcHelloInterval.
         Implementations should save the value of this object in
         persistent memory so that it survives restarts or reboot."
    REFERENCE
        "Link Management Protocol, RFC 4204."
    ::= { lmpObjects 4 }

lmpCcHelloIntervalDefaultMin OBJECT-TYPE
    SYNTAX          LmpInterval
    MAX-ACCESS      read-write
    STATUS          current
    DESCRIPTION
        "This object specifies the default minimum value for the
         HelloInterval parameter.  It is used as a default value
         for lmpCcHelloIntervalMin.  Implementations should save the
         value of this object in persistent memory so that it survives
         restarts or reboot."
    ::= { lmpObjects 5 }

lmpCcHelloIntervalDefaultMax OBJECT-TYPE
    SYNTAX          LmpInterval
    MAX-ACCESS      read-write
    STATUS          current
    DESCRIPTION
        "This object specifies the default maximum value for the
         HelloInterval parameter.  It is used as a default value
         for lmpCcHelloIntervalMax.  Implementations should save the
         value of this object in persistent memory so that it survives
         restarts or reboot."
    ::= { lmpObjects 6 }

lmpCcHelloDeadIntervalDefault OBJECT-TYPE
    SYNTAX          LmpInterval
    MAX-ACCESS      read-write
```

```
   STATUS          current
   DESCRIPTION
       "This object specifies the default HelloDeadInterval parameter
        to use in the Hello protocol keep-alive phase.  It indicates
        how long a device should wait before declaring the control
        channel dead.  The HelloDeadInterval parameter should be at
        least three times the value of HelloInterval.  It is used as
        a default value for lmpCcHelloDeadInterval.  Implementations
        should save the value of this object in persistent memory so
        that it survives restarts or reboot."
   REFERENCE
       "Link Management Protocol, RFC 4204."
   ::= { lmpObjects 7 }

lmpCcHelloDeadIntervalDefaultMin OBJECT-TYPE
   SYNTAX          LmpInterval
   MAX-ACCESS      read-write
   STATUS          current
   DESCRIPTION
       "This object specifies the default minimum value for the
        HelloDeadInterval parameter.  It is used as a default value
        for lmpCcHelloDeadIntervalMin.  Implementations should save
        the value of this object in persistent memory so that it
        survives restarts or reboot."
   ::= { lmpObjects 8 }

lmpCcHelloDeadIntervalDefaultMax OBJECT-TYPE
   SYNTAX          LmpInterval
   MAX-ACCESS      read-write
   STATUS          current
   DESCRIPTION
       "This object specifies the default maximum value for the
        HelloDeadInterval parameter.  It is used as a default value
        for lmpCcHelloDeadIntervalMax.  Implementations should save the
        value of this object in persistent memory so that it survives
        restarts or reboot."
   ::= { lmpObjects 9 }

-- LMP Control Channel Table

lmpControlChannelTable OBJECT-TYPE
   SYNTAX          SEQUENCE OF LmpControlChannelEntry
   MAX-ACCESS      not-accessible
   STATUS          current
   DESCRIPTION
       "This table specifies LMP control channel information."
   ::= { lmpObjects 10 }
```

```
lmpControlChannelEntry OBJECT-TYPE
   SYNTAX          LmpControlChannelEntry
   MAX-ACCESS      not-accessible
   STATUS          current
   DESCRIPTION
       "An entry in this table is created by an LMP-enabled device for
        every control channel.  Whenever a new entry is created with
        lmpCcIsIf set to true(1), a corresponding entry is
        created in ifTable as well (see RFC 2863)."
   INDEX          { lmpCcId }
   ::= { lmpControlChannelTable 1 }

LmpControlChannelEntry ::= SEQUENCE {
  lmpCcId                         Unsigned32,
  lmpCcUnderlyingIfIndex          InterfaceIndexOrZero,
  lmpCcIsIf                       TruthValue,
  lmpCcNbrNodeId                  LmpNodeId,
  lmpCcRemoteId                   Unsigned32,
  lmpCcRemoteAddressType          InetAddressType,
  lmpCcRemoteIpAddr               InetAddress,
  lmpCcSetupRole                  INTEGER,
  lmpCcAuthentication             TruthValue,
  lmpCcHelloInterval              LmpInterval,
  lmpCcHelloIntervalMin           LmpInterval,
  lmpCcHelloIntervalMax           LmpInterval,
  lmpCcHelloIntervalNegotiated    LmpInterval,
  lmpCcHelloDeadInterval          LmpInterval,
  lmpCcHelloDeadIntervalMin       LmpInterval,
  lmpCcHelloDeadIntervalMax       LmpInterval,
  lmpCcHelloDeadIntervalNegotiated LmpInterval,
  lmpCcLastChange                 TimeTicks,
  lmpCcAdminStatus                INTEGER,
  lmpCcOperStatus                 INTEGER,
  lmpCcRowStatus                  RowStatus,
  lmpCcStorageType                StorageType
}

lmpCcId OBJECT-TYPE
   SYNTAX          Unsigned32 (1..4294967295)
   MAX-ACCESS      not-accessible
   STATUS          current
   DESCRIPTION
       "This value represents the local control channel identifier.
        The control channel identifier is a non-zero 32-bit number."
   ::= { lmpControlChannelEntry 1 }

lmpCcUnderlyingIfIndex OBJECT-TYPE
   SYNTAX          InterfaceIndexOrZero
```

```
    MAX-ACCESS      read-create
    STATUS          current
    DESCRIPTION
        "If lmpCcIsIf is set to true(1), this object carries the
         index into the ifTable of the entry that represents the
         LMP interface over which LMP will transmit its traffic.
         If this object is set to zero but lmpCcIsIf is set to
         true(1), the control channel is not currently associated
         with any underlying interface, and the control channel's
         operational status must not be up(1); nor should the
         control channel forward or receive traffic.
         If lmpCcIsIf is set to false(2), this object should be set
         to zero and ignored."
    ::= { lmpControlChannelEntry 2 }

lmpCcIsIf OBJECT-TYPE
    SYNTAX          TruthValue
    MAX-ACCESS      read-create
    STATUS          current
    DESCRIPTION
        "In implementations where the control channels are modeled
         as interfaces, the value of this object is true(1), and
         this control channel is represented by an interface in
         the interfaces group table as indicated by the value of
         lmpCcUnderlyingIfIndex.  If control channels are not
         modeled as interfaces, the value of this object is
         false(2), and there is no corresponding interface for
         this control channel in the interfaces group table;
         the value of lmpCcUnderlyingIfIndex should be
         ignored."
    ::= { lmpControlChannelEntry 3 }

lmpCcNbrNodeId OBJECT-TYPE
    SYNTAX          LmpNodeId
    MAX-ACCESS      read-create
    STATUS          current
    DESCRIPTION
        "This is the Node ID of the control channel remote node.
         This value either is configured or gets created by the node
         when a Config message is received or when an outgoing Config
         message is acknowledged by the remote node."
    ::= { lmpControlChannelEntry 4 }

lmpCcRemoteId OBJECT-TYPE
    SYNTAX          Unsigned32
    MAX-ACCESS      read-only
    STATUS          current
    DESCRIPTION
```

          "This value represents the remote control channel identifier
           (32-bit number). It is determined during the negotiation
           phase. A value of zero means that the remote control channel
           identifier has not yet been learned."
       ::= { lmpControlChannelEntry 5 }

lmpCcRemoteAddressType OBJECT-TYPE
    SYNTAX   InetAddressType
    MAX-ACCESS   read-create
    STATUS   current
    DESCRIPTION
        "This value represents the remote control channel IP address
         type. In point-to-point configuration, this value can be set
         to unknown(0)."
    ::= { lmpControlChannelEntry 6 }

lmpCcRemoteIpAddr OBJECT-TYPE
    SYNTAX   InetAddress
    MAX-ACCESS   read-create
    STATUS   current
    DESCRIPTION
        "This value represents the remote control channel Internet
         address for numbered control channel. The type of this
         address is determined by lmpCcRemoteAddressType.
         The control channel must be numbered on non-point-to-point
         configuration. For point-to-point configuration, the
         remote control channel address can be of type unknown,
         in which case this object must be a zero-length string. The
         lmpCcRemoteId object then identifies the unnumbered
         address."
    ::= { lmpControlChannelEntry 7 }

lmpCcSetupRole OBJECT-TYPE
    SYNTAX   INTEGER { active(1), passive(2) }
    MAX-ACCESS   read-create
    STATUS   current
    DESCRIPTION
        "The role that this node should take during establishment
         of this control channel. An active node will initiate
         establishment. A passive node will wait for the remote node
         to initiate. A pair of nodes that both take the passive role
         will never establish communications."
    DEFVAL   { active }
    ::= { lmpControlChannelEntry 8 }

lmpCcAuthentication OBJECT-TYPE
    SYNTAX   TruthValue
    MAX-ACCESS   read-create

```
   STATUS          current
   DESCRIPTION
       "This object indicates whether the control channel must use
        authentication."
   REFERENCE
       "Link Management Protocol, RFC 4204."
   ::= { lmpControlChannelEntry 9 }

lmpCcHelloInterval OBJECT-TYPE
   SYNTAX          LmpInterval
   MAX-ACCESS      read-create
   STATUS          current
   DESCRIPTION
       "This object specifies the value of the HelloInterval
        parameter.  The default value for this object should be
        set to lmpCcHelloIntervalDefault."
   ::= { lmpControlChannelEntry 10 }

lmpCcHelloIntervalMin OBJECT-TYPE
   SYNTAX          LmpInterval
   MAX-ACCESS      read-create
   STATUS          current
   DESCRIPTION
       "This object specifies the minimum value for the
        HelloInterval parameter.  The default value for this
        object should be set to lmpCcHelloIntervalMinDefault."
   ::= { lmpControlChannelEntry 11 }

lmpCcHelloIntervalMax OBJECT-TYPE
   SYNTAX          LmpInterval
   MAX-ACCESS      read-create
   STATUS          current
   DESCRIPTION
       "This object specifies the maximum value for the
        HelloInterval parameter.  The default value for this
        object should be set to lmpCcHelloIntervalMaxDefault."
   ::= { lmpControlChannelEntry 12 }

lmpCcHelloIntervalNegotiated OBJECT-TYPE
   SYNTAX          LmpInterval
   MAX-ACCESS      read-only
   STATUS          current
   DESCRIPTION
       "Once the control channel is active, this object represents
        the negotiated HelloInterval value."
   ::= { lmpControlChannelEntry 13 }

lmpCcHelloDeadInterval OBJECT-TYPE
```

```
   SYNTAX          LmpInterval
   MAX-ACCESS      read-create
   STATUS          current
   DESCRIPTION
       "This object specifies the value of the HelloDeadInterval
        parameter.  The default value for this object should be
        set to lmpCcHelloDeadIntervalDefault."
   ::= { lmpControlChannelEntry 14 }

lmpCcHelloDeadIntervalMin OBJECT-TYPE
   SYNTAX          LmpInterval
   MAX-ACCESS      read-create
   STATUS          current
   DESCRIPTION
       "This object specifies the minimum value for the
        HelloDeadInterval parameter.  The default value for this
        object should be set to lmpCcHelloDeadIntervalMinDefault."
   ::= { lmpControlChannelEntry 15 }

lmpCcHelloDeadIntervalMax OBJECT-TYPE
   SYNTAX          LmpInterval
   MAX-ACCESS      read-create
   STATUS          current
   DESCRIPTION
       "This object specifies the maximum value for the
        HelloDeadInterval parameter.  The default value for this
        object should be set to lmpCcHelloIntervalMaxDefault."
   ::= { lmpControlChannelEntry 16 }

lmpCcHelloDeadIntervalNegotiated OBJECT-TYPE
   SYNTAX          LmpInterval
   MAX-ACCESS      read-only
   STATUS          current
   DESCRIPTION
       "Once the control channel is active, this object represents
        the negotiated HelloDeadInterval value."
   ::= { lmpControlChannelEntry 17 }

lmpCcLastChange OBJECT-TYPE
   SYNTAX          TimeTicks
   MAX-ACCESS      read-only
   STATUS          current
   DESCRIPTION
       "The value of sysUpTime at the time the control channel entered
        its current operational state.  If the current state was
        entered prior to the last re-initialization of the local
        network management subsystem, then this object contains a
        zero value."
```

```
    ::= { lmpControlChannelEntry 18 }

lmpCcAdminStatus OBJECT-TYPE
    SYNTAX          INTEGER { up(1), down(2) }
    MAX-ACCESS      read-create
    STATUS          current
    DESCRIPTION
        "The desired operational status of this control channel."
    ::= { lmpControlChannelEntry 19 }

lmpCcOperStatus OBJECT-TYPE
    SYNTAX          INTEGER {
                        up(1),
                        down(2),
                        configSnd(3),
                        configRcv(4),
                        active(5),
                        goingDown(6)
                    }
    MAX-ACCESS      read-only
    STATUS          current
    DESCRIPTION
        "The actual operational status of this control channel."
    ::= { lmpControlChannelEntry 20 }

lmpCcRowStatus 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 the status is active(1).
         All read-create objects must have valid and consistent
         values before the row can be activated."
    ::= { lmpControlChannelEntry 21 }

lmpCcStorageType OBJECT-TYPE
    SYNTAX          StorageType
    MAX-ACCESS      read-create
    STATUS          current
    DESCRIPTION
        "The storage type for this conceptual row in the
         lmpControlChannelTable.  Conceptual rows having the value
         'permanent' need not allow write-access to any
         columnar object in the row."

