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                    Definitions of Managed Objects
               for Synchronous Optical Network (SONET)
          Linear Automatic Protection Switching (APS) Architectures

Status of this Memo

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

Abstract

   This memo defines a portion of the Management Information Base (MIB)
   for use with network management protocols in TCP/IP based internets.
   In particular, it defines objects for managing networks using
   Synchronous Optical Network (SONET) linear Automatic Protection
   Switching (APS) architectures.

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1. Introduction

   This memo defines a portion of the Management Information Base (MIB)
   used for managing SONET linear Automatic Protection Switching (APS)
   architectures. Two linear APS architectures are supported, the 1+1
   architecture and the 1:n architecture.

2. The Internet-Standard Management Framework

   For a detailed overview of the documents that describe the current
   Internet-Standard Management Framework, please refer to section 7 of
   RFC 3410 [RFC3410].

   Managed objects are accessed via a virtual information store, termed
   the Management Information Base or MIB. MIB objects are generally
   accessed through the Simple Network Management Protocol (SNMP).
   Objects in the MIB are defined using the mechanisms defined in the
   Structure of Management Information (SMI). This memo specifies a MIB
   module that is compliant to the SMIv2, which is described in STD 58,
   RFC 2578 [RFC2578], STD 58, RFC 2579 [RFC2579] and STD 58, RFC 2580
   [RFC2580].

3. Overview

   These objects are used to control and manage SONET linear APS
   architectures. Ring APS groups are not currently supported by this
   MIB.

   The MIB includes three scalars, containing counts of APS groups and
   SONET LTEs, a notification enable object, and six tables.

   The apsMapTable contains entries for each SONET LTE interface
   available on the system. The table serves two purposes. It can be
   used to locate SONET LTE interfaces that are not currently included
   in APS groups. It also provides a mapping from InterfaceIndex to
   group name and channel number for those SONET LTE interfaces that are
   included in APS groups. Entries in apsMapTable cannot be added or
   deleted through operations defined in this MIB. However, an
   apsMapEntry may be added or deleted through other system mechanisms,
   such as hot swap. Also, existing entries cannot be directly modified
   and instead, such modifications occur as a result of side-effects of
   operations on the apsChanConfigTable.

   The apsChanConfigTable supports addition, modification and deletion
   of entries representing linear APS channels. Entries are indexed by
   a text group name and integer channel number. Each entry contains an
   InterfaceIndex value identifying the SONET LTE used for the channel
   and the priority of the channel. A side effect of row creation or

deletion is the setting of map entry fields. Creation of two or more
entries in this table with a common group name index and consecutive
channel numbers is the first step in the creation and configuration
of an APS group. It is not necessary to create channel numbers in
order; however, before an APS group is made active, the set of
channels must begin with channel number 0 (for architectures other
than onePlusOneOptimized) or channel number 1 (for the
onePlusOneOptimized architecture) and must have consecutive channel
numbers not exceeding 14. Note that the term null channel, which is
used throughout this document, refers to the protection line.

The apsConfigTable supports addition, modification, and deletion of
entries representing linear APS groups. Entries are indexed by a
text group name. Each entry contains parameters that specify the
configuration of a particular linear APS group. Entries are created
in this table after a set of channels are created in the
apsChanConfigTable. To successfully set an instance of
apsConfigRowStatus to active the apsConfigEntry must contain valid
values and all associated apsChanConfigEntry rows must be valid and
produce a consecutive set of channels beginning with channel number 0
or 1, depending on the selected architecture.

The apsCommandTable provides linear APS commands that support
protection switching and the ability to modify APS operation.
Entries in this table are created as a side effect of setting the
associated apsConfigRowStatus object to active. Entries in this
table are deleted if the associated apsConfigRowStatus object is set
to any value except active.

The apsChanStatusTable provides individual channel statistics.

The apsStatusTable provides group level statistics.

An APS group is created and configured with the following sequence of
events:

CHANNEL CONFIGURATION

Create an entry in the apsChanConfigTable. Set the
apsChanConfigGroupName in an apsChanConfigEntry to a user-friendly
text string which will serve as the APS group name. The string must
not be equal to the apsConfigName of an existing apsConfigEntry with
apsConfigRowStatus set to active, since a channel cannot be added to
an active group. The string may be set equal to the apsConfigName of
a row which is currently not set to active, or it may be set to a
string which does not currently exist in any instance of
apsConfigName. A channel number is entered in apsChanConfigNumber.
A channel priority is entered in apsChanConfigPriority, if the

   intended architecture is 1:n. apsChanConfigPriority is ignored if
   the architecture is 1+1. The InterfaceIndex value of a SONET LTE
   interface is entered in apsChanConfigIfIndex.

   This step is repeated for all apsChanConfigEntry instances which are
   to be included in the APS group.

   ACTIVATING THE GROUP

   If the apsChanConfigGroupName does not exist in an instance of
   apsConfigName, an apsConfigEntry is created with the
   apsChanConfigGroupName value used as the index for the row. The
   apsConfigRowStatus value may be set to createAndGo. The
   apsGroupConfigEntry and apsChanConfigEntry instances with matching
   name fields will be checked for consistency. If any errors in the
   channel numbers, architecture or configuration are uncovered the
   apsConfigRowStatus set will return inconsistentValue, otherwise
   noError is returned.

   If the apsChanConfigGroupName value used in channel configuration
   exists in a previously created, inactive apsConfigEntry instance, the
   apsConfigRowStatus value may be set to active.

   An agent is not required to process SNMP Set Requests that affect
   multiple control objects within this MIB. This is intended to
   simplify the processing of Set Requests for the various control
   tables by eliminating the possibility that a single Set PDU will
   contain multiple varbinds which are in conflict, such as a PDU which
   both activates a given apsConfigEntry while at the same time it
   deactivates an associated apsChanConfigEntry.

4. Definitions

APS-MIB DEFINITIONS ::= BEGIN

IMPORTS
        MODULE-IDENTITY, NOTIFICATION-TYPE, OBJECT-TYPE,
        Gauge32, Counter32, Integer32, transmission
                FROM SNMPv2-SMI

        TEXTUAL-CONVENTION, RowStatus,
        TimeStamp, StorageType
                FROM SNMPv2-TC

        SnmpAdminString
                FROM SNMP-FRAMEWORK-MIB

```
        ifIndex, InterfaceIndex
                FROM IF-MIB

        MODULE-COMPLIANCE, OBJECT-GROUP, NOTIFICATION-GROUP
                FROM SNMPv2-CONF;

apsMIB MODULE-IDENTITY
    LAST-UPDATED         "200302280000Z"  -- February 28, 2003
    ORGANIZATION         "IETF AToMMIB Working Group"
    CONTACT-INFO
        "       Jim Kuhfeld
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    DESCRIPTION
        "This management information module supports the configuration
         and management of SONET linear APS groups. The definitions and
         descriptions used in this MIB have been derived from
         Synchronous Optical Network (SONET) Transport Systems:
         Common Generic Criteria, GR-253-CORE Issue 3, September 2000,
         section 5.3. The MIB is also consistent with the Multiplex
         Section Protection (MSP) protocol as specified in ITU-T
         Recommendation G.783, Characteristics of synchronous digital
         hierarchy (SDH) equipment function blocks, Annex A and B.

         Copyright (C) The Internet Society (2003).  This version of
         this MIB module is part of RFC 3498; see the RFC itself for
         full legal notices.
         "
```

    REVISION   "200302280000Z" -- February 28, 2003
    DESCRIPTION
        "Initial version of this MIB, published as RFC 3498."
        ::= { transmission 49 }

apsMIBObjects OBJECT IDENTIFIER
        ::= { apsMIB 1 }

apsMIBNotifications OBJECT IDENTIFIER
        ::= { apsMIB 2 }

apsMIBConformance OBJECT IDENTIFIER
        ::= { apsMIB 3 }

ApsK1K2 ::= TEXTUAL-CONVENTION
    STATUS current
    DESCRIPTION
        "This Textual Convention describes an object that stores
         a SONET K1 and K2 byte APS protocol field.

