Remote Network Monitoring MIB Extensions for ATM Networks
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1. Introduction

This memo defines an experimental portion of the Management Information
Base (MIB) for use with network management protocols in the Internet
community. In particular, it describes managed objects used for
managing remote monitoring probes, specifically for ATM networks.

1.1. The SNMP Network Management Framework

The SNMP Network Management Framework presently consists of three major
components. They are:

   the SMI, described in RFC 1902 [1] - the mechanisms used for
   describing and naming objects for the purpose of management.

   the MIB-II, STD 17, RFC 1213 [2] - the core set of managed objects
   for the Internet suite of protocols.

   the protocol, RFC 1157 [3] and/or RFC 1905 [4], - the protocol for
   accessing managed objects.

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

1.2. Object Definitions

Managed objects are accessed via a virtual information store, termed the
Management Information Base or MIB. Objects in the MIB are defined
using the subset of Abstract Syntax Notation One (ASN.1) defined in the
SMI. In particular, each object type is named by an OBJECT IDENTIFIER,
an administratively assigned name. The object type together with an
object instance serves to uniquely identify a specific instantiation of
the object. For human convenience, we often use a textual string,
termed the descriptor, to refer to the object type.

2. Overview

This document addresses issues related to applying 'RMON technology' to ATM Networks:

- functional applicability of existing RMON groups

- new functionality for ATM networks

- collection source design issues

- flexible resource allocation

- data reduction mechanisms

- standardization track issues

RMON-based applications can provide system administrators with valuable data about network utilization and behavior. RMON agents offer applications developers resource-intensive functions such as high-level statistics gathering and low-level filtering/capture of MAC frames.

RMON is traditionally deployed as one or more NMS applications managing multiple RMON probes, each of which is monitoring one or more network segments. RMON for ATM networks will require a different deployment model, as well as many other new MIB features.

2.1. RMON Resource Sharing Model

There are some design features that are used throughout all the RMON MIBs. The most important is the RMON resource-sharing model. RMON agents are expected to create certain 'common' data-collection resources (ownerString starts with the string "monitor"). Only system administrators should be allowed to delete or modify these 'monitor-owned' resources.

NMS applications can create short-lived control entries (ownerString set to unique NMS-ID) if the monitor-owned collections are not appropriate for a given task. Some features, such as topN reporting, event-reporting, history collection (other than 30 sec/30 min intervals), and filter/capture, require NMS configuration in most implementations.

The resource owner (NMS) is expected to pick a unique value for the owner string and supply this value in the first setRequest PDU creating

the control row. An NMS must check the rowStatus object (i.e.
errorStatus of PDU setting status to createAnd* before using the
resource, to make sure another NMS was not allocated the resource
instead. Before terminating, the NMS application must delete any
control entries that it created. There is no control-row garbage
collection defined in RMON, so an NMS application must check for its own
stale control entries before creating new ones, upon startup.

An NMS application may optionally use another applications' resources in
a read-only manner, if applicable. Usually, this is only done when a
resource request is refused. The system administrator is responsible for
deleting RMON resources (monitor or NMS-owned) to make room for new
applications.

2.2. Relationship to Existing MIBs

There are several RFCs (and I-Ds) which specify RMON MIBs and agent
specifications:

2.2.1. RMON

The Remote Network Monitoring MIB (RMON or RMON-1) (RFC1757) [5]]
provides several management functions that may be directly or indirectly
applicable to ATM Networks:

  - detailed link layer statistics for ethernet segments (etherStats
    group)

  - remote polling of detailed link layer statistics for ethernet
    segments (history, etherHistory groups)

  - basic statistics--per host and per conversation--for all valid MAC
    addresses discovered on each monitored segment (host and matrix
    groups)

  - TopN Report statistics (topN talkers or errors)--per-host--for each
    valid MAC address discovered on each monitored segment (hostTopN
    group) bit-level frame filtering and frame-slice capture (filter,
    channel, capture groups)

  - simple threshold monitoring, event-logging, and event-notification
    for any MIB instance

2.2.2. TR-RMON

The Token Ring Extensions for RMON MIB (RFC1513) (TR-RMON) [6] provides
the same kind of detailed link layer statistics and remote polling as
found in RMON-1 (tokenRingMLStats/History, tokenRingPStats/History). The
TR-RMON MIB is highly integrated with RMON-1, which is possible because
both link layers use the same address format. An RMON MIB for ATM could
be structured and positioned like the TR-MIB, but none of the shared
tables can be directly applied to ATM. Since RMON-1 will be augmented
and updated by RMON-2, any ATM-RMON standardization effort within the
IETF should align with the RMON-2 MIB, but maintain the same 'extensions
MIB' structure as found in the TR-RMON MIB.

2.2.3. RMON-2 MIB

The emerging 'RMON-2' standard (RMON-2) [7] provides many additions and
improvements to RMON-1:

  - complete protocol distribution per segment (or 'collection source')

  - collection of network to MAC address bindings seen in packets on
    all segments

  - collection of source MAC address to physical interface bindings on
    all segments

  - probe configuration, such as startup parameters and trap
    destination management

  - collection of per network-layer host basic statistics (network
    layer and above)

  - collection of per-conversation basic statistics (network layer and
    above)

  - TopN Report statistics per conversation (network layer and above)

  - improvements such as relative-offset frame filtering, user-defined
    remote-polling, faster table retrieval, and better accuracy
    reporting.

Although the protocol analysis features are not directly applicable,
there are many design improvements in RMON-2 that can be integrated into
ATM-RMON:

- TimeFilter indexing (see section on post-collection data reduction
  for details)

- TopN report improvements such as auto-restart, report count, and
  'last-create-time' to detect discontinuities

- Control entry inserts and deletes counters (this replaces the
  RMON-1 'table-size' object)

- ProtocolDirectory collection-control design (i.e. central
  configuration defines what data is collected in each functional
  group)

2.2.4. RMON-2 Protocol Identifiers

The RMON Protocol Identifiers Specification (RMONPROT) [8] defines
encoding rules for protocolDirID, protocolDirParameters, and
protocolDirType MIB objects It is required only if RMON-2 packet
analysis is applied to frames monitored (on circuits which use frames).
It is not directly applicable to the ATM-RMON MIB, and not discussed in
this document.

2.2.5. ATOM MIB

The Atom MIB is the fundemental MIB for manging ATM networks (RFC 1695)
[9], but it is not directly referenced by this MIB, except for use of
the 'IfIndex' textual convention. It is possible other textual
conventions will be imported as well (TBD).

2.2.6. ATOM Supplemental MIB

The Atom Supplemental MIB [10] defines additional management
capabilities for ATM networks. The 'AtmAddr' textual convention is
imported from this MIB, but no other relationship exists at this time.

2.3. ATM-RMON Functional Requirements

Applying RMON to ATM networks will require some new design changes and
new functionality. Special problems such as high speeds, "cells vs.
frames" issues, and the connection-oriented nature of ATM need special
MIB solutions in order to implement RMON for ATM networks.

2.3.1. Collection Perspective

There are four different 'collection perspectives' that should be
accommodated:

(A)   stand-alone probe attached to a single port of a switch. ATM
      traffic is copied somehow to the RMON probe.

(B)   embedded probe within a switch., with no access to the switch
      fabric. ATM traffic is copied somehow to the RMON probe.

(C)   embedded probe within a switch, with access to the switch fabric.
      ATM traffic is monitored directly, probably implemented in
      hardware. Probes of this type are likely to monitor traffic at
      cell header level only. A lower level of conformance, or some other
      mechanism (e.g. additional software), will most likely be needed
      for this type of probe.

(D)   stand-alone probe, tapping an NNI link between two switches. ATM
      traffic is monitored directly (subject to probe capabilities),
      without switch intervention. All cells in both directions are
      copied somehow to the RMON probe.

Figure 1: Probe Location

```
+--------------------------------------------------------------------------+
|                                                                          |
      |  External Probe w/Circuit Steering      Internal Probe w/Circuit
Steering  |
      |  --------------------------------
--------------------------------  |
|                                                                          |
      |                   ||
||                       |
      |                   ||
||                       |
      |        +---------++---------+          +----------++-----------
+     |
      |        | (A)                 |          | (B)
|     |
      |  ====|     ATM Switch      |====    ====|  ATM Switch  | |      |
====    |
      |        |                     |          |                 V V
|     |
      |        +---------++---------+          |  +----------------+
|     |
      |                   || | |               |  |   RMON probe    |
|     |
      |                   ||  V V              |  +----------------+
|     |
      |        +---------------------+          +----------++-----------
+     |
      |        |     RMON probe      |
||     |
      |        +---------------------+
||                       |
|                                                                          |
|                                                                          |
      |  Internal Probe wo/Circuit Steering    External Probe wo/Circuit
Steering  |
      |  --------------------------------
--------------------------------  |
|                                                                          |
      |                   ||
||                       |
||       |
```

```
     |            ||                      ||
||         |
     |      +--------++-------+       +------++------+      +------+
+------+ |
     |      | (C)            |       | (D)          |      |
| |
     |  ====|   ATM Switch w/ |====   ====| ATM Switch 1 |===++==| ATM Switch 2
| |
     |      |  internal RMON  |       |              |      || |
| |
     |      | instrumentation |       +------++------+   ||  +------+
+------+ |
     |      +-----------------+               ||         ||
||         |
     |            ||                      ||         ||
||         |
     |            ||                              +------++------
+         |
     |                                            |  RMON probe
|         |
     |                                            +--------------
+         |

     |                                                                       |

     +-----------------------------------------------------------------------+
```
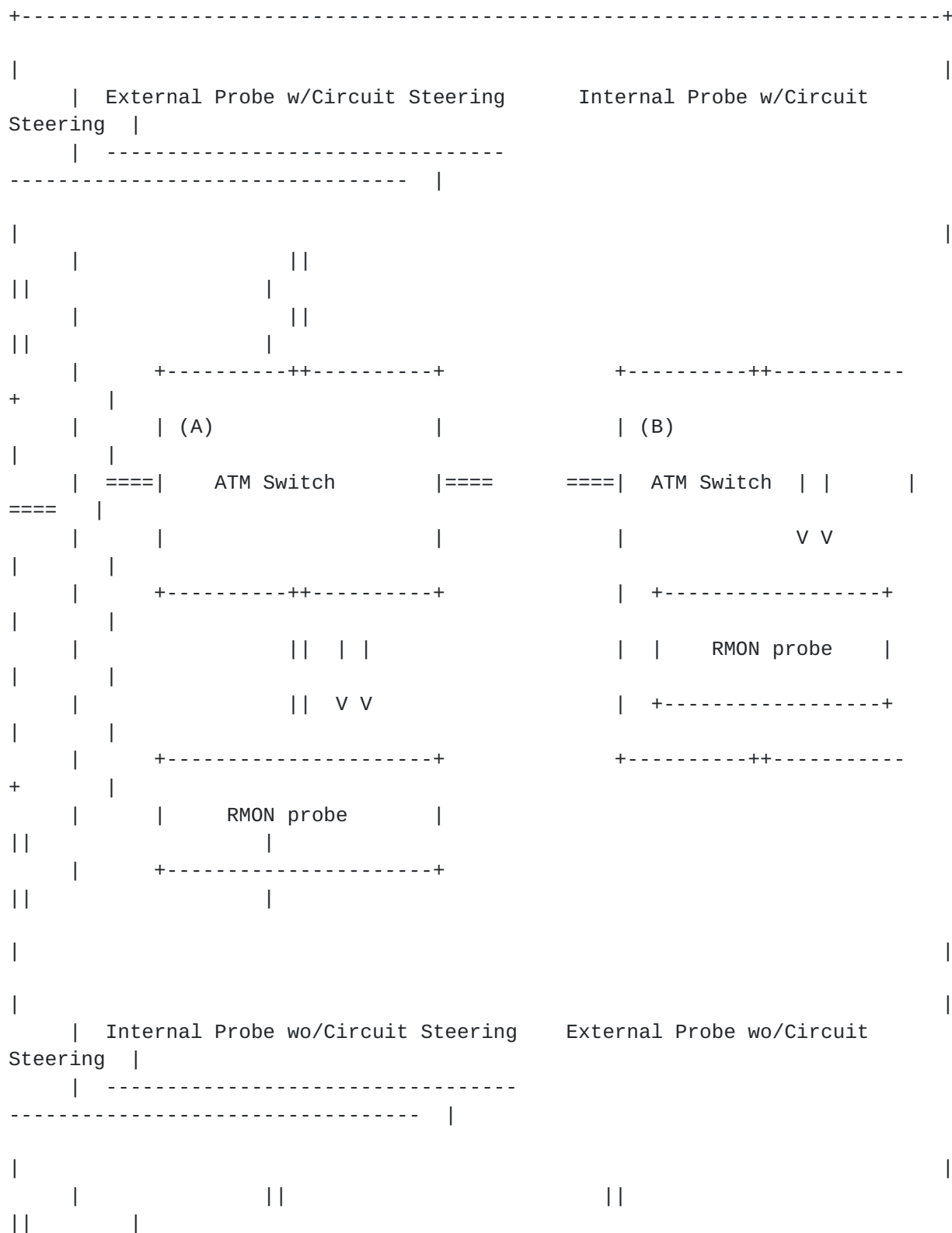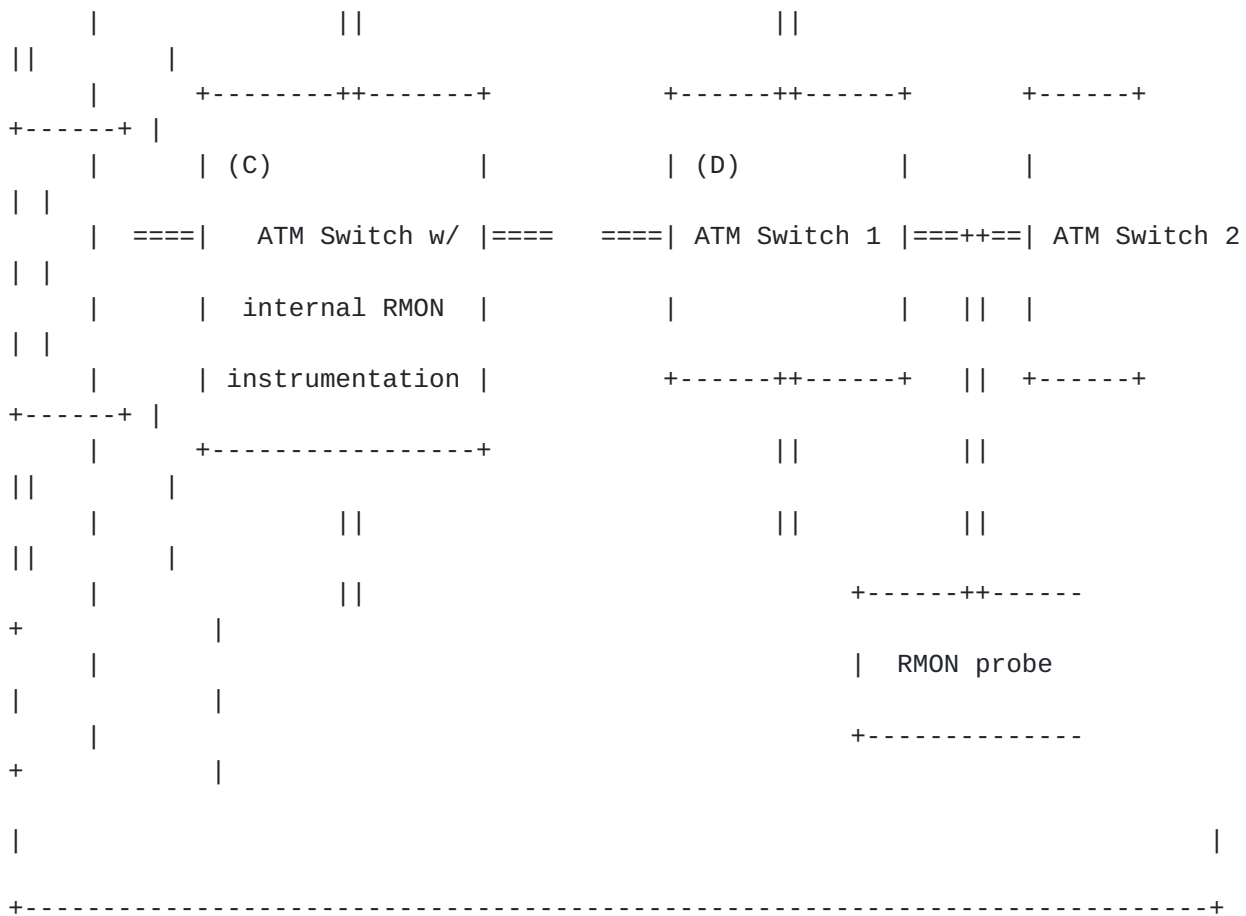
Unless RMON instrumentation is embedded into the switch fabric (C), or
placed between two switches (D), then circuit steering is required (A
and B) for RMON instrumentation software to access ATM traffic. For such
probes, each full-duplex circuit is (presumably) mapped into two
redirected half-duplex circuits:

    - inbound(ifIndex/VPI/VCI)

    - outbound(ifIndex/VPI/VCI)

A 'probe-tap' (D) does not pre-filter data by selecting particular
circuits for monitoring. Instead, it receives al VCs on an NNI link,
without switch participation.

2.3.2. Cell Collection Requirements

The ATM-RMON MIB will provide the following new functionality:

    - ATM layer instrumentation

    - complex collection source aggregation

    - data reduction configuration and status

    - basic cell statistics (i.e. statsTable)

    - basic cell statistics per host (i.e. hostTable)

    - basic cell counts per conversation (i.e. matrixTable)

Circuit Steering requirements are not addressed in this document. RMON
collection requirements will be considered independently of circuit
steering techniques. Although references to 'copied' circuits are made
in this document, actual circuit-steering implementation may be
different.

At this time, only some very basic statistics are defined:

    - point-to-point cell count

    - point-to-multipoint cell count

    - number of point-to-point calls

    - number of point-to-multipoint calls

    - total point-to-point connection time

    - total point-to-multipoint connection time

Other statistics (e.g. error counters) may be added in the future.

2.3.3. Frame Collection Requirements

An optional feature set for ATM-RMON is the analysis of frames on AAL-5
circuits. This can be accomplished with some minor additions to the
RMON-1 or RMON-2 MIBs. New values for dataSource objects can be defined
which reference ATM collection sources (see MIB proposal below). The
data can be formatted into RMON-1 host, matrix, hostTopN, and
filter/capture groups with virtually no MIB changes. By adding
encapsulation definitions to the RMON-2 protocolDirectory, RMON-2 host,
matrix, matrixTopN, and filter2 groups can be implemented for ATM
network traffic.

[TBD: Details on frame analysis integration w/RMON-1 and RMON-2 MIBs.]

2.4. ATM-RMON Design Goals

The RMON Working Group within the Internet Engineering Task Force (IETF)
will be updating and augmenting the RMON MIB soon, and several of these
changes can be incorporated into an ATM-RMON MIB. The main advantages to
'borrowing' from the existing RMON MIB:

  - allow system administrators to reuse operational experience with
    RMON concepts and RMON data presentation (e.g. basic/host/matrix
    stats for a given media or protocol).

  - allow portions of standard MIBs to be applied directly to ATM-RMON
    without modification.

  - allow RMON NMS and probe vendors to possibly take advantage of
    their RMON-1 implementation experience.

  - allow flexible configuration with low complexity.

ATM-RMON will require new configuration mechanisms to deal with varying
application needs and probe capabilities. RMON-1 defines a 'dataSource'
object of type OBJECT IDENTIFIER, which allows new or proprietary
mechanisms beyond the 'ifIndex' object. RMON-2 provides for extension of
allowable dataSource values. (The 'ifIndex.N' and
'rptrGroupPortIndex.N.M' formats are the only collection sources
supported by the RMON WG at this time, but vendors are free to define
unofficial values.) New MIB tables to specify collection parameters for

ATM will be required. The dataSource object can be used to reference a circuit-selection control entry instead of an instance of ifIndex.

The ability to select circuits for monitoring is important for the conservation of agent resources. An NMS must be able to specify an arbitrary number of circuits (subject to agent capabilities), in combination with circuits that are selected by the ATM address(es). This requires:

- a mechanism to include or exclude connections by {ifIndex/VPI/VCI} tuples -- intended for PVC capture

- a mechanism to include or exclude all connections for a given ATM address or masked address -- intended for SVC capture

- a mechanism to 'glue' all the selection logic together

2.4.1. Data Reduction

Traditionally, RMON host and matrix tables can be very large, and take a great deal of resources to manage by the NMS and maintain by the agent. The high speeds and complex collection requirements make it very desirable to reduce both the agent and NMS load for processing RMON data.

Generally, agent resources can be saved with pre-collection data reduction, and NMS resources can be saved with post-collection data reduction. Both types are integrated into ATM-RMON.

2.4.1.1. Pre-collection Data Reduction

The most effective way to save probe resources is to limit what data is ever processed in any manner by the probe:

- sampling of frames to allow a probe to decode a subset of all possible frames on a given collection source.

- need to disallow sampling on some circuits.

- sampling configuration -- need balance between NMS and agent configuration

- need sampling accuracy reporting

  - need powerful, yet easy-to-configure circuit selection to direct
    probe resources most efficiently

Resources can be optimized (in an implementation-specific manner) by
statistical sampling of all cells within a given cell flow. Sampling
may also apply to circuit selection on one or more ports within a given
switch.

Sampling can be useful for frame analysis, and accomplished (in an
implementation-specific manner) by capturing all the consecutive cells
which comprise a particular frame.

2.4.1.2. **Post-collection Data Reduction**

Even with pre-collection data reduction it is likely ATM-RMON data
tables will grow quite large, so it is also desirable to minimimze the
number of SNMP transactions required to retrieve or refresh these data
tables. The mechanisms included in this MIB are:

  - Time Filter indexing -- allows an NMS to retrieve only the changed
    values since its last polling interval.

  - selection aggregation -- address-masking capability of the circuit
    selection feature allows an NMS to reduce the number of actual
    counters maintained by the probe.

  - TopN Report aggregation -- probe continuously monitors the top
    talkers over a given interval, and automatically generates a report
    at the end of each interval.

2.4.2. **Collection Source Issues**

The current RMON 'dataSource' model is not particularly useful for ATM
networks, since ATM is connection-oriented, and is not used in this MIB.
Instead, a set of global tables are used to define 'circuit selection
groups' (called 'vcSelectGroups'). Traditional RMON collections (e.g.
stats, host, hostTopN, matrix) can be done using a vcSelectGroup as the
dataSource. Some issues regarding the design of the ATM-RMON 'dataSource
model' include:

  - collection criteria must be detailed -- combined criteria with
    include/exclude , masking

- collection criteria setup cannot be modified on the fly for a
  particular vcSelectGroup, while any collections based on that
  vcSelectGroup are in progress. However, vcSelectGroups can be added
  and deleted while collections based on existed vcSelectGroups are
  in progress.

- selection MIB table setup rules TBD (i.e. overall logic is
  combinatorial, but some precedence rules and corner cases must be
  documented).

