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Definitions of Managed Objects for Classical IP and ARP Over ATM Using SMIv2 (IPOA-MIB)

Status of this Memo

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Abstract

The purpose of this memo is to define the Management Information Base (MIB) for supporting Classical IP and ARP over ATM as specified in Classical IP and ARP over ATM, refer to reference [3]. Support of an ATM interface by an IP layer will require implementation of objects from several Management Information Bases (MIBs) as well as their enhancement in order to enable usage of ATM transports. It is the intent of this MIB to fully adhere to all prerequisite MIBs unless explicitly stated. Deviations will be documented in corresponding conformance statements. The specification of this MIB will utilize the Structure of Management Information (SMI) for Version 2 of the Simple Network Management Protocol Version (refer to RFC 1902, reference [1]).

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1. Introduction

This document is a product of the Internetworking Over NBMA Working Group. Its purpose is to define a MIB module for extending the traditional MIBs supported by a TCP/IP implementation to support Classical IP and ARP over ATM.

Many MIB related RFCs and Internet Drafts have been considered in the development of this document. The ones that are considered central to the extensions defined by this document are:

- RFC 2011 - SNMPv2 Management Information Base for the Internet Protocol using SMIv2 [9]. The IP over ATM (IPOA) MIB provides extensions to the IP Group for handling IP over ATM flows. A basic understanding of the IP Group is essential for understanding this document.

- o RFC 2233 - The Interfaces Group MIB (IF-MIB) using SMIv2, reference [2]. This document is important since it provides several very useful enhancements over the interface group defined in RFC 1213 (reference [5]) that aid in handling ATM related interfaces.

- o RFC 1695 - Definitions of Managed Objects for ATM Management [4] (ATM-MIB). Support of this MIB is REQUIRED for implementing the layers between AAL5 and ATM. The contents of this MIB will not explicitly be addressed here. The ATM-MIB provides a basis for managing ATM interface layering and management of:

  - ATM Switched Virtual Connections (SVCs)
  - ATM Permanent Virtual Connections (PVCs)

The ATM Forum UNI ILMI MIB is specified by the ATM Forum in various versions of the UNI specification. The ILMI MIBs being defined are not supported via SNMP agents but via SNMP requests sent over an ATM network to an ATM entity encapsulated in an AAL5 header. Support of the ILMI MIB(s) is considered out of the scope of this document.

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in RFC 2119, reference [10].

2. The SNMPv2 Network Management Framework

The SNMPv2 Network Management Framework consists of seven major components. They are:

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

- o RFC 1903 [6] defines textual conventions for SNMPv2.

- o RFC 1904 [8] defines conformance statements for SNMPv2.

- o RFC 1905 [7] defines transport mappings for SNMPv2.

- o RFC 1906 [12] defines the protocol operations used for network access to managed objects.

- o RFC 1907 [13] defines the Management Information Base for SNMPv2.

- o RFC 1908 [14] specifies coexistence between SNMPv1 and SNMPv2.

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

This memo specifies a MIB module that is compliant to the SNMPv2 SMI. A semantically identical MIB conforming to the SNMPv1 SMI can be produced through the appropriate translation.

2.1. 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.

3. Structure of the MIB

The Classical ARP and IP over ATM (IPOA) MIB structure is split into three components:

- o Basic Support MIB Definitions
- o Client Supported MIB Definitions
- o Server Supported MIB Definitions

All IP and ARP over ATM entities, both clients and ATMARP Servers, are REQUIRED to support the MIB definitions in the Basic Support MIB Definitions section. Clients need to additionally support the MIB definitions outlined in the Client specific section and ATMARP Servers MUST additionally support the ATMARP Server specific MIB definitions.

Implementation of the Definitions of Managed Objects for ATM Management [4] defines the modeling of the various layers within an ATM Interface. This modeling is assumed as a prerequisite for the IPOA-MIB. The IPOA-MIB makes no assumptions on how this layering is actually implemented within a system. Several of the MIB tables defined by the IPOA-MIB, like the base TCP/IP MIBs, require that an ifIndex exist that points to an ATM Interface. Refer to the ATM-MIB [4] for the definition of ATM Interface layering.

The use of an IP over ATM Virtual Interface layer is NOT explicitly REQUIRED by the IPOA-MIB. The use of virtual layers above an ATM-MIB defined interface layer is not absolutely necessary for modeling the

attachment of IP to an ATM network. The IPOA-MIB refers to use of a generic ifIndex object, whose value SHOULD reflect that of some specific ATM related interface as determined by an implementation. It is up to the implementers of this MIB to determine their own ATM interface layering (assuming compliance with the IF-MIB and the ATM-MIB).

The Internet Assigned Numbers Authority (IANA) ifType ipOverAtm(114) was created for use by systems that require a virtual IP over ATM interface layer. The IF-MIB's ifStackTable SHOULD be used to show the relationship between virtual IP over ATM interfaces and the actual ATM physical interface layers. The current set of ifType values can be accessed via the IANA homepage at: "http://www.iana.org/iana/".

3.1. Basic Support MIB Definitions

Basic support that MUST be implemented by both Clients and ATMARP Servers consists of:

- o ATM Logical IP Subnet (LIS) Table
- o ATM Logical IP Subnet Interface Mapping Table
- o ATMARP Remote Server Table
- o ATM VC Table
- o ATM Config PVC Table
- o Notifications

3.1.1. ATM Logical IP Subnet (LIS) Table

The ATM Logical IP Subnet (LIS) Table defines the subnets that this system is a member of for purposes of reaching destinations over an ATM transport. The LIS table is indexed by the subnet address (ipoaLisSubnetAddr) and not ifIndex. The ipoaLisIfMappingTable described in the next section provides the mapping between Logical IP Subnets and the interface layer. It is possible that the same LIS can be reached via different ATM interfaces.

The ipAddrTable and the ipoaClientTable provides the mapping from a local IP address to an ATM interface. One or more ipAddrTable entries can point to the same ipoaLisEntry. An ipAddrEntry's ipAdEntAddr ANDed with its ipAdEntNetMask SHOULD equal an ipoaLisEntry's ipoaLisSubnetAddr. Given that an interface can be multi-homed, each local IP address associated with an interface requires an entry in the ipAddrTable. Each ipAddrTable entry for a local IP address associated with an ATM interface SHOULD map to an entry in the ipoaLisTable.

The bulk of the objects in an ipoaLisEntry exists to control ATMARP for a particular LIS. In a PVC only environment it is implementation dependent as to whether this table should be supported:

ipoaLisInactivityTimer
ipoaLisMinHoldingTime
ipoaLisQDepth
ipoaLisMaxCalls
ipoaLisCacheEntryAge
ipoaLisRetries
ipoaLisTimeout

The value of an ipoaLisMaxCalls object defines the maximum number of VCs that can be established simultaneously per LIS. The value of an ipoaLisDefaultPeakCellRate object defines the best effort default peak cell rate in both the forward and backward directions when establishing VCCs (Virtual Channel Connections). Refer to RFC 1755, ATM Signaling Support for IP over ATM (reference [11]), for a definition of the use of this object's value.

The ipAddrTable's ipAdEntReasmMaxSize is the "The size of the largest IP datagram which this entity can re-assemble from incoming IP fragmented datagrams received on this interface" and is different from the ipoaLisTable's ipoaLisDefaultMtu with is the default MTU used within an LIS. Note that this is the default MTU, not the actual MTU (which is represented as ipoaVcNegotiatedMtu in the ipoaVcTable).

The ipoaLisRowStatus object enables entries in the ipoaLisTable to be created or deleted via SNMP. Creation of an ipoaLisTable entry results in the addition of a corresponding ipAddrTable entry and an ipoaLisIfMappingTable entry. Creation of multiple ipAddrTable entries and ipoaLisIfMappingTable entries for the same LIS is not addressed by this document. When ipoaLisRowStatus is changed from active(1) to notInService(2) or from active(1) to destroy(6), this has the side-effect of removing all entries from the ipNetToMediaTable that are associated with this LIS (in other words, it flushes the entity's ATMARP cache). It also removes the ipoaVcTable entries that were associated with those ipNetToMediaTable entries. Destroying the row removes the corresponding entries in the ipoaArpSrvrTable, ipoaArpClientTable, ipoaLisIfMappingTable, and the ipoaArpRemoteSrvrTable.

Entries in both the ipNetToMediaTable and the ipoaVcTable that are associated with an ipoaConfigPvcEntry are not affected by changes to ipoaLisRowStatus.

3.1.2. ATM Logical IP Subnet Interface Mapping Table

The ipoaLisIfMappingTable maps a LIS to all ATM interfaces from which it is configured to be supported. Each entry in the ipoaLisIfMappingTable SHOULD map to an ipAddrTable entry. It is also possible for a system, most commonly a switch, to have multiple LISs associated with the same ATM interface.

3.1.3. ATMARP Remote Server Table

Entries in the ipoaArpRemoteSrvrTable exists to locally configure the remote ATMARP Servers that exist on a per LIS and interface basis. Classical IP and ARP over ATM [3] requires that at least one ATMARP Server be configured per LIS where SVC traffic is intended. PVC usage doesn't require use of ATMARP. No ipoaArpRemoteSrvrTable entries SHOULD be configured for a LIS where only PVCs will be used. An entry in the ipoaArpRemoteSrvrTable is indexed by the subnet address of the LIS (ipoaLisSubnetAddr), the ATM address of the remote ATMARP Server (ipoaArpRemoteSrvrAtmAddr) and an interface ifIndex (ipoaArpRemoteSrvrIfIndex) value.

