        Definitions of Managed Objects for High Bit-Rate DSL - 2nd generation
              (HDSL2) and Single-Pair High-Speed Digital Subscriber
                              Line (SHDSL) Lines

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.

Abstract

   This document defines a portion of the Management Information Base
   (MIB) module for use with network management protocols in the
   Internet community. In particular, it describes objects used for
   managing High Bit-Rate DSL - 2nd generation (HDSL2) and Single-Pair
   High-Speed Digital Subscriber Line (SHDSL) interfaces.

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1. Introduction

   This document defines a portion of the Management Information Base
   (MIB) module for use with network management protocols in the
   Internet community. In particular, it describes objects used for
   managing High Bit-Rate DSL - 2nd generation (HDSL2) [18] and Single-
   Pair High-Speed Digital Subscriber Line (SHDSL) interfaces [19].

2. The SNMP Management Framework

   The SNMP Management Framework presently consists of five major
   components:

   o   An overall architecture, described in RFC 2571 [1].

   o   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 is described in
       STD 16, RFC 1155 [2], STD 16, RFC 1212 [3], and RFC 1215 [4]. The
       second version, called SMIv2, is described in STD 58, RFC 2578
       [5], RFC 2579 [6], and RFC 2580 [7].

   o   Message protocols for transferring management information. The
       first version of the SNMP message protocol is called SNMPv1 and is
       described in STD 15, RFC 1157 [8]. A second version of the SNMP
       message protocol, which is not an Internet standards track
       protocol, is called SNMPv2c and described is in RFC 1901 [9] and
       RFC 1906 [10]. The third version of the message protocol is
       called SNMPv3 and is described in RFC 1906 [10], RFC 2572 [11],
       and RFC 2574 [12].

   o   Protocol operations for accessing management information. The
       first set of protocol operations and associated PDU formats is
       described in STD 15, RFC 1157 [8]. A second set of protocol
       operations and associated PDU formats is described in RFC 1905
       [13].

   o   A set of fundamental applications described in RFC 2573 [14] and
       the view-based access control mechanism described in RFC 2575
       [15].

A more detailed introduction to the current SNMP Management Framework
can be found in RFC 2570 [16].

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.

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT",
"SHOULD", "SHOULD NOT", "RECOMMENDED", "MAY", and "OPTIONAL" in this
document are to be interpreted as described in RFC 2119 [17].

3. Introduction

This document describes an SNMP MIB for managing HDSL2/SHDSL Lines.
These definitions are based upon the specifications for the HDSL2 and
SHDSL Embedded Operations Channel (EOC) as defined in ANSI
T1E1.4/2000-006 [18] and ITU G.991.2 [19].

The MIB is located in the MIB tree under MIB 2 transmission, as
discussed in the MIB-2 Integration (RFC 1213 [20] and RFC 2863 [21])
section of this document.

3.1. Relationship of the HDSL2/SHDSL Line MIB to other MIBs

This section outlines the relationship of this MIB with other MIBs
described in RFCs. Specifically, IF-MIB as presented in RFC 2863
[21] is discussed.

3.1.1 General IF-MIB Integration (RFC 2863)

The HDSL2/SHDSL Line MIB specifies the detailed attributes of a data
interface. As such, it needs to integrate with RFC 2863 [21]. The
IANA has assigned the following ifTypes to HDSL2 and SHDSL:

```
IANAifType ::= TEXTUAL-CONVENTION
    ...
SYNTAX INTEGER {
    ...
    hdsl2 (168), -- High Bit-Rate DSL, 2nd generation
    shdsl (169), -- Multirate HDSL2
    ...
    }
```

Note that the ifFixedLengthGroup from RFC 2863 [21] MUST be supported
and that the ifRcvAddressGroup does not apply to this MIB.

3.1.2 Usage of ifTable

The MIB branch identified by this ifType contains tables appropriate
for this interface type. Most such tables extend the ifEntry table,
and are indexed by ifIndex. For interfaces in systems implementing
this MIB, those table entries indexed by ifIndex MUST be persistent.

The following attributes are part of the mandatory ifGeneral group in
RFC 2863 [21], and are not duplicated in the HDSL2/SHDSL Line MIB.

```
========================================================================
      ifIndex                 Interface index.

      ifDescr                 See interfaces MIB [21].

      ifType                  hdsl2(168) or shdsl(169).

      ifSpeed                 Set as appropriate.
                              (This is fixed at 1552000 for HDSL2
                              lines)

      ifPhysAddress           This object MUST have an octet string
                              with zero length.

      ifAdminStatus           See interfaces MIB [21].

      ifOperStatus            See interfaces MIB [21].

      ifLastChange            See interfaces MIB [21].

      ifName                  See interfaces MIB [21].

      ifLinkUpDownTrapEnable  Default to enabled(1).

      ifHighSpeed             Set as appropriate.
                              (For HDSL2 lines, this is fixed at 2)

      ifConnectorPresent      Set as appropriate.

========================================================================
```
Figure 1: Use of ifTable Objects

3.2 IANA Considerations

   The HDSL2-SHDSL-LINE-MIB module requires the allocation of a single
   object identifier for its MODULE-IDENTITY. The IANA has allocated
   this object identifier in the transmission subtree (48), defined in
   the SNMPv2-SMI MIB module.

4. Conventions used in the MIB

4.1. Naming Conventions

   A. xtuC refers to a central site terminal unit;
       H2TU-C for HDSL2, or STU-C for SHDSL.
   B. xtuR refers to a remote site terminal unit;
       H2TU-R for HDSL2, or STU-R for SHDSL.
   C. xtu refers to a terminal unit; either an xtuC or xtuR.

       D. xru refer to a regenerator unit;
           H2RU for HDSL2, or SRU for SHDSL.
       E. xU refers to any HDSL2/SHDSL unit; either an xtu or xru.
       F. CRC is cyclic redundancy check [19].
       G. ES means errored second [19].
       H. LOSW means loss of sync word [19].
       I. LOSWS means LOSW seconds [19].
       J. SES means severely errored second [19].
       K. SNR means signal-to-noise ratio [19].
       L. UAS means unavailable second [19].

4.2. Textual Conventions

   The following textual conventions are defined to reflect the line
   topology in the MIB (further discussed in the following section) and
   to define the behavior of the statistics to be maintained by an
   agent.

   o   Hdsl2ShdslUnitId:

   Attributes with this syntax uniquely identify each unit in a
   HDSL2/SHDSL span. It mirrors the EOC addressing mechanism:

   xtuC(1)   - CO terminal unit
   xtuR(2)   - CPE terminal unit
   xru1(3) .. xru8(10)   - regenerators, numbered from
                              central office side
   o   Hdsl2ShdslUnitSide:

   Attributes with this syntax reference the two sides of a unit:

   networkSide(1)   - N in figure 2, below
   customerSide(2) - C in figure 2, below

   o   Hdsl2ShdslWirePair:

   Attributes with this syntax reference the wire-pairs connecting the
   units:

   wirePair1(1)   - First pair for HDSL2/SHDSL.

   wirePair2(2)   - Optional second pair for SHDSL only.

   o   Hdsl2ShdslTransmissionModeType:

   Attributes with this syntax specify the regional setting for a SHDSL
   line. Specified as a BITS construct, the two mode types are:

```
region1   - ITU-T G.991.2 Annex A
region2   - ITU-T G.991.2 Annex B
```

o   Hdsl2ShdslPerfCurrDayCount:

Attributes with this syntax define the behavior of the 1-day (24
hour) gauges found in the MIB.

o   Hdsl2Shdsl1DayIntervalCount:

Attributes with this syntax define the behavior of the 1-day (24
hour) interval counters found in the MIB.

o   Hdsl2ShdslPerfTimeElapsed:

Attributes with this syntax define the behavior of the elapsed time
counters found in the MIB.

o   Hdsl2ShdslPerfIntervalThreshold:

Attributes with this syntax define the behavior of the alarm
thresholds found in the MIB.

o   Hdsl2ShdslClockReferenceType

Attributes with this syntax define the clock references for the
HDSL2/SHDSL span.

4.3. Structure

The MIB is structured into following MIB groups:

o   Span Configuration Group:

This group supports MIB objects for configuring parameters for the
HDSL2/SHDSL span. It contains the following table:

    - hdsl2ShdslSpanConfTable

o   Span Status Group:

This group supports MIB objects for retrieving span status
information. It contains the following table:

    - hdsl2ShdslSpanStatusTable

   o   Unit Inventory Group:

   This group supports MIB objects for retrieving unit inventory
   information about units in HDSL2/SHDSL lines via the EOC. It contains
   the following table:

      - hdsl2ShdslInventoryTable

   o   Segment Endpoint Configuration Group:

   This group supports MIB objects for configuring parameters for the
   HDSL2/SHDSL segment endpoints. It contains the following table:

      - hdsl2ShdslEndpointConfTable

   o   Segment Endpoint Current Status/Performance Group:

   This group supports MIB objects that provide the current
   status/performance information relating to segment endpoints. It
   contains the following table:

      - hdsl2ShdslEndpointCurrTable

   o   Segment Endpoint 15-Minute Interval Status/Performance Group:

   This group supports MIB objects that provide historic
   status/performance information relating to segment endpoints in 15-
   minute intervals. It contains the following table:

      - hdsl2Shdsl15MinIntervalTable

   o   Segment Endpoint 1-Day Interval Status/Performance Group:

   This group supports MIB objects that provide historic
   status/performance information relating to segment endpoints in 1-day
   intervals. It contains the following table:

      - hdsl2Shdsl1DayIntervalTable

   o   Maintenance Group:

   This group supports MIB objects for performing maintenance operations
   such as loopbacks for HDSL2/SHDSL lines. It contains the following
   table(s):

      - hdsl2ShdslEndpointMaintTable
      - hdsl2ShdslUnitMaintTable

o   Span Configuration Profile Group:

This group supports MIB objects for defining configuration profiles
for HDSL2/SHDSL Spans. It contains the following table:

- hdsl2ShdslSpanConfProfileTable

o   Segment Endpoint Alarm Configuration Profile Group:

This group supports MIB objects for defining alarm configuration
profiles for HDSL2/SHDSL Segment Endpoints. It contains the
following table:

- hdsl2ShdslEndpointAlarmConfProfileTable

o   Notifications Group:

This group defines the notifications supported for HDSL2/SHDSL lines:

- hdsl2ShdslLoopAttenCrossing
- hdsl2ShdslSNRMarginCrossing
- hdsl2ShdslPerfESThresh
- hdsl2ShdslPerfSESThresh
- hdsl2ShdslPerfCRCanomaliesThresh
- hdsl2ShdslPerfLOSWSThresh
- hdsl2ShdslPerfUASThresh
- hdsl2ShdslSpanInvalidNumRepeaters
- hdsl2ShdslLoopbackFailure
- hdsl2ShdslpowerBackoff
- hdsl2ShdsldeviceFault
- hdsl2ShdsldcContinuityFault
- hdsl2ShdslconfigInitFailure
- hdsl2ShdslprotocolInitFailure
- hdsl2ShdslnoNeighborPresent
- hdsl2ShdslLocalPowerLoss

4.3.1 Line Topology

An HDSL2/SHDSL Line consists of a minimum of two units - xtuC (the
central termination unit) and an xtuR (the remote termination unit).
The line may optionally support up to 8 repeater/regenerator units
(xru) as shown in the figure below.

```
     <-- Network Side                          Customer Side -->

    |<//////////////////// HDSL2/SHDSL Span ///////////////////>|

             <~~~>           <~~~> HDSL2/SHDSL Segments  <~~~>

     +-------+   +-------+   +-------+      +-------+   +-------+
     +        C=1=N        C=1=N        C=..1..=N        C=1=N        +
     | xtuC  |   | xru1  |   | xru2  |      | xru8  |   | xtuR  |
     +        C=2=N        C=2=N        C=..2..=N        C=2=N        +
     +-------+   +-------+   +-------+      +-------+   +-------+


     Key:   <////> HDSL2/SHDSL Span
            <~~~~> HDSL2/SHDSL Segment
            =1=    HDSL2/SHDSL wire-pair-1
            =2=    SHDSL optional wire-pair-2 (Not applicable to HDSL2)
            C      Customer Side Segment Endpoint (modem)
            N      Network Side Segment Endpoint (modem)
```
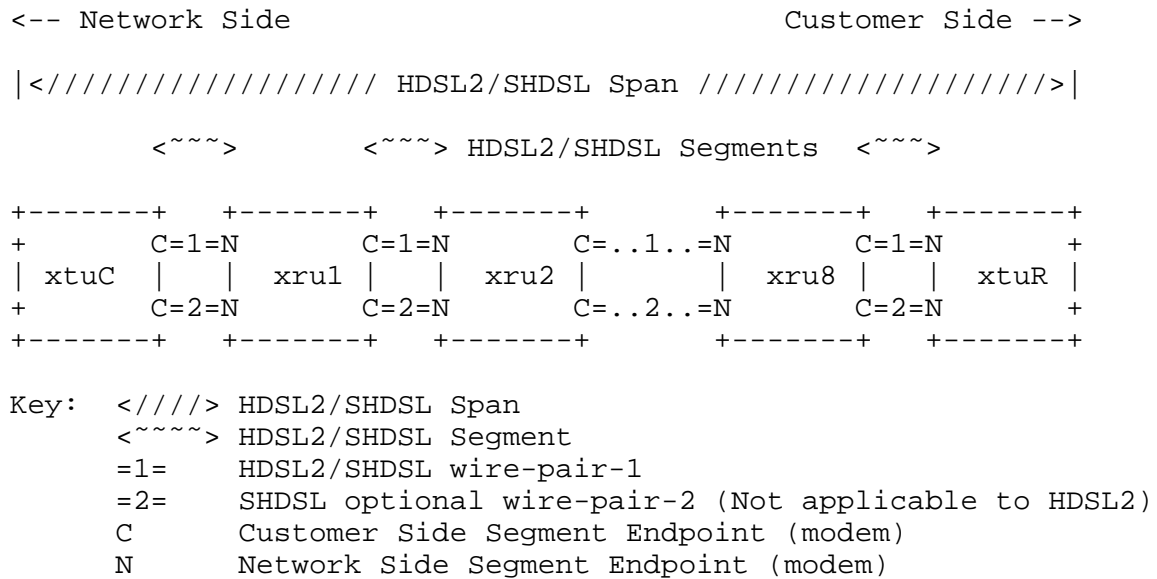
           Figure 2: General topology for an HDSL2/SHDSL Line

4.4. Counters, Interval Buckets and Thresholds

   For SNR Margin, Loop Attenuation, ES, SES, CRC anomalies, LOSW, and
   UAS, there are event counters, current 15-minute and 0 to 96 15-
   minute history bucket(s) of "interval-counters", as well as current
   and 0 to 30 previous 1-day interval-counter(s). Each current 15-
   minute event bucket has an associated threshold notification.

   Unlike RFC 2493 [22] and RFC 2662 [23], there is no representation in
   the MIB for invalid buckets. In those cases where the data for an
   interval is suspect or known to be invalid, the agent MUST NOT report
   the interval. If the current 15-minute event bucket is determined to
   be invalid, notifications based upon the value of the event bucket
   MUST NOT be generated.

