Definitions of Managed Objects
for HPR using SMIv2

Status of this Memo

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

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2. Introduction

   This memo defines a portion of the Management Information Base (MIB)
   for use with network management protocols in the Internet community.
   In particular, it defines objects for monitoring and controlling
   network devices with HPR (High Performance Routing) capabilities.
   This memo identifies managed objects for the HPR protocol.

3. The SNMP Network Management Framework

   The SNMP Network Management Framework consists of several components.
   For the purpose of this specification, the applicable components of
   the Framework are the SMI and related documents [1, 2, 3], which
   define the mechanisms used for describing and naming objects for the
   purpose of management.

   The Framework permits new objects to be defined for the purpose of
   experimentation and evaluation.

4. Overview

   This document identifies objects for monitoring the configuration and
   active characteristics of devices with HPR capabilities. HPR is an
   enhancement to the Advanced Peer-to-Peer Network (APPN) architecture
   that provides fast data routing and improved session reliability.
   APPN is one of the protocols that can use the HPR transport
   mechanism. See the SNANAU APPN MIB [4] for management of APPN and
   APPN use of the HPR transport.

   The HPR terms and overall architecture [5] are available at
   http://www.networking.ibm.com/app/aiwdoc/aiwsrc.htm.

   Automatic Network Routing (ANR) is a fast low-level routing
   technique. Each node assigns a unique (within that node) ANR label
   for each out-bound link as it is activated. The label size is
   defined by the ANR node, and nodes only need to know how to interpret
   their own labels. The ANR string is a group of ANR labels encoded in
   a header in front of the message being sent. At each hop the node
   strips off its own ANR label and forwards the message onto the link
   with that label. The last label in the string is the Network
   Connection Endpoint (NCE), which identifies the component within the
   destination node that is to receive the message.

   Rapid Transport Protocol (RTP) is an end-to-end full duplex transport
   connection (pipe). It provides for high-speed transport of data
   using ANR. RTP is connection-oriented, and delivers data in correct
   order reliably. Error recovery is done efficiently with selective
   retransmission of data. An RTP path can be switched without
   disrupting the sessions using it. An RTP path switch may be done
   automatically if a link in the path fails and another RTP path is
   available, or on demand to attempt to restore the optimal path.

   RTP performs flow/congestion control with the Adaptive Rate-Based
   (ARB) algorithm, described in [5]. ARB is done only at the endpoints
   of the RTP pipe, so intermediate hops are not involved.

ARB regulates the flow of data over an RTP connection by adaptively
changing the sender's rate based on feedback on the receiver's rate.
It is designed to prevent congestion rather than react to it.

In this document, we describe HPR managed objects.

Highlights of the management functions supported by the HPR MIB
module include the following:

o   Identifying network connection endpoints (NCEs).

o   Identifying how incoming packets are routed based on ANR labels.

o   Monitoring the RTP connections between nodes.

o   Ability to trigger an RTP path switch. The MIB only supports a
        path switch with no specified path. Some implementations may
        have a product-specific option to specify a new path. The
        hprOperatorPathSwitchSupport object identifies this support.

o   Historical information about RTP path switch attempts.

This MIB module does not support:

o   Configuration of HPR nodes.

o   Protocol-specific uses of HPR (such as APPN).

o   Traps. The APPN MIB contains a trap for Alert conditions that
        may affect HPR resources. The value for the affectedObject
        object contained in the alertTrap is determined by the
        implementation. It may contain a VariablePointer from the HPR
        MIB. The APPN/HPR Alerts are defined in [6].

4.1. HPR MIB Structure

Although HPR is an extension to APPN, the HPR MIB relies very little
upon the APPN MIB. The appnNodeCounterDisconTime object in the APPN
MIB is used to detect discontinuities in HPR MIB counters. The
hprNodeCpName object in this MIB has the same value as the
appnNodeCpName object in the APPN MIB.

The HPR MIB module contains the following collections of objects:

o   hprGlobal - general HPR objects.

o   hprAnrRouting - objects related to the ANR routing table.

   o   hprTransportUser - objects related to users of the HPR
         transport.

   o   hprRtp - objects related to the HPR Transport Tower.

   These are described below in more detail.

4.1.1. hprGlobal group

   The hprGlobal group consists of general objects such as the APPN CP
   (control point) name of the HPR node and the level of support for
   operator-requested path switches.

4.1.2. hprAnrRouting group

   The hprAnrRouting group consists objects to monitor and control the
   counting of ANR packets received and the following table:

   The hprAnrRoutingTable correlates incoming ANR labels to the outbound
   transmission group (TG) or local NCE to which incoming packet will be
   forwarded. An entry defines the label type as identifying a local
   NCE or a TG, identifies the NCE or TG, and counts the number of
   packets received with the entry's ANR label.

4.1.3. hprTransportUser group

   The hprTransportUser group consists of the following table:

   The hprNceTable identifies network connection endpoints and their
   function types. The function type can be any combination of a CP,
   logical unit (LU), boundary function, and route setup.

4.1.4. hprRtp group

   The hprRtp group consists of the following objects and tables:

   1) hprRtpGlobe

   These objects contain information about the number of RTP connection
   setups, and control of RTP counters.

   2) hprRtpTable

   This table contains one entry for each RTP connection. The
   information includes local and remote NCE IDs and TCIDs (transport
   connection identifiers), timers, send rates, and statistics. A path
   switch can be triggered by the hprRptPathSwitchTrigger object if the
   agent node supports it; however, a new path cannot be specified.

   3) hprRtpStatusTable

   This table contains statistics and historical information for RTP
   path switches attempts, including old and new ANR strings and Route
   Selection Control Vectors (RSCVs), why the path switch was initiated,
   and the result (successful or reason for failure).