The object ipoaArpRemoteSrvrIpAddr in an ipoaArpRemoteSrvrEntry is set with the IP Address of the Remote ATMARP Server when a VC to the Remote ATMARP Server is established. A value of 0.0.0.0 SHOULD be used when the IP address of the Remote ATMARP Server is not known. Once ipoaArpRemoteSrvrIpAddr is set then the ipoaVcTable can be searched using ipoaArpRemoteSrvrIfIndex and ipoaArpRemoteSrvrIpAddr to find the VC in use to the Remote ATMARP Server.

ipoaArpRemoteSrvrIfIndex is defined to have the textual convention of InterfaceIndexOrZero. Adding ipoaArpRemoteSrvrIfIndex to the index clause allows a system to have a VC to a ATMARP Remote Server on a per LIS and interface basis. An entry in this table SHOULD exist for each interface on a per LIS basis. Each interface would then have a separate VC to the Remote ATMARP Server for ATMARP purposes.

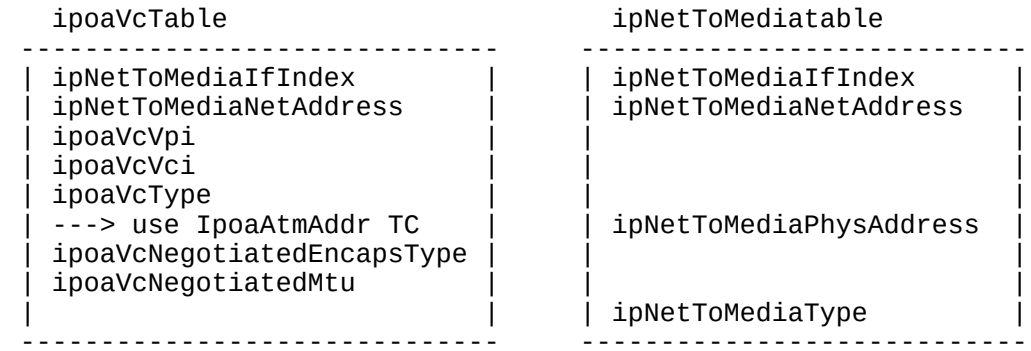
An implementation that wants to use a single VC MAY use an ipoaArpRemoteSrvrIfIndex value of 0 when configuring an ipoaArpRemoteSrvrEntry for the associating LIS. If ipoaArpRemoteSrvrIfIndex is 0 then an implementation dependent method MAY be used for finding the VPI and VCI of the VC in use to the Remote ATMARP Server. For example, search the ipoaVcTable for a match between ipNetToMediaNetAddress and ipoaArpRemoteSrvrIpAddr from an ipoaArpRemoteSrvrEntry, ignoring ipNetToMediaIfIndex. Since a single VC is being used the first match SHOULD correspond to the correct VC.

If a PVC is intended to be used to communicate with a remote ATMARP Server then the ipoaConfigPvcTable MUST be used to create and activate the PVC prior to activating a ipoaArpRemoteSrvrEntry.

The object ipoaArpRemoteSrvrRowStatus allows for row creation and deletion of entries in the ipoaArpRemoteSrvrTable. The objects ipoaArpRemoteSrvrAdminStatus and ipoaArpRemoteSrvrOperStatus exist to control and reflect the operational use of a Remote ATMARP Server defined by an ipoaArpRemoteSrvrEntry. The object ipoaArpRemoteSrvrOperStatus SHOULD have a value of up(1) when an SVC has been established to the Remote ATMARP Server or if using a PVC when the InATMARP reply with the IP Address of the Remote ATMARP Server has been received. The value of down(2) SHOULD be used to indicate that a VC to the Remote ATMARP Server doesn't exist.

3.1.4. ATM VC Table

An entry in the ipoaVcTable SHOULD have at least one corresponding ipNetToMediaTable entry. Both tables use the ipNetToMediaTable's indexes ipNetToMediaIfIndex and ipNetToMediaNetAddress. The ipoaVcTable has the additional indexes ipoaVcVpi and ipoaVcVci. An ipoaVcEntry exists for every VC per ATM interface per destination IP address. Refer to the following diagram that illustrates the relationship between ipoaVcTable and the ipNetToMediaTable:



ipoaVcType indicates if the entry is for an SVC or a PVC. An ipoaVcEntry, corresponding to an PVC, is created automatically when an ipoaConfigPvcEntry is created and the IP Address at the end of the PVC is discovered. The associating ipNetToMediaTable entry would have its ipNetToMediaType set to static(4). ipNetToMediaTable entries created during ATMARP processing have a ipNetToMediaType of dynamic(3). The process to locally configuring an ipNetToMediaTable entry and an ipoaVcTable entry for an SVC without using ATMARP is not within the scope of this document.

The objects ipoaVcVpi and ipoaVcVci are defined to have a MAX-ACCESS of not-accessible since they are only used for purposes of indexing an entry in the ipoaVcTable.

3.1.5. ATM Config PVC Table

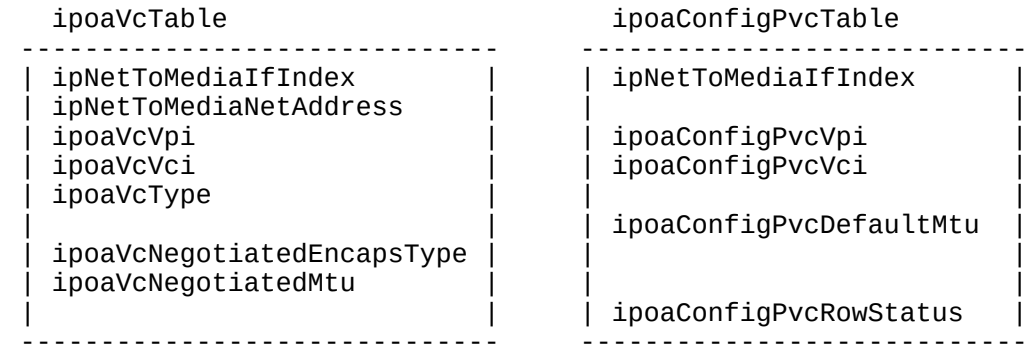
An entry in the ipoaVcTable is created after the InATMARP reply is successfully received for an ipoaConfigPvcEntry during its activation. InATMARP should return the IP Address of the other end of the PVC in order to have the needed indexes to create an ipNetToMediaEntry and an ipoaVcEntry.

The corresponding ARP Cache entry SHOULD be deleted whenever a PVC becomes unusable.

A Network Management Station wanting to create a PVC at a particular system for use as an IP transport would:

- use the ATM-MIB, reference [4], to create the PVC
- use the ipoaConfigPvcTable in the IPOA-MIB to configure the PVC for use by IP

Refer to the following diagram that illustrates the relationship between the ipoaVcTable and the ipoaConfigPvcTable:



When the ipoaVcEntry is created its ipoaVcType will be set to pvc(1), its ipoaVcNegotiatedEncapsType set to llcSnap(1), and its ipoaVcNegotiatedMtu set to 9180 octets by default. Classical IP and ARP over ATM [3] allows use of other MTU values for PVCs but considers the selection of a value other than 9180 to be out of scope. ipoaConfigPvcDefaultMtu can be used to configure the MTU to be used for the PVC. Both ends MUST have the same value configured. The associating ipNetToMediaTable entry would have its ipNetToMediaType set to static(4).

Changing ipoaConfigPvcRowStatus from active(1) to notInService(2) or from active(1) to destroy(6) has the side-effect of removing the corresponding ipNetToMediaTable, ipoaVcTable, and ipoaConfigPvcTable entries.

3.1.6. Notifications

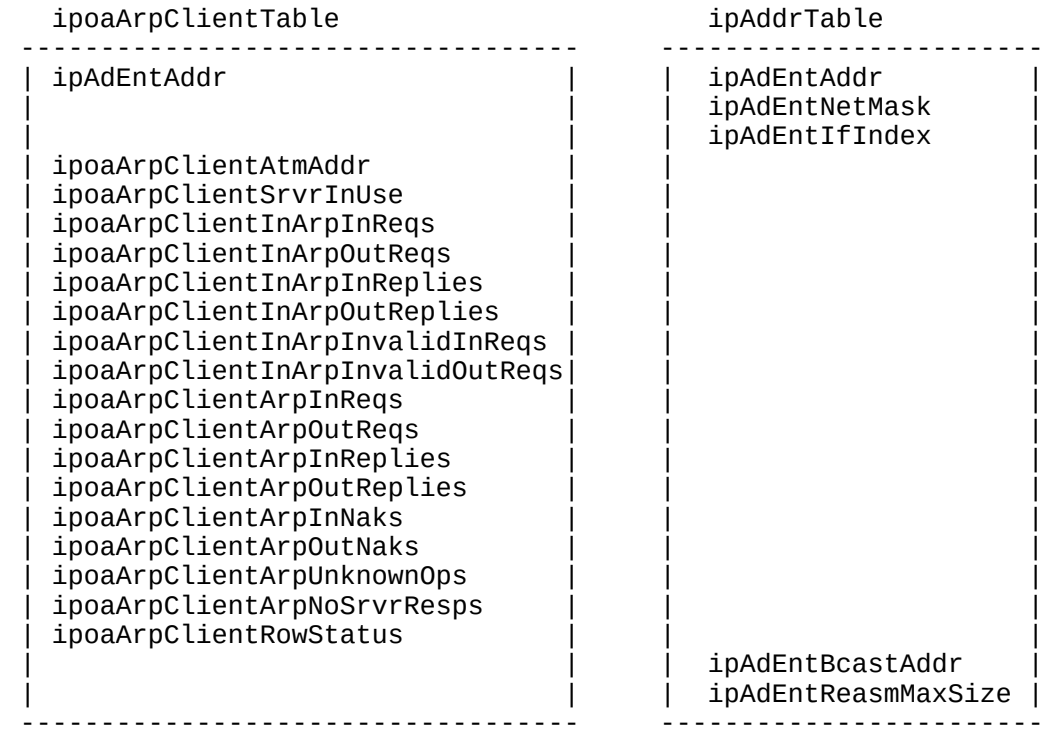
Both ATM clients and ATMARP Servers MUST support generation of an ipoaMtuExceeded notification.

3.2. Client Supported MIB Definitions

The ATMARP Client Table is the only additional MIB table that a client MUST implement.