   Not reporting an interval will result in holes in the associated
   table. For example, the table, hdsl2Shdsl15MinIntervalTable, is
   indexed by { ifIndex, hdsl2ShdslInvIndex, hdsl2ShdslEndpointSide,
   hdsl2ShdslEndpointWirePair, hdsl2Shdsl15MinIntervalNumber}. If
   interval 12 is determined to be invalid but intervals 11 and 13 are
   valid, a Get Next operation on the indices .1.1.1.1.11 would return
   indices .1.1.1.1.13.

There is no requirement for an agent to ensure a fixed relationship
between the start of a fifteen minute interval and any wall clock;
however some implementations may align the fifteen minute intervals
with quarter hours. Likewise, an implementation may choose to align
one day intervals with the start of a day.

Counters are not reset when an xU is reinitialized, only when the
agent is reset or reinitialized (or under specific request outside
the scope of this MIB).

4.5. Profiles

As a managed node can handle a large number of xUs, (e.g., hundreds
or perhaps thousands of lines), provisioning every parameter on every
xU may become burdensome. Moreover, most lines are provisioned
identically with the same set of parameters. To simplify the
provisioning process, this MIB makes use of profiles. A profile is a
set of parameters that can be shared by multiple lines using the same
configuration.

The following profiles are used in this MIB:

o Span Configuration Profiles - Span configuration profiles contain
   parameters for configuring HDSL2/SHDSL spans. They are defined in
   the hdsl2ShdslSpanConfProfileTable. Since span configuration
   parameters are only applicable for SHDSL, the support for span
   configuration profiles are optional for HDSL2 interfaces.

   Note that the configuration of the span dictates the behavior for
   each individual segment end point in the span. If a different
   configuration is provisioned for any given segment end point
   within the span, the new configuration for this segment end point
   will override the span configuration for this segment end point
   only.

o Segment Endpoint Alarm Configuration Profiles - These profiles
   contain parameters for configuring alarm thresholds for
   HDSL2/SHDSL segment endpoints. These profiles are defined in the
   hdsl2ShdslEndpointAlarmConfProfileTable.

   The index value for this profile is a locally-unique
   administratively assigned name for the profile having the textual
   convention 'SnmpAdminString' (RFC 2571 [1]).

One or more lines may be configured to share parameters of a single
profile (e.g., hdsl2ShdslEndpointAlarmConfProfile = 'silver') by
setting its hdsl2ShdslEndpointAlarmConfProfile objects to the value
of this profile. If a change is made to the profile, all lines that

refer to it will be reconfigured to the changed parameters. Before a
profile can be deleted or taken out of service it must be first
unreferenced from all associated lines.

Implementations MUST provide a default profile whose name is 'DEFVAL'
for each profile type. The values of the associated parameters will
be vendor specific unless otherwise indicated in this document.
Before a line's profiles have been set, these profiles will be
automatically used by setting hdsl2ShdslEndpointAlarmConfProfile and
hdsl2ShdslSpanConfProfile to 'DEFVAL' where appropriate. This
default profile name, 'DEFVAL', is considered reserved in the context
of profiles defined in this MIB.

Profiles are created, assigned, and deleted dynamically using the
profile name and profile row status in each of the four profile
tables.

Profile changes MUST take effect immediately. These changes MAY
result in a restart (hard reset or soft restart) of the units on the
line.

4.6. Notifications

The ability to generate the SNMP notifications coldStart/WarmStart
(per [21]) which are per agent (e.g., per Digital Subscriber Line
Access Multiplexer, or DSLAM, in such a device), and linkUp/linkDown
(per [21]) which are per interface (i.e., HDSL2/SHDSL line) is
required.

A linkDown notification MAY be generated whenever any of ES, SES, CRC
Anomaly, LOSW, or UAS event occurs. The corresponding linkUp
notification MAY be sent when all link failure conditions are
cleared.

The notifications defined in this MIB are for initialization failure
and for the threshold crossings associated with the following events:
ES, SES, CRC Anomaly, LOSW, and UAS. Each threshold has its own
enable/threshold value. When that value is 0, the notification is
disabled.

The hdsl2ShdslEndpointCurrStatus is a bitmask representing all
outstanding error conditions associated with a particular Segment
Endpoint. Note that since status of remote endpoints is obtained via
the EOC, this information may be unavailable for units that are
unreachable via EOC during a line error condition. Therefore, not
all conditions may always be included in its current status.
Notifications corresponding to the bit fields in this object are
defined.

Two alarm conditions, SNR Margin Alarm and Loop Attenuation Alarm,
are organized in a manner slightly different from that implied in the
EOC specifications. In the MIB, these alarm conditions are tied to
the two thresholds hdsl2ShdslEndpointThreshSNRMargin and
hdsl2ShdslEndpointThreshLoopAttenuation found in the
hdsl2ShdslEndpointAlarmConfProfileTable. In the EOC, the alarm
conditions associated with these thresholds are per-unit. In the
MIB, these alarm conditions are per-endpoint. For terminal units,
this has no impact. For repeaters, this implies an implementation
variance where the agent in the terminal unit is responsible for
detecting a threshold crossing. As the reporting of a repeater
detected alarm condition to the polling terminal unit occurs in the
same EOC message as the reporting of the current SNR Margin and Loop
Attenuation values, it is anticipated that this will have very little
impact on agent implementation.

A threshold notification occurs whenever the corresponding current
15-minute interval error counter becomes equal to, or exceeds the
threshold value. One notification may be sent per interval per
interface. Since the current 15-minute counter is reset to 0 every
15 minutes, and if the condition persists, the notification may recur
as often as every 15 minutes. For example, to get a notification
whenever a "loss of" event occurs (but at most once every 15
minutes), set the corresponding threshold to 1. The agent will
generate a notification when the event originally occurs.

Note that the Network Management System, or NMS, may receive a
linkDown notification, as well, if enabled (via
ifLinkUpDownTrapEnable [21]). At the beginning of the next 15 minute
interval, the counter is reset. When the first second goes by and
the event occurs, the current interval bucket will be 1, which equals
the threshold, and the notification will be sent again.

A hdsl2ShdslSpanInvalidNumRepeaters notification may be generated
following completion of the discovery phase if the number of
repeaters discovered on the line differs from the number of repeaters
specified in hdsl2ShdslSpanConfNumRepeaters. For those conditions
where the number of provisioned repeaters is greater than those
encountered during span discovery, all table entries associated with
the nonexistent repeaters are to be discarded. For those conditions
where the number of provisioned repeaters is less than those
encountered during span discovery, additional table entries are to be
created using the default span configuration profile.

5. Conformance and Compliance

    For both HDSL2 and SHDSL lines, the following group(s) are mandatory:

        hdsl2ShdslSpanConfGroup
        hdsl2ShdslSpanStatusGroup
        hdsl2ShdslInventoryGroup
        hdsl2ShdslEndpointConfGroup
        hdsl2Shdsl15MinIntervalGroup
        hdsl2Shdsl1DayIntervalGroup
        hdsl2ShdslMaintenanceGroup
        hdsl2ShdslEndpointAlarmConfGroup
        hdsl2ShdslNotificationGroup

    For HDSL2 lines, the following group(s) are optional:

        hdsl2ShdslSpanConfProfileGroup
        hdsl2ShdslSpanShdslStatusGroup

6. Definitions

HDSL2-SHDSL-LINE-MIB DEFINITIONS ::= BEGIN

IMPORTS
MODULE-IDENTITY,
OBJECT-TYPE,
Counter32,
Unsigned32,
Gauge32,
NOTIFICATION-TYPE,
Integer32,
transmission   FROM SNMPv2-SMI
RowStatus,
TEXTUAL-CONVENTION   FROM SNMPv2-TC
ifIndex   FROM IF-MIB
PerfCurrentCount,
PerfIntervalCount   FROM PerfHist-TC-MIB
SnmpAdminString   FROM SNMP-FRAMEWORK-MIB
MODULE-COMPLIANCE,
OBJECT-GROUP,
NOTIFICATION-GROUP   FROM SNMPv2-CONF;

hdsl2ShdslMIB MODULE-IDENTITY
    LAST-UPDATED "200205090000Z" -- May 9, 2002
    ORGANIZATION "ADSLMIB Working Group"
    CONTACT-INFO "WG-email: adslmib@ietf.org
              Info: https://www1.ietf.org/mailman/listinfo/adslmib
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DESCRIPTION
      "This MIB module defines a collection of objects for managing
       HDSL2/SHDSL lines. An agent may reside at either end of the
       line, however the MIB is designed to require no management
       communication between the modems beyond that inherent in the
       low-level EOC line protocol as defined in ANSI T1E1.4/2000-006
       (for HDSL2 lines), or in ITU G.991.2 (for SHDSL lines)."
 REVISION "200205090000Z" -- May 9, 2002
 DESCRIPTION "Initial version, published as RFC 3276."

 ::= { transmission 48 }

hdsl2ShdslMibObjects OBJECT IDENTIFIER ::= { hdsl2ShdslMIB 1 }

-- Textual Conventions used in this MIB
--

Hdsl2ShdslPerfCurrDayCount ::= TEXTUAL-CONVENTION
    STATUS   current
    DESCRIPTION
      "A gauge associated with interface performance measurements in
       a current 1-day (24 hour) measurement interval.

       The value of this gauge starts at zero at the beginning of an
       interval and is increased when associated events occur, until
       the end of the 1-day interval. At that time the value of the
       gauge is stored in the previous 1-day history interval, as
       defined in a companion object of type

          Hdsl2Shdsl1DayIntevalCount, and the current interval gauge
          is restarted at zero.

          In the case where the agent has no valid data available for
          this interval the corresponding object instance is not
          available and upon a retrieval request a corresponding error
          message shall be returned to indicate that this instance does
          not exist. Please note that zero is a valid value."
     SYNTAX Gauge32

Hdsl2Shdsl1DayIntervalCount ::= TEXTUAL-CONVENTION
     STATUS   current
     DESCRIPTION
       "A counter associated with interface performance measurements
        during the most previous 1-day (24 hour) measurement interval.
        The value of this gauge is equal to the value of the current
        day gauge, as defined in a companion object of type
        Hdsl2ShdslPerfCurrDayCount, at the end of its most recent
        interval.

        In the case where the agent has no valid data available for
        this interval the corresponding object instance is not
        available and upon a retrieval request a corresponding error
        message shall be returned to indicate that this instance does
        not exist."
     SYNTAX Gauge32

Hdsl2ShdslPerfTimeElapsed ::= TEXTUAL-CONVENTION
     STATUS   current
     DESCRIPTION
       "The number of seconds that have elapsed since the beginning of
        the current measurement period. If, for some reason, such as
        an adjustment in the system's time-of-day clock or the addition
        of a leap second, the current interval exceeds the maximum
        value, the agent will return the maximum value.

        For 15 minute intervals, the range is limited to (0..899).
        For 24 hour intervals, the range is limited to (0..86399)."
     SYNTAX   Unsigned32(0..86399)

Hdsl2ShdslPerfIntervalThreshold ::= TEXTUAL-CONVENTION
     STATUS   current
     DESCRIPTION
       "This convention defines a range of values that may be set in
        a fault threshold alarm control. As the number of seconds in
        a 15-minute interval numbers at most 900, objects of this type
        may have a range of 0...900, where the value of 0 disables the
        alarm."

```
   SYNTAX     Unsigned32(0..900)


Hdsl2ShdslUnitId ::= TEXTUAL-CONVENTION
   STATUS     current
   DESCRIPTION
     "This is the unique identification for all units in a
      HDSL2/SHDSL Span.  It is based on the EOC unit addressing
      scheme with reference to the xtuC."
   SYNTAX     INTEGER
          {
          xtuC(1),
          xtuR(2),
          xru1(3),
          xru2(4),
          xru3(5),
          xru4(6),
          xru5(7),
          xru6(8),
          xru7(9),
          xru8(10)
          }

Hdsl2ShdslUnitSide ::= TEXTUAL-CONVENTION
   STATUS     current
   DESCRIPTION
     "This is the referenced side of a HDSL2/SHDSL unit - Network
      or Customer side.  The side facing the Network is the Network
      side, while the side facing the Customer is the Customer side."
   SYNTAX     INTEGER
          {
          networkSide(1),
          customerSide(2)
          }

Hdsl2ShdslWirePair ::= TEXTUAL-CONVENTION
   STATUS     current
   DESCRIPTION
     "This is the referenced pair of wires in a HDSL2/SHDSL Segment.
      HDSL2 only supports a single pair (wirePair1), while SHDSL
      supports an optional second pair (wirePair2)."
   SYNTAX     INTEGER
          {
          wirePair1(1),
          wirePair2(2)
          }

Hdsl2ShdslTransmissionModeType ::= TEXTUAL-CONVENTION
   STATUS     current
```

```
   DESCRIPTION
      "Contains the regional setting of the HDSL2/SHDSL span,
      represented as a bit-map of possible settings. The various
      bit positions are:

      Bit   Meaning        Description
      1     region 1       Indicates ITU-T G.991.2 Annex A.
      2     region 2       Indicates ITU-T G.991.2 Annex B."
   SYNTAX      BITS
            {
            region1(0),
            region2(1)
            }


Hdsl2ShdslClockReferenceType ::= TEXTUAL-CONVENTION
   STATUS      current
   DESCRIPTION
      "The various STU-C symbol clock references for the
      HDSL2/SHDSL span, represented as an enumeration."
   SYNTAX      INTEGER
            {
            localClk(1),           -- Mode-1 per G991.2
            networkClk(2),         -- Mode-2 per G991.2
            dataOrNetworkClk(3),   -- Mode-3a per G991.2
            dataClk(4)             -- Mode-3b per G991.2
            }

-- Span Configuration Group
--


hdsl2ShdslSpanConfTable OBJECT-TYPE
   SYNTAX      SEQUENCE OF Hdsl2ShdslSpanConfEntry
   MAX-ACCESS not-accessible
   STATUS      current
   DESCRIPTION
      "This table supports overall configuration of HDSL2/SHDSL
       Spans.  Entries in this table MUST be maintained in a
       persistent manner."
   ::= { hdsl2ShdslMibObjects 1 }


hdsl2ShdslSpanConfEntry OBJECT-TYPE
   SYNTAX       Hdsl2ShdslSpanConfEntry
   MAX-ACCESS  not-accessible
   STATUS       current
   DESCRIPTION
      "An entry in the hdsl2ShdslSpanConfTable.  Each entry
       represents the complete Span in a single HDSL2/SHDSL line.
       It is indexed by the ifIndex of the associated HDSL2/SHDSL
```

```
        line."
    INDEX { ifIndex }
    ::= { hdsl2ShdslSpanConfTable 1 }


Hdsl2ShdslSpanConfEntry ::=
    SEQUENCE
    {
    hdsl2ShdslSpanConfNumRepeaters          Unsigned32,
    hdsl2ShdslSpanConfProfile               SnmpAdminString,
    hdsl2ShdslSpanConfAlarmProfile          SnmpAdminString
    }

    hdsl2ShdslSpanConfNumRepeaters OBJECT-TYPE
    SYNTAX      Unsigned32(0..8)
    UNITS       "repeaters"
    MAX-ACCESS  read-write
    STATUS      current
    DESCRIPTION
      "This object provisions the number of repeaters/regenerators
      in this HDSL2/SHDSL Span."
    ::= { hdsl2ShdslSpanConfEntry 1 }

hdsl2ShdslSpanConfProfile OBJECT-TYPE
    SYNTAX      SnmpAdminString (SIZE(1..32))
    MAX-ACCESS  read-write
    STATUS      current
    DESCRIPTION
      "This object is a pointer to a span configuration profile in
      the hdsl2ShdslSpanConfProfileTable, which applies to this span.
      The value of this object is the index of the referenced profile
      in the hdsl2ShdslSpanConfProfileTable.  Note that span
      configuration profiles are only applicable to SHDSL lines.

      HDSL2 lines MUST reference the default profile, 'DEFVAL'.
      By default, this object will have the value 'DEFVAL' (the index
      of the default profile).

      Any attempt to set this object to a value that is not the value
      of the index for an active entry in the profile table,
      hdsl2ShdslSpanConfProfileTable, MUST be rejected."
    ::= { hdsl2ShdslSpanConfEntry 2 }

hdsl2ShdslSpanConfAlarmProfile OBJECT-TYPE
    SYNTAX      SnmpAdminString (SIZE(1..32))
    MAX-ACCESS  read-write
    STATUS      current
    DESCRIPTION
      "This object is a pointer to an Alarm configuration profile in
```

      the hdsl2ShdslEndpointAlarmConfProfileTable. The value of this
      object is the index of the referenced profile in the
      hdsl2ShdslEndpointAlarmConfProfileTable. The alarm threshold
      configuration in the referenced profile will be used by default
      for all segment endpoints in this span. Individual endpoints
      may override this profile by explicitly specifying some other
      profile in the hdsl2ShdslEndpointConfTable. By default, this
      object will have the value 'DEFVAL' (the index of the default
      profile).