[3](#). **MIB Proposal**

The following MIB proposal is based, in part, on the RMON-2 MIB. The
open issues list:

- no error counter instrumentation yet

- no matrix TopN functionality yet

- no notifications/traps defined yet

- still needs to be syntax-checked and MIB-linted

   some details on configuration, rollover time issues, 64-bit counter
   SMI issues, and frame/cells/both selection are still TBD
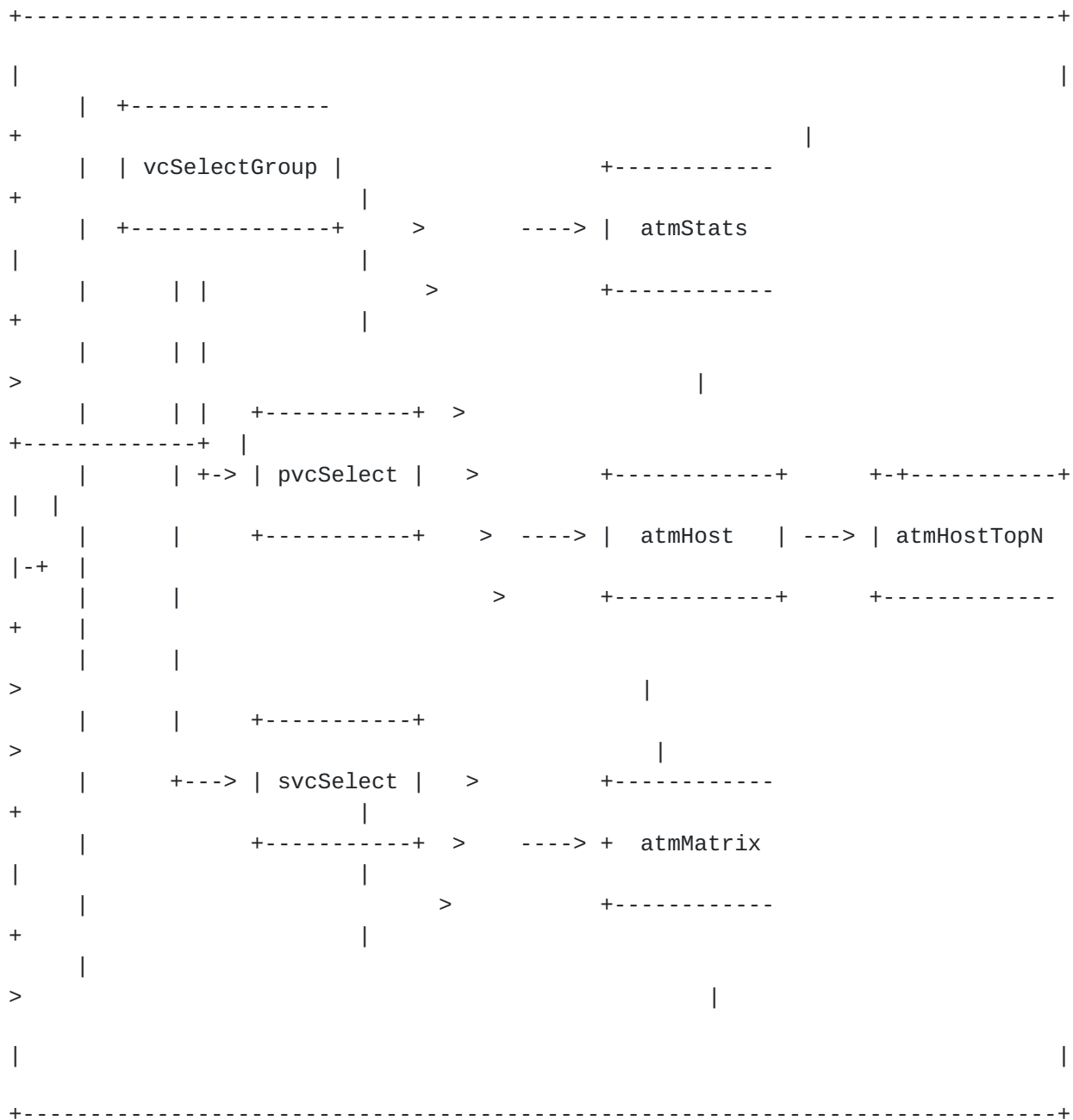
RMON-1 and RMON-2 integration is achieved by setting the particular
dataSource object to reference an instance of the 'vcSelectGroupIndex'
object, but details are not discussed in this MIB.

[3.1](#). **MIB Structure**

The MIB contains four groups:

- vcSelect -- circuit selection; data tables indexed by a common
   index 'vcSelectGroupIndex', which replaces the dataSource indirect
   pointer and arbitrary small integer index used in RMON-1/RMON-2

- atmStats -- basic statistics; allows individual host traffic
   contribution percentage to be easily calculated.

- atmHost -- ATM host statistics and hostTopN reporting

- atmMatrix -- ATM circuit statistics

Figure 2: ATM-RMON MIB Structure

```
+------------------------------------------------------------------------------+
|                                                                              |
     |  +--------------
+                                                               |
     | | vcSelectGroup |                   +------------
+                                 |
     | +---------------+     >         ----> |  atmStats
|                      |
     |      | |                 >               +------------
+                                 |
     |      | |
>                                                        |
     |      | |   +-----------+  >
+-------------+  |
     |         | +-> | pvcSelect |   >          +------------+      +-+-----------+
|  |
     |         |      +-----------+    >  ----> |  atmHost   | ---> | atmHostTopN
|-+  |
     |         |                        >          +------------+      +-------------
+    |
     |         |                                                      
>                                                         |
     |         |      +-----------+
>                                                          |
     |         +---> | svcSelect |   >              +------------
+                      |
     |                 +-----------+  >     ----> +  atmMatrix
|                      |
     |                            >          +------------
+                      |
     |
>                                                         |
|                                                                              |
+------------------------------------------------------------------------------+
```

The vcSelectGroup is used to define the VCCs to be monitored for a
particular set of functions (a subset of all ATM-RMON, RMON-1, and
RMON-2 groups). Each vcSelectGroup is used as a collection source for
zero or one atmStats, atmHost, and atmMatrix collections. There may be
an arbitrary number of atmHostTopN entries defined per vcSelectGroup.

For processing of frames collected (in an implementation-specific way)

from the vcSelectGroup, the appropriate RMON-1 or RMON-2 dataSource
instance is set to the OBJECT IDENTIFIER 'vcSelectGroupIndex.I'. [TBD:
Row creation, modification, and deletion problems related to table
dependencies between ATM-RMON and the other RMON MIBs.

For processing of packets collected on behalf the RMON-2 MIB, the
propoer protocol identifiers must be set up before the nlHost, alHost,
nlMatrix, alMatrix, and filter2 groups can be utilized. [TBD ATM
encapsulation macro identifier additions to [8].]

[4]. **Definitions**

```
ATM-RMON-MIB DEFINITIONS ::= BEGIN

IMPORTS
    MODULE-IDENTITY, OBJECT-TYPE, Counter32,
    Integer32, Gauge32, IpAddress,
    TimeTicks, Counter64, experimental
        FROM SNMPv2-SMI
    TEXTUAL-CONVENTION, RowStatus, DisplayString,
    TimeStamp, TruthValue
        FROM SNMPv2-TC
    MODULE-COMPLIANCE, OBJECT-GROUP
        FROM SNMPv2-CONF
    OwnerString
        FROM RFC1757-MIB
    ZeroBasedCounter32, LastCreateTime, TimeFilter
        FROM RMON2-MIB
    IfIndex
        FROM ATM-MIB
    AtmAddr
        FROM ATM2-MIB;

    --  Remote Network Monitoring MIB for ATM Networks

atmRmon MODULE-IDENTITY
    LAST-UPDATED "9602210000Z"
    ORGANIZATION "IETF"
    CONTACT-INFO
        "Andy Bierman
         Bierman Consulting
         Phone:  +1 805 648 2028
         Email:  abierman@west.net

         Keith McCloghrie
         Cisco Systems, Inc.
         Phone: +1 408 526-5260
         Email: kzm@cisco.com"
    DESCRIPTION
            "The MIB module for managing remote monitoring device
            implementations for ATM networks."
    ::= { experimental xx }

vcSelect        OBJECT IDENTIFIER ::= { atmRmon 1 }
atmStats        OBJECT IDENTIFIER ::= { atmRmon 2 }
```

atmHost   OBJECT IDENTIFIER ::= { atmRmon 3 }
atmMatrix   OBJECT IDENTIFIER ::= { atmRmon 4 }

atmRmonConformance OBJECT IDENTIFIER ::= { atmRmon 5 }

    -- Textual Conventions:

QoSIndex ::= TEXTUAL-CONVENTION
    STATUS current
    DESCRIPTION
            "This TC describes an object that identifies the cell
            delivery quality-of-service classification, associated with
            a particular vcSelectGroup collection."
    SYNTAX INTEGER {
        unknownQos(1), -- includes 'other'; [need separate enum?]
        cbrQos(2),   -- constant bit rate
        rtVbrQos(3),   -- variable bit rate (real-time)
        nrtVbrQos(4),   -- variable bit-rate (non-real-time)
        abrQos(5),   -- available bit rate
        ubrQos(6)   -- unspecified bit rate
    }

ResourcePriority ::= TEXTUAL-CONVENTION
    STATUS current
    DESCRIPTION
            "This TC describes an object which indicates the resource
            priority of the entire entry. Lower priorities indicate a
            lesser requirement to retain resources than higher priority
            values. A probe is strongly encouraged, but not required,
            to honor all priority requests, all of the time.

            Objects declared with this TC should be contained within a
            conceptual control table entry. The indicated resource
            priority applies to the control entry and all internal data
            structures maintained on behalf of the control entry.

            A probe is expected to honor the priority requests in an
            implementation-dependent way. At this time, it is
            unspecified as to the priority ordering of entries with the
            same ResourcePriority value."
    SYNTAX INTEGER {
        lowPriority(1),
        normalPriority(2),
        highPriority(3)
    }

ZeroBasedCounter64 ::= TEXTUAL-CONVENTION
    STATUS current

DESCRIPTION
            "This TC describes an object which counts events with the
            following semantics: objects of this type will be set to
            zero(0) on creation and will thereafter count appropriate
            events, wrapping back to zero(0) when the value 2^64 is
            reached.

            Provided that an application discovers the new object within
            the minimum time to wrap it can use the initial value as a
            delta since it last polled the table of which this object is
            part. It is important for a management station to be aware

            of this minimum time and the actual time between polls, and
            to discard data if the actual time is too long or there is
            no defined minimum time.

            Typically this TC is used in tables where the INDEX space is
            constantly changing and/or the TimeFilter mechanism is in
            use."
    -- THIS IS BROKEN AND NEEDS TO BE CHANGED ASAP!
    -- For SNMPv2, a new type Unsigned64 is needed
    -- don't know what to do for SNMPv1 yet
    -- choices are OCTET STRING (SIZE(8)) using 2
    -- ZeroBasedCounter32 objects instead
    SYNTAX Counter64

```
     --
     -- Virtual Circuit Selection group  (vcSelect)
     --
     -- Defines the circuits to be included or excluded in
     -- a particular host or matrix collection
     --     vcSelectGroupTable
     --     pvcSelectTable
     --     svcSelectTable

vcSelectGroupTable OBJECT-TYPE
     SYNTAX      SEQUENCE OF VcSelectGroupEntry
     MAX-ACCESS  not-accessible
     STATUS      current
     DESCRIPTION
             "Controls the setup of virtual circuit selection criteria
             used on behalf of any collection associated with entries in
             this table (e.g. atmHostTable).

             This table allows pvcSelect and svcSelect entries with the
             same value of vcSelectGroupIndex to be grouped together to
             form selection criteria logical-OR expressions.

             Rules for combining and prioritizing the order of pvcSelect
             and svcSelect entries:

                Each pvcSelect or svcSelect entry is grouped together by
                its major index (vcSelectGroupIndex), and is evaluated in
                the order of its minor index (pvcSelectIndex or
                svcSelectIndex).

                Each successive pvcEntry defines a PVC to be included or
                excluded from the vcSelectGroup.  These are evaluated, in
                ascending order of pvcSelectIndex, to determine the PVC
                select criteria for this vcSelectGroup. Higher-indexed
                entries have precedence when resolving conflicts.  [TBD:
                More detail, Error checking and reporting]

                Each successive svcEntry defines a group of SVCs to be
                included or excluded from the vcSelectGroup, by masked
                ATM address. This mask identifies ATM addresses (calling
                or called party) that are using one or more SVCs
                identified by the probe (in an implementation-specific
                manner).

                Each entry is evaluated, in ascending order of
```

                svcSelectIndex, to determine the SVC select criteria for
                this vcSelectGroup. Higher-indexed entries have
                precedence when resolving conflicts. [TBD: More detail
                on conflicts, error checking, and error reporting]

                Rationale: This table controls selection of the circuits to
                be monitored on behalf of one or more collections (e.g. host
                or matrix) performed by this probe."
        ::= { vcSelect 1 }

vcSelectGroupEntry OBJECT-TYPE
        SYNTAX   VcSelectGroupEntry
        MAX-ACCESS not-accessible
        STATUS   current
        DESCRIPTION
                "A conceptual row in the vcSelectGroupTable.