         K1 is located in the first octet, K2 is located in
         the second octet. Bits are numbered from left to right.

         Bits 1-4 of the K1 byte indicate a request.

         1111 Lockout of Protection
         1110 Forced Switch
         1101 SF - High Priority
         1100 SF - Low Priority
         1011 SD - High Priority
         1010 SD - Low Priority
         1001 not used
         1000 Manual Switch
         0111 not used
         0110 Wait-to-Restore
         0101 not used
         0100 Exercise
         0011 not used
         0010 Reverse Request
         0001 Do Not Revert
         0000 No Request

         Bits 5-8 of the K1 byte indicate the channel associated with
         the request defined in bits 1-4.

         0000 is the Null channel.

         1-14 are working channels.
         15   is the extra traffic channel

         Bits 1-4 of the K2 byte indicate a channel. The channel is
         defined with the same syntax as K1 Bits 5-8.

         Bit 5 of the K2 byte indicates the
         architecture.

         0 if the architecture is 1+1
         1 if the architecture is 1:n

         Bits 6-8 of the K2 byte indicates the mode.

         000 - 011 are reserved for future use
         100 indicates the mode is unidirectional
         101 indicates the mode is bidirectional
         110 RDI-L
         111 AIS-L
         "
     REFERENCE
         "Bellcore (Telcordia Technologies) GR-253-CORE, Issue 3,
         September 2000, 5.3.5."
     SYNTAX   OCTET STRING (SIZE (2))

ApsSwitchCommand ::= TEXTUAL-CONVENTION
     STATUS   current
     DESCRIPTION
         "An APS switch command allows a user to perform protection
          switch actions.

         If the APS switch command cannot be executed because an
         equal or higher priority request is in effect, an
         inconsistentValue error is returned.

         The Switch command values are:

         noCmd

         This value should be returned by a read request when no switch
         command has been written to the object in question since
         initialization. This value may not be used in a write
         operation. If noCmd is used in a write operation a wrongValue
         error is returned.

        clear

        Clears all of the switch commands listed below for the
        specified channel.

        lockoutOfProtection

        Prevents any of the working channels from switching to the
        protection line. The specified channel should be the protection
        channel, otherwise an inconsistentValue error is returned.

        forcedSwitchWorkToProtect

        Switches the specified working channel to the protection line.
        If the protection channel is specified an inconsistentValue
        error is returned.

        forcedSwitchProtectToWork

        Switches the working channel back from the protection
        line to the working line. The specified channel should be
        the protection channel, otherwise an inconsistentValue
        error is returned.

        manualSwitchWorkToProtect

        Switches the specified working channel to the protection line.
        If the protection channel is specified an inconsistentValue
        error is returned.

        manualSwitchProtectToWork

        Switches the working channel back from the protection
        line to the working line. The specified channel should be
        the protection channel, otherwise an inconsistentValue
        error is returned.

        exercise

        Exercises the protocol for a protection switch of the specified
        channel by issuing an Exercise request for that channel and
        checking the response on the APS channel. "
    SYNTAX   INTEGER {
                noCmd(1),
                clear(2),
                lockoutOfProtection(3),
                forcedSwitchWorkToProtect(4),
                forcedSwitchProtectToWork(5),

```
                    manualSwitchWorkToProtect(6),
                    manualSwitchProtectToWork(7),
                    exercise(8)
                 }

ApsControlCommand ::= TEXTUAL-CONVENTION
    STATUS         current
    DESCRIPTION
        "An APS control command applies only to LTE that support the
        1:n architecture and performs the following actions.

        The Control command values are:

        noCmd

        This value should be returned by a read request when no control
        command has been written to the object in question since
        initialization. This value may not be used in a write
        operation.  If noCmd is used in a write operation a wrongValue
        error is returned.

        lockoutWorkingChannel

        Prevents the specified working channel from switching to the
        protection line. If the protection line is specified an
        inconsistentValue error is returned.

        clearLockoutWorkingChannel

        Clears the lockout a working channel command for the channel
        specified. If the protection line is specified an
        inconsistentValue error is returned."
    SYNTAX         INTEGER {
                    noCmd(1),
                    lockoutWorkingChannel(2),
                    clearLockoutWorkingChannel(3)
                 }

--
-- APS Configuration Table
--
-- This table supports the addition, configuration and deletion of APS
-- groups.
--

apsConfig     OBJECT IDENTIFIER ::= { apsMIBObjects 1 }
```

```
apsConfigGroups OBJECT-TYPE
    SYNTAX      Gauge32
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "The count of APS groups. This count includes all rows in
         apsConfigTable, regardless of the value of apsConfigRowStatus."
    ::= { apsConfig 1 }

apsConfigTable OBJECT-TYPE
    SYNTAX      SEQUENCE OF ApsConfigEntry
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "This table lists the APS groups that have been configured
         on the system."
    ::= { apsConfig 2 }

apsConfigEntry OBJECT-TYPE
    SYNTAX      ApsConfigEntry
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "A conceptual row in the apsConfigTable."
    INDEX { IMPLIED apsConfigName }
    ::= { apsConfigTable  1 }

ApsConfigEntry ::= SEQUENCE {
    apsConfigName               SnmpAdminString,
    apsConfigRowStatus          RowStatus,
    apsConfigMode               INTEGER,
    apsConfigRevert             INTEGER,
    apsConfigDirection          INTEGER,
    apsConfigExtraTraffic       INTEGER,
    apsConfigSdBerThreshold     Integer32,
    apsConfigSfBerThreshold     Integer32,
    apsConfigWaitToRestore      Integer32,
    apsConfigCreationTime       TimeStamp,
    apsConfigStorageType        StorageType
}

apsConfigName OBJECT-TYPE
    SYNTAX      SnmpAdminString (SIZE (1..32))
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "A textual name for the APS group."
    ::= { apsConfigEntry 1 }
```

apsConfigRowStatus OBJECT-TYPE
    SYNTAX   RowStatus
    MAX-ACCESS read-create
    STATUS   current
    DESCRIPTION
        "The status of this APS group entry.

        An entry may not exist in the active state unless all
        objects in the entry have an appropriate value. Also,
        all associated apsChanConfigEntry rows must represent
        a set of consecutive channel numbers beginning with
        0 or 1, depending on the selected architecture.

