**Definitions of Managed Objects for
ATM Adaptation Layer 2**

May 5, 2001

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1. Abstract

 This memo defines a portion of the Management Information Base (MIB)
 for use with network management protocols in the Internet community.
 In particular, it describes objects used for managing ATM Adaptation
 Layer-2 based interfaces, devices, networks and services.

 This memo is an extension to RFC 1215 [25].

2. Conventions used in this document
 CID   Channel Identifier
 CPS   Common Part SubLayer
 HEC   Header Error Control
 PDU   Protocol Data Unit
 SDU   Service Data Unit
 STF   Start Field.
 VCC   Virtual Channel Connection
 VPI   Virtual Path Identifier
 VCI   Virtual Channel Identifier

 Textual Conventions used in this MIB are defined in [6] and [19].

[3](). Overview

ATM AAL2 management objects are used to manage ATM interfaces,
ATM virtual links, ATM cross-connects, AAL2 entities and AAL2
Connections supported by ATM hosts, ATM switches and ATM networks.
This section provides an overview and background of how to use this
MIB.

The purpose of this memo is primarily to manage ATM AAL2 VCs.

[3.1]() Background

In addition to the MIB module defined in this memo, other MIB modules
are necessary to manage ATM interfaces, links and cross-connects.
Examples include MIB II for general system and interface management
([RFC 1213]() [[3]()] and [RFC 2863]() [[4]()]), the DS3 or SONET MIBs for management
of SONET and DS3 physical interfaces, and, as appropriate, MIB modules
for applications that make use of ATM, such as SMDS [28] and LAN
Emulation [27]. These MIB modules are outside the scope of this
specification.

This MIB module also requires the use of the ATM-MIB module defined
in [[24]()] and ATM-specific textual conventions defined in [34].

The current specification of this supplemental ATM2-MIB is based on
SNMPv2-SMI.

[3.2]() Structure of the MIB

The managed ATM AAL2 objects are arranged into the following tables:
1. ATM AAL2 interface configuration table
2. AAL2 connection performance statistics table
3. AAL2 Channel Identifier (CID) Performance Statistics Table

[3.2.1]() Support of ATM AAL2 by ifTable

The AAL2 entity in an ATM device (e.g., switch or host) is managed
using the ifTable. There are additional counters specified for AAL2
than those specified in the ATM B-ICI document [[21]()]. Specific
interpretations of ifTable for the AAL2 CPCS layer are as follows.

```
  Object   Use for AAL2 CPCS layer entity
  ======   =============================

  ifIndex  Each AAL2 entity is represented by an ifEntry.

  ifDescr  Description of the AAL2 entity.

  ifType   The value that is allocated for AAL2 is 187.

  ifMtu    Set to the largest PDU size for the
```

```
          AAL2 CPCS layer that can be processed
          by the AAL2 entity.

   ifSpeed           Set to 0.

   ifPhysAddress    An octet string of zero length.

   ifAdminStatus    See [17].

   ifOperStatus     Assumes the value down(2) if the AAL2
                    layer is down.

   ifLastChange     See [17].

   ifInOctets       The number of received AAL2 CPCS PDU octets.

   ifOutOctets      The number of AAL2 CPCS PDU octets
                    transmitted.

   ifInUcastPkts    The number of received AAL2 CPCS PDUs passed
                    to a higher-layer.

   ifOutUcastPkts   The number of AAL2 CPCS PDUs received from a
                    higher-layer for transmission.
                    [Note:  The number of AAL2 PDUs actually
                    transmitted is the number received from a
                    higher-layer for transmission minus any which
                    are counted by ifOutErrors and ifOutDiscards.]

   ifInErrors       Number of errored AAL2 CPCS PDUs received.
                    The types of errors counted include  CRC-32 errors,
                    SAR time-out errors, and oversized SDU errors.

   IfInUnknownProtos Set to 0.

   ifInDiscards      Number of received AAL2 CPCS PDUs discarded.
                     Possible reason may be input buffer overflow.

   ifOutErrors       Number of AAL2 CPCS PDUs that could not be
                     transmitted due to errors.

   ifOutDiscards     Number of AAL2 CPCS PDUs received for
                     transmission that are discarded. Possible
                     reason may be output buffer overflow.

   ifInMulticastPkts  Set to 0.

   ifInBroadcastPkts  Set to 0.

   ifOutMulticastPkts Set to 0.

   ifOutBroadcastPkts Set to 0.
```

```
   ifName              Textual name (unique on this system) of the
                       AAL2 entity or an octet string of zero length.

   ifHighSpeed         Set to 0.

   ifConnectorPresent Set to false (2).

   ifPromiscuousMode  Set to false(2).

   ifLinkUpDownTrapEnable    Default is disabled (2).

   ifAlias    The non-volatile 'alias' name for the interface
              as specified by a network manager.
```