3.2.1. ATMARP Client Table

An entry in the ipoaArpClientTable SHOULD have a corresponding ipAddrTable entry where both are indexed by the same ipAdEntAddr value. Refer to the following diagram that illustrates the relationship between ipoaArpClientTable and ipAddrTable entries:



Both tables have the same index, ipAdEntAddr. The ipAddrTable's ipAdEntNetMask when ANDed with its corresponding ipAdEntAddr yield the subnet of the LIS which can be used as an index into the ipoaLisTable (ipoaLisSubnetAddr). The ipAddrTable's ipAdEntIfIndex points to an interface ifTable entry via an ifIndex value. The attachment point for IP into an ATM network is via an ATM interface's ifIndex. Each ipoaArpClientEntry MUST point to an ATM interface via its corresponding ipAddrEntry.

ipoaArpClientAtmAddr is the local ATM address associated with the corresponding ATM ifTable entry. ipoaArpClientSrvrInUse is the ATM address of the ATMARP Server being used for a particular client. If SVCs are not being used then the value of this object is a zero-length OCTET STRING.

It is sometimes possible for a system to have multiple IP addresses configured within the same IP subnet. The indexing of this table would seem to preclude that. However, it is possible to have additional entries in the ipAddrTable with the same ifIndex and with the same subnet address. The mechanism for adding these multiple entries to the ipAddrTable (which is read-only) is beyond the scope of this document.

The counter object ipoaArpClientInArpInvalidInReqs is "The number of times that this client detected an invalid InATMARP request." This object SHOULD be incremented when processing fails for an InATMARP request (e.g., for incorrect InATMARP request structure fields). The object ipoaArpClientInArpInvalidOutReqs is defined as "The number of times that this client did not receive an InATMARP reply." This is different from ipoaArpClientArpNoSrvrResps which counts the number of times no response was received from an ATMARP request.

InATMARP retransmission processing is not controlled by objects in the ipoaLisTable. In general, the ipoaLisTable objects relate to ATMARP Server processing. Configuration of InATMARP retransmission processing is considered to be implementation dependent and not defined by the IPOA-MIB.

Implementations SHOULD use local policy for defining both InATMARP timeout and retry count values. This policy would be expected to differ for sending an InATMARP Request over a PVC as opposed to an SVC. For transmission of an InATMARP Request over a SVC a timeout of 60 seconds with a retry count of 3 is suggested. InATMARP transmission over a PVC should differ since its retry limit may need to be infinite in order to ensure that InATMARP Request processing eventually occurs.

3.3. Server Supported MIB Definitions

ATMARP Servers MUST support:

- o ATMARP Server Table
- o Notifications

as defined in the following sections. This table exists only on a system where at least one ATMARP Server is present.

3.3.1. ATMARP Server Table

This table defines the list of ATMARP Servers within a LIS. Each entry of the table defines each ATMARP Server's ATM address, the LIS it is a member of, and various InATMARP and ATMARP statistics.

An entry in this table provides information about an ATMARP Server within a LIS and is indexed by ipAdEntAddr (a local IP Address from an IP Address Table entry) and ipoaArpSrvrAddr (an ATM Address associated with the ATMARP Server).

Entries MAY be created by a management application using the ipoaArpSrvrRowStatus object. Entries in this table MAY also be created by the system and not by a management application, for example via ILMI.

Entries in this table MAY be deleted by setting the ipoaArpSrvrRowStatus object to destroy(6). This includes entries that were added by the system and not by a management application.

On a host that supports multiple ATMARP Servers where the local IP address being associated with each ATMARP Server is the same (for example a non-multihomed host), the ATM Address (ipoaArpSrvrAddr) uniquely identifies a particular ATMARP Server. On a host supporting multiple ATMARP Servers having a single ATM Interface with a single ATM Address, the ipAdEntAddr MUST be used to uniquely identify an entry in the ipoaArpSrvrTable.

The indexing of the ipoaArpSrvrTable does not allow entries with the same or no local IP Address (ipAdEntAddr) and the same ATM Address (ipoaArpSrvrAddr) to exist. The values of the index elements when combined to index a row must be unique.

3.3.2. Notifications

An ATMARP Server MUST support the following notifications:

- ipoaDuplicateIpAddress
- ipoaLisCreate
- ipoaLisDelete

Generation of ipoaLisCreate and ipoaLisDelete notifications is controlled by the ipoaLisTrapEnable object. These notifications indicate when an ipoaLisEntry is either created or deleted. The purpose of these notifications is to enable Network Management Applications to dynamically discover the existence of ATMARP Server LIS participation in order to eventually determine LIS composition via subsequent SNMP queries. It is permissible for an ATM client-only system to support the ipoaLisTrapEnable object and generate ipoaLisCreate and ipoaLisDelete notifications.