        When set to notInService changes may be made to apsConfigMode,
        apsConfigRevert, apsConfigDirection, apsConfigExtraTraffic,
        apsConfigSdBerThreshold, apsConfigSfBerThreshold,
        and apsConfigWaitToRestore. Also, associated apsChanConfigTable
        objects may be added, deleted and modified."
    ::= { apsConfigEntry 2 }

apsConfigMode OBJECT-TYPE
    SYNTAX   INTEGER {
                    onePlusOne(1),
                    oneToN(2),
                    onePlusOneCompatible(3),
                    onePlusOneOptimized(4)
                    }
    MAX-ACCESS read-create
    STATUS   current
    DESCRIPTION
        "The architecture of the APS group.

        onePlusOne

        The 1+1 architecture permanently bridges the working
        line to the protection line.

        oneToN

        The 1:n architecture allows one protection channel to
        protect up to n working channels. When a fault is detected
        on one of the n working channels that channel is bridged
        over the protection channel.

        onePlusOneCompatible

          This refers to 1 + 1 bidirectional switching compatible with
          1:n bidirectional switching as specified in ITU-T
          Recommendation G.783 (04/97) section A.3.4.1. Since this
          mode necessitates bidirectional switching, apsConfigDirection
          must be set to bidirectional whenever onePlusOneCompatible
          is set.

          onePlusOneOptimized

          This refers to 1 + 1 bidirectional switching optimized
          for a network using predominantly 1 + 1 bidirectional
          switching as specified in ITU-T Recommendation G.783 (04/97)
          section B.1. Since this mode necessitates bidirectional
          switching, apsConfigDirection must be set to bidirectional
          whenever onePlusOneOptimized is set.

          This object may not be modified if the associated
          apsConfigRowStatus object is equal to active(1)."
      DEFVAL {onePlusOne}
      ::= { apsConfigEntry 3 }

apsConfigRevert OBJECT-TYPE
      SYNTAX   INTEGER { nonrevertive(1), revertive(2) }
      MAX-ACCESS read-create
      STATUS   current
      DESCRIPTION
        "The revertive mode of the APS group.

          nonrevertive

          Traffic remains on the protection line until another switch
          request is received.

          revertive

          When the condition that caused a switch to the protection
          line has been cleared the signal is switched back to the
          working line. Since switching is revertive with the 1:n
          architecture, apsConfigRevert must be set to revertive if
          apsConfigMode is set to oneToN.

          Switching may optionally be revertive with the 1+1 architecture.

          This object may not be modified if the associated
          apsConfigRowStatus object is equal to active(1). "
      DEFVAL { nonrevertive }
      ::= { apsConfigEntry 4 }

apsConfigDirection OBJECT-TYPE
    SYNTAX   INTEGER { unidirectional(1), bidirectional(2) }
    MAX-ACCESS read-create
    STATUS   current
    DESCRIPTION
       "The directional mode of the APS group.

        unidirectional

        The unidirectional mode provides protection in one direction.

        bidirectional

        The bidirectional mode provides protection in both
        directions.

        This object may not be modified if the associated
        apsConfigRowStatus object is equal to active(1). "
    DEFVAL {unidirectional}
    ::= { apsConfigEntry 5 }

apsConfigExtraTraffic OBJECT-TYPE
    SYNTAX   INTEGER { enabled(1), disabled(2) }
    MAX-ACCESS read-create
    STATUS   current
    DESCRIPTION
       "This object enables or disables the transfer of extra traffic
        on the protection channel in a 1:n architecture. This object
        must be set to disabled if the architecture is 1+1. It may be
        necessary to disable this in order to interwork with other SONET
        network elements that don't support extra traffic.

        This object may not be modified if the associated
        apsConfigRowStatus object is equal to active(1). "
    DEFVAL { disabled }
    ::= { apsConfigEntry 6 }

apsConfigSdBerThreshold OBJECT-TYPE
    SYNTAX   Integer32 (5..9)
    MAX-ACCESS read-create
    STATUS   current
    DESCRIPTION
        "The Signal Degrade Bit Error Rate.

         The negated value of this number is used as the exponent of
         10 for computing the threshold value for the Bit Error Rate
         (BER). For example, a value of 5 indicates a BER threshold of
         10^{-5}.

           This object may be modified if the associated
           apsConfigRowStatus object is equal to active(1)."
      DEFVAL { 5 }
      ::= { apsConfigEntry 7 }

apsConfigSfBerThreshold OBJECT-TYPE
      SYNTAX   Integer32 (3..5)
      MAX-ACCESS read-create
      STATUS   current
      DESCRIPTION
          "The Signal Failure Bit Error Rate.

           The negated value of this number is used as the exponent of
           10 for computing the threshold value for the Bit Error Rate
           (BER). For example, a value of 5 indicates a BER threshold of
           10^{-5}.

           This object may be modified if the associated
           apsConfigRowStatus object is equal to active(1)."
      DEFVAL { 3 }
      ::= { apsConfigEntry 8 }

apsConfigWaitToRestore OBJECT-TYPE
      SYNTAX   Integer32 (0..720)
      UNITS   "seconds"
      MAX-ACCESS read-create
      STATUS   current
      DESCRIPTION
          "The Wait To Restore period in seconds.

           After clearing of a condition that necessitated an
           automatic switch, the wait to restore period must elapse
           before reverting. This is intended to avoid rapid switch
           oscillations.

           GR-253-CORE specifies a Wait To Restore range of 5 to 12
           minutes. G.783 defines a 5 to 12 minute Wait To Restore
           range in section 5.4.1.1.3, but also allows for a shorter
           WTR period in Table 2-1,
           WaitToRestore value (MI_WTRtime: 0..(5)..12 minutes).

           This object may not be modified if the associated
           apsConfigRowStatus object is equal to active(1)."
      DEFVAL { 300 }
      ::= { apsConfigEntry 9 }

apsConfigCreationTime OBJECT-TYPE
    SYNTAX   TimeStamp
    MAX-ACCESS read-only
    STATUS   current
    DESCRIPTION
        "The value of sysUpTime at the time the row was
         created"
    ::= { apsConfigEntry 10 }

apsConfigStorageType OBJECT-TYPE
    SYNTAX   StorageType
    MAX-ACCESS read-create
    STATUS   current
    DESCRIPTION
        "The storage type for this conceptual row.
         Conceptual rows having the value 'permanent' need not
         allow write-access to any columnar objects in the row."
    DEFVAL   { nonVolatile }
    ::= { apsConfigEntry 11 }

--
-- APS Status Table
--
-- This table provides APS group statistics.
--

apsStatusTable OBJECT-TYPE
    SYNTAX   SEQUENCE OF ApsStatusEntry
    MAX-ACCESS not-accessible
    STATUS   current
    DESCRIPTION
        "This table provides status information about APS groups
         that have been configured on the system."
    ::= { apsMIBObjects 2 }

apsStatusEntry OBJECT-TYPE
    SYNTAX   ApsStatusEntry
    MAX-ACCESS not-accessible
    STATUS   current
    DESCRIPTION
        "A conceptual row in the apsStatusTable."
    AUGMENTS { apsConfigEntry }
    ::= { apsStatusTable 1 }