    DEFVAL          { nonVolatile }
```

```
   ::= { lmpControlChannelEntry 22 }

-- End of lmpControlChannelTable


-- LMP Control Channel Performance Table

lmpControlChannelPerfTable OBJECT-TYPE
    SYNTAX          SEQUENCE OF LmpControlChannelPerfEntry
    MAX-ACCESS      not-accessible
    STATUS          current
    DESCRIPTION
        "This table specifies LMP control channel performance
         counters."
    ::= { lmpObjects 11 }

lmpControlChannelPerfEntry OBJECT-TYPE
    SYNTAX          LmpControlChannelPerfEntry
    MAX-ACCESS      not-accessible
    STATUS          current
    DESCRIPTION
        "An entry in this table is created by a LMP-enabled device for
         every control channel.  lmpCcCounterDiscontinuityTime is used
         to indicate potential discontinuity for all counter objects
         in this table."
    INDEX           { lmpCcId }
    ::= { lmpControlChannelPerfTable 1 }

LmpControlChannelPerfEntry ::= SEQUENCE {
  lmpCcInOctets                      Counter32,
  lmpCcInDiscards                    Counter32,
  lmpCcInErrors                      Counter32,
  lmpCcOutOctets                     Counter32,
  lmpCcOutDiscards                   Counter32,
  lmpCcOutErrors                     Counter32,
  lmpCcConfigReceived                Counter32,
  lmpCcConfigSent                    Counter32,
  lmpCcConfigRetransmit              Counter32,
  lmpCcConfigAckReceived             Counter32,
  lmpCcConfigAckSent                 Counter32,
  lmpCcConfigNackReceived            Counter32,
  lmpCcConfigNackSent                Counter32,
  lmpCcHelloReceived                 Counter32,
  lmpCcHelloSent                     Counter32,
  lmpCcBeginVerifyReceived           Counter32,
  lmpCcBeginVerifySent               Counter32,
  lmpCcBeginVerifyRetransmit         Counter32,
  lmpCcBeginVerifyAckReceived        Counter32,
```

```
   lmpCcBeginVerifyAckSent            Counter32,
   lmpCcBeginVerifyNackReceived       Counter32,
   lmpCcBeginVerifyNackSent           Counter32,
   lmpCcEndVerifyReceived             Counter32,
   lmpCcEndVerifySent                 Counter32,
   lmpCcEndVerifyRetransmit           Counter32,
   lmpCcEndVerifyAckReceived          Counter32,
   lmpCcEndVerifyAckSent              Counter32,
   lmpCcTestStatusSuccessReceived     Counter32,
   lmpCcTestStatusSuccessSent         Counter32,
   lmpCcTestStatusSuccessRetransmit   Counter32,
   lmpCcTestStatusFailureReceived     Counter32,
   lmpCcTestStatusFailureSent         Counter32,
   lmpCcTestStatusFailureRetransmit   Counter32,
   lmpCcTestStatusAckReceived         Counter32,
   lmpCcTestStatusAckSent             Counter32,
   lmpCcLinkSummaryReceived           Counter32,
   lmpCcLinkSummarySent               Counter32,
   lmpCcLinkSummaryRetransmit         Counter32,
   lmpCcLinkSummaryAckReceived        Counter32,
   lmpCcLinkSummaryAckSent            Counter32,
   lmpCcLinkSummaryNackReceived       Counter32,
   lmpCcLinkSummaryNackSent           Counter32,
   lmpCcChannelStatusReceived         Counter32,
   lmpCcChannelStatusSent             Counter32,
   lmpCcChannelStatusRetransmit       Counter32,
   lmpCcChannelStatusAckReceived      Counter32,
   lmpCcChannelStatusAckSent          Counter32,
   lmpCcChannelStatusReqReceived      Counter32,
   lmpCcChannelStatusReqSent          Counter32,
   lmpCcChannelStatusReqRetransmit    Counter32,
   lmpCcChannelStatusRspReceived      Counter32,
   lmpCcChannelStatusRspSent          Counter32,
   lmpCcCounterDiscontinuityTime      TimeStamp
}

lmpCcInOctets OBJECT-TYPE
    SYNTAX      Counter32
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
            "The total number of LMP message octets received on the
             control channel."
    ::= { lmpControlChannelPerfEntry 1 }

lmpCcInDiscards OBJECT-TYPE
    SYNTAX      Counter32
    MAX-ACCESS  read-only
```

```
     STATUS        current
     DESCRIPTION
             "The number of inbound packets that were chosen to be
              discarded even though no errors had been detected.  One
              possible reason for discarding such a packet could be to
              free up buffer space."
     ::= { lmpControlChannelPerfEntry 2 }

lmpCcInErrors OBJECT-TYPE
     SYNTAX        Counter32
     MAX-ACCESS    read-only
     STATUS        current
     DESCRIPTION
             "The number of inbound packets that contained errors
              preventing them from being processed by LMP."
     ::= { lmpControlChannelPerfEntry 3 }

lmpCcOutOctets OBJECT-TYPE
     SYNTAX        Counter32
     MAX-ACCESS    read-only
     STATUS        current
     DESCRIPTION
             "The total number of LMP message octets transmitted out of
              the control channel."
     ::= { lmpControlChannelPerfEntry 4 }

lmpCcOutDiscards OBJECT-TYPE
     SYNTAX        Counter32
     MAX-ACCESS    read-only
     STATUS        current
     DESCRIPTION
             "The number of outbound packets that were chosen to be
              discarded even though no errors had been detected to
              prevent their being transmitted.  One possible reason
              for discarding such a packet could be to free up buffer
              space."
     ::= { lmpControlChannelPerfEntry 5 }

lmpCcOutErrors OBJECT-TYPE
     SYNTAX        Counter32
     MAX-ACCESS    read-only
     STATUS        current
     DESCRIPTION
             "The number of outbound packets that could not be
              transmitted because of errors."
     ::= { lmpControlChannelPerfEntry 6 }

lmpCcConfigReceived OBJECT-TYPE
```

```
    SYNTAX          Counter32
    MAX-ACCESS      read-only
    STATUS          current
    DESCRIPTION
        "This object counts the number of Config messages that have
         been received on this control channel."
    ::= { lmpControlChannelPerfEntry 7 }

lmpCcConfigSent OBJECT-TYPE
    SYNTAX          Counter32
    MAX-ACCESS      read-only
    STATUS          current
    DESCRIPTION
        "This object counts the number of Config messages that have
         been sent on this control channel."
    ::= { lmpControlChannelPerfEntry 8 }

lmpCcConfigRetransmit OBJECT-TYPE
    SYNTAX          Counter32
    MAX-ACCESS      read-only
    STATUS          current
    DESCRIPTION
        "This object counts the number of Config messages that
         have been retransmitted over this control channel."
    ::= { lmpControlChannelPerfEntry 9 }

lmpCcConfigAckReceived OBJECT-TYPE
    SYNTAX          Counter32
    MAX-ACCESS      read-only
    STATUS          current
    DESCRIPTION
        "This object counts the number of ConfigAck messages that have
         been received on this control channel."
    ::= { lmpControlChannelPerfEntry 10 }

lmpCcConfigAckSent OBJECT-TYPE
    SYNTAX          Counter32
    MAX-ACCESS      read-only
    STATUS          current
    DESCRIPTION
        "This object counts the number of ConfigAck messages that have
         been sent on this control channel."
    ::= { lmpControlChannelPerfEntry 11 }

lmpCcConfigNackReceived OBJECT-TYPE
    SYNTAX          Counter32
    MAX-ACCESS      read-only
    STATUS          current
```

         DESCRIPTION
             "This object counts the number of ConfigNack messages that have
              been received on this control channel."
          ::= { lmpControlChannelPerfEntry 12 }

lmpCcConfigNackSent OBJECT-TYPE
    SYNTAX   Counter32
    MAX-ACCESS   read-only
    STATUS   current
    DESCRIPTION
        "This object counts the number of ConfigNack messages that have
         been sent on this control channel."
     ::= { lmpControlChannelPerfEntry 13 }

lmpCcHelloReceived OBJECT-TYPE
    SYNTAX   Counter32
    MAX-ACCESS   read-only
    STATUS   current
    DESCRIPTION
        "This object counts the number of Hello messages that have
         been received on this control channel."
     ::= { lmpControlChannelPerfEntry 14 }

lmpCcHelloSent OBJECT-TYPE
    SYNTAX   Counter32
    MAX-ACCESS   read-only
    STATUS   current
    DESCRIPTION
        "This object counts the number of Hello messages that have
         been sent on this control channel."
     ::= { lmpControlChannelPerfEntry 15 }

lmpCcBeginVerifyReceived OBJECT-TYPE
    SYNTAX   Counter32
    MAX-ACCESS   read-only
    STATUS   current
    DESCRIPTION
        "This object counts the number of BeginVerify messages that have
         been received on this control channel."
     ::= { lmpControlChannelPerfEntry 16 }

lmpCcBeginVerifySent OBJECT-TYPE
    SYNTAX   Counter32
    MAX-ACCESS   read-only
    STATUS   current
    DESCRIPTION
        "This object counts the number of BeginVerify messages that have
         been sent on this control channel."

```
    ::= { lmpControlChannelPerfEntry 17 }

lmpCcBeginVerifyRetransmit OBJECT-TYPE
    SYNTAX          Counter32
    MAX-ACCESS      read-only
    STATUS          current
    DESCRIPTION
        "This object counts the number of BeginVerify messages that
         have been retransmitted over this control channel."
    ::= { lmpControlChannelPerfEntry 18 }

lmpCcBeginVerifyAckReceived OBJECT-TYPE
    SYNTAX          Counter32
    MAX-ACCESS      read-only
    STATUS          current
    DESCRIPTION
        "This object counts the number of BeginVerifyAck messages that
         have been received on this control channel."
    ::= { lmpControlChannelPerfEntry 19 }

lmpCcBeginVerifyAckSent OBJECT-TYPE
    SYNTAX          Counter32
    MAX-ACCESS      read-only
    STATUS          current
    DESCRIPTION
        "This object counts the number of BeginVerifyAck messages that
         have been sent on this control channel."
    ::= { lmpControlChannelPerfEntry 20 }

lmpCcBeginVerifyNackReceived OBJECT-TYPE
    SYNTAX          Counter32
    MAX-ACCESS      read-only
    STATUS          current
    DESCRIPTION
        "This object counts the number of BeginVerifyNack messages that
         have been received on this control channel."
    ::= { lmpControlChannelPerfEntry 21 }

lmpCcBeginVerifyNackSent OBJECT-TYPE
    SYNTAX          Counter32
    MAX-ACCESS      read-only
    STATUS          current
    DESCRIPTION
        "This object counts the number of BeginVerifyNack messages that
         have been sent on this control channel."
    ::= { lmpControlChannelPerfEntry 22 }

lmpCcEndVerifyReceived OBJECT-TYPE
```

```
     SYNTAX          Counter32
     MAX-ACCESS      read-only
     STATUS          current
     DESCRIPTION
         "This object counts the number of EndVerify messages that have
          been received on this control channel."
     ::= { lmpControlChannelPerfEntry 23 }

lmpCcEndVerifySent OBJECT-TYPE
     SYNTAX          Counter32
     MAX-ACCESS      read-only
     STATUS          current
     DESCRIPTION
         "This object counts the number of EndVerify messages that have
          been sent on this control channel."
     ::= { lmpControlChannelPerfEntry 24 }

lmpCcEndVerifyRetransmit OBJECT-TYPE
     SYNTAX          Counter32
     MAX-ACCESS      read-only
     STATUS          current
     DESCRIPTION
         "This object counts the number of EndVerify messages that
          have been retransmitted over this control channel."
     ::= { lmpControlChannelPerfEntry 25 }

lmpCcEndVerifyAckReceived OBJECT-TYPE
     SYNTAX          Counter32
     MAX-ACCESS      read-only
     STATUS          current
     DESCRIPTION
         "This object counts the number of EndVerifyAck messages that
          have been received on this control channel."
     ::= { lmpControlChannelPerfEntry 26 }

lmpCcEndVerifyAckSent OBJECT-TYPE
     SYNTAX          Counter32
     MAX-ACCESS      read-only
     STATUS          current
     DESCRIPTION
         "This object counts the number of EndVerifyAck messages that
          have been sent on this control channel."
     ::= { lmpControlChannelPerfEntry 27 }

lmpCcTestStatusSuccessReceived OBJECT-TYPE
     SYNTAX          Counter32
     MAX-ACCESS      read-only
     STATUS          current
```