5. Definitions

HPR-MIB DEFINITIONS ::= BEGIN

   IMPORTS
        DisplayString, DateAndTime, TimeStamp, TEXTUAL-CONVENTION
             FROM SNMPv2-TC

        Counter32, Gauge32, Unsigned32, TimeTicks,
        OBJECT-TYPE, MODULE-IDENTITY
             FROM SNMPv2-SMI

        MODULE-COMPLIANCE, OBJECT-GROUP
             FROM SNMPv2-CONF

        snanauMIB
             FROM SNA-NAU-MIB

        SnaControlPointName
             FROM APPN-MIB;

hprMIB MODULE-IDENTITY
        LAST-UPDATED "970514000000Z"
        ORGANIZATION "AIW APPN / HPR MIB SIG"
        CONTACT-INFO

               "

                        Bob Clouston
                        Cisco Systems
                        7025 Kit Creek Road
                        P.O. Box 14987
                        Research Triangle Park, NC 27709, USA
                        Tel: 1 919 472 2333
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                        IBM Corporation
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                              Research Triangle Park, NC 27709, USA
                              Tel: 1 919 254 4436
                              E-mail: remoore@ralvm6.vnet.ibm.com
             "
       DESCRIPTION
                 "This is the MIB module for objects used to
                  manage network devices with HPR capabilities."
::= { snanauMIB 6 }
-- snanauMIB ::= { mib-2 34 }

-- **
-- Textual Conventions
-- **
-- SnaControlPointName is imported from the APPN MIB

HprNceTypes ::= TEXTUAL-CONVENTION
       STATUS current
       DESCRIPTION
           "A bit string identifying the set of functions provided by a
           network connection endpoint (NCE). The following values are
           defined:

                   bit 0:   control point
                   bit 1:   logical unit
                   bit 2:   boundary function
                   bit 3:   route setup
             "

       SYNTAX BITS { controlPoint(0),
                     logicalUnit(1),
                     boundaryFunction(2),
                     routeSetup(3) }

HprRtpCounter ::= TEXTUAL-CONVENTION
       STATUS current
       DESCRIPTION
           "An object providing statistics for an RTP connection. A
           Management Station can detect discontinuities in this counter
           by monitoring the correspondingly indexed
           hprRtpCounterDisconTime object."