4. Definitions

```
  IPOA-MIB DEFINITIONS ::= BEGIN

  IMPORTS
      MODULE-IDENTITY, OBJECT-TYPE, NOTIFICATION-TYPE,
      transmission, Integer32, IpAddress, Counter32,
      Gauge32
          FROM SNMPv2-SMI
      TEXTUAL-CONVENTION, RowStatus
          FROM SNMPv2-TC
      MODULE-COMPLIANCE, OBJECT-GROUP, NOTIFICATION-GROUP
          FROM SNMPv2-CONF
      ipNetToMediaNetAddress, ipNetToMediaIfIndex,
      ipNetToMediaPhysAddress, ipAdEntAddr
          FROM IP-MIB

  --  The following textual conventions are defined locally within
  --  this MIB module.  They have been prefixed with 'Ipoa' to
  --  distinguish them from their counterparts in the ATM-TC-MIB.
  --  This was done so that the IPOA-MIB could be advanced as
  --  a standards-based MIB without waiting for the ATM-TC-MIB.

  --  AtmConnKind, AtmAddr
  --      FROM ATM-TC-MIB

      InterfaceIndex, InterfaceIndexOrZero
          FROM IF-MIB
      ;

  ipoaMIB MODULE-IDENTITY
      LAST-UPDATED "9802090000Z" -- February 9, 1998
      ORGANIZATION "IETF Internetworking Over NBMA Working
                    Group (ion)"
      CONTACT-INFO
          "Maria Greene (greene@xedia.com)
           Xedia Corp.

           Jim Luciani (jluciani@BayNetworks.com)
           Bay Networks

           Kenneth White (kennethw@vnet.ibm.com)
           IBM Corp.

           Ted Kuo (tkuo@eos.ncsu.edu)
           Bay Networks"
      DESCRIPTION
          "This module defines a portion of the management
```

```
          information base (MIB) for managing Classical IP and
          ARP over ATM entities."
      ::= { transmission 46 }

  -- Textual Conventions

  IpoaEncapsType ::= TEXTUAL-CONVENTION
      STATUS      current
      DESCRIPTION
          "The encapsulation type used on a VC."
      SYNTAX      INTEGER {
                      llcSnap(1),
                      vcMuxed(2),
                      other(3)
                  }

  IpoaVpiInteger ::= TEXTUAL-CONVENTION
      STATUS     current
      DESCRIPTION
          "An integer large enough to contain the value of a VPI."
      SYNTAX     Integer32 (0..255)

  IpoaVciInteger ::= TEXTUAL-CONVENTION
      STATUS     current
      DESCRIPTION
          "An integer large enough to contain the value of a VCI."
      SYNTAX     Integer32 (0..65535)

  IpoaAtmAddr ::= TEXTUAL-CONVENTION
      DISPLAY-HINT "1x"
      STATUS  current
      DESCRIPTION
         "The ATM address used by the network entity.
          The semantics are implied by the length.
          The address types are:

          - no address (0 octets)
          - E.164 (8 octets)
          - NSAP (20 octets)

          In addition, when subaddresses are used IpoaAtmAddr
          may represent the concatenation of address and
          subaddress.  The associated address types are:

          - E.164, E.164 (16 octets)
          - E.164, NSAP (28 octets)
          - NSAP, NSAP (40 octets)
```

```
          Address lengths other than defined in this definition
          imply address types defined elsewhere.
          Note: The E.164 address is encoded in BCD format."
      SYNTAX   OCTET STRING (SIZE(0..40))

  IpoaAtmConnKind ::= TEXTUAL-CONVENTION
      STATUS  current
      DESCRIPTION
         "The use of call control.  The use is as follows:
             pvc(1)
                Virtual link of a PVC.  Should not be
                used in a PVC/SVC (i.e., SPVC)
                crossconnect.
             svcIncoming(2)
                Virtual link established after a
                received signaling request to setup
                an SVC.
             svcOutgoing(3)
                Virtual link established after a
                transmitted or forwarded signaling
                request to setup an SVC.
             spvcInitiator(4)
                Virtual link at the PVC side of an
                SVC/PVC crossconnect, where the
                switch is the initiator of the SPVC
                setup.
             spvcTarget(5)
                Virtual link at the PVC side of an
                SVC/PVC crossconnect, where the
                switch is the target of the SPVC
                setup.

          An spvcInitiator is always cross-connected to
          an svcOutgoing, and an spvcTarget is always
          cross-connected to an svcIncoming."
      SYNTAX   INTEGER {
                        pvc(1),
                        svcIncoming(2),
                        svcOutgoing(3),
                        spvcInitiator(4),
                        spvcTarget(5)
                       }

  -- Top-level structure of the MIB

  ipoaObjects        OBJECT IDENTIFIER ::= { ipoaMIB 1 }
  ipoaNotifications  OBJECT IDENTIFIER ::= { ipoaMIB 2 }
  ipoaConformance    OBJECT IDENTIFIER ::= { ipoaMIB 3 }
```

```
  -- MIB Objects

  ipoaLisTrapEnable  OBJECT-TYPE
      SYNTAX      INTEGER { enabled(1), disabled(2) }
      MAX-ACCESS  read-write
      STATUS      current
      DESCRIPTION
         "Indicates whether ipoaLisCreate and ipoaLisDelete
          traps should be generated by this system.

          By default, this object should have the value
          enabled(1) for systems where ATMARP Servers are
          present and disabled(2) on systems where only
          clients reside."
      ::= { ipoaObjects 1 }

  -- The ATM Logical IP Subnet (LIS) Table

  ipoaLisTable OBJECT-TYPE
      SYNTAX      SEQUENCE OF IpoaLisEntry
      MAX-ACCESS  not-accessible
      STATUS      current
      DESCRIPTION
          "There is one entry in this table for every Logical IP
          Subnet (LIS) of which this system is a member.

          The bulk of the objects in an ipoaLisEntry exists
          to control ATMARP for a particular LIS.  In a PVC only
          environment it is implementation dependent as to
          whether this table should be supported."
      ::= { ipoaObjects 2 }

  ipoaLisEntry OBJECT-TYPE
      SYNTAX      IpoaLisEntry
      MAX-ACCESS  not-accessible
      STATUS      current
      DESCRIPTION
          "Information about a single LIS of which this system
          is a member.

          Membership in a LIS is independent of the actual ATM
          interfaces being used.  The ipoaLisTable defines
          all LISs that a system is a member of.  The ipAddrTable
          and the ipoaClientTable provides the mapping from local
          IP address to ATM interface.  The ipoaLisIfMappingTable
          provides the mappings between Logical IP Subnets and
          interfaces.
```

```
          The ipoaLisTable is indexed by ipoaLisSubnetAddr (IP
          subnet address).  An entry in the ipoaLisTable should
          exist for each ipAddrEntry that is associated with an
          ATM related interface used for Classical IP and ARP
          over ATM traffic.

          Its ipAdEntAddr and ipAdEntNetMask when ANDed together
          should equal the ipoaLisSubnetAddr of the corresponding
          ipoaLisEntry."
      INDEX       { ipoaLisSubnetAddr }
      ::= { ipoaLisTable 1 }

  IpoaLisEntry ::= SEQUENCE {
      ipoaLisSubnetAddr          IpAddress,
      ipoaLisDefaultMtu          Integer32,
      ipoaLisDefaultEncapsType   IpoaEncapsType,
      ipoaLisInactivityTimer     Integer32,
      ipoaLisMinHoldingTime      Integer32,
      ipoaLisQDepth              Integer32,
      ipoaLisMaxCalls            Integer32,
      ipoaLisCacheEntryAge       Integer32,
      ipoaLisRetries             Integer32,
      ipoaLisTimeout             Integer32,
      ipoaLisDefaultPeakCellRate Integer32,
      ipoaLisActiveVcs           Gauge32,
      ipoaLisRowStatus           RowStatus
  }

  ipoaLisSubnetAddr OBJECT-TYPE
      SYNTAX      IpAddress
      MAX-ACCESS  read-only
      STATUS      current
      DESCRIPTION
          "The IP subnet address associated with this LIS."
      ::= { ipoaLisEntry 1 }

  ipoaLisDefaultMtu OBJECT-TYPE
      SYNTAX      Integer32 (0..65535)
      MAX-ACCESS  read-create
      STATUS      current
      DESCRIPTION
          "The default MTU used within this LIS.  Note that the
          actual MTU used for a VC between two members of the
          LIS may be negotiated during connection setup and may
          be different than this value.  The ipoaVcNegotiatedMtu
          object indicates the actual MTU in use for a
          particular VC."
      DEFVAL { 9180 }
```

```
      ::= { ipoaLisEntry 2 }

  ipoaLisDefaultEncapsType OBJECT-TYPE
      SYNTAX      IpoaEncapsType
      MAX-ACCESS  read-create
      STATUS      current
      DESCRIPTION
          "The default encapsulation to use on VCs created for
          this LIS.  Note that the actual encapsulation type may
          be negotiated during connection setup and may be
          different than this value.  The
          ipoaVcNegotiatedEncapsType object indicates the actual
          encapsulation in use for a particular VC."
      DEFVAL { llcSnap }
      ::= { ipoaLisEntry 3 }

  ipoaLisInactivityTimer OBJECT-TYPE
      SYNTAX      Integer32
      UNITS       "seconds"
      MAX-ACCESS  read-create
      STATUS      current
      DESCRIPTION
          "The time, in seconds, before a call established for an
          ipNetToMediaEntry on a client will timeout due to no
          traffic being passed on the VC.  A value of 0 implies
          no time out."
      REFERENCE
          "RFC 1755, Sec. 3.4 VC Teardown"
      DEFVAL      { 1200 }
      ::= { ipoaLisEntry 4 }

  ipoaLisMinHoldingTime OBJECT-TYPE
      SYNTAX      Integer32 (0..65535)
      UNITS       "seconds"
      MAX-ACCESS  read-create
      STATUS      current
      DESCRIPTION
          "The minimum amount of time, in seconds, that a call
          will remain open.  If 0 then ipoaInactivityTimer will
          completely determine when a call is terminated."
      REFERENCE
          "RFC 1755, Sec. 3.4 VC Teardown"
      DEFVAL      { 60 }
      ::= { ipoaLisEntry 5 }

  ipoaLisQDepth OBJECT-TYPE
      SYNTAX      Integer32 (1..65535)
      UNITS       "packets"
```

```
      MAX-ACCESS  read-create
      STATUS      current
      DESCRIPTION
          "The maximum number of outstanding requests that are
           allowed while waiting for ATMARP replies and
           InATMARP replies for this LIS."
      DEFVAL      { 1 }
      ::= { ipoaLisEntry 6 }

  ipoaLisMaxCalls OBJECT-TYPE
      SYNTAX      Integer32 (1..65535)
      MAX-ACCESS  read-create
      STATUS      current
      DESCRIPTION
          "The maximum number of SVCs that can be established
          simultaneously for this LIS."
      DEFVAL      { 500 }
      ::= { ipoaLisEntry 7 }

  ipoaLisCacheEntryAge OBJECT-TYPE
      SYNTAX      Integer32 (60..1200)