                An example of the indexing of this entry is
                vcSelectGroupCreateTime.7"
        INDEX { vcSelectGroupIndex }
        ::= { vcSelectGroupTable 1 }

VcSelectGroupEntry ::= SEQUENCE {
        vcSelectGroupIndex   Integer32,
        vcSelectGroupDescr   DisplayString,
        vcSelectGroupCreateTime   LastCreateTime,
        vcSelectGroupOwner   OwnerString,
        vcSelectGroupStatus   RowStatus
}

vcSelectGroupIndex OBJECT-TYPE
        SYNTAX   Integer32 (1..65535)
        MAX-ACCESS not-accessible
        STATUS   current
        DESCRIPTION
                "A unique index for this vcSelectGroupEntry."
        ::= { vcSelectGroupEntry 1 }

vcSelectGroupDescr OBJECT-TYPE
        SYNTAX   DisplayString (SIZE(0..64))
        MAX-ACCESS read-create
        STATUS   current
        DESCRIPTION
                "An administratively-assigned descriptive label for this
                vcSelectGroup entry."

```
    ::= { vcSelectGroupEntry 2 }

vcSelectGroupCreateTime OBJECT-TYPE
    SYNTAX      LastCreateTime
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
            "The value of sysUpTime when this Group entry was activated.
            This can be used by the management station to ensure that
            the table has not been deleted and recreated between polls."
    ::= { vcSelectGroupEntry 3 }

vcSelectGroupOwner OBJECT-TYPE
    SYNTAX      OwnerString
    MAX-ACCESS  read-create
    STATUS      current
    DESCRIPTION
            "The entity that configured this entry and is therefore
            using the resources assigned to it."
    ::= { vcSelectGroupEntry 4 }

vcSelectGroupStatus OBJECT-TYPE
    SYNTAX      RowStatus
    MAX-ACCESS  read-create
    STATUS      current
    DESCRIPTION
            "The status of this row.

            An entry may not exist in the active state unless all
            objects in the entry have an appropriate value.  All
            pvcSelectEntries and svcSelectEntries with a corresponding
            value of vcSelectGroupIndex must be in the active state
            before this object may be set to active(1).

            If this object is not equal to active(1), all associated
            data collections shall be deleted. That is, any associated
            collections in the atmHostTable or atmMatrixTable.

            Note that pvcSelectEntries and svcSelectEntries are not
            deleted when this entry leaves the active state."
    ::= { vcSelectGroupEntry 5 }
```

-- pvcSelectTable
--
-- Defines the PVCs to be included or excluded in
-- a particular data collection (e.g. host or matrix)

pvcSelectTable OBJECT-TYPE
    SYNTAX   SEQUENCE OF PvcSelectEntry
    MAX-ACCESS not-accessible
    STATUS   current
    DESCRIPTION
            "Controls the setup of PVC circuit selection criteria for
            the host and matrix groups.

            Rationale: This table controls selection of the virtual
            circuits to be monitored on behalf of one or more
            collections performed by this probe."
    ::= { vcSelect 2 }

pvcSelectEntry OBJECT-TYPE
    SYNTAX   PvcSelectEntry
    MAX-ACCESS not-accessible
    STATUS   current
    DESCRIPTION
            "A conceptual row in the pvcSelectTable.

            An example of the indexing of this entry is
            pvcSelectCreateTime.7.2"
    INDEX { vcSelectGroupIndex, pvcSelectIndex }
    ::= { pvcSelectTable 1 }

PvcSelectEntry ::= SEQUENCE {
    pvcSelectIndex   Integer32,
    pvcSelectIfIndex   IfIndex,
    pvcSelectVPI   Integer32,
    pvcSelectVCI   Integer32,
    pvcSelectInclude   TruthValue,
    pvcSelectCreateTime   LastCreateTime,
    pvcSelectOwner   OwnerString,
    pvcSelectStatus   RowStatus
}

pvcSelectIndex OBJECT-TYPE
    SYNTAX   Integer32 (1..65535)
    MAX-ACCESS not-accessible
    STATUS   current

```
    DESCRIPTION
            "A unique index for this pvcSelectEntry."
    ::= { pvcSelectEntry 1 }

pvcSelectIfIndex OBJECT-TYPE
    SYNTAX     IfIndex
    MAX-ACCESS read-create
    STATUS     current
    DESCRIPTION
            "The ifIndex value describing the ATM interface associated
            with this pvcSelectEntry.

            This object may not be modified if the associated instance
            of pvcSelectStatus is equal to active(1)."
    ::= { pvcSelectEntry 2 }

pvcSelectVPI OBJECT-TYPE
    SYNTAX     Integer32
    MAX-ACCESS read-create
    STATUS     current
    DESCRIPTION
            "The VPI value associated with this pvcSelectEntry.

            [TBD: wildcarding]

            This object may not be modified if the associated instance
            of pvcSelectStatus is equal to active(1)."
    ::= { pvcSelectEntry 3 }

pvcSelectVCI OBJECT-TYPE
    SYNTAX     Integer32
    MAX-ACCESS read-create
    STATUS     current
    DESCRIPTION
            "The VCI value associated with this pvcSelectEntry.

            [TBD: wildcarding]

            This object may not be modified if the associated instance
            of pvcSelectStatus is equal to active(1)."
    ::= { pvcSelectEntry 4 }

pvcSelectInclude OBJECT-TYPE
    SYNTAX     TruthValue
    MAX-ACCESS read-create
```

```
    STATUS     current
    DESCRIPTION
            "This object controls whether the indicated PVC is included
            or excluded in the associated vcSelectGroup.

            If this object has the value true(1), the circuit indicated
            by this entry is included in the vcSelectGroup.

            If it has the value false(2), the circuit indicated by this
            entry is excluded from the vcSelectGroup.

            This object may not be modified if the associated instance
            of pvcSelectStatus is equal to active(1)."
    ::= { pvcSelectEntry 5 }

pvcSelectLastCreateTime OBJECT-TYPE
    SYNTAX     LastCreateTime
    MAX-ACCESS read-only
    STATUS     current
    DESCRIPTION
            "The value of sysUpTime when this pvcSelect entry was
            activated.  This can be used by the management station to
            ensure that the table has not been deleted and recreated
            between polls."
    ::= { pvcSelectEntry 6 }

pvcSelectOwner OBJECT-TYPE
    SYNTAX      OwnerString
    MAX-ACCESS  read-create
    STATUS      current
    DESCRIPTION
            "The entity that configured this entry and is therefore
            using the resources assigned to it."
    ::= { pvcSelectEntry 7 }

pvcSelectStatus OBJECT-TYPE
    SYNTAX     RowStatus
    MAX-ACCESS  read-create
    STATUS      current
    DESCRIPTION
            "The status of this row.

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

            This object may not be modified if the associated instance
            of vcSelectGroupStatus is equal to active(1).

            If this object is not equal to active(1), all associated
            data collections shall be deleted. That is, any associated
            collections in the atmHostTable or atmMatrixTable."
    ::= { pvcSelectEntry 8 }

    -- svcSelectTable
    --
    -- Defines the SVCs to be included or excluded in
    -- a particular host or matrix collection

svcSelectTable OBJECT-TYPE
    SYNTAX   SEQUENCE OF SvcSelectEntry
    MAX-ACCESS not-accessible
    STATUS   current
    DESCRIPTION
            "Controls the setup of SVC circuit selection criteria for
            the host and matrix groups.

            Rules for combining multiple svcSelectEntries within the
            same vcSelectGroup [TBD].

            [TBD -- Error conditions, conflict resolution]

            Rationale: This table controls selection of the circuits to
            be monitored on behalf of one or more collections (either
            host or matrix) performed by this probe."
    ::= { vcSelect 3 }

svcSelectEntry OBJECT-TYPE
    SYNTAX   SvcSelectEntry
    MAX-ACCESS not-accessible
    STATUS   current
    DESCRIPTION
            "A conceptual row in the svcSelectTable.

            An example of the indexing of this entry is
            svcSelectControlCreateTime.7.1"
    INDEX { vcSelectGroupIndex, svcSelectIndex }
    ::= { svcSelectTable 1 }

SvcSelectEntry ::= SEQUENCE {

```
    svcSelectIndex              Integer32,
    svcSelectIfIndex            IfIndex,
    svcSelectAddr               AtmAddr,
    svcSelectAddrMask           AtmAddr,
    svcSelectInclude            TruthValue,
    svcSelectCreateTime         LastCreateTime,
    svcSelectOwner              OwnerString,
    svcSelectStatus             RowStatus
}

svcSelectIndex OBJECT-TYPE
    SYNTAX      Integer32 (1..65535)
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
            "A unique index for this svcSelectEntry."
    ::= { svcSelectEntry 1 }

svcSelectIfIndex OBJECT-TYPE
    SYNTAX      IfIndex
    MAX-ACCESS  read-create
    STATUS      current
    DESCRIPTION
            "The ifIndex value describing the ATM interface associated
            with this svcSelectEntry. The SVCs are identified for this
            entry on this interface only.

            This object may not be modified if the associated instance
            of svcSelectStatus is equal to active(1)."
    ::= { svcSelectEntry 2 }

svcSelectAddr OBJECT-TYPE
    SYNTAX      AtmAddr
    MAX-ACCESS  read-create
    STATUS      current
    DESCRIPTION
            "This object describes the SVCs, selected by ATM
            address(es), identified by this svcSelectEntry. Note that
            only non-zero length variants of the AtmAddr are permitted
            in this table.

            If the associated svcSelectInclude instance is true(1), all
            cells transmitted on behalf of calling or called parties
            identified by the SVC-match-algorithm are included in the
            indicated vcSelectGroup.
```

If the associated svcSelectInclude instance is false(2), all
cells transmitted on behalf of calling or called parties
identified by the SVC-match-algorithm are excluded from the
indicated vcSelectGroup.

The associated instance of svcSelectAddrMask must be the
same type and length as this object. Address types are
determined by the length of this object, as defined in
[ATM2-MIB].

SVC-match-algorithm:

```
boolean  SVC-match-algorithm()
{
   for (each corresponding bit in the calling-party or
         called-party atmAddr, svcSelectAddr, and
         svcSelectAddrMask objects)
   {
       if (svcSelectAddrMask-bit)
          if (svcSelectAddr-bit ^ atmAddr-bit)
              return(FALSE);
   }
   return(TRUE);
}
```

Address-to-cell association is done in an implementation-
specific manner, requiring examination of signaling
information related to the SVCs described by this
svcSelectEntry.

This object may not be modified if the associated instance
of svcSelectStatus is equal to active(1)."
::= { svcSelectEntry 3 }

svcSelectAddrMask OBJECT-TYPE
    SYNTAX   AtmAddr
    MAX-ACCESS read-create
    STATUS   current
    DESCRIPTION
            "This object controls the SVC-match-algorithm performed on
            cells identified by this svcSelectEntry. This object must be
            the same exact type and length as the associated
            svcSelectAddr object.

            While executing the SVC-match-algorithm, each bit in the

            svcSelectAddrMask is examined. If the value is one, then the
            corresponding svcSelectAddr bit must match the calling or
            called party address bit. If the value is zero, then no test
            is done for this bit position. Refer to the svcSelectAddr
            object description for more details on the SVC-match-
            algorithm.

            This object may not be modified if the associated instance
            of svcSelectStatus is equal to active(1)."
    ::= { svcSelectEntry 4 }

svcSelectInclude OBJECT-TYPE
    SYNTAX   TruthValue
    MAX-ACCESS read-create
    STATUS   current
    DESCRIPTION
            "This object controls whether SVCs for the indicated
            addresses are included or excluded in the associated
            vcSelectGroup.

            If this object has the value true(1), then circuits
            indicated by this entry are included in the
            vcSelectionGroup.

            If this object has the value false(2), then circuits
            indicated by this entry are excluded from the
            vcSelectionGroup.

            This object may not be modified if the associated instance
            of svcSelectStatus is equal to active(1)."
    ::= { svcSelectEntry 5 }

svcSelectLastCreateTime OBJECT-TYPE
    SYNTAX   LastCreateTime
    MAX-ACCESS read-only
    STATUS   current
    DESCRIPTION
            "The value of sysUpTime when this svcSelect entry was
            activated. This can be used by the management station to
            ensure that the table has not been deleted and recreated
            between polls."
    ::= { svcSelectEntry 6 }

svcSelectOwner OBJECT-TYPE
    SYNTAX   OwnerString

```
    MAX-ACCESS  read-create
    STATUS      current
    DESCRIPTION
            "The entity that configured this entry and is therefore
            using the resources assigned to it."
    ::= { svcSelectEntry 7 }

svcSelectStatus OBJECT-TYPE
    SYNTAX      RowStatus
    MAX-ACCESS  read-create
    STATUS      current
    DESCRIPTION
            "The status of this row.

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

            This object may not be modified if the associated instance
            of vcSelectGroupStatus is equal to active(1).

            If this object is not equal to active(1), all associated
            data collections shall be deleted. That is, any associated
            collections in the atmHostTable or atmMatrixTable."
    ::= { svcSelectEntry 8 }
```

```
     --
     -- ATM Stats Group
     --
     -- Counts the total amount of traffic sent on behalf all ATM addresses
     -- discovered by the probe, according to associated vcSelectGroup
     -- criteria

atmStatsControlTable OBJECT-TYPE
     SYNTAX       SEQUENCE OF AtmStatsControlEntry
     MAX-ACCESS   not-accessible
     STATUS       current
     DESCRIPTION
             "A list of ATM basic statistic collection table control
             entries.  These entries will enable the collection of
             statistical totals for an entire vcSelectGroup."
     ::= { atmStats 1 }

atmStatsControlEntry OBJECT-TYPE
     SYNTAX       AtmStatsControlEntry
     MAX-ACCESS   not-accessible
     STATUS       current
     DESCRIPTION
             "A conceptual row in the atmStatsControlTable.  Entries in
             this table are identified and indexed by the
             vcSelectGroupIndex object.  At most one atmStats collection
             is done per vcSelectGroup.