```
   DESCRIPTION
       "This object counts the number of TestStatusSuccess messages
        that have been received on this control channel."
    ::= { lmpControlChannelPerfEntry 28 }


lmpCcTestStatusSuccessSent OBJECT-TYPE
    SYNTAX          Counter32
    MAX-ACCESS      read-only
    STATUS          current
    DESCRIPTION
       "This object counts the number of TestStatusSuccess messages
        that have been sent on this control channel."
    ::= { lmpControlChannelPerfEntry 29 }


lmpCcTestStatusSuccessRetransmit OBJECT-TYPE
    SYNTAX          Counter32
    MAX-ACCESS      read-only
    STATUS          current
    DESCRIPTION
       "This object counts the number of TestStatusSuccess messages
        that have been retransmitted over this control channel."
    ::= { lmpControlChannelPerfEntry 30 }


lmpCcTestStatusFailureReceived OBJECT-TYPE
    SYNTAX          Counter32
    MAX-ACCESS      read-only
    STATUS          current
    DESCRIPTION
       "This object counts the number of TestStatusFailure messages
        that have been received on this control channel."
    ::= { lmpControlChannelPerfEntry 31 }


lmpCcTestStatusFailureSent OBJECT-TYPE
    SYNTAX          Counter32
    MAX-ACCESS      read-only
    STATUS          current
    DESCRIPTION
       "This object counts the number of TestStatusFailure messages
        that have been sent on this control channel."
    ::= { lmpControlChannelPerfEntry 32 }


lmpCcTestStatusFailureRetransmit OBJECT-TYPE
    SYNTAX          Counter32
    MAX-ACCESS      read-only
    STATUS          current
    DESCRIPTION
       "This object counts the number of TestStatusFailure messages
        that have been retransmitted over this control channel."
```

```
   ::= { lmpControlChannelPerfEntry 33 }

lmpCcTestStatusAckReceived OBJECT-TYPE
   SYNTAX        Counter32
   MAX-ACCESS    read-only
   STATUS        current
   DESCRIPTION
       "This object counts the number of TestStatusAck messages
        that have been received on this control channel."
   ::= { lmpControlChannelPerfEntry 34 }

lmpCcTestStatusAckSent OBJECT-TYPE
   SYNTAX        Counter32
   MAX-ACCESS    read-only
   STATUS        current
   DESCRIPTION
       "This object counts the number of TestStatusAck messages
        that have been sent on this control channel."
   ::= { lmpControlChannelPerfEntry 35 }

lmpCcLinkSummaryReceived OBJECT-TYPE
   SYNTAX        Counter32
   MAX-ACCESS    read-only
   STATUS        current
   DESCRIPTION
       "This object counts the number of LinkSummary messages
        that have been received on this control channel."
   ::= { lmpControlChannelPerfEntry 36 }

lmpCcLinkSummarySent OBJECT-TYPE
   SYNTAX        Counter32
   MAX-ACCESS    read-only
   STATUS        current
   DESCRIPTION
       "This object counts the number of LinkSummary messages
        that have been sent on this control channel."
   ::= { lmpControlChannelPerfEntry 37 }

lmpCcLinkSummaryRetransmit OBJECT-TYPE
   SYNTAX        Counter32
   MAX-ACCESS    read-only
   STATUS        current
   DESCRIPTION
     "This object counts the number of LinkSummary messages that
      have been retransmitted over this control channel."
   ::= { lmpControlChannelPerfEntry 38 }

lmpCcLinkSummaryAckReceived OBJECT-TYPE
```

```
   SYNTAX          Counter32
   MAX-ACCESS      read-only
   STATUS          current
   DESCRIPTION
       "This object counts the number of LinkSummaryAck messages
        that have been received on this control channel."
   ::= { lmpControlChannelPerfEntry 39 }

lmpCcLinkSummaryAckSent OBJECT-TYPE
   SYNTAX          Counter32
   MAX-ACCESS      read-only
   STATUS          current
   DESCRIPTION
       "This object counts the number of LinkSummaryAck messages
        that have been sent on this control channel."
   ::= { lmpControlChannelPerfEntry 40 }

lmpCcLinkSummaryNackReceived OBJECT-TYPE
   SYNTAX          Counter32
   MAX-ACCESS      read-only
   STATUS          current
   DESCRIPTION
       "This object counts the number of LinkSummaryNack messages
        that have been received on this control channel."
   ::= { lmpControlChannelPerfEntry 41 }

lmpCcLinkSummaryNackSent OBJECT-TYPE
   SYNTAX          Counter32
   MAX-ACCESS      read-only
   STATUS          current
   DESCRIPTION
       "This object counts the number of LinkSummaryNack messages
        that have been sent on this control channel."
   ::= { lmpControlChannelPerfEntry 42 }

lmpCcChannelStatusReceived OBJECT-TYPE
   SYNTAX          Counter32
   MAX-ACCESS      read-only
   STATUS          current
   DESCRIPTION
       "This object counts the number of ChannelStatus messages
        that have been received on this control channel."
   ::= { lmpControlChannelPerfEntry 43 }

lmpCcChannelStatusSent OBJECT-TYPE
   SYNTAX          Counter32
   MAX-ACCESS      read-only
   STATUS          current
```

```
      DESCRIPTION
          "This object counts the number of ChannelStatus messages
           that have been sent on this control channel."
      ::= { lmpControlChannelPerfEntry 44 }

  lmpCcChannelStatusRetransmit OBJECT-TYPE
      SYNTAX          Counter32
      MAX-ACCESS      read-only
      STATUS          current
      DESCRIPTION
          "This object counts the number of ChannelStatus messages
           that have been retransmitted on this control channel."
      ::= { lmpControlChannelPerfEntry 45 }

  lmpCcChannelStatusAckReceived OBJECT-TYPE
      SYNTAX          Counter32
      MAX-ACCESS      read-only
      STATUS          current
      DESCRIPTION
          "This object counts the number of ChannelStatusAck messages
           that have been received on this control channel."
      ::= { lmpControlChannelPerfEntry 46 }

  lmpCcChannelStatusAckSent OBJECT-TYPE
      SYNTAX          Counter32
      MAX-ACCESS      read-only
      STATUS          current
      DESCRIPTION
          "This object counts the number of ChannelStatus messages
           that have been sent on this control channel."
      ::= { lmpControlChannelPerfEntry 47 }

  lmpCcChannelStatusReqReceived OBJECT-TYPE
      SYNTAX          Counter32
      MAX-ACCESS      read-only
      STATUS          current
      DESCRIPTION
          "This object counts the number of ChannelStatusRequest messages
           that have been received on this control channel."
      ::= { lmpControlChannelPerfEntry 48 }

  lmpCcChannelStatusReqSent OBJECT-TYPE
      SYNTAX          Counter32
      MAX-ACCESS      read-only
      STATUS          current
      DESCRIPTION
          "This object counts the number of ChannelStatusRequest messages
           that have been sent on this control channel."
```

```
    ::= { lmpControlChannelPerfEntry 49 }

lmpCcChannelStatusReqRetransmit OBJECT-TYPE
    SYNTAX          Counter32
    MAX-ACCESS      read-only
    STATUS          current
    DESCRIPTION
        "This object counts the number of ChannelStatusRequest messages
         that have been retransmitted on this control channel."
    ::= { lmpControlChannelPerfEntry 50 }

lmpCcChannelStatusRspReceived OBJECT-TYPE
    SYNTAX          Counter32
    MAX-ACCESS      read-only
    STATUS          current
    DESCRIPTION
        "This object counts the number of ChannelStatusResponse messages
         that have been received on this control channel."
    ::= { lmpControlChannelPerfEntry 51 }

lmpCcChannelStatusRspSent OBJECT-TYPE
    SYNTAX          Counter32
    MAX-ACCESS      read-only
    STATUS          current
    DESCRIPTION
        "This object counts the number of ChannelStatusResponse messages
         that have been sent on this control channel."
    ::= { lmpControlChannelPerfEntry 52 }

lmpCcCounterDiscontinuityTime OBJECT-TYPE
    SYNTAX          TimeStamp
    MAX-ACCESS      read-only
    STATUS          current
    DESCRIPTION
        "The value of sysUpTime on the most recent occasion at which
         one or more of this control channel's counters suffered a
         discontinuity.  The relevant counters are the specific
         instances associated with this control channel of any
         Counter32 object contained in the lmpControlChannelPerfTable.
         If no such discontinuities have occurred since the last re-
         initialization of the local management subsystem, then this
         object contains a zero value."
    ::= { lmpControlChannelPerfEntry 53 }

-- End of lmpControlChannelPerfTable

-- LMP TE Link Table
```

```
lmpTeLinkTable OBJECT-TYPE
    SYNTAX         SEQUENCE OF LmpTeLinkEntry
    MAX-ACCESS     not-accessible
    STATUS         current
    DESCRIPTION
        "This table specifies the LMP-specific TE link information.
         Overall TE link information is kept in three separate tables:
         ifTable for interface-specific information, lmpTeLinkTable
         for LMP specific information, and teLinkTable for generic
         TE link information.  ifIndex is the common index to all
         tables."
    ::= { lmpObjects 12 }

lmpTeLinkEntry OBJECT-TYPE
    SYNTAX         LmpTeLinkEntry
    MAX-ACCESS     not-accessible
    STATUS         current
    DESCRIPTION
        "An entry in this table exists for each ifEntry with an
         ifType of teLink(200) that is managed by LMP.  An ifEntry with
         an ifIndex must exist before the corresponding lmpTeLinkEntry is
         created.  If a TE link entry in the ifTable is destroyed, then
         so is the corresponding entry in the lmpTeLinkTable.  The
         administrative status value is controlled from the ifEntry.
         Setting the administrative status to testing prompts LMP to
         start link verification on the TE link.  Information about the
         TE link that is not LMP specific is contained in the
         teLinkTable of the TE-LINK-STD-MIB MIB module."
    INDEX         { ifIndex }
    ::= { lmpTeLinkTable 1 }

LmpTeLinkEntry ::= SEQUENCE {
  lmpTeLinkNbrRemoteNodeId  LmpNodeId,
  lmpTeLinkVerification     TruthValue,
  lmpTeLinkFaultManagement  TruthValue,
  lmpTeLinkDwdm             TruthValue,
  lmpTeLinkOperStatus       INTEGER,
  lmpTeLinkRowStatus        RowStatus,
  lmpTeLinkStorageType      StorageType
}

lmpTeLinkNbrRemoteNodeId OBJECT-TYPE
    SYNTAX         LmpNodeId
    MAX-ACCESS     read-create
    STATUS         current
    DESCRIPTION
        "This is the Node ID of the TE link remote node.  This value
         may be learned during the control channel parameter negotiation
```