      Any attempt to set this object to a value that is not the value
      of the index for an active entry in the profile table,
      hdsl2ShdslEndpointAlarmConfProfileTable, MUST be rejected."
   ::= { hdsl2ShdslSpanConfEntry 3 }

-- Span Status Group
--

hdsl2ShdslSpanStatusTable OBJECT-TYPE
   SYNTAX   SEQUENCE OF Hdsl2ShdslSpanStatusEntry
   MAX-ACCESS not-accessible
   STATUS   current
   DESCRIPTION
     "This table provides overall status information of
      HDSL2/SHDSL spans. This table contains live data from
      equipment. As such, it is NOT persistent."
   ::= { hdsl2ShdslMibObjects 2 }

hdsl2ShdslSpanStatusEntry OBJECT-TYPE
   SYNTAX   Hdsl2ShdslSpanStatusEntry
   MAX-ACCESS not-accessible
   STATUS   current
   DESCRIPTION
     "An entry in the hdsl2ShdslSpanStatusTable. Each entry
      represents the complete span in a single HDSL2/SHDSL line.
      It is indexed by the ifIndex of the associated HDSL2/SHDSL
      line."
   INDEX { ifIndex }
   ::= { hdsl2ShdslSpanStatusTable 1 }

Hdsl2ShdslSpanStatusEntry ::=
   SEQUENCE
   {
   hdsl2ShdslStatusNumAvailRepeaters   Unsigned32,
   hdsl2ShdslStatusMaxAttainableLineRate   Unsigned32,
   hdsl2ShdslStatusActualLineRate   Unsigned32,
   hdsl2ShdslStatusTransmissionModeCurrent
            Hdsl2ShdslTransmissionModeType

```
    }

hdsl2ShdslStatusNumAvailRepeaters OBJECT-TYPE
    SYNTAX       Unsigned32(0..8)
    MAX-ACCESS   read-only
    STATUS       current
    DESCRIPTION
      "Contains the actual number of repeaters/regenerators
       discovered in this HDSL2/SHDSL span."
    ::= { hdsl2ShdslSpanStatusEntry 1 }

hdsl2ShdslStatusMaxAttainableLineRate OBJECT-TYPE
    SYNTAX       Unsigned32(0..4112000)
    UNITS        "bps"
    MAX-ACCESS   read-only
    STATUS       current
    DESCRIPTION
      "Contains the maximum attainable line rate in this HDSL2/SHDSL
       span.  This object provides the maximum rate the line is
       capable of achieving.  This is based upon measurements made
       during line probing."
    ::= { hdsl2ShdslSpanStatusEntry 2 }

hdsl2ShdslStatusActualLineRate OBJECT-TYPE
    SYNTAX       Unsigned32(0..4112000)
    UNITS        "bps"
    MAX-ACCESS   read-only
    STATUS       current
    DESCRIPTION
      "Contains the actual line rate in this HDSL2/SHDSL span.  This
       should equal ifSpeed."
    ::= { hdsl2ShdslSpanStatusEntry 3 }

hdsl2ShdslStatusTransmissionModeCurrent OBJECT-TYPE
    SYNTAX       Hdsl2ShdslTransmissionModeType
    MAX-ACCESS   read-only
    STATUS       current
    DESCRIPTION
      "Contains the current Power Spectral Density (PSD) regional
       setting of the HDSL2/SHDSL span."
    ::= { hdsl2ShdslSpanStatusEntry 4 }

-- Unit Inventory Group
--

hdsl2ShdslInventoryTable OBJECT-TYPE
    SYNTAX       SEQUENCE OF Hdsl2ShdslInventoryEntry
    MAX-ACCESS not-accessible
```

```
    STATUS      current
    DESCRIPTION
      "This table supports retrieval of unit inventory information
       available via the EOC from units in a HDSL2/SHDSL line.

       Entries in this table are dynamically created during the
       line discovery process.  The life cycle for these entries
       is as follows:

          - xtu discovers a device, either a far-end xtu or an xru
          - an inventory table entry is created for the device
          - the line goes down for whatever reason
          - inventory table entries for unreachable devices are
            destroyed.

       As these entries are created/destroyed dynamically, they
       are NOT persistent."
    ::= { hdsl2ShdslMibObjects 3 }

hdsl2ShdslInventoryEntry OBJECT-TYPE
    SYNTAX      Hdsl2ShdslInventoryEntry
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
      "An entry in the hdsl2ShdslInventoryTable.  Each entry
       represents inventory information for a single unit in a
       HDSL2/SHDSL line.  It is indexed by the ifIndex of the
       HDSL2/SHDSL line and the Hdsl2ShdslUnitId of the
       associated unit."
    INDEX { ifIndex, hdsl2ShdslInvIndex }
    ::= { hdsl2ShdslInventoryTable 1 }

Hdsl2ShdslInventoryEntry ::=
    SEQUENCE
    {
    hdsl2ShdslInvIndex                      Hdsl2ShdslUnitId,
    hdsl2ShdslInvVendorID                   OCTET STRING,
    hdsl2ShdslInvVendorModelNumber          OCTET STRING,
    hdsl2ShdslInvVendorSerialNumber         OCTET STRING,
    hdsl2ShdslInvVendorEOCSoftwareVersion   Integer32,
    hdsl2ShdslInvStandardVersion            Integer32,
    hdsl2ShdslInvVendorListNumber           OCTET STRING,
    hdsl2ShdslInvVendorIssueNumber          OCTET STRING,
    hdsl2ShdslInvVendorSoftwareVersion      OCTET STRING,
    hdsl2ShdslInvEquipmentCode              OCTET STRING,
    hdsl2ShdslInvVendorOther                OCTET STRING,
    hdsl2ShdslInvTransmissionModeCapability
                          Hdsl2ShdslTransmissionModeType
```

```
    }

hdsl2ShdslInvIndex OBJECT-TYPE
    SYNTAX       Hdsl2ShdslUnitId
    MAX-ACCESS   not-accessible
    STATUS       current
    DESCRIPTION
        "Each entry in this table corresponds to a physical element
        in a HDSL2/SHDSL Span.  It is based on the EOC unit addressing
        scheme with reference to the xtuC."
    ::= { hdsl2ShdslInventoryEntry 1 }

hdsl2ShdslInvVendorID OBJECT-TYPE
    SYNTAX       OCTET STRING(SIZE(8))
    MAX-ACCESS   read-only
    STATUS       current
    DESCRIPTION
        "Vendor ID as reported in an Inventory Response message."
    ::= { hdsl2ShdslInventoryEntry 2 }

hdsl2ShdslInvVendorModelNumber OBJECT-TYPE
    SYNTAX       OCTET STRING(SIZE(12))
    MAX-ACCESS   read-only
    STATUS       current
    DESCRIPTION
        "Vendor model number as reported in an Inventory Response
         message."
    ::= { hdsl2ShdslInventoryEntry 3 }

hdsl2ShdslInvVendorSerialNumber OBJECT-TYPE
    SYNTAX       OCTET STRING(SIZE(12))
    MAX-ACCESS   read-only
    STATUS       current
    DESCRIPTION
        "Vendor serial number as reported in an Inventory Response
         message."
    ::= { hdsl2ShdslInventoryEntry 4 }

hdsl2ShdslInvVendorEOCSoftwareVersion OBJECT-TYPE
    SYNTAX       Integer32
    MAX-ACCESS   read-only
    STATUS       current
    DESCRIPTION
        "Vendor EOC version as reported in a Discovery Response
         message."
    ::= { hdsl2ShdslInventoryEntry 5 }

hdsl2ShdslInvStandardVersion OBJECT-TYPE
```

```
   SYNTAX      Integer32
   MAX-ACCESS  read-only
   STATUS      current
   DESCRIPTION
     "Version of the HDSL2/SHDSL standard implemented, as reported
      in an Inventory Response message."
   ::= { hdsl2ShdslInventoryEntry 6 }

hdsl2ShdslInvVendorListNumber OBJECT-TYPE
   SYNTAX      OCTET STRING(SIZE(3))
   MAX-ACCESS  read-only
   STATUS      current
   DESCRIPTION
     "Vendor list number as reported in an Inventory Response
      message."
   ::= { hdsl2ShdslInventoryEntry 7 }

hdsl2ShdslInvVendorIssueNumber OBJECT-TYPE
   SYNTAX      OCTET STRING(SIZE(2))
   MAX-ACCESS  read-only
   STATUS      current
   DESCRIPTION
     "Vendor issue number as reported in an Inventory Response
      message."
   ::= { hdsl2ShdslInventoryEntry 8 }

hdsl2ShdslInvVendorSoftwareVersion OBJECT-TYPE
   SYNTAX      OCTET STRING(SIZE(6))
   MAX-ACCESS  read-only
   STATUS      current
   DESCRIPTION
     "Vendor software version as reported in an Inventory Response
      message."
   ::= { hdsl2ShdslInventoryEntry 9 }

hdsl2ShdslInvEquipmentCode OBJECT-TYPE
   SYNTAX      OCTET STRING(SIZE(10))
   MAX-ACCESS  read-only
   STATUS      current
   DESCRIPTION
     "Equipment code conforming to ANSI T1.213, Coded Identification
      of Equipment Entities."
   ::= { hdsl2ShdslInventoryEntry 10 }

hdsl2ShdslInvVendorOther OBJECT-TYPE
   SYNTAX      OCTET STRING(SIZE(12))
   MAX-ACCESS  read-only
   STATUS      current
```

```
     DESCRIPTION
       "Other vendor information as reported in an Inventory Response
        message."
     ::= { hdsl2ShdslInventoryEntry 11 }

hdsl2ShdslInvTransmissionModeCapability OBJECT-TYPE
    SYNTAX       Hdsl2ShdslTransmissionModeType
    MAX-ACCESS   read-only
    STATUS       current
    DESCRIPTION
       "Contains the transmission mode capability of the SHDSL unit."
    ::= { hdsl2ShdslInventoryEntry 12 }

-- Segment Endpoint Configuration Group
--

hdsl2ShdslEndpointConfTable OBJECT-TYPE
    SYNTAX       SEQUENCE OF Hdsl2ShdslEndpointConfEntry
    MAX-ACCESS   not-accessible
    STATUS       current
    DESCRIPTION
       "This table supports configuration parameters for segment
        endpoints in a HDSL2/SHDSL line.  As this table is indexed
        by ifIndex, it MUST be maintained in a persistent manner."
    ::= { hdsl2ShdslMibObjects 4 }

hdsl2ShdslEndpointConfEntry OBJECT-TYPE
    SYNTAX       Hdsl2ShdslEndpointConfEntry
    MAX-ACCESS   not-accessible
    STATUS       current
    DESCRIPTION
       "An entry in the hdsl2ShdslEndpointConfTable.  Each entry
        represents a single segment endpoint in a HDSL2/SHDSL line.
        It is indexed by the ifIndex of the HDSL2/SHDSL line, the
        UnitId of the associated unit, the side of the unit, and the
        wire-pair of the associated modem."
    INDEX { ifIndex, hdsl2ShdslInvIndex, hdsl2ShdslEndpointSide,
            hdsl2ShdslEndpointWirePair}
    ::= { hdsl2ShdslEndpointConfTable 1 }

Hdsl2ShdslEndpointConfEntry ::=
    SEQUENCE
    {
    hdsl2ShdslEndpointSide                   Hdsl2ShdslUnitSide,
    hdsl2ShdslEndpointWirePair               Hdsl2ShdslWirePair,
    hdsl2ShdslEndpointAlarmConfProfile       SnmpAdminString
    }
```

```
hdsl2ShdslEndpointSide OBJECT-TYPE
    SYNTAX        Hdsl2ShdslUnitSide
    MAX-ACCESS    not-accessible
    STATUS        current
    DESCRIPTION
      "The side of the unit associated with this segment endpoint -
       Network/Customer side - as per the Hdsl2ShdslUnitSide textual
       convention."
    ::= { hdsl2ShdslEndpointConfEntry 1 }

hdsl2ShdslEndpointWirePair OBJECT-TYPE
    SYNTAX        Hdsl2ShdslWirePair
    MAX-ACCESS    not-accessible
    STATUS        current
    DESCRIPTION
      "The wire-pair of the modem associated with this segment
       endpoint as per the Hdsl2ShdslWirePair textual convention."
    ::= { hdsl2ShdslEndpointConfEntry 2 }

hdsl2ShdslEndpointAlarmConfProfile OBJECT-TYPE
    SYNTAX        SnmpAdminString (SIZE(0..32))
    MAX-ACCESS    read-write
    STATUS        current
    DESCRIPTION
      "This object configures the alarm threshold values to be used
       for this segment endpoint.  The values are obtained from the
       alarm configuration profile referenced by this object.  The
       value of this object is the index of the referenced profile in
       the hdsl2ShdslEndpointAlarmConfProfileTable, or NULL (a zero-
       length SnmpAdminString).  If the value is a zero-length
       SnmpAdminString, the endpoint uses the default Alarm
       Configuration Profile for the associated span as per the
       hdsl2ShdslSpanConfAlarmProfile object in the
       hdsl2ShdslSpanConfTable.  The default value of this object is
       a zero-length SnmpAdminString.

       Any attempt to set this object to a value that is not the value
       of the index for an active entry in the profile table,
       hdsl2ShdslEndpointAlarmConfProfileTable, MUST be rejected."
    ::= { hdsl2ShdslEndpointConfEntry 3 }

-- Segment Endpoint Current Status/Performance Group
--

hdsl2ShdslEndpointCurrTable OBJECT-TYPE
    SYNTAX        SEQUENCE OF Hdsl2ShdslEndpointCurrEntry
    MAX-ACCESS    not-accessible
    STATUS        current
```

```
     DESCRIPTION
        "This table contains current status and performance information
         for segment endpoints in HDSL2/SHDSL Lines.  As with other
         tables in this MIB indexed by ifIndex, entries in this table
         MUST be maintained in a persistent manner."
      ::= { hdsl2ShdslMibObjects 5 }

hdsl2ShdslEndpointCurrEntry OBJECT-TYPE
     SYNTAX      Hdsl2ShdslEndpointCurrEntry
     MAX-ACCESS  not-accessible
     STATUS      current
     DESCRIPTION
        "An entry in the hdsl2ShdslEndpointCurrTable.  Each entry
         contains status and performance information relating to a
         single segment endpoint.  It is indexed by the ifIndex of the
         HDSL2/SHDSL line, the UnitId of the associated unit, the side
         of the unit, and the wire-pair of the associated modem."
      INDEX { ifIndex, hdsl2ShdslInvIndex, hdsl2ShdslEndpointSide,
              hdsl2ShdslEndpointWirePair }
      ::= { hdsl2ShdslEndpointCurrTable 1 }

Hdsl2ShdslEndpointCurrEntry ::=
     SEQUENCE
     {
     hdsl2ShdslEndpointCurrAtn               Integer32,
     hdsl2ShdslEndpointCurrSnrMgn            Integer32,
     hdsl2ShdslEndpointCurrStatus            BITS,
     hdsl2ShdslEndpointES                    Counter32,
     hdsl2ShdslEndpointSES                   Counter32,
     hdsl2ShdslEndpointCRCanomalies          Counter32,
     hdsl2ShdslEndpointLOSWS                 Counter32,
     hdsl2ShdslEndpointUAS                   Counter32,
     hdsl2ShdslEndpointCurr15MinTimeElapsed
                              Hdsl2ShdslPerfTimeElapsed,
     hdsl2ShdslEndpointCurr15MinES           PerfCurrentCount,
     hdsl2ShdslEndpointCurr15MinSES          PerfCurrentCount,
     hdsl2ShdslEndpointCurr15MinCRCanomalies PerfCurrentCount,
     hdsl2ShdslEndpointCurr15MinLOSWS        PerfCurrentCount,
     hdsl2ShdslEndpointCurr15MinUAS          PerfCurrentCount,
     hdsl2ShdslEndpointCurr1DayTimeElapsed
                              Hdsl2ShdslPerfTimeElapsed,
     hdsl2ShdslEndpointCurr1DayES
                              Hdsl2ShdslPerfCurrDayCount,
     hdsl2ShdslEndpointCurr1DaySES
                              Hdsl2ShdslPerfCurrDayCount,
     hdsl2ShdslEndpointCurr1DayCRCanomalies
                              Hdsl2ShdslPerfCurrDayCount,
     hdsl2ShdslEndpointCurr1DayLOSWS
```

```
                                     Hdsl2ShdslPerfCurrDayCount,
    hdsl2ShdslEndpointCurr1DayUAS
                                     Hdsl2ShdslPerfCurrDayCount
    }

hdsl2ShdslEndpointCurrAtn OBJECT-TYPE
    SYNTAX        Integer32(-127..128)
    UNITS         "dB"
    MAX-ACCESS    read-only
    STATUS        current
    DESCRIPTION
      "The current loop attenuation for this endpoint as reported in
       a Network or Customer Side Performance Status message."
    REFERENCE    "HDSL2 Section 7.5.3.7; SHDSL Section 9.5.5.7"
    ::= { hdsl2ShdslEndpointCurrEntry 1 }

hdsl2ShdslEndpointCurrSnrMgn OBJECT-TYPE
    SYNTAX        Integer32(-127..128)
    UNITS         "dB"
    MAX-ACCESS    read-only
    STATUS        current
    DESCRIPTION
      "The current SNR margin for this endpoint as reported in a
       Status Response/SNR message."
    REFERENCE    "HDSL2 Section 7.5.3.7; SHDSL Section 9.5.5.7"
    ::= { hdsl2ShdslEndpointCurrEntry 2 }

hdsl2ShdslEndpointCurrStatus OBJECT-TYPE
    SYNTAX        BITS
                  {
                  noDefect(0),
                  powerBackoff(1),
                  deviceFault(2),
                  dcContinuityFault(3),
                  snrMarginAlarm(4),
                  loopAttenuationAlarm(5),
                  loswFailureAlarm(6),
                  configInitFailure(7),
                  protocolInitFailure(8),
                  noNeighborPresent(9),
                  loopbackActive(10)
                  }
    MAX-ACCESS    read-only
    STATUS        current
    DESCRIPTION
      "Contains the current state of the endpoint.  This is a
      bitmap of possible conditions. The various bit positions
      are:
```