       SYNTAX Counter32

-- **
  hprObjects   OBJECT IDENTIFIER ::= { hprMIB 1 }
-- **

-- **

```
hprGlobal               OBJECT IDENTIFIER ::= { hprObjects 1 }
-- ****************************************************************
-- The hprGlobal group applies to both intermediate and end nodes.
-- ****************************************************************

hprNodeCpName OBJECT-TYPE
     SYNTAX SnaControlPointName
     MAX-ACCESS read-only
     STATUS current
     DESCRIPTION
         "Administratively assigned network name for the APPN node
         where this HPR implementation resides.  If this object has
         the same value as the appnNodeCpName object in the APPN MIB,
         then the two objects are referring to the same APPN node."

     ::= { hprGlobal 1 }

hprOperatorPathSwitchSupport  OBJECT-TYPE
     SYNTAX INTEGER {
                     notSupported(1),
                    switchTriggerSupported(2),
                    switchToPathSupported(3)
                    }
     MAX-ACCESS read-only
     STATUS current
     DESCRIPTION
         "This object indicates an implementation's level of support
         for an operator-requested path switch.

            notSupported(1)             - the agent does not support
                                          operator-requested path switches
            switchTriggerSupported(2) - the agent supports a 'switch
                                          path now' command from an
                                          operator, but not a command to
                                          switch to a specified path
            switchToPathSupported(3)  - the agent supports both a
                                          'switch path now' command and a
                                          command to switch to a specified
                                          path.  Note that the latter
                                          command is not available via
                                          this MIB; a system that supports
                                          it must do so via other means,
                                          such as a local operator
                                          interface."

     ::= { hprGlobal 2 }

-- ****************************************************************
```

```
hprAnrRouting          OBJECT IDENTIFIER ::= { hprObjects 2 }
-- ****************************************************************

hprAnrsAssigned OBJECT-TYPE
     SYNTAX Counter32
     UNITS "ANR labels"
     MAX-ACCESS read-only
     STATUS current
     DESCRIPTION
         "The count of ANR labels assigned by this node since it was
         last re-initialized.  A Management Station can detect
         discontinuities in this counter by monitoring the
         appnNodeCounterDisconTime object in the APPN MIB."

     ::= { hprAnrRouting 1 }

hprAnrCounterState  OBJECT-TYPE
     SYNTAX INTEGER {
                   notActive(1),
                   active(2)
                   }
     MAX-ACCESS read-write
     STATUS current
     DESCRIPTION
         "This object is used for a network management station to turn
         on/off the counting of ANR packets in the hprAnrRoutingTable.
         The initial value of this object is an implementation choice.

                   notActive(1) - the counter hprAnrPacketsReceived
                                  returns no meaningful value
                   active(2)    - the counter hprAnrPacketsReceived is
                                  being incremented and is returning
                                  meaningful values"

     ::= { hprAnrRouting 2 }

hprAnrCounterStateTime OBJECT-TYPE
     SYNTAX DateAndTime
     MAX-ACCESS read-only
     STATUS current
     DESCRIPTION
         "The time when the hprAnrCounterState object last changed its
         value.  The initial value returned by this object is the time
         at which the APPN node instrumented with this MIB was last
         brought up."

     ::= { hprAnrRouting 3 }
```

```
hprAnrRoutingTable OBJECT-TYPE
      SYNTAX SEQUENCE OF HprAnrRoutingEntry
      MAX-ACCESS not-accessible
      STATUS current
      DESCRIPTION
          "The ANR Routing table provides a means of correlating an
          incoming ANR label (i.e., one assigned by this node) with the
          TG over which a packet containing the label will be forwarded.
          When the ANR label identifies a local NCE, the hprAnrOutTgDest
          and hprAnrOutTgNum objects have no meaning.  The table also
          contains an object to count the number of packets received
          with a given ANR label."

      ::= { hprAnrRouting 4 }

hprAnrRoutingEntry OBJECT-TYPE
      SYNTAX HprAnrRoutingEntry
      MAX-ACCESS not-accessible
      STATUS current
      DESCRIPTION
          "The ANR label is used to index this table."

      INDEX  { hprAnrLabel }

      ::= { hprAnrRoutingTable 1 }

HprAnrRoutingEntry ::= SEQUENCE {
      hprAnrLabel             OCTET STRING,
      hprAnrType              INTEGER,
      hprAnrOutTgDest         DisplayString,
      hprAnrOutTgNum          INTEGER,
      hprAnrPacketsReceived   Counter32,
      hprAnrCounterDisconTime TimeStamp
      }

hprAnrLabel OBJECT-TYPE
      SYNTAX OCTET STRING (SIZE (1..8))
      MAX-ACCESS not-accessible
      STATUS current
      DESCRIPTION
          "The first ANR label in an incoming packet."

      ::= { hprAnrRoutingEntry 1 }

hprAnrType OBJECT-TYPE
      SYNTAX INTEGER {
                      nce(1),
                      tg(2)
```

```
                      }
          MAX-ACCESS read-only
          STATUS current
          DESCRIPTION
              "An object indicating whether an ANR label assigned by this
              node identifies a local NCE or a TG on which outgoing packets
              are forwarded.

                  nce(1)  - the ANR label identifies a local NCE.  In this
                            case the hprAnrOutTgDest and hprAnrOutTgNum
                            objects have no meaning.
                  tg(2)   - the ANR label identifies a TG."

          ::= { hprAnrRoutingEntry 2 }

hprAnrOutTgDest OBJECT-TYPE
          SYNTAX DisplayString (SIZE (0 | 3..17))
          MAX-ACCESS read-only
          STATUS current
          DESCRIPTION
              "Destination node for the TG over which packets with this ANR
              label are forwarded.  This is the fully qualified name of an
              APPN network node or end node, formatted according to the
              SnaControlPointName textual convention.  If the ANR label
              identifies a local NCE, then this object returns a zero-length
              string.

              This object corresponds to the appnLocalTgDest object in the
              APPN MIB."

          ::= { hprAnrRoutingEntry 3 }

hprAnrOutTgNum OBJECT-TYPE
          SYNTAX INTEGER (0..255)
          MAX-ACCESS read-only
          STATUS current
          DESCRIPTION
              "Number of the TG over which packets with this ANR label are
              forwarded.  If the ANR label identifies a local NCE, then this
              object returns the value 0, since 0 is not a valid TG number
              for a TG that supports HPR.

              This object corresponds to the appnLocalTgNum object in the
              APPN MIB."

          ::= { hprAnrRoutingEntry 4 }

hprAnrPacketsReceived OBJECT-TYPE
```

```
            SYNTAX Counter32
            UNITS "ANR packets"
            MAX-ACCESS read-only
            STATUS current
            DESCRIPTION
                "The count of packets received with this ANR label as their
                first label.

                A Management Station can detect discontinuities in this
                counter by monitoring the hprAnrCounterDisconTime object in
                the same row."

            ::= { hprAnrRoutingEntry 5 }

hprAnrCounterDisconTime OBJECT-TYPE
            SYNTAX TimeStamp
            MAX-ACCESS read-only
            STATUS current
            DESCRIPTION
                "The value of the sysUpTime object when the
                hprAnrPacketsReceived counter for this ANR label last
                experienced a discontinuity.  This will be the more recent of
                two times:  the time at which the ANR label was associated with
                either an outgoing TG or a local NCE, or the time at which the
                ANR counters were last turned on or off."

            ::= { hprAnrRoutingEntry 6 }

-- ********************************************************************
hprTransportUser     OBJECT IDENTIFIER ::= { hprObjects 3 }
-- ********************************************************************
-- Transport Service User (TU) Table: (RTP Connection Users)
--
-- There will be several users of the HPR transport and each HPR node
-- shall maintain a table of these users.
-- ********************************************************************

hprNceTable OBJECT-TYPE
            SYNTAX SEQUENCE OF HprNceEntry
            MAX-ACCESS not-accessible
            STATUS current
            DESCRIPTION
                "The Network Connection Endpoint (NCE) table."

            ::= { hprTransportUser 1 }

hprNceEntry OBJECT-TYPE
            SYNTAX HprNceEntry
```

```
        MAX-ACCESS not-accessible
        STATUS current
        DESCRIPTION
            "The NCE ID is used to index this table."

        INDEX  { hprNceId }

        ::= { hprNceTable 1 }

HprNceEntry ::= SEQUENCE {
        hprNceId            OCTET STRING,
        hprNceType          HprNceTypes,
        hprNceDefault       HprNceTypes,
        hprNceInstanceId    OCTET STRING
        }

hprNceId OBJECT-TYPE
        SYNTAX OCTET STRING (SIZE (1..8))
        MAX-ACCESS not-accessible
        STATUS current
        DESCRIPTION
            "The Network Connection Endpoint (NCE) ID.  NCEs identify
            Control Points (Cp), Logical Units (Lu), HPR Boundary
            Functions (Bf) and Route Setup (Rs) Functions.  A value for
            this object can be retrieved from any of the following
            objects in the APPN MIB:

                - appnLsCpCpNceId
                - appnLsRouteNceId
                - appnLsBfNceId
                - appnIsInRtpNceId
                - appnIsRtpNceId

            In each case this value identifies a row in this table
            containing information related to that in the APPN MIB."

        ::= { hprNceEntry 1 }

hprNceType OBJECT-TYPE
        SYNTAX HprNceTypes
        MAX-ACCESS read-only
        STATUS current
        DESCRIPTION
            "A bit string identifying the function types provided by this
            Network Connection Endpoint (NCE)."

        ::= { hprNceEntry 2 }
```

```
hprNceDefault OBJECT-TYPE
      SYNTAX HprNceTypes
      MAX-ACCESS read-only
      STATUS current
      DESCRIPTION
           "A bit string identifying the function types for which this
           Network Connection Endpoint (NCE) is the default NCE.  While
           default NCEs are not explicitly defined in the architecture,
           some implementations provide them; for such implementations,
           it is useful to make this information available to a
           Management Station."

      ::= { hprNceEntry 3 }

hprNceInstanceId   OBJECT-TYPE
      SYNTAX OCTET STRING (SIZE (4))
      MAX-ACCESS read-only
      STATUS current
      DESCRIPTION
           "The NCE instance identifier (NCEII) identifying the current
           instance of this NCE.  An NCEII is used to denote different
           instances (IPLs) of an NCE component.  Each time an NCE is
           activated (IPL'd), it acquires a different, unique NCEII."

      ::= { hprNceEntry 4 }

-- *********************************************************************
hprRtp                OBJECT IDENTIFIER ::= { hprObjects 4 }
-- *********************************************************************
-- *********************************************************************
--
-- The RTP group is implemented by all managed nodes supporting the
-- HPR Transport Tower.  The group contains several scalars (simple
-- objects) and a table.
-- *********************************************************************

-- *********************************************************************
hprRtpGlobe           OBJECT IDENTIFIER ::= { hprRtp 1}
-- *********************************************************************
hprRtpGlobeConnSetups  OBJECT-TYPE
      SYNTAX Counter32
      UNITS "RTP connection setups"
      MAX-ACCESS read-only
      STATUS current
      DESCRIPTION
           "The count of RTP connection setups in which this node has
           participated, as either sender or receiver, since it was last
           re-initialized.  Retries of a setup attempt do not cause the
```

            counter to be incremented.