3.2.2 AAL2 Connection Performance Statistics Table

An AAL2 connection table is used to provide AAL2 performance
information for each AAL2 virtual connection that is terminated
at the AAL2 entity contained within an ATM switch or host.

3.2.3 AAL2 Channel Identifier (CID) Performance Statistics Table

An AAL2 Channel Identifier(CID) performance statistics table is
used to provide Channel Identifier performance information for
AAL2 CID.

5.   Definitions

```
    AAL2-MIB DEFINITIONS ::= BEGIN

    IMPORTS
         MODULE-IDENTITY,
         OBJECT-TYPE,
         Counter32, Counter64
         FROM SNMPv2-SMI
         MODULE-COMPLIANCE,
         OBJECT-GROUP
                 FROM SNMPv2-CONF

       ifIndex
            FROM IF-MIB;

     Aal2MIB    MODULE-IDENTITY
            LAST-UPDATED    "200105040000Z"
            ORGANIZATION    "Cisco Systems, Inc."
            CONTACT-INFO
            "               Cisco Systems
                            Customer Service
            Postal:         170 W Tasman Drive
```

```
                        San Jose, CA 95134
                        USA

         Tel:           +1 800 553-NETS

         E-mail:        cs-atm@cisco.com
         DESCRIPTION
           " ATM AAL2 MIB file that provides AAL2
             specific information"

         REVISION        "200105040000Z"
         DESCRIPTION
           "Initial version of this MIB module."
         ::= { Mgmt XXXX}

      Aal2MIBObjects    OBJECT IDENTIFIER ::= { Aal2MIB 1 }
      aal2VccObjects    OBJECT IDENTIFIER ::= { Aal2MIBObjects 1 }
      aal2VccCidObjects OBJECT IDENTIFIER ::= { Aal2MIBObjects 2 }

-- This table contains AAL2 performance statistics of a VCC at the
-- interface associated with an AAL2 entity in an ATM host


         aal2VccTable            OBJECT-TYPE
             SYNTAX              SEQUENCE OF CAal2VccEntry
             MAX-ACCESS          not-accessible
             STATUS              current
             DESCRIPTION
              "This table contains AAL2 VCC performance
               parameters, one entry per VPI/VCI pair."
             ::= { aal2VccObjects 1 }

         aal2VccEntry            OBJECT-TYPE
             SYNTAX              CAal2VccEntry
             MAX-ACCESS          not-accessible
             STATUS              current
             DESCRIPTION
              "This list contains the AAL2 VCC performance
               parameters and is indexed by ifIndex and the
               associated VPI/VCI."
             INDEX { ifIndex, aal2VccVpi, aal2VccVci }
             ::= { aal2VccTable 1 }

         Aal2VccEntry    ::= SEQUENCE  {
             aal2VccVpi                      INTEGER,
             aal2VccVci                      INTEGER,
             aal2VccParityErrors             Counter32,
             aal2VccOverSizedSDUs            Counter32,
             aal2VccStfSeqErrors             Counter32,
             aal2VccInvalidPtrErrors         Counter32,
             aal2VccHecCodeErrors            Counter32,
```

```
     aal2VccOutPkts                     Counter64,
     aal2VccInPkts                      Counter64,
     aal2VccInOctets                    Counter64,
     aal2VccOutOctets                   Counter64,
     aal2VccSubCellMuxMode              INTEGER
 }

 aal2VccVpi                      OBJECT-TYPE
     SYNTAX                      INTEGER  (0..4095)
     MAX-ACCESS                  not-accessible
     STATUS                      current
     DESCRIPTION
      "The VPI value of the AAL2 VCC at the interface
       identified by the ifIndex."
     ::= { aal2VccEntry 1 }

 aal2VccVci                      OBJECT-TYPE
     SYNTAX                      INTEGER  (0..65535)
     MAX-ACCESS                  not-accessible
     STATUS                      current
     DESCRIPTION
      "The VCI value of the AAL2 VCC at the interface
       identified by the ifIndex."
     ::= { aal2VccEntry 2 }

 aal2VccParityErrors             OBJECT-TYPE
     SYNTAX                      Counter32
     MAX-ACCESS                  read-only
     STATUS                      current
     DESCRIPTION
      "The number of AAL2 CPS PDUs received with
       parity errors on this AAL2 VCC."
     ::= { aal2VccEntry 3 }

 aal2VccOverSizedSDUs            OBJECT-TYPE
     SYNTAX                      Counter32
