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Layer Two Tunneling Protocol "L2TP" Management Information Base

Status of this Memo

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

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Abstract

This memo defines a portion of the Management Information Base (MIB) for use with network management protocols in TCP/IP-based internets. In particular, it defines objects for managing networks using Layer 2 Tunneling Protocol (L2TP).

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1.0 Introduction

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 used for managing L2TP devices.

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 [RFC2119].

2.0 The SNMP Management Framework

The SNMP Management Framework presently consists of five major components:

- An overall architecture, described in RFC 2571 [RFC2571].

- Mechanisms for describing and naming objects and events for the purpose of management. The first version of this Structure of Management Information (SMI) is called SMIv1 and described in STD 16, RFC 1155 [RFC1155], STD 16, RFC 1212 [RFC1212] and RFC 1215 [RFC1215]. The second version, called SMIv2, is described in STD 58, RFC 2578 [RFC2578], STD 58, RFC 2579 [RFC2579] and STD 58, RFC 2580 [RFC2580].

- Message protocols for transferring management information. The first version of the SNMP message protocol is called SNMPv1 and described in STD 15, RFC 1157 [RFC1157]. A second version of the SNMP message protocol, which is not an Internet standards track protocol, is called SNMPv2c and described in RFC 1901 [RFC1901] and RFC 1906 [RFC1906]. The third version of the message protocol is called SNMPv3 and described in RFC 1906 [RFC1906], RFC 2572 [RFC2572] and RFC 2574 [RFC2574].

- Protocol operations for accessing management information. The first set of protocol operations and associated PDU formats is described in STD 15, RFC 1157 [RFC1157]. A second set of protocol operations and associated PDU formats is described in RFC 1905 [RFC1905].

- A set of fundamental applications described in RFC 2573 [RFC2573] and the view-based access control mechanism described in RFC 2575 [RFC2575].

A more detailed introduction to the current SNMP Management Framework can be found in RFC 2570 [RFC2570].

Managed objects are accessed via a virtual information store, termed the Management Information Base or MIB. Objects in the MIB are defined using the mechanisms defined in the SMI.

This memo specifies a MIB module that is compliant to the SMIv2. A MIB conforming to the SMIv1 can be produced through the appropriate translations. The resulting translated MIB must be semantically equivalent, except where objects or events are omitted because no translation is possible (use of Counter64). Some machine readable information in SMIv2 will be converted into textual descriptions in SMIv1 during the translation process. However, this loss of machine readable information is not considered to change the semantics of the MIB.

3.0 Overview

The objects defined in this MIB are to be used when describing Layer Two Tunneling Protocol (L2TP) tunnels. The L2TP protocol is defined in [RFC2661]. This MIB consists of seven groups briefly described below:

l2tpConfigGroup
l2tpStatsGroup
: These two groups of objects provide information on the configuration, state and statistics of the L2TP protocol, its tunnels and sessions. These groups are mandatory for implementors of this MIB.

l2tpDomainGroup
: This optional group of objects provides configuration, state and statistical information for L2TP tunnel endpoint domains. A L2TP tunnel endpoint domain is considered to be a collection of L2TP devices typically belonging to a common administrative domain or geographic location.

l2tpMappingGroup
: This optional group contains mapping tables to assist management applications to map between protocol identifiers and table indices.

l2tpIpUdpGroup
: This group provides the state and statistics information for L2TP tunnels which are being transported by UDP/IP. This group is mandatory for L2TP implementations that support L2TP over UDP/IP.

l2tpSecurityGroup
: This group is optional for SNMP agents which support both authentication and privacy of SNMP messages for the management of L2TP keys.

l2tpTrapGroup
: This group contains the notifications that could be generated by a L2TP implementation.

l2tpHCPacketGroup
: This group is optional for L2TP implementations that could potentially overflow the L2TP Domain tables 32-bit statistics counters in less than an hour.

3.1 Relationship to the Interface MIB

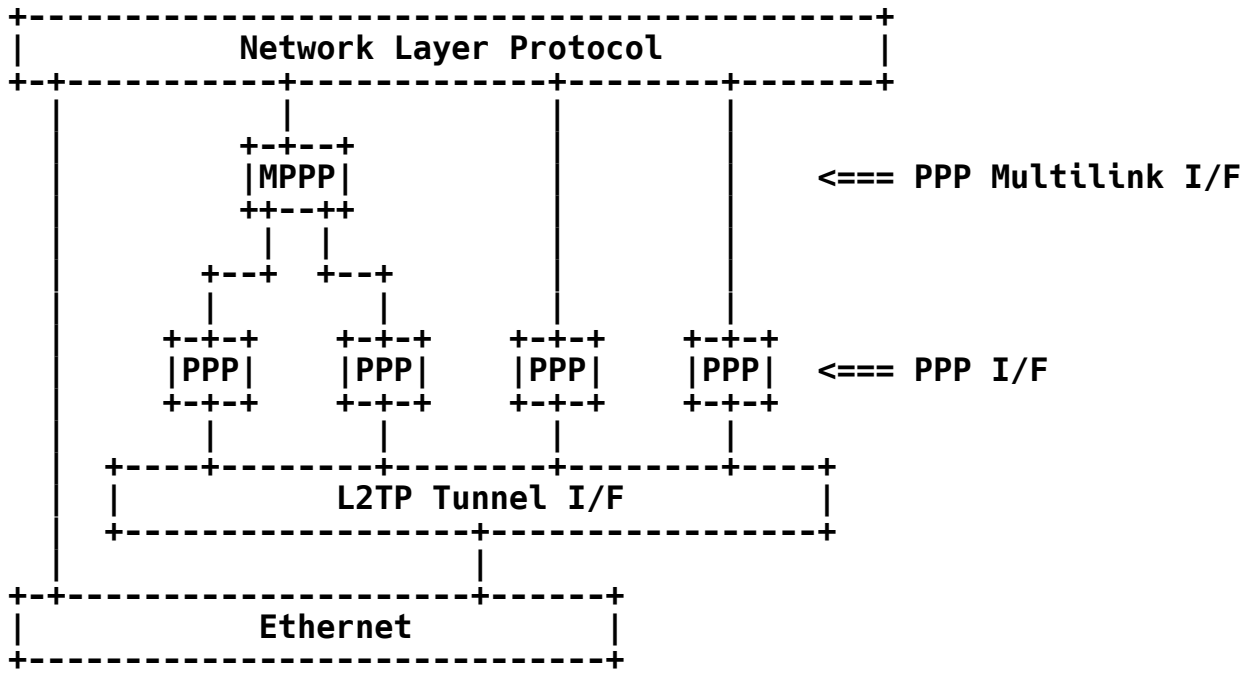
This section clarifies the relationship of this MIB to the Interfaces MIB [RFC2863]. Several areas of correlation are addressed in the following subsections. The implementor is referred to the Interfaces MIB document in order to understand the general intent of these areas.

3.1.1 Layering Model

This MIB contains several tables which are extensions to the IP Tunnel MIB described in [RFC2667] which itself defines extensions to the Interface MIB [RFC2863]. An L2TP tunnel is represented as a separate identifiable logical interface sub-layer. The tunnel stack layering model is described in [RFC2667].

In addition to that described in [RFC2667] an L2TP tunnel will not be at the top of the ifStack on a L2TP device that is acting as a L2TP Network Server (LNS). In this case PPP interfaces will be layered on top of the tunnel interface.

In the example diagram below, the interface layering is shown as it might appear at the LNS.



The ifStackTable is used to describe the layering of the interface sub-layers. For the example given above the ifTable and ifStackTable may appear as follows:

ifIndex	ifType	Tunnel MIB tables	Description
1	ethernetCsmacd(6)		Ethernet interface
2	tunnel(131)	tunnelIfTable l2tpTunnelConfigTable l2tpTunnelStatsTable	Tunnel interface
3	ppp(23)		PPP interface #1
4	ppp(23)		PPP interface #2
5	ppp(23)		PPP interface #3
6	ppp(23)		PPP interface #4
7	mlppp(108)		MLPPP interface

The corresponding ifStack table entries would then be:

ifStackTable Entries

HigherLayer	LowerLayer
0	5
0	6
0	7
1	0
2	1
3	2
4	2
5	2
6	2
7	3
7	4

L2TP Access Concentrator (LAC) tunnel interfaces on the other hand appear at the top of the interface layering stack. In this case the layering model is as described in [RFC2667].

However in order to support the tunneling of packets received from interfaces carrying framed PPP packets on the LAC to the LNS (and the propagation of decapsulated PPP packets to that interface) additional configuration is required. This is further described in section 3.4.

3.1.2 Interface MIB Objects

Except where noted in the tables below, all objects MUST be supported from the ifGeneralInformationGroup and one of the following three groups:

- o ifPacketGroup OR
- o ifHCPacketGroup OR
- o ifVHCPacketGroup

depending on the particular implementation.

The following tables describe how objects from the ifGeneralInformationGroup and ifPacketGroup (similar support should be provided for the high and very high capacity packet groups) are to be interpreted and supported for L2TP tunnel interfaces.

3.1.2.1 L2TP Tunnel Interfaces

All Interface MIB objects not listed in the above groups for L2TP tunnel interfaces MUST be supported as described in [RFC2863].

Interface MIB Object	Support Description
ifTable.ifDescr	Refer to the Interface MIB.
ifTable.ifType	tunnel(131).
ifTable.ifMtu	Dependent on the tunnel transport layer. For UDP/IP transports the MTU should be 65467 (65535-60(IP)-8(UDP)).
ifTable.ifSpeed	Return zero.
ifTable.ifPhyAddress	The assigned tunnel identifier.
ifTable.ifAdminStatus	Setting ifAdminStatus to 'up' injects a 'Local Open' request into the tunnel FSM. Setting ifAdminStatus to 'down' injects a 'Tunnel Close' event into the tunnel FSM. Setting ifAdminStatus to 'testing' is not currently defined but could be used to test tunnel connectivity.
ifTable.ifOperStatus	ifOperStatus values are to be interpreted as follows: 'up' - tunnel is established. 'down' - administratively down or peer unreachable. 'testing' - in some test mode. 'unknown' - status cannot be determined for some reason. 'dormant' - operational but waiting for local or remote trigger to bring up the tunnel. 'notPresent' - configuration missing. 'lowerLayerDown' - down due to state of lower-layer interface(s).
ifTable.ifInOctets	The total number of octets received on the tunnel including control and payload octets.
ifTable.ifInUcastPkts	The total number of packets received on the tunnel including control and payload packets.

ifTable.ifInDiscards	The total number of received packets that were discarded on both control and payload channels.
ifTable.ifInErrors	The total number of packets received in error including control and payload packets.
ifTable.ifInUnknownProtos	Return zero.
ifTable.ifOutOctets	The total number of octets transmitted from the tunnel including control and payload octets.
ifTable.ifOutUcastPkts	The total number of packets transmitted from the tunnel including control and payload packets.
ifTable.ifOutDiscards	The total number of discarded packets that were requested to be transmitted including control and payload packets.
ifTable.ifOutErrors	The total number of packets that were requested to be transmitted that were in error including control and payload packets.
ifXTable.ifName	Refer to the Interface MIB.
ifXTable.ifInMulticastPkts	Return zero.
ifXTable.ifInBroadcastPkts	Return zero.
ifXTable.ifOutMulticastPkts	Return zero.
ifXTable.ifOutBroadcastPkts	Return zero.
ifXTable.ifOutBroadcastPkts	Return zero.
ifXTable.ifLinkUpDownTrapEnable	Default set to enabled(1).

ifXTable.ifHighSpeed Return zero.

ifXTable.ifPromiscuousMode
Set to false(2).

ifXTable.ifConnectorPresent
Set to false(2).

3.2 Relationship to other MIBs

3.2.1 Relationship to the IP Tunnel MIB

The IP Tunnel MIB [RFC2667] describes tunnel interfaces that have an ifType of tunnel(131). The IP Tunnel MIB is considered to contain a collection of objects common to all IP tunneling protocols, including L2TP. In addition to the IP Tunnel MIB, tunnel encapsulation specific MIBs (like this MIB) extend the IP Tunnel MIB to further describe encapsulation specific information. Implementation of the IP Tunnel MIB is required for L2TP tunnels over IP.

3.3 L2TP Tunnel Creation

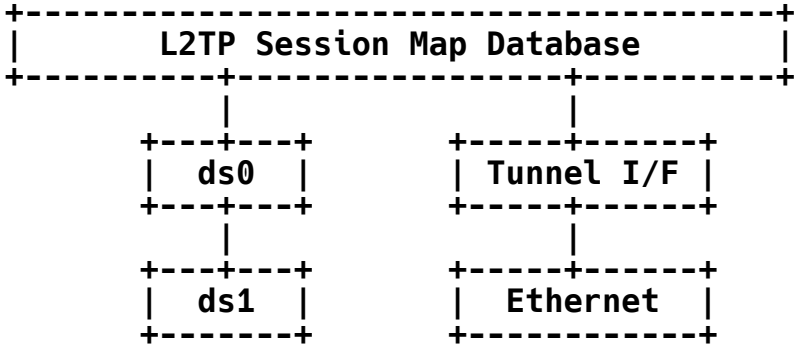
Tunnel creation is detailed for tunnels over IP in the IP Tunnel MIB. The creation of a tunnelIfEntry in [RFC2667] when the encapsulation method is "l2tp" will have the side effect of creating entries in the l2tpTunnelConfigTable, l2tpTunnelStatsTable and the l2tpUdpStatsTable's.