             An example of the indexing of this entry is
             atmStatsDroppedCells.1"
     INDEX { vcSelectGroupIndex }
     ::= { atmStatsControlTable 1 }

AtmStatsControlEntry ::= SEQUENCE {
     atmStatsControlDroppedCells         Counter32,
     atmStatsControlHCDroppedCells       Counter64,
     atmStatsControlOwner                OwnerString,
     atmStatsControlStatus               RowStatus
}

atmStatsControlDroppedCells OBJECT-TYPE
     SYNTAX     Counter32
     MAX-ACCESS read-only
     STATUS     current
     DESCRIPTION
             "The total number of cells which were received by the probe
```

          but for which the probe chose not to count in this
          collection for whatever reason. Most often, this event
          occurs when the probe is out of some resources and decides
          to shed load from one or more collections.

          This count does not include cells that were not counted
          because they had errors."
    ::= { atmStatsControlEntry 1 }

atmStatsControlHCDroppedCells OBJECT-TYPE
    SYNTAX   Counter64
    MAX-ACCESS read-only
    STATUS   current
    DESCRIPTION
          "The total number of cells which were received by the probe
          but for which the probe chose not to count in this
          collection for whatever reason. Most often, this event
          occurs when the probe is out of some resources and decides
          to shed load from one or more collections.

          This count does not include cells that were not counted
          because they had errors."
    ::= { atmStatsControlEntry 2 }

atmStatsControlOwner OBJECT-TYPE
    SYNTAX   OwnerString
    MAX-ACCESS read-create
    STATUS   current
    DESCRIPTION
          "The entity that configured this entry and is therefore
          using the resources assigned to it."
    ::= { atmStatsControlEntry 3 }

atmStatsControlStatus OBJECT-TYPE
    SYNTAX   RowStatus
    MAX-ACCESS read-create
    STATUS   current
    DESCRIPTION
          "The status of this atmStatsControlEntry.

          An entry may not exist in the active state unless all
          objects in the entry have an appropriate value.
          Specifically, the associated instance of vcSelectGroupStatus
          must be equal to active(1) before this object may be set to
          active(1).

          If this object is not equal to active(1), all associated
          entries in the atmStatsTable shall be deleted."
     ::= { atmStatsControlEntry 4 }

```
-- atmStatsTable
-- call and traffic basic statistics collected on behalf of specific
-- vcSelectGroups

atmStatsTable OBJECT-TYPE
    SYNTAX      SEQUENCE OF atmStatsEntry
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
            "A collection of statistical totals for all ATM host
            addresses that have been discovered on behalf of the
            vcSelectGroup associated with this entry."
    ::= { atmStats 2 }

atmStatsEntry OBJECT-TYPE
    SYNTAX      AtmStatsEntry
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
            "A conceptual row in the atmStatsTable.

            The vcSelectGroupIndex value in the index identifies the
            vcSelectGroup on whose behalf this entry was created.

            An example of the indexing of this entry is
            atmStatsP2pCells.8.28775.3"
    INDEX { vcSelectGroupIndex, atmStatsTimeMark, atmStatsQoS }
    ::= { atmStatsTable 1 }

AtmStatsEntry ::= SEQUENCE {
    atmStatsTimeMark            TimeFilter,
    atmStatsQoS                 QoSIndex,
    atmStatsCreateTime          LastCreateTime,
    atmStatsP2pCells            Counter32,
    atmStatsP2mpCells           Counter32,
    atmStatsHCP2pCells          Counter64,
    atmStatsHCP2mpCells         Counter64,
    atmStatsNumP2pCalls         Counter32,
    atmStatsNumP2mpCalls        Counter32,
    atmStatsP2pConnectionTime   TimeStamp,
    atmStatsP2mpConnectionTime  TimeStamp
}

atmStatsTimeMark OBJECT-TYPE
    SYNTAX      TimeFilter
```

```
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
            "A TimeFilter for this entry.  See the TimeFilter textual
            convention in [RMON2-MIB] to see how this works."
    ::= { atmStatsEntry 1 }

atmStatsQoS OBJECT-TYPE
    SYNTAX      QoSIndex
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
            "The quality of service classification for this entry.  See
            the QoSFilter textual convention for details and specific
            QoS values."
    ::= { atmStatsEntry 2 }

atmStatsCreateTime OBJECT-TYPE
    SYNTAX      LastCreateTime
    MAX-ACCESS read-only
    STATUS      current
    DESCRIPTION
            "The value of sysUpTime when this entry was activated.  This
            can be used by the management station to ensure that the
            entry has not been deleted and recreated between polls."
    ::= { atmStatsEntry 3 }

atmStatsP2pCells OBJECT-TYPE
    SYNTAX      Counter32
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
            "The total number of error-free cells detected on point-to-
            point circuits on behalf of this vcSelectGroup collection."
    ::= { atmStatsEntry 4 }

atmStatsP2mpCells OBJECT-TYPE
    SYNTAX      Counter32
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
            "The total number of error-free cells detected on point-to-
            multipoint circuits on behalf of this vcSelectGroup
            collection."
 ::= { atmStatsEntry 5 }
```

atmStatsHCP2pCells OBJECT-TYPE
    SYNTAX   Counter64
    MAX-ACCESS   read-only
    STATUS   current
    DESCRIPTION
            "The total number of error-free cells detected on point-to-
            point circuits on behalf of this vcSelectGroup collection."
    ::= { atmStatsEntry 6 }

atmStatsHCP2mpCells OBJECT-TYPE
    SYNTAX   Counter64
    MAX-ACCESS   read-only
    STATUS   current
    DESCRIPTION
            "The total number of error-free cells detected on point-to-
            multipoint circuits on behalf of this vcSelectGroup
            collection."
    ::= { atmStatsEntry 7 }

atmStatsNumP2pCalls OBJECT-TYPE
    SYNTAX   Counter32
    MAX-ACCESS   read-only
    STATUS   current
    DESCRIPTION
            "The total number of calls detected on point-to-point
            circuits on behalf of this vcSelectGroup collection."
    ::= { atmStatsEntry 8 }

atmStatsNumP2mpCalls OBJECT-TYPE
    SYNTAX   Counter32
    MAX-ACCESS   read-only
    STATUS   current
    DESCRIPTION
            "The number of calls detected on point-to-multipoint
            circuits on behalf of this vcSelectGroup collection."
    ::= { atmStatsEntry 9 }

atmStatsP2pConnectionTime OBJECT-TYPE
    SYNTAX   TimeStamp
    MAX-ACCESS   read-only
    STATUS   current
    DESCRIPTION
            "The elapsed time of all calls identified by the associated
            instance of atmStatsNumP2pCalls." -- will this roll too fast
            to be useful? -- to rollover in < 1 hour, approx. 12000

```
        sustained, concurrent -- have to be active.
   ::= { atmStatsEntry 10 }


atmStatsP2mpConnectionTime OBJECT-TYPE
   SYNTAX      TimeStamp
   MAX-ACCESS  read-only
   STATUS      current
   DESCRIPTION
        "The elapsed time of all calls identified by the associated
        instance of atmStatsNumP2mpCalls." -- will this roll too
        fast to be useful?  -- to rollover in < 1 hour,  approx.
        12000 sustained, concurrent -- have to be active.
   ::= { atmStatsEntry 11 }
```

```
--
-- ATM Host Group
--
-- Counts the amount of traffic sent on behalf of each ATM address
-- discovered by the probe, according to associated vcSelectGroup
-- criteria

atmHostControlTable OBJECT-TYPE
    SYNTAX      SEQUENCE OF AtmHostControlEntry
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
            "A list of ATM host table control entries.

            These entries will enable the collection of ATM host
            information in the atmHostTable.

            Entries in the atmHostTable will be created on behalf of
            each entry in this table. A probe is required to support at
            most one atmHost collection per instance of an associated
            vcSelectGroup, therefore the table is indexed by the
            vcSelectGroupIndex.

            Default monitor-owned atmHostControl entries:
                [TBD] "
    ::= { atmHost 1 }

atmHostControlEntry OBJECT-TYPE
    SYNTAX      AtmHostControlEntry
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
            "A conceptual row in the atmHostControlTable.  Entries in
            this table are identified and indexed by the
            vcSelectGroupIndex object.  At most one atmHost collection
            is done per vcSelectGroup.

            An example of the indexing of this entry is
            atmHostControlInserts.1"
    INDEX { vcSelectGroupIndex }
    ::= { atmHostControlTable 1 }

AtmHostControlEntry ::= SEQUENCE {
    atmHostControlInserts               Counter32,
    atmHostControlDeletes               Counter32,
```

```
    atmHostControlMaxDesiredEntries       Integer32,
    atmHostControlPriority                ResourcePriority,
    atmHostControlDroppedCells            Counter32,
    atmHostControlHCDroppedCells          Counter64,
    atmHostControlOwner                   OwnerString,
    atmHostControlStatus                  RowStatus
}

atmHostControlInserts OBJECT-TYPE
    SYNTAX     Counter32
    MAX-ACCESS read-only
    STATUS     current
    DESCRIPTION
            "The number of times an atmHost entry has been inserted into
            the atmHost table.  If an entry is inserted, then deleted,
            and then inserted, this counter will be incremented by 2.

            To allow for efficient implementation strategies, agents may
            delay updating this object for short periods of time.  For
            example, an implementation strategy may allow internal data
            structures to differ from those visible via SNMP for short
            periods of time.  This counter may reflect the internal data
            structures for those short periods of time.

            Note that the table size can be determined by subtracting
            atmHostControlDeletes from atmHostControlInserts."
    ::= { atmHostControlEntry 1 }

atmHostControlDeletes OBJECT-TYPE
    SYNTAX     Counter32
    MAX-ACCESS read-only
    STATUS     current
    DESCRIPTION
            "The number of times an atmHost entry has been deleted from
            the atmHost table (for any reason).  If an entry is deleted,
            then inserted, and then deleted, this counter will be
            incremented by 2.

            To allow for efficient implementation strategies, agents may
            delay updating this object for short periods of time.  For
            example, an implementation strategy may allow internal data
            structures to differ from those visible via SNMP for short
            periods of time.  This counter may reflect the internal data
            structures for those short periods of time.
```

           Note that the table size can be determined by subtracting
           atmHostControlDeletes from atmHostControlInserts."
    ::= { atmHostControlEntry 2 }

atmHostControlMaxDesiredEntries OBJECT-TYPE
    SYNTAX   Integer32
    MAX-ACCESS read-create
    STATUS   current
    DESCRIPTION
           "The maximum number of entries that are desired in the
           atmHostTable on behalf of this control entry. The probe will
           not create more than this number of associated entries in
           the table, but may choose to create fewer entries in this
           table for any reason including the lack of resources.

           If this object is set to a value less than the current
           number of entries, enough entries are chosen in an
           implementation-dependent manner and deleted so that the
           number of entries in the table equals the value of this
           object.

           If this value is set to -1, the probe may create any number
           of entries in this table. If the associated
           atmHostControlStatus object is equal to active(1), this
           object may not be modified.

           This object may be used to control how resources are
           allocated on the probe for the various RMON functions."
    ::= { atmHostControlEntry 3 }

atmHostControlPriority OBJECT-TYPE
    SYNTAX   ResourcePriority
    MAX-ACCESS read-create
    STATUS   current
    DESCRIPTION
           "The priority this collection should be given to retain
           resources, in the event the probe must reclaim some
           resources in order to add new entries to an existing atmHost
           collection or add new collections of other types."
    DEFVAL { normalPriority(2) }
    ::= { atmHostControlEntry 4 }

atmHostControlDroppedCells OBJECT-TYPE
    SYNTAX   Counter32
    MAX-ACCESS read-only

```
    STATUS      current
    DESCRIPTION
            "The total number of cells which were received by the probe
            but for which the probe chose not to count in this
            collection for whatever reason.  Most often, this event
            occurs when the probe is out of some resources and decides
            to shed load from one or more collections.

            This count does not include cells that were not counted
            because they had errors."
    ::= { atmHostControlEntry 5 }

atmHostControlHCDroppedCells OBJECT-TYPE
    SYNTAX      Counter64
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
            "The total number of cells which were received by the probe
            but for which the probe chose not to count in this
            collection for whatever reason.  Most often, this event
            occurs when the probe is out of some resources and decides
            to shed load from one or more collections.