```
        phase (in the Config message).  Node ID is an address whose
        type must be IPv4."
     ::= { lmpTeLinkEntry 1 }


lmpTeLinkVerification OBJECT-TYPE
    SYNTAX          TruthValue
    MAX-ACCESS      read-create
    STATUS          current
    DESCRIPTION
        "This object indicates whether the LMP link verification
         procedure is enabled for this TE link."
    REFERENCE
        "Link Management Protocol, RFC 4204."
     ::= { lmpTeLinkEntry 2 }


lmpTeLinkFaultManagement OBJECT-TYPE
    SYNTAX          TruthValue
    MAX-ACCESS      read-create
    STATUS          current
    DESCRIPTION
        "This object indicates whether the LMP fault management procedure
         is enabled on this TE link."
    REFERENCE
        "Link Management Protocol, RFC 4204."
     ::= { lmpTeLinkEntry 3 }


lmpTeLinkDwdm OBJECT-TYPE
    SYNTAX          TruthValue
    MAX-ACCESS      read-create
    STATUS          current
    DESCRIPTION
        "This object indicates whether the LMP DWDM procedure is enabled
         on this TE link."
    REFERENCE
        "Link Management Protocol (LMP) for Dense Wavelength Division
         Multiplexing (DWDM) Optical Line Systems, RFC 4209."
     ::= { lmpTeLinkEntry 4 }


lmpTeLinkOperStatus OBJECT-TYPE
    SYNTAX          INTEGER {
                      up(1), down(2), testing(3), init(4), degraded(5)
                    }
    MAX-ACCESS      read-only
    STATUS          current
    DESCRIPTION
        "The actual operational status of this TE link.  The status
         is set to testing when the TE link is performing link
         verification.  A degraded state indicates that there is
```

```
         no active control channel between the pair of nodes that
         form the endpoints of the TE link, but that at least one
         data-bearing link on the TE link is allocated."
   ::= { lmpTeLinkEntry 5 }


lmpTeLinkRowStatus 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 the status is active(1).
        All read-create objects must have valid and consistent
        values before the row can be activated."
   ::= { lmpTeLinkEntry 6 }


lmpTeLinkStorageType OBJECT-TYPE
   SYNTAX          StorageType
   MAX-ACCESS      read-create
   STATUS          current
   DESCRIPTION
       "The storage type for this conceptual row in the
        lmpTeLinkTable.  Conceptual rows having the value
        'permanent' need not allow write-access to any
        columnar object in the row."
   DEFVAL         { nonVolatile }
   ::= { lmpTeLinkEntry 7 }

-- End of lmpTeLinkTable


lmpGlobalLinkVerificationInterval OBJECT-TYPE
   SYNTAX          Unsigned32
   UNITS           "milliseconds"
   MAX-ACCESS      read-write
   STATUS          current
   DESCRIPTION
       "This object indicates how often the link verification
        procedure is executed.  The interval is in milliseconds.
        A value of 0 is used to indicate that the link
        verification procedure should not be executed.  The
        interval specified in this object should be large enough
        to allow the verification procedure to be completed
        before the start of the next interval.
        Implementations should save the value of this object in
        persistent memory so that it survives restarts or reboot."
   ::= { lmpObjects 13 }
```

-- LMP Link Verification Table

lmpLinkVerificationTable OBJECT-TYPE
    SYNTAX   SEQUENCE OF LmpLinkVerificationEntry
    MAX-ACCESS   not-accessible
    STATUS   current
    DESCRIPTION
        "This table specifies TE link information associated with the
         LMP verification procedure."
    ::= { lmpObjects 14 }

lmpLinkVerificationEntry OBJECT-TYPE
    SYNTAX   LmpLinkVerificationEntry
    MAX-ACCESS   not-accessible
    STATUS   current
    DESCRIPTION
        "An entry in this table is created by an LMP-enabled device for
         every TE link that supports the LMP verification
         procedure."
    INDEX   { ifIndex }
    ::= { lmpLinkVerificationTable 1 }

LmpLinkVerificationEntry ::= SEQUENCE {
  lmpLinkVerifyInterval   LmpInterval,
  lmpLinkVerifyDeadInterval   LmpInterval,
  lmpLinkVerifyTransportMechanism BITS,
  lmpLinkVerifyAllLinks   TruthValue,
  lmpLinkVerifyTransmissionRate   Unsigned32,
  lmpLinkVerifyWavelength   Unsigned32,
  lmpLinkVerifyRowStatus   RowStatus,
  lmpLinkVerifyStorageType   StorageType
}

lmpLinkVerifyInterval OBJECT-TYPE
    SYNTAX   LmpInterval
    MAX-ACCESS   read-create
    STATUS   current
    DESCRIPTION
        "This object specifies the VerifyInterval parameter used
         in the LMP link verification process. It indicates the
         interval at which the Test messages are sent."
    REFERENCE
        "Link Management Protocol, RFC 4204."
    ::= { lmpLinkVerificationEntry 1 }

lmpLinkVerifyDeadInterval OBJECT-TYPE
    SYNTAX   LmpInterval
    MAX-ACCESS   read-create

```
   STATUS          current
   DESCRIPTION
       "This object specifies the VerifyDeadInterval parameter used
        in the verification of the physical connectivity of data-
        bearing links.  It specifies the observation period used to
        detect a Test message at the remote node."
   REFERENCE
       "Link Management Protocol, RFC 4204."
   ::= { lmpLinkVerificationEntry 2 }

lmpLinkVerifyTransportMechanism OBJECT-TYPE
   SYNTAX          BITS {
                       -- All encoding types:
                       payload(0),
                       -- SONET/SDH encoding type:
                       dccSectionOverheadBytes(1),
                       dccLineOverheadBytes(2),
                       j0Trace(3),
                       j1Trace(4),
                       j2Trace(5)
                   }
   MAX-ACCESS      read-create
   STATUS          current
   DESCRIPTION
       "This defines the transport mechanism for the Test messages.  The
        scope of this bit mask is restricted to each link encoding
        type.  The local node will set the bits corresponding to the
        various mechanisms it can support for transmitting LMP Test
        messages.  The receiver chooses the appropriate mechanism in the
        BeginVerifyAck message."
   REFERENCE
       "Link Management Protocol, RFC 4204
        Synchronous Optical Network (SONET)/Synchronous Digital
        Hierarchy (SDH) Encoding for Link Management Protocol (LMP)
        Test Messages, RFC 4207."
   ::= { lmpLinkVerificationEntry 3 }

lmpLinkVerifyAllLinks OBJECT-TYPE
   SYNTAX          TruthValue
   MAX-ACCESS      read-create
   STATUS          current
   DESCRIPTION
       "A value of true(1) for this object indicates that the
        verification process checks all unallocated links; otherwise,
        only the new ports or component links that have been added to
        this TE link are verified."
   ::= { lmpLinkVerificationEntry 4 }
```

lmpLinkVerifyTransmissionRate OBJECT-TYPE
   SYNTAX   Unsigned32
   UNITS   "bytes per second"
   MAX-ACCESS   read-create
   STATUS   current
   DESCRIPTION
       "This is the transmission rate of the data link over which
        the Test messages will be transmitted and is expressed in
        bytes per second."
   REFERENCE
       "Link Management Protocol, RFC 4204."
   ::= { lmpLinkVerificationEntry 5 }

lmpLinkVerifyWavelength OBJECT-TYPE
   SYNTAX   Unsigned32
   UNITS   "nanometers"
   MAX-ACCESS   read-create
   STATUS   current
   DESCRIPTION
       "This value corresponds to the wavelength at
        which the Test messages will be transmitted and is
        measured in nanometers (nm). If each data-bearing link
        corresponds to a separate wavelength, then this value should
        be set to 0."
   REFERENCE
       "Link Management Protocol, RFC 4204."
   ::= { lmpLinkVerificationEntry 6 }

lmpLinkVerifyRowStatus 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 the status is active(1).
        All read-create objects must have valid and consistent
        values before the row can be activated."
   ::= { lmpLinkVerificationEntry 7 }

lmpLinkVerifyStorageType OBJECT-TYPE
   SYNTAX   StorageType
   MAX-ACCESS   read-create
   STATUS   current
   DESCRIPTION
       "The storage type for this conceptual row in the
        lmpLinkVerificationTable. Conceptual rows having the value
        'permanent' need not allow write-access to any

          columnar object in the row."
    DEFVAL   { nonVolatile }
    ::= { lmpLinkVerificationEntry 8 }

-- End of lmpLinkVerificationTable

-- LMP TE Link Performance Table

lmpTeLinkPerfTable OBJECT-TYPE
    SYNTAX   SEQUENCE OF LmpTeLinkPerfEntry
    MAX-ACCESS   not-accessible
    STATUS   current
    DESCRIPTION
        "This table specifies LMP TE link performance counters."
    ::= { lmpObjects 15 }

lmpTeLinkPerfEntry OBJECT-TYPE
    SYNTAX   LmpTeLinkPerfEntry
    MAX-ACCESS   not-accessible
    STATUS   current
    DESCRIPTION
        "An entry in this table is created by an LMP-enabled device for
         every TE link. lmpTeCounterDiscontinuityTime is used
         to indicate potential discontinuity for all counter objects
         in this table."
    INDEX   { ifIndex }
    ::= { lmpTeLinkPerfTable 1 }

LmpTeLinkPerfEntry ::= SEQUENCE {
  lmpTeInOctets   Counter32,
  lmpTeOutOctets   Counter32,
  lmpTeBeginVerifyReceived   Counter32,
  lmpTeBeginVerifySent   Counter32,
  lmpTeBeginVerifyRetransmit   Counter32,
  lmpTeBeginVerifyAckReceived   Counter32,
  lmpTeBeginVerifyAckSent   Counter32,
  lmpTeBeginVerifyNackReceived   Counter32,
  lmpTeBeginVerifyNackSent   Counter32,
  lmpTeEndVerifyReceived   Counter32,
  lmpTeEndVerifySent   Counter32,
  lmpTeEndVerifyRetransmit   Counter32,
  lmpTeEndVerifyAckReceived   Counter32,
  lmpTeEndVerifyAckSent   Counter32,
  lmpTeTestStatusSuccessReceived   Counter32,
  lmpTeTestStatusSuccessSent   Counter32,
  lmpTeTestStatusSuccessRetransmit Counter32,
  lmpTeTestStatusFailureReceived   Counter32,

```
    lmpTeTestStatusFailureSent        Counter32,
    lmpTeTestStatusFailureRetransmit  Counter32,
    lmpTeTestStatusAckReceived        Counter32,
    lmpTeTestStatusAckSent            Counter32,
    lmpTeLinkSummaryReceived          Counter32,
    lmpTeLinkSummarySent              Counter32,
    lmpTeLinkSummaryRetransmit        Counter32,
    lmpTeLinkSummaryAckReceived       Counter32,
    lmpTeLinkSummaryAckSent           Counter32,
    lmpTeLinkSummaryNackReceived      Counter32,
    lmpTeLinkSummaryNackSent          Counter32,
    lmpTeChannelStatusReceived        Counter32,
    lmpTeChannelStatusSent            Counter32,
    lmpTeChannelStatusRetransmit      Counter32,
    lmpTeChannelStatusAckReceived     Counter32,
    lmpTeChannelStatusAckSent         Counter32,
    lmpTeChannelStatusReqReceived     Counter32,
    lmpTeChannelStatusReqSent         Counter32,
    lmpTeChannelStatusReqRetransmit   Counter32,
    lmpTeChannelStatusRspReceived     Counter32,
    lmpTeChannelStatusRspSent         Counter32,
    lmpTeCounterDiscontinuityTime     TimeStamp
}

lmpTeInOctets OBJECT-TYPE
    SYNTAX       Counter32
    MAX-ACCESS   read-only
    STATUS       current
    DESCRIPTION
            "The total number of LMP message octets received for
             this TE link."
    ::= { lmpTeLinkPerfEntry 1 }

lmpTeOutOctets OBJECT-TYPE
    SYNTAX       Counter32
    MAX-ACCESS   read-only
    STATUS       current
    DESCRIPTION
            "The total number of LMP message octets transmitted out
             for this TE link."
    ::= { lmpTeLinkPerfEntry 2 }

lmpTeBeginVerifyReceived OBJECT-TYPE
    SYNTAX       Counter32
    MAX-ACCESS   read-only
    STATUS       current
    DESCRIPTION
        "This object counts the number of BeginVerify messages that have
```