      UNITS       "seconds"
      MAX-ACCESS  read-create
      STATUS      current
      DESCRIPTION
          "The time, in seconds, before an ipNetToMediaEntry will
          age out of the table.  Note that the default value will
          be different for a client and a server.  An ATMARP
          Server should use a default of 1200 and a client should
          use 900."
      DEFVAL      { 900 }
      ::= { ipoaLisEntry 8 }

  ipoaLisRetries OBJECT-TYPE
      SYNTAX      Integer32 (0..10)
      MAX-ACCESS  read-create
      STATUS      current
      DESCRIPTION
          "The number of times the ATMARP request will be retried
          when no response is received in the timeout interval
          indicated by ipoaLisTimeout."
      DEFVAL      { 2 }
      ::= { ipoaLisEntry 9 }

  ipoaLisTimeout OBJECT-TYPE
      SYNTAX      Integer32 (1..60)
      UNITS       "seconds"
      MAX-ACCESS  read-create
```

```
      STATUS      current
      DESCRIPTION
          "The time to wait, in seconds, before retransmission
          of an ARP request."
      DEFVAL      { 10 }
      ::= { ipoaLisEntry 10 }

  ipoaLisDefaultPeakCellRate OBJECT-TYPE
      SYNTAX Integer32
      MAX-ACCESS read-create
      STATUS current
      DESCRIPTION
          "This object is the signalling parameter that
           should be used when setting up all best effort
           VCCs (Virtual Channel Connections).
           This parameter applies to the forward and
           backward direction on a per best effort VCC basis.
           A value of zero implies that no configured default
           exists and that local policy should be used to
           determine the actual default to used during
           call setup.  ATM Signaling Support for IP over ATM
           (RFC 1755) recommends 1/10th of the ATM interface's
           speed."
      ::= { ipoaLisEntry 11 }

  ipoaLisActiveVcs OBJECT-TYPE
      SYNTAX      Gauge32
      MAX-ACCESS  read-only
      STATUS      current
      DESCRIPTION
          "Number of active SVCs for this LIS."
      ::= { ipoaLisEntry 12 }

  ipoaLisRowStatus OBJECT-TYPE
      SYNTAX      RowStatus
      MAX-ACCESS  read-create
      STATUS      current
      DESCRIPTION
          "This object allows entries to be created and deleted
          in the ipoaLisTable.

          When the ipoaLisRowStatus deleted (by setting this
          object to destroy(6)), this has the side-effect of
          removing all entries from the ipNetToMediaTable that
          are associated with this LIS (in other words, it
          flushes the entity's ATMARP cache).  It also removes
          the ipoaVcTable entries that were associated with those
          ipNetToMediaTable entries.  Destroying the row also
```

```
          removes the corresponding entries in the
          ipoaArpSrvrTable, ipoaArpClientTable,
          ipoaLisIfMappingTable, and ipoaArpRemoteSrvrTable.

          Entries in both the ipNetToMediaTable and the
          ipoaVcTable that are associated with a
          ipoaConfigPvcEntry are not affected by changes to
          ipoaLisRowStatus."
      REFERENCE
          "RFC 1903, 'Textual Conventions for Version 2 of the
          Simple Network Management Protocol (SNMPv2).'"
      ::= { ipoaLisEntry 13 }


  -- The ATM Logical IP Subnet Interface Mapping Table

  ipoaLisIfMappingTable OBJECT-TYPE
      SYNTAX      SEQUENCE OF IpoaLisIfMappingEntry
      MAX-ACCESS  not-accessible
      STATUS      current
      DESCRIPTION
          "There is one entry in this table for every combination
           of ipoaLisEntry and IP over ATM interface."
      ::= { ipoaObjects 3 }

  ipoaLisIfMappingEntry OBJECT-TYPE
      SYNTAX      IpoaLisIfMappingEntry
      MAX-ACCESS  not-accessible
      STATUS      current
      DESCRIPTION
          "Defines an entry in the ipoaLisIfMappingTable."
      INDEX  { ipoaLisSubnetAddr, ipoaLisIfMappingIfIndex }
      ::= { ipoaLisIfMappingTable 1 }

  IpoaLisIfMappingEntry ::= SEQUENCE {
      ipoaLisIfMappingIfIndex   InterfaceIndex,
      ipoaLisIfMappingRowStatus RowStatus
  }

  ipoaLisIfMappingIfIndex OBJECT-TYPE
      SYNTAX      InterfaceIndex
      MAX-ACCESS  not-accessible
      STATUS      current
      DESCRIPTION
          "The ipAdEntIfIndex object from an ipAddrEntry
           is used as an index to this table when its
           ipAdEntAddr is in the subnet implied by
           ipoaLisSubnetAddr."
```

```
      ::= { ipoaLisIfMappingEntry 1 }

  ipoaLisIfMappingRowStatus OBJECT-TYPE
      SYNTAX      RowStatus
      MAX-ACCESS  read-create
      STATUS      current
      DESCRIPTION
          "This object allows entries to be created and deleted
          in the ipoaLisIfMappingTable."
      REFERENCE
          "RFC 1903, 'Textual Conventions for Version 2 of the
          Simple Network Management Protocol (SNMPv2).'"
      ::= { ipoaLisIfMappingEntry 2 }

  -- The ATMARP Client Table

  ipoaArpClientTable OBJECT-TYPE
      SYNTAX      SEQUENCE OF IpoaArpClientEntry
      MAX-ACCESS  not-accessible
      STATUS      current
      DESCRIPTION
          "The ATMARP clients running on this system."
      ::= { ipoaObjects 4 }

  ipoaArpClientEntry OBJECT-TYPE
      SYNTAX      IpoaArpClientEntry
      MAX-ACCESS  not-accessible
      STATUS      current
      DESCRIPTION
          "Information about a single ATMARP Client.  Clients
          can be started and stopped by adding and removing
          entries from this table.  An entry in the
          ipoaArpClientTable has a corresponding entry in the
          ipAddrTable.  Both are indexed by ipAdEntAddr.
          The ifIndex and subnet mask of a client entry are the
          ipAddrEntry's ipAdEntIfIndex and ipAdEntNetMask,
          respectively.

          Note that adding and removing entries from this table
          may have the same effect on the corresponding
          ipAddrTable entry.  Row creation of an entry in this
          table requires that either the corresponding ipAddrTable
          entry exists or that ipAdEntIfIndex and ipAdEntNetMask
          be specified in the creation of an ipoaArpClientEntry
          at a minimum in order to create the corresponding
          ipAddrEntry.  Specification of ipAdEntBcastAddr and
          ipAdEntReasmMaxSize to complete an ipAddrEntry is
          implementation dependent.
```

```
          Whether a corresponding ipAddrEntry is deleted during
          the deletion of an ipoaArpClientEntry is considered
          implementation dependent."
      INDEX       { ipAdEntAddr }
      ::= { ipoaArpClientTable 1 }

  IpoaArpClientEntry ::= SEQUENCE {
      ipoaArpClientAtmAddr             IpoaAtmAddr,
      ipoaArpClientSrvrInUse           IpoaAtmAddr,
      ipoaArpClientInArpInReqs         Counter32,
      ipoaArpClientInArpOutReqs        Counter32,
      ipoaArpClientInArpInReplies      Counter32,
      ipoaArpClientInArpOutReplies     Counter32,
      ipoaArpClientInArpInvalidInReqs  Counter32,
      ipoaArpClientInArpInvalidOutReqs Counter32,
      ipoaArpClientArpInReqs           Counter32,
      ipoaArpClientArpOutReqs          Counter32,
      ipoaArpClientArpInReplies        Counter32,
      ipoaArpClientArpOutReplies       Counter32,
      ipoaArpClientArpInNaks           Counter32,
      ipoaArpClientArpOutNaks          Counter32,
      ipoaArpClientArpUnknownOps       Counter32,
      ipoaArpClientArpNoSrvrResps      Counter32,
      ipoaArpClientRowStatus           RowStatus
  }

  ipoaArpClientAtmAddr OBJECT-TYPE
      SYNTAX      IpoaAtmAddr
      MAX-ACCESS  read-create
      STATUS      current
      DESCRIPTION
          "The ATM address of the client."
      ::= { ipoaArpClientEntry 1 }

  ipoaArpClientSrvrInUse OBJECT-TYPE
      SYNTAX      IpoaAtmAddr
      MAX-ACCESS  read-only
      STATUS      current
      DESCRIPTION
          "The ATM address of the ATMARP Server,
          ipoaArpRemoteSrvrAtmAddr, in use by this client.  A
          zero length octet string implies that communication
          with a Remote ATMARP Server is not in effect."
      DEFVAL { ''H }
      ::= { ipoaArpClientEntry 2 }

  ipoaArpClientInArpInReqs OBJECT-TYPE
      SYNTAX      Counter32
```

```
      MAX-ACCESS  read-only
      STATUS      current
      DESCRIPTION
          "The number of InATMARP requests received by this
          client."
      ::= { ipoaArpClientEntry 3 }

  ipoaArpClientInArpOutReqs OBJECT-TYPE
      SYNTAX      Counter32
      MAX-ACCESS  read-only
      STATUS      current
      DESCRIPTION
          "The number of InATMARP requests sent by this client."
      ::= { ipoaArpClientEntry 4 }

  ipoaArpClientInArpInReplies OBJECT-TYPE
      SYNTAX      Counter32
      MAX-ACCESS  read-only
      STATUS      current
      DESCRIPTION
          "The number of InATMARP replies received by this
          client."
      ::= { ipoaArpClientEntry 5 }

  ipoaArpClientInArpOutReplies OBJECT-TYPE
      SYNTAX      Counter32
      MAX-ACCESS  read-only
      STATUS      current
      DESCRIPTION
          "Total number of InATMARP replies sent by this client."
      ::= { ipoaArpClientEntry 6 }

  ipoaArpClientInArpInvalidInReqs OBJECT-TYPE
      SYNTAX      Counter32
      MAX-ACCESS  read-only
      STATUS      current
      DESCRIPTION
          "The number of times that this client detected an
          invalid InATMARP request."
      ::= { ipoaArpClientEntry 7 }

  ipoaArpClientInArpInvalidOutReqs OBJECT-TYPE
      SYNTAX      Counter32
      MAX-ACCESS  read-only
      STATUS      current
      DESCRIPTION
          "The number of times that this client did not
          receive an InATMARP reply."
```

```
      ::= { ipoaArpClientEntry 8 }

  ipoaArpClientArpInReqs OBJECT-TYPE
      SYNTAX      Counter32
      MAX-ACCESS  read-only
      STATUS      current
      DESCRIPTION
          "Total number of ATMARP requests received by this
          client."
      ::= { ipoaArpClientEntry 9 }

  ipoaArpClientArpOutReqs OBJECT-TYPE
      SYNTAX      Counter32
      MAX-ACCESS  read-only
      STATUS      current
      DESCRIPTION
          "Total number of ATMARP requests sent by this client."
      ::= { ipoaArpClientEntry 10 }

  ipoaArpClientArpInReplies OBJECT-TYPE
      SYNTAX      Counter32
      MAX-ACCESS  read-only
      STATUS      current
      DESCRIPTION
          "Total number of ATMARP replies received by this
          client."
      ::= { ipoaArpClientEntry 11 }

  ipoaArpClientArpOutReplies OBJECT-TYPE
      SYNTAX      Counter32
      MAX-ACCESS  read-only
      STATUS      current
      DESCRIPTION
          "Total number of ATMARP replies sent by this client."