The creation of L2TP tunnel interfaces over transports other than IP is expected to be defined in the MIB definition for that specific L2TP tunnel transport.

3.4 L2TP Session Mapping

The l2tpSessionMapTable table allows management applications to determine which session within a tunnel a particular interface (either a PPP or DS0 interface) is mapped to. On the LAC it also provides a management application the ability to map a particular physical or virtual interface terminating a PPP link to a particular L2TP tunnel. This is required since the interface stacking as performed (and instrumented by the ifStackTable) on the LNS cannot be applied at the LAC.

The following diagram illustrates the conceptual binding that occurs.



The stacking of the individual interface stacks would be described by the ifStackTable.

4.0 L2TP Object Definitions

```
L2TP-MIB DEFINITIONS ::= BEGIN

IMPORTS
        Integer32, Unsigned32, Counter32, Gauge32,
        Counter64, transmission, MODULE-IDENTITY,
        OBJECT-TYPE, NOTIFICATION-TYPE
            FROM SNMPv2-SMI
        TEXTUAL-CONVENTION, RowStatus, TruthValue,
        StorageType
            FROM SNMPv2-TC
        SnmpAdminString
            FROM SNMP-FRAMEWORK-MIB
        OBJECT-GROUP, MODULE-COMPLIANCE, NOTIFICATION-GROUP
            FROM SNMPv2-CONF
        InterfaceIndex
            FROM IF-MIB;

l2tp    MODULE-IDENTITY
        LAST-UPDATED    "200208230000Z" -- 23 August 2002
        ORGANIZATION    "IETF L2TP Working Group"
        CONTACT-INFO
          "Evan Caves
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            Layer Two Tunneling Protocol Extensions WG
            Working Group Area:    Internet
            Working Group Name:    l2tpext
            General Discussion:    l2tp@l2tp.net"

         DESCRIPTION
            "The MIB module that describes managed objects of
             general use by the Layer Two Transport Protocol."

         -- revision log

         REVISION        "200208230000Z" -- 23 August 2002
         DESCRIPTION
            "First revision, published as RFC 3371."

         ::= { transmission 95 }

   --
   --      Textual Conventions
   --

   L2tpMilliSeconds ::=  TEXTUAL-CONVENTION
         DISPLAY-HINT    "d-3"
         STATUS          current
         DESCRIPTION
            "A period of time measured in units of .001 of seconds
             when used in conjunction with the DISPLAY-HINT will
             show seconds and fractions of second with a resolution
             of .001 of a second."
         SYNTAX          Integer32 (0..2147483646)

   --
   --      Definitions of significant branches
   --
```

```
   l2tpNotifications   OBJECT IDENTIFIER  ::= { l2tp 0 }
   l2tpObjects         OBJECT IDENTIFIER  ::= { l2tp 1 }
   l2tpTransports      OBJECT IDENTIFIER  ::= { l2tp 3 }
   l2tpConformance     OBJECT IDENTIFIER  ::= { l2tp 4 }

   --
   --      Definitions of significant branches under l2tpObjects
   --
   l2tpScalar          OBJECT IDENTIFIER  ::= { l2tpObjects 1 }
   l2tpConfig          OBJECT IDENTIFIER  ::= { l2tpScalar 1 }
   l2tpStats           OBJECT IDENTIFIER  ::= { l2tpScalar 2 }

   --
   --      Definitions of significant branches under l2tpTransports
   --
   --      Note that future transports of L2TP (e.g.: Frame relay)
   --      should create their own branch under l2tpTransports.

   l2tpTransportIpUdp  OBJECT IDENTIFIER  ::= { l2tpTransports 1 }
   l2tpIpUdpObjects    OBJECT IDENTIFIER  ::= { l2tpTransportIpUdp 1 }
   l2tpIpUdpTraps      OBJECT IDENTIFIER  ::= { l2tpTransportIpUdp 2 }

   --
   --      The L2TP Scalar Configuration Group
   --
   --      This group of objects is used to manage configuration
   --      of the L2TP protocol environment.

   l2tpAdminState          OBJECT-TYPE
           SYNTAX          INTEGER {
                               enabled(1),
                               disabled(2)
                           }
           MAX-ACCESS      read-write
           STATUS          current
           DESCRIPTION
              "This object defines the administrative state of
               the L2TP protocol. Setting this object to
               'disabled' causes all tunnels to be immediately
               disconnected and no further tunnels to be either
               initiated or accepted. The value of this object
               must be maintained in non-volatile memory."
           ::= { l2tpConfig 1 }

   l2tpDrainTunnels        OBJECT-TYPE
           SYNTAX          TruthValue
           MAX-ACCESS      read-write
           STATUS          current
```

```
            DESCRIPTION
               "Setting this object to 'true' will prevent any new
                tunnels and/or sessions to be either initiated or
                accepted but does NOT disconnect any active
                tunnels/sessions. Setting this object to true(1)
                causes all domains and their respective tunnels
                to transition to the draining state. Note that
                when this occurs the 'xxxDraining' status objects
                of the domains and their tunnels should reflect
                that they are 'draining'. Setting this object has
                no affect on the domains or their tunnels
                'xxxDrainTunnels' configuration objects. To cancel
                a drain this object should be set to false(2).
                The object l2tpDrainingTunnels reflects
                the current L2TP draining state. The value of
                this object must be maintained in non-volatile
                memory."
            ::= { l2tpConfig 2 }

    --
    --      The L2TP Scalar Status and Statistics Group
    --
    --      This group of objects describe the current state and
    --      statistics of L2TP.

    l2tpProtocolVersions    OBJECT-TYPE
            SYNTAX          OCTET STRING (SIZE(2..256))
            MAX-ACCESS      read-only
            STATUS          current
            DESCRIPTION
                "Vector of supported L2TP protocol version and
                 revision numbers. Supported versions are identified
                 via a two octet pairing where the first octet indicates
                 the version and the second octet contains the revision."
            ::= { l2tpStats 1 }

    l2tpVendorName          OBJECT-TYPE
            SYNTAX          SnmpAdminString
            MAX-ACCESS      read-only
            STATUS          current
            DESCRIPTION
               "This object identifies the Vendor name of the L2TP
                protocol stack."
            ::= { l2tpStats 2 }

    l2tpFirmwareRev         OBJECT-TYPE
            SYNTAX          Integer32
            MAX-ACCESS      read-only
```

```
            STATUS          current
            DESCRIPTION
               "This object defines the firmware revision for the
                L2TP protocol stack."
            ::= { l2tpStats 3 }

   l2tpDrainingTunnels     OBJECT-TYPE
            SYNTAX          TruthValue
            MAX-ACCESS      read-only
            STATUS          current
            DESCRIPTION
               "This object indicates if the local L2TP is draining
                off sessions from all tunnels."
            ::= { l2tpStats 4 }

   --
   --      The L2TP Domain Configuration Table
   --

   l2tpDomainConfigTable   OBJECT-TYPE
            SYNTAX          SEQUENCE OF L2tpDomainConfigEntry
            MAX-ACCESS      not-accessible
            STATUS          current
            DESCRIPTION
               "The L2TP Domain configuration table. This table
                contains objects that can be used to configure
                the operational characteristics of a tunnel
                domain. There is a 1-1 correspondence between
                conceptual rows of this table and conceptual
                rows of the l2tpDomainStatsTable."
            ::= { l2tpObjects 2 }

   l2tpDomainConfigEntry   OBJECT-TYPE
            SYNTAX          L2tpDomainConfigEntry
            MAX-ACCESS      not-accessible
            STATUS          current
            DESCRIPTION
               "An L2TP Domain configuration entry. An entry in this
                table may correspond to a single endpoint or a group
                of tunnel endpoints."
            INDEX { l2tpDomainConfigId }
            ::= { l2tpDomainConfigTable 1 }

   L2tpDomainConfigEntry ::=
            SEQUENCE {
                l2tpDomainConfigId
                    SnmpAdminString,
                l2tpDomainConfigAdminState
```

```
                INTEGER,
            l2tpDomainConfigDrainTunnels
                TruthValue,
            l2tpDomainConfigAuth
                INTEGER,
            l2tpDomainConfigSecret
                SnmpAdminString,
            l2tpDomainConfigTunnelSecurity
                INTEGER,
            l2tpDomainConfigTunnelHelloInt
                Integer32,
            l2tpDomainConfigTunnelIdleTO
                Integer32,
            l2tpDomainConfigControlRWS
                Integer32,
            l2tpDomainConfigControlMaxRetx
                Integer32,
            l2tpDomainConfigControlMaxRetxTO
                Integer32,
            l2tpDomainConfigPayloadSeq
                INTEGER,
            l2tpDomainConfigReassemblyTO
                L2tpMilliSeconds,
            l2tpDomainConfigProxyPPPAuth
                TruthValue,
            l2tpDomainConfigStorageType
                StorageType,
            l2tpDomainConfigStatus
                RowStatus
        }

   l2tpDomainConfigId OBJECT-TYPE
        SYNTAX          SnmpAdminString (SIZE (1..80))
        MAX-ACCESS      not-accessible
        STATUS          current
        DESCRIPTION
           "The identifier, usually in the form of a Domain
            Name (full or partial), describing a single tunnel
            endpoint or a domain of tunnel endpoints. This is
            typically used as a 'handle' to identify the
            tunnel configuration requirements for both incoming
            and outgoing tunnel connection attempts. Both the
            LAC and  LNS could use information provided in the
            Host Name AVP attribute however the tunnel initiator
            could use other means not specified to identify
            the domain's tunnel configuration requirements.
            For example; three rows in this table have
            l2tpDomainConfigId values of 'lac1.isp.com',
```

```
            'isp.com' and 'com'. A tunnel endpoint then identifies
            itself as 'lac1.isp.com' which would match the
            'lac1.isp.com' entry in this table. A second tunnel
            endpoint then identifies itself as 'lac2.isp.com'.
            This endpoint is then associated with the 'isp.com'
            entry of this table."
        ::= { l2tpDomainConfigEntry 1 }

    l2tpDomainConfigAdminState OBJECT-TYPE
        SYNTAX          INTEGER {
                            enabled(1),
                            disabled(2)
                        }
        MAX-ACCESS      read-create
        STATUS          current
        DESCRIPTION
           "This object defines the administrative state of this
            tunnel domain. Setting this object to disabled(2)
            causes all tunnels to be immediately disconnected
            and no further tunnels to be either initiated or
            accepted. Note that all columnar objects corresponding
            to this conceptual row cannot be modified when
            the administrative state is enabled EXCEPT those
            objects which specifically state otherwise."
        DEFVAL { enabled }
        ::= { l2tpDomainConfigEntry 2 }

    l2tpDomainConfigDrainTunnels OBJECT-TYPE
        SYNTAX          TruthValue
        MAX-ACCESS      read-create
        STATUS          current
        DESCRIPTION
           "Setting this object to 'true' will prevent any new
            tunnels and/or sessions from being either initiated
            or accepted but does NOT disconnect any active
            tunnels/sessions for this tunnel domain. Setting
            this object to true(1) causes all tunnels within
            this domain to transition to the draining state.
            Note that when this occurs the
            l2tpTunnelStatsDrainingTunnel status objects of
            all of this domain's tunnels should reflect that
            they are 'draining'. Setting this object has no
            effect on this domain's associated tunnels
            l2tpTunnelConfigDrainTunnel configuration objects.
            To cancel a drain this object should be set to
            false(2).  Setting this object to false(2) when
            the L2TP object l2tpDrainTunnels is true(1) has
            no affect, all domains and their tunnels will
```

```
            continue to drain."
        DEFVAL { false }
        ::= { l2tpDomainConfigEntry 3 }

   l2tpDomainConfigAuth OBJECT-TYPE
        SYNTAX          INTEGER {
                            none(1),
                            simple(2),
                            challenge(3)
                        }
        MAX-ACCESS      read-create
        STATUS          current
        DESCRIPTION
           "This object describes how tunnel peers belonging
            to this domain are to be authenticated. The value
            simple(2) indicates that peers are authenticated
            simply by their host name as described in the Host
            Name AVP.  The value challenge(3) indicates that
            all peers are challenged to prove their identification.
            This mechanism is described in the L2TP protocol."
        REFERENCE "RFC 2661 Section 5.1"
        DEFVAL { none }
        ::= { l2tpDomainConfigEntry 4 }

   l2tpDomainConfigSecret  OBJECT-TYPE
        SYNTAX          SnmpAdminString (SIZE (0..255))
        MAX-ACCESS      read-create
        STATUS          current
        DESCRIPTION
           "This object is used to configure the shared secret
            used during the tunnel authentication phase of
            tunnel establishment. This object MUST be accessible
            only via requests using both authentication and
            privacy. The agent MUST report an empty string in
            response to get, get-next and get-bulk requests."
        ::= { l2tpDomainConfigEntry 5 }

   l2tpDomainConfigTunnelSecurity OBJECT-TYPE
        SYNTAX          INTEGER {
                            none(1),
                            other(2),
                            ipSec(3)
                        }
        MAX-ACCESS      read-create
        STATUS          current
        DESCRIPTION
           "This object defines whether this tunnel domain
            requires that all tunnels are to be secured. The
```

```
            value of ipsec(3) indicates that all tunnel packets,
            control and session, have IP Security headers. The
            type of IP Security headers (AH, ESP etc) and how
            they are further described is outside the scope of
            this document."