    noDefect   There no defects on the line.

    powerBackoff   Indicates enhanced Power Backoff.

    deviceFault   Indicates a vendor-dependent
                          diagnostic or self-test fault
                          has been detected.

    dcContinuityFault   Indicates vendor-dependent
                          conditions that interfere with
                          span powering such as short and
                          open circuits.

    snrMarginAlarm   Indicates that the SNR margin
                          has dropped below the alarm threshold.

    loopAttenuationAlarm Indicates that the loop attenuation
                          exceeds the alarm threshold.

    loswFailureAlarm   Indicates a forward LOSW alarm.

    configInitFailure   Endpoint failure during initialization
                          due to paired endpoint not able to
                          support requested configuration.

    protocolInitFailure   Endpoint failure during initialization
                          due to incompatible protocol used by
                          the paired endpoint.

    noNeighborPresent   Endpoint failure during initialization
                          due to no activation sequence detected
                          from paired endpoint.

    loopbackActive   A loopback is currently active at this
                          Segment Endpoint.

    This is intended to supplement ifOperStatus. Note that there
    is a 1-1 relationship between the status bits defined in this
    object and the notification thresholds defined elsewhere in
    this MIB."
   REFERENCE   "HDSL2 Section 7.5.3.7; SHDSL Section 9.5.5.7"
   ::= { hdsl2ShdslEndpointCurrEntry 3 }

hdsl2ShdslEndpointES OBJECT-TYPE
    SYNTAX   Counter32
    UNITS   "seconds"
    MAX-ACCESS   read-only
    STATUS   current

```
   DESCRIPTION
     "Count of Errored Seconds (ES) on this endpoint since the xU
      was last restarted."
   REFERENCE   "HDSL2 Section 7.5.3.7; SHDSL Section 9.5.5.7"
   ::= { hdsl2ShdslEndpointCurrEntry 4 }

hdsl2ShdslEndpointSES OBJECT-TYPE
   SYNTAX          Counter32
   UNITS           "seconds"
   MAX-ACCESS      read-only
   STATUS          current
   DESCRIPTION
     "Count of Severely Errored Seconds (SES) on this endpoint
      since the xU was last restarted."
   REFERENCE   "HDSL2 Section 7.5.3.7; SHDSL Section 9.5.5.7"
   ::= { hdsl2ShdslEndpointCurrEntry 5 }

hdsl2ShdslEndpointCRCanomalies OBJECT-TYPE
   SYNTAX          Counter32
   UNITS           "detected CRC Anomalies"
   MAX-ACCESS      read-only
   STATUS          current
   DESCRIPTION
     "Count of CRC anomalies on this endpoint since the xU was
      last restarted."
   REFERENCE   "HDSL2 Section 7.5.3.7; SHDSL Section 9.5.5.7"
   ::= { hdsl2ShdslEndpointCurrEntry 6 }

hdsl2ShdslEndpointLOSWS OBJECT-TYPE
   SYNTAX          Counter32
   UNITS           "seconds"
   MAX-ACCESS      read-only
   STATUS          current
   DESCRIPTION
     "Count of Loss of Sync Word (LOSW) Seconds on this endpoint
      since the xU was last restarted."
   REFERENCE   "HDSL2 Section 7.5.3.7; SHDSL Section 9.5.5.7"
   ::= { hdsl2ShdslEndpointCurrEntry 7 }

hdsl2ShdslEndpointUAS OBJECT-TYPE
   SYNTAX          Counter32
   UNITS           "seconds"
   MAX-ACCESS      read-only
   STATUS          current
   DESCRIPTION
     "Count of Unavailable Seconds (UAS) on this endpoint since
      the xU was last restarted."
   REFERENCE   "HDSL2 Section 7.5.3.7; SHDSL Section 9.5.5.7"
```

```
    ::= { hdsl2ShdslEndpointCurrEntry 8 }

hdsl2ShdslEndpointCurr15MinTimeElapsed OBJECT-TYPE
    SYNTAX        Hdsl2ShdslPerfTimeElapsed
    UNITS         "seconds"
    MAX-ACCESS    read-only
    STATUS        current
    DESCRIPTION
      "Total elapsed seconds in the current 15-minute interval."
    ::= { hdsl2ShdslEndpointCurrEntry 9 }

hdsl2ShdslEndpointCurr15MinES OBJECT-TYPE
    SYNTAX        PerfCurrentCount
    UNITS         "seconds"
    MAX-ACCESS    read-only
    STATUS        current
    DESCRIPTION
      "Count of Errored Seconds (ES) in the current 15-minute
       interval."
    REFERENCE     "HDSL2 Section 7.5.3.7; SHDSL Section 9.5.5.7"
    ::= { hdsl2ShdslEndpointCurrEntry 10 }

hdsl2ShdslEndpointCurr15MinSES OBJECT-TYPE
    SYNTAX        PerfCurrentCount
    UNITS         "seconds"
    MAX-ACCESS    read-only
    STATUS        current
    DESCRIPTION
      "Count of Severely Errored Seconds (SES) in the current
       15-minute interval."
    REFERENCE     "HDSL2 Section 7.5.3.7; SHDSL Section 9.5.5.7"
    ::= { hdsl2ShdslEndpointCurrEntry 11 }

hdsl2ShdslEndpointCurr15MinCRCanomalies OBJECT-TYPE
    SYNTAX        PerfCurrentCount
    UNITS         "detected CRC Anomalies"
    MAX-ACCESS    read-only
    STATUS        current
    DESCRIPTION
      "Count of CRC anomalies in the current 15-minute interval."
    REFERENCE     "HDSL2 Section 7.5.3.7; SHDSL Section 9.5.5.7"
    ::= { hdsl2ShdslEndpointCurrEntry 12 }

hdsl2ShdslEndpointCurr15MinLOSWS OBJECT-TYPE
    SYNTAX        PerfCurrentCount
    UNITS         "seconds"
    MAX-ACCESS    read-only
    STATUS        current
```

```
    DESCRIPTION
      "Count of Loss of Sync Word (LOSW) Seconds in the current
       15-minute interval."
    REFERENCE    "HDSL2 Section 7.5.3.7; SHDSL Section 9.5.5.7"
    ::= { hdsl2ShdslEndpointCurrEntry 13 }

hdsl2ShdslEndpointCurr15MinUAS OBJECT-TYPE
    SYNTAX       PerfCurrentCount
    UNITS        "seconds"
    MAX-ACCESS   read-only
    STATUS       current
    DESCRIPTION
      "Count of Unavailable Seconds (UAS) in the current 15-minute
       interval."
    REFERENCE    "HDSL2 Section 7.5.3.7; SHDSL Section 9.5.5.7"
    ::= { hdsl2ShdslEndpointCurrEntry 14 }

hdsl2ShdslEndpointCurr1DayTimeElapsed OBJECT-TYPE
    SYNTAX       Hdsl2ShdslPerfTimeElapsed
    UNITS        "seconds"
    MAX-ACCESS   read-only
    STATUS       current
    DESCRIPTION
      "Number of seconds that have elapsed since the beginning of
       the current 1-day interval."
    ::= { hdsl2ShdslEndpointCurrEntry 15 }

hdsl2ShdslEndpointCurr1DayES OBJECT-TYPE
    SYNTAX       Hdsl2ShdslPerfCurrDayCount
    UNITS        "seconds"
    MAX-ACCESS   read-only
    STATUS       current
    DESCRIPTION
      "Count of Errored Seconds (ES) during the current day as
       measured by hdsl2ShdslEndpointCurr1DayTimeElapsed."
    REFERENCE    "HDSL2 Section 7.5.3.7; SHDSL Section 9.5.5.7"
    ::= { hdsl2ShdslEndpointCurrEntry 16 }

hdsl2ShdslEndpointCurr1DaySES OBJECT-TYPE
    SYNTAX       Hdsl2ShdslPerfCurrDayCount
    UNITS        "seconds"
    MAX-ACCESS   read-only
    STATUS       current
    DESCRIPTION
      "Count of Severely Errored Seconds (SES) during the current
       day as measured by hdsl2ShdslEndpointCurr1DayTimeElapsed."
    REFERENCE    "HDSL2 Section 7.5.3.7; SHDSL Section 9.5.5.7"
    ::= { hdsl2ShdslEndpointCurrEntry 17 }
```

hdsl2ShdslEndpointCurr1DayCRCanomalies OBJECT-TYPE
    SYNTAX   Hdsl2ShdslPerfCurrDayCount
    UNITS   "detected CRC Anomalies"
    MAX-ACCESS   read-only
    STATUS   current
    DESCRIPTION
      "Count of CRC anomalies during the current day as measured
       by hdsl2ShdslEndpointCurr1DayTimeElapsed."
    REFERENCE   "HDSL2 Section 7.5.3.7; SHDSL Section 9.5.5.7"
    ::= { hdsl2ShdslEndpointCurrEntry 18 }

hdsl2ShdslEndpointCurr1DayLOSWS OBJECT-TYPE
    SYNTAX   Hdsl2ShdslPerfCurrDayCount
    UNITS   "seconds"
    MAX-ACCESS   read-only
    STATUS   current
    DESCRIPTION
      "Count of Loss of Sync Word (LOSW) Seconds during the current
       day as measured by hdsl2ShdslEndpointCurr1DayTimeElapsed."
    REFERENCE   "HDSL2 Section 7.5.3.7; SHDSL Section 9.5.5.7"
    ::= { hdsl2ShdslEndpointCurrEntry 19 }

hdsl2ShdslEndpointCurr1DayUAS OBJECT-TYPE
    SYNTAX   Hdsl2ShdslPerfCurrDayCount
    UNITS   "seconds"
    MAX-ACCESS   read-only
    STATUS   current
    DESCRIPTION
      "Count of Unavailable Seconds (UAS) during the current day as
       measured by hdsl2ShdslEndpointCurr1DayTimeElapsed."
    REFERENCE   "HDSL2 Section 7.5.3.7; SHDSL Section 9.5.5.7"
    ::= { hdsl2ShdslEndpointCurrEntry 20 }