     MAX-ACCESS                  read-only
     STATUS                      current
     DESCRIPTION
      "The number of AAL2 CPS PDUs discarded on this
       AAL2 VCC at the interface associated with an
       AAL2 entity because the AAL2 SDUs were too
       large."
     ::= { aal2VccEntry 4 }

 aal2VccStfSeqErrors             OBJECT-TYPE
     SYNTAX                      Counter32
     MAX-ACCESS                  read-only
     STATUS                      current
     DESCRIPTION
      "The number of AAL2 CPS PDUs discarded on this
```

```
          AAL2 VCC at the interface associated with an
          AAL2 entity because of STF sequence errors."
        ::= { aal2VccEntry 5 }

    aal2VccInvalidPtrErrors          OBJECT-TYPE
        SYNTAX                       Counter32
        MAX-ACCESS                   read-only
        STATUS                       current
        DESCRIPTION
         "The number of AAL2 CPS PDUs discarded on this
          AAL2 VCC at the interface associated with an
          AAL2 entity because of invalid pointer."
        ::= { aal2VccEntry 6 }

    aal2VccHecCodeErrors             OBJECT-TYPE
        SYNTAX                       Counter32
        MAX-ACCESS                   read-only
        STATUS                       current
        DESCRIPTION
         "The number of AAL2 CPS PDUs discarded on this
          AAL2 VCC at the interface associated with an
          AAL2 entity because of Hec Code Error."
        ::= { aal2VccEntry 7 }

     aal2VccInPkts                        OBJECT-TYPE
        SYNTAX                       Counter64
        MAX-ACCESS                   read-only
        STATUS                       current
        DESCRIPTION
         "The number of AAL2 CPS PDUs received on this
          AAL2 VCC at the interface associated with an
          AAL2 entity."
        ::= { aal2VccEntry 8 }

     aal2VccOutPkts                       OBJECT-TYPE
        SYNTAX                       Counter64
        MAX-ACCESS                   read-only
        STATUS                       current
        DESCRIPTION
         "The number of AAL2 CPS PDUs transmitted on this
          AAL2 VCC at the interface associated with an
          AAL2 entity."
        ::= { aal2VccEntry 9 }

     aal2VccInOctets                         OBJECT-TYPE
        SYNTAX                       Counter64
        MAX-ACCESS                   read-only
        STATUS                       current
        DESCRIPTION
         "The number of AAL2 CPS PDU octets received on
          this AAL2 VCC at the interface associated with
```

```
                     an AAL2 entity."
                 ::= { aal2VccEntry 10 }

            aal2VccOutOctets                OBJECT-TYPE
                SYNTAX                      Counter64
                MAX-ACCESS                  read-only
                STATUS                      current
                DESCRIPTION
                 "The number of AAL2 CPS PDU octets transmitted
                  on this AAL2 VCC at the interface associated
                  with an AAL2 entity."
                 ::= { aal2VccEntry 11 }

             aal2VccSubCellMuxMode           OBJECT-TYPE
                SYNTAX                      INTEGER {
                                             enabled (1),
                                             disabled (2)
                                            }
                MAX-ACCESS                  read-write
                STATUS                      current
                DESCRIPTION
                 "This object indicates whether subcell multiplex
                  mode is enabled/disabled on this VCC at the
                  interface associated with an AAL2 entity."
                 ::= { aal2VccEntry 12 }

-- This table contains AAL2 performance statistics of a Channel
-- Identifier(CID) of a VCC at the interface associated with an AAL2
-- entity in an ATM host

            aal2CidTable            OBJECT-TYPE
                SYNTAX              SEQUENCE OF CAal2CidEntry
                MAX-ACCESS          not-accessible
                STATUS              current
                DESCRIPTION
                 "This table contains AAL2 CID performance
                  parameters, one entry per VPI/VCI and CID
                  pair."