         DEFVAL { none }
         ::= { l2tpDomainConfigEntry 6 }

   l2tpDomainConfigTunnelHelloInt OBJECT-TYPE
         SYNTAX          Integer32 (0..3600)
         UNITS           "seconds"
         MAX-ACCESS      read-create
         STATUS          current
         DESCRIPTION
            "This object defines the interval in which Hello
            (or keep-alive) packets are to be sent by local
            peers belonging to this tunnel domain. The value
            zero effectively disables the sending of Hello
            packets. This object may be modified when the
            administrative state is enabled for this conceptual
            row."
         DEFVAL { 60 }
         ::= { l2tpDomainConfigEntry 7 }

   l2tpDomainConfigTunnelIdleTO OBJECT-TYPE
         SYNTAX          Integer32 (-1..86400)
         UNITS           "seconds"
         MAX-ACCESS      read-create
         STATUS          current
         DESCRIPTION
            "This object defines the period of time that an
            established tunnel belonging to this tunnel
            domain with no active sessions will wait before
            disconnecting the tunnel. A value of zero indicates
            that the tunnel will disconnect immediately after the
            last session disconnects. A value of -1 leaves the
            tunnel up indefinitely. This object may be modified
            when the administrative state is enabled for this
            conceptual row."
         DEFVAL { 0 }
         ::= { l2tpDomainConfigEntry 8 }

   l2tpDomainConfigControlRWS OBJECT-TYPE
         SYNTAX          Integer32 (1..65535)
         MAX-ACCESS      read-create
         STATUS          current
         DESCRIPTION
            "This object defines the control channel receive
```

```
            window size for tunnels belonging to this domain. It
            specifies the maximum number of packets the tunnel
            peer belonging to this domain can send without waiting
            for an acknowledgement from this peer."
        DEFVAL { 4 }
        ::= { l2tpDomainConfigEntry 9 }

   l2tpDomainConfigControlMaxRetx OBJECT-TYPE
        SYNTAX          Integer32 (0..32)
        MAX-ACCESS      read-create
        STATUS          current
        DESCRIPTION
           "This object defines the maximum number of retransmissions
            which the L2TP stack will attempt for tunnels belonging
            to this domain before assuming that the peer is no
            longer responding."
        DEFVAL { 5 }
        ::= { l2tpDomainConfigEntry 10 }

   l2tpDomainConfigControlMaxRetxTO OBJECT-TYPE
        SYNTAX          Integer32 (1..32)
        UNITS           "seconds"
        MAX-ACCESS      read-create
        STATUS          current
        DESCRIPTION
           "This object defines the maximum retransmission timeout
            interval which the L2TP stack will wait for tunnels
            belonging to this domain before retransmitting a
            control packet that has not been acknowledged."
        DEFVAL { 16 }
        ::= { l2tpDomainConfigEntry 11 }

   l2tpDomainConfigPayloadSeq OBJECT-TYPE
        SYNTAX          INTEGER {
                            onDemand(1),
                            never(2),
                            always(3)
                        }
        MAX-ACCESS      read-create
        STATUS          current
        DESCRIPTION
           "This object determines whether or not session payload
            packets will be requested to be sent with sequence
            numbers from tunnel peers belonging to this domain.
            The value onDemand(1) allows the L2TP implementation
            to initiate payload sequencing when necessary based
            on local information (e.g: during LCP/NCP negotiations
            or for CCP). The value never(2) indicates that L2TP
```

```
                will never initiate sequencing but will do sequencing
                if asked. The value always(3) indicates that L2TP
                will send the Sequencing Required AVP during session
                establishment."
            DEFVAL { onDemand }
            ::= { l2tpDomainConfigEntry 12 }

    l2tpDomainConfigReassemblyTO OBJECT-TYPE
            SYNTAX          L2tpMilliSeconds
            MAX-ACCESS      read-create
            STATUS          current
            DESCRIPTION
               "This object defines the number of milliseconds that
                local peers of this tunnel domain will wait before
                processing payload packets that were received out of
                sequence (which are waiting for the packet(s) to put
                them in sequence).  A low value increases the chance
                of delayed packets to be discarded (which MAY cause
                the PPP decompression engine to reset) while a high
                value may cause more queuing and possibly degrade
                throughput if packets are truly lost. The default
                value for this object is zero which will result in
                all delayed packets being lost."
            DEFVAL { 0 }
            ::= { l2tpDomainConfigEntry 13 }

    l2tpDomainConfigProxyPPPAuth OBJECT-TYPE
            SYNTAX          TruthValue
            MAX-ACCESS      read-create
            STATUS          current
            DESCRIPTION
               "This object is used to configure the sending
                or acceptance of the PPP Proxy Authentication
                AVP's on the LAC or LNS."
            DEFVAL { true }
            ::= { l2tpDomainConfigEntry 14 }

    l2tpDomainConfigStorageType  OBJECT-TYPE
            SYNTAX          StorageType
            MAX-ACCESS      read-create
            STATUS          current
            DESCRIPTION
               "The storage type for this conceptual row.

                Conceptual rows having the value 'permanent' must
                allow write-access at a minimum to:

                - l2tpDomainConfigAdminState and
```

```
                  l2tpDomainConfigDrainTunnels at all times
                - l2tpDomainConfigSecret if l2tpDomainConfigAuth
                  has been configured as 'challenge'

                It is an implementation issue to decide if a SET for
                a readOnly or permanent row is accepted at all. In some
                contexts this may make sense, in others it may not. If
                a SET for a readOnly or permanent row is not accepted
                at all, then a 'wrongValue' error must be returned."
            ::= { l2tpDomainConfigEntry 15 }

    l2tpDomainConfigStatus  OBJECT-TYPE
            SYNTAX          RowStatus
            MAX-ACCESS      read-create
            STATUS          current
            DESCRIPTION
               "The status of this Domain entry. Columnar objects
                corresponding to this conceptual row may be modified
                according to their description clauses when this
                RowStatus object is 'active'."
            ::= { l2tpDomainConfigEntry 16 }

    --
    --      The L2TP Domain Status and Statistics Table
    --

    l2tpDomainStatsTable    OBJECT-TYPE
            SYNTAX          SEQUENCE OF L2tpDomainStatsEntry
            MAX-ACCESS      not-accessible
            STATUS          current
            DESCRIPTION
               "The L2TP Domain Status and Statistics table. This
                table contains objects that can be used to describe
                the current status and statistics of a tunnel domain.
                There is a 1-1 correspondence between conceptual
                rows of this table and conceptual rows of the
                l2tpDomainConfigTable."
            ::= { l2tpObjects 3 }

    l2tpDomainStatsEntry    OBJECT-TYPE
            SYNTAX          L2tpDomainStatsEntry
            MAX-ACCESS      not-accessible
            STATUS          current
            DESCRIPTION
               "An L2TP Domain Stats entry. An entry in this table
                may correspond to a single endpoint or a group of
                tunnel endpoints."
            AUGMENTS { l2tpDomainConfigEntry }
```

```
            ::= { l2tpDomainStatsTable 1 }

    L2tpDomainStatsEntry ::=
            SEQUENCE {
                l2tpDomainStatsTotalTunnels
                    Counter32,
                l2tpDomainStatsFailedTunnels
                    Counter32,
                l2tpDomainStatsFailedAuths
                    Counter32,
                l2tpDomainStatsActiveTunnels
                    Gauge32,
                l2tpDomainStatsTotalSessions
                    Counter32,
                l2tpDomainStatsFailedSessions
                    Counter32,
                l2tpDomainStatsActiveSessions
                    Gauge32,
                l2tpDomainStatsDrainingTunnels
                    TruthValue,
                l2tpDomainStatsControlRxOctets
                    Counter32,
                l2tpDomainStatsControlRxPkts
                    Counter32,
                l2tpDomainStatsControlTxOctets
                    Counter32,
                l2tpDomainStatsControlTxPkts
                    Counter32,
                l2tpDomainStatsPayloadRxOctets
                    Counter32,
                l2tpDomainStatsPayloadRxPkts
                    Counter32,
                l2tpDomainStatsPayloadRxDiscs
                    Counter32,
                l2tpDomainStatsPayloadTxOctets
                    Counter32,
                l2tpDomainStatsPayloadTxPkts
                    Counter32,
                l2tpDomainStatsControlHCRxOctets
                    Counter64,
                l2tpDomainStatsControlHCRxPkts
                    Counter64,
                l2tpDomainStatsControlHCTxOctets
                    Counter64,
                l2tpDomainStatsControlHCTxPkts
                    Counter64,
                l2tpDomainStatsPayloadHCRxOctets
                    Counter64,
```

```
                l2tpDomainStatsPayloadHCRxPkts
                    Counter64,
                l2tpDomainStatsPayloadHCRxDiscs
                    Counter64,
                l2tpDomainStatsPayloadHCTxOctets
                    Counter64,
                l2tpDomainStatsPayloadHCTxPkts
                    Counter64
            }

    l2tpDomainStatsTotalTunnels OBJECT-TYPE
            SYNTAX          Counter32
            MAX-ACCESS      read-only
            STATUS          current
            DESCRIPTION
               "This object returns the total number of tunnels
                that have successfully reached the established
                state for this tunnel domain."
            ::= { l2tpDomainStatsEntry 1 }

    l2tpDomainStatsFailedTunnels OBJECT-TYPE
            SYNTAX          Counter32
            MAX-ACCESS      read-only
            STATUS          current
            DESCRIPTION
               "This object returns the number of tunnels that
                failed (eg: connection timeout, unsupported
                or malformed AVP's etc) to reach the established
                state for this tunnel domain."
            ::= { l2tpDomainStatsEntry 2 }

    l2tpDomainStatsFailedAuths OBJECT-TYPE
            SYNTAX          Counter32
            MAX-ACCESS      read-only
            STATUS          current
            DESCRIPTION
               "This object returns the number of failed tunnel
                connection attempts for this domain because the
                tunnel peer failed authentication."
            ::= { l2tpDomainStatsEntry 3 }

    l2tpDomainStatsActiveTunnels OBJECT-TYPE
            SYNTAX          Gauge32
            MAX-ACCESS      read-only
            STATUS          current
            DESCRIPTION
               "This object returns the number of tunnels that
                are currently active for this domain."
```

```
            ::= { l2tpDomainStatsEntry 4 }

      l2tpDomainStatsTotalSessions OBJECT-TYPE
            SYNTAX          Counter32
            MAX-ACCESS      read-only
            STATUS          current
            DESCRIPTION
               "This object returns the total number of sessions
                that have successfully reached the established
                state for this tunnel domain."
            ::= { l2tpDomainStatsEntry 5 }

      l2tpDomainStatsFailedSessions OBJECT-TYPE
            SYNTAX          Counter32
            MAX-ACCESS      read-only
            STATUS          current
            DESCRIPTION
               "This object returns the number of sessions that
                failed (eg: connection timeout, unsupported
                or malformed AVP's etc) to reach the established
                state for this tunnel domain."
            ::= { l2tpDomainStatsEntry 6 }

      l2tpDomainStatsActiveSessions OBJECT-TYPE
            SYNTAX          Gauge32
            MAX-ACCESS      read-only
            STATUS          current
            DESCRIPTION
               "This object returns the number of sessions that
                are currently active for this domain."
            ::= { l2tpDomainStatsEntry 7 }

      l2tpDomainStatsDrainingTunnels OBJECT-TYPE
            SYNTAX          TruthValue
            MAX-ACCESS      read-only
            STATUS          current
            DESCRIPTION
               "This object indicates if this domain is draining
                off sessions from all tunnels."
            ::= { l2tpDomainStatsEntry 8 }

      l2tpDomainStatsControlRxOctets OBJECT-TYPE
            SYNTAX          Counter32
            MAX-ACCESS      read-only
            STATUS          current
            DESCRIPTION
               "This object returns the number of control channel
                octets received for this tunnel domain."
```

```
            ::= { l2tpDomainStatsEntry 9 }

      l2tpDomainStatsControlRxPkts OBJECT-TYPE
            SYNTAX          Counter32
            MAX-ACCESS      read-only
            STATUS          current
            DESCRIPTION
               "This object returns the number of control packets
                received for this tunnel domain."
            ::= { l2tpDomainStatsEntry 10 }

      l2tpDomainStatsControlTxOctets OBJECT-TYPE
            SYNTAX          Counter32
            MAX-ACCESS      read-only
            STATUS          current
            DESCRIPTION
               "This object returns the number of control channel
                octets that were transmitted to tunnel endpoints
                for this domain."
            ::= { l2tpDomainStatsEntry 11 }

      l2tpDomainStatsControlTxPkts OBJECT-TYPE
            SYNTAX          Counter32
            MAX-ACCESS      read-only
            STATUS          current
            DESCRIPTION
               "This object returns the number of control packets
                that were transmitted to tunnel endpoints for
                this domain."
            ::= { l2tpDomainStatsEntry 12 }

      l2tpDomainStatsPayloadRxOctets OBJECT-TYPE
            SYNTAX          Counter32
            MAX-ACCESS      read-only