```
           been received for this TE link."
      ::= { lmpTeLinkPerfEntry 3 }


   lmpTeBeginVerifySent OBJECT-TYPE
      SYNTAX         Counter32
      MAX-ACCESS     read-only
      STATUS         current
      DESCRIPTION
          "This object counts the number of BeginVerify messages that have
           been sent for this TE link."
      ::= { lmpTeLinkPerfEntry 4 }


   lmpTeBeginVerifyRetransmit OBJECT-TYPE
      SYNTAX         Counter32
      MAX-ACCESS     read-only
      STATUS         current
      DESCRIPTION
          "This object counts the number of BeginVerify messages that
           have been retransmitted for this TE link."
      ::= { lmpTeLinkPerfEntry 5 }


   lmpTeBeginVerifyAckReceived OBJECT-TYPE
      SYNTAX         Counter32
      MAX-ACCESS     read-only
      STATUS         current
      DESCRIPTION
          "This object counts the number of BeginVerifyAck messages that
           have been received for this TE link."
      ::= { lmpTeLinkPerfEntry 6 }


   lmpTeBeginVerifyAckSent OBJECT-TYPE
      SYNTAX         Counter32
      MAX-ACCESS     read-only
      STATUS         current
      DESCRIPTION
          "This object counts the number of BeginVerifyAck messages that
           have been sent for this TE link."
      ::= { lmpTeLinkPerfEntry 7 }


   lmpTeBeginVerifyNackReceived OBJECT-TYPE
      SYNTAX         Counter32
      MAX-ACCESS     read-only
      STATUS         current
      DESCRIPTION
          "This object counts the number of BeginVerifyNack messages that
           have been received for this TE link."
      ::= { lmpTeLinkPerfEntry 8 }
```

```
lmpTeBeginVerifyNackSent OBJECT-TYPE
    SYNTAX         Counter32
    MAX-ACCESS     read-only
    STATUS         current
    DESCRIPTION
        "This object counts the number of BeginVerifyNack messages that
         have been sent for this TE link."
    ::= { lmpTeLinkPerfEntry 9 }

lmpTeEndVerifyReceived OBJECT-TYPE
    SYNTAX         Counter32
    MAX-ACCESS     read-only
    STATUS         current
    DESCRIPTION
        "This object counts the number of EndVerify messages that have
         been received for this TE link."
    ::= { lmpTeLinkPerfEntry 10 }

lmpTeEndVerifySent OBJECT-TYPE
    SYNTAX         Counter32
    MAX-ACCESS     read-only
    STATUS         current
    DESCRIPTION
        "This object counts the number of EndVerify messages that have
         been sent for this TE link."
    ::= { lmpTeLinkPerfEntry 11 }

lmpTeEndVerifyRetransmit OBJECT-TYPE
    SYNTAX         Counter32
    MAX-ACCESS     read-only
    STATUS         current
    DESCRIPTION
        "This object counts the number of EndVerify messages that
         have been retransmitted over this control channel."
    ::= { lmpTeLinkPerfEntry 12 }

lmpTeEndVerifyAckReceived OBJECT-TYPE
    SYNTAX         Counter32
    MAX-ACCESS     read-only
    STATUS         current
    DESCRIPTION
        "This object counts the number of EndVerifyAck messages that
         have been received for this TE link."
    ::= { lmpTeLinkPerfEntry 13 }

lmpTeEndVerifyAckSent OBJECT-TYPE
    SYNTAX         Counter32
    MAX-ACCESS     read-only
```

```
   STATUS          current
   DESCRIPTION
       "This object counts the number of EndVerifyAck messages that
        have been sent for this TE link."
   ::= { lmpTeLinkPerfEntry 14 }

lmpTeTestStatusSuccessReceived OBJECT-TYPE
   SYNTAX          Counter32
   MAX-ACCESS      read-only
   STATUS          current
   DESCRIPTION
       "This object counts the number of TestStatusSuccess messages
        that have been received for this TE link."
   ::= { lmpTeLinkPerfEntry 15 }

lmpTeTestStatusSuccessSent OBJECT-TYPE
   SYNTAX          Counter32
   MAX-ACCESS      read-only
   STATUS          current
   DESCRIPTION
       "This object counts the number of TestStatusSuccess messages
        that have been sent for this TE link."
   ::= { lmpTeLinkPerfEntry 16 }

lmpTeTestStatusSuccessRetransmit OBJECT-TYPE
   SYNTAX          Counter32
   MAX-ACCESS      read-only
   STATUS          current
   DESCRIPTION
       "This object counts the number of TestStatusSuccess messages
        that have been retransmitted for this TE link."
   ::= { lmpTeLinkPerfEntry 17 }

lmpTeTestStatusFailureReceived OBJECT-TYPE
   SYNTAX          Counter32
   MAX-ACCESS      read-only
   STATUS          current
   DESCRIPTION
       "This object counts the number of TestStatusFailure messages
        that have been received for this TE link."
   ::= { lmpTeLinkPerfEntry 18 }

lmpTeTestStatusFailureSent OBJECT-TYPE
   SYNTAX          Counter32
   MAX-ACCESS      read-only
   STATUS          current
   DESCRIPTION
       "This object counts the number of TestStatusFailure messages
```

        that have been sent for this TE link."
    ::= { lmpTeLinkPerfEntry 19 }

lmpTeTestStatusFailureRetransmit OBJECT-TYPE
    SYNTAX   Counter32
    MAX-ACCESS   read-only
    STATUS   current
    DESCRIPTION
        "This object counts the number of TestStatusFailure messages
         that have been retransmitted on this TE link."
    ::= { lmpTeLinkPerfEntry 20 }

lmpTeTestStatusAckReceived OBJECT-TYPE
    SYNTAX   Counter32
    MAX-ACCESS   read-only
    STATUS   current
    DESCRIPTION
        "This object counts the number of TestStatusAck messages that
         have been received for this TE link."
    ::= { lmpTeLinkPerfEntry 21 }

lmpTeTestStatusAckSent OBJECT-TYPE
    SYNTAX   Counter32
    MAX-ACCESS   read-only
    STATUS   current
    DESCRIPTION
        "This object counts the number of TestStatusAck messages that
         have been sent for this TE link."
    ::= { lmpTeLinkPerfEntry 22 }

lmpTeLinkSummaryReceived OBJECT-TYPE
    SYNTAX   Counter32
    MAX-ACCESS   read-only
    STATUS   current
    DESCRIPTION
        "This object counts the number of LinkSummary messages that
         have been received for this TE link."
    ::= { lmpTeLinkPerfEntry 23 }

lmpTeLinkSummarySent OBJECT-TYPE
    SYNTAX   Counter32
    MAX-ACCESS   read-only
    STATUS   current
    DESCRIPTION
        "This object counts the number of LinkSummary messages that
         have been sent for this TE link."
    ::= { lmpTeLinkPerfEntry 24 }

lmpTeLinkSummaryRetransmit OBJECT-TYPE
    SYNTAX   Counter32
    MAX-ACCESS   read-only
    STATUS   current
    DESCRIPTION
        "This object counts the number of LinkSummary messages that
         have been retransmitted over this control channel."
    ::= { lmpTeLinkPerfEntry 25 }

lmpTeLinkSummaryAckReceived OBJECT-TYPE
    SYNTAX   Counter32
    MAX-ACCESS   read-only
    STATUS   current
    DESCRIPTION
        "This object counts the number of LinkSummaryAck messages that
         have been received for this TE link."
    ::= { lmpTeLinkPerfEntry 26 }

lmpTeLinkSummaryAckSent OBJECT-TYPE
    SYNTAX   Counter32
    MAX-ACCESS   read-only
    STATUS   current
    DESCRIPTION
        "This object counts the number of LinkSummaryAck messages that
         have been sent for this TE link."
    ::= { lmpTeLinkPerfEntry 27 }

lmpTeLinkSummaryNackReceived OBJECT-TYPE
    SYNTAX   Counter32
    MAX-ACCESS   read-only
    STATUS   current
    DESCRIPTION
        "This object counts the number of LinkSummaryNack messages that
         have been received for this TE link."
    ::= { lmpTeLinkPerfEntry 28 }

lmpTeLinkSummaryNackSent OBJECT-TYPE
    SYNTAX   Counter32
    MAX-ACCESS   read-only
    STATUS   current
    DESCRIPTION
        "This object counts the number of LinkSummaryNack messages that
         have been sent for this TE link."
    ::= { lmpTeLinkPerfEntry 29 }

lmpTeChannelStatusReceived OBJECT-TYPE
    SYNTAX   Counter32
    MAX-ACCESS   read-only

```
   STATUS          current
   DESCRIPTION
       "This object counts the number of ChannelStatus messages that
        have been received for this TE link."
   ::= { lmpTeLinkPerfEntry 30 }

lmpTeChannelStatusSent OBJECT-TYPE
   SYNTAX          Counter32
   MAX-ACCESS      read-only
   STATUS          current
   DESCRIPTION
       "This object counts the number of ChannelStatus messages that
        have been sent for this TE link."
   ::= { lmpTeLinkPerfEntry 31 }

lmpTeChannelStatusRetransmit OBJECT-TYPE
   SYNTAX          Counter32
   MAX-ACCESS      read-only
   STATUS          current
   DESCRIPTION
       "This object counts the number of ChannelStatus messages that
        have been retransmitted for this TE link."
   ::= { lmpTeLinkPerfEntry 32 }

lmpTeChannelStatusAckReceived OBJECT-TYPE
   SYNTAX          Counter32
   MAX-ACCESS      read-only
   STATUS          current
   DESCRIPTION
       "This object counts the number of ChannelStatusAck messages
        that have been received for this TE link."
   ::= { lmpTeLinkPerfEntry 33 }

lmpTeChannelStatusAckSent OBJECT-TYPE
   SYNTAX          Counter32
   MAX-ACCESS      read-only
   STATUS          current
   DESCRIPTION
       "This object counts the number of ChannelStatus messages
        that have been sent for this TE link."
   ::= { lmpTeLinkPerfEntry 34 }

lmpTeChannelStatusReqReceived OBJECT-TYPE
   SYNTAX          Counter32
   MAX-ACCESS      read-only
   STATUS          current
   DESCRIPTION
       "This object counts the number of ChannelStatusRequest messages
```

          that have been received for this TE link."
   ::= { lmpTeLinkPerfEntry 35 }

lmpTeChannelStatusReqSent OBJECT-TYPE
   SYNTAX   Counter32
   MAX-ACCESS   read-only
   STATUS   current
   DESCRIPTION
       "This object counts the number of ChannelStatusRequest messages
        that have been sent for this TE link."
   ::= { lmpTeLinkPerfEntry 36 }

lmpTeChannelStatusReqRetransmit OBJECT-TYPE
   SYNTAX   Counter32
   MAX-ACCESS   read-only
   STATUS   current
   DESCRIPTION
       "This object counts the number of ChannelStatusRequest messages
        that have been retransmitted for this TE link."
   ::= { lmpTeLinkPerfEntry 37 }

lmpTeChannelStatusRspReceived OBJECT-TYPE
   SYNTAX   Counter32
   MAX-ACCESS   read-only
   STATUS   current
   DESCRIPTION
       "This object counts the number of ChannelStatusResponse messages
        that have been received for this TE link."
   ::= { lmpTeLinkPerfEntry 38 }

lmpTeChannelStatusRspSent OBJECT-TYPE
   SYNTAX   Counter32
   MAX-ACCESS   read-only
   STATUS   current
   DESCRIPTION
       "This object counts the number of ChannelStatusResponse messages
        that have been sent for this TE link."
   ::= { lmpTeLinkPerfEntry 39 }

lmpTeCounterDiscontinuityTime OBJECT-TYPE
    SYNTAX   TimeStamp
    MAX-ACCESS   read-only
    STATUS   current
    DESCRIPTION
        "The value of sysUpTime on the most recent occasion at which
         one or more of this TE link's counters suffered a
         discontinuity. The relevant counters are the specific
         instances associated with this TE link of any Counter32

```
            object contained in the lmpTeLinkPerfTable.  If
            no such discontinuities have occurred since the last re-
            initialization of the local management subsystem, then this
            object contains a zero value."
      ::= { lmpTeLinkPerfEntry 40 }

-- End of lmpTeLinkPerfTable


-- LMP Data Link Table

lmpDataLinkTable OBJECT-TYPE
   SYNTAX          SEQUENCE OF LmpDataLinkEntry
   MAX-ACCESS      not-accessible
   STATUS          current
   DESCRIPTION
       "This table specifies the data-bearing links managed by the
        LMP."
   ::= { lmpObjects 16 }

lmpDataLinkEntry OBJECT-TYPE
   SYNTAX          LmpDataLinkEntry
   MAX-ACCESS      not-accessible
   STATUS          current
   DESCRIPTION
       "An entry in this table exists for each ifEntry that represents
        a data-bearing link.  An ifEntry with an ifIndex must exist
        before the corresponding lmpDataLinkEntry is created.
        If an entry representing the data-bearing link is destroyed in
        the ifTable, then so is the corresponding entry in the
        lmpDataLinkTable.  The administrative status value is
        controlled from the ifEntry.  The index to this table is also
        used to get information in the componentLinkTable
        of the TE-LINK-STD-MIB MIB module."
   INDEX           { ifIndex }
   ::= { lmpDataLinkTable 1 }