                 ::= { aal2VccCidObjects 1 }

            aal2CidEntry            OBJECT-TYPE
                SYNTAX              CAal2CidEntry
                MAX-ACCESS          not-accessible
                STATUS              current
                DESCRIPTION
                 "This list contains the AAL2 CID performance
                  parameters."
                INDEX               { ifIndex, aal2CidVpi,
                                      aal2CidVci, aal2CidId }
                 ::= { cAal2CidTable 1 }
```

```
Aal2CidEntry    ::= SEQUENCE  {
    cAal2CidVpi                     INTEGER,
    cAal2CidVci                     INTEGER,
    cAal2CidId                      INTEGER,
    cAal2CidParityErrors            Counter32,
    cAal2CidOverSizedSDUs           Counter32,
    cAal2CidStfSeqErrors            Counter32,
    cAal2CidInvalidPtrErrors        Counter32,
    cAal2CidHecCodeErrors           Counter32,
    cAal2CidOutPkts                 Counter32,
    cAal2CidInPkts                  Counter32,
    cAal2CidInOctets                Counter32,
    cAal2CidOutOctets               Counter32
}

aal2CidVpi              OBJECT-TYPE
    SYNTAX              INTEGER  (0..4095)
    MAX-ACCESS          not-accessible
    STATUS              current
    DESCRIPTION
    "The VPI value of the AAL2 CID at the interface
     identified by the ifIndex."
    ::= { aal2CidEntry 1 }

aal2CidVci              OBJECT-TYPE
    SYNTAX              INTEGER  (0..65535)
    MAX-ACCESS          not-accessible
    STATUS              current
    DESCRIPTION
     "The VCI value of the AAL2 CID at the interface
      identified by the ifIndex."
    ::= { aal2CidEntry 2 }

aal2CidId              OBJECT-TYPE
    SYNTAX              INTEGER  (0..255)
    MAX-ACCESS          not-accessible
    STATUS              current
    DESCRIPTION
     "The CID value of the AAL2 CID at the interface
      identified by the ifIndex."
    ::= { aal2CidEntry 3 }

aal2CidParityErrors    OBJECT-TYPE
    SYNTAX              Counter32
    MAX-ACCESS          read-only
    STATUS              current
    DESCRIPTION
     "The number of AAL2 CPS PDUs received with
      Parity errors on this AAL2 CID at the
      Interface associated with an AAL2 entity"
    ::= { aal2CidEntry 4 }
```

```
aal2CidOverSizedSDUs     OBJECT-TYPE
    SYNTAX              Counter32
    MAX-ACCESS          read-only
    STATUS              current
    DESCRIPTION
     "The number of AAL2 CPS PDUs discarded on this
      AAL2 CID at the interface associated with an
      AAL2 entity because the AAL2 SDUs were too
      large."
    ::= { aal2CidEntry 5 }

aal2CidStfSeqErrors      OBJECT-TYPE
    SYNTAX              Counter32
    MAX-ACCESS          read-only
    STATUS              current
    DESCRIPTION
     "The number of AAL2 CPS PDUs discarded on this
      AAL2 CID at the interface associated with an
      AAL2 entity because of STF sequence errors."
    ::= { aal2CidEntry 6 }

aal2CidInvalidPtrErrors  OBJECT-TYPE
    SYNTAX              Counter32
    MAX-ACCESS          read-only
    STATUS              current
    DESCRIPTION
     "The number of AAL2 CPS PDUs discarded on this
      AAL2 CID at the interface associated with an
      AAL2 entity because of invalid pointer."
    ::= { aal2CidEntry 7 }

aal2CidHecCodeErrors     OBJECT-TYPE
    SYNTAX              Counter32
    MAX-ACCESS          read-only
    STATUS              current
    DESCRIPTION
     "The number of AAL2 CPS PDUs discarded on this
      AAL2 CID at the interface associated with an
      AAL2 entity because of Hec Code Error."
    ::= { aal2CidEntry 8 }

 aal2CidInPkts           OBJECT-TYPE
    SYNTAX              Counter32
     MAX-ACCESS         read-only
     STATUS             current
     DESCRIPTION
      "The number of AAL2 CPS PDUs received on this
       AAL2 CID at the interface associated with an
       AAL2 entity."
     ::= { aal2CidEntry 9 }
```

```
            aal2CidOutPkts        OBJECT-TYPE
                SYNTAX            Counter32
                MAX-ACCESS        read-only
                STATUS            current
                DESCRIPTION
                 "The number of AAL2 CPS PDUs transmitted on
                  this AAL2 CID at the interface associated
                  with an AAL2 entity."