            STATUS          current
            DESCRIPTION
               "This object returns the number of payload channel
                octets that were received for this tunnel domain."
            ::= { l2tpDomainStatsEntry 13 }

      l2tpDomainStatsPayloadRxPkts OBJECT-TYPE
            SYNTAX          Counter32
            MAX-ACCESS      read-only
            STATUS          current
            DESCRIPTION
               "This object returns the number of payload packets
                that were received for this tunnel domain."
            ::= { l2tpDomainStatsEntry 14 }
```

```
   l2tpDomainStatsPayloadRxDiscs OBJECT-TYPE
           SYNTAX          Counter32
           MAX-ACCESS      read-only
           STATUS          current
           DESCRIPTION
              "This object returns the number of received payload
               packets that were discarded by this tunnel domain."
           ::= { l2tpDomainStatsEntry 15 }

   l2tpDomainStatsPayloadTxOctets OBJECT-TYPE
           SYNTAX          Counter32
           MAX-ACCESS      read-only
           STATUS          current
           DESCRIPTION
              "This object returns the number of payload channel
               octets that were transmitted to tunnel peers
               within this tunnel domain."
           ::= { l2tpDomainStatsEntry 16 }

   l2tpDomainStatsPayloadTxPkts OBJECT-TYPE
           SYNTAX          Counter32
           MAX-ACCESS      read-only
           STATUS          current
           DESCRIPTION
              "This object returns the number of payload packets
               that were transmitted to tunnel peers within
               this tunnel domain."
           ::= { l2tpDomainStatsEntry 17 }

   --
   -- High Capacity Counter objects.  These objects are all
   -- 64 bit versions of the above 32-bit counters.  These
   -- objects all have the same basic semantics as their
   -- 32-bit counterparts, however, their syntax has been
   -- extended to 64 bits.
   --

   l2tpDomainStatsControlHCRxOctets OBJECT-TYPE
           SYNTAX          Counter64
           MAX-ACCESS      read-only
           STATUS          current
           DESCRIPTION
              "This object is a 64-bit version of
               l2tpDomainStatsControlRxOctets."
           ::= { l2tpDomainStatsEntry 18 }

   l2tpDomainStatsControlHCRxPkts OBJECT-TYPE
           SYNTAX          Counter64
```

```
            MAX-ACCESS      read-only
            STATUS          current
            DESCRIPTION
               "This object is a 64-bit version of
                l2tpDomainStatsControlRxPkts."
            ::= { l2tpDomainStatsEntry 19 }

   l2tpDomainStatsControlHCTxOctets OBJECT-TYPE
            SYNTAX          Counter64
            MAX-ACCESS      read-only
            STATUS          current
            DESCRIPTION
               "This object is a 64-bit version of
                l2tpDomainStatsControlTxOctets."
            ::= { l2tpDomainStatsEntry 20 }

   l2tpDomainStatsControlHCTxPkts OBJECT-TYPE
            SYNTAX          Counter64
            MAX-ACCESS      read-only
            STATUS          current
            DESCRIPTION
               "This object is a 64-bit version of
                l2tpDomainStatsControlTxPkts."
            ::= { l2tpDomainStatsEntry 21 }

   l2tpDomainStatsPayloadHCRxOctets OBJECT-TYPE
            SYNTAX          Counter64
            MAX-ACCESS      read-only
            STATUS          current
            DESCRIPTION
               "This object is a 64-bit version of
                l2tpDomainStatsPayloadRxOctets."
            ::= { l2tpDomainStatsEntry 22 }

   l2tpDomainStatsPayloadHCRxPkts OBJECT-TYPE
            SYNTAX          Counter64
            MAX-ACCESS      read-only
            STATUS          current
            DESCRIPTION
               "This object is a 64-bit version of
                l2tpDomainStatsPayloadRxPkts."
            ::= { l2tpDomainStatsEntry 23 }

   l2tpDomainStatsPayloadHCRxDiscs OBJECT-TYPE
            SYNTAX          Counter64
            MAX-ACCESS      read-only
            STATUS          current
            DESCRIPTION
```

```
            "This object is a 64-bit version of
             l2tpDomainStatsPayloadRxDiscs."
         ::= { l2tpDomainStatsEntry 24 }

   l2tpDomainStatsPayloadHCTxOctets OBJECT-TYPE
         SYNTAX          Counter64
         MAX-ACCESS      read-only
         STATUS          current
         DESCRIPTION
            "This object is a 64-bit version of
             l2tpDomainStatsPayloadTxOctets."
         ::= { l2tpDomainStatsEntry 25 }

   l2tpDomainStatsPayloadHCTxPkts OBJECT-TYPE
         SYNTAX          Counter64
         MAX-ACCESS      read-only
         STATUS          current
         DESCRIPTION
            "This object is a 64-bit version of
             l2tpDomainStatsPayloadTxPkts."
         ::= { l2tpDomainStatsEntry 26 }

   --
   --      The L2TP Tunnel Configuration Table
   --

   l2tpTunnelConfigTable   OBJECT-TYPE
         SYNTAX          SEQUENCE OF L2tpTunnelConfigEntry
         MAX-ACCESS      not-accessible
         STATUS          current
         DESCRIPTION
            "The L2TP tunnel configuration table. This
             table contains objects that can be used to
             (re)configure the operational characteristics
             of a single L2TP tunnel. There is a 1-1
             correspondence between conceptual rows of
             this table and conceptual rows of the
             l2tpTunnelStatsTable. Entries in this table
             have the same persistency characteristics as
             that of the tunnelConfigTable."
         REFERENCE "RFC 2667"
         ::= { l2tpObjects 4 }

   l2tpTunnelConfigEntry   OBJECT-TYPE
         SYNTAX          L2tpTunnelConfigEntry
         MAX-ACCESS      not-accessible
         STATUS          current
         DESCRIPTION
```

```
            "A L2TP tunnel interface configuration entry.
             Entries in this table come and go as a result
             of protocol interactions or on management
             operations. The latter occurs when a row is
             instantiated in the tunnelConfigTable row
             and the encapsulation method is 'l2tp'."
        REFERENCE "RFC 2667"
        INDEX { l2tpTunnelConfigIfIndex }
        ::= { l2tpTunnelConfigTable 1 }

   L2tpTunnelConfigEntry ::=
        SEQUENCE {
            l2tpTunnelConfigIfIndex
                InterfaceIndex,
            l2tpTunnelConfigDomainId
                SnmpAdminString,
            l2tpTunnelConfigAuth
                INTEGER,
            l2tpTunnelConfigSecret
                SnmpAdminString,
            l2tpTunnelConfigSecurity
                INTEGER,
            l2tpTunnelConfigHelloInterval
                Integer32,
            l2tpTunnelConfigIdleTimeout
                Integer32,
            l2tpTunnelConfigControlRWS
                Integer32,
            l2tpTunnelConfigControlMaxRetx
                Integer32,
            l2tpTunnelConfigControlMaxRetxTO
                Integer32,
            l2tpTunnelConfigPayloadSeq
                INTEGER,
            l2tpTunnelConfigReassemblyTO
                L2tpMilliSeconds,
            l2tpTunnelConfigTransport
                INTEGER,
            l2tpTunnelConfigDrainTunnel
                TruthValue,
            l2tpTunnelConfigProxyPPPAuth
                TruthValue
        }

   l2tpTunnelConfigIfIndex OBJECT-TYPE
        SYNTAX          InterfaceIndex
        MAX-ACCESS      not-accessible
        STATUS          current
```

```
            DESCRIPTION
               "This value for this object is equal to the value
                of ifIndex of the Interfaces MIB for tunnel
                interfaces of type L2TP."
            ::= { l2tpTunnelConfigEntry 1 }

   l2tpTunnelConfigDomainId OBJECT-TYPE
            SYNTAX          SnmpAdminString (SIZE (1..80))
            MAX-ACCESS      read-write
            STATUS          current
            DESCRIPTION
               "The tunnel domain that this tunnel belongs
                to. A LNS tunnel endpoint will typically inherit
                this value from the endpoint domain table. A
                LAC may be provided with this information during
                tunnel setup. When a zero length string is returned
                this tunnel does not belong belong to any particular
                domain."
            ::= { l2tpTunnelConfigEntry 2 }

   l2tpTunnelConfigAuth OBJECT-TYPE
            SYNTAX          INTEGER {
                                none(1),
                                simple(2),
                                challenge(3)
                            }
            MAX-ACCESS      read-write
            STATUS          current
            DESCRIPTION
               "This object describes how L2TP tunnel peers are
                to be authenticated. The value 'simple' indicates
                that peers are authenticated simply by their host
                name as described in the Host Name AVP. The value
                'challenge' indicates that all peers are challenged
                to prove their identification. This mechanism is
                described in the L2TP protocol. This object cannot
                be modified when the tunnel is in a connecting or
                connected state."
            DEFVAL { none }
            ::= { l2tpTunnelConfigEntry 3 }

   l2tpTunnelConfigSecret  OBJECT-TYPE
            SYNTAX          SnmpAdminString (SIZE (0..255))
            MAX-ACCESS      read-write
            STATUS          current
            DESCRIPTION
               "This object is used to configure the shared secret
                used during the tunnel authentication phase of
```

```
            tunnel establishment. This object cannot be modified
            when the tunnel is in a connecting or connected
            state. This object MUST be accessible only via
            requests using both authentication and privacy.
            The agent MUST report an empty string in response
            to get, get-next and get-bulk requests."
        ::= { l2tpTunnelConfigEntry 4 }

    l2tpTunnelConfigSecurity OBJECT-TYPE
        SYNTAX          INTEGER {
                            none(1),
                            other(2),
                            ipsec(3)
                        }
        MAX-ACCESS      read-write
        STATUS          current
        DESCRIPTION
           "This object defines whether this tunnel is to be
            secured. The value of 'ipSec' indicates that all
            tunnel packets, control and session, have IP
            Security headers. The type of IP Security headers
            (AH, ESP etc) and how they are further described
            is outside the scope of this document. This object
            cannot be modified when the tunnel is in a connecting
            or connected state."
        DEFVAL { none }
        ::= { l2tpTunnelConfigEntry 5 }

    l2tpTunnelConfigHelloInterval OBJECT-TYPE
        SYNTAX          Integer32  (0..3600)
        UNITS           "seconds"
        MAX-ACCESS      read-write
        STATUS          current
        DESCRIPTION
           "This object defines the interval in which Hello
            (or keep-alive) packets are to be sent to the
            tunnel peer.  The value zero effectively disables
            the sending of Hello packets. Modifications to this
            object have immediate effect."
        DEFVAL { 60 }
        ::= { l2tpTunnelConfigEntry 6 }

    l2tpTunnelConfigIdleTimeout OBJECT-TYPE
        SYNTAX          Integer32 (-1..86400)
        UNITS           "seconds"
        MAX-ACCESS      read-write
        STATUS          current
        DESCRIPTION
```

```
            "This object defines the period of time that an
             established tunnel with no sessions will wait
             before disconnecting the tunnel. A value of
             zero indicates that the tunnel will disconnect
             immediately after the last session disconnects.
             A value of -1 leaves the tunnel up indefinitely.
             Modifications to this object have immediate
             effect."
         DEFVAL { 0 }
         ::= { l2tpTunnelConfigEntry 7 }

   l2tpTunnelConfigControlRWS OBJECT-TYPE
         SYNTAX          Integer32 (1..65535)
         MAX-ACCESS      read-write
         STATUS          current
         DESCRIPTION
            "This object defines the control channel receive
             window size. It specifies the maximum number of
             packets the tunnel peer can send without waiting
             for an acknowledgement from this peer. This object
             cannot be modified when the tunnel is in a con-
             necting or connected state."
         DEFVAL { 4 }
         ::= { l2tpTunnelConfigEntry 8 }

   l2tpTunnelConfigControlMaxRetx OBJECT-TYPE
         SYNTAX          Integer32 (0..32)
         MAX-ACCESS      read-write
         STATUS          current
         DESCRIPTION
            "This object defines the number of retransmissions
             which the tunnel will attempt before assuming that
             the peer is no longer responding. A value of zero
             indicates that this peer will not attempt to
             retransmit an unacknowledged control packet.
             Modifications to this object have immediate
             effect."
         DEFVAL { 5 }
         ::= { l2tpTunnelConfigEntry 9 }

   l2tpTunnelConfigControlMaxRetxTO OBJECT-TYPE
         SYNTAX          Integer32 (1..32)
         UNITS           "seconds"
         MAX-ACCESS      read-write
         STATUS          current
         DESCRIPTION
            "This object defines the maximum retransmission timeout
             interval which the tunnel will wait before retrans-
```

```
            mitting a control packet that has not been acknowledged.
            Modifications to this object have immediate effect."
        DEFVAL { 16 }
        ::= { l2tpTunnelConfigEntry 10 }

   l2tpTunnelConfigPayloadSeq OBJECT-TYPE
        SYNTAX          INTEGER {
                            onDemand(1),
                            never(2),
                            always(3)
                        }
        MAX-ACCESS      read-write
        STATUS          current
        DESCRIPTION
           "This object determines whether or not session payload
            packets will be requested to be sent with sequence
            numbers from tunnel peers belonging to this domain.
            The value onDemand(1) allows the L2TP implementation
            to initiate payload sequencing when necessary based
            on local information (e.g: during LCP/NCP negotiations
            or for CCP). The value never(2) indicates that L2TP
            will never initiate sequencing but will do sequencing
            if asked. The value always(3) indicates that L2TP
            will send the Sequencing Required AVP during session
            establishment. Modifications to this object have