            A Management Station can detect discontinuities in this
            counter by monitoring the appnNodeCounterDisconTime object
            in the APPN MIB."

        ::= { hprRtpGlobe 1 }

hprRtpGlobeCtrState OBJECT-TYPE
        SYNTAX INTEGER {
                    notActive(1),
                    active(2)
                    }
        MAX-ACCESS read-write
        STATUS current
        DESCRIPTION
            "This object allows a network management station to turn the
            counters in the hprRtpTable on and off. The initial value of
            this object is an implementation choice.

                    notActive(1) - the counters in the hprRtpTable are
                                   returning no meaningful values
                    active(2)   - the counters in the hprRtpTable are
                                   being incremented and are returning
                                   meaningful values"

        ::= { hprRtpGlobe 2 }

hprRtpGlobeCtrStateTime OBJECT-TYPE
        SYNTAX DateAndTime
        MAX-ACCESS read-only
        STATUS current
        DESCRIPTION
            "The time when the value of the hprRtpGlobeCtrState object
            last changed. The initial value returned by this object is
            the time at which the APPN node instrumented with this MIB
            was last brought up."

        ::= { hprRtpGlobe 3 }

-- **
-- The RTP Connection Table
-- There may be many RTP connections on a node supporting the functions
-- specified in the RTP option set. Each node implementing this option
-- set shall maintain a table of these RTP connections.
-- **

hprRtpTable OBJECT-TYPE

```
        SYNTAX SEQUENCE OF HprRtpEntry
        MAX-ACCESS not-accessible
        STATUS current
        DESCRIPTION
            "The RTP Connection table"

        ::= { hprRtp 2 }

hprRtpEntry OBJECT-TYPE
        SYNTAX HprRtpEntry
        MAX-ACCESS not-accessible
        STATUS current
        DESCRIPTION
            "The local NCE ID and local TCID are used to index this
            table."

        INDEX
              { hprRtpLocNceId,
                hprRtpLocTcid }

        ::= { hprRtpTable 1 }

HprRtpEntry ::= SEQUENCE {
        hprRtpLocNceId          OCTET STRING,        -- local nce id
        hprRtpLocTcid           OCTET STRING,        -- local tcid
        hprRtpRemCpName         SnaControlPointName,-- remote cp name
        hprRtpRemNceId          OCTET STRING,        -- remote nce id
        hprRtpRemTcid           OCTET STRING,        -- remote tcid
        hprRtpPathSwitchTrigger INTEGER,             -- trigger (read-write)
        hprRtpRscv              OCTET STRING,        -- rscv
        hprRtpTopic             DisplayString,       -- topic (cos)
        hprRtpState             INTEGER,             -- state
        hprRtpUpTime            TimeTicks,           -- up time

        hprRtpLivenessTimer     Unsigned32,          -- liveness timer
        hprRtpShortReqTimer     Unsigned32,          -- short request timer
        hprRtpPathSwTimer       Unsigned32,          -- path switch timer
        hprRtpLivenessTimeouts  HprRtpCounter,       -- liveness timeouts
        hprRtpShortReqTimeouts  HprRtpCounter,       -- short req timeouts

        hprRtpMaxSendRate       Gauge32,             -- maximum send rate
        hprRtpMinSendRate       Gauge32,             -- minimum send rate
        hprRtpCurSendRate       Gauge32,             -- current send rate

        hprRtpSmRdTripDelay     Gauge32,             -- smooth rnd trip
                                                        delay

        hprRtpSendPackets       HprRtpCounter,       -- packets sent
```

```
        hprRtpRecvPackets         HprRtpCounter,     -- packets received
        hprRtpSendBytes           HprRtpCounter,     -- bytes sent
        hprRtpRecvBytes           HprRtpCounter,     -- bytes received

        hprRtpRetrPackets         HprRtpCounter,     -- pkts re-xmitted
        hprRtpPacketsDiscarded    HprRtpCounter,     -- pkts discarded
        hprRtpDetectGaps          HprRtpCounter,     -- gaps detected
        hprRtpRateReqSends        HprRtpCounter,     -- rate req send

        hprRtpOkErrPathSws        HprRtpCounter,     -- ok  err path sws
        hprRtpBadErrPathSws       HprRtpCounter,     -- bad err path sws
        hprRtpOkOpPathSws         HprRtpCounter,     -- ok  op  path sws
        hprRtpBadOpPathSws        HprRtpCounter,     -- bad op  path sws

        hprRtpCounterDisconTime TimeStamp            -- discontinuity ind
          }
hprRtpLocNceId OBJECT-TYPE
      SYNTAX OCTET STRING (SIZE (1..8))
      MAX-ACCESS not-accessible
      STATUS current
      DESCRIPTION
          "The local Network Connection Endpoint (NCE) ID of this RTP
          connection.  NCEs identify CPs, LUs, Boundary Functions (BFs),
          and Route Setup (RS) components.  A value for this object can
          be retrieved from any of the following objects in the APPN
          MIB:

                  - appnLsCpCpNceId
                  - appnLsRouteNceId
                  - appnLsBfNceId
                  - appnIsInRtpNceId
                  - appnIsRtpNceId

          In each case this value identifies a row in this table
          containing information related to that in the APPN MIB."

        ::= { hprRtpEntry 1 }

hprRtpLocTcid OBJECT-TYPE
      SYNTAX OCTET STRING (SIZE (8))
      MAX-ACCESS not-accessible
      STATUS current
      DESCRIPTION
          "The local TCID of this RTP connection.  A value for this
          object can be retrieved from either the appnIsInRtpTcid object
          or the appnIsRtpTcid object the APPN MIB; in each case this
          value identifies a row in this table containing information
```

        related to that in the APPN MIB."

     ::= { hprRtpEntry 2 }

hprRtpRemCpName OBJECT-TYPE
     SYNTAX SnaControlPointName
     MAX-ACCESS read-only
     STATUS current
     DESCRIPTION
         "Administratively assigned network name for the remote node of
         this RTP connection."

     ::= { hprRtpEntry 3 }

hprRtpRemNceId OBJECT-TYPE
     SYNTAX OCTET STRING (SIZE (1..8))
     MAX-ACCESS read-only
     STATUS current
     DESCRIPTION
         "The remote Network Connection Endpoint (NCE) of this RTP
         connection. NCEs identify CPs, LUs, Boundary Functions (BFs),
         and Route Setup (RS) components."