                 ::= { aal2CidEntry 10 }

            aal2CidInOctets       OBJECT-TYPE
                SYNTAX            Counter32
                MAX-ACCESS        read-only
                STATUS            current
                DESCRIPTION
                 "The number of AAL2 CPS PDU octets received on
                  this AAL2 CID at the interface associated with
                  an AAL2 entity."
                 ::= { aal2CidEntry 11 }

            aal2CidOutOctets      OBJECT-TYPE
                SYNTAX            Counter32
                MAX-ACCESS        read-only
                STATUS            current
                DESCRIPTION
                 "The number of AAL2 CPS PDU octets transmitted
                  on this AAL2 CID at the interface associated
                  with an AAL2 entity."
                 ::= { aal2CidEntry 12 }

-- Conformance Information

Aal2MIBConformance OBJECT IDENTIFIER ::= { Aal2MIB 2 }
Aal2MIBCompliances OBJECT IDENTIFIER ::=
                                   { Aal2MIBConformance 1 }
Aal2MIBGroups      OBJECT IDENTIFIER ::=
                                   { Aal2MIBConformance 2 }

-- Compliance Statement
Aal2MIBCompliance MODULE-COMPLIANCE
        STATUS  current
        DESCRIPTION
          "The compliance statement for entities which implement
           this  AAL2 MIB."
        MODULE  -- this module
           MANDATORY-GROUPS { cAal2VccGroup,
                              cAal2VccCidGroup }
        ::= { Aal2MIBCompliances 1 }

-- units of conformance:
```

```
aal2VccGroup OBJECT-GROUP
        OBJECTS {
                aal2VccParityErrors,
                aal2VccOverSizedSDUs,
                aal2VccStfSeqErrors,
                aal2VccInvalidPtrErrors,
                aal2VccHecCodeErrors,
                aal2VccOutPkts,
                aal2VccInPkts,
                aal2VccInOctets,
                aal2VccOutOctets,
                aal2VccSubCellMuxMode
        }

        STATUS  current
        DESCRIPTION
                "A collection of objects providing AAL2 related
                 parameters corresponding to a VPI/VCI."
        ::= { Aal2MIBGroups 1 }

aal2VccCidGroup OBJECT-GROUP
        OBJECTS {
                aal2CidParityErrors,
                aal2CidOverSizedSDUs,
                aal2CidStfSeqErrors,
                aal2CidInvalidPtrErrors,
                aal2CidHecCodeErrors,
                aal2CidOutPkts,
                aal2CidInPkts,
                aal2CidInOctets,
                aal2CidOutOctets
             }

        STATUS  current
        DESCRIPTION
                "A collection of objects providing AAL2 related
                 parameters corresponding to a VPI/VCI  and CID."
        ::= { Aal2MIBGroups 2 }

END
```

6. Security Considerations

 The managed objects in this MIB contain sensitive information since,
 collectively, they allow tracing and influencing of virtual connections
 in ATM switches or networks and provide information of their traffic
 characteristics.

 It is thus important to control even GET access to these objects and
 possibly to even encrypt the values of these object when sending them

over the network via SNMP. Not all versions of SNMP provide features
for such a secure environment.

SNMPv1 by itself is not a secure environment. Even if the network itself
is secure (for example by using IPSec), even then, there is no control
as to who on the secure network is allowed to access and GET/SET
(read/change/create/delete) the objects in this MIB.

It is recommended that the implementers consider the security features
as provided by the SNMPv3 framework. Specifically, the use of the
User-based Security Model RFC 2274 [12] and the View-based Access Control
Model RFC 2275 [15] is recommended.

It is then a customer/user responsibility to ensure that the SNMP entity
giving access to an instance of this MIB, is properly configured to give
access to the objects only to those principals (users) that have legitimate
rights to indeed GET or SET (change/create/delete) them.

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8. Acknowledgments

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 ATM Forum Technical Committee, VTOA Working Group and NM Working Group.

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