            immediate effect."
        DEFVAL { onDemand }
        ::= { l2tpTunnelConfigEntry 11 }

   l2tpTunnelConfigReassemblyTO OBJECT-TYPE
        SYNTAX          L2tpMilliSeconds
        MAX-ACCESS      read-write
        STATUS          current
        DESCRIPTION
           "This object defines the number of milliseconds that
            this tunnel will wait before processing payload packets
            that were received out of sequence (which are waiting
            for the packet(s) to put them in sequence).  A low value
            increases the chance of delayed packets to be discarded
            (which MAY cause the PPP decompression engine to
            reset) while a high value may cause more queuing and
            possibly degrade throughput if packets are truly lost.
            The default value for this object is zero which will
            result in all delayed packets being lost. Modifications
            to this object have immediate effect."
        DEFVAL { 0 }
        ::= { l2tpTunnelConfigEntry 12 }
```

```
   l2tpTunnelConfigTransport OBJECT-TYPE
           SYNTAX          INTEGER {
                              other(1),
                              none(2),
                              udpIp(3),
                              frameRelay(4),
                              atm(5)
                           }
           MAX-ACCESS      read-write
           STATUS          current
           DESCRIPTION
              "This object defines the underlying transport media
               that is in use for this tunnel entry. Different tunnel
               transports may define MIB extensions to the L2TP tunnel
               table to realize the transport layer. For example if the
               value of this object is 'udpIp' then the value of ifIndex
               for this table may be used to determine state from the
               l2tpUdpStatsTable. This object cannot be modified when
               the tunnel is in a connecting or connected state."
           ::= { l2tpTunnelConfigEntry 13 }

   l2tpTunnelConfigDrainTunnel OBJECT-TYPE
           SYNTAX          TruthValue
           MAX-ACCESS      read-write
           STATUS          current
           DESCRIPTION
              "Setting this object to 'true' will prevent any new
               session from being either initiated or accepted but
               does NOT disconnect any active sessions for this
               tunnel. Note that when this occurs the
               l2tpTunnelStatsDrainingTunnel status object of
               this tunnel should reflect that it is 'draining'.
               To cancel a drain this object should be set to
               false(2).  Setting this object to false(2) when
               the L2TP objects l2tpDrainTunnels or
               l2tpDomainConfigDrainTunnels is true(1) has
               no affect, this tunnels will continue to drain."
           DEFVAL { false }
           ::= { l2tpTunnelConfigEntry 14 }

   l2tpTunnelConfigProxyPPPAuth OBJECT-TYPE
           SYNTAX          TruthValue
           MAX-ACCESS      read-write
           STATUS          current
           DESCRIPTION
              "This object is used to configure the sending
               or acceptance of the session PPP Proxy
               Authentication AVP's on the LAC or LNS."
```

```
            DEFVAL { true }
            ::= { l2tpTunnelConfigEntry 15 }

    --
    --      The L2TP Tunnel Status and Statisticss Table
    --


    l2tpTunnelStatsTable    OBJECT-TYPE
            SYNTAX          SEQUENCE OF L2tpTunnelStatsEntry
            MAX-ACCESS      not-accessible
            STATUS          current
            DESCRIPTION
               "The L2TP tunnel status and statistics table. This
                table contains objects that can be used to describe
                the current status and statistics of a single L2TP
                tunnel. There is a 1-1 correspondence between
                conceptual rows of this table and conceptual rows of
                the l2tpTunnelConfigTable."
            ::= { l2tpObjects 5 }

    l2tpTunnelStatsEntry    OBJECT-TYPE
            SYNTAX          L2tpTunnelStatsEntry
            MAX-ACCESS      not-accessible
            STATUS          current
            DESCRIPTION
               "An L2TP tunnel interface stats entry."
            AUGMENTS { l2tpTunnelConfigEntry }
            ::= { l2tpTunnelStatsTable 1 }

    L2tpTunnelStatsEntry ::=
            SEQUENCE {
                l2tpTunnelStatsLocalTID
                    Integer32,
                l2tpTunnelStatsRemoteTID
                    Integer32,
                l2tpTunnelStatsState
                    INTEGER,
                l2tpTunnelStatsInitiated
                    INTEGER,
                l2tpTunnelStatsRemoteHostName
                    SnmpAdminString,
                l2tpTunnelStatsRemoteVendorName
                    SnmpAdminString,
                l2tpTunnelStatsRemoteFirmwareRev
                    Integer32,
                l2tpTunnelStatsRemoteProtocolVer
                    OCTET STRING,
```

```
                l2tpTunnelStatsInitialRemoteRWS
                    Integer32,
                l2tpTunnelStatsBearerCaps
                    INTEGER,
                l2tpTunnelStatsFramingCaps
                    INTEGER,
                l2tpTunnelStatsControlRxPkts
                    Counter32,
                l2tpTunnelStatsControlRxZLB
                    Counter32,
                l2tpTunnelStatsControlOutOfSeq
                    Counter32,
                l2tpTunnelStatsControlOutOfWin
                    Counter32,
                l2tpTunnelStatsControlTxPkts
                    Counter32,
                l2tpTunnelStatsControlTxZLB
                    Counter32,
                l2tpTunnelStatsControlAckTO
                    Counter32,
                l2tpTunnelStatsCurrentRemoteRWS
                    Gauge32,
                l2tpTunnelStatsTxSeq
                    Integer32,
                l2tpTunnelStatsTxSeqAck
                    Integer32,
                l2tpTunnelStatsRxSeq
                    Integer32,
                l2tpTunnelStatsRxSeqAck
                    Integer32,
                l2tpTunnelStatsTotalSessions
                    Counter32,
                l2tpTunnelStatsFailedSessions
                    Counter32,
                l2tpTunnelStatsActiveSessions
                    Gauge32,
                l2tpTunnelStatsLastResultCode
                    Integer32,
                l2tpTunnelStatsLastErrorCode
                    Integer32,
                l2tpTunnelStatsLastErrorMessage
                    SnmpAdminString,
                l2tpTunnelStatsDrainingTunnel
                    TruthValue
            }

    l2tpTunnelStatsLocalTID OBJECT-TYPE
            SYNTAX          Integer32 (0..65535)
```

```
            MAX-ACCESS      read-only
            STATUS          current
            DESCRIPTION
               "This object contains the local tunnel Identifier."
            REFERENCE "RFC 2661, Section 3.1"
            ::= { l2tpTunnelStatsEntry 1 }

      l2tpTunnelStatsRemoteTID OBJECT-TYPE
            SYNTAX          Integer32 (0..65535)
            MAX-ACCESS      read-only
            STATUS          current
            DESCRIPTION
               "This object contains the remote tunnel Identifier."
            REFERENCE "RFC 2661, Section 3.1"
            ::= { l2tpTunnelStatsEntry 2 }

      l2tpTunnelStatsState    OBJECT-TYPE
            SYNTAX          INTEGER {
                                tunnelIdle(1),
                                tunnelConnecting(2),
                                tunnelEstablished(3),
                                tunnelDisconnecting(4)
                            }
            MAX-ACCESS      read-only
            STATUS          current
            DESCRIPTION
               "This field contains the current state of the
                control tunnel."
            ::= { l2tpTunnelStatsEntry 3 }

      l2tpTunnelStatsInitiated OBJECT-TYPE
            SYNTAX          INTEGER {
                                locally(1),
                                remotely(2)
                            }
            MAX-ACCESS      read-only
            STATUS          current
            DESCRIPTION
               "This object indicates whether the tunnel was
                initiated locally or by the remote tunnel peer."
            ::= { l2tpTunnelStatsEntry 4 }

      l2tpTunnelStatsRemoteHostName OBJECT-TYPE
            SYNTAX          SnmpAdminString
            MAX-ACCESS      read-only
            STATUS          current
            DESCRIPTION
               "This object contains the host name as discovered
```

```
            during the tunnel establishment phase (via the Host
            Name AVP) of the L2TP peer. If the tunnel is idle
            this object should maintain its value from the last
            time it was connected."
        ::= { l2tpTunnelStatsEntry 5 }

   l2tpTunnelStatsRemoteVendorName OBJECT-TYPE
        SYNTAX          SnmpAdminString
        MAX-ACCESS      read-only
        STATUS          current
        DESCRIPTION
           "This object identifies the vendor name of the peer's
            L2TP implementation. If the tunnel is idle this
            object should maintain its value from the last time
            it was connected."
        ::= { l2tpTunnelStatsEntry 6 }

   l2tpTunnelStatsRemoteFirmwareRev OBJECT-TYPE
        SYNTAX          Integer32
        MAX-ACCESS      read-only
        STATUS          current
        DESCRIPTION
           "This object contains the tunnel peer's firmware
            revision number. If the tunnel is idle this object
            should maintain its value from the last time it
            was connected."
        ::= { l2tpTunnelStatsEntry 7 }

   l2tpTunnelStatsRemoteProtocolVer OBJECT-TYPE
        SYNTAX          OCTET STRING (SIZE(2))
        MAX-ACCESS      read-only
        STATUS          current
        DESCRIPTION
           "This object describes the protocol version and
            revision of the tunnel peers implementation. The
            first octet contains the protocol version. The
            second octet contains the protocol revision."
        ::= { l2tpTunnelStatsEntry 8 }

   l2tpTunnelStatsInitialRemoteRWS OBJECT-TYPE
        SYNTAX          Integer32 (0..65535)
        MAX-ACCESS      read-only
        STATUS          current
        DESCRIPTION
           "This object contains the initial remote peer's
            receive window size as indicated by the tunnel peer
            (in the RWS AVP) during the tunnel establishment
            phase. If the tunnel is idle this object should
```

```
                maintain its value from the last time it was
                connected."
            ::= { l2tpTunnelStatsEntry 9 }

    l2tpTunnelStatsBearerCaps OBJECT-TYPE
            SYNTAX          INTEGER {
                                none(1),
                                digital(2),
                                analog(3),
                                digitalAnalog(4)
                            }
            MAX-ACCESS      read-only
            STATUS          current
            DESCRIPTION
               "This object describes the Bearer Capabilities of
                the tunnel peer. If the tunnel is idle this object
                should maintain its value from the last time it was
                connected."
            ::= { l2tpTunnelStatsEntry 10 }

    l2tpTunnelStatsFramingCaps OBJECT-TYPE
            SYNTAX          INTEGER {
                                none(1),
                                sync(2),
                                async(3),
                                syncAsync(4)
                            }
            MAX-ACCESS      read-only
            STATUS          current
            DESCRIPTION
               "This object describes the Framing Capabilities of
                the tunnel peer. If the tunnel is idle this object
                should maintain its value from the last time it was
                connected."
            ::= { l2tpTunnelStatsEntry 11 }

    l2tpTunnelStatsControlRxPkts OBJECT-TYPE
            SYNTAX          Counter32
            MAX-ACCESS      read-only
            STATUS          current
            DESCRIPTION
               "This object contains the number of control packets
                received on the tunnel."
            ::= { l2tpTunnelStatsEntry 12 }

    l2tpTunnelStatsControlRxZLB OBJECT-TYPE
            SYNTAX          Counter32
            MAX-ACCESS      read-only
```

```
            STATUS          current
            DESCRIPTION
               "This object returns a count of the number of Zero
                Length Body control packet acknowledgement packets
                that were received."
            ::= { l2tpTunnelStatsEntry 13 }

      l2tpTunnelStatsControlOutOfSeq OBJECT-TYPE
            SYNTAX          Counter32
            MAX-ACCESS      read-only
            STATUS          current
            DESCRIPTION
               "This object returns a count of the number of
                control packets that were not received in the
                correct order (as per the sequence number)
                on this tunnel including out of window
                packets."
            ::= { l2tpTunnelStatsEntry 14 }

      l2tpTunnelStatsControlOutOfWin OBJECT-TYPE
            SYNTAX          Counter32
            MAX-ACCESS      read-only
            STATUS          current
            DESCRIPTION
               "This object contains the number of control
                packets that were received outside of the
                offered receive window. It is implementation
                specific as to whether these packets are queued
                or discarded."
            ::= { l2tpTunnelStatsEntry 15 }

      l2tpTunnelStatsControlTxPkts OBJECT-TYPE
            SYNTAX          Counter32
            MAX-ACCESS      read-only
            STATUS          current
            DESCRIPTION
               "This object contains the number of control
                packets that were transmitted to the tunnel
                peer."
            ::= { l2tpTunnelStatsEntry 16 }

      l2tpTunnelStatsControlTxZLB OBJECT-TYPE
            SYNTAX          Counter32
            MAX-ACCESS      read-only
            STATUS          current
            DESCRIPTION
               "This object contains the number of Zero Length
                Body control packets transmitted to the tunnel
```

```
                peer."
            ::= { l2tpTunnelStatsEntry 17 }

    l2tpTunnelStatsControlAckTO OBJECT-TYPE
            SYNTAX          Counter32
            MAX-ACCESS      read-only
            STATUS          current
            DESCRIPTION
               "This object returns a count of the number of
                control packet timeouts due to the lack of a
                timely acknowledgement from the tunnel peer."