ApsStatusEntry ::= SEQUENCE {
    apsStatusK1K2Rcv   ApsK1K2,
    apsStatusK1K2Trans   ApsK1K2,
    apsStatusCurrent   BITS,

```
    apsStatusModeMismatches      Counter32,
    apsStatusChannelMismatches   Counter32,
    apsStatusPSBFs               Counter32,
    apsStatusFEPLFs              Counter32,
    apsStatusSwitchedChannel     Integer32,
    apsStatusDiscontinuityTime   TimeStamp
}

apsStatusK1K2Rcv OBJECT-TYPE
    SYNTAX      ApsK1K2
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "The current value of the K1 and K2 bytes received on the
         protection channel."
    ::= { apsStatusEntry 1 }

apsStatusK1K2Trans OBJECT-TYPE
    SYNTAX      ApsK1K2
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "The current value of the K1 and K2 bytes transmitted on the
         protection channel."
    ::= { apsStatusEntry 2 }

apsStatusCurrent OBJECT-TYPE
    SYNTAX      BITS {
                  modeMismatch(0),
                  channelMismatch(1),
                  psbf(2),
                  feplf(3),
                  extraTraffic(4)
                }
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "The current status of the APS group.

         modeMismatch

         Modes other than 1+1 unidirectional monitor protection line
         K2 bit 5, which indicates the architecture and K2 bits
         6-8, which indicate if the mode is unidirectional or
         bidirectional. A conflict between the current local mode
         and the received K2 mode information constitutes a
         mode mismatch.
```

channelMismatch

This bit indicates a mismatch between the transmitted K1
channel and the received K2 channel has been detected.

psbf

This bit indicates a Protection Switch Byte Failure (PSBF) is
in effect. This condition occurs when either an inconsistent
APS byte or an invalid code is detected. An inconsistent APS
byte occurs when no three consecutive K1 bytes of the last 12
successive frames are identical, starting with the last frame
containing a previously consistent byte. An invalid code occurs
when the incoming K1 byte contains an unused code or a code
irrelevant for the specific switching operation (e.g., Reverse
Request while no switching request is outstanding) in three
consecutive frames. An invalid code also occurs when the
incoming K1 byte contains an invalid channel number in three
consecutive frames.

feplf

Modes other than 1+1 unidirectional monitor the K1 byte
for Far-End Protection-Line failures. A Far-End
Protection-Line defect is declared based on receiving
SF on the protection line.

extraTraffic

This bit indicates whether extra traffic is currently being
accepted on the protection line. "
    ::= { apsStatusEntry 3 }

apsStatusModeMismatches OBJECT-TYPE
    SYNTAX   Counter32
    MAX-ACCESS read-only
    STATUS   current
    DESCRIPTION
        "A count of Mode Mismatch conditions.

        Discontinuities in the value of this counter can occur at
        re-initialization of the management system, and at other
        times as indicated by the value of
        apsStatusDiscontinuityTime."
    ::= { apsStatusEntry 4 }

apsStatusChannelMismatches OBJECT-TYPE
    SYNTAX   Counter32
    MAX-ACCESS read-only
    STATUS   current
    DESCRIPTION
        "A count of Channel Mismatch conditions.

         Discontinuities in the value of this counter can occur at
         re-initialization of the management system, and at other
         times as indicated by the value of
         apsStatusDiscontinuityTime."
    ::= { apsStatusEntry 5 }

apsStatusPSBFs OBJECT-TYPE
    SYNTAX   Counter32
    MAX-ACCESS read-only
    STATUS   current
    DESCRIPTION
        "A count of Protection Switch Byte Failure conditions.
         This condition occurs when either an inconsistent APS
         byte or an invalid code is detected. An inconsistent APS
         byte occurs when no three consecutive K1 bytes of the last
         12 successive frames are identical, starting with the last
         frame containing a previously consistent byte. An invalid
         code occurs when the incoming K1 byte contains an unused
         code or a code irrelevant for the specific switching
         operation (e.g., Reverse Request while no switching request
         is outstanding) in three consecutive frames. An invalid code
         also occurs when the incoming K1 byte contains an invalid
         channel number in three consecutive frames.

         Discontinuities in the value of this counter can occur at
         re-initialization of the management system, and at other
         times as indicated by the value of
         apsStatusDiscontinuityTime."
    ::= { apsStatusEntry 6 }

apsStatusFEPLFs OBJECT-TYPE
    SYNTAX   Counter32
    MAX-ACCESS read-only
    STATUS   current
    DESCRIPTION
        "A count of Far-End Protection-Line Failure conditions.
         This condition is declared based on receiving SF on
         the protection line in the K1 byte.

          Discontinuities in the value of this counter can occur at
          re-initialization of the management system, and at other
          times as indicated by the value of
          apsStatusDiscontinuityTime."
     ::= { apsStatusEntry 7 }

apsStatusSwitchedChannel OBJECT-TYPE
     SYNTAX   Integer32
     MAX-ACCESS read-only
     STATUS   current
     DESCRIPTION
         "This field is set to the number of the channel that is
          currently switched to protection. The value 0 indicates no
          channel is switched to protection. The values 1-14 indicate
          that working channel is switched to protection."
     ::= { apsStatusEntry 8 }

apsStatusDiscontinuityTime OBJECT-TYPE
     SYNTAX   TimeStamp
     MAX-ACCESS read-only
     STATUS   current
     DESCRIPTION
         "The value of sysUpTime on the most recent occasion at which
          any one or more of this APS group's counters suffered a
          discontinuity. The relevant counters are the specific
          instances associated with this APS group of any Counter32
          object contained in apsStatusTable. If no such
          discontinuities have occurred since the last re-initialization
          of the local management subsystem, then this object contains
          a zero value."
     ::= { apsStatusEntry 9 }

--
-- APS Map Group
--
-- Lists the SONET LTE interfaces that may be used to create APS groups.
--