      ::= { ipoaArpClientEntry 12 }

  ipoaArpClientArpInNaks OBJECT-TYPE
      SYNTAX      Counter32
      MAX-ACCESS  read-only
      STATUS      current
      DESCRIPTION
          "Total number of negative ATMARP replies
           received by this client."
      ::= { ipoaArpClientEntry 13 }

  ipoaArpClientArpOutNaks OBJECT-TYPE
      SYNTAX      Counter32
      MAX-ACCESS  read-only
```

```
      STATUS      current
      DESCRIPTION
          "Total number of negative ATMARP replies sent by
          this client.

          Classic IP and ARP over ATM does not require an
          ATMARP client to transmit an ATMARP_NAK upon
          receipt of an ATMARP request from another ATMARP
          client.  However, implementation experience has
          shown that this error condition is somewhat easy
          to create inadvertently by configuring one ATMARP
          client with an ipoaArpRemoteSrvrTable entry
          containing an ipoaArpRemoteSrvrAtmAddr value which
          is the ATM address of another ATMARP client-only
          system.

          If an ATMARP client supports the transmission of
          ATMARP_NAKs, then it should increment
          ipoaArpClientArpOutNaks each time it transmits
          an ATMARP_NAK.  Otherwise, support of this
          object is considered optional."
      ::= { ipoaArpClientEntry 14 }

  ipoaArpClientArpUnknownOps OBJECT-TYPE
      SYNTAX      Counter32
      MAX-ACCESS  read-only
      STATUS      current
      DESCRIPTION
          "The number of times that this client received
           an ATMARP message with an operation code for which
           it is not coded to support."
      ::= { ipoaArpClientEntry 15 }

  ipoaArpClientArpNoSrvrResps OBJECT-TYPE
      SYNTAX      Counter32
      MAX-ACCESS  read-only
      STATUS      current
      DESCRIPTION
          "The number of times this client failed to receive
           a response from a ATMARP Server within the
           ipoaLisTimeout value for ipoaLisRetries times.
           This may imply that the client will re-elect a
           new primary ATMARP Server for this LIS from the
           ipoaArpRemoteSrvrTable."
      ::= { ipoaArpClientEntry 16 }

  ipoaArpClientRowStatus OBJECT-TYPE
      SYNTAX      RowStatus
```

```
      MAX-ACCESS  read-create
      STATUS      current
      DESCRIPTION
          "This object allows entries to be created and
          deleted from the ipoaArpClientTable."
      REFERENCE
          "RFC 1903, 'Textual Conventions for Version 2 of the
          Simple Network Management Protocol (SNMPv2).'"
      ::= { ipoaArpClientEntry 17 }

  -- The ATMARP Server Table

  ipoaArpSrvrTable OBJECT-TYPE
      SYNTAX      SEQUENCE OF IpoaArpSrvrEntry
      MAX-ACCESS  not-accessible
      STATUS      current
      DESCRIPTION
          "The ATMARP Servers running on this system."
      ::= { ipoaObjects 5 }

  ipoaArpSrvrEntry OBJECT-TYPE
      SYNTAX      IpoaArpSrvrEntry
      MAX-ACCESS  not-accessible
      STATUS      current
      DESCRIPTION
          "Information about an ATMARP Server within a LIS.  An
          entry in this table has two indexes: first ipAdEntAddr,
          which is the IP address that this system uses as a
          member of the LIS, and then ipoaArpSrvrAddr, which is
          the ATM address of the ATMARP Server.

          Entries may be created by a management application
          using the ipoaArpSrvrRowStatus object.  Entries in this
          table may also be created by the system and not by a
          management application, for example via ILMI.

          Entries in this table may be deleted by setting the
          ipoaArpSrvrRowStatus object to 'destroy(6)'.  This
          includes entries that were added by the system and not
          by a management application."
      INDEX  { ipAdEntAddr, ipoaArpSrvrAddr }
      ::= { ipoaArpSrvrTable 1 }

  IpoaArpSrvrEntry ::= SEQUENCE {
      ipoaArpSrvrAddr                 IpoaAtmAddr,
      ipoaArpSrvrLis                  IpAddress,
      ipoaArpSrvrInArpInReqs          Counter32,
      ipoaArpSrvrInArpOutReqs         Counter32,
```

```
      ipoaArpSrvrInArpInReplies       Counter32,
      ipoaArpSrvrInArpOutReplies      Counter32,
      ipoaArpSrvrInArpInvalidInReqs   Counter32,
      ipoaArpSrvrInArpInvalidOutReqs  Counter32,
      ipoaArpSrvrArpInReqs            Counter32,
      ipoaArpSrvrArpOutReplies        Counter32,
      ipoaArpSrvrArpOutNaks           Counter32,
      ipoaArpSrvrArpDupIpAddrs        Counter32,
      ipoaArpSrvrArpUnknownOps        Counter32,
      ipoaArpSrvrRowStatus            RowStatus
  }

  ipoaArpSrvrAddr OBJECT-TYPE
      SYNTAX      IpoaAtmAddr
      MAX-ACCESS  not-accessible
      STATUS      current
      DESCRIPTION
          "The ATM address of the ATMARP Server."
      ::= { ipoaArpSrvrEntry 1 }

  ipoaArpSrvrLis OBJECT-TYPE
      SYNTAX      IpAddress
      MAX-ACCESS  read-create
      STATUS      current
      DESCRIPTION
          "The subnet address that identifies the LIS with
          which this server is associated."
      ::= { ipoaArpSrvrEntry 2 }

  ipoaArpSrvrInArpInReqs OBJECT-TYPE
      SYNTAX      Counter32
      MAX-ACCESS  read-only
      STATUS      current
      DESCRIPTION
          "The number of InATMARP requests received by this
          ATMARP Server."
      ::= { ipoaArpSrvrEntry 3 }

  ipoaArpSrvrInArpOutReqs OBJECT-TYPE
      SYNTAX      Counter32
      MAX-ACCESS  read-only
      STATUS      current
      DESCRIPTION
          "The number of InATMARP requests sent by this ATMARP
          Server."
      ::= { ipoaArpSrvrEntry 4 }

  ipoaArpSrvrInArpInReplies OBJECT-TYPE
```

```
      SYNTAX      Counter32
      MAX-ACCESS  read-only
      STATUS      current
      DESCRIPTION
          "The number of InATMARP replies received by this
          ATMARP Server."
      ::= { ipoaArpSrvrEntry 5 }

  ipoaArpSrvrInArpOutReplies OBJECT-TYPE
      SYNTAX      Counter32
      MAX-ACCESS  read-only
      STATUS      current
      DESCRIPTION
          "The number of InATMARP replies sent by this ATMARP
          Server."
      ::= { ipoaArpSrvrEntry 6 }

  ipoaArpSrvrInArpInvalidInReqs OBJECT-TYPE
      SYNTAX      Counter32
      MAX-ACCESS  read-only
      STATUS      current
      DESCRIPTION
          "The number of invalid InATMARP requests received by
           this ATMARP Server."
      ::= { ipoaArpSrvrEntry 7 }

  ipoaArpSrvrInArpInvalidOutReqs OBJECT-TYPE
      SYNTAX      Counter32
      MAX-ACCESS  read-only
      STATUS      current
      DESCRIPTION
          "The number of times that this server did not receive
           an InATMARP reply."
      ::= { ipoaArpSrvrEntry 8 }

  ipoaArpSrvrArpInReqs OBJECT-TYPE
      SYNTAX      Counter32
      MAX-ACCESS  read-only
      STATUS      current
      DESCRIPTION
          "Total number of ATMARP requests received by this
          ATMARP Server."
      ::= { ipoaArpSrvrEntry 9 }

  ipoaArpSrvrArpOutReplies OBJECT-TYPE
      SYNTAX      Counter32
      MAX-ACCESS  read-only
      STATUS      current
```

```
      DESCRIPTION
          "Total number of ATMARP replies sent by this ATMARP
          Server."
      ::= { ipoaArpSrvrEntry 10 }

  ipoaArpSrvrArpOutNaks OBJECT-TYPE
      SYNTAX      Counter32
      MAX-ACCESS  read-only
      STATUS      current
      DESCRIPTION
          "Total number of negative ATMARP replies sent by this
           ATMARP Server."
      ::= { ipoaArpSrvrEntry 11 }

  ipoaArpSrvrArpDupIpAddrs OBJECT-TYPE
      SYNTAX      Counter32
      MAX-ACCESS  read-only
      STATUS      current
      DESCRIPTION
          "The number of times that a duplicate IP address was
           detected by this ATMARP Server."
      ::= { ipoaArpSrvrEntry 12 }

  ipoaArpSrvrArpUnknownOps OBJECT-TYPE
      SYNTAX      Counter32
      MAX-ACCESS  read-only
      STATUS      current
      DESCRIPTION
          "The number of times that this ATMARP Server received
           an ATMARP message with an operation code for which it
           is not coded to support."
      ::= { ipoaArpSrvrEntry 13 }

  ipoaArpSrvrRowStatus OBJECT-TYPE
      SYNTAX      RowStatus
      MAX-ACCESS  read-create
      STATUS      current
      DESCRIPTION
          "This object allows entries to be created and deleted
          from the ipoaArpSrvrTable."
      REFERENCE
          "RFC 1903, 'Textual Conventions for Version 2 of the
          Simple Network Management Protocol (SNMPv2).'"
      ::= { ipoaArpSrvrEntry 14 }

  -- The Remote ATMARP Server Table

  ipoaArpRemoteSrvrTable OBJECT-TYPE
```

```
      SYNTAX      SEQUENCE OF IpoaArpRemoteSrvrEntry
      MAX-ACCESS  not-accessible
      STATUS      current
      DESCRIPTION
          "A table of non-local ATMARP Servers associated with a
          LIS.  An entry in this table has three indexes: first
          the ipoaLisSubnetAddr of the LIS for which the
          corresponding ATMARP Server provides ATMARP services,
          then the ipoaArpRemoteSrvrAtmAddr, which is the ATM
          address of the remote ATMARP Server, and finally the
          ifIndex of the interface on which the VC to the ATMARP
          Remote Server will be opened.  An ifIndex value of 0
          should be used when a single VC is to be shared for
          ATMARP purposes by multiple interfaces."
      ::= { ipoaObjects 6 }

  ipoaArpRemoteSrvrEntry OBJECT-TYPE
      SYNTAX      IpoaArpRemoteSrvrEntry
      MAX-ACCESS  not-accessible
      STATUS      current
      DESCRIPTION
          "Information about one non-local ATMARP Server."
      INDEX  { ipoaLisSubnetAddr, ipoaArpRemoteSrvrAtmAddr,
               ipoaArpRemoteSrvrIfIndex }
      ::= { ipoaArpRemoteSrvrTable 1 }

  IpoaArpRemoteSrvrEntry ::= SEQUENCE {
      ipoaArpRemoteSrvrAtmAddr      IpoaAtmAddr,
      ipoaArpRemoteSrvrRowStatus    RowStatus,
      ipoaArpRemoteSrvrIfIndex      InterfaceIndexOrZero,
      ipoaArpRemoteSrvrIpAddr       IpAddress,
      ipoaArpRemoteSrvrAdminStatus  INTEGER,
      ipoaArpRemoteSrvrOperStatus   INTEGER
  }

  ipoaArpRemoteSrvrAtmAddr OBJECT-TYPE
      SYNTAX      IpoaAtmAddr
      MAX-ACCESS  not-accessible
      STATUS      current
      DESCRIPTION
          "The ATM address of the remote ATMARP Server."
      ::= { ipoaArpRemoteSrvrEntry 1 }

  ipoaArpRemoteSrvrRowStatus OBJECT-TYPE
      SYNTAX      RowStatus
      MAX-ACCESS  read-create
      STATUS      current
      DESCRIPTION
```

```
            "This object allows entries to be created and deleted
            from the ipoaArpRemoteSrvrTable.

            Deleting an ipoaArpRemoteSrvrEntry (by setting this