LmpDataLinkEntry ::= SEQUENCE {
  lmpDataLinkType                 INTEGER,
  lmpDataLinkAddressType          InetAddressType,
  lmpDataLinkIpAddr               InetAddress,
  lmpDataLinkRemoteIpAddress      InetAddress,
  lmpDataLinkRemoteIfId           InterfaceIndexOrZero,
  lmpDataLinkEncodingType         TeLinkEncodingType,
  lmpDataLinkActiveOperStatus     INTEGER,
  lmpDataLinkPassiveOperStatus    INTEGER,
  lmpDataLinkRowStatus            RowStatus,
  lmpDataLinkStorageType          StorageType
```

```
      }

   lmpDataLinkType OBJECT-TYPE
       SYNTAX          INTEGER {
                          port(1),
                          componentLink(2)
                       }
       MAX-ACCESS      read-only
       STATUS          current
       DESCRIPTION
           "This attribute specifies whether this data-bearing link is
            a port or a component link.  Component links are multiplex
            capable, whereas ports are not multiplex capable."
       REFERENCE
           "Link Management Protocol, RFC 4204."
       ::= { lmpDataLinkEntry 1 }

   lmpDataLinkAddressType OBJECT-TYPE
       SYNTAX          InetAddressType
       MAX-ACCESS      read-create
       STATUS          current
       DESCRIPTION
           "This attribute specifies the data-bearing link IP address
            type.  If the data-bearing link is unnumbered, the address
            type must be set to unknown(0)."
       ::= { lmpDataLinkEntry 2 }

   lmpDataLinkIpAddr 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
            lmpDataLinkAddressType object.

            For IPv4 and IPv6 numbered links, this object represents
            the local IP address associated with the data-bearing
            link.  For an unnumbered link, the local address is
            of type unknown, and this object is set to the zero-length
            string; the ifIndex object then identifies the
            unnumbered address."
       ::= { lmpDataLinkEntry 3 }

   lmpDataLinkRemoteIpAddress OBJECT-TYPE
       SYNTAX          InetAddress
       MAX-ACCESS      read-create
       STATUS          current
```

```
    DESCRIPTION
        "The remote Internet address for numbered data-bearing links.
         The type of this address is determined by the
         lmpDataLinkAddressType object.

         For IPv4 and IPv6 numbered links, this object represents the
         remote IP address associated with the data-bearing link.  For
         an unnumbered link, the remote address is of type unknown,
         and this object is set to the zero-length string; the
         lmpDataLinkRemoteIfId object then identifies the unnumbered
         address.

         This information is either configured manually or
         communicated by the remote node during the link verification
         procedure."
    ::= { lmpDataLinkEntry 4 }

lmpDataLinkRemoteIfId OBJECT-TYPE
    SYNTAX          InterfaceIndexOrZero
    MAX-ACCESS      read-create
    STATUS          current
    DESCRIPTION
        "Interface identifier of the remote end point.  This
         information is either configured manually or
         communicated by the remote node during the link verification
         procedure."
    ::= { lmpDataLinkEntry 5 }

lmpDataLinkEncodingType OBJECT-TYPE
    SYNTAX          TeLinkEncodingType
    MAX-ACCESS      read-create
    STATUS          current
    DESCRIPTION
        "The encoding type of the data-bearing link."
    REFERENCE
        "Generalized MPLS Signaling Functional Description, RFC 3471."
    ::= { lmpDataLinkEntry 6 }

lmpDataLinkActiveOperStatus OBJECT-TYPE
    SYNTAX          INTEGER {
                        upAlloc(1),
                        upFree(2),
                        down(3),
                        testing(4) }
    MAX-ACCESS      read-only
    STATUS          current
    DESCRIPTION
        "The actual operational status of this data-bearing link
```

```
        (active FSM)."
   REFERENCE
        "Link Management Protocol, RFC 4204."
   ::= { lmpDataLinkEntry 7 }


lmpDataLinkPassiveOperStatus OBJECT-TYPE
   SYNTAX          INTEGER {
                     upAlloc(1),
                     upFree(2),
                     down(3),
                     psvTst(4) }
   MAX-ACCESS     read-only
   STATUS         current
   DESCRIPTION
        "The actual operational status of this data-bearing link
        (passive FSM)."
   REFERENCE
        "Link Management Protocol, RFC 4204."
   ::= { lmpDataLinkEntry 8 }


lmpDataLinkRowStatus 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 the status is active(1).
        All read-create objects must have valid and consistent
        values before the row can be activated."
   ::= { lmpDataLinkEntry 9 }


lmpDataLinkStorageType OBJECT-TYPE
   SYNTAX          StorageType
   MAX-ACCESS     read-create
   STATUS         current
   DESCRIPTION
        "The storage type for this conceptual row in the
        lmpDataLinkTable.  Conceptual rows having the value
        'permanent' need not allow write-access to any
        columnar object in the row."
   DEFVAL         { nonVolatile }
   ::= { lmpDataLinkEntry 10 }

-- End of lmpDataLinkTable


-- LMP Data Link Performance Table
```

```
lmpDataLinkPerfTable OBJECT-TYPE
    SYNTAX          SEQUENCE OF LmpDataLinkPerfEntry
    MAX-ACCESS      not-accessible
    STATUS          current
    DESCRIPTION
        "This table specifies the data-bearing links LMP performance
         counters."
    ::= { lmpObjects 17 }

lmpDataLinkPerfEntry OBJECT-TYPE
    SYNTAX          LmpDataLinkPerfEntry
    MAX-ACCESS      not-accessible
    STATUS          current
    DESCRIPTION
        "An entry in this table contains information about
         the LMP performance counters for the data-bearing links.
         lmpDataLinkDiscontinuityTime is used to indicate potential
         discontinuity for all counter objects in this table."
    INDEX           { ifIndex }
    ::= { lmpDataLinkPerfTable 1 }

LmpDataLinkPerfEntry ::= SEQUENCE {
  lmpDataLinkTestReceived       Counter32,
  lmpDataLinkTestSent           Counter32,
  lmpDataLinkActiveTestSuccess  Counter32,
  lmpDataLinkActiveTestFailure  Counter32,
  lmpDataLinkPassiveTestSuccess Counter32,
  lmpDataLinkPassiveTestFailure Counter32,
  lmpDataLinkDiscontinuityTime  TimeStamp
}

lmpDataLinkTestReceived OBJECT-TYPE
    SYNTAX          Counter32
    MAX-ACCESS      read-only
    STATUS          current
    DESCRIPTION
        "This object counts the number of Test messages that have
         been received on this data-bearing link."
    ::= { lmpDataLinkPerfEntry 1 }

lmpDataLinkTestSent OBJECT-TYPE
    SYNTAX          Counter32
    MAX-ACCESS      read-only
    STATUS          current
    DESCRIPTION
        "This object counts the number of Test messages that have
         been sent on this data-bearing link."
    ::= { lmpDataLinkPerfEntry 2 }
```

```
lmpDataLinkActiveTestSuccess OBJECT-TYPE
    SYNTAX          Counter32
    MAX-ACCESS      read-only
    STATUS          current
    DESCRIPTION
        "This object counts the number of data-bearing link tests
         that were successful on the active side of this data-
         bearing link."
    ::= { lmpDataLinkPerfEntry 3 }

lmpDataLinkActiveTestFailure OBJECT-TYPE
    SYNTAX          Counter32
    MAX-ACCESS      read-only
    STATUS          current
    DESCRIPTION
        "This object counts the number of data-bearing link tests
         that failed on the active side of this data-bearing link."
    ::= { lmpDataLinkPerfEntry 4 }

lmpDataLinkPassiveTestSuccess OBJECT-TYPE
    SYNTAX          Counter32
    MAX-ACCESS      read-only
    STATUS          current
    DESCRIPTION
        "This object counts the number of data-bearing link tests
         that were successful on the passive side of this data-
         bearing link."
    ::= { lmpDataLinkPerfEntry 5 }

lmpDataLinkPassiveTestFailure OBJECT-TYPE
    SYNTAX          Counter32
    MAX-ACCESS      read-only
    STATUS          current
    DESCRIPTION
        "This object counts the number of data-bearing link tests
         that failed on the passive side of this data-bearing link."
    ::= { lmpDataLinkPerfEntry 6 }

lmpDataLinkDiscontinuityTime OBJECT-TYPE
    SYNTAX          TimeStamp
    MAX-ACCESS      read-only
    STATUS          current
    DESCRIPTION
        "The value of sysUpTime on the most recent occasion at which
         one or more of this data-bearing link's counters suffered
         a discontinuity.  The relevant counters are the specific
         instances associated with this data-bearing link of any
         Counter32 object contained in the lmpDataLinkPerfTable.  If
```

            no such discontinuities have occurred since the last re-
            initialization of the local management subsystem, then this
            object contains a zero value."
      ::= { lmpDataLinkPerfEntry 7 }

-- End of lmpDataLinkPerfTable

-- Notification Configuration

lmpNotificationMaxRate OBJECT-TYPE
    SYNTAX   Unsigned32
    MAX-ACCESS   read-write
    STATUS   current
    DESCRIPTION
        "The LMP notification rate depends on the size of the network,
        the type of links, the network configuration, the
        reliability of the network, etc.

        When this MIB was designed, care was taken to minimize the
        amount of notifications generated for LMP purposes. Wherever
        possible, notifications are state driven, meaning that the
        notifications are sent only when the system changes state.
        The only notifications that are repeated and that could cause a
        problem as far as congestion is concerned are the ones
        associated with data link verification.
        Without any considerations to handling of these
        notifications, a problem may arise if the number of data
        links is high. Since the data link verification notifications
        can happen only once per data link per link verification
        interval, the notification rate should be sustainable if one
        chooses an appropriate link verification interval for a given
        network configuration. For instance, a network of 100 nodes
        with 5 links of 128 wavelengths each and a link verification
        of 1 minute, where no more than 10% of the links failed at any
        given time, would have 1 notification per second sent from
        each node, or 100 notifications per second for the whole
        network. The rest of the notifications are negligible
        compared to this number.

        To alleviate the congestion problem, the
        lmpNotificationMaxRate object can be used to implement a
        throttling mechanism. It is also possible to enable/disable
        certain type of notifications.

        This variable indicates the maximum number of
        notifications issued per minute. If events occur
        more rapidly, the implementation may simply fail to

```
           emit these notifications during that period or may
           queue them until an appropriate time.  A value of 0
           means that no throttling is applied and events may be
           notified at the rate at which they occur.
           Implementations should save the value of this object in
           persistent memory so that it survives restarts or reboot."
       ::= { lmpObjects 18 }

   lmpLinkPropertyNotificationsEnabled OBJECT-TYPE
       SYNTAX          TruthValue
       MAX-ACCESS      read-write
       STATUS          current
       DESCRIPTION
           "If this object is true(1), then it enables the
           generation of lmpTeLinkPropertyMismatch
           and lmpDataLinkPropertyMismatch notifications;
           otherwise, these notifications are not emitted.
           Implementations should save the value of this object in
           persistent memory so that it survives restarts or reboot."
       DEFVAL        { false }
       ::= { lmpObjects 19 }

   lmpUnprotectedNotificationsEnabled OBJECT-TYPE
       SYNTAX          TruthValue
       MAX-ACCESS      read-write
       STATUS          current
       DESCRIPTION
           "If this object is true(1), then it enables the
           generation of lmpUnprotected notifications;
           otherwise, these notifications are not emitted.
           Implementations should save the value of this object in
           persistent memory so that it survives restarts or reboot."
       DEFVAL        { false }
       ::= { lmpObjects 20 }

   lmpCcUpDownNotificationsEnabled OBJECT-TYPE
       SYNTAX          TruthValue
       MAX-ACCESS      read-write
       STATUS          current
       DESCRIPTION
           "If this object is true(1), then it enables the generation of
           lmpControlChannelUp and lmpControlChannelDown notifications;
           otherwise, these notifications are not emitted.
           Implementations should save the value of this object in
           persistent memory so that it survives restarts or reboot."
       DEFVAL        { false }
       ::= { lmpObjects 21 }
```