            ::= { l2tpTunnelStatsEntry 18 }

    l2tpTunnelStatsCurrentRemoteRWS OBJECT-TYPE
            SYNTAX          Gauge32 (0..65535)
            MAX-ACCESS      read-only
            STATUS          current
            DESCRIPTION
               "This object contains the current remote receive
                window size as determined by the local flow
                control mechanism employed."
            ::= { l2tpTunnelStatsEntry 19 }

    l2tpTunnelStatsTxSeq  OBJECT-TYPE
            SYNTAX          Integer32 (0..65535)
            MAX-ACCESS      read-only
            STATUS          current
            DESCRIPTION
               "This object contains the next send sequence number
                for the control channel."
            ::= { l2tpTunnelStatsEntry 20 }

    l2tpTunnelStatsTxSeqAck OBJECT-TYPE
            SYNTAX          Integer32 (0..65535)
            MAX-ACCESS      read-only
            STATUS          current
            DESCRIPTION
               "This object contains the send sequence number that
                the tunnel peer has acknowledged for the control
                channel. The flow control state can be determined
                by subtracting the l2tpTunnelStatsTxSeq from
                l2tpTunnelStatsTxSeqAck and comparing this value
                to l2tpTunnelStatsCurrentRemoteRWS (taking into
                consideration sequence number wraps)."
            ::= { l2tpTunnelStatsEntry 21 }

    l2tpTunnelStatsRxSeq  OBJECT-TYPE
            SYNTAX          Integer32 (0..65535)
```

```
            MAX-ACCESS      read-only
            STATUS          current
            DESCRIPTION
               "This object contains the next receive sequence
                number expected to be received on this control
                channel."
            ::= { l2tpTunnelStatsEntry 22 }

      l2tpTunnelStatsRxSeqAck OBJECT-TYPE
            SYNTAX          Integer32 (0..65535)
            MAX-ACCESS      read-only
            STATUS          current
            DESCRIPTION
               "This object contains the last receive sequence
                number that was acknowledged back to the tunnel
                peer for the control channel."
            ::= { l2tpTunnelStatsEntry 23 }

      l2tpTunnelStatsTotalSessions OBJECT-TYPE
            SYNTAX          Counter32
            MAX-ACCESS      read-only
            STATUS          current
            DESCRIPTION
               "This object contains the total number of sessions
                that this tunnel has successfully connected through
                to its tunnel peer since this tunnel was created."
            ::= { l2tpTunnelStatsEntry 24 }

      l2tpTunnelStatsFailedSessions OBJECT-TYPE
            SYNTAX          Counter32
            MAX-ACCESS      read-only
            STATUS          current
            DESCRIPTION
               "This object contains the total number of sessions
                that were initiated but failed to reach the
                established phase."
            ::= { l2tpTunnelStatsEntry 25 }

      l2tpTunnelStatsActiveSessions OBJECT-TYPE
            SYNTAX          Gauge32
            MAX-ACCESS      read-only
            STATUS          current
            DESCRIPTION
               "This object contains the total number of sessions
                in the established state for this tunnel."
            ::= { l2tpTunnelStatsEntry 26 }

      l2tpTunnelStatsLastResultCode OBJECT-TYPE
```

```
            SYNTAX          Integer32 (0..65535)
            MAX-ACCESS      read-only
            STATUS          current
            DESCRIPTION
               "This object contains the last value of the result
                code as described in the Result Code AVP which
                caused the tunnel to disconnect."
            ::= { l2tpTunnelStatsEntry 27 }

   l2tpTunnelStatsLastErrorCode OBJECT-TYPE
            SYNTAX          Integer32 (0..65535)
            MAX-ACCESS      read-only
            STATUS          current
            DESCRIPTION
               "This object contains the last value of the error
                code as described in the Result Code AVP which
                caused the tunnel to disconnect."
            ::= { l2tpTunnelStatsEntry 28 }

   l2tpTunnelStatsLastErrorMessage OBJECT-TYPE
            SYNTAX          SnmpAdminString
            MAX-ACCESS      read-only
            STATUS          current
            DESCRIPTION
               "This object contains the last value of the optional
                message as described in the Result Code AVP which
                caused the tunnel to disconnect."
            ::= { l2tpTunnelStatsEntry 29 }

   l2tpTunnelStatsDrainingTunnel OBJECT-TYPE
            SYNTAX          TruthValue
            MAX-ACCESS      read-only
            STATUS          current
            DESCRIPTION
               "This object indicates if this tunnel is draining
                off sessions. This object will return false(2) when
                the tunnel is not draining sessions or after the
                last session has disconnected when the tunnel is in
                the draining state."
            ::= { l2tpTunnelStatsEntry 30 }

   --
   --      { l2tpObjects 6 } reserved for future use
   --

   --
   --      The L2TP Session Status and Statistics Table
   --
```

```
   l2tpSessionStatsTable   OBJECT-TYPE
           SYNTAX          SEQUENCE OF L2tpSessionStatsEntry
           MAX-ACCESS      not-accessible
           STATUS          current
           DESCRIPTION
              "The L2TP session status and statistics table. This
               table contains the objects that can be used to
               describe the current status and statistics of a
               single L2TP tunneled session."
           ::= { l2tpObjects 7 }

   l2tpSessionStatsEntry   OBJECT-TYPE
           SYNTAX          L2tpSessionStatsEntry
           MAX-ACCESS      not-accessible
           STATUS          current
           DESCRIPTION
              "An L2TP session interface stats entry."
           INDEX { l2tpSessionStatsTunnelIfIndex,
                   l2tpSessionStatsLocalSID }
           ::= { l2tpSessionStatsTable 1 }

   L2tpSessionStatsEntry ::=
           SEQUENCE {
               l2tpSessionStatsTunnelIfIndex
                   InterfaceIndex,
               l2tpSessionStatsIfIndex
                   InterfaceIndex,
               l2tpSessionStatsLocalSID
                   Integer32,
               l2tpSessionStatsRemoteSID
                   Integer32,
               l2tpSessionStatsUserName
                   SnmpAdminString,
               l2tpSessionStatsState
                   INTEGER,
               l2tpSessionStatsCallType
                   INTEGER,
               l2tpSessionStatsCallSerialNumber
                   Unsigned32,
               l2tpSessionStatsTxConnectSpeed
                   Unsigned32,
               l2tpSessionStatsRxConnectSpeed
                   Unsigned32,
               l2tpSessionStatsCallBearerType
                   INTEGER,
               l2tpSessionStatsFramingType
                   INTEGER,
               l2tpSessionStatsPhysChanId
```

```
                Unsigned32,
            l2tpSessionStatsDNIS
                SnmpAdminString,
            l2tpSessionStatsCLID
                SnmpAdminString,
            l2tpSessionStatsSubAddress
                SnmpAdminString,
            l2tpSessionStatsPrivateGroupID
                SnmpAdminString,
            l2tpSessionStatsProxyLcp
                TruthValue,
            l2tpSessionStatsAuthMethod
                INTEGER,
            l2tpSessionStatsSequencingState
                INTEGER,
            l2tpSessionStatsOutSequence
                Counter32,
            l2tpSessionStatsReassemblyTO
                Counter32,
            l2tpSessionStatsTxSeq
                Integer32,
            l2tpSessionStatsRxSeq
                Integer32
        }

   l2tpSessionStatsTunnelIfIndex OBJECT-TYPE
        SYNTAX          InterfaceIndex
        MAX-ACCESS      not-accessible
        STATUS          current
        DESCRIPTION
           "This object identifies the session's associated
            L2TP tunnel ifIndex value."
        ::= { l2tpSessionStatsEntry 1 }

   l2tpSessionStatsIfIndex OBJECT-TYPE
        SYNTAX          InterfaceIndex
        MAX-ACCESS      read-only
        STATUS          current
        DESCRIPTION
           "This object identifies the ifIndex value of the
            interface from which PPP packets are being tunneled.
            For example this could be a DS0 ifIndex on a
            LAC or it would be the PPP ifIndex on the LNS."
        ::= { l2tpSessionStatsEntry 2 }

   l2tpSessionStatsLocalSID OBJECT-TYPE
        SYNTAX          Integer32 (1..65535)
        MAX-ACCESS      not-accessible
```

```
            STATUS          current
            DESCRIPTION
               "This object contains the local assigned session
                identifier for this session."
            REFERENCE "RFC 2661, Section 3.1"
            ::= { l2tpSessionStatsEntry 3 }

      l2tpSessionStatsRemoteSID OBJECT-TYPE
            SYNTAX          Integer32  (0..65535)
            MAX-ACCESS      read-only
            STATUS          current
            DESCRIPTION
               "This object contains the remote assigned session
                identifier for this session. When a session is
                starting this value may be zero until the remote
                tunnel endpoint has responded."
            REFERENCE "RFC 2661, Section 3.1"
            ::= { l2tpSessionStatsEntry 4 }

      l2tpSessionStatsUserName OBJECT-TYPE
            SYNTAX          SnmpAdminString
            MAX-ACCESS      read-only
            STATUS          current
            DESCRIPTION
               "This object identifies the peer session name on
                this interface. This is typically the login name
                of the remote user. If the user name is unknown to
                the local tunnel peer then this object will contain
                a null string."
            ::= { l2tpSessionStatsEntry 5 }

      l2tpSessionStatsState   OBJECT-TYPE
            SYNTAX          INTEGER {
                                sessionIdle(1),
                                sessionConnecting(2),
                                sessionEstablished(3),
                                sessionDisconnecting(4)
                            }
            MAX-ACCESS      read-only
            STATUS          current
            DESCRIPTION
               "This object contains the current state of the
                session."
            ::= { l2tpSessionStatsEntry 6 }

      l2tpSessionStatsCallType OBJECT-TYPE
            SYNTAX          INTEGER {
                                lacIncoming(1),
```

```
                            lnsIncoming(2),
                            lacOutgoing(3),
                            lnsOutgoing(4)
                        }
        MAX-ACCESS      read-only
        STATUS          current
        DESCRIPTION
           "This object indicates the type of call and the
            role this tunnel peer is providing for this
            session. For example, lacIncoming(1) indicates
            that this tunnel peer is acting as a LAC and
            generated a Incoming-Call-Request to the tunnel
            peer (the LNS). Note that tunnel peers can be
            both LAC and LNS simultaneously."
        ::= { l2tpSessionStatsEntry 7 }

   l2tpSessionStatsCallSerialNumber OBJECT-TYPE
        SYNTAX          Unsigned32
        MAX-ACCESS      read-only
        STATUS          current
        DESCRIPTION
           "This object contains the serial number that has
            been assigned to this  session."
        ::= { l2tpSessionStatsEntry 8 }

   l2tpSessionStatsTxConnectSpeed OBJECT-TYPE
        SYNTAX          Unsigned32
        UNITS           "bits per second"
        MAX-ACCESS      read-only
        STATUS          current
        DESCRIPTION
           "This object returns the last known transmit
            baud rate for this session."
        ::= { l2tpSessionStatsEntry 9 }

   l2tpSessionStatsRxConnectSpeed OBJECT-TYPE
        SYNTAX          Unsigned32
        UNITS           "bits per second"
        MAX-ACCESS      read-only
        STATUS          current
        DESCRIPTION
           "This object returns the last known receive
            baud rate for this session established."
        ::= { l2tpSessionStatsEntry 10 }

   l2tpSessionStatsCallBearerType OBJECT-TYPE
        SYNTAX          INTEGER {
                            none(1),
```

```
                            digital(2),
                            analog(3)
                        }
        MAX-ACCESS      read-only
        STATUS          current
        DESCRIPTION
           "This object describes the bearer type of this
            session."
        ::= { l2tpSessionStatsEntry 11 }

   l2tpSessionStatsFramingType OBJECT-TYPE
        SYNTAX          INTEGER {
                            none(1),
                            sync(2),
                            async(3)
                        }
        MAX-ACCESS      read-only
        STATUS          current
        DESCRIPTION
           "This object describes the framing type of this
            session."
        ::= { l2tpSessionStatsEntry 12 }

   l2tpSessionStatsPhysChanId OBJECT-TYPE
        SYNTAX          Unsigned32
        MAX-ACCESS      read-only
        STATUS          current
        DESCRIPTION
           "This object contains the physical channel
            identifier for the session."
        ::= { l2tpSessionStatsEntry 13 }

   l2tpSessionStatsDNIS    OBJECT-TYPE
        SYNTAX          SnmpAdminString
        MAX-ACCESS      read-only
        STATUS          current
        DESCRIPTION
           "This object identifies the Dialed Number
            Information String that the LAC obtained from
            the network for the session. If no DNIS was
            provided then a null string will be returned."
        ::= { l2tpSessionStatsEntry 14 }

   l2tpSessionStatsCLID    OBJECT-TYPE
        SYNTAX          SnmpAdminString
        MAX-ACCESS      read-only
        STATUS          current
        DESCRIPTION
```

```
            "This object identifies the Calling Line ID
             that the LAC obtained from the network for
             the session. If no CLID was provided then a
             null string will be returned."
         ::= { l2tpSessionStatsEntry 15 }

   l2tpSessionStatsSubAddress OBJECT-TYPE
         SYNTAX          SnmpAdminString
         MAX-ACCESS      read-only
         STATUS          current
         DESCRIPTION
            "This object identifies the Sub Address that
             the LAC obtained from the network for the
             session. If no Sub Address was provided then
             a null string will be returned."
         ::= { l2tpSessionStatsEntry 16 }