     ::= { hprRtpEntry 4 }

hprRtpRemTcid OBJECT-TYPE
     SYNTAX OCTET STRING (SIZE (8))
     MAX-ACCESS read-only
     STATUS current
     DESCRIPTION
         "The remote TCID of this RTP connection."

     ::= { hprRtpEntry 5 }

hprRtpPathSwitchTrigger OBJECT-TYPE
     SYNTAX INTEGER {
                     ready(1),
                     switchPathNow(2)
                    }
     MAX-ACCESS read-write
     STATUS current
     DESCRIPTION
         "Object by which a Management Station can trigger an operator-
         requested path switch, by setting the value to
         switchPathNow(2). Setting this object to switchPathNow(2)
         triggers a path switch even if its previous value was already
         switchPathNow(2).

          The value ready(1) is returned on GET operations until a SET
          has been processed; after that the value received on the most
          recent SET is returned.

          This MIB module provides no support for an operator-requested
          switch to a specified path."

     ::= { hprRtpEntry 6 }

hprRtpRscv OBJECT-TYPE
     SYNTAX OCTET STRING (SIZE (0..255))
     MAX-ACCESS read-only
     STATUS current
     DESCRIPTION
          "The forward Route Selection Control Vector for this RTP
          connection. The format of this vector is described in SNA
          Formats.

          The value returned in this object during a path switch is
          implementation-dependent: it may be the old path, the new
          path, a zero-length string, or some other valid RSCV string."

     ::= { hprRtpEntry 7 }

hprRtpTopic OBJECT-TYPE
     SYNTAX DisplayString (SIZE(8))
     MAX-ACCESS read-only
     STATUS current
     DESCRIPTION
          "The topic for this RTP connection. This is used to indicate
          the Class of Service."

     ::= { hprRtpEntry 8 }

hprRtpState OBJECT-TYPE
     SYNTAX INTEGER {
                    rtpListening(1),
                    rtpCalling(2),
                    rtpConnected(3),
                    rtpPathSwitching(4),
                    rtpDisconnecting(5),
                    other(99)
                    }
     MAX-ACCESS read-only
     STATUS current
     DESCRIPTION
          "The state of the RTP connection, from the perspective of the
          local RTP protocol machine:

```
                        rtpListening      - connection open; waiting for other end
                                            to call in
                        rtpCalling        - connection opened, attempting to call
                                            out, have not yet received any data
                                            from other end
                        rtpConnected      - connection is active; responded to a
                                            call-in or received other end's TCID
                                            from a call-out attempt
                        rtpPathSwitching  - the path switch timer is running;
                                            attempting to find a new path for this
                                            connection.
                        rtpDisconnecting  - no sessions are using this connection;
                                            in process of bringing it down
                        other             - the connection is not in any of the
                                            states listed above."

          ::= { hprRtpEntry 9 }

hprRtpUpTime OBJECT-TYPE
        SYNTAX TimeTicks
        UNITS "1/100ths of a second"
        MAX-ACCESS read-only
        STATUS current
        DESCRIPTION
            "The length of time the RTP connection has been up, measured
            in 1/100ths of a second."

          ::= { hprRtpEntry 10 }

hprRtpLivenessTimer OBJECT-TYPE
        SYNTAX Unsigned32
        UNITS "1/100ths of a second"
        MAX-ACCESS read-only
        STATUS current
        DESCRIPTION
            "The value of the liveness (ALIVE) timer of this RTP
            connection, in units of 1/100th of a second.  When this timer
            expires and no packet has arrived from the partner since it
            was last set, packets with Status Request indicators will be
            sent to see if the RTP connection is still alive."

          ::= { hprRtpEntry 11 }

hprRtpShortReqTimer  OBJECT-TYPE
        SYNTAX Unsigned32
        UNITS "1/100ths of a second"
        MAX-ACCESS read-only
        STATUS current
```

        DESCRIPTION
             "The value of the RTP SHORT_REQ timer, in units of 1/100 of a
             second. This timer represents the maximum time that a sender
             waits for a reply from a receiver."

        ::= { hprRtpEntry 12 }

hprRtpPathSwTimer OBJECT-TYPE
        SYNTAX Unsigned32
        UNITS "1/100ths of a second"
        MAX-ACCESS read-only
        STATUS current
        DESCRIPTION
             "The length of time that RTP should attempt a path switch
             for a connection, in units of 1/100th of a second."

        ::= { hprRtpEntry 13 }

hprRtpLivenessTimeouts OBJECT-TYPE
        SYNTAX HprRtpCounter
        UNITS "liveness timeouts"
        MAX-ACCESS read-only
        STATUS current
        DESCRIPTION
             "The count of liveness timeouts for this RTP connection."

        ::= { hprRtpEntry 14 }

hprRtpShortReqTimeouts OBJECT-TYPE
        SYNTAX HprRtpCounter
        UNITS "short request timeouts"
        MAX-ACCESS read-only
        STATUS current
        DESCRIPTION
             "The count of short request timeouts for this RTP connection."

        ::= { hprRtpEntry 15 }

hprRtpMaxSendRate OBJECT-TYPE
        SYNTAX Gauge32
        UNITS "bytes per second"
        MAX-ACCESS read-only
        STATUS current
        DESCRIPTION
             "The high-water mark for this RTP connection's send rate, in
             units of bytes per second. This is the high-water mark for
             the entire life of the connection, not just the high-water
             mark for the connection's current path.

                   For more details on this and other parameters related to HPR,
                   see the High Performance Routing Architecture Reference."

              ::= { hprRtpEntry 16 }

hprRtpMinSendRate OBJECT-TYPE
        SYNTAX Gauge32
        UNITS "bytes per second"
        MAX-ACCESS read-only
        STATUS current
        DESCRIPTION
              "The low-water mark for this RTP connection's send rate, in
              units of bytes per second. This is the low-water mark for the
              entire life of the connection, not just the low-water mark for
              the connection's current path.

              For more details on this and other parameters related to HPR,
              see the High Performance Routing Architecture Reference."

              ::= { hprRtpEntry 17 }

hprRtpCurSendRate OBJECT-TYPE
        SYNTAX Gauge32
        UNITS "bytes per second"
        MAX-ACCESS read-only
        STATUS current
        DESCRIPTION
              "The current send rate for this RTP connection, in units of
              bytes per second.

              For more details on this and other parameters related to HPR,
              see the High Performance Routing Architecture Reference."

