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       Definitions of Managed Objects for G.SHDSL.BIS Lines
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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. This document
   introduces extensions to several objects and textual conventions

   defined in HDSL2-SHDSL-Line MIB ([RFC 3276](#)). This MIB described in
   this document will obsolete the MIB described in [RFC 3276](#).

Table of Contents

1. Introduction

This document defines a portion of the Management Information Base
(MIB) module for use with network management protocols in the
Internet community. The MIB described in RFC 3276 [RFC3276]
describes objects used for managing High Bit-Rate DSL - 2nd
generation (HDSL2) [T1E1.4] and Single-Pair High-Speed Digital
Subscriber Line (SHDSL) interfaces [G.991.2]. This document
obsoletes RFC 3276 [RFC3276] which supports G.SHDSL in that the MIB
described herein supports G.SDHSL.bis as described in the G.991.2
[G.991.2]. In addition, objects have been added to improve the
management of SHDSL lines.

2. The SNMP Management Framework

The SNMP Management Framework presently consists of five major
components:

o An overall architecture, described in RFC 3411 [RFC3411].

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 [RFC1155], STD 16, RFC 1212 [RFC1212], and RFC
   1215 [RFC1215]. The second version, called SMIv2, is described in
   STD 58, RFC 2578 [RFC2578], RFC 2579 [RFC2579], and RFC 2580
   [RFC2580].

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 [RFC1157]. 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 [RFC1901]
   and RFC 3417 [RFC3417]. The third version of the message protocol
   is called SNMPv3 and is described in RFC 3417 [RFC3417], RFC 3412
   [RFC3412], and RFC 3414 [RFC3414].

o Protocol operations for accessing management information. The
   first set of protocol operations and associated PDU formats is
   described in STD 15, RFC 1157 [RFC1157]. A second set of protocol
   operations and associated PDU formats is described in RFC 3416
   [RFC3416].

o A set of fundamental applications described in RFC 3413 [RFC3413]
   and the view-based access control mechanism described in RFC 3415
   [RFC3415].

A more detailed introduction to the current SNMP Management Framework
can be found in RFC 3410 [RFC3410].

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 [RFC2119].

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 [T1E1.4] and ITU G.991.2 [G.991.2].

The MIB is located in the MIB tree under MIB 2 transmission, as
discussed in the MIB-2 Integration (RFC 3418 [RFC3418] and RFC 2863
[RFC2863]) 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
[RFC2863] 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 [RFC2863].
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 [RFC2863] 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 [RFC2863], and are not duplicated in the HDSL2/SHDSL Line
MIB.

    ==

       ifIndex   Interface index.

       ifDescr   See interfaces MIB [RFC2863].

       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 [RFC2863].

       ifOperStatus   See interfaces MIB [RFC2863].

       ifLastChange   See interfaces MIB [RFC2863].

       ifName   See interfaces MIB [RFC2863].

       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 [G.991.2].
   G.   ES means errored second [G.991.2].
   J.   LOSW means loss of sync word [G.991.2].
   I.   LOSWS means LOSW seconds [G.991.2].
   J.   SES means severely errored second [G.991.2].
   K.   SNR means signal-to-noise ratio [G.991.2].
   L.   UAS means unavailable second [G.991.2].

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.

         wirePair3(3)   - Optional third pair for SHDSL.bis only.

         wirePair4(4)   - Optional fourth pair for SHDSL.bis 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
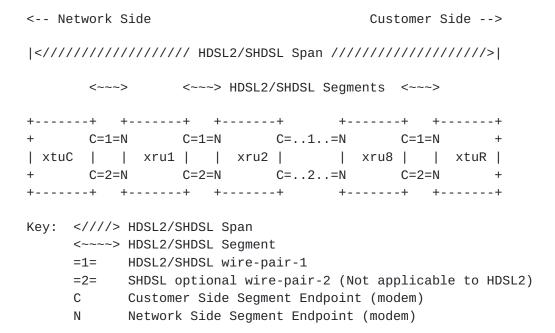(xru) as shown in the figure below.


```
    <-- 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 3593 [RFC3593] and RFC 2662 [RFC2662], 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 3411 [RFC3411]).

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 [RFC2863]) which are per agent (e.g., per Digital Subscriber
Line Access Multiplexer, or DSLAM, in such a device), and linkUp/
linkDown (per [RFC2863]) 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 [RFC2863]). 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 "200406070000Z" -- June 7, 2004
      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 "200406070000Z" -- June 7, 2004
      DESCRIPTION "Initial version, published as draft G.SHDSL.BIS."

      ::= { 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 or two wire),
          SHDS lines support an optional second pair (wirePair2 or four