-- Segment Endpoint 15-Minute Interval Status/Performance Group
--

hdsl2Shdsl15MinIntervalTable OBJECT-TYPE
    SYNTAX   SEQUENCE OF Hdsl2Shdsl15MinIntervalEntry
    MAX-ACCESS   not-accessible
    STATUS   current
    DESCRIPTION
      "This table provides one row for each HDSL2/SHDSL endpoint
       performance data collection interval. This table contains
       live data from equipment. As such, it is NOT persistent."
    ::= { hdsl2ShdslMibObjects 6 }

hdsl2Shdsl15MinIntervalEntry OBJECT-TYPE
    SYNTAX   Hdsl2Shdsl15MinIntervalEntry

```
   MAX-ACCESS  not-accessible
   STATUS      current
   DESCRIPTION
     "An entry in the hdsl2Shdsl15MinIntervalTable."
   INDEX { ifIndex, hdsl2ShdslInvIndex, hdsl2ShdslEndpointSide,
         hdsl2ShdslEndpointWirePair, hdsl2Shdsl15MinIntervalNumber}
   ::= { hdsl2Shdsl15MinIntervalTable 1 }

Hdsl2Shdsl15MinIntervalEntry ::=
   SEQUENCE
   {
   hdsl2Shdsl15MinIntervalNumber         Unsigned32,
   hdsl2Shdsl15MinIntervalES             PerfIntervalCount,
   hdsl2Shdsl15MinIntervalSES            PerfIntervalCount,
   hdsl2Shdsl15MinIntervalCRCanomalies   PerfIntervalCount,
   hdsl2Shdsl15MinIntervalLOSWS          PerfIntervalCount,
   hdsl2Shdsl15MinIntervalUAS            PerfIntervalCount
   }

hdsl2Shdsl15MinIntervalNumber OBJECT-TYPE
   SYNTAX      Unsigned32(1..96)
   MAX-ACCESS  not-accessible
   STATUS      current
   DESCRIPTION
     "Performance Data Interval number. 1 is the the most recent
      previous interval; interval 96 is 24 hours ago. Intervals
      2..96 are optional."
   ::= { hdsl2Shdsl15MinIntervalEntry 1 }

hdsl2Shdsl15MinIntervalES OBJECT-TYPE
   SYNTAX      PerfIntervalCount
   UNITS       "seconds"
   MAX-ACCESS  read-only
   STATUS      current
   DESCRIPTION
     "Count of Errored Seconds (ES) during the interval."
   REFERENCE   "HDSL2 Section 7.5.3.7; SHDSL Section 9.5.5.7"
   ::= { hdsl2Shdsl15MinIntervalEntry 2 }

hdsl2Shdsl15MinIntervalSES OBJECT-TYPE
   SYNTAX      PerfIntervalCount
   UNITS       "seconds"
   MAX-ACCESS  read-only
   STATUS      current
   DESCRIPTION
     "Count of Severely Errored Seconds (SES) during the interval."
   REFERENCE   "HDSL2 Section 7.5.3.7; SHDSL Section 9.5.5.7"
   ::= { hdsl2Shdsl15MinIntervalEntry 3 }
```

```
hdsl2Shdsl15MinIntervalCRCanomalies OBJECT-TYPE
    SYNTAX       PerfIntervalCount
    UNITS        "detected CRC Anomalies"
    MAX-ACCESS   read-only
    STATUS       current
    DESCRIPTION
      "Count of CRC anomalies during the interval."
    REFERENCE    "HDSL2 Section 7.5.3.7; SHDSL Section 9.5.5.7"
    ::= { hdsl2Shdsl15MinIntervalEntry 4 }

hdsl2Shdsl15MinIntervalLOSWS OBJECT-TYPE
    SYNTAX       PerfIntervalCount
    UNITS        "seconds"
    MAX-ACCESS   read-only
    STATUS       current
    DESCRIPTION
      "Count of Loss of Sync Word (LOSW) Seconds during the
       interval."
    REFERENCE    "HDSL2 Section 7.5.3.7; SHDSL Section 9.5.5.7"
    ::= { hdsl2Shdsl15MinIntervalEntry 5 }

hdsl2Shdsl15MinIntervalUAS OBJECT-TYPE
    SYNTAX       PerfIntervalCount
    UNITS        "seconds"
    MAX-ACCESS   read-only
    STATUS       current
    DESCRIPTION
      "Count of Unavailable Seconds (UAS) during the interval."
    REFERENCE    "HDSL2 Section 7.5.3.7; SHDSL Section 9.5.5.7"
    ::= { hdsl2Shdsl15MinIntervalEntry 6 }

-- Segment Endpoint 1-Day Interval Status/Performance Group
--

hdsl2Shdsl1DayIntervalTable OBJECT-TYPE
    SYNTAX       SEQUENCE OF Hdsl2Shdsl1DayIntervalEntry
    MAX-ACCESS   not-accessible
    STATUS       current
    DESCRIPTION
      "This table provides one row for each HDSL2/SHDSL endpoint
       performance data collection interval.  This table contains
       live data from equipment.  As such, it is NOT persistent."
    ::= { hdsl2ShdslMibObjects 7 }

hdsl2Shdsl1DayIntervalEntry OBJECT-TYPE
    SYNTAX       Hdsl2Shdsl1DayIntervalEntry
    MAX-ACCESS   not-accessible
    STATUS       current
```

```
   DESCRIPTION
     "An entry in the hdsl2Shdsl1DayIntervalTable."
   INDEX { ifIndex, hdsl2ShdslInvIndex, hdsl2ShdslEndpointSide,
           hdsl2ShdslEndpointWirePair, hdsl2Shdsl1DayIntervalNumber }
   ::= { hdsl2Shdsl1DayIntervalTable 1 }

Hdsl2Shdsl1DayIntervalEntry ::=
   SEQUENCE
   {
   hdsl2Shdsl1DayIntervalNumber          Unsigned32,
   hdsl2Shdsl1DayIntervalMoniSecs        Hdsl2ShdslPerfTimeElapsed,
   hdsl2Shdsl1DayIntervalES              Hdsl2Shdsl1DayIntervalCount,
   hdsl2Shdsl1DayIntervalSES             Hdsl2Shdsl1DayIntervalCount,
   hdsl2Shdsl1DayIntervalCRCanomalies    Hdsl2Shdsl1DayIntervalCount,
   hdsl2Shdsl1DayIntervalLOSWS           Hdsl2Shdsl1DayIntervalCount,
   hdsl2Shdsl1DayIntervalUAS             Hdsl2Shdsl1DayIntervalCount
   }

hdsl2Shdsl1DayIntervalNumber OBJECT-TYPE
   SYNTAX      Unsigned32(1..30)
   MAX-ACCESS  not-accessible
   STATUS      current
   DESCRIPTION
     "History Data Interval number. Interval 1 is the the most
      recent previous day; interval 30 is 30 days ago. Intervals
      2..30 are optional."
   ::= { hdsl2Shdsl1DayIntervalEntry 1 }

hdsl2Shdsl1DayIntervalMoniSecs OBJECT-TYPE
   SYNTAX      Hdsl2ShdslPerfTimeElapsed
   UNITS       "seconds"
   MAX-ACCESS  read-only
   STATUS      current
   DESCRIPTION
     "The amount of time in the 1-day interval over which the
      performance monitoring information is actually counted.
      This value will be the same as the interval duration except
      in a situation where performance monitoring data could not
      be collected for any reason."
   ::= { hdsl2Shdsl1DayIntervalEntry 2 }

hdsl2Shdsl1DayIntervalES OBJECT-TYPE
   SYNTAX      Hdsl2Shdsl1DayIntervalCount
   UNITS       "seconds"
   MAX-ACCESS  read-only
   STATUS      current
   DESCRIPTION
     "Count of Errored Seconds (ES) during the 1-day interval as
```

```
      measured by hdsl2Shdsl1DayIntervalMoniSecs."
   REFERENCE    "HDSL2 Section 7.5.3.7; SHDSL Section 9.5.5.7"
   ::= { hdsl2Shdsl1DayIntervalEntry 3 }


hdsl2Shdsl1DayIntervalSES OBJECT-TYPE
   SYNTAX       Hdsl2Shdsl1DayIntervalCount
   UNITS        "seconds"
   MAX-ACCESS   read-only
   STATUS       current
   DESCRIPTION
     "Count of Severely Errored Seconds (SES) during the 1-day
      interval as measured by hdsl2Shdsl1DayIntervalMoniSecs."
   REFERENCE    "HDSL2 Section 7.5.3.7; SHDSL Section 9.5.5.7"
   ::= { hdsl2Shdsl1DayIntervalEntry 4 }


hdsl2Shdsl1DayIntervalCRCanomalies OBJECT-TYPE
   SYNTAX       Hdsl2Shdsl1DayIntervalCount
   UNITS        "detected CRC Anomalies"
   MAX-ACCESS   read-only
   STATUS       current
   DESCRIPTION
     "Count of CRC anomalies during the 1-day interval as
      measured by hdsl2Shdsl1DayIntervalMoniSecs."
   REFERENCE    "HDSL2 Section 7.5.3.7; SHDSL Section 9.5.5.7"
   ::= { hdsl2Shdsl1DayIntervalEntry 5 }


hdsl2Shdsl1DayIntervalLOSWS OBJECT-TYPE
   SYNTAX       Hdsl2Shdsl1DayIntervalCount
   UNITS        "seconds"
   MAX-ACCESS   read-only
   STATUS       current
   DESCRIPTION
     "Count of Loss of Sync Word (LOSW) Seconds during the 1-day
      interval as measured by hdsl2Shdsl1DayIntervalMoniSecs."
   REFERENCE    "HDSL2 Section 7.5.3.7; SHDSL Section 9.5.5.7"
   ::= { hdsl2Shdsl1DayIntervalEntry 6 }


hdsl2Shdsl1DayIntervalUAS OBJECT-TYPE
   SYNTAX       Hdsl2Shdsl1DayIntervalCount
   UNITS        "seconds"
   MAX-ACCESS   read-only
   STATUS       current
   DESCRIPTION
     "Count of Unavailable Seconds (UAS) during the 1-day interval
      as measured by hdsl2Shdsl1DayIntervalMoniSecs."
   REFERENCE    "HDSL2 Section 7.5.3.7; SHDSL Section 9.5.5.7"
   ::= { hdsl2Shdsl1DayIntervalEntry 7 }
```

```
-- Maintenance Group
--


hdsl2ShdslEndpointMaintTable OBJECT-TYPE
    SYNTAX       SEQUENCE OF Hdsl2ShdslEndpointMaintEntry
    MAX-ACCESS   not-accessible
    STATUS       current
    DESCRIPTION
      "This table supports maintenance operations (eg. loopbacks)
       to be performed on HDSL2/SHDSL segment endpoints.  This table
       contains live data from equipment.  As such, it is NOT
       persistent."
    ::= { hdsl2ShdslMibObjects 8 }

hdsl2ShdslEndpointMaintEntry OBJECT-TYPE
    SYNTAX       Hdsl2ShdslEndpointMaintEntry
    MAX-ACCESS   not-accessible
    STATUS       current
    DESCRIPTION
      "An entry in the hdsl2ShdslEndpointMaintTable.  Each entry
       corresponds to a single segment endpoint, and is indexed by the
       ifIndex of the HDSL2/SHDSL line, the UnitId of the associated
       unit and the side of the unit."
    INDEX { ifIndex, hdsl2ShdslInvIndex, hdsl2ShdslEndpointSide }
    ::= { hdsl2ShdslEndpointMaintTable 1 }

Hdsl2ShdslEndpointMaintEntry ::=
    SEQUENCE
    {
    hdsl2ShdslMaintLoopbackConfig      INTEGER,
    hdsl2ShdslMaintTipRingReversal     INTEGER,
    hdsl2ShdslMaintPowerBackOff        INTEGER,
    hdsl2ShdslMaintSoftRestart         INTEGER
    }

hdsl2ShdslMaintLoopbackConfig OBJECT-TYPE
    SYNTAX       INTEGER
                 {
                 noLoopback(1),
                 normalLoopback(2),
                 specialLoopback(3)
                 }
    MAX-ACCESS   read-write
    STATUS       current
    DESCRIPTION
      "This object controls configuration of loopbacks for the
       associated segment endpoint.  The status of the loopback
       is obtained via the hdsl2ShdslEndpointCurrStatus object."
```

```
    ::= { hdsl2ShdslEndpointMaintEntry 1 }

hdsl2ShdslMaintTipRingReversal OBJECT-TYPE
    SYNTAX      INTEGER
                {
                normal(1),
                reversed(2)
                }
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
      "This object indicates the state of the tip/ring pair at the
       associated segment endpoint."
    ::= { hdsl2ShdslEndpointMaintEntry 2 }

hdsl2ShdslMaintPowerBackOff OBJECT-TYPE
    SYNTAX      INTEGER
                {
                default(1),
                enhanced(2)
                }
    MAX-ACCESS  read-write
    STATUS      current
    DESCRIPTION
      "This object configures the receiver at the associated
       segment endpoint to operate in default or enhanced power
       backoff mode."
    ::= { hdsl2ShdslEndpointMaintEntry 3 }

hdsl2ShdslMaintSoftRestart OBJECT-TYPE
    SYNTAX      INTEGER
                {
                ready(1),
                restart(2)
                }
    MAX-ACCESS  read-write
    STATUS      current
    DESCRIPTION
      "This object enables the manager to trigger a soft restart
       of the modem at the associated segment endpoint.  The manager
       may only set this object to the 'restart(2)' value, which
       initiates a restart.  The agent will perform a restart after
       approximately 5 seconds.  Following the 5 second period, the
       agent will restore the object to the 'ready(1)' state."
    ::= { hdsl2ShdslEndpointMaintEntry 4 }

hdsl2ShdslUnitMaintTable OBJECT-TYPE
    SYNTAX      SEQUENCE OF Hdsl2ShdslUnitMaintEntry
```

```
   MAX-ACCESS  not-accessible
   STATUS      current
   DESCRIPTION
     "This table supports maintenance operations for units in a
      HDSL2/SHDSL line.  Entries in this table MUST be maintained
      in a persistent manner."
   ::= { hdsl2ShdslMibObjects 9 }

hdsl2ShdslUnitMaintEntry OBJECT-TYPE
   SYNTAX      Hdsl2ShdslUnitMaintEntry
   MAX-ACCESS  not-accessible
   STATUS      current
   DESCRIPTION
     "An entry in the hdsl2ShdslUnitMaintTable.  Each entry
      corresponds to a single unit, and is indexed by the ifIndex
      of the HDSL2/SHDSL line and the UnitId of the associated
      unit."
   INDEX { ifIndex, hdsl2ShdslInvIndex  }
   ::= { hdsl2ShdslUnitMaintTable 1 }

Hdsl2ShdslUnitMaintEntry ::=
   SEQUENCE
   {
   hdsl2ShdslMaintLoopbackTimeout     Integer32,
   hdsl2ShdslMaintUnitPowerSource     INTEGER
   }

hdsl2ShdslMaintLoopbackTimeout OBJECT-TYPE
   SYNTAX      Integer32(0..4095)
   UNITS       "minutes"
   MAX-ACCESS  read-write
   STATUS      current
   DESCRIPTION
     "This object configures the timeout value for loopbacks
      initiated at segments endpoints contained in the associated
      unit.  A value of 0 disables the timeout."
   ::= { hdsl2ShdslUnitMaintEntry 1 }

hdsl2ShdslMaintUnitPowerSource OBJECT-TYPE
   SYNTAX      INTEGER
               {
               local(1),
               span(2)
               }
   MAX-ACCESS  read-only
   STATUS      current
   DESCRIPTION
     "This object indicates the DC power source being used by the
```

```
      associated unit."
    ::= { hdsl2ShdslUnitMaintEntry 2 }


-- Span Configuration Profile Group
--

hdsl2ShdslSpanConfProfileTable OBJECT-TYPE
    SYNTAX      SEQUENCE OF Hdsl2ShdslSpanConfProfileEntry
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
      "This table supports definitions of span configuration
       profiles for SHDSL lines.  HDSL2 does not support these
       configuration options.  This table MUST be maintained
       in a persistent manner."
    ::= { hdsl2ShdslMibObjects 10 }

hdsl2ShdslSpanConfProfileEntry OBJECT-TYPE
    SYNTAX      Hdsl2ShdslSpanConfProfileEntry
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
      "Each entry corresponds to a single span configuration
       profile.  Each profile contains a set of span configuration
       parameters.  The configuration parameters in a profile are
       applied to those lines referencing that profile (see the
       hdsl2ShdslSpanConfProfile object).  Profiles may be
       created/deleted using the row creation/deletion mechanism
       via hdsl2ShdslSpanConfProfileRowStatus.  If an active
       entry is referenced in hdsl2ShdslSpanConfProfile, the
       entry MUST remain active until all references are removed."
    INDEX { IMPLIED hdsl2ShdslSpanConfProfileName }
    ::= { hdsl2ShdslSpanConfProfileTable 1 }

Hdsl2ShdslSpanConfProfileEntry ::=
    SEQUENCE
    {
    hdsl2ShdslSpanConfProfileName                 SnmpAdminString,
    hdsl2ShdslSpanConfWireInterface               INTEGER,
    hdsl2ShdslSpanConfMinLineRate                 Unsigned32,
    hdsl2ShdslSpanConfMaxLineRate                 Unsigned32,
    hdsl2ShdslSpanConfPSD                         INTEGER,
    hdsl2ShdslSpanConfTransmissionMode
                                      Hdsl2ShdslTransmissionModeType,
    hdsl2ShdslSpanConfRemoteEnabled               INTEGER,
    hdsl2ShdslSpanConfPowerFeeding                INTEGER,
    hdsl2ShdslSpanConfCurrCondTargetMarginDown    Integer32,
    hdsl2ShdslSpanConfWorstCaseTargetMarginDown   Integer32,
```

```
   hdsl2ShdslSpanConfCurrCondTargetMarginUp    Integer32,
   hdsl2ShdslSpanConfWorstCaseTargetMarginUp   Integer32,
   hdsl2ShdslSpanConfUsedTargetMargins         BITS,
   hdsl2ShdslSpanConfReferenceClock
                                     Hdsl2ShdslClockReferenceType,
   hdsl2ShdslSpanConfLineProbeEnable           INTEGER,
   hdsl2ShdslSpanConfProfileRowStatus          RowStatus