            object to destroy(6)) may affect ipoaArpClientTable
            entries.  The object ipoaArpClientSrvrInUse in an
            ipoaArpClientSrvrEntry may contain the ATM address
            of an ATMARP Remote Server whose entry in the
            ipoaArpRemoteSrvrTable is being removed.  In this
            case, any corresponding ipoaArpClientSrvrInUse
            objects should be at a minimum invalidated by
            setting their values to that of a zero length
            OCTET STRING.

            The value of ipoaArpRemoteSrvrOperStatus should be
            consistent with that of ipoaArpRemoteSrvrRowStatus.
            For example, successfully setting the value of
            this object to notInService(2) after its being in
            the up(1) state should result in
            ipoaArpRemoteSrvrOperStatus being set to down(2)
            if currently up(1)."
        REFERENCE
            "RFC 1903, 'Textual Conventions for Version 2 of the
            Simple Network Management Protocol (SNMPv2).'"
        ::= { ipoaArpRemoteSrvrEntry 2 }

    ipoaArpRemoteSrvrIfIndex OBJECT-TYPE
        SYNTAX      InterfaceIndexOrZero
        MAX-ACCESS  not-accessible
        STATUS      current
        DESCRIPTION
            "The ifIndex of the interface that the VC to the
             Remote ATMARP Server is associated with."
        ::= { ipoaArpRemoteSrvrEntry 3 }

    ipoaArpRemoteSrvrIpAddr OBJECT-TYPE
        SYNTAX      IpAddress
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
            "The IP Address of the Remote ATMARP Server.  A
            value of 0.0.0.0 implies that this address isn't
            known."
        DEFVAL { '00000000'H }
        ::= { ipoaArpRemoteSrvrEntry 4 }

    ipoaArpRemoteSrvrAdminStatus OBJECT-TYPE
        SYNTAX  INTEGER {
```

```
                up(1),  -- use this ATMARP Server
                down(2) -- stop using this ATMARP Server
              }
      MAX-ACCESS  read-create
      STATUS      current
      DESCRIPTION
          "The desired state for use of the ATMARP Server
           represented by an entry in this table.
           ipoaArpRemoteSrvrAdminStatus values:

           up(1)   - Attempt to activate use of the
                     ATMARP Server represented by this
                     entry in the ipoaArpRemoteSrvrTable.
           down(2) - Deactivate use of this ATMARP
                     Server.

           When a managed system creates an entry in this
           table ipoaArpRemoteSrvrAdminStatus and
           ipoaArpRemoteSrvrOperStatus are initialized as
           down(2) by default."
      DEFVAL { down }
      ::= { ipoaArpRemoteSrvrEntry 5 }

  ipoaArpRemoteSrvrOperStatus OBJECT-TYPE
      SYNTAX  INTEGER {
                 up(1),  -- eligible for use
                 down(2) -- not eligible for use
              }
      MAX-ACCESS  read-only
      STATUS      current
      DESCRIPTION
          "The current operational state for use of a Remote
           ATMARP Server.  An up(1) entry has a VC
           established to the respective Remote ATMARP
           Server:

           up(1)  - A VC exists to Remote ATMARP Server
                    whose IP Address is stored in
                    ipoaArpRemoteSrvrIpAddr.  This VC can
                    be determined by searching the
                    ipoaVcTable using
                    ipoaArpRemoteSrvrIfIndex (if not 0,
                    otherwise ignore ipNetToMediaIfIndex
                    index) and ipoaArpRemoteSrvrIpAddr.
                    An ipoaArpClientEntry should exist
                    with its ipoaArpClientSrvrInUse
                    object having the same value as
                    ipoaArpRemoteSrvrAtmAddr.
```

```
          down(2) - Entry exists without an active VC to
                    the Remote ATMARP Server.

          Transition from up(1) to down(2)
          status may affect ipoaArpClientTable entries.
          The object ipoaArpClientSrvrInUse in an
          ipoaArpClientSrvrEntry may contain the ATM address
          of an ATMARP Remote Server whose entry in the
          ipoaArpRemoteSrvrTable is being deactivated.  In
          this case, any corresponding ipoaArpClientSrvrInUse
          objects should be at a minimum invalidated by
          setting their values to that of a zero length
          OCTET STRING.

          If ipoaArpRemoteSrvrAdminStatus is down(2) then
          ipoaArpRemoteSrvrOperStatus should be down(2).
          If ipoaArpRemoteSrvrAdminStatus is changed to
          up(1) then ipoaArpRemoteSrvrOperStatus should
          change to up(1) if the Remote ATMARP Server
          entry can be activated."
      DEFVAL { down }
      ::= { ipoaArpRemoteSrvrEntry 6 }

  -- The ATM VC Table

  ipoaVcTable OBJECT-TYPE
      SYNTAX      SEQUENCE OF IpoaVcEntry
      MAX-ACCESS  not-accessible
      STATUS      current
      DESCRIPTION
          "A system that supports IP over ATM is an IP system and
          therefore MUST support all of the appropriate tables in
          the SNMPv2-MIB (RFC 1907), the IF-MIB (RFC 2233),
          the IP-MIB (RFC 2011), the TCP-MIB (RFC 2012), and
          the UDP-MIB (RFC 2013).  This includes the
          ipNetToMediaTable (the ARP cache) that is defined
          within the IP-MIB (RFC 2011).  The ipoaVcTable
          keeps a set of VCs for each entry in the ARP cache
          that was put there by an IP over ATM system acting
          as either a host or server.  The ipoaVcTable doesn't
          augment the ipNetToMediaTable (ARP Cache) since the
          the correspondence between tables is not necessarily
          one-to-one.

          An ipNetToMediaPhysAddress object should contain the
          content as defined by the IpoaAtmAddr textual
          convention when used to hold an IPOA-MIB ATM Address."
      ::= { ipoaObjects 7 }
```

```
  ipoaVcEntry OBJECT-TYPE
      SYNTAX      IpoaVcEntry
      MAX-ACCESS  not-accessible
      STATUS      current
      DESCRIPTION
          "A VC (permanent or switched) that this host or server
          has opened with another member of a LIS.  Additional
          information can be determined about the VC from the
          ATM-MIB.

          Entries in this table cannot be created by management
          applications.

          In an SVC environment, an entry is automatically added
          by the system as the result of ATMARP processing.

          In a PVC environment, an entry is automatically added
          to this table when an entry is created in the
          ipoaConfigPvcTable and the IP Address at the remote
          end of the PVC is discovered using InATMARP.  An
          entry also is added to the ipNetToMediaTable."
      INDEX       { ipNetToMediaIfIndex,
                    ipNetToMediaNetAddress,
                    ipoaVcVpi,
                    ipoaVcVci
                  }
      ::= { ipoaVcTable 1 }


  IpoaVcEntry ::= SEQUENCE {
      ipoaVcVpi                   IpoaVpiInteger,
      ipoaVcVci                   IpoaVciInteger,
      ipoaVcType                  IpoaAtmConnKind,
      ipoaVcNegotiatedEncapsType IpoaEncapsType,
      ipoaVcNegotiatedMtu         Integer32 }

  ipoaVcVpi OBJECT-TYPE
      SYNTAX      IpoaVpiInteger
      MAX-ACCESS  not-accessible
      STATUS      current
      DESCRIPTION
          "The VPI value for the Virtual Circuit."
      ::= { ipoaVcEntry 1 }

  ipoaVcVci OBJECT-TYPE
      SYNTAX      IpoaVciInteger
      MAX-ACCESS  not-accessible
      STATUS      current
```

```
      DESCRIPTION
          "The VCI value for the Virtual Circuit."
      ::= { ipoaVcEntry 2 }

  ipoaVcType OBJECT-TYPE
      SYNTAX      IpoaAtmConnKind
      MAX-ACCESS  read-only
      STATUS      current
      DESCRIPTION
          "The type of the Virtual Circuit."
      ::= { ipoaVcEntry 3 }

  ipoaVcNegotiatedEncapsType OBJECT-TYPE
      SYNTAX      IpoaEncapsType
      MAX-ACCESS  read-only
      STATUS      current
      DESCRIPTION
          "The encapsulation type used when communicating over
          this circuit."
      ::= { ipoaVcEntry 4 }

  ipoaVcNegotiatedMtu OBJECT-TYPE
      SYNTAX      Integer32 (0..65535)
      MAX-ACCESS  read-only
      STATUS      current
      DESCRIPTION
          "The MTU used when communicating over this circuit."
      ::= { ipoaVcEntry 5 }

  -- The ATM Config PVC Table

  ipoaConfigPvcTable OBJECT-TYPE
      SYNTAX      SEQUENCE OF IpoaConfigPvcEntry
      MAX-ACCESS  not-accessible
      STATUS      current
      DESCRIPTION
          "This table MUST be supported when PVCs are intended to
          be supported in order to enable the setup of PVCs for
          use by IP."
      ::= { ipoaObjects 8 }

  ipoaConfigPvcEntry OBJECT-TYPE
      SYNTAX      IpoaConfigPvcEntry
      MAX-ACCESS  not-accessible
      STATUS      current
      DESCRIPTION
          "Defines a single PVC that exists at this host for
          use by IP."
```

```
      INDEX       { ipoaConfigPvcIfIndex,
                    ipoaConfigPvcVpi,
                    ipoaConfigPvcVci
                  }
      ::= { ipoaConfigPvcTable 1 }

  IpoaConfigPvcEntry ::= SEQUENCE {
      ipoaConfigPvcIfIndex              InterfaceIndex,
      ipoaConfigPvcVpi                  IpoaVpiInteger,
      ipoaConfigPvcVci                  IpoaVciInteger,
      ipoaConfigPvcDefaultMtu           Integer32,
      ipoaConfigPvcRowStatus            RowStatus }

  ipoaConfigPvcIfIndex OBJECT-TYPE
      SYNTAX      InterfaceIndex
      MAX-ACCESS  not-accessible
      STATUS      current
      DESCRIPTION
          "The ifIndex of the ATM Interface that this PVC
           is associated with."
      ::= { ipoaConfigPvcEntry 1 }

  ipoaConfigPvcVpi OBJECT-TYPE
      SYNTAX      IpoaVpiInteger
      MAX-ACCESS  not-accessible
      STATUS      current
      DESCRIPTION
          "The VPI value for the Virtual Circuit."
      ::= { ipoaConfigPvcEntry 2 }

  ipoaConfigPvcVci OBJECT-TYPE
      SYNTAX      IpoaVciInteger
      MAX-ACCESS  not-accessible
      STATUS      current
      DESCRIPTION
          "The VCI value for the Virtual Circuit."
      ::= { ipoaConfigPvcEntry 3 }

  ipoaConfigPvcDefaultMtu OBJECT-TYPE
      SYNTAX      Integer32 (0..65535)
      MAX-ACCESS  read-create
      STATUS      current
      DESCRIPTION
         "Classical IP and ARP over ATM allows use of
         other MTU values for PVCs but considers how a
         value other than 9180 could be selected to be out
         of scope.  ipoaConfigPvcDefaultMtu can be used to
         configure the MTU to be used for the PVC.
```

```
          Both ends MUST have the same value configured."