```
        wire), and G.SHDSL.bis support an optional third pair
        (wirePair3 or six wire) and an optional fourth pair
        (wirePair4 or eight wire)."
     SYNTAX    INTEGER
            {
            wirePair1(1),    -- two wire
            wirePair2(2),    -- four wire
            wirePair3(3),    -- six wire
            wirePair4(4)     -- eight wire
            }

   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,
   hdsl2ShdslStatusMaxAttainablePayloadRate Unsigned32,
   hdsl2ShdslStatusActualPayloadRate       Unsigned32
   }

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
   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.  This rate includes payload (user data)
      and any applicable framing overhead."
   ::= { hdsl2ShdslSpanStatusEntry 2 }

hdsl2ShdslStatusActualLineRate OBJECT-TYPE
   SYNTAX     Unsigned32
   UNITS      "bps"
   MAX-ACCESS read-only
   STATUS     current
   DESCRIPTION
     "Contains the actual line rate in this HDSL2/SHDSL span.  This
      should equal ifSpeed.  This rate includes payload (user data)
```

```
         and any applicable framing overhead"
      ::= { 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 }

   hdsl2ShdslStatusMaxAttainablePayloadRate OBJECT-TYPE
      SYNTAX      Unsigned32
      UNITS       "bps"
      MAX-ACCESS  read-only
      STATUS      current
      DESCRIPTION
        "Contains the maximum attainable payload (user data)
         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.  Any
         framing overhead is not included."
      ::= { hdsl2ShdslSpanStatusEntry 5 }

   hdsl2ShdslStatusActualPayloadRate OBJECT-TYPE
      SYNTAX      Unsigned32
      UNITS       "bps"
      MAX-ACCESS  read-only
      STATUS      current
      DESCRIPTION
        "Contains the actual line rate in this HDSL2/SHDSL span.  Any
         framing overhead is not included."
      ::= { hdsl2ShdslSpanStatusEntry 6 }

   -- 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,
     hdsl2ShdslEndpointCurrTipRingReversal    Integer,
     hdsl2ShdslEndpointCurrActivationState    Integer
     }

  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 }

      hdsl2ShdslEndpointCurrTipRingReversal OBJECT-TYPE
         SYNTAX   INTEGER
                      {
                      normal(1),
                      reversed(2)
                      }
         MAX-ACCESS   read-only
         STATUS   current
         DESCRIPTION
           "This object indicates the state of the tip/ring for the
            wire pair."
         ::= { hdsl2ShdslEndpointCurrEntryEntry 21 }