   }

hdsl2ShdslSpanConfProfileName OBJECT-TYPE
   SYNTAX       SnmpAdminString (SIZE(1..32))
   MAX-ACCESS   not-accessible
   STATUS       current
   DESCRIPTION
     "This object is the unique index associated with this profile.
      Entries in this table are referenced via the object
      hdsl2ShdslSpanConfProfile in Hdsl2ShdslSpanConfEntry."
   ::= { hdsl2ShdslSpanConfProfileEntry 1 }

hdsl2ShdslSpanConfWireInterface OBJECT-TYPE
   SYNTAX       INTEGER
                {
                twoWire(1),
                fourWire(2)
                }
   MAX-ACCESS   read-create
   STATUS       current
   DESCRIPTION
     "This object configures the two-wire or optional four-wire
      operation for SHDSL Lines."
   DEFVAL       { twoWire }
   ::= { hdsl2ShdslSpanConfProfileEntry 2 }

hdsl2ShdslSpanConfMinLineRate OBJECT-TYPE
   SYNTAX       Unsigned32(0..4112000)
   UNITS        "bps"
   MAX-ACCESS   read-create
   STATUS       current
   DESCRIPTION
     "This object configures the minimum transmission rate for
      the associated SHDSL Line in bits-per-second (bps).  If
      the minimum line rate equals the maximum line rate
      (hdsl2ShdslSpanMaxLineRate), the line rate is considered
      'fixed'.  If the minimum line rate is less than the maximum
      line rate, the line rate is considered 'rate-adaptive'."
   DEFVAL       { 1552000 }
   ::= { hdsl2ShdslSpanConfProfileEntry 3 }
```

```
hdsl2ShdslSpanConfMaxLineRate OBJECT-TYPE
    SYNTAX       Unsigned32(0..4112000)
    UNITS        "bps"
    MAX-ACCESS   read-create
    STATUS       current
    DESCRIPTION
      "This object configures the maximum transmission rate for
       the associated SHDSL Line in bits-per-second (bps).  If
       the minimum line rate equals the maximum line rate
       (hdsl2ShdslSpanMaxLineRate), the line rate is considered
       'fixed'.  If the minimum line rate is less than the maximum
       line rate, the line rate is considered 'rate-adaptive'."
    DEFVAL       { 1552000 }
    ::= { hdsl2ShdslSpanConfProfileEntry 4 }

hdsl2ShdslSpanConfPSD OBJECT-TYPE
    SYNTAX       INTEGER
                 {
                 symmetric(1),
                 asymmetric(2)
                 }
    MAX-ACCESS   read-create
    STATUS       current
    DESCRIPTION
      "This object configures use of symmetric/asymmetric PSD (Power
       Spectral Density) Mask for the associated SHDSL Line.  Support
       for symmetric PSD is mandatory for all supported data rates.
       Support for asymmetric PSD is optional."
    DEFVAL       { symmetric }
    ::= { hdsl2ShdslSpanConfProfileEntry 5 }

hdsl2ShdslSpanConfTransmissionMode OBJECT-TYPE
    SYNTAX       Hdsl2ShdslTransmissionModeType
    MAX-ACCESS   read-create
    STATUS       current
    DESCRIPTION
      "This object specifies the regional setting for the SHDSL
       line."
    DEFVAL       { { region1 } }
    ::= { hdsl2ShdslSpanConfProfileEntry 6 }

hdsl2ShdslSpanConfRemoteEnabled OBJECT-TYPE
    SYNTAX       INTEGER
                 {
                 enabled(1),
                 disabled(2)
                 }
    MAX-ACCESS   read-create
```

```
   STATUS        current
   DESCRIPTION
     "This object enables/disables support for remote management
      of the units in a SHDSL line from the STU-R via the EOC."
   DEFVAL        { enabled }
   ::= { hdsl2ShdslSpanConfProfileEntry 7 }


hdsl2ShdslSpanConfPowerFeeding OBJECT-TYPE
   SYNTAX        INTEGER
                 {
                 noPower(1),
                 powerFeed(2),
                 wettingCurrent(3)
                 }
   MAX-ACCESS    read-create
   STATUS        current
   DESCRIPTION
     "This object enables/disables support for optional power
      feeding in a SHDSL line."
   DEFVAL        { noPower }
   ::= { hdsl2ShdslSpanConfProfileEntry 8 }


hdsl2ShdslSpanConfCurrCondTargetMarginDown OBJECT-TYPE
   SYNTAX        Integer32(-10..21)
   UNITS         "dB"
   MAX-ACCESS    read-create
   STATUS        current
   DESCRIPTION
     "This object specifies the downstream current condition target
      SNR margin for a SHDSL line.  The SNR margin is the difference
      between the desired SNR and the actual SNR.  Target SNR margin
      is the desired SNR margin for a unit."
   DEFVAL        { 0 }
   ::= { hdsl2ShdslSpanConfProfileEntry 9 }


hdsl2ShdslSpanConfWorstCaseTargetMarginDown OBJECT-TYPE
   SYNTAX        Integer32(-10..21)
   UNITS         "dB"
   MAX-ACCESS    read-create
   STATUS        current
   DESCRIPTION
     "This object specifies the downstream worst case target SNR
      margin for a SHDSL line.  The SNR margin is the difference
      between the desired SNR and the actual SNR.  Target SNR
      margin is the desired SNR margin for a unit."
   DEFVAL        { 0 }
   ::= { hdsl2ShdslSpanConfProfileEntry 10 }
```

```
hdsl2ShdslSpanConfCurrCondTargetMarginUp OBJECT-TYPE
    SYNTAX        Integer32(-10..21)
    UNITS         "dB"
    MAX-ACCESS    read-create
    STATUS        current
    DESCRIPTION
      "This object specifies the upstream current condition target
       SNR margin for a SHDSL line.  The SNR margin is the difference
       between the desired SNR and the actual SNR.  Target SNR margin
       is the desired SNR margin for a unit."
    DEFVAL        { 0 }
    ::= { hdsl2ShdslSpanConfProfileEntry 11 }

hdsl2ShdslSpanConfWorstCaseTargetMarginUp OBJECT-TYPE
    SYNTAX        Integer32(-10..21)
    UNITS         "dB"
    MAX-ACCESS    read-create
    STATUS        current
    DESCRIPTION
      "This object specifies the upstream worst case target SNR
       margin for a SHDSL line.  The SNR margin is the difference
       between the desired SNR and the actual SNR.  Target SNR margin
       is the desired SNR margin for a unit."
    DEFVAL        { 0 }
    ::= { hdsl2ShdslSpanConfProfileEntry 12 }

hdsl2ShdslSpanConfUsedTargetMargins OBJECT-TYPE
    SYNTAX        BITS
                  {
                  currCondDown(0),
                  worstCaseDown(1),
                  currCondUp(2),
                  worstCaseUp(3)
                  }
    MAX-ACCESS    read-create
    STATUS        current
    DESCRIPTION
      "Contains indicates whether a target SNR margin is enabled or
       disabled. This is a bit-map of possible settings.  The
       various bit positions are:

       currCondDown      current condition downstream target SNR
                         margin enabled

       worstCaseDown     worst case downstream target SNR margin
                         enabled

       currCondUp        current condition upstream target SNR
```

```
                         margin enabled

      worstCaseUp        worst case upstream target SNR margin
                         enabled."
   DEFVAL        { { currCondDown } }
   ::= { hdsl2ShdslSpanConfProfileEntry 13 }


hdsl2ShdslSpanConfReferenceClock OBJECT-TYPE
   SYNTAX       Hdsl2ShdslClockReferenceType
   MAX-ACCESS   read-create
   STATUS       current
   DESCRIPTION
     "This object configures the clock reference for the STU-C
     in a SHDSL Line."
   DEFVAL        { localClk }
   ::= { hdsl2ShdslSpanConfProfileEntry 14 }


hdsl2ShdslSpanConfLineProbeEnable OBJECT-TYPE
   SYNTAX       INTEGER
                {
                disable(1),
                enable(2)
                }
   MAX-ACCESS   read-create
   STATUS       current
   DESCRIPTION
     "This object enables/disables support for Line Probe of
     the units in a SHDSL line.  When Line Probe is enabled, the
     system performs Line Probing to find the best possible
     rate.  If Line probe is disabled, the rate adaptation phase
     is skipped to shorten set up time."
   DEFVAL        { disable }
   ::= { hdsl2ShdslSpanConfProfileEntry 15 }


hdsl2ShdslSpanConfProfileRowStatus OBJECT-TYPE
   SYNTAX       RowStatus
   MAX-ACCESS   read-create
   STATUS       current
   DESCRIPTION
     "This object controls creation/deletion of the associated
      entry in this table per the semantics of RowStatus.  If an
      active entry is referenced in hdsl2ShdslSpanConfProfile, the
      entry MUST remain active until all references are removed."
   ::= { hdsl2ShdslSpanConfProfileEntry 16 }

-- Segment Endpoint Alarm Configuration Profile group
--
```

```
hdsl2ShdslEndpointAlarmConfProfileTable OBJECT-TYPE
    SYNTAX       SEQUENCE OF Hdsl2ShdslEndpointAlarmConfProfileEntry
    MAX-ACCESS  not-accessible
    STATUS       current
    DESCRIPTION
      "This table supports definitions of alarm configuration
       profiles for HDSL2/SHDSL segment endpoints.  This table
       MUST be maintained in a persistent manner."
    ::= { hdsl2ShdslMibObjects 11 }

hdsl2ShdslEndpointAlarmConfProfileEntry OBJECT-TYPE
    SYNTAX       Hdsl2ShdslEndpointAlarmConfProfileEntry
    MAX-ACCESS  not-accessible
    STATUS       current
    DESCRIPTION
      "Each entry corresponds to a single alarm configuration profile.
       Each profile contains a set of parameters for setting alarm
       thresholds for various performance attributes monitored at
       HDSL2/SHDSL segment endpoints.  Profiles may be created/deleted
       using the row creation/deletion mechanism via
       hdsl2ShdslEndpointAlarmConfProfileRowStatus.  If an active
       entry is referenced in either hdsl2ShdslSpanConfAlarmProfile
       or hdsl2ShdslEndpointAlarmConfProfile, the entry MUST remain
       active until all references are removed."
    INDEX { IMPLIED hdsl2ShdslEndpointAlarmConfProfileName }
    ::= { hdsl2ShdslEndpointAlarmConfProfileTable 1 }

Hdsl2ShdslEndpointAlarmConfProfileEntry ::=
    SEQUENCE
    {
    hdsl2ShdslEndpointAlarmConfProfileName      SnmpAdminString,
    hdsl2ShdslEndpointThreshLoopAttenuation     Integer32,
    hdsl2ShdslEndpointThreshSNRMargin           Integer32,
    hdsl2ShdslEndpointThreshES
             Hdsl2ShdslPerfIntervalThreshold,
    hdsl2ShdslEndpointThreshSES
             Hdsl2ShdslPerfIntervalThreshold,
    hdsl2ShdslEndpointThreshCRCanomalies        Integer32,
    hdsl2ShdslEndpointThreshLOSWS
             Hdsl2ShdslPerfIntervalThreshold,
    hdsl2ShdslEndpointThreshUAS
             Hdsl2ShdslPerfIntervalThreshold,
    hdsl2ShdslEndpointAlarmConfProfileRowStatus  RowStatus
    }

hdsl2ShdslEndpointAlarmConfProfileName OBJECT-TYPE
    SYNTAX       SnmpAdminString (SIZE(1..32))
    MAX-ACCESS  not-accessible
```

```
   STATUS        current
   DESCRIPTION
     "This object is the unique index associated with this profile."
   ::= { hdsl2ShdslEndpointAlarmConfProfileEntry 1 }

hdsl2ShdslEndpointThreshLoopAttenuation OBJECT-TYPE
   SYNTAX        Integer32(-127..128)
   UNITS         "dB"
   MAX-ACCESS    read-create
   STATUS        current
   DESCRIPTION
     "This object configures the loop attenuation alarm threshold.
      When the current value of hdsl2ShdslEndpointCurrAtn reaches
      or exceeds this threshold, a hdsl2ShdslLoopAttenCrossing
      MAY be generated."
   DEFVAL        { 0 }
   ::= { hdsl2ShdslEndpointAlarmConfProfileEntry 2 }

hdsl2ShdslEndpointThreshSNRMargin OBJECT-TYPE
   SYNTAX        Integer32(-127..128)
   UNITS         "dB"
   MAX-ACCESS    read-create
   STATUS        current
   DESCRIPTION
     "This object configures the SNR margin alarm threshold.
      When the current value of hdsl2ShdslEndpointCurrSnrMgn
      reaches or drops below this threshold, a
      hdsl2ShdslSNRMarginCrossing MAY be generated."
   DEFVAL        { 0 }
   ::= { hdsl2ShdslEndpointAlarmConfProfileEntry 3 }

hdsl2ShdslEndpointThreshES OBJECT-TYPE
   SYNTAX        Hdsl2ShdslPerfIntervalThreshold
   UNITS         "seconds"
   MAX-ACCESS    read-create
   STATUS        current
   DESCRIPTION
     "This object configures the threshold for the number of
      errored seconds (ES) within any given 15-minute performance
      data collection interval.  If the value of errored seconds
      in a particular 15-minute collection interval reaches/
      exceeds this value, a hdsl2ShdslPerfESThresh MAY be
      generated.  At most one notification will be sent per
      interval per endpoint."
   DEFVAL        { 0 }
   ::= { hdsl2ShdslEndpointAlarmConfProfileEntry 4 }

hdsl2ShdslEndpointThreshSES OBJECT-TYPE
```

```
    SYNTAX        Hdsl2ShdslPerfIntervalThreshold
    UNITS         "seconds"
    MAX-ACCESS    read-create
    STATUS        current
    DESCRIPTION
      "This object configures the threshold for the number of
       severely errored seconds (SES) within any given 15-minute
       performance data collection interval.  If the value of
       severely errored seconds in a particular 15-minute collection
       interval reaches/exceeds this value, a hdsl2ShdslPerfSESThresh
       MAY be generated.  At most one notification will be sent per
       interval per endpoint."
    DEFVAL        { 0 }
    ::= { hdsl2ShdslEndpointAlarmConfProfileEntry 5 }

hdsl2ShdslEndpointThreshCRCanomalies OBJECT-TYPE
    SYNTAX        Integer32
    UNITS         "detected CRC Anomalies"
    MAX-ACCESS    read-create
    STATUS        current
    DESCRIPTION
      "This object configures the threshold for the number of
       CRC anomalies within any given 15-minute performance data
       collection interval.  If the value of CRC anomalies in a
       particular 15-minute collection interval reaches/exceeds
       this value, a hdsl2ShdslPerfCRCanomaliesThresh MAY be
       generated.  At most one notification will be sent per
       interval per endpoint."
    DEFVAL        { 0 }
    ::= { hdsl2ShdslEndpointAlarmConfProfileEntry 6 }

hdsl2ShdslEndpointThreshLOSWS OBJECT-TYPE
    SYNTAX        Hdsl2ShdslPerfIntervalThreshold
    UNITS         "seconds"
    MAX-ACCESS    read-create
    STATUS        current
    DESCRIPTION
      "This object configures the threshold for the number of
       Loss of Sync Word (LOSW) Seconds within any given 15-minute
       performance data collection interval.  If the value of LOSW
       in a particular 15-minute collection interval reaches/exceeds
       this value, a hdsl2ShdslPerfLOSWSThresh MAY be generated.
       At most one notification will be sent per interval per
       endpoint."
    DEFVAL        { 0 }
    ::= { hdsl2ShdslEndpointAlarmConfProfileEntry 7 }

hdsl2ShdslEndpointThreshUAS OBJECT-TYPE
```

```
   SYNTAX       Hdsl2ShdslPerfIntervalThreshold
   UNITS        "seconds"
   MAX-ACCESS   read-create
   STATUS       current
   DESCRIPTION
     "This object configures the threshold for the number of
      unavailable seconds (UAS) within any given 15-minute
      performance data collection interval.  If the value of UAS
      in a particular 15-minute collection interval reaches/exceeds
      this value, a hdsl2ShdslPerfUASThresh MAY be generated.
      At most one notification will be sent per interval per