apsMap   OBJECT IDENTIFIER ::= { apsMIBObjects 3 }

apsChanLTEs OBJECT-TYPE
     SYNTAX   Gauge32
     MAX-ACCESS read-only
     STATUS   current
     DESCRIPTION
         "The count of SONET LTE interfaces on the system.
          Each interface that is included has an ifType value of
          sonet(39)."

```
    ::= { apsMap 1 }


apsMapTable OBJECT-TYPE
    SYNTAX       SEQUENCE OF ApsMapEntry
    MAX-ACCESS   not-accessible
    STATUS       current
    DESCRIPTION
        "This table lists the SONET LTE interfaces on the system.
         Each interface that is listed has an ifType value of
         sonet(39)."
    ::= { apsMap 2 }


apsMapEntry OBJECT-TYPE
    SYNTAX       ApsMapEntry
    MAX-ACCESS   not-accessible
    STATUS       current
    DESCRIPTION
        "A conceptual row in the apsMapTable."
    INDEX { ifIndex }
    ::= { apsMapTable  1 }


ApsMapEntry ::= SEQUENCE {
    apsMapGroupName              SnmpAdminString,
    apsMapChanNumber            Integer32
}


apsMapGroupName OBJECT-TYPE
    SYNTAX       SnmpAdminString (SIZE (0..32))
    MAX-ACCESS   read-only
    STATUS       current
    DESCRIPTION
        "A textual name for the APS group which this channel is
         included in. If the channel is not part of an APS group
         this value is set to a string of size 0.

         When an instance of apsChanConfigIfIndex is set equal to an
         instance of ifIndex that has an ifType value of sonet(39),
         apsMapGroupName is set equal to the corresponding value of
         apsChanConfigGroupName.

         If an instance of ifIndex that has an ifType value of
         sonet(39) ceases to be equal to an instance of
         apsChanConfigIfIndex, either because of a change in the value
         of apsChanConfigIfIndex, or because of row deletion in the
         ApsChanConfigTable, apsMapGroupName is set to a string of
         size 0."
    ::= { apsMapEntry 2 }
```

```
apsMapChanNumber OBJECT-TYPE
    SYNTAX     Integer32 (-1..14)
    MAX-ACCESS read-only
    STATUS     current
    DESCRIPTION
        "This field is set to a unique channel number within an APS
         group.  The value 0 indicates the null channel. The values
         1-14 define a working channel. If the SONET LTE is not part
         of an APS group this value is set to -1.

         When an instance of apsChanConfigIfIndex is set equal to an
         instance of ifIndex that has an  ifType value of sonet(39),
         apsMapChanNumber is set equal to the corresponding value of
         apsChanConfigNumber.

         If an instance of ifIndex that has an  ifType value of
         sonet(39) ceases to be equal to an instance of
         apsChanConfigIfIndex, either because of a change in the
         value of apsChanConfigIfIndex, or because of row deletion
         in the ApsChanConfigTable, apsMapChanNumber is set to -1."
    ::= { apsMapEntry 3 }

--
-- APS Channel Configuration Table
--
-- This table supports the addition, configuration and deletion of
-- channels in APS groups.
--

apsChanConfigTable OBJECT-TYPE
    SYNTAX     SEQUENCE OF ApsChanConfigEntry
    MAX-ACCESS not-accessible
    STATUS     current
    DESCRIPTION
        "This table lists the APS channels that have been configured
         in APS groups."
    ::= { apsMIBObjects 4 }

apsChanConfigEntry OBJECT-TYPE
    SYNTAX     ApsChanConfigEntry
    MAX-ACCESS not-accessible
    STATUS     current
    DESCRIPTION
        "A conceptual row in the apsChanConfigTable."
    INDEX {apsChanConfigGroupName, apsChanConfigNumber}
    ::= { apsChanConfigTable  1 }
```

```
ApsChanConfigEntry ::= SEQUENCE {
    apsChanConfigGroupName              SnmpAdminString,
    apsChanConfigNumber                 Integer32,
    apsChanConfigRowStatus              RowStatus,
    apsChanConfigIfIndex                InterfaceIndex,
    apsChanConfigPriority               INTEGER,
    apsChanConfigStorageType            StorageType
}
```

apsChanConfigGroupName OBJECT-TYPE
    SYNTAX   SnmpAdminString (SIZE (1..32))
    MAX-ACCESS not-accessible
    STATUS   current
    DESCRIPTION
        "A textual name for the APS group which this channel is
         included in."
    ::= { apsChanConfigEntry 1 }

apsChanConfigNumber OBJECT-TYPE
    SYNTAX   Integer32 (0..14)
    MAX-ACCESS not-accessible
    STATUS   current
    DESCRIPTION
        "This field is set to a unique channel number within an APS
         group. The value 0 indicates the null channel. The values
         1-14 define a working channel.

         This field must be assigned a unique number within the group."
    ::= { apsChanConfigEntry 2 }

apsChanConfigRowStatus OBJECT-TYPE
    SYNTAX   RowStatus
    MAX-ACCESS read-create
    STATUS   current
    DESCRIPTION
        "The status of this APS channel entry.

         An entry may not exist in the active state unless all
         objects in the entry have an appropriate value.

         A row in the apsChanConfigTable may not be created,
         deleted, set to notInService or otherwise modified
         if the apsChanConfigGroupName value is equal to an
         apsConfigName value and the associated apsConfigRowStatus
         object is equal to active. However, if the apsConfigRowStatus
         object is equal to notInService, a row may be created, deleted
         or modified. In other words, a channel may not be added,
         deleted or modified if the group is active.

A row may be created with an apsChanConfigGroupName value
that is not equal to any existing instance of apsConfigName.
This action is the initial step in adding a SONET LTE to a
new APS group.

If this object is set to destroy, the associated instance
of apsMapGroupName will be set to a string of size 0 and
the apsMapChanNumber will be set to -1. The channel status
entry will also be deleted by this action.

apsChanConfigNumber must be set to a unique channel number
within the APS group. The value 0 indicates the null channel.
The values 1-14 define a working channel. When an attempt is
made to set the corresponding apsConfigRowStatus field to
active the apsChanConfigNumber values of all entries with equal
apsChanConfigGroupName fields must represent a set of
consecutive integer values beginning with 0 or 1, depending on
the architecture of the group, and ending with n, where n is
greater than or equal to 1 and less than or equal to 14.
Otherwise, the error inconsistentValue is returned to the
apsConfigRowStatus set attempt."
    ::= { apsChanConfigEntry 3 }

apsChanConfigIfIndex OBJECT-TYPE
    SYNTAX   InterfaceIndex
    MAX-ACCESS read-create
    STATUS   current
    DESCRIPTION
        "The Interface Index assigned to a SONET LTE. This is an
         interface with ifType sonet(39). The value of this object
         must be unique among all instances of apsChanConfigIfIndex.
         In other words, a particular SONET LTE can only be configured
         in one APS group.

         This object cannot be set if the apsChanConfigGroupName
         instance associated with this row is equal to an instance of
         apsConfigName and the corresponding apsConfigRowStatus object
         is set to active. In other words this value cannot be changed
         if the APS group is active. However, this value may be changed
         if the apsConfigRowStatus value is equal to notInService."
    ::= { apsChanConfigEntry 4 }

apsChanConfigPriority OBJECT-TYPE
    SYNTAX   INTEGER {low(1), high(2)}
    MAX-ACCESS read-create
    STATUS   current
    DESCRIPTION
        "The priority of the channel.

          This field determines whether high or low priority
          SD and SF codes are used in K1 requests.

          This field is only applicable if the channel is to be included
          in a group using the 1:n architecture. It is not applicable if
          the channel is to be included in a group using the 1+1
          architecture, and is ignored in that case.