              ::= { hprRtpEntry 18 }

hprRtpSmRdTripDelay OBJECT-TYPE
        SYNTAX Gauge32
        UNITS "1/1000ths of a second"
        MAX-ACCESS read-only
        STATUS current
        DESCRIPTION
              "The smoothed round trip delay for this RTP connection, in
              units of 1/1000th of a second (ms).

              For more details on this and other parameters related to HPR,
              see the High Performance Routing Architecture Reference."

              ::= { hprRtpEntry 19 }

hprRtpSendPackets OBJECT-TYPE
        SYNTAX HprRtpCounter
        UNITS "RTP packets"
        MAX-ACCESS read-only
        STATUS current
        DESCRIPTION
            "The count of packets successfully sent on this RTP
            connection."

        ::= { hprRtpEntry 20 }

hprRtpRecvPackets OBJECT-TYPE
        SYNTAX HprRtpCounter
        UNITS "RTP packets"
        MAX-ACCESS read-only
        STATUS current
        DESCRIPTION
            "The count of packets received on this RTP connection. The
            counter is incremented only once if duplicate copies of a
            packet are received."

        ::= { hprRtpEntry 21 }

hprRtpSendBytes OBJECT-TYPE
        SYNTAX HprRtpCounter
        UNITS "bytes"
        MAX-ACCESS read-only
        STATUS current
        DESCRIPTION
            "The count of bytes sent on this RTP connection. Both RTP
            Transport Header (THDR) bytes and data bytes are included in
            this count."

        ::= { hprRtpEntry 22 }

hprRtpRecvBytes OBJECT-TYPE
        SYNTAX HprRtpCounter
        UNITS "bytes"
        MAX-ACCESS read-only
        STATUS current
        DESCRIPTION
            "The count of bytes received on this RTP connection. Both RTP
            Transport Header (THDR) bytes and data bytes are included in
            this count."

        ::= { hprRtpEntry 23 }

hprRtpRetrPackets OBJECT-TYPE

```
        SYNTAX HprRtpCounter
        UNITS "RTP packets"
        MAX-ACCESS read-only
        STATUS current
        DESCRIPTION
            "The count of packets retransmitted on this RTP connection."

        ::= { hprRtpEntry 24 }

hprRtpPacketsDiscarded OBJECT-TYPE
        SYNTAX HprRtpCounter
        UNITS "RTP packets"
        MAX-ACCESS read-only
        STATUS current
        DESCRIPTION
            "The count of packets received on this RTP connection and then
            discarded.  A packet may be discarded because it is determined
            to be a duplicate, or for other reasons."

        ::= { hprRtpEntry 25 }

hprRtpDetectGaps OBJECT-TYPE
        SYNTAX HprRtpCounter
        UNITS "gaps"
        MAX-ACCESS read-only
        STATUS current
        DESCRIPTION
            "The count of gaps detected on this RTP connection."

        ::= { hprRtpEntry 26 }

hprRtpRateReqSends OBJECT-TYPE
        SYNTAX HprRtpCounter
        UNITS "rate requests"
        MAX-ACCESS read-only
        STATUS current
        DESCRIPTION
            "The count of Rate Requests sent on this RTP connection."

        ::= { hprRtpEntry 27 }

hprRtpOkErrPathSws OBJECT-TYPE
        SYNTAX HprRtpCounter
        UNITS "path switch attempts"
        MAX-ACCESS read-only
        STATUS current
        DESCRIPTION
            "The count of successful path switch attempts for this RTP
```

                 connection due to errors."

          ::= { hprRtpEntry 28 }

hprRtpBadErrPathSws OBJECT-TYPE
        SYNTAX HprRtpCounter
        UNITS "path switch attempts"
        MAX-ACCESS read-only
        STATUS current
        DESCRIPTION
            "The count of unsuccessful path switches for this RTP
            connection due to errors."

          ::= { hprRtpEntry 29 }

hprRtpOkOpPathSws OBJECT-TYPE
        SYNTAX HprRtpCounter
        UNITS "path switches"
        MAX-ACCESS read-only
        STATUS current
        DESCRIPTION
            "The count of successful path switches for this RTP connection
            due to operator requests."

          ::= { hprRtpEntry 30 }

hprRtpBadOpPathSws OBJECT-TYPE
        SYNTAX HprRtpCounter
        UNITS "path switches"
        MAX-ACCESS read-only
        STATUS current
        DESCRIPTION
            "The count of unsuccessful path switches for this RTP
            connection due to operator requests. This counter is not
            incremented by an implementation that does not support
            operator-requested path switches, even if a Management Station
            requests such a path switch by setting the
            hprRtpPathSwitchTrigger object."

          ::= { hprRtpEntry 31 }

hprRtpCounterDisconTime OBJECT-TYPE
        SYNTAX TimeStamp
        MAX-ACCESS read-only
        STATUS current
        DESCRIPTION
            "The value of the sysUpTime object when the counters for this
            RTP connection last experienced a discontinuity. This will be

        the more recent of two times: the time at which the
        connection was established or the time at which the HPR
        counters were last turned on or off."

    ::= { hprRtpEntry 32 }

-- **
-- The RTP Connection Status Table
-- This table contains statistics and historical information related to
-- both successful and unsuccessful RTP path switches. This
-- information can be important for both trend analysis and problem
-- determination.
--
-- Note the terminology here: when RTP is triggered to find a new path
-- for a connection, this initiates a 'path switch,' which will end up
-- being either successful or unsuccessful. During this path switch,
-- RTP will make one or more 'path switch attempts,' which are attempts
-- to find a new path for the connection and switch the connection to
-- it. This 'new' path may be the same path that the connection was
-- using before the path switch.
--
-- It is an implementation option how many entries to keep in this
-- table, and how long to retain any individual entry.
-- **
hprRtpStatusTable OBJECT-TYPE
    SYNTAX SEQUENCE OF HprRtpStatusEntry
    MAX-ACCESS not-accessible
    STATUS current
    DESCRIPTION
        "RTP Connection Status Table: This table contains historical
        information on RTP connections. An entry is created in this
        table when a path switch is completed, either successfully or
        unsuccessfully."

    ::= { hprRtp 3 }

hprRtpStatusEntry OBJECT-TYPE
    SYNTAX HprRtpStatusEntry
    MAX-ACCESS not-accessible
    STATUS current
    DESCRIPTION
        "This table is indexed by local NCE ID, local TCID, and an
        integer hprRtpStatusIndex. Thus the primary grouping of table
        rows is by RTP connection, with the multiple entries for a
        given RTP connection ordered by time."