      endpoint."
   DEFVAL       { 0 }
   ::= { hdsl2ShdslEndpointAlarmConfProfileEntry 8 }

hdsl2ShdslEndpointAlarmConfProfileRowStatus OBJECT-TYPE
   SYNTAX       RowStatus
   MAX-ACCESS   read-create
   STATUS       current
   DESCRIPTION
     "This object controls creation/deletion of the associated
      entry in this table as per the semantics of RowStatus.
      If an active entry is referenced in either
      hdsl2ShdslSpanConfAlarmProfile or
      hdsl2ShdslEndpointAlarmConfProfile, the entry MUST remain
      active until all references are removed."
   ::= { hdsl2ShdslEndpointAlarmConfProfileEntry 9 }

-- Notifications Group
--

hdsl2ShdslNotifications OBJECT IDENTIFIER ::= { hdsl2ShdslMIB 0 }

hdsl2ShdslLoopAttenCrossing NOTIFICATION-TYPE
   OBJECTS
   {
   hdsl2ShdslEndpointCurrAtn,
   hdsl2ShdslEndpointThreshLoopAttenuation
   }
   STATUS      current
   DESCRIPTION
     "This notification indicates that the loop attenuation
      threshold (as per the hdsl2ShdslEndpointThreshLoopAttenuation
      value) has been reached/exceeded for the HDSL2/SHDSL segment
      endpoint."
   ::= { hdsl2ShdslNotifications 1 }

hdsl2ShdslSNRMarginCrossing NOTIFICATION-TYPE
```

```
   OBJECTS
   {

   hdsl2ShdslEndpointCurrSnrMgn,
   hdsl2ShdslEndpointThreshSNRMargin
   }
   STATUS      current
   DESCRIPTION
     "This notification indicates that the SNR margin threshold (as
      per the hdsl2ShdslEndpointThreshSNRMargin value) has been
      reached/exceeded for the HDSL2/SHDSL segment endpoint."
   ::= { hdsl2ShdslNotifications 2 }

hdsl2ShdslPerfESThresh NOTIFICATION-TYPE
   OBJECTS
   {
   hdsl2ShdslEndpointCurr15MinES,
   hdsl2ShdslEndpointThreshES
   }
   STATUS      current
   DESCRIPTION
     "This notification indicates that the errored seconds threshold
      (as per the hdsl2ShdslEndpointThreshES value) has been reached/
      exceeded for the HDSL2/SHDSL segment endpoint."
   ::= { hdsl2ShdslNotifications 3 }

hdsl2ShdslPerfSESThresh NOTIFICATION-TYPE
   OBJECTS
   {
   hdsl2ShdslEndpointCurr15MinSES,
   hdsl2ShdslEndpointThreshSES
   }
   STATUS      current
   DESCRIPTION
     "This notification indicates that the severely errored seconds
      threshold (as per the hdsl2ShdslEndpointThreshSES value) has
      been reached/exceeded for the HDSL2/SHDSL Segment Endpoint."
   ::= { hdsl2ShdslNotifications 4 }

hdsl2ShdslPerfCRCanomaliesThresh NOTIFICATION-TYPE
   OBJECTS
   {
   hdsl2ShdslEndpointCurr15MinCRCanomalies,
   hdsl2ShdslEndpointThreshCRCanomalies
   }
   STATUS     current
   DESCRIPTION
     "This notification indicates that the CRC anomalies threshold
```

```
      (as per the hdsl2ShdslEndpointThreshCRCanomalies value) has
      been reached/exceeded for the HDSL2/SHDSL Segment Endpoint."
   ::= { hdsl2ShdslNotifications 5 }

hdsl2ShdslPerfLOSWSThresh NOTIFICATION-TYPE
   OBJECTS
   {

   hdsl2ShdslEndpointCurr15MinLOSWS,
   hdsl2ShdslEndpointThreshLOSWS
   }
   STATUS      current
   DESCRIPTION
     "This notification indicates that the LOSW seconds threshold
      (as per the hdsl2ShdslEndpointThreshLOSWS value) has been
      reached/exceeded for the HDSL2/SHDSL segment endpoint."
   ::= { hdsl2ShdslNotifications 6 }

hdsl2ShdslPerfUASThresh NOTIFICATION-TYPE
   OBJECTS
   {
   hdsl2ShdslEndpointCurr15MinUAS,
   hdsl2ShdslEndpointThreshUAS
   }
   STATUS      current
   DESCRIPTION
     "This notification indicates that the unavailable seconds
      threshold (as per the hdsl2ShdslEndpointThreshUAS value) has
      been reached/exceeded for the HDSL2/SHDSL segment endpoint."
   ::= { hdsl2ShdslNotifications 7 }

hdsl2ShdslSpanInvalidNumRepeaters NOTIFICATION-TYPE
   OBJECTS
   {
   hdsl2ShdslSpanConfNumRepeaters
   }
   STATUS      current
   DESCRIPTION
     "This notification indicates that a mismatch has been detected
      between the number of repeater/regenerator units configured
      for a HDSL2/SHDSL line via the hdsl2ShdslSpanConfNumRepeaters
      object and the actual number of repeater/regenerator units
      discovered via the EOC."
   ::= { hdsl2ShdslNotifications 8 }

hdsl2ShdslLoopbackFailure NOTIFICATION-TYPE
   OBJECTS
   {
```

```
   hdsl2ShdslMaintLoopbackConfig
   }
   STATUS      current
   DESCRIPTION
     "This notification indicates that an endpoint maintenance
      loopback command failed for an HDSL2/SHDSL segment."
   ::= { hdsl2ShdslNotifications 9 }

hdsl2ShdslpowerBackoff NOTIFICATION-TYPE
   OBJECTS
   {
   hdsl2ShdslEndpointCurrStatus
   }
   STATUS      current
   DESCRIPTION
     "This notification indicates that the bit setting for
      powerBackoff in the hdsl2ShdslEndpointCurrStatus object for
      this endpoint has changed."
   ::= { hdsl2ShdslNotifications 10 }

hdsl2ShdsldeviceFault NOTIFICATION-TYPE
   OBJECTS
   {
   hdsl2ShdslEndpointCurrStatus
   }
   STATUS      current
   DESCRIPTION
     "This notification indicates that the bit setting for
      deviceFault in the hdsl2ShdslEndpointCurrStatus object for
      this endpoint has changed."
   ::= { hdsl2ShdslNotifications 11 }

hdsl2ShdsldcContinuityFault NOTIFICATION-TYPE
   OBJECTS
   {
   hdsl2ShdslEndpointCurrStatus
   }
   STATUS      current
   DESCRIPTION
     "This notification indicates that the bit setting for
      dcContinuityFault in the hdsl2ShdslEndpointCurrStatus object
      for this endpoint has changed."
   ::= { hdsl2ShdslNotifications 12 }

hdsl2ShdslconfigInitFailure NOTIFICATION-TYPE
   OBJECTS
   {
   hdsl2ShdslEndpointCurrStatus
```

```
   }
   STATUS     current
   DESCRIPTION
     "This notification indicates that the bit setting for
      configInitFailure in the hdsl2ShdslEndpointCurrStatus object
      for this endpoint has changed."
   ::= { hdsl2ShdslNotifications 13 }

hdsl2ShdslprotocolInitFailure NOTIFICATION-TYPE
   OBJECTS
   {
   hdsl2ShdslEndpointCurrStatus
   }
   STATUS     current
   DESCRIPTION
     "This notification indicates that the bit setting for
      protocolInitFailure in the hdsl2ShdslEndpointCurrStatus
      object for this endpoint has changed."
   ::= { hdsl2ShdslNotifications 14 }

hdsl2ShdslnoNeighborPresent NOTIFICATION-TYPE
   OBJECTS
   {
   hdsl2ShdslEndpointCurrStatus
   }
   STATUS     current
   DESCRIPTION
     "This notification indicates that the bit setting for
      noNeighborPresent in the hdsl2ShdslEndpointCurrStatus object
      for this endpoint has changed."
   ::= { hdsl2ShdslNotifications 15 }

hdsl2ShdslLocalPowerLoss NOTIFICATION-TYPE
   OBJECTS
   {
   hdsl2ShdslInvVendorID
   }
   STATUS     current
   DESCRIPTION
     "This notification indicates impending unit failure due to
      loss of local power (last gasp)."
   ::= { hdsl2ShdslNotifications 16 }

-- conformance information
--

hdsl2ShdslConformance OBJECT IDENTIFIER ::= { hdsl2ShdslMIB 3 }
hdsl2ShdslGroups       OBJECT IDENTIFIER ::=
```

```
             { hdsl2ShdslConformance 1 }
hdsl2ShdslCompliances OBJECT IDENTIFIER ::=
             { hdsl2ShdslConformance 2 }

-- agent compliance statements

hdsl2ShdslLineMibCompliance MODULE-COMPLIANCE
   STATUS   current
   DESCRIPTION
     "The section outlines compliance requirements for this MIB."
   MODULE
   MANDATORY-GROUPS
   {
   hdsl2ShdslSpanConfGroup,
   hdsl2ShdslSpanStatusGroup,
   hdsl2ShdslInventoryGroup,
   hdsl2ShdslEndpointConfGroup,
   hdsl2ShdslEndpointCurrGroup,
   hdsl2Shdsl15MinIntervalGroup,
   hdsl2Shdsl1DayIntervalGroup,
   hdsl2ShdslMaintenanceGroup,
   hdsl2ShdslEndpointAlarmConfGroup,
   hdsl2ShdslNotificationGroup
   }

GROUP   hdsl2ShdslInventoryShdslGroup
   DESCRIPTION
     "Support for this group is only required for implementations
     supporting SHDSL lines."

GROUP   hdsl2ShdslSpanShdslStatusGroup
   DESCRIPTION
     "Support for this group is only required for implementations
     supporting SHDSL lines."

GROUP   hdsl2ShdslSpanConfProfileGroup
   DESCRIPTION
     "Support for this group is only required for implementations
     supporting SHDSL lines."

   ::= { hdsl2ShdslCompliances 1 }

-- units of conformance
--

hdsl2ShdslSpanConfGroup OBJECT-GROUP
   OBJECTS
   {
```

```
   hdsl2ShdslSpanConfNumRepeaters,
   hdsl2ShdslSpanConfProfile,
   hdsl2ShdslSpanConfAlarmProfile
   }
   STATUS        current
   DESCRIPTION
     "This group supports objects for configuring span related
      parameters for HDSL2/SHDSL lines."
   ::= { hdsl2ShdslGroups 1 }

hdsl2ShdslSpanStatusGroup OBJECT-GROUP
   OBJECTS
   {
   hdsl2ShdslStatusNumAvailRepeaters
   }
   STATUS        current
   DESCRIPTION
     "This group supports objects for retrieving span related
      status for HDSL2/SHDSL lines."
   ::= { hdsl2ShdslGroups 2 }

hdsl2ShdslInventoryShdslGroup OBJECT-GROUP
   OBJECTS
   {
   hdsl2ShdslInvTransmissionModeCapability
   }
   STATUS        current
   DESCRIPTION
     "This group supports objects for retrieving SHDSL-specific
      inventory information."
   ::= { hdsl2ShdslGroups 3 }

hdsl2ShdslSpanShdslStatusGroup OBJECT-GROUP
   OBJECTS
   {
   hdsl2ShdslStatusMaxAttainableLineRate,
   hdsl2ShdslStatusActualLineRate,
   hdsl2ShdslStatusTransmissionModeCurrent
   }
   STATUS        current
   DESCRIPTION
     "This group supports objects for retrieving SHDSL-specific
      span related status."
   ::= { hdsl2ShdslGroups 4 }

hdsl2ShdslInventoryGroup OBJECT-GROUP
   OBJECTS
   {
```

```
   hdsl2ShdslInvVendorID,
   hdsl2ShdslInvVendorModelNumber,
   hdsl2ShdslInvVendorSerialNumber,
   hdsl2ShdslInvVendorEOCSoftwareVersion,
   hdsl2ShdslInvStandardVersion,
   hdsl2ShdslInvVendorListNumber,
   hdsl2ShdslInvVendorIssueNumber,
   hdsl2ShdslInvVendorSoftwareVersion,
   hdsl2ShdslInvEquipmentCode,
   hdsl2ShdslInvVendorOther
   }
   STATUS       current
   DESCRIPTION
     "This group supports objects that provide unit inventory
      information about the units in HDSL2/SHDSL lines."
   ::= { hdsl2ShdslGroups 5 }

hdsl2ShdslEndpointConfGroup OBJECT-GROUP
   OBJECTS
   {
   hdsl2ShdslEndpointCurrAtn
   }
   STATUS       current
   DESCRIPTION
     "This group supports objects for configuring parameters for
      segment endpoints in HDSL2/SHDSL lines."
   ::= { hdsl2ShdslGroups 6 }

hdsl2ShdslEndpointCurrGroup OBJECT-GROUP
   OBJECTS
   {
   hdsl2ShdslEndpointCurrAtn,
   hdsl2ShdslEndpointCurrSnrMgn,
   hdsl2ShdslEndpointCurrStatus,
   hdsl2ShdslEndpointES,
   hdsl2ShdslEndpointSES,
   hdsl2ShdslEndpointCRCanomalies,
   hdsl2ShdslEndpointLOSWS,
   hdsl2ShdslEndpointUAS,
   hdsl2ShdslEndpointCurr15MinTimeElapsed,
   hdsl2ShdslEndpointCurr15MinES,
   hdsl2ShdslEndpointCurr15MinSES,
   hdsl2ShdslEndpointCurr15MinCRCanomalies,
   hdsl2ShdslEndpointCurr15MinLOSWS,
   hdsl2ShdslEndpointCurr15MinUAS,
   hdsl2ShdslEndpointCurr1DayTimeElapsed,
   hdsl2ShdslEndpointCurr1DayES,
   hdsl2ShdslEndpointCurr1DaySES,
```

```
   hdsl2ShdslEndpointCurr1DayCRCanomalies,
   hdsl2ShdslEndpointCurr1DayLOSWS,
   hdsl2ShdslEndpointCurr1DayUAS
   }
   STATUS       current
   DESCRIPTION
     "This group supports objects which provide current status and
      performance measurements relating to segment endpoints in
      HDSL2/SHDSL lines."
   ::= { hdsl2ShdslGroups 7 }

hdsl2Shdsl15MinIntervalGroup OBJECT-GROUP
   OBJECTS
   {
   hdsl2Shdsl15MinIntervalES,
   hdsl2Shdsl15MinIntervalSES,
   hdsl2Shdsl15MinIntervalCRCanomalies,
   hdsl2Shdsl15MinIntervalLOSWS,
   hdsl2Shdsl15MinIntervalUAS
   }
   STATUS       current
   DESCRIPTION
     "This group supports objects which maintain historic
      performance measurements relating to segment endpoints in
      HDSL2/SHDSL lines in 15-minute intervals."
   ::= { hdsl2ShdslGroups 8 }

hdsl2Shdsl1DayIntervalGroup OBJECT-GROUP
   OBJECTS
   {
   hdsl2Shdsl1DayIntervalMoniSecs,
   hdsl2Shdsl1DayIntervalES,
   hdsl2Shdsl1DayIntervalSES,
   hdsl2Shdsl1DayIntervalCRCanomalies,
   hdsl2Shdsl1DayIntervalLOSWS,
   hdsl2Shdsl1DayIntervalUAS
   }
   STATUS       current
   DESCRIPTION
     "This group supports objects which maintain historic
      performance measurements relating to segment endpoints in
      HDSL2/SHDSL lines in 1-day intervals."
   ::= { hdsl2ShdslGroups 9 }

hdsl2ShdslMaintenanceGroup OBJECT-GROUP
   OBJECTS
   {
   hdsl2ShdslMaintLoopbackConfig,
```

```
   hdsl2ShdslMaintTipRingReversal,
   hdsl2ShdslMaintPowerBackOff,
   hdsl2ShdslMaintSoftRestart,
   hdsl2ShdslMaintLoopbackTimeout,
   hdsl2ShdslMaintUnitPowerSource
   }
   STATUS      current
   DESCRIPTION
     "This group supports objects that provide support for
      maintenance actions for HDSL2/SHDSL lines."
   ::= { hdsl2ShdslGroups 10 }

hdsl2ShdslEndpointAlarmConfGroup OBJECT-GROUP
   OBJECTS
   {
   hdsl2ShdslEndpointAlarmConfProfile,
   hdsl2ShdslEndpointThreshLoopAttenuation,
   hdsl2ShdslEndpointThreshSNRMargin,
   hdsl2ShdslEndpointThreshES,
   hdsl2ShdslEndpointThreshSES,
   hdsl2ShdslEndpointThreshCRCanomalies,
   hdsl2ShdslEndpointThreshLOSWS,
   hdsl2ShdslEndpointThreshUAS,
   hdsl2ShdslEndpointAlarmConfProfileRowStatus
   }
   STATUS      current
   DESCRIPTION
     "This group supports objects that allow configuration of alarm
      thresholds for various performance parameters for HDSL2/SHDSL
      lines."
   ::= { hdsl2ShdslGroups 11 }

hdsl2ShdslNotificationGroup NOTIFICATION-GROUP
   NOTIFICATIONS
   {
   hdsl2ShdslLoopAttenCrossing,
   hdsl2ShdslSNRMarginCrossing,
   hdsl2ShdslPerfESThresh,
   hdsl2ShdslPerfSESThresh,
   hdsl2ShdslPerfCRCanomaliesThresh,
   hdsl2ShdslPerfLOSWSThresh,
   hdsl2ShdslPerfUASThresh,
   hdsl2ShdslSpanInvalidNumRepeaters,
   hdsl2ShdslLoopbackFailure,
   hdsl2ShdslpowerBackoff,
   hdsl2ShdsldeviceFault,
   hdsl2ShdsldcContinuityFault,
   hdsl2ShdslconfigInitFailure,
```

```
   hdsl2ShdslprotocolInitFailure,
   hdsl2ShdslnoNeighborPresent,
   hdsl2ShdslLocalPowerLoss
   }
   STATUS      current
   DESCRIPTION
     "This group supports notifications of significant conditions
      associated with HDSL2/SHDSL lines."
   ::= { hdsl2ShdslGroups 12 }

hdsl2ShdslSpanConfProfileGroup OBJECT-GROUP
   OBJECTS
   {
   hdsl2ShdslSpanConfWireInterface,
   hdsl2ShdslSpanConfMinLineRate,
   hdsl2ShdslSpanConfMaxLineRate,
   hdsl2ShdslSpanConfPSD,
   hdsl2ShdslSpanConfTransmissionMode,
   hdsl2ShdslSpanConfRemoteEnabled,
   hdsl2ShdslSpanConfPowerFeeding,
   hdsl2ShdslSpanConfCurrCondTargetMarginDown,
   hdsl2ShdslSpanConfWorstCaseTargetMarginDown,
   hdsl2ShdslSpanConfCurrCondTargetMarginUp,
   hdsl2ShdslSpanConfWorstCaseTargetMarginUp,
   hdsl2ShdslSpanConfUsedTargetMargins,
   hdsl2ShdslSpanConfReferenceClock,
   hdsl2ShdslSpanConfLineProbeEnable,
   hdsl2ShdslSpanConfProfileRowStatus
   }
   STATUS      current
   DESCRIPTION
     "This group supports objects that constitute configuration
      profiles for configuring span related parameters in SHDSL
      lines."
   ::= { hdsl2ShdslGroups 13 }
END
```