      hdsl2ShdslEndpointCurrActivationState OBJECT-TYPE
         SYNTAX   INTEGER
                      {
                      preActivation(1), -- PreTrain
                      activation(2),   -- Training
                      data(3)   -- Trained
                      }

```
      MAX-ACCESS  read-only
      STATUS      current
      DESCRIPTION
        "This object indicates the activation or training state of
         the wirepair."
      REFERENCE   "ITU-T G.991.2, Section 6.2 PMD Activation Sequence"
      ::= { hdsl2ShdslEndpointCurrEntryEntry 21 }

   -- 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),
                sixWire(3),
                eightWire(4)
                }
    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
    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) and includes
       both payload (user data) and any applicable framing overhead.
       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
    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) and includes
       both payload (user data) and any applicable framing overhead.
       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."

    GROUP hdsl2ShdslCurrShdslGroup
        DESCRIPTION
          "Support for this group is only required for implementations
          supporting SHDSL lines."

    OBJECT hdsl2ShdslSpanConfWireInterface
        SYNTAX   INTEGER
                     {
                     twoWire(1),
                     fourWire(2)
                     }
        DESCRIPTION
          "An implementation only has to support the range as
          applicable for the original g.shdsl specification defined
          in RFC 3276."

    OBJECT hdsl2ShdslStatusMaxAttainableLineRate
        SYNTAX   Unsigned32(0..4112000)
        DESCRIPTION
          "An implementation only has to support the range as
          applicable for the original g.shdsl specification defined
          in RFC 3276."

    OBJECT hdsl2ShdslStatusActualLineRate
        SYNTAX   Unsigned32(0..4112000)
        DESCRIPTION

```
         "An implementation only has to support the range as
         applicable for the original g.shdsl specification defined
         in RFC 3276."

   OBJECT hdsl2ShdslSpanConfMinLineRate
      SYNTAX      Unsigned32(0..4112000)
      DESCRIPTION
         "An implementation only has to support the range as
         applicable for the original g.shdsl specification defined
         in RFC 3276."

   OBJECT hdsl2ShdslSpanConfMaxLineRate
      SYNTAX      Unsigned32(0..4112000)
      DESCRIPTION
         "An implementation only has to support the range as
         applicable for the original g.shdsl specification defined
         in RFC 3276."

      ::= { 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,
     hdsl2ShdslStatusMaxAttainablePayloadRate,
     hdsl2ShdslStatusActualPayloadRate
     }
     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 }

   hdsl2ShdslCurrShdslGroup OBJECT-GROUP
      OBJECTS
      {
      hdsl2ShdslEndpointCurrTipRingReversal,
      hdsl2ShdslEndpointCurrActivationState
      }
      STATUS      current
      DESCRIPTION
        "This group supports objects which provide current
         SHDSL-specific wire pair status."
      ::= { hdsl2ShdslGroups 14 }
   END
```

7. **Implementation Analysis**

   A management application which supports RFC 3276 could mistakenly
   flag a unit which responds with a rate or wire pair which exceeds the
   ranges and/or enumerations specified in RFC 3276. For example, a
   G.SHDSL.bis line with four wire pairs would report statistics for
   wire pairs that do not exist in RFC 3276. That is, a GET-NEXT
   request issues with the object identifier:

```
      hdsl2ShdslEndpointCurrAtn.1.1.1.2
```

   might return

```
      hdsl2ShdslEndpointCurrAtn.1.1.1.3 = 0
```

   with a G.SHDS.bis unit and

```
   hdsl2ShdslEndpointCurrSnrMgn.1.1.1.1 = 0
```

with an HDSL2 unit as these objects are indexed by


```
   INDEX  { ifIndex, hdsl2ShdslInvIndex, hdsl2ShdslendpointSide,
            hdsl2ShdslEndpointWirePair }
```

A management application which intends to manage G.SHDSL.bis agents, should be modified to accept this sequence.

One should note that this same unmodified management application is still capable if managing G.SHDSL.bis agents albeit to the degree of G.SHDSL (non-bis) limitations. That is, it can create and monitor configurations limited to two wire pairs with an upper rate limit of 4112000 bits/second.

[8](#). 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 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 3414 [RFC3414] and the
View-based Access Control Model RFC 3415 [RFC3415] 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.

It is conceivable that a management application that was designed to
support G.SHDSL as defined in RFC 3276 [RFC3276] could be broken by a
G.SHDSL.bis agent which reports objects for additional wire pairs (as
noted in Section 7).

For example, if a management application blindly loaded object
instances into an array until the object changes (during repeated
GET-NEXT requests). It is anticipated that the modifications to the
management application code would be straightforward. Perhaps of the
form:

    if (name[12] .gt; 2) reject();

  or

```
    if ( *val .gt; 4112000) reject();
```

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