          This object cannot be set if the apsChanConfigGroupName
          instance associated with this row is equal to an instance of
          apsConfigName and the corresponding apsConfigRowStatus object
          is set to active. In other words this value cannot be changed
          if the APS group is active. However, this value may be changed
          if the apsConfigRowStatus value is equal to notInService."
     DEFVAL { low }
     ::= { apsChanConfigEntry 5 }

apsChanConfigStorageType OBJECT-TYPE
     SYNTAX   StorageType
     MAX-ACCESS   read-create
     STATUS   current
     DESCRIPTION
         "The storage type for this conceptual row.
          Conceptual rows having the value 'permanent' need not
          allow write-access to any columnar objects in the row."
     DEFVAL { nonVolatile }
     ::= { apsChanConfigEntry 6 }

--
-- APS Command Table
--
-- This table provides the ability to initiate APS commands.
--

apsCommandTable OBJECT-TYPE
     SYNTAX   SEQUENCE OF ApsCommandEntry
     MAX-ACCESS   not-accessible
     STATUS   current
     DESCRIPTION
         "This table allows commands to be sent to configured APS
          groups."
     ::= { apsMIBObjects 5 }

apsCommandEntry OBJECT-TYPE
     SYNTAX   ApsCommandEntry
     MAX-ACCESS   not-accessible
     STATUS   current
     DESCRIPTION

```
        "A conceptual row in the apsCommandTable. This row exists only
         if the associated apsConfigEntry is active."
    INDEX {apsChanConfigGroupName, apsChanConfigNumber}
    ::= { apsCommandTable  1 }

ApsCommandEntry ::= SEQUENCE {
    apsCommandSwitch          ApsSwitchCommand,
    apsCommandControl         ApsControlCommand
}

apsCommandSwitch OBJECT-TYPE
    SYNTAX      ApsSwitchCommand
    MAX-ACCESS  read-write
    STATUS      current
    DESCRIPTION
        "Allows the initiation of an APS switch command on the
         APS group and channel specified by the index values.

         When read this object returns the last command written
         or noCmd if no command has been written to this
         channel since initialization. The return of the last command
         written does not imply that this command is currently in
         effect.  This request may have been preempted by a higher
         priority local or remote request. In order to determine the
         current state of the APS group it is necessary to read
         the objects apsStatusK1K2Rcv and apsStatusK1K2Trans.

         The value lockoutOfProtection should only be applied to the
         protection line channel since that switch command prevents any
         of the working channels from switching to the protection line.
         Following the same logic, forcedSwitchProtectToWork and
         manualSwitchProtectToWork should only be applied to the
         protection line channel.

         forcedSwitchWorkToProtect and manualSwitchWorkToProtect
         should only be applied to a working channel."
    ::= { apsCommandEntry 1 }

apsCommandControl OBJECT-TYPE
    SYNTAX      ApsControlCommand
    MAX-ACCESS  read-write
    STATUS      current
    DESCRIPTION
        "Allows the initiation of an APS control command on the
         APS group and channel specified by the index values.
```

           When read this object returns the last command written or
           noCmd if no command has been written to this channel since
           initialization.

           This object does not apply to the protection line."
       ::= { apsCommandEntry 2 }

--
-- APS Channel Status Table
--
-- This table provides APS channel statistics.
--

apsChanStatusTable OBJECT-TYPE
    SYNTAX   SEQUENCE OF ApsChanStatusEntry
    MAX-ACCESS not-accessible
    STATUS   current
    DESCRIPTION
        "This table contains status information for all SONET LTE
         interfaces that are included in APS groups."
    ::= { apsMIBObjects 6 }

apsChanStatusEntry OBJECT-TYPE
    SYNTAX   ApsChanStatusEntry
    MAX-ACCESS not-accessible
    STATUS   current
    DESCRIPTION
        "A conceptual row in the apsChanStatusTable."
    AUGMENTS { apsChanConfigEntry }
    ::= { apsChanStatusTable 1 }

ApsChanStatusEntry ::= SEQUENCE {
    apsChanStatusCurrent   BITS,
    apsChanStatusSignalDegrades   Counter32,
    apsChanStatusSignalFailures   Counter32,
    apsChanStatusSwitchovers   Counter32,
    apsChanStatusLastSwitchover   TimeStamp,
    apsChanStatusSwitchoverSeconds   Counter32,
    apsChanStatusDiscontinuityTime   TimeStamp
}

apsChanStatusCurrent OBJECT-TYPE
    SYNTAX   BITS {
                lockedOut(0),
                sd(1),
                sf(2),
                switched(3),
                wtr(4)

```
            }
    MAX-ACCESS read-only
    STATUS     current
    DESCRIPTION
        "Indicates the current state of the port.

        lockedOut

        This bit, when applied to a working channel, indicates that
        the channel is prevented from switching to the protection
        line.  When applied to the null channel, this bit indicates
        that no working channel may switch to the protection line.

        sd

        A signal degrade condition is in effect.

        sf

        A signal failure condition is in effect.

        switched

        The switched bit is applied to a working channel if that
        channel is currently switched to the protection line.

        wtr

        A Wait-to-Restore state is in effect."
    ::= { apsChanStatusEntry 1 }

apsChanStatusSignalDegrades OBJECT-TYPE
    SYNTAX     Counter32
    MAX-ACCESS read-only
    STATUS     current
    DESCRIPTION
        "A count of Signal Degrade conditions. This condition
         occurs when the line Bit Error Rate exceeds the currently
         configured value of the relevant instance of
         apsConfigSdBerThreshold.

         Discontinuities in the value of this counter can occur at
         re-initialization of the management system, and at other
         times as indicated by the value of
         apsChanStatusDiscontinuityTime."

    ::= { apsChanStatusEntry 2 }
```

apsChanStatusSignalFailures OBJECT-TYPE
    SYNTAX   Counter32
    MAX-ACCESS read-only
    STATUS   current
    DESCRIPTION
        "A count of Signal Failure conditions that have been
         detected on the incoming signal. This condition occurs
         when a loss of signal, loss of frame, AIS-L or a Line
         bit error rate exceeding the currently configured value of
         the relevant instance of apsConfigSfBerThreshold.

         Discontinuities in the value of this counter can occur at
         re-initialization of the management system, and at other
         times as indicated by the value of
         apsChanStatusDiscontinuityTime."

    ::= { apsChanStatusEntry 3 }

apsChanStatusSwitchovers OBJECT-TYPE
    SYNTAX   Counter32
    MAX-ACCESS read-only
    STATUS   current
    DESCRIPTION
        "When queried with index value apsChanConfigNumber other than
         0, this object will return the number of times this channel
         has switched to the protection line.

         When queried with index value apsChanConfigNumber set to 0,
         which is the protection line, this object will return the
         number of times that any working channel has been switched
         back to the working line from this protection line.

         Discontinuities in the value of this counter can occur at
         re-initialization of the management system, and at other
         times as indicated by the value of
         apsChanStatusDiscontinuityTime."

    ::= { apsChanStatusEntry 4 }

apsChanStatusLastSwitchover OBJECT-TYPE
    SYNTAX   TimeStamp
    MAX-ACCESS read-only
    STATUS   current
    DESCRIPTION
        "When queried with index value apsChanConfigNumber other than
         0, this object will return the value of sysUpTime when this
         channel last completed a switch to the protection line. If

           this channel has never switched to the protection line, the
           value 0 will be returned.

           When queried with index value apsChanConfigNumber set to 0,
           which is the protection line, this object will return the
           value of sysUpTime the last time that a working channel was
           switched back to the working line from this protection line.
           If no working channel has ever switched back to the working
           line from this protection line, the value 0 will be returned."

       ::= { apsChanStatusEntry 5 }

apsChanStatusSwitchoverSeconds OBJECT-TYPE
    SYNTAX   Counter32
    MAX-ACCESS read-only
    STATUS   current
    DESCRIPTION
        "The cumulative Protection Switching Duration (PSD) time in
         seconds. For a working channel, this is the cumulative number
         of seconds that service was carried on the protection line.
         For the protection line, this is the cumulative number of
         seconds that the protection line has been used to carry any
         working channel traffic. This information is only valid if
         revertive switching is enabled. The value 0 will be returned
         otherwise.