   l2tpSessionStatsPrivateGroupID OBJECT-TYPE
         SYNTAX          SnmpAdminString
         MAX-ACCESS      read-only
         STATUS          current
         DESCRIPTION
            "This object identifies the Private Group
             Identifier used for this tunneled session.
             If no Private Group Identifier was provided
             then a null string will be returned."
         ::= { l2tpSessionStatsEntry 17 }

   l2tpSessionStatsProxyLcp OBJECT-TYPE
         SYNTAX          TruthValue
         MAX-ACCESS      read-only
         STATUS          current
         DESCRIPTION
            "Indicates whether the LAC performed proxy LCP
             for this session."
         ::= { l2tpSessionStatsEntry 18 }

   l2tpSessionStatsAuthMethod OBJECT-TYPE
         SYNTAX          INTEGER {
                             none(1),
                             text(2),
                             pppChap(3),
                             pppPap(4),
                             pppEap(5),
                             pppMsChapV1(6),
                             pppMsChapV2(7),
                             other(8)
                         }
```

```
            MAX-ACCESS      read-only
            STATUS          current
            DESCRIPTION
               "This object contains the proxy authentication
                method employed by the LAC for the session. If
                l2tpSessionProxyLcp is false(2) this object
                should not be interpreted."
            ::= { l2tpSessionStatsEntry 19 }

      l2tpSessionStatsSequencingState OBJECT-TYPE
            SYNTAX          INTEGER {
                                none(1),
                                remote(2),
                                local(3),
                                both(4)
                            }
            MAX-ACCESS      read-only
            STATUS          current
            DESCRIPTION
               "This object defines which tunnel peers have
                requested payload sequencing. The value of
                both(4) indicates that both peers have requested
                payload sequencing."
            ::= { l2tpSessionStatsEntry 20 }

      l2tpSessionStatsOutSequence OBJECT-TYPE
            SYNTAX          Counter32
            MAX-ACCESS      read-only
            STATUS          current
            DESCRIPTION
               "This object returns the total number of packets
                received for this session which were received out
                of sequence."
            ::= { l2tpSessionStatsEntry 21 }

      l2tpSessionStatsReassemblyTO OBJECT-TYPE
            SYNTAX          Counter32
            MAX-ACCESS      read-only
            STATUS          current
            DESCRIPTION
               "This object returns the number of reassembly
                timeouts that have occurred for this session."
            ::= { l2tpSessionStatsEntry 22 }

      l2tpSessionStatsTxSeq OBJECT-TYPE
            SYNTAX          Integer32 (0..65535)
            MAX-ACCESS      read-only
            STATUS          current
```

```
            DESCRIPTION
               "This object contains the next send sequence number
                for for this session."
            ::= { l2tpSessionStatsEntry 23 }

      l2tpSessionStatsRxSeq OBJECT-TYPE
            SYNTAX          Integer32 (0..65535)
            MAX-ACCESS      read-only
            STATUS          current
            DESCRIPTION
               "This object contains the next receive sequence
                number expected to be received on this session."
            ::= { l2tpSessionStatsEntry 24 }

      --
      --      The L2TP Tunnel Mapping Table
      --

      l2tpTunnelMapTable      OBJECT-TYPE
            SYNTAX          SEQUENCE OF L2tpTunnelMapEntry
            MAX-ACCESS      not-accessible
            STATUS          current
            DESCRIPTION
               "The L2TP Tunnel index mapping table. This table
                is intended to assist management applications
                to quickly determine what the ifIndex value is
                for a given local tunnel identifier."
            ::= { l2tpObjects 8 }

      l2tpTunnelMapEntry OBJECT-TYPE
            SYNTAX          L2tpTunnelMapEntry
            MAX-ACCESS      not-accessible
            STATUS          current
            DESCRIPTION
               "An L2TP tunnel index map entry."
            INDEX { l2tpTunnelMapLocalTID }
            ::= { l2tpTunnelMapTable 1 }

      L2tpTunnelMapEntry ::=
            SEQUENCE {
                l2tpTunnelMapLocalTID
                    Integer32,
                l2tpTunnelMapIfIndex
                    InterfaceIndex
            }

      l2tpTunnelMapLocalTID   OBJECT-TYPE
            SYNTAX          Integer32 (1..65535)
```

```
            MAX-ACCESS      not-accessible
            STATUS          current
            DESCRIPTION
               "This object contains the local tunnel Identifier."
            REFERENCE "RFC 2661, Section 3.1"
            ::= { l2tpTunnelMapEntry 1 }

    l2tpTunnelMapIfIndex    OBJECT-TYPE
            SYNTAX          InterfaceIndex
            MAX-ACCESS      read-only
            STATUS          current
            DESCRIPTION
               "This value for this object is equal to the value
                of ifIndex of the Interfaces MIB for tunnel
                interfaces of type L2TP."
            ::= { l2tpTunnelMapEntry 2 }

    --
    --      The L2TP Session Mapping Table
    --

    l2tpSessionMapTable     OBJECT-TYPE
            SYNTAX          SEQUENCE OF L2tpSessionMapEntry
            MAX-ACCESS      not-accessible
            STATUS          current
            DESCRIPTION
               "The L2TP Session index mapping table. This table
                is intended to assist management applications
                to map interfaces to a tunnel and session
                identifier."
            ::= { l2tpObjects 9 }

    l2tpSessionMapEntry     OBJECT-TYPE
            SYNTAX          L2tpSessionMapEntry
            MAX-ACCESS      not-accessible
            STATUS          current
            DESCRIPTION
               "An L2TP Session index map entry."
            INDEX { l2tpSessionMapIfIndex }
            ::= { l2tpSessionMapTable 1 }

    L2tpSessionMapEntry ::=
            SEQUENCE {
                l2tpSessionMapIfIndex
                    InterfaceIndex,
                l2tpSessionMapTunnelIfIndex
                    InterfaceIndex,
                l2tpSessionMapLocalSID
```

```
                Integer32,
            l2tpSessionMapStatus
                RowStatus
        }

   l2tpSessionMapIfIndex   OBJECT-TYPE
           SYNTAX          InterfaceIndex
           MAX-ACCESS      not-accessible
           STATUS          current
           DESCRIPTION
              "This object identifies the ifIndex value of the
               interface which is receiving or sending its packets
               over an L2TP tunnel. For example this could be a DS0
               ifIndex on a LAC or a PPP ifIndex on the LNS."
           ::= { l2tpSessionMapEntry 1 }

   l2tpSessionMapTunnelIfIndex OBJECT-TYPE
           SYNTAX          InterfaceIndex
           MAX-ACCESS      read-create
           STATUS          current
           DESCRIPTION
              "This object identifies the sessions associated
               L2TP tunnel ifIndex value. When this object is
               set it provides a binding between a particular
               interface identified by l2tpSessionMapIfIndex
               to a particular tunnel."
           ::= { l2tpSessionMapEntry 2 }

   l2tpSessionMapLocalSID  OBJECT-TYPE
           SYNTAX          Integer32 (1..65535)
           MAX-ACCESS      read-only
           STATUS          current
           DESCRIPTION
              "This object contains the local assigned session
               identifier for this session."
           REFERENCE "RFC 2661, Section 3.1"
           ::= { l2tpSessionMapEntry 3 }

   l2tpSessionMapStatus    OBJECT-TYPE
           SYNTAX          RowStatus
           MAX-ACCESS      read-create
           STATUS          current
           DESCRIPTION
              "The status of this session map entry."
           ::= { l2tpSessionMapEntry 4 }

   --
   --      { l2tpIpUdpObjects 1 } reserved for future use
```

```
   --
   --      The L2TP UDP/IP Transport Status and Statistics Table
   --

   l2tpUdpStatsTable       OBJECT-TYPE
           SYNTAX          SEQUENCE OF L2tpUdpStatsEntry
           MAX-ACCESS      not-accessible
           STATUS          current
           DESCRIPTION
              "The L2TP UDP/IP transport stats table. This table
               contains objects that can be used to describe the
               current status and statistics of the UDP/IP L2TP
               tunnel transport."
           ::= { l2tpIpUdpObjects 2 }

   l2tpUdpStatsEntry       OBJECT-TYPE
           SYNTAX          L2tpUdpStatsEntry
           MAX-ACCESS      not-accessible
           STATUS          current
           DESCRIPTION
              "An L2TP UDP/IP transport stats entry."
           INDEX { l2tpUdpStatsIfIndex }
           ::= { l2tpUdpStatsTable 1 }

   L2tpUdpStatsEntry ::=
           SEQUENCE {
               l2tpUdpStatsIfIndex
                   InterfaceIndex,
               l2tpUdpStatsPeerPort
                   Integer32,
               l2tpUdpStatsLocalPort
                   Integer32
           }

   l2tpUdpStatsIfIndex     OBJECT-TYPE
           SYNTAX          InterfaceIndex
           MAX-ACCESS      not-accessible
           STATUS          current
           DESCRIPTION
              "This value for this object is equal to the
               value of ifIndex of the Interfaces MIB for
               tunnel interfaces of type L2TP and which have
               a L2TP transport of UDP/IP."
           ::= { l2tpUdpStatsEntry 1 }

   l2tpUdpStatsPeerPort    OBJECT-TYPE
           SYNTAX          Integer32 (0..65535)
           MAX-ACCESS      read-only
```

```
            STATUS          current
            DESCRIPTION
               "This object reflects the peer's UDP port number
                used for this tunnel. When not known a value of
                zero should be returned."
            ::= { l2tpUdpStatsEntry 2 }

      l2tpUdpStatsLocalPort   OBJECT-TYPE
            SYNTAX          Integer32 (0..65535)
            MAX-ACCESS      read-only
            STATUS          current
            DESCRIPTION
               "This object reflects the local UDP port number
                that this tunnel is bound to."
            ::= { l2tpUdpStatsEntry 3 }

      --
      --      Definition of generic L2TP notifications
      --

      l2tpTunnelAuthFailure NOTIFICATION-TYPE
            OBJECTS         {
                            l2tpTunnelStatsInitiated,
                            l2tpTunnelStatsRemoteHostName
                            }
            STATUS          current
            DESCRIPTION
               "A l2tpTunnelAuthFailure trap signifies that an
                attempt to establish a tunnel to a remote peer
                has failed authentication."
            ::= { l2tpNotifications 1 }

      --
      --      conformance information
      --

      l2tpGroups      OBJECT IDENTIFIER ::= { l2tpConformance 1 }
      l2tpCompliances OBJECT IDENTIFIER ::= { l2tpConformance 2 }

      --
      --      compliance statements
      --

      l2tpMIBFullCompliance MODULE-COMPLIANCE
            STATUS          current
            DESCRIPTION
               "When this MIB is implemented with support for
                read-create and read-write, then such an
```

```
            implementation can claim full compliance. Such
            an implementation can then be both monitored
            and configured with this MIB."

         MODULE          -- this module

      -- unconditionally mandatory groups
         MANDATORY-GROUPS {
                             l2tpConfigGroup,
                             l2tpStatsGroup,
                             l2tpTrapGroup
                          }
      -- conditionally mandatory groups
         GROUP           l2tpIpUdpGroup
         DESCRIPTION
            "This group is mandatory for implementations that
             support L2TP over UDP/IP."

      -- optional groups
         GROUP           l2tpDomainGroup
         DESCRIPTION
            "This group is optional for L2TP devices that
             group tunnel endpoints into tunnel domains."

      -- optional Mapping Group
         GROUP           l2tpMappingGroup
         DESCRIPTION
            "This group is optional for L2TP devices that
             provide index mapping."

      -- optional Security Group
         GROUP           l2tpSecurityGroup
         DESCRIPTION
            "This group is optional for SNMP agents which support
             both authentication and privacy of SNMP messages for
             the management of L2TP keys."

      -- optional High Capacity Group
         GROUP           l2tpHCPacketGroup
         DESCRIPTION
            "This group is mandatory for implementations that
             support the l2tpDomainGroup AND could potentially
             overflow the L2TP Domain 32-bit counters is less
             than one hour."

        ::= { l2tpCompliances 1 }

   l2tpMIBReadOnlyCompliance MODULE-COMPLIANCE
```

```
            STATUS          current
            DESCRIPTION
               "When this MIB is implemented without support for
                read-create and read-write (i.e. in read-only mode),
                then such an implementation can claim read-only
                compliance. Such an implementation can then be
                monitored but can not be configured with this MIB."

            MODULE          -- this module

          -- unconditionally mandatory groups
            MANDATORY-GROUPS {
                               l2tpConfigGroup,
                               l2tpStatsGroup,
                               l2tpTrapGroup
                             }

            OBJECT   l2tpAdminState
            MIN-ACCESS read-only
            DESCRIPTION
               "Write access is not required."

            OBJECT   l2tpDrainTunnels
            MIN-ACCESS read-only
            DESCRIPTION
               "Write access is not required."

            OBJECT   l2tpTunnelConfigDomainId
            MIN-ACCESS read-only
            DESCRIPTION
               "Write access is not required."

            OBJECT   l2tpTunnelConfigHelloInterval
            MIN-ACCESS read-only
            DESCRIPTION
               "Write access is not required."

            OBJECT   l2tpTunnelConfigIdleTimeout
            MIN-ACCESS read-only
            DESCRIPTION
               "Write access is not required."

            OBJECT   l2tpTunnelConfigControlRWS
            MIN-ACCESS read-only
            DESCRIPTION
               "Write access is not required."

            OBJECT   l2tpTunnelConfigControlMaxRetx
```