      DEFVAL { 9180 }
      ::= { ipoaConfigPvcEntry 4 }

  ipoaConfigPvcRowStatus OBJECT-TYPE
      SYNTAX      RowStatus
      MAX-ACCESS  read-create
      STATUS      current
      DESCRIPTION
         "This object allows rows to be created and deleted in
         the ipoaConfigPvcTable.  Creation of an entry in this
         table should eventually result in the creation of an
         ipNetToMediaEntry and a corresponding ipoaVcEntry
         after InATMARP has determined the destination address
         of the remote system that the PVC is connected to.
         Setting this object to destroy(6) should remove the
         corresponding ipNetToMediaTable and ipoaVcTable
         entries."
     REFERENCE
         "RFC 1903, 'Textual Conventions for Version 2 of the
         Simple Network Management Protocol (SNMPv2).'"
     ::= { ipoaConfigPvcEntry 5 }


  -- Notifications

  ipoaTrapPrefix  OBJECT IDENTIFIER ::= { ipoaNotifications 0 }

  ipoaMtuExceeded NOTIFICATION-TYPE
      OBJECTS {
          ipoaVcNegotiatedMtu
      }
      STATUS  current
      DESCRIPTION
          "A frame was received that exceeds the negotiated
          MTU size.  The VPI and VCI of the VC for which this
          condition was detected can be determined from the
          index values for ipoaVcNegotiatedMtu.  In addition,
          the ifIndex and IP Address can be determined as
          well (refer to the ipoaVcTable)."
      ::= { ipoaTrapPrefix 1 }

  ipoaDuplicateIpAddress NOTIFICATION-TYPE
      OBJECTS {
          ipNetToMediaIfIndex,
          ipNetToMediaNetAddress,
          ipNetToMediaPhysAddress,
          ipNetToMediaPhysAddress
```

```
      }
      STATUS  current
      DESCRIPTION
          "The ATMARP Server has detected more than one ATM end
          point attempting to associate the same IP address with
          different ATM addresses."
      ::= { ipoaTrapPrefix 2 }

  ipoaLisCreate NOTIFICATION-TYPE
      OBJECTS {
          ipoaLisSubnetAddr
      }
      STATUS  current
      DESCRIPTION
          "Generation of this trap occurs when an ipoaLisEntry is
          created while the ipoaLisTrapEnable.0 object has the
          value enabled(1)."
      ::= { ipoaTrapPrefix 3 }

  ipoaLisDelete NOTIFICATION-TYPE
      OBJECTS {
          ipoaLisSubnetAddr
      }
      STATUS  current
      DESCRIPTION
          "Generation of this trap occurs when an ipoaLisEntry is
          deleted while the ipoaLisTrapEnable.0 object has the
          value enabled(1)."
      ::= { ipoaTrapPrefix 4 }

  -- Conformance Definitions

  ipoaGroups      OBJECT IDENTIFIER ::= { ipoaConformance 1 }

  ipoaCompliances OBJECT IDENTIFIER ::= { ipoaConformance 2 }

  -- compliance statements

  ipoaCompliance MODULE-COMPLIANCE
      STATUS  current
      DESCRIPTION
          "The compliance statement for agents that support the
          IPOA-MIB."
      MODULE -- this module
          MANDATORY-GROUPS { ipoaGeneralGroup,
                             ipoaBasicNotificationsGroup
                }
          GROUP ipoaClientGroup
```

```
        DESCRIPTION
            "This group is mandatory for all hosts where IP
            over ATM client support is present."
        GROUP ipoaSrvrGroup
        DESCRIPTION
            "This group is mandatory for all hosts where ATMARP
            Servers are present."
        GROUP ipoaSrvrNotificationsGroup
        DESCRIPTION
            "This group is mandatory for all hosts where ATMARP
            Servers are present."
        GROUP ipoaLisNotificationsGroup
        DESCRIPTION
            "This group is mandatory for all hosts where
            ATMARP client only support is present and
            ipoaLisTrapEnable is allowed to be set to
            enabled(1)."
        GROUP ipoaLisTableGroup
        DESCRIPTION
            "This group is mandatory for all entities which
            support IP over ATM SVCs.  Support of objects in
            this group by IP over ATM clients which only
            support IP over ATM PVCs is optional."

        OBJECT ipoaLisDefaultMtu
        MIN-ACCESS  read-only
        DESCRIPTION
            "The agent is not required to allow the user
            to change the default MTU from the value 9180.

            The agent is not required to support a SET
            operation to this object in the absence of
            adequate security."

        OBJECT ipoaLisDefaultEncapsType
        MIN-ACCESS  read-only
        DESCRIPTION
            "The agent is not required to allow the user to
            specify the default encapsulation type for the
            LIS.

            The agent is not required to support a SET
            operation to this object in the absence of
            adequate security."

        OBJECT ipoaLisInactivityTimer
        MIN-ACCESS  read-only
        DESCRIPTION
```

```
            "The agent is not required to support a SET
            operation to this object in the absence of
            adequate security."

        OBJECT ipoaLisMinHoldingTime
        MIN-ACCESS  read-only
        DESCRIPTION
            "The agent is not required to support a SET
            operation to this object in the absence of
            adequate security."

        OBJECT ipoaLisQDepth
        MIN-ACCESS  read-only
        DESCRIPTION
            "The agent is not required to support a SET
            operation to this object in the absence of
            adequate security."

        OBJECT ipoaLisMaxCalls
        MIN-ACCESS  read-only
        DESCRIPTION
            "The agent is not required to support a SET
            operation to this object in the absence of
            adequate security."

        OBJECT ipoaLisCacheEntryAge
        MIN-ACCESS  read-only
        DESCRIPTION
            "The agent is not required to support a SET
            operation to this object in the absence of
            adequate security."

        OBJECT ipoaLisRetries
        MIN-ACCESS  read-only
        DESCRIPTION
            "The agent is not required to allow the user
            to change the default number of times an ATMARP
            request will be retried when no response is
            received from the default of 2.

            The agent is not required to support a SET
            operation to this object in the absence of
            adequate security."

        OBJECT ipoaLisTimeout
        MIN-ACCESS  read-only
        DESCRIPTION
            "The agent is not required to allow the user
```

```
            to change the default retransmission time from
            the default of 10 seconds.

            The agent is not required to support a SET
            operation to this object in the absence of
            adequate security."

        OBJECT ipoaLisDefaultPeakCellRate
        MIN-ACCESS  read-only
        DESCRIPTION
            "Implementations that do not support IP over
            ATM SVC usage are not required to allow the
            user to specify a best effort default peak cell
            rate since typically the ipoaLisTable won't
            exist.

            The agent is not required to support a SET
            operation to this object in the absence of
            adequate security."

        OBJECT ipoaLisIfMappingRowStatus
        SYNTAX   INTEGER {
                           active(1) -- subset of RowStatus
                         }
        MIN-ACCESS read-only
        DESCRIPTION
            "The agent is not required to support a SET
            operation to this object, and only one
            of the six enumerated values for the
            RowStatus textual convention need be
            supported, specifically: active(1)."

        OBJECT ipoaArpClientAtmAddr
        MIN-ACCESS  read-only
        DESCRIPTION
            "The agent is not required to support a SET
            operation to this object in the absence of
            adequate security."

        OBJECT ipoaArpSrvrLis
        MIN-ACCESS  read-only
        DESCRIPTION
            "The agent is not required to support a SET
            operation to this object in the absence of
            adequate security."

        OBJECT ipoaArpRemoteSrvrAdminStatus
        MIN-ACCESS  read-only
```

```
            DESCRIPTION
                "The agent is not required to support a SET
                operation to this object in the absence of
                adequate security.  In this case the value of
                this object should be up(1) when a VC
                exists to the Remote ATMARP Server or
                otherwise down(2), and the agent should not
                allow a SET operation to this object."

            OBJECT ipoaConfigPvcDefaultMtu
            MIN-ACCESS  read-only
            DESCRIPTION
                "The agent is not required to support a SET
                operation to this object in the absence of
                adequate security."

            OBJECT ipoaLisRowStatus
            SYNTAX   INTEGER {
                               active(1) -- subset of RowStatus
                             }
            MIN-ACCESS read-only
            DESCRIPTION
                "Write access is not required, and only one
                of the six enumerated values for the
                RowStatus textual convention need be
                supported, specifically: active(1)."

            OBJECT ipoaArpClientRowStatus
            SYNTAX   INTEGER {
                               active(1) -- subset of RowStatus
                             }
            MIN-ACCESS read-only
            DESCRIPTION
                "Write access is not required, and only one
                of the six enumerated values for the
                RowStatus textual convention need be
                supported, specifically: active(1)."

            OBJECT ipoaArpRemoteSrvrRowStatus
            SYNTAX   INTEGER {
                               active(1) -- subset of RowStatus
                             }
            MIN-ACCESS read-only
            DESCRIPTION
                "Write access is not required, and only one
                of the six enumerated values for the
                RowStatus textual convention need be
                supported, specifically: active(1)."
```

```
          OBJECT ipoaArpSrvrRowStatus
          SYNTAX   INTEGER {
                             active(1) -- subset of RowStatus
                           }
          MIN-ACCESS read-only
          DESCRIPTION
              "Write access is not required, and only one
              of the six enumerated values for the
              RowStatus textual convention need be
              supported, specifically: active(1)."