         Discontinuities in the value of this counter can occur at
         re-initialization of the management system, and at other
         times as indicated by the value of
         apsChanStatusDiscontinuityTime. For example, if the value
         of an instance of apsChanStatusSwitchoverSeconds changes
         from a non-zero value to zero due to revertive switching
         being disabled, it is expected that the corresponding
         value of apsChanStatusDiscontinuityTime will be updated
         to reflect the time of the configuration change.
         "
       ::= { apsChanStatusEntry 6 }

apsChanStatusDiscontinuityTime OBJECT-TYPE
    SYNTAX   TimeStamp
    MAX-ACCESS read-only
    STATUS   current
    DESCRIPTION
        "The value of sysUpTime on the most recent occasion at which
         any one or more of this channel's counters suffered a
         discontinuity. The relevant counters are the specific
         instances associated with this channel of any Counter32
         object contained in apsChanStatusTable. If no such

```
        discontinuities have occurred since the last re-initialization
        of the local management subsystem, then this object contains
        a zero value."
    ::= { apsChanStatusEntry 7 }


apsNotificationEnable OBJECT-TYPE
    SYNTAX     BITS {
               switchover(0),
               modeMismatch(1),
               channelMismatch(2),
               psbf(3),
               feplf(4)
            }
    MAX-ACCESS read-write
    STATUS     current
    DESCRIPTION
        "Provides the ability to enable and disable notifications
         defined in this MIB.

         switchover

         Indicates   apsEventSwitchover notifications
         should be generated.


         modeMismatch

         Indicates   apsEventModeMismatch notifications
         should be generated.


         channelMismatch

         Indicates   apsEventChannelMismatch notifications
         should be generated.


         psbf

         Indicates   apsEventPSBF notifications
         should be generated.


         feplf

         Indicates   apsEventFEPLF notifications
         should be generated. "
    DEFVAL { { } }
    ::= { apsMIBObjects 7 }

--
-- APS EVENTS
```

```
--

apsNotificationsPrefix OBJECT IDENTIFIER
        ::= { apsMIBNotifications 0 }

apsEventSwitchover NOTIFICATION-TYPE
    OBJECTS { apsChanStatusSwitchovers, apsChanStatusCurrent }
    STATUS  current
    DESCRIPTION
        "An apsEventSwitchover notification is sent when the
        value of an instance of apsChanStatusSwitchovers increments."
    ::= { apsNotificationsPrefix 1 }

apsEventModeMismatch NOTIFICATION-TYPE
    OBJECTS { apsStatusModeMismatches, apsStatusCurrent }
    STATUS  current
    DESCRIPTION
        "An apsEventModeMismatch notification is sent when the
        value of an instance of apsStatusModeMismatches increments."
    ::= { apsNotificationsPrefix 2 }

apsEventChannelMismatch NOTIFICATION-TYPE
    OBJECTS { apsStatusChannelMismatches, apsStatusCurrent }
    STATUS  current
    DESCRIPTION
        "An apsEventChannelMismatch notification is sent when the
        value of an instance of apsStatusChannelMismatches increments."
    ::= { apsNotificationsPrefix 3 }

apsEventPSBF NOTIFICATION-TYPE
    OBJECTS { apsStatusPSBFs, apsStatusCurrent }
    STATUS  current
    DESCRIPTION
        "An apsEventPSBF notification is sent when the
        value of an instance of apsStatusPSBFs increments."
    ::= { apsNotificationsPrefix 4 }

apsEventFEPLF NOTIFICATION-TYPE
    OBJECTS { apsStatusFEPLFs, apsStatusCurrent }
    STATUS  current
    DESCRIPTION
        "An apsEventFEPLFs notification is sent when the
        value of an instance of apsStatusFEPLFs increments."
    ::= { apsNotificationsPrefix 5 }

-- conformance information
```

```
apsGroups        OBJECT IDENTIFIER ::= { apsMIBConformance 1 }
apsCompliances OBJECT IDENTIFIER ::= { apsMIBConformance 2 }


apsFullCompliance MODULE-COMPLIANCE
     STATUS   current
     DESCRIPTION
         "When this MIB is implemented with support for read-create, then
          such an implementation can claim read/write compliance. Linear
          APS groups can then be both monitored and configured with this
          MIB.

          Note that An agent is not required to process SNMP Set Requests
          that affect multiple control objects within this MIB. This is
          intended to simplify the processing of Set Requests for the
          various control tables by eliminating the possibility that a
          single Set PDU will contain multiple varbinds which are in
          conflict. "

     MODULE
     MANDATORY-GROUPS { apsConfigGeneral, apsStatusGeneral,
                        apsChanGeneral }

         OBJECT   apsConfigRowStatus
         SYNTAX INTEGER { active(1) }
         WRITE-SYNTAX INTEGER { createAndGo(4), destroy(6) }
         DESCRIPTION
             "Support for createAndWait and notInService is not
              required."

         OBJECT   apsChanConfigRowStatus
         SYNTAX INTEGER { active(1) }
         WRITE-SYNTAX INTEGER { createAndGo(4), destroy(6) }
         DESCRIPTION
             "Support for createAndWait and notInService is not
              required."

         GROUP       apsConfigWtr
         DESCRIPTION
             "Implementation of this group is optional for all
              linear APS implementations. The information is
              applicable to groups supporting a configurable
              WTR period."

         GROUP       apsCommandOnePlusOne
         DESCRIPTION
             "Implementation of this group is optional for all
              linear APS implementations. The information is
              applicable to groups implementing the linear
```

              APS 1+1 architecture and supporting set operations."

        GROUP   apsCommandOneToN
         DESCRIPTION
             "Implementation of this group is optional for all
              linear APS implementations. The information is
              applicable to groups implementing the linear
              APS 1:n architecture and supporting set operations."

        GROUP   apsChanOneToN
         DESCRIPTION
             "Implementation of this group is optional for all
              linear APS implementations. The information is
              applicable to groups implementing the linear
              APS 1:n architecture."

        GROUP   apsTotalsGroup
         DESCRIPTION
             "Implementation of this group is optional for all
              linear APS implementations."

        GROUP   apsMapGroup
         DESCRIPTION
             "Implementation of this group is optional for all
              linear APS implementations."

        GROUP   apsEventGroup
         DESCRIPTION
             "Implementation of this group is optional for all
              linear APS implementations."

     ::= { apsCompliances 1 }

--
-- Read-Only Compliance
--

apsReadOnlyCompliance MODULE-COMPLIANCE
    STATUS current
    DESCRIPTION
        "When this MIB is implemented without support for read-create
         (i.e. in read-only mode), then that implementation can claim
         read-only compliance. In that case, linear APS groups can be
         monitored but cannot be configured with this MIB."

    MODULE
    MANDATORY-GROUPS { apsConfigGeneral, apsStatusGeneral,
                       apsChanGeneral }

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

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

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

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

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

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

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

        OBJECT   apsConfigRowStatus
        SYNTAX   INTEGER { active(1) }
        MIN-ACCESS   read-only
        DESCRIPTION
            "Write access is not required, and active is the only status
             that needs to be supported."