            This count does not include cells that were not counted
            because they had errors."
    ::= { atmHostControlEntry 6 }

atmHostControlOwner OBJECT-TYPE
    SYNTAX      OwnerString
    MAX-ACCESS  read-create
    STATUS      current
    DESCRIPTION
            "The entity that configured this entry and is therefore
            using the resources assigned to it."
    ::= { atmHostControlEntry 7 }

atmHostControlStatus OBJECT-TYPE
    SYNTAX      RowStatus
    MAX-ACCESS  read-create
    STATUS      current
    DESCRIPTION
            "The status of this atmHostControlEntry.

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

Specifically, the associated instances of
atmHostControlMaxDesiredEntries, atmHostControlPriority, and
vcSelectGroupStatus must be equal to active(1) before this
object may be set to active(1).

If this object is not equal to active(1), all associated
entries in the atmHostTable shall be deleted."
    ::= { atmHostControlEntry 8 }

```
-- atmHostTable
-- call and traffic data collected on behalf of specific
-- vcSelectGroups

atmHostTable OBJECT-TYPE
    SYNTAX      SEQUENCE OF AtmHostEntry
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
            "A collection of statistics for a particular ATM host
            address that has been discovered on behalf of the
            vcSelectGroup associated with this entry.  Note that only
            non-zero length variants of the AtmAddr object are collected
            in this table.

            The probe will add to this table all addresses seen as the
            source or destination address in all cells identified by the
            associated vcSelectGroupEntry criteria."
    ::= { atmHost 2 }

atmHostEntry OBJECT-TYPE
    SYNTAX      AtmHostEntry
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
            "A conceptual row in the atmHostTable.

            The vcSelectGroupIndex value in the index identifies the
            vcSelectGroup on whose behalf this entry was created.

            An example of the indexing of this entry is
            atmHostInP2pCells.4.28375.20.<NSAP>.3"
    INDEX { vcSelectGroupIndex, atmHostTimeMark,
            atmHostAddress, atmHostQoS }
    ::= { atmHostTable 1 }

AtmHostEntry ::= SEQUENCE {
    atmHostTimeMark            TimeFilter,
    atmHostAddress             AtmAddr,
    atmHostQos                 QoSIndex,
    atmHostCreateTime          LastCreateTime,
    atmHostInP2pCells          ZeroBasedCounter32,
    atmHostOutP2pCells         ZeroBasedCounter32,
    atmHostInP2mpCells         ZeroBasedCounter32,
    atmHostOutPm2pCells        ZeroBasedCounter32,
```

```
    atmHostInHCP2pCells          ZeroBasedCounter64,
    atmHostOutHCP2pCells         ZeroBasedCounter64,
    atmHostInHCP2mpCells         ZeroBasedCounter64,
    atmHostOutHCPm2pCells        ZeroBasedCounter64,
    atmHostInNumP2pCalls         ZeroBasedCounter32,
    atmHostOutNumP2pCalls        ZeroBasedCounter32,
    atmHostInNumP2mpCalls        ZeroBasedCounter32,
    atmHostOutNumP2mpCalls       ZeroBasedCounter32,
    atmHostP2pConnectionTime     TimeStamp,
    atmHostP2mpConnectionTime    TimeStamp
}

atmHostTimeMark OBJECT-TYPE
    SYNTAX      TimeFilter
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
            "A TimeFilter for this entry.  See the TimeFilter textual
            convention in [RMON2-MIB] to see how this works."
    ::= { atmHostEntry 1 }

atmHostAddress OBJECT-TYPE
    SYNTAX      AtmAddr
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
            "The ATM address for this atmHostEntry.

            This is represented as an octet string with specific
            semantics and length as identified by the AtmAddr textual
            convention."
    ::= { atmHostEntry 2 }

atmHostQoS OBJECT-TYPE
    SYNTAX      QoSIndex
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
            "The quality of service classification for this entry.  See
            the QoSFilter textual convention for details and specific
            QoS values."
    ::= { atmHostEntry 3 }

atmHostCreateTime OBJECT-TYPE
    SYNTAX      LastCreateTime
```

        MAX-ACCESS read-only
        STATUS   current
        DESCRIPTION
                "The value of sysUpTime when this entry was activated. This
                can be used by the management station to ensure that the
                entry has not been deleted and recreated between polls."
        ::= { atmHostEntry 4 }

atmHostInP2pCells OBJECT-TYPE
        SYNTAX   ZeroBasedCounter32
        MAX-ACCESS read-only
        STATUS   current
        DESCRIPTION
                "The number of error-free cells detected on point-to-point
                circuits in which this ATM address was identified as the
                called party."
        ::= { atmHostEntry 5 }

atmHostOutP2pCells OBJECT-TYPE
        SYNTAX   ZeroBasedCounter32
        MAX-ACCESS read-only
        STATUS   current
        DESCRIPTION
                "The number of error-free cells detected on point-to-point
                circuits in which this ATM address was identified as the
                calling party."
        ::= { atmHostEntry 6 }

atmHostInP2mpCells OBJECT-TYPE
        SYNTAX   ZeroBasedCounter32
        MAX-ACCESS read-only
        STATUS   current
        DESCRIPTION
                "The number of error-free cells detected on point-to-
                multipoint circuits in which this ATM address was identified
                as the called party."
        ::= { atmHostEntry 7 }

atmHostOutP2mpCells OBJECT-TYPE
        SYNTAX   ZeroBasedCounter32
        MAX-ACCESS read-only
        STATUS   current
        DESCRIPTION
                "The number of error-free cells detected on point-to-
                multipoint circuits in which this ATM address was identified

```
            as the calling party."
    ::= { atmHostEntry 8 }

atmHostInHCP2pCells OBJECT-TYPE
    SYNTAX      ZeroBasedCounter64
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
            "The number of error-free cells detected on point-to-point
            circuits in which this ATM address was identified as the
            called party."
    ::= { atmHostEntry 9 }

atmHostOutHCP2pCells OBJECT-TYPE
    SYNTAX      ZeroBasedCounter64
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
            "The number of error-free cells detected on point-to-point
            circuits in which this ATM address Was identified as the
            calling party."
    ::= { atmHostEntry 10 }

atmHostInHCP2mpCells OBJECT-TYPE
    SYNTAX      ZeroBasedCounter64
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
            "The number of error-free cells detected on point-to-
            multipoint circuits in which this ATM address was identified
            as the called party."
    ::= { atmHostEntry 11 }

atmHostOutHCP2mpCells OBJECT-TYPE
    SYNTAX      ZeroBasedCounter64
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
            "The number of error-free cells detected on point-to-
            multipoint circuits in which this ATM address was identified
            as the calling party."
    ::= { atmHostEntry 12 }

atmHostInNumP2pCalls OBJECT-TYPE
    SYNTAX      ZeroBasedCounter32
```

```
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
            "The number of calls detected on point-to-point circuits in
            which this ATM address was identified as the called party."
    ::= { atmHostEntry 13 }

atmHostOutNumP2pCalls OBJECT-TYPE
    SYNTAX      ZeroBasedCounter32
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
            "The number of calls detected on point-to-point circuits in
            which this ATM address was identified as the calling party."
    ::= { atmHostEntry 14 }

atmHostInNumP2mpCalls OBJECT-TYPE
    SYNTAX      ZeroBasedCounter32
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
            "The number of calls detected on point-to-multipoint
            circuits in which this ATM address was identified as the
            called party."
    ::= { atmHostEntry 15 }

atmHostOutNumP2mpCalls OBJECT-TYPE
    SYNTAX      ZeroBasedCounter32
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
            "The number of calls detected on point-to-multipoint
            circuits in which this ATM address was identified as the
            calling party."
    ::= { atmHostEntry 16 }

atmHostP2pConnectionTime OBJECT-TYPE
    SYNTAX      TimeStamp
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
            "The elapsed time of all calls identified by the associated
            instances of atmHostInNumP2pCalls and
            atmHostOutNumP2pCalls."
    ::= { atmHostEntry 17 }
```

atmHostP2mpConnectionTime OBJECT-TYPE
    SYNTAX   TimeStamp
    MAX-ACCESS   read-only
    STATUS   current
    DESCRIPTION
            "The elapsed time of all calls identified by the associated
            instances of atmHostInNumP2mpCalls and
            atmHostOutNumP2mpCalls."
    ::= { atmHostEntry 18 }

```
--
-- ATM HostTopN Group
--
-- Finds and reports the top traffic contributors,
-- according to associated vcSelectGroup criteria

atmHostTopNControlTable OBJECT-TYPE
    SYNTAX       SEQUENCE OF AtmHostTopNControlEntry
    MAX-ACCESS   not-accessible
    STATUS       current
    DESCRIPTION
            "A set of parameters that control the creation of a report
            of the top N host entries according to a selected metric."
    ::= { atmHost 3 }

atmHostTopNControlEntry OBJECT-TYPE
    SYNTAX       AtmHostTopNControlEntry
    MAX-ACCESS   not-accessible
    STATUS       current
    DESCRIPTION
            "A conceptual row in the atmHostTopNControlTable.

            An example of the indexing of this table is
            atmHostTopNControlDuration.3.1"
    INDEX { vcSelectGroupIndex, atmHostTopNControlIndex }
    ::= { atmHostTopNControlTable 1 }

AtmHostTopNControlEntry    ::= SEQUENCE {
    atmHostTopNControlIndex              Integer32,
    atmHostTopNControlRateBase           INTEGER,
    atmHostTopNControlTimeRemaining      Integer32,
    atmHostTopNControlGeneratedReports   Counter32,
    atmHostTopNControlDuration           Integer32,
    atmHostTopNControlRequestedSize      Integer32,
    atmHostTopNControlGrantedSize        Integer32,
    atmHostTopNControlStartTime          TimeStamp,
    atmHostTopNControlOwner              OwnerString,
    atmHostTopNControlStatus             RowStatus
}

atmHostTopNControlIndex OBJECT-TYPE
    SYNTAX       Integer32 (1..65535)
    MAX-ACCESS   not-accessible
    STATUS       current
    DESCRIPTION
```

           "An index that is used to uniquely identify an entry in the
           atmHostTopNControlTable. Each such entry defines one top N
           report prepared on behalf of one atmHost entry and one
           vcSelectGroup entry."
    ::= { atmHostTopNControlEntry 1 }

atmHostTopNControlRateBase OBJECT-TYPE
    SYNTAX INTEGER {
        atmHostTopNInP2pCells(1),
        atmHostTopNOutP2pCells(2),
        atmHostTopNInP2mpCells(3),
        atmHostTopNOutP2mpCells(4),
        atmHostTopNInNumP2pCalls(5),
        atmHostTopNOutNumP2pCalls(6),
        atmHostTopNInNumP2mpCalls(7),
        atmHostTopNOutNumP2mpCalls(8),
        atmHostTopNP2pConnectionTime(9),
        atmHostTopNP2mpConnectionTime(10)
    }
    MAX-ACCESS   read-create
    STATUS   current
    DESCRIPTION
           "The variable for each atmHost entry that the
           atmHostTopNEntries are sorted by.

           This object may not be modified if the associated
           atmHostTopNControl   STATUS object is equal to active(1)."
    ::= { atmHostTopNControlEntry 2 }

atmHostTopNControlTimeRemaining OBJECT-TYPE
    SYNTAX   Integer32
    MAX-ACCESS read-create
    STATUS   current
    DESCRIPTION
           "The number of seconds left in the report currently being
           collected. When this object is modified by the management
           station, a new collection is started, possibly aborting a
           currently running report. The new value is used as the
           requested duration of this report, and is immediately loaded
           into the associated atmHostTopNControlDuration object. When
           the report finishes, the probe will automatically start
           another collection with the same initial value of
           atmHostTopNControlTimeRemaining. Thus the management
           station may simply read the resulting reports repeatedly,
           checking the startTime and duration each time to ensure that

            a report was not missed or that the report parameters were
            not changed.

            While the value of this object is non-zero, it decrements by
            one per second until it reaches zero. At the time that this
            object decrements to zero, the report is made accessible in
            the atmHostTopNTable, overwriting any report that may be
            there.

            When this object is modified by the management station, any
            associated entries in the atmHostTopNTable shall be
            deleted."
    DEFVAL { 1800 }
    ::= { atmHostTopNControlEntry 3 }

atmHostTopNControlGeneratedReports OBJECT-TYPE
    SYNTAX   Counter32
    MAX-ACCESS read-only
    STATUS   current
    DESCRIPTION
            "The number of reports that have been generated by this
            entry."
    ::= { atmHostTopNControlEntry 4 }

atmHostTopNControlDuration OBJECT-TYPE
    SYNTAX   Integer32
    MAX-ACCESS read-only
    STATUS   current
    DESCRIPTION
            "The number of seconds that this report has collected during
            the last sampling interval.