```
lmpTeLinkNotificationsEnabled OBJECT-TYPE
    SYNTAX        TruthValue
    MAX-ACCESS    read-write
    STATUS        current
    DESCRIPTION
        "If this object is true(1), then it enables the
         generation of lmpTeLinkDegraded and lmpTeLinkNotDegraded
         notifications; otherwise, these notifications are not emitted.
         Implementations should save the value of this object in
         persistent memory so that it survives restarts or reboot."
    DEFVAL        { false }
    ::= { lmpObjects 22 }


lmpDataLinkNotificationsEnabled OBJECT-TYPE
    SYNTAX        TruthValue
    MAX-ACCESS    read-write
    STATUS        current
    DESCRIPTION
        "If this object is true(1), then it enables the
         generation of lmpDataLinkVerificationFailure
         notification; otherwise, these notifications are not emitted.
         Implementations should save the value of this object in
         persistent memory so that it survives restarts or reboot."
    DEFVAL        { false }
    ::= { lmpObjects 23 }



-- Notifications

-- Link Property Mismatch Notifications

lmpTeLinkPropertyMismatch NOTIFICATION-TYPE
    OBJECTS        { teLinkRemoteIpAddr,
                     teLinkIncomingIfId }
    STATUS         current
    DESCRIPTION
        "This notification is generated when a TE link property
         mismatch is detected on the node.  The received remote TE link
         ID of the misconfigured TE link is represented by either
         teLinkRemoteIpAddr or teLinkIncomingIfId, depending on whether
         the TE link is numbered or unnumbered.  This notification
         should not be sent unless lmpLinkPropertyNotificationsEnabled
         is true(1).  It is recommended that this notification be
         reported only the first time a mismatch is detected.
         Otherwise, for a given TE link, this notification can occur
         no more than once per verification interval
         (lmpGlobalLinkVerificationInterval)."
    ::= { lmpNotifications 1 }
```

lmpDataLinkPropertyMismatch NOTIFICATION-TYPE
    OBJECTS   { lmpDataLinkType, lmpDataLinkRemoteIfId }
    STATUS   current
    DESCRIPTION
        "This notification is generated when a data-bearing link
         property mismatch is detected on the node. lmpDataLinkType
         is used to identify the local identifiers associated with
         the data link. (The data link interface index can be used
         to determine the TE link interface index, as this
         relationship is captured in the interface stack table.)
         The remote entity interface ID is the remote entity
         interface ID received in the LinkSummary message.
         This notification should not be sent unless
         lmpLinkPropertyNotificationsEnabled is true(1). It is
         recommended that this notification be reported only the
         first time a mismatch is detected. Otherwise, for a given
         data link, this notification can occur no more than once
         per verification interval (lmpGlobalLinkVerificationInterval)."
    ::= { lmpNotifications 2 }

-- Neighbor Notification

lmpUnprotected NOTIFICATION-TYPE
    OBJECTS   { lmpCcNbrNodeId }
    STATUS   current
    DESCRIPTION
        "This notification is generated when there is more than one
         control channel between LMP neighbors and the last redundant
         control channel has failed. If the remaining operational
         control channel fails, then there will be no more control
         channels between the pair of nodes and all the TE links
         between the pair of nodes, will go to degraded state. This
         notification should not be sent unless
         lmpUnprotectedNotificationsEnabled is set to true(1)."
    ::= { lmpNotifications 3 }

-- Control Channel Notifications

lmpControlChannelUp NOTIFICATION-TYPE
    OBJECTS   { lmpCcAdminStatus, lmpCcOperStatus }
    STATUS   current
    DESCRIPTION
        "This notification is generated when a control
         channel transitions to the up operational state. This
         notification should not be sent unless
         lmpCcUpDownNotificationsEnabled is true(1)."
    ::= { lmpNotifications 4 }

```
lmpControlChannelDown NOTIFICATION-TYPE
    OBJECTS         { lmpCcAdminStatus, lmpCcOperStatus }
    STATUS          current
    DESCRIPTION
        "This notification is generated when a control channel
         transitions out of the up operational state.  This
         notification should not be sent unless
         lmpCcUpDownNotificationsEnabled is true(1)."
    ::= { lmpNotifications 5 }

-- TE Link Notification

lmpTeLinkDegraded NOTIFICATION-TYPE
    OBJECTS         { lmpTeLinkOperStatus }
    STATUS          current
    DESCRIPTION
        "This notification is generated when a lmpTeLinkOperStatus
         object for a TE link enters the degraded state.  This
         notification should not be sent unless
         lmpTeLinkNotificationsEnabled is true(1)."
    ::= { lmpNotifications 6 }

lmpTeLinkNotDegraded NOTIFICATION-TYPE
    OBJECTS         { lmpTeLinkOperStatus }
    STATUS          current
    DESCRIPTION
        "This notification is generated when a lmpTeLinkOperStatus
         object for a TE link leaves the degraded state.  This
         notification should not be sent unless
         lmpTeLinkNotificationsEnabled is true(1)."
    ::= { lmpNotifications 7 }

-- Data-bearing Link Notification

lmpDataLinkVerificationFailure NOTIFICATION-TYPE
    OBJECTS         { lmpDataLinkActiveOperStatus,
                      lmpDataLinkPassiveOperStatus }
    STATUS          current
    DESCRIPTION
        "This notification is generated when a data-bearing
         link verification fails.  This notification should not be sent
         unless lmpDataLinkNotificationsEnabled is true(1).  For a given
         data link, this notification can occur no more than once per
         verification interval (lmpGlobalLinkVerificationInterval)."
    ::= { lmpNotifications 8 }

-- End of notifications
```

```
-- Module compliance

lmpCompliances
   OBJECT IDENTIFIER ::= { lmpConformance 1 }

lmpGroups
   OBJECT IDENTIFIER ::= { lmpConformance 2 }

lmpModuleFullCompliance MODULE-COMPLIANCE
   STATUS current
   DESCRIPTION
       "Compliance statement for agents that support the
        configuration and monitoring of LMP MIB."
   MODULE -- this module

       MANDATORY-GROUPS     { lmpNodeGroup,
                              lmpControlChannelGroup,
                              lmpLinkPropertyCorrelationGroup,
                              lmpPerfGroup,
                              lmpTeLinkGroup,
                              lmpDataLinkGroup }

       GROUP lmpCcIsNotInterfaceGroup
       DESCRIPTION
           "This group is mandatory for devices that support
            control channels that are not interfaces, in addition to
            lmpControlChannelGroup.  The following constraint applies:
            lmpCcIsIf must at least be read-only, returning false(2)."

       GROUP lmpCcIsInterfaceGroup
       DESCRIPTION
           "This group is mandatory for devices that support
            control channels that are interfaces, in addition to
            lmpControlChannelGroup.  The following constraint applies:
            lmpCcIsIf must at least be read-only, returning true(1)."

       GROUP lmpLinkVerificationGroup
       DESCRIPTION
           "This group is mandatory for devices that support
            the link verification procedure."

       GROUP lmpNotificationGroup
       DESCRIPTION
           "This group is optional."

       -- lmpNbrTable

       OBJECT       lmpNbrRowStatus
```

```
     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."

     -- lmpControlChannelTable

     OBJECT       lmpCcRemoteAddressType
     SYNTAX       INTEGER { unknown(0), ipv4(1), ipv6(2) }
     DESCRIPTION
         "Only ipv4(1) and ipv6(2) address types need to be
          supported for non-point-to-point configurations."

     OBJECT       lmpCcRemoteIpAddr
     SYNTAX       InetAddress (SIZE(0|4|16))
     DESCRIPTION
         "The size of the IP address depends on the address type."

     OBJECT       lmpCcRowStatus
     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."

     OBJECT       lmpCcOperStatus
     SYNTAX       INTEGER { up(1), down(2) }
     DESCRIPTION
         "A value of configSnd(3), configRcv(4), active(5), or
          goingDown(6) need not be supported."

     -- lmpTeLinkTable

     OBJECT       lmpTeLinkOperStatus
     SYNTAX       INTEGER { up(1), down(2), degraded(5) }
     DESCRIPTION
         "The testing(3) and init(4) state need not be supported."

     OBJECT       lmpTeLinkRowStatus
     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."
```

```
        -- lmpDataLinkTable

        OBJECT        lmpDataLinkActiveOperStatus
        SYNTAX        INTEGER { upAlloc(1), upFree(2), down(3) }
        DESCRIPTION
            "A value of testing(4) need not be supported."
        OBJECT        lmpDataLinkPassiveOperStatus
        SYNTAX        INTEGER { upAlloc(1), upFree(2), down(3) }
        DESCRIPTION
            "A value of psvTst(4) need not be supported."

        OBJECT        lmpDataLinkRowStatus
        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."

    ::= { lmpCompliances 1 }

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

        -- The mandatory groups have to be implemented
        -- by all LMP-enabled devices.  However, they may all be supported
        -- as read-only objects in the case where manual
        -- configuration is not supported.

        MANDATORY-GROUPS      { lmpNodeGroup,
                                lmpControlChannelGroup,
                                lmpLinkPropertyCorrelationGroup,
                                lmpPerfGroup,
                                lmpTeLinkGroup,
                                lmpDataLinkGroup }

        GROUP lmpCcIsNotInterfaceGroup
        DESCRIPTION
            "This group is mandatory for devices that support
             control channels that are not interfaces, in addition to
             lmpControlChannelGroup.  The following constraint applies:
             lmpCcIsIf must at least be read-only, returning false(2)."

        GROUP lmpCcIsInterfaceGroup
```

```
        DESCRIPTION
            "This group is mandatory for devices that support
             control channels that are interfaces, in addition to
             lmpControlChannelGroup.  The following constraint applies:
             lmpCcIsIf must at least be read-only, returning true(1)."

        GROUP lmpLinkVerificationGroup
        DESCRIPTION
            "This group is mandatory for devices that support
             the link verification procedure."

        GROUP lmpNotificationGroup
        DESCRIPTION
            "This group is optional."

        -- Scalars

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

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

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

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

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

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

        OBJECT      lmpCcHelloDeadIntervalDefaultMin
```

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

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

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

        -- lmpNbrTable

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

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

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

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

        -- lmpControlChannelTable

        OBJECT      lmpCcUnderlyingIfIndex
        MIN-ACCESS  read-only
        DESCRIPTION
```

```
        "Write access is not required."

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

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

   OBJECT        lmpCcRemoteAddressType
   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 non-point-to-point configurations."

   OBJECT        lmpCcRemoteIpAddr
   SYNTAX        InetAddress (SIZE(0|4|16))
   MIN-ACCESS    read-only
   DESCRIPTION
        "The size of the IP address depends on the address type."

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

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

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

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

   OBJECT        lmpCcHelloDeadIntervalMin
   MIN-ACCESS    read-only
   DESCRIPTION
```

```
          "Write access is not required."


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


     OBJECT        lmpCcRowStatus
     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        lmpCcOperStatus
     SYNTAX        INTEGER { up(1), down(2) }
     DESCRIPTION
          "A value of configSnd(3), configRcv(4), active(5), or
           goingDown(6) need not be supported."

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


     -- lmpLinkVerificationTable

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


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


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


     -- lmpTeLinkTable

     OBJECT        lmpTeLinkNbrRemoteNodeId
     MIN-ACCESS  read-only
     DESCRIPTION
          "Write access is not required if the link verification
```

           procedure is enabled."

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

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

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

        OBJECT   lmpTeLinkOperStatus
        SYNTAX   INTEGER { up(1), down(2), degraded(5) }
        DESCRIPTION
            "The testing(3) and init(4) state need not be supported."

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

        -- lmpTeLinkVerificationTable

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

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

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

     -- lmpDataLinkTable

     OBJECT      lmpDataLinkAddressType
     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      lmpDataLinkIpAddr
     SYNTAX      InetAddress (SIZE(0|4|16))
     MIN-ACCESS  read-only
     DESCRIPTION
         "The size of the data-bearing link IP address depends on
          the type of data-bearing link.  Data-bearing 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      lmpDataLinkRemoteIpAddress
     SYNTAX      InetAddress (SIZE(0|4|16))
     MIN-ACCESS  read-only
     DESCRIPTION
         "Write access is not required if the link verification
          procedure is enabled."

     OBJECT      lmpDataLinkRemoteIfId
     MIN-ACCESS  read-only
     DESCRIPTION
         "Write access is not required if the link verification
          procedure is enabled."