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

            OBJECT   l2tpTunnelConfigControlMaxRetxTO
            MIN-ACCESS read-only
            DESCRIPTION
               "Write access is not required."

            OBJECT   l2tpTunnelConfigPayloadSeq
            MIN-ACCESS read-only
            DESCRIPTION
               "Write access is not required."

            OBJECT   l2tpTunnelConfigReassemblyTO
            MIN-ACCESS read-only
            DESCRIPTION
               "Write access is not required."

            OBJECT   l2tpTunnelConfigTransport
            MIN-ACCESS read-only
            DESCRIPTION
               "Write access is not required."

            OBJECT   l2tpTunnelConfigDrainTunnel
            MIN-ACCESS read-only
            DESCRIPTION
               "Write access is not required."

            OBJECT   l2tpTunnelConfigProxyPPPAuth
            MIN-ACCESS read-only
            DESCRIPTION
               "Write access is not required."

         -- conditionally mandatory groups
            GROUP           l2tpIpUdpGroup
            DESCRIPTION
               "This group is mandatory for implementations that
                support L2TP over UDP/IP."

         -- optional groups
            GROUP           l2tpDomainGroup
            DESCRIPTION
               "This group is optional for L2TP devices that
                group tunnel endpoints into tunnel domains."

            OBJECT   l2tpDomainConfigAdminState
            MIN-ACCESS read-only
```

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

            OBJECT   l2tpDomainConfigDrainTunnels
            MIN-ACCESS read-only
            DESCRIPTION
               "Write access is not required."

            OBJECT   l2tpDomainConfigTunnelHelloInt
            MIN-ACCESS read-only
            DESCRIPTION
               "Write access is not required."

            OBJECT   l2tpDomainConfigTunnelIdleTO
            MIN-ACCESS read-only
            DESCRIPTION
               "Write access is not required."

            OBJECT   l2tpDomainConfigControlRWS
            MIN-ACCESS read-only
            DESCRIPTION
               "Write access is not required."

            OBJECT   l2tpDomainConfigControlMaxRetx
            MIN-ACCESS read-only
            DESCRIPTION
               "Write access is not required."

            OBJECT   l2tpDomainConfigControlMaxRetxTO
            MIN-ACCESS read-only
            DESCRIPTION
               "Write access is not required."

            OBJECT   l2tpDomainConfigPayloadSeq
            MIN-ACCESS read-only
            DESCRIPTION
               "Write access is not required."

            OBJECT   l2tpDomainConfigReassemblyTO
            MIN-ACCESS read-only
            DESCRIPTION
               "Write access is not required."

            OBJECT   l2tpDomainConfigProxyPPPAuth
            MIN-ACCESS read-only
            DESCRIPTION
               "Write access is not required."
```

```
            OBJECT   l2tpDomainConfigStorageType
            MIN-ACCESS read-only
            DESCRIPTION
               "Write access is not required."

            OBJECT   l2tpDomainConfigStatus
            MIN-ACCESS read-only
            DESCRIPTION
               "Write access is not required."

         -- optional Mapping Group
            GROUP           l2tpMappingGroup
            DESCRIPTION
               "This group is optional for L2TP devices that
                provide index mapping."

            OBJECT   l2tpSessionMapTunnelIfIndex
            MIN-ACCESS read-only
            DESCRIPTION
               "Write access is not required."

            OBJECT   l2tpSessionMapStatus
            MIN-ACCESS read-only
            DESCRIPTION
               "Write access is not required."

         -- optional Security Group
            GROUP           l2tpSecurityGroup
            DESCRIPTION
               "This group is optional for SNMP agents which support
                both authentication and privacy of SNMP messages for
                the management of L2TP keys."

            OBJECT   l2tpDomainConfigAuth
            MIN-ACCESS read-only
            DESCRIPTION
               "Write access is not required."

            OBJECT   l2tpDomainConfigSecret
            MIN-ACCESS read-only
            DESCRIPTION
               "Write access is not required."

            OBJECT   l2tpDomainConfigTunnelSecurity
            MIN-ACCESS read-only
            DESCRIPTION
               "Write access is not required."
```

```
            OBJECT   l2tpTunnelConfigAuth
            MIN-ACCESS read-only
            DESCRIPTION
               "Write access is not required."

            OBJECT   l2tpTunnelConfigSecret
            MIN-ACCESS read-only
            DESCRIPTION
               "Write access is not required."

            OBJECT   l2tpTunnelConfigSecurity
            MIN-ACCESS read-only
            DESCRIPTION
               "Write access is not required."

         -- optional High Capacity Group
            GROUP           l2tpHCPacketGroup
            DESCRIPTION
               "This group is mandatory for implementations that
                support the l2tpDomainGroup AND could potentially
                overflow the L2TP Domain 32-bit counters is less
                than one hour."

            ::= { l2tpCompliances 2 }

   -- units of conformance

   l2tpConfigGroup OBJECT-GROUP
            OBJECTS {
                l2tpAdminState,
                l2tpDrainTunnels,
                l2tpTunnelConfigDomainId,
                l2tpTunnelConfigHelloInterval,
                l2tpTunnelConfigIdleTimeout,
                l2tpTunnelConfigControlRWS,
                l2tpTunnelConfigControlMaxRetx,
                l2tpTunnelConfigControlMaxRetxTO,
                l2tpTunnelConfigPayloadSeq,
                l2tpTunnelConfigReassemblyTO,
                l2tpTunnelConfigTransport,
                l2tpTunnelConfigDrainTunnel,
                l2tpTunnelConfigProxyPPPAuth
            }
            STATUS          current
            DESCRIPTION
               "A collection of objects providing configuration
                information of the L2TP protocol, tunnels and
                sessions."
```

```
            ::= { l2tpGroups 1 }

    l2tpStatsGroup OBJECT-GROUP
            OBJECTS {
                l2tpProtocolVersions,
                l2tpVendorName,
                l2tpFirmwareRev,
                l2tpDrainingTunnels,
                l2tpTunnelStatsLocalTID,
                l2tpTunnelStatsRemoteTID,
                l2tpTunnelStatsState,
                l2tpTunnelStatsInitiated,
                l2tpTunnelStatsRemoteHostName,
                l2tpTunnelStatsRemoteVendorName,
                l2tpTunnelStatsRemoteFirmwareRev,
                l2tpTunnelStatsRemoteProtocolVer,
                l2tpTunnelStatsInitialRemoteRWS,
                l2tpTunnelStatsBearerCaps,
                l2tpTunnelStatsFramingCaps,
                l2tpTunnelStatsControlRxPkts,
                l2tpTunnelStatsControlRxZLB,
                l2tpTunnelStatsControlOutOfSeq,
                l2tpTunnelStatsControlOutOfWin,
                l2tpTunnelStatsControlTxPkts,
                l2tpTunnelStatsControlTxZLB,
                l2tpTunnelStatsControlAckTO,
                l2tpTunnelStatsCurrentRemoteRWS,
                l2tpTunnelStatsTxSeq,
                l2tpTunnelStatsTxSeqAck,
                l2tpTunnelStatsRxSeq,
                l2tpTunnelStatsRxSeqAck,
                l2tpTunnelStatsTotalSessions,
                l2tpTunnelStatsFailedSessions,
                l2tpTunnelStatsActiveSessions,
                l2tpTunnelStatsLastResultCode,
                l2tpTunnelStatsLastErrorCode,
                l2tpTunnelStatsLastErrorMessage,
                l2tpTunnelStatsDrainingTunnel,
                l2tpSessionStatsIfIndex,
                l2tpSessionStatsRemoteSID,
                l2tpSessionStatsUserName,
                l2tpSessionStatsState,
                l2tpSessionStatsCallType,
                l2tpSessionStatsCallSerialNumber,
                l2tpSessionStatsTxConnectSpeed,
                l2tpSessionStatsRxConnectSpeed,
                l2tpSessionStatsCallBearerType,
                l2tpSessionStatsFramingType,
```

```
                l2tpSessionStatsPhysChanId,
                l2tpSessionStatsDNIS,
                l2tpSessionStatsCLID,
                l2tpSessionStatsSubAddress,
                l2tpSessionStatsPrivateGroupID,
                l2tpSessionStatsProxyLcp,
                l2tpSessionStatsAuthMethod,
                l2tpSessionStatsSequencingState,
                l2tpSessionStatsOutSequence,
                l2tpSessionStatsReassemblyTO,
                l2tpSessionStatsTxSeq,
                l2tpSessionStatsRxSeq
            }
            STATUS          current
            DESCRIPTION
               "A collection of objects providing status and
                statistics of the L2TP protocol, tunnels and
                sessions."
            ::= { l2tpGroups 2 }

    l2tpIpUdpGroup OBJECT-GROUP
            OBJECTS {
                l2tpUdpStatsPeerPort,
                l2tpUdpStatsLocalPort
            }
            STATUS          current
            DESCRIPTION
               "A collection of objects providing status and
                statistics of the L2TP UDP/IP transport layer."
            ::= { l2tpGroups 3 }

    l2tpDomainGroup OBJECT-GROUP
            OBJECTS {
                l2tpDomainConfigAdminState,
                l2tpDomainConfigDrainTunnels,
                l2tpDomainConfigTunnelHelloInt,
                l2tpDomainConfigTunnelIdleTO,
                l2tpDomainConfigControlRWS,
                l2tpDomainConfigControlMaxRetx,
                l2tpDomainConfigControlMaxRetxTO,
                l2tpDomainConfigPayloadSeq,
                l2tpDomainConfigReassemblyTO,
                l2tpDomainConfigProxyPPPAuth,
                l2tpDomainConfigStorageType,
                l2tpDomainConfigStatus,
                l2tpDomainStatsTotalTunnels,
                l2tpDomainStatsFailedTunnels,
                l2tpDomainStatsFailedAuths,
```

```
            l2tpDomainStatsActiveTunnels,
            l2tpDomainStatsTotalSessions,
            l2tpDomainStatsFailedSessions,
            l2tpDomainStatsActiveSessions,
            l2tpDomainStatsDrainingTunnels,
            l2tpDomainStatsControlRxOctets,
            l2tpDomainStatsControlRxPkts,
            l2tpDomainStatsControlTxOctets,
            l2tpDomainStatsControlTxPkts,
            l2tpDomainStatsPayloadRxOctets,
            l2tpDomainStatsPayloadRxPkts,
            l2tpDomainStatsPayloadRxDiscs,
            l2tpDomainStatsPayloadTxOctets,
            l2tpDomainStatsPayloadTxPkts
        }
        STATUS          current
        DESCRIPTION
           "A collection of objects providing configuration,
            status and statistics of L2TP tunnel domains."
        ::= { l2tpGroups 4 }

   l2tpMappingGroup OBJECT-GROUP
        OBJECTS {
            l2tpTunnelMapIfIndex,
            l2tpSessionMapTunnelIfIndex,
            l2tpSessionMapLocalSID,
            l2tpSessionMapStatus
        }
        STATUS          current
        DESCRIPTION
           "A collection of objects providing index mapping."
        ::= { l2tpGroups 5 }

   l2tpSecurityGroup OBJECT-GROUP
        OBJECTS {
            l2tpDomainConfigAuth,
            l2tpDomainConfigSecret,
            l2tpDomainConfigTunnelSecurity,
            l2tpTunnelConfigAuth,
            l2tpTunnelConfigSecret,
            l2tpTunnelConfigSecurity
        }
        STATUS          current
        DESCRIPTION
           "A collection of objects providing L2TP security
            configuration."
        ::= { l2tpGroups 6 }
```

```
   l2tpTrapGroup NOTIFICATION-GROUP
           NOTIFICATIONS {
               l2tpTunnelAuthFailure
           }
           STATUS          current
           DESCRIPTION
              "A collection of L2TP trap events as specified
               in NOTIFICATION-TYPE constructs."
           ::= { l2tpGroups 7 }

   l2tpHCPacketGroup OBJECT-GROUP
           OBJECTS {
               l2tpDomainStatsControlHCRxOctets,
               l2tpDomainStatsControlHCRxPkts,
               l2tpDomainStatsControlHCTxOctets,
               l2tpDomainStatsControlHCTxPkts,
               l2tpDomainStatsPayloadHCRxOctets,
               l2tpDomainStatsPayloadHCRxPkts,
               l2tpDomainStatsPayloadHCRxDiscs,
               l2tpDomainStatsPayloadHCTxOctets,
               l2tpDomainStatsPayloadHCTxPkts
            }
           STATUS          current
           DESCRIPTION
              "A collection of objects providing High Capacity
               64-bit counter objects."
           ::= { l2tpGroups 8 }

   END
```

5.0 Security Considerations

This MIB contains readable objects whose values provide information related to L2TP tunnel interfaces. There are also a number of objects that have a MAX-ACCESS clause of read-write and/or read-create, such as those which allow an administrator to dynamically configure tunnels.

While unauthorized access to the readable objects is relatively innocuous, unauthorized access to the write-able objects could cause a denial of service, or could cause unauthorized creation and/or manipulation of tunnels. Hence, the support for SET operations in a non-secure environment without proper protection can have a negative effect on network operations.

SNMPv1 by itself is such an insecure environment. Even if the network itself is secure (for example by using IPSec [RFC2401]), even then, there is no control as to who on the secure network is allowed to access and SET (change/create/delete) the objects in this MIB.

If the agent allows configuring keys (for example the l2tpDomainConfigSecret object) via SNMP, for use by L2TP, then the security of L2TP is at best only as secure as SNMP. For this reason, all objects in the l2tpSecurityGroup MUST NOT be accessible via unencrypted messages. It is also recommended that keys not be made visible through SNMP GET (or GET-NEXT or GET-BULK) messages, even if encryption is used.

It is recommended that the implementers consider the security features as provided by the SNMPv3 framework. Specifically, the use of the User-based Security Model RFC 2574 [RFC2574] and the View-based Access Control Model RFC 2575 [RFC2575] is recommended.

It is then a customer/user responsibility to ensure that the SNMP entity giving access to this MIB, is properly configured to give access to those objects only to those principals (users) that have legitimate rights to access them.

6.0 Acknowledgements

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7.0 References

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