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

        OBJECT   apsChanConfigIfIndex
```

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

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

          OBJECT apsChanConfigRowStatus
          SYNTAX INTEGER { active(1) }
          MIN-ACCESS read-only
          DESCRIPTION
              "Write access is not required, and active is the only status
               that needs to be supported."

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

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

          GROUP   apsConfigWtr
          DESCRIPTION
              "Implementation of this group is optional for all
               linear APS implementations. The information is
               applicable to groups supporting a configurable
               WTR period."

          GROUP   apsCommandOnePlusOne
          DESCRIPTION
              "Implementation of this group is optional for all
               linear APS implementations. The information is
               applicable to groups implementing the linear
               APS 1+1 architecture and supporting set operations."

         GROUP   apsCommandOneToN
          DESCRIPTION
              "Implementation of this group is optional for all
               linear APS implementations. The information is
               applicable to groups implementing the linear
               APS 1:n architecture and supporting set operations."

         GROUP   apsChanOneToN

            DESCRIPTION
                "Implementation of this group is optional for all
                 linear APS implementations. The information is
                 applicable to groups implementing the linear
                 APS 1:n architecture."

         GROUP   apsTotalsGroup
          DESCRIPTION
                "Implementation of this group is optional for all
                 linear APS implementations."

         GROUP   apsMapGroup
          DESCRIPTION
                "Implementation of this group is optional for all
                 linear APS implementations."

         GROUP   apsEventGroup
          DESCRIPTION
                "Implementation of this group is optional for all
                 linear APS implementations."

      ::= { apsCompliances 2 }

-- units of conformance

apsConfigGeneral   OBJECT-GROUP
     OBJECTS
     {
         apsConfigMode,
         apsConfigRevert,
         apsConfigDirection,
         apsConfigExtraTraffic,
         apsConfigSdBerThreshold,
         apsConfigSfBerThreshold,
         apsConfigCreationTime,
         apsConfigRowStatus,
         apsConfigStorageType,
         apsNotificationEnable
     }
     STATUS current
     DESCRIPTION
         "A collection of apsConfigTable objects providing configuration
          information applicable to all linear APS groups."
     ::= { apsGroups 1 }

apsConfigWtr   OBJECT-GROUP
     OBJECTS
     {

```
        apsConfigWaitToRestore
    }
    STATUS  current
    DESCRIPTION
        "The apsConfigTable object that provides information which is
         applicable to groups supporting a configurable WTR period."
    ::= { apsGroups 2 }

-- If set operations are not supported neither of the following two
-- groups are implemented. If sets are supported only one of these
-- groups is implemented for a linear APS group instance.

apsCommandOnePlusOne    OBJECT-GROUP
    OBJECTS
    {
        apsCommandSwitch
    }
    STATUS  current
    DESCRIPTION
        "The  apsCommandTable object which is applicable to groups
         implementing the linear APS 1+1 architecture. Also, set
         operations must be supported."
    ::= { apsGroups 3 }

apsCommandOneToN    OBJECT-GROUP
    OBJECTS
    {
        apsCommandSwitch,
        apsCommandControl
    }
    STATUS  current
    DESCRIPTION
        "A collection of apsCommandTable objects which are applicable to
         groups implementing the linear APS 1:n architecture. Also, set
         operations must be supported."
    ::= { apsGroups 4 }

apsStatusGeneral    OBJECT-GROUP
    OBJECTS
    {
        apsStatusK1K2Rcv,
        apsStatusK1K2Trans,
        apsStatusCurrent,
        apsStatusModeMismatches,
        apsStatusChannelMismatches,
        apsStatusPSBFs,
        apsStatusFEPLFs,
        apsStatusSwitchedChannel,
```

```
            apsStatusDiscontinuityTime
    }
    STATUS  current
    DESCRIPTION
        "A collection of apsStatusTable objects providing status
         information applicable to all linear APS groups."
    ::= { apsGroups 5 }

apsChanGeneral   OBJECT-GROUP
    OBJECTS
    {
        apsChanConfigIfIndex,
        apsChanConfigRowStatus,
        apsChanConfigStorageType,
        apsChanStatusCurrent,
        apsChanStatusSignalDegrades,
        apsChanStatusSignalFailures,
        apsChanStatusSwitchovers,
        apsChanStatusLastSwitchover,
        apsChanStatusSwitchoverSeconds,
        apsChanStatusDiscontinuityTime
    }
    STATUS  current
    DESCRIPTION
        "A collection of channel objects providing information
         applicable to all linear APS channels."
    ::= { apsGroups 6 }

apsChanOneToN    OBJECT-GROUP
    OBJECTS
    {
        apsChanConfigPriority
    }
    STATUS  current
    DESCRIPTION
        "The apsChanConfigTable object that provides information which
         is only applicable to groups implementing the linear APS 1:n
         architecture."
    ::= { apsGroups 7 }

apsTotalsGroup OBJECT-GROUP
    OBJECTS
    {
        apsConfigGroups,
        apsChanLTEs
    }
    STATUS  current
    DESCRIPTION
```

```
        "A collection of objects providing optional counts of configured
         APS groups and SONET LTE interfaces."
    ::= { apsGroups 8 }


apsMapGroup OBJECT-GROUP
    OBJECTS
    {
        apsMapGroupName,
        apsMapChanNumber
    }
    STATUS  current
    DESCRIPTION
        "A collection of apsMapTable objects providing a mapping
         from sonet(39) InterfaceIndex to group name and channel
         number for assigned APS channels and a list of unassigned
         sonet(39) interfaces."
    ::= { apsGroups 9 }


apsEventGroup NOTIFICATION-GROUP
    NOTIFICATIONS {apsEventSwitchover, apsEventModeMismatch,
                   apsEventChannelMismatch, apsEventPSBF,
                   apsEventFEPLF }
    STATUS     current
    DESCRIPTION
        "A collection of SONET linear APS notifications."
    ::= { apsGroups 10 }


END
```

5. Intellectual Property

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8. Informative References

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9. Security Considerations

   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. In particular, the APS command objects
   apsCommandSwitch and apsCommandControl and the APS configuration
   objects apsConfigRowStatus, apsConfigMode, apsConfigRevert,
   apsConfigDirection, apsConfigExtraTraffic, apsConfigSdBerThreshold,
   apsConfigSfBerThreshold, apsConfigWaitToRestore,
   apsConfigStorageType, apsChanConfigRowStatus, apsChanConfigIfIndex,
   apsChanConfigPriority, apsChanConfigStorageType and
   apsNotificationEnable have the potential of disrupting APS operations
   if set operations are performed with malicious intent.

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

   It is recommended that implementers consider the security features as
   provided by the SNMPv3 framework (see [RFC3410], section 8),
   including full support for the SNMPv3 cryptographic mechanisms (for
   authentication and privacy).

   Further, deployment of SNMP versions prior to SNMPv3 is not
   recommended. Instead, it is recommended to deploy SNMPv3 and to
   enable cryptographic security. It is then a customer/operator
   responsibility to ensure that access to an instance of this MIB
   module is properly configured for only those principals (users) that
   have legitimate rights to GET or SET object instances.

10. Editors' Addresses

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