    INDEX
        { hprRtpStatusLocNceId,

```
                  hprRtpStatusLocTcid,
                  hprRtpStatusIndex }

      ::= { hprRtpStatusTable 1 }

  HprRtpStatusEntry ::= SEQUENCE {
     hprRtpStatusLocNceId              OCTET STRING, -- local nce id
     hprRtpStatusLocTcid              OCTET STRING, -- local tcid
     hprRtpStatusIndex               Unsigned32,   -- index
     hprRtpStatusStartTime            DateAndTime,  -- time stamp
     hprRtpStatusEndTime              DateAndTime,  -- time stamp
     hprRtpStatusRemCpName            SnaControlPointName,-- remote cp name
     hprRtpStatusRemNceId             OCTET STRING, -- remote nce id
     hprRtpStatusRemTcid              OCTET STRING, -- remote tcid
     hprRtpStatusNewRscv              OCTET STRING, -- new rscv
     hprRtpStatusOldRscv              OCTET STRING, -- old rscv
     hprRtpStatusCause               INTEGER,      -- cause
     hprRtpStatusLastAttemptResult INTEGER        -- result of last
                                      }

hprRtpStatusLocNceId OBJECT-TYPE
     SYNTAX OCTET STRING (SIZE (1..8))
     MAX-ACCESS not-accessible
     STATUS current
     DESCRIPTION
         "The local Network Connection Endpoint (NCE) of this RTP
         connection.  NCEs identify CPs, LUs, Boundary Functions (BFs),
         and Route Setup (RS) components."

      ::= { hprRtpStatusEntry 1 }

hprRtpStatusLocTcid OBJECT-TYPE
     SYNTAX OCTET STRING (SIZE (8))
     MAX-ACCESS not-accessible
     STATUS current
     DESCRIPTION
         "The local TCID of this RTP connection."

      ::= { hprRtpStatusEntry 2 }

hprRtpStatusIndex OBJECT-TYPE
     SYNTAX Unsigned32 (1..4294967295)
     MAX-ACCESS not-accessible
     STATUS current
     DESCRIPTION
         "Table index.  This value begins at one and is incremented
         when a new entry is added to the table.  It is an
         implementation choice whether to run a single counter for
```

           all entries in the table, or to run a separate counter for
           the entries for each RTP connection. In the unlikely event
           of a wrap, it is assumed that Management Stations will have
           the ability to order table entries correctly."

       ::= { hprRtpStatusEntry 3 }

hprRtpStatusStartTime OBJECT-TYPE
       SYNTAX DateAndTime
       MAX-ACCESS read-only
       STATUS current
       DESCRIPTION
           "The time when the path switch began."

       ::= { hprRtpStatusEntry 4 }

hprRtpStatusEndTime OBJECT-TYPE
       SYNTAX DateAndTime
       MAX-ACCESS read-only
       STATUS current
       DESCRIPTION
           "The time when the path switch was ended, either successfully
           or unsuccessfully."

       ::= { hprRtpStatusEntry 5 }

hprRtpStatusRemCpName OBJECT-TYPE
       SYNTAX SnaControlPointName
       MAX-ACCESS read-only
       STATUS current
       DESCRIPTION
           "Administratively assigned network name for the remote node of
           this RTP connection."

       ::= { hprRtpStatusEntry 6 }

hprRtpStatusRemNceId OBJECT-TYPE
       SYNTAX OCTET STRING (SIZE (1..8))
       MAX-ACCESS read-only
       STATUS current
       DESCRIPTION
           "The remote Network Connection Endpoint (NCE) of this RTP
           connection. NCEs identify CPs, LUs, Boundary Functions (BFs),
           and Route Setup (RS) components."