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

```
      OBJECT        lmpDataLinkActiveOperStatus
      SYNTAX        INTEGER { upAlloc(1), upFree(2), down(3) }
      DESCRIPTION
           "A value of testing(4) need not be supported."

      OBJECT        lmpDataLinkPassiveOperStatus
      SYNTAX        INTEGER { upAlloc(1), upFree(2), down(3) }
      DESCRIPTION
           "A value of psvTst(4) need not be supported."

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

   ::= { lmpCompliances 2 }

-- Units of conformance

lmpNodeGroup OBJECT-GROUP
   OBJECTS { lmpAdminStatus,
             lmpOperStatus,
             lmpNbrAdminStatus,
             lmpNbrOperStatus,
             lmpNbrRowStatus,
             lmpNbrStorageType,
             lmpUnprotectedNotificationsEnabled,
             lmpNotificationMaxRate
           }
   STATUS  current
   DESCRIPTION
           "Collection of objects that represent LMP node
            configuration."
   ::= { lmpGroups 1 }

lmpControlChannelGroup OBJECT-GROUP
   OBJECTS {
             lmpNbrRetransmitInterval,
             lmpNbrRetryLimit,
             lmpNbrRetransmitDelta,
             lmpNbrAdminStatus,
```

```
            lmpNbrOperStatus,
            lmpNbrRowStatus,
            lmpNbrStorageType,
            lmpCcHelloIntervalDefault,
            lmpCcHelloIntervalDefaultMin,
            lmpCcHelloIntervalDefaultMax,
            lmpCcHelloDeadIntervalDefault,
            lmpCcHelloDeadIntervalDefaultMin,
            lmpCcHelloDeadIntervalDefaultMax,
            lmpCcNbrNodeId,
            lmpCcRemoteId,
            lmpCcRemoteAddressType,
            lmpCcRemoteIpAddr,
            lmpCcSetupRole,
            lmpCcAuthentication,
            lmpCcHelloInterval,
            lmpCcHelloIntervalMin,
            lmpCcHelloIntervalMax,
            lmpCcHelloIntervalNegotiated,
            lmpCcHelloDeadInterval,
            lmpCcHelloDeadIntervalMin,
            lmpCcHelloDeadIntervalMax,
            lmpCcHelloDeadIntervalNegotiated,
            lmpCcOperStatus,
            lmpCcRowStatus,
            lmpCcStorageType,
            lmpCcUpDownNotificationsEnabled
           }
   STATUS  current
   DESCRIPTION
          "Objects that can be used to configure LMP interface."
   ::= { lmpGroups 2 }

lmpCcIsInterfaceGroup OBJECT-GROUP
   OBJECTS { lmpCcIsIf }
   STATUS  current
   DESCRIPTION
          "Objects that can be used to configure control channels
           that are interfaces."
   ::= { lmpGroups 3 }

lmpCcIsNotInterfaceGroup OBJECT-GROUP
   OBJECTS { lmpCcUnderlyingIfIndex,
            lmpCcIsIf,
            lmpCcLastChange,
            lmpCcAdminStatus
           }
   STATUS  current
```

```
      DESCRIPTION
              "Objects that can be used to configure control channels
               that are not interfaces."
      ::= { lmpGroups 4 }


   lmpLinkPropertyCorrelationGroup OBJECT-GROUP
      OBJECTS { lmpLinkPropertyNotificationsEnabled }
      STATUS  current
      DESCRIPTION
              "Collection of objects used to configure the link
               property correlation procedure."
      ::= { lmpGroups 5 }


   lmpLinkVerificationGroup OBJECT-GROUP
      OBJECTS { lmpGlobalLinkVerificationInterval,
                lmpLinkVerifyInterval,
                lmpLinkVerifyDeadInterval,
                lmpLinkVerifyTransportMechanism,
                lmpLinkVerifyAllLinks,
                lmpLinkVerifyTransmissionRate,
                lmpLinkVerifyWavelength,
                lmpLinkVerifyRowStatus,
                lmpLinkVerifyStorageType,
                lmpDataLinkNotificationsEnabled
              }
      STATUS  current
      DESCRIPTION
              "Collection of objects that represent the link
               verification procedure configuration."
      ::= { lmpGroups 6 }


   lmpPerfGroup OBJECT-GROUP
      OBJECTS { lmpCcInOctets,
                lmpCcInDiscards,
                lmpCcInErrors,
                lmpCcOutOctets,
                lmpCcOutDiscards,
                lmpCcOutErrors,
                lmpCcConfigReceived,
                lmpCcConfigSent,
                lmpCcConfigRetransmit,
                lmpCcConfigAckReceived,
                lmpCcConfigAckSent,
                lmpCcConfigNackSent,
                lmpCcConfigNackReceived,
                lmpCcHelloReceived,
                lmpCcHelloSent,
                lmpCcBeginVerifyReceived,
```

```
        lmpCcBeginVerifySent,
        lmpCcBeginVerifyRetransmit,
        lmpCcBeginVerifyAckReceived,
        lmpCcBeginVerifyAckSent,
        lmpCcBeginVerifyNackReceived,
        lmpCcBeginVerifyNackSent,
        lmpCcEndVerifyReceived,
        lmpCcEndVerifySent,
        lmpCcEndVerifyRetransmit,
        lmpCcEndVerifyAckReceived,
        lmpCcEndVerifyAckSent,
        lmpCcTestStatusSuccessReceived,
        lmpCcTestStatusSuccessSent,
        lmpCcTestStatusSuccessRetransmit,
        lmpCcTestStatusFailureReceived,
        lmpCcTestStatusFailureSent,
        lmpCcTestStatusFailureRetransmit,
        lmpCcTestStatusAckReceived,
        lmpCcTestStatusAckSent,
        lmpCcLinkSummaryReceived,
        lmpCcLinkSummarySent,
        lmpCcLinkSummaryRetransmit,
        lmpCcLinkSummaryAckReceived,
        lmpCcLinkSummaryAckSent,
        lmpCcLinkSummaryNackReceived,
        lmpCcLinkSummaryNackSent,
        lmpCcChannelStatusReceived,
        lmpCcChannelStatusSent,
        lmpCcChannelStatusRetransmit,
        lmpCcChannelStatusAckReceived,
        lmpCcChannelStatusAckSent,
        lmpCcChannelStatusReqReceived,
        lmpCcChannelStatusReqSent,
        lmpCcChannelStatusReqRetransmit,
        lmpCcChannelStatusRspReceived,
        lmpCcChannelStatusRspSent,
        lmpCcCounterDiscontinuityTime,
        lmpTeInOctets,
        lmpTeOutOctets,
        lmpTeBeginVerifyReceived,
        lmpTeBeginVerifySent,
        lmpTeBeginVerifyRetransmit,
        lmpTeBeginVerifyAckReceived,
        lmpTeBeginVerifyAckSent,
        lmpTeBeginVerifyNackReceived,
        lmpTeBeginVerifyNackSent,
        lmpTeEndVerifyReceived,
        lmpTeEndVerifySent,
```

```
                lmpTeEndVerifyRetransmit,
                lmpTeEndVerifyAckReceived,
                lmpTeEndVerifyAckSent,
                lmpTeTestStatusSuccessReceived,
                lmpTeTestStatusSuccessSent,
                lmpTeTestStatusSuccessRetransmit,
                lmpTeTestStatusFailureReceived,
                lmpTeTestStatusFailureSent,
                lmpTeTestStatusFailureRetransmit,
                lmpTeTestStatusAckReceived,
                lmpTeTestStatusAckSent,
                lmpTeLinkSummaryReceived,
                lmpTeLinkSummarySent,
                lmpTeLinkSummaryRetransmit,
                lmpTeLinkSummaryAckReceived,
                lmpTeLinkSummaryAckSent,
                lmpTeLinkSummaryNackReceived,
                lmpTeLinkSummaryNackSent,
                lmpTeChannelStatusReceived,
                lmpTeChannelStatusSent,
                lmpTeChannelStatusRetransmit,
                lmpTeChannelStatusAckReceived,
                lmpTeChannelStatusAckSent,
                lmpTeChannelStatusReqReceived,
                lmpTeChannelStatusReqSent,
                lmpTeChannelStatusReqRetransmit,
                lmpTeChannelStatusRspSent,
                lmpTeChannelStatusRspReceived,
                lmpTeCounterDiscontinuityTime,
                lmpDataLinkTestReceived,
                lmpDataLinkTestSent,
                lmpDataLinkActiveTestSuccess,
                lmpDataLinkActiveTestFailure,
                lmpDataLinkPassiveTestSuccess,
                lmpDataLinkPassiveTestFailure,
                lmpDataLinkDiscontinuityTime
               }
     STATUS   current
     DESCRIPTION
             "Collection of objects used to provide performance
              information about LMP interfaces and data-bearing links."
     ::= { lmpGroups 7 }

  lmpTeLinkGroup OBJECT-GROUP
     OBJECTS { lmpTeLinkNbrRemoteNodeId,
               lmpTeLinkVerification,
               lmpTeLinkFaultManagement,
               lmpTeLinkDwdm,
```

```
                 lmpTeLinkOperStatus,
                 lmpTeLinkRowStatus,
                 lmpTeLinkStorageType,
                 lmpTeLinkNotificationsEnabled
             }
    STATUS  current
    DESCRIPTION
            "Objects that can be used to configure TE links."
    ::= { lmpGroups 8 }

lmpDataLinkGroup OBJECT-GROUP
    OBJECTS { lmpDataLinkType,
              lmpDataLinkAddressType,
              lmpDataLinkIpAddr,
              lmpDataLinkRemoteIpAddress,
              lmpDataLinkRemoteIfId,
              lmpDataLinkEncodingType,
              lmpDataLinkActiveOperStatus,
              lmpDataLinkPassiveOperStatus,
              lmpDataLinkRowStatus,
              lmpDataLinkStorageType
            }
    STATUS  current
    DESCRIPTION
            "Collection of objects that represent data-bearing link
             configuration."
    ::= { lmpGroups 9 }

lmpNotificationGroup NOTIFICATION-GROUP
    NOTIFICATIONS { lmpTeLinkPropertyMismatch,
                    lmpDataLinkPropertyMismatch,
                    lmpUnprotected,
                    lmpControlChannelUp,
                    lmpControlChannelDown,
                    lmpTeLinkDegraded,
                    lmpTeLinkNotDegraded,
                    lmpDataLinkVerificationFailure }
    STATUS  current
    DESCRIPTION
            "Set of notifications defined in this module."
    ::= { lmpGroups 10 }

-- End of LMP-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:

   -    Unauthorized changes to the lmpNbrTable, lmpControlChannelTable,
        lmpTeLinkTable, and lmpDataLinkTable may disrupt allocation of
        resources 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:

   -    The lmpNbrTable exposes the network provider's node IP addresses.

   -    lmpControlChannelTable exposes the network provider's control
        network.

   -    lmpDataLinkTable exposes the network provider's data network.

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

   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

     The general structure of this document has been modeled around the
     MPLS Label Switching Router (LSR) MIB [RFC3813].

     The authors wish to thank Dmitry Ryumkin, Baktha Muralidharan and
     George Wang.

     Thanks to Tom Petch for spotting inconsistencies in RFC 4327 and to
     Bert Wijnen for document review.

13. IANA Considerations

     No new IANA actions are requested in this document. All IANA actions
     from RFC 4327 still hold and are reproduced here for information.

     Note that new assignments can only be made via a Standards Action as
     specified in [RFC2434].

13.1. IANA Considerations for LMP ifType

     The IANA has assigned 227 ifType for LMP interfaces.

13.2. IANA Considerations for LMP-MIB

     The IANA has assigned { transmission 227 } to the LMP-MIB module
     specified in this document.

14. Changes from RFC 4327 to RFC 4631

     The following changes have been made relative to RFC 4327.

     a. Show that this document obsoletes RFC 4327.
     b. Indicate in Abstract that this document provides minor
         corrections to RFC 4327.
     c. Correct use of TruthValue settings such that True is always 1,
         and False is always 2.
     d. Update to acknowledgements section.
     e. Note in IANA section to show no further action required.
     f. Remove identification of RFC 4327 and request RFC Editor to
         insert new RFC number.
     g. Update timestamps.

      h. Update author information.
      i. Added punctuation to REFERENCE clauses.
      j. Update Revision History clause.
      k. Add this section.
      l. Remove square braces from references to external documents from
          within the MIB module itself.
      m. Minor editorial corrections to text and DESCRIPTIONS clauses.

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