            When the associated atmHostTopNControlTimeRemaining object
            is set, this object shall be set by the probe to the same
            value and shall not be modified until the next time the
            atmHostTopNControlTimeRemaining is set.

            This value shall be zero if no reports have been requested
            for this atmHostTopNControlEntry."
    ::= { atmHostTopNControlEntry 5 }

atmHostTopNControlRequestedSize OBJECT-TYPE
    SYNTAX   Integer32
    MAX-ACCESS read-create
    STATUS   current

      DESCRIPTION
              "The maximum number of host entries requested for this
              report.

              When this object is created or modified, the probe should
              set atmHostTopNControlGrantedSize as closely to this object
              as is possible for the particular probe implementation and
              available resources."
      DEFVAL { 150 }
      ::= { atmHostTopNControlEntry 6 }

  atmHostTopNControlGrantedSize OBJECT-TYPE
      SYNTAX   Integer32
      MAX-ACCESS read-only
      STATUS   current
      DESCRIPTION
              "The maximum number of host entries in this report.

              When the associated atmHostTopNControlRequestedSize object
              is created or modified, the probe should set this object as
              closely to the requested value as is possible for the
              particular implementation and available resources. The probe
              must not lower this value except as a result of a set to the
              associated atmHostTopNControlRequestedSize object.

              For example, if the value of atmHostTopNControlRateBase is
              equal to atmHostTopNP2pCells(1), when the next topN report
              is generated, host entries with the highest value of
              atmHostP2pCells shall be placed in this table in decreasing
              order of this rate until there is no more room or until
              there are no more host entries. Each atmHostP2pCells value
              is copied to the associated atmHostTopNRate object.

              It is an implementation-specific matter how entries with the
              same value are sorted. It is also an implementation-
              specific matter as to whether or not zero-valued entries are
              available."
      ::= { atmHostTopNControlEntry 7 }

  atmHostTopNControlStartTime OBJECT-TYPE
      SYNTAX   TimeStamp
      MAX-ACCESS read-only
      STATUS   current
      DESCRIPTION
              "The value of sysUpTime when this top N report was last

            started. In other words, this is the time that the
            associated atmHostTopNControlTimeRemaining object was
            modified to start the requested report or the time the
            report was last automatically (re)started.

            This object may be used by the management station to
            determine if a report was missed or not."
    ::= { atmHostTopNControlEntry 8 }

atmHostTopNControlOwner OBJECT-TYPE
    SYNTAX   OwnerString
    MAX-ACCESS read-create
    STATUS   current
    DESCRIPTION
            "The entity that configured this entry and is therefore
            using the resources assigned to it."
    ::= { atmHostTopNControlEntry 9 }

atmHostTopNControlStatus OBJECT-TYPE
    SYNTAX   RowStatus
    MAX-ACCESS read-create
    STATUS   current
    DESCRIPTION
            "The status of this atmHostTopNControlEntry.

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

            If this object is not equal to active(1), all associated
            entries in the atmHostTopNTable shall be deleted by the
            agent."
    ::= { atmHostTopNControlEntry 10 }

```
--
-- atmHostTopNTable
--
atmHostTopNTable OBJECT-TYPE
    SYNTAX      SEQUENCE OF AtmHostTopNEntry
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
            "A set of statistics for those network layer matrix entries
            that have counted the highest number of octets or packets."
    ::= { atmHost 4 }

atmHostTopNEntry OBJECT-TYPE
    SYNTAX      AtmHostTopNEntry
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
            "A conceptual row in the atmHostTopNTable.

            The atmHostTopNControlIndex value in the index identifies
            the atmHostTopNControlEntry on whose behalf this entry was
            created.

            An example of the indexing of this table is
            atmHostTopNAddress.1.3.10"
    INDEX { vcSelectGroupIndex, atmHostTopNControlIndex,
            atmHostTopNIndex }
    ::= { atmHostTopNTable 1 }

AtmHostTopNEntry    ::= SEQUENCE {
    atmHostTopNIndex           Integer32,
    atmHostTopNAddress         AtmAddr,
    atmHostTopNRate            Integer32
    -- what to do about HCRate?? Need the SMI to support Integer64!
}

atmHostTopNIndex OBJECT-TYPE
    SYNTAX      Integer32 (1..65535)
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
            "An index that uniquely identifies an entry in the
            atmHostTopNTable among those in the same report.  This index
            is between 1 and N, where N is the number of entries in this
            report.
```

            Each host in the selected hostTable, for the report
            interval, is ranked in descending order of the metric
            identified by the atmHostTopNRate object.

            For example, if the value of atmHostTopNControlRateBase is
            equal to atmHostTopNP2pCells(1), increasing values of
            atmHostTopNIndex shall be assigned to entries with
            decreasing delta values of atmHostP2pCells (for the report
            interval), until index N is assigned or there are no more
            atmHostTopNEntries."
    ::= { atmHostTopNEntry 1 }

atmHostTopNAddress OBJECT-TYPE
    SYNTAX   AtmAddr
    MAX-ACCESS read-only
    STATUS   current
    DESCRIPTION
            "The ATM address of this host. Only non-zero length variants
            of AtmAddr textual convention are allowed in this table."
    ::= { atmHostTopNEntry 2 }

atmHostTopNRate OBJECT-TYPE
    SYNTAX   Integer32
    MAX-ACCESS read-only
    STATUS   current
    DESCRIPTION
            "The value of the ranked metric for this host, for this
            report.

            If the associated value of atmHostTopNRateBase is equal to
            atmHostTopNInP2pCells(1), then this object is assigned the
            delta value of the atmHostInP2pCells object during this
            report interval.

            If the associated value of atmHostTopNRateBase is equal to
            atmHostTopNOutP2pCells(2), then this object is assigned the
            delta value of the atmHostOutP2pCells object during this
            report interval.

            If the associated value of atmHostTopNRateBase is equal to
            atmHostTopNInP2mpCells(3), then this object is assigned the
            delta value of the atmHostInP2mpCells object during this
            report interval.

            If the associated value of atmHostTopNRateBase is equal to

                atmHostTopNOutP2mpCells(4), then this object is assigned the
                delta value of the atmHostOutP2mpCells object during this
                report interval.

                If the associated value of atmHostTopNRateBase is equal to
                atmHostTopNInNumP2pCalls(5), then this object is assigned
                the delta value of the atmHostInNumP2pCalls object during
                this report interval.

                If the associated value of atmHostTopNRateBase is equal to
                atmHostTopNOutNumP2pCalls(6), then this object is assigned
                the delta value of the atmHostOutNumP2pCalls object during
                this report interval.

                If the associated value of atmHostTopNRateBase is equal to
                atmHostTopNInNumP2mpCalls(7), then this object is assigned
                the delta value of the atmHostInNumP2mpCalls object during
                this report interval.

                If the associated value of atmHostTopNRateBase is equal to
                atmHostTopNOutNumP2mpCalls(8), then this object is assigned
                the delta value of the atmHostOutNumP2mpCalls object during
                this report interval.

                If the associated value of atmHostTopNRateBase is equal to
                atmHostTopNP2pConnectionTime(9), then this object is
                assigned the delta value of the atmHostP2pConnectionTime
                object during this report interval.

                If the associated value of atmHostTopNRateBase is equal to
                atmHostTopNP2mpConnectionTime(10), then this object is
                assigned the delta value of the atmHostP2mpConnectionTime
                object during this report interval."
        ::= { atmHostTopNEntry 3 }

```
--
-- ATM Matrix Group
--
-- Counts the amount of traffic sent on behalf of each source
-- and destination ATM address discovered by the probe,
-- according to associated vcSelectGroup criteria

atmMatrixControlTable OBJECT-TYPE
    SYNTAX      SEQUENCE OF AtmMatrixControlEntry
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
            "A list of ATM matrix table control entries.

            These entries will enable the collection of ATM matrix
            information in the atmMatrixTable.

            Entries in the atmMatrixTable will be created on behalf of
            each entry in this table. A probe is required to support at
            most one atmMatrix collection per instance of an associated
            vcSelectGroup, therefore the table is indexed by the
            vcSelectGroupIndex.

            Default monitor-owned atmMatrixControl entries:
                        [TBD]"
    ::= { atmMatrix 1 }

atmMatrixControlEntry OBJECT-TYPE
    SYNTAX      AtmMatrixControlEntry
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
            "A conceptual row in the atmMatrixControlTable.  Entries in
            this table are identified and indexed by the
            vcSelectGroupIndex object.  At most one atmMatrix collection
            is done per vcSelectGroup.

            An example of the indexing of this entry is
            atmMatrixControlInserts.1"
    INDEX { vcSelectGroupIndex }
    ::= { atmMatrixControlTable 1 }

AtmMatrixControlEntry    ::= SEQUENCE {
    atmMatrixControlInserts             Counter32,
    atmMatrixControlDeletes             Counter32,
```

```
    atmMatrixControlMaxDesiredEntries   Integer32,
    atmMatrixControlPriority            ResourcePriority,
    atmMatrixControlDroppedCells        Counter32,
    atmMatrixControlHCDroppedCells      Counter64,
    atmMatrixControlOwner               OwnerString,
    atmMatrixControlStatus              RowStatus
}

atmMatrixControlInserts OBJECT-TYPE
    SYNTAX      Counter32
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
            "The number of times an atmMatrix entry has been inserted
            into the atmMatrix table.  If an entry is inserted, then
            deleted, and then inserted, this counter will be incremented
            by 2.

            To allow for efficient implementation strategies, agents may
            delay updating this object for short periods of time.  For
            example, an implementation strategy may allow internal data
            structures to differ from those visible via SNMP for short
            periods of time.  This counter may reflect the internal data
            structures for those short periods of time.

            Note that the table size can be determined by subtracting
            atmMatrixControlDeletes from atmMatrixControlInserts."
    ::= { atmMatrixControlEntry 1 }

atmMatrixControlDeletes OBJECT-TYPE
    SYNTAX      Counter32
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
            "The number of times an atmMatrix entry has been deleted
            from the atmMatrix table (for any reason).  If an entry is
            deleted, then inserted, and then deleted, this counter will
            be incremented by 2.

            To allow for efficient implementation strategies, agents may
            delay updating this object for short periods of time.  For
            example, an implementation strategy may allow internal data
            structures to differ from those visible via SNMP for short
            periods of time.  This counter may reflect the internal data
            structures for those short periods of time.
```

                Note that the table size can be determined by subtracting
                atmMatrixControlDeletes from atmMatrixControlInserts."
        ::= { atmMatrixControlEntry 2 }

atmMatrixControlMaxDesiredEntries OBJECT-TYPE
        SYNTAX   Integer32
        MAX-ACCESS   read-create
        STATUS   current
        DESCRIPTION
                "The maximum number of entries that are desired in the
                atmMatrixTable on behalf of this control entry. The probe
                will not create more than this number of associated entries
                in the table, but may choose to create fewer entries in this
                table for any reason including the lack of resources.

                If this object is set to a value less than the current
                number of entries, enough entries are chosen in an
                implementation-dependent manner and deleted so that the
                number of entries in the table equals the value of this
                object.

                If this value is set to -1, the probe may create any number
                of entries in this table. If the associated
                atmMatrixControl   STATUS object is equal to active(1), this
                object may not be modified.

                This object may be used to control how resources are
                allocated on the probe for the various RMON functions."
        ::= { atmMatrixControlEntry 3 }

atmMatrixControlPriority OBJECT-TYPE
        SYNTAX   ResourcePriority
        MAX-ACCESS   read-create
        STATUS   current
        DESCRIPTION
                "The priority this collection should be given to retain
                resources, in the event the probe must reclaim some
                resources in order to add new entries to an existing
                atmMatrix collection or add new collections of other types."
        DEFVAL { normalPriority(2) }
        ::= { atmMatrixControlEntry 4 }

atmMatrixControlDroppedCells OBJECT-TYPE
        SYNTAX   Counter32
        MAX-ACCESS   read-only

```
    STATUS      current
    DESCRIPTION
            "The total number of cells which were received by the probe
            but for which the probe chose not to count in this
            collection for whatever reason.  Most often, this event
            occurs when the probe is out of some resources and decides
            to shed load from one or more collections.

            This count does not include cells that were not counted
            because they had errors."
    ::= { atmMatrixControlEntry 5 }

atmMatrixControlHCDroppedCells OBJECT-TYPE
    SYNTAX      Counter64
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
                "The total number of cells which were received by the
            probe but for which the probe chose not to count in this
            collection for whatever reason.  Most often, this event
            occurs when the probe is out of some resources and decides
            to shed load from one or more collections.

            This count does not include cells that were not counted
            because they had errors."
    ::= { atmMatrixControlEntry 6 }

atmMatrixControlOwner OBJECT-TYPE
    SYNTAX      OwnerString
    MAX-ACCESS  read-create
    STATUS      current
    DESCRIPTION
            "The entity that configured this entry and is therefore
            using the resources assigned to it."
    ::= { atmMatrixControlEntry 7 }

 atmMatrixControlStatus OBJECT-TYPE
    SYNTAX      RowStatus
    MAX-ACCESS  read-create
    STATUS      current
    DESCRIPTION
            "The status of this atmMatrixControlEntry.

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

          Specifically, the associated instances of
          atmMatrixControlMaxDesiredEntries, atmMatrixControlPriority,
          and vcSelectGroup   STATUS must be equal to active(1) before
          this object may be set to active(1).

          If this object is not equal to active(1), all associated
          entries in the atmMatrixTable shall be deleted."
     ::= { atmMatrixControlEntry 8 }

```
-- atmMatrixTable
-- call and traffic data collected on behalf of specific
-- vcSelectGroups

atmMatrixTable OBJECT-TYPE
    SYNTAX      SEQUENCE OF AtmMatrixEntry
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
            "A collection of statistics for a particular ATM host
            address that has been discovered on behalf of the
            vcSelectGroup associated with this entry.  Note that only
            non-zero length variants of the AtmAddr object are collected
            in this table.

            The probe will add to this table all addresses seen as the
            source or destination address in all cells identified by the
            associated vcSelectGroupEntry criteria."
    ::= { atmMatrix 2 }

atmMatrixEntry OBJECT-TYPE
    SYNTAX      AtmMatrixEntry
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
            "A conceptual row in the atmMatrixTable.

            The vcSelectGroupIndex value in the index identifies the
            vcSelectGroup on whose behalf this entry was created.

            An example of the indexing of this entry is
            atmMatrixInP2pCells.4.28980.20.<NSAP>.20.<NSAP>.3"
    INDEX { vcSelectGroupIndex, atmMatrixTimeMark,
            atmMatrixCallingAddress, atmMatrixCalled,
            atmMatrixQoS }
    ::= { atmMatrixTable 1 }

AtmMatrixEntry    ::= SEQUENCE {
    atmMatrixTimeMark           TimeFilter,
    atmMatrixCallingAddress     AtmAddr,
    atmMatrixCalledAddress      AtmAddr,
    atmMatrixQos                QoSIndex,
    atmMatrixCreateTime         LastCreateTime,
    atmMatrixP2pCells           ZeroBasedCounter32,
    atmMatrixP2mpCells          ZeroBasedCounter32,
```

```
    atmMatrixHCP2pCells          ZeroBasedCounter64,
    atmMatrixHCP2mpCells         ZeroBasedCounter64,
    atmMatrixNumP2pCalls         ZeroBasedCounter32,
    atmMatrixNumP2mpCalls        ZeroBasedCounter32,
    atmMatrixP2pConnectionTime  TimeStamp,
    atmMatrixP2mpConnectionTime TimeStamp
}

atmMatrixTimeMark OBJECT-TYPE
    SYNTAX      TimeFilter
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
            "A TimeFilter for this entry.  See the TimeFilter textual
            convention in [RMON2-MIB] to see how this works."
    ::= { atmMatrixEntry 1 }

atmMatrixCallingAddress OBJECT-TYPE
    SYNTAX      AtmAddr
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
            "The calling party ATM address for this atmMatrixEntry.

            This is represented as an octet string with specific
            semantics and length as identified by the AtmAddr textual
            convention."
    ::= { atmMatrixEntry 2 }

atmMatrixCalledAddress OBJECT-TYPE
    SYNTAX      AtmAddr
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
            "The called party ATM address for this atmMatrixEntry.

            This is represented as an octet string with specific
            semantics and length as identified by the AtmAddr textual
            convention."
    ::= { atmMatrixEntry 3 }

atmMatrixQos OBJECT-TYPE
    SYNTAX      QoSIndex
    MAX-ACCESS  not-accessible
    STATUS      current
```

        DESCRIPTION
                "The quality of service classification for this entry. See
                the QoSFilter textual convention for details and specific
                QoS values."
        ::= { atmMatrixEntry 4 }

atmMatrixCreateTime OBJECT-TYPE
        SYNTAX   LastCreateTime
        MAX-ACCESS   read-only
        STATUS   current
        DESCRIPTION
                "The value of sysUpTime when this entry was activated. This
                can be used by the management station to ensure that the
                entry has not been deleted and recreated between polls."
        ::= { atmMatrixEntry 5 }

 atmMatrixP2pCells OBJECT-TYPE
        SYNTAX   ZeroBasedCounter32
        MAX-ACCESS   read-only
        STATUS   current
        DESCRIPTION
                "The number of error-free cells detected on point-to-point
                circuits in which these ATM addresses were identified as the
                calling and called parties."
        ::= { atmMatrixEntry 6 }

atmMatrixP2mpCells OBJECT-TYPE
        SYNTAX   ZeroBasedCounter32
        MAX-ACCESS   read-only
        STATUS   current
        DESCRIPTION
                "The number of error-free cells detected on point-to-
                multipoint circuits in which these ATM addresses were
                identified as the calling and called parties."
        ::= { atmMatrixEntry 7 }

atmMatrixHCP2pCells OBJECT-TYPE
        SYNTAX   ZeroBasedCounter64
        MAX-ACCESS   read-only
        STATUS   current
        DESCRIPTION
                "The number of error-free cells detected on point-to-point
                circuits in which these ATM addresses were identified as the
                calling and called parties."
        ::= { atmMatrixEntry 8 }

atmMatrixHCP2mpCells OBJECT-TYPE
    SYNTAX   ZeroBasedCounter64
    MAX-ACCESS read-only
    STATUS   current
    DESCRIPTION
            "The number of error-free cells detected on point-to-
            multipoint circuits in which these ATM addresses were
            identified as the calling and called parties."
    ::= { atmMatrixEntry 9 }

atmMatrixNumP2pCalls OBJECT-TYPE
    SYNTAX   ZeroBasedCounter32
    MAX-ACCESS read-only
    STATUS   current
    DESCRIPTION
            "The number of calls detected on point-to-point circuits in
            which these ATM addresses were identified as the calling and
            called parties."
    ::= { atmMatrixEntry 10 }

atmMatrixNumP2mpCalls OBJECT-TYPE
    SYNTAX   ZeroBasedCounter32
    MAX-ACCESS read-only
    STATUS   current
    DESCRIPTION
            "The number of calls detected on point-to-multipoint
            circuits in which these ATM addresses were identified as the
            calling and called parties."
    ::= { atmMatrixEntry 11 }

atmMatrixP2pConnectionTime OBJECT-TYPE
    SYNTAX   TimeStamp
    MAX-ACCESS read-only
    STATUS   current
    DESCRIPTION
            "The elapsed time of all calls identified by the associated
            instance of atmMatrixNumP2pCalls."
    ::= { atmMatrixEntry 12 }

atmMatrixP2mpConnectionTime OBJECT-TYPE
    SYNTAX   TimeStamp
    MAX-ACCESS read-only
    STATUS   current
    DESCRIPTION
            "The elapsed time of all calls identified by the associated

```
            instance of atmMatrixNumP2mpCalls."
    ::= { atmMatrixEntry 13 }


 -- TBD: atmMatrixTopN group
```

 -- Conformance Macros

```
atmRmonMIBCompliances   OBJECT IDENTIFIER ::= { atmRmonConformance 1 }
atmRmonMIBGroups        OBJECT IDENTIFIER ::= { atmRmonConformance 2 }


atmRmonMIBCompliance MODULE-COMPLIANCE
    STATUS  current
    DESCRIPTION
            "Describes the requirements for conformance to the ATM-RMON
            MIB.

            TBD: separate conformance statements with and without 64 bit
            counters."
    MODULE  -- this module
    MANDATORY-GROUPS {  vcSelectGroup,
                        atmStatsGroup,
                        atmHostGroup,
                        atmMatrixGroup }
    ::= { atmRmonMIBCompliances 1 }

vcSelectGroup OBJECT-GROUP
    OBJECTS {   vcSelectGroupDescr, vcSelectGroupCreateTime,
                vcSelectGroupOwner, vcSelectGroupStatus,
                pvcSelectIfIndex,  pvcSelectVPI,
                pvcSelectVCI,  pvcSelectInclude,
                pvcSelectCreateTime, pvcSelectOwner,
                pvcSelectStatus, svcSelectIndex,
                svcSelectIfIndex, svcSelectAddr,
                svcSelectAddrMask, svcSelectInclude,
                svcSelectCreateTime, svcSelectOwner,
                svcSelectStatus }
    STATUS      current
    DESCRIPTION
            "Selects the virtual circuits that should be monitored as
            part of a specific collection-group."
    ::= { atmRmonMIBGroups 1 }

atmStatsGroup OBJECT-GROUP
        OBJECTS { atmStatsControlDroppedCells,
         atmStatsControlHCDroppedCells,
         atmStatsControlOwner,
         atmStatsControlStatus,
         atmStatsCreateTime,
         atmStatsP2pCells,
```

```
            atmStatsP2mpCells,
            atmStatsHCP2pCells,
            atmStatsHCP2mpCells,
            atmStatsNumP2pCalls,
            atmStatsNumP2mpCalls,
            atmStatsP2pConnectionTime,
            atmStatsP2mpConnectionTime  }
    STATUS current
    DESCRIPTION
            "Counts the basic statistics for collections on behalf of
             particular vcSelectGroup collections."
    ::= { atmRmonMIBGroups 2 }

atmHostGroup OBJECT-GROUP
    OBJECTS {
            atmHostControlInserts,
            atmHostControlDeletes,
            atmHostControlMaxDesiredEntries,
            atmHostControlPriority,
            atmHostControlDroppedCells,
            atmHostControlHCDroppedCells,
            atmHostControlOwner,
            atmHostControlStatus,
            atmHostCreateTime,
            atmHostInP2pCells, atmHostOutP2pCells,
            atmHostInP2mpCells, atmHostOutPm2pCells,
            atmHostInHCP2pCells, atmHostOutHCP2pCells,
            atmHostInHCP2mpCells, atmHostOutHCPm2pCells,
            atmHostInNumP2pCalls, atmHostOutNumP2pCalls,
            atmHostInNumP2mpCalls, atmHostOutNumP2mpCalls,
            atmHostP2pConnectionTime,
            atmHostP2mpConnectionTime,
            atmHostTopNControlRateBase,
            atmHostTopNControlTimeRemaining,
            atmHostTopNControlGeneratedReports,
            atmHostTopNControlDuration,
            atmHostTopNControlRequestedSize,
            atmHostTopNControlGrantedSize,
            atmHostTopNControlStartTime,
            atmHostTopNControlOwner,
            atmHostTopNControl   STATUS,
            atmHostTopNAddress, atmHostTopNRate }
    STATUS  current
    DESCRIPTION
            "Counts the amount of traffic sent from and to each ATM
```

                address discovered by the probe, on behalf of particular
                vcSelectGroup collections."
        ::= { atmRmonMIBGroups 3 }

atmMatrixGroup OBJECT-GROUP
        OBJECTS { atmMatrixControlInserts,
            atmMatrixControlDeletes,
            atmMatrixControlMaxDesiredEntries,
            atmMatrixControlPriority,
            atmMatrixControlDroppedCells,
            atmMatrixControlHCDroppedCells,
            atmMatrixControlOwner,
            atmMatrixControlStatus,
            atmMatrixCreateTime,
            atmMatrixP2pCells,
            atmMatrixP2mpCells,
            atmMatrixHCP2pCells,
            atmMatrixHCP2mpCells,
            atmMatrixNumP2pCalls,
            atmMatrixNumP2mpCalls,
            atmMatrixP2pConnectionTime,
            atmMatrixP2mpConnectionTime }
        STATUS current
        DESCRIPTION
                "Counts the amount of traffic sent between each pair of ATM
                addresses discovered by the probe, on behalf of particular
                vcSelectGroup collections."
        ::= { atmRmonMIBGroups 4 }

END

5. Acknowledgements

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[6](#). References

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7. Security Considerations

Security issues are not discussed in this memo.

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