       ::= { hprRtpStatusEntry 7 }

hprRtpStatusRemTcid OBJECT-TYPE

```
     SYNTAX OCTET STRING (SIZE (8))
     MAX-ACCESS read-only
     STATUS current
     DESCRIPTION
         "The remote TCID of this RTP connection."

     ::= { hprRtpStatusEntry 8 }

hprRtpStatusNewRscv OBJECT-TYPE
     SYNTAX OCTET STRING (SIZE (0..255))
     MAX-ACCESS read-only
     STATUS current
     DESCRIPTION
         "The new Route Selection Control Vector for this RTP
         connection.  A zero-length string indicates that no value is
         available, perhaps because the implementation does not save
         RSCVs."

     ::= { hprRtpStatusEntry 9 }

hprRtpStatusOldRscv OBJECT-TYPE
     SYNTAX OCTET STRING (SIZE (0..255))
     MAX-ACCESS read-only
     STATUS current
     DESCRIPTION
         "The old Route Selection Control Vector for this RTP
         connection.  A zero-length string indicates that no value is
         available, perhaps because the implementation does not save
         RSCVs."

     ::= { hprRtpStatusEntry 10 }

hprRtpStatusCause OBJECT-TYPE
     SYNTAX INTEGER {
                  other(1),
                  rtpConnFail(2),
                  locLinkFail(3),
                  remLinkFail(4),
                  operRequest(5)
                 }
     MAX-ACCESS read-only
     STATUS current
     DESCRIPTION
         "The reason for the path switch:

             other(1)        - Reason other than those listed below,
             rtpConnFail(2) - RTP connection failure detected,
             locLinkFail(3) - Local link failure,
```

```
                        remLinkFail(4) - Remote link failure (learned from TDUs),
                        operRequest(5) - Operator requested path switch. "

          ::= { hprRtpStatusEntry 11 }

hprRtpStatusLastAttemptResult  OBJECT-TYPE
     SYNTAX INTEGER { successful(1),
                      initiatorMoving(2),
                      directorySearchFailed(3),
                      rscvCalculationFailed(4),
                      negativeRouteSetupReply(5),
                      backoutRouteSetupReply(6),
                      timeoutDuringFirstAttempt(7),
                      otherUnsuccessful(8)
                    }
     MAX-ACCESS read-only
     STATUS current
     DESCRIPTION
         "The result of the last completed path switch attempt.  If the
         path switch is aborted in the middle of a path switch attempt
         because the path switch timer expires, the result of the
         previous path switch attempt is reported.

         The values are defined as follows:

             successful(1)                - The final path switch
                                            attempt was successful.
             initiatorMoving(2)           - The final path switch
                                            attempt failed because the
                                            initiator is mobile, and
                                            there was no active link
                                            out of this node.
             directorySearchFailed(3)     - The final path switch
                                            attempt failed because a
                                            directory search for the
                                            destination node's CP name
                                            failed.
             rscvCalculationFailed(4)     - The final path switch
                                            attempt failed because an
                                            RSCV to the node containing
                                            the remote RTP endpoint
                                            could not be calculated.
             negativeRouteSetupReply(5)   - The final path switch
                                            attempt failed because route
                                            setup failed for the new
                                            path.
             backoutRouteSetupReply(6)    - The final path switch
                                            attempt failed because the
```

```
                                          remote RTP endpoint refused
                                          to continue the RTP
                                          connection.
               timeoutDuringFirstAttempt(7) - The path switch timer
                                          expired during the first
                                          path switch attempt.
               otherUnsuccessful(8)       - The final path switch
                                          attempt failed for a reason
                                          other than those listed
                                          above."


        ::= { hprRtpStatusEntry 12 }


-- ****************************************************************
-- Conformance information
-- ****************************************************************

hprConformance         OBJECT IDENTIFIER ::= { hprMIB 2 }

hprCompliances         OBJECT IDENTIFIER ::= { hprConformance 1 }
hprGroups              OBJECT IDENTIFIER ::= { hprConformance 2 }

-- Compliance statements

hprCompliance  MODULE-COMPLIANCE
      STATUS   current
      DESCRIPTION
         "The compliance statement for the SNMPv2 entities that
         implement the HPR MIB."

      MODULE  -- this module

--      Unconditionally mandatory groups
          MANDATORY-GROUPS  {
                            hprGlobalConfGroup,
                            hprAnrRoutingConfGroup,
                            hprTransportUserConfGroup
                            }

--      Conditionally mandatory groups
          GROUP   hprRtpConfGroup
          DESCRIPTION
             "The hprRtpConfGroup is mandatory for HPR implementations
             supporting the HPR transport tower."

        ::= { hprCompliances 1 }
```

```
-- Units of conformance
hprGlobalConfGroup OBJECT-GROUP
        OBJECTS {
                hprNodeCpName,
                hprOperatorPathSwitchSupport
                }
        STATUS  current
        DESCRIPTION
            "A collection of objects providing the instrumentation of HPR
            general information and capabilities."

        ::= { hprGroups 1 }

hprAnrRoutingConfGroup OBJECT-GROUP
        OBJECTS {
                hprAnrsAssigned,
                hprAnrCounterState,
                hprAnrCounterStateTime,
                hprAnrType,
                hprAnrOutTgDest,
                hprAnrOutTgNum,
                hprAnrPacketsReceived,
                hprAnrCounterDisconTime
                }
        STATUS  current
        DESCRIPTION
            "A collection of objects providing instrumentation for the
            node's ANR routing."

        ::= { hprGroups 2 }

hprTransportUserConfGroup OBJECT-GROUP
        OBJECTS {
                hprNceType,
                hprNceDefault,
                hprNceInstanceId
                }
        STATUS  current
        DESCRIPTION
            "A collection of objects providing information on the users of
            the HPR transport known to the node."

        ::= { hprGroups 3 }

hprRtpConfGroup  OBJECT-GROUP
        OBJECTS {
                hprRtpGlobeConnSetups,
                hprRtpGlobeCtrState,
```

```
                hprRtpGlobeCtrStateTime,
                hprRtpRemCpName,
                hprRtpRemNceId,
                hprRtpRemTcid,
                hprRtpPathSwitchTrigger,
                hprRtpRscv,
                hprRtpTopic,
                hprRtpState,
                hprRtpUpTime,
                hprRtpLivenessTimer,
                hprRtpShortReqTimer,
                hprRtpPathSwTimer,
                hprRtpLivenessTimeouts,
                hprRtpShortReqTimeouts,

                hprRtpMaxSendRate,
                hprRtpMinSendRate,
                hprRtpCurSendRate,

                hprRtpSmRdTripDelay,

                hprRtpSendPackets,
                hprRtpRecvPackets,
                hprRtpSendBytes,
                hprRtpRecvBytes,

                hprRtpRetrPackets,
                hprRtpPacketsDiscarded,
                hprRtpDetectGaps,
                hprRtpRateReqSends,

                hprRtpOkErrPathSws,
                hprRtpBadErrPathSws,
                hprRtpOkOpPathSws,
                hprRtpBadOpPathSws,
                hprRtpCounterDisconTime,

                hprRtpStatusStartTime,
                hprRtpStatusEndTime,
                hprRtpStatusRemNceId,
                hprRtpStatusRemTcid,
                hprRtpStatusRemCpName,
                hprRtpStatusNewRscv,
                hprRtpStatusOldRscv,
                hprRtpStatusCause,
                hprRtpStatusLastAttemptResult

            }
```

```
        STATUS   current
        DESCRIPTION
            "A collection of objects providing the instrumentation for RTP
            connection end points."

        ::= { hprGroups 4 }
```

-- end of conformance statement

END

6. Acknowledgments

   This MIB module is the product of the IETF SNA NAU MIB WG and the AIW
   APPN/HPR MIBs SIG. Thanks to Ray Bird, IBM Corporation; Jim Cobban,
   Nortel; and Laura Petrie, IBM Corporation, for their contributions
   and review.

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        Network Management Protocol (SNMPv2)", RFC 1904, January 1996.

   [4] Clouston, B., and B. Moore, "Definition of Managed Objects for
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   [5] IBM, APPN High Performance Routing Architecture Reference, SV40-
        1018-00.

   [6] IBM, SNA/MS Formats, GC31-8302-00

8. Security Considerations

   In most cases, MIBs are not themselves security risks; if SNMP
   security is operating as intended, the use of a MIB to view
   information about a system, or to change some parameter at the
   system, is a tool, not a threat.

None of the read-only objects in the HPR MIB reports a password, user
data, or anything else that is particularly sensitive. Some
enterprises view their network configuration itself, as well as
information about network usage and performance, as corporate assets;
such enterprises may wish to restrict SNMP access to most of the
objects in the MIB.

One read-write object in the MIB can affect network operations:

o   hprRtpPathSwitchTrigger: Setting this object to 'switchPathNow'
     triggers an immediate path switch attempt. An HPR path switch
     does not itself disrupt the SNA sessions using the RTP
     connection undergoing the path switch. However, frequent path
     switches for many RTP connections can have an adverse impact on
     overall network performance.

     It is recommended that SNMP access to this object be restricted.

     Other read-write objects control the gathering of network
     management data; controlling access to these objects is less
     critical.

9. Authors' Addresses

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