7. Security Considerations

   Blocking unauthorized access to the HDSL2-SHDSL MIB via the element
   management system is outside the scope of this document. It should
   be noted that access to the MIB permits the unauthorized entity to
   modify the profiles (section 6.4) such that both subscriber service
   and network operations can be interfered with. Subscriber service
   can be altered by modifying any of a number of service
   characteristics such as rate partitioning and maximum transmission
   rates. Network operations can be impacted by modification of
   notification thresholds such as SES thresholds.

There are a number of managed objects in this MIB that may be
considered to contain sensitive information. Access to these objects
would allow an intruder to obtain information about which vendor's
equipment is in use on the network. Further, such information is
considered sensitive in many environments for competitive reasons.

These identifying objects in the inventory group are:

- hdsl2ShdslInvVendorID
- hdsl2ShdslInvVendorModelNumber
- hdsl2ShdslInvVendorSerialNumber
- hdsl2ShdslInvVendorEOCSoftwareVersion
- hdsl2ShdslInvStandardVersion
- hdsl2ShdslInvVendorListNumber
- hdsl2ShdslInvVendorIssueNumber
- hdsl2ShdslInvVendorSoftwareVersion
- hdsl2ShdslInvEquipmentCode
- hdsl2ShdslInvVendorOther
- hdsl2ShdslInvTransmissionModeCapability

Therefore, it may be important in some environments to control read
access to these objects and possibly to even encrypt the values of
these object when sending them over the network via SNMP. Not all
versions of SNMP provide features for such a secure environment.

It is recommended that the implementors consider the security
features as provided by the SNMPv3 framework. Specifically, the use
of the User-based Security Model RFC 2574 [12] and the View-based
Access Control Model RFC 2575 [15] are recommended.

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

HDSL2-SHDSL layer connectivity from the xtuR will permit the
subscriber to manipulate both the HDSL2-SHDSL link directly and the
HDSL2-SHDSL embedded operations channel (EOC) for their own loop.
For example, unchecked or unfiltered fluctuations initiated by the
subscriber could generate sufficient notifications to potentially
overwhelm either the management interface to the network or the
element manager.

It should be noted that interface indices in this MIB are maintained
persistently. VACM data relating to these should be stored
persistently.

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

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9. References

    [1]   Harrington, D., Presuhn, R. and B. Wijnen, "An Architecture for
           Describing SNMP Management Frameworks", RFC 2571, April 1999.

    [2]   Rose, M. and K. McCloghrie, "Structure and Identification of
           Management Information for TCP/IP-based Internets", STD 16, RFC
           1155, May 1990.

    [3]   Rose, M. and K. McCloghrie, "Concise MIB Definitions", STD 16,
           RFC 1212, March 1991.

    [4]   Rose, M., "A Convention for Defining Traps for use with the
           SNMP", RFC 1215, March 1991.

    [5]   McCloghrie, K., Perkins, D., Schoenwaelder, J., Case, J., Rose,
           M. and S. Waldbusser, "Structure of Management Information
           Version 2 (SMIv2)", STD 58, RFC 2578, April 1999.

    [6]   McCloghrie, K., Perkins, D., Schoenwaelder, J., Case, J., Rose,
           M. and S. Waldbusser, "Textual Conventions for SMIv2", STD 58,
           RFC 2579, April 1999.

    [7]   McCloghrie, K., Perkins, D., Schoenwaelder, J., Case, J., Rose,
           M. and S. Waldbusser, "Conformance Statements for SMIv2", STD
           58, RFC 2580, April 1999.

    [8]   Case, J., Fedor, M., Schoffstall, M. and J. Davin, "Simple
           Network Management Protocol", STD 15, RFC 1157, May 1990.

    [9]   Case, J., McCloghrie, K., Rose, M. and S. Waldbusser,
           "Introduction to Community-based SNMPv2", RFC 1901, January
           1996.

    [10]   Case, J., McCloghrie, K., Rose, M. and S. Waldbusser,
           "Transport Mappings for Version 2 of the Simple Network
           Management Protocol (SNMPv2)", RFC 1906, January 1996.

    [11]   Case, J., Harrington D., Presuhn, R. and B. Wijnen, "Message
           Processing and Dispatching for the Simple Network Management
           Protocol (SNMP)", RFC 2572, April 1999.

    [12]   Blumenthal, U. and B. Wijnen, "User-based Security Model (USM)
           for version 3 of the Simple Network Management Protocol
           (SNMPv3)", RFC 2574, April 1999.

[13] Case, J., McCloghrie, K., Rose, M. and S. Waldbusser, "Protocol
      Operations for Version 2 of the Simple Network Management
      Protocol (SNMPv2)", RFC 1905, January 1996.

[14] Levi, D., Meyer, P. and B. Stewart, "SNMPv3 Applications", RFC
      2573, April 1999.

[15] Wijnen, B., Presuhn, R. and K. McCloghrie, "View-based Access
      Control Model (VACM) for the Simple Network Management Protocol
      (SNMP)", RFC 2575, April 1999.

[16] Case, J., Mundy, R., Partain, D. and B. Stewart, "Introduction
      to Version 3 of the Internet-standard Network Management
      Framework", RFC 2570, April 1999.

[17] Bradner, S., "Key Words for use in RFCs to Indicate Requirement
      Levels", BCP 14, RFC 2119, March 1997.

[18] American National Standards Institute, ANSI T1E1.4/2000-006,
      February 2000.

[19] Blackwell, S., Editor, "Single-Pair High-Speed Digital
      Subscriber Line (SHDSL) Transceivers", ITU-T Draft G.991.2,
      April 2000.

[20] McCloghrie, K. and M. Rose, M., "Management Information Base
      for Network Management of TCP/IP-based internets: MIB-II", STD
      17, RFC 1213, March 1991.

[21] McCloghrie, K. and F. Kastenholz, "The Interfaces Group MIB",
      RFC 2863, June 2000.

[22] Tesink, K., "Textual Conventions for MIB Modules Using
      Performance History Based on 15 Minute Intervals", RFC 2493,
      January 1999.

[23] Bathrick, G. and F. Ly, "Definitions of Managed Objects for the
      ADSL Lines", RFC 2662, August 1999.

[24] Pate, P., Lynch, B. and K. Rehbehn, "Definitions of Managed
      Objects for Monitoring and Controlling the UNI/NNI Multilink
      Frame Relay Function", RFC 3020, December 2000.

[25] American National Standards Institute, "Coded Identification of
      Equipment Entities of the North American Telecommunications
      System for the Purpose of Information Exchange", T1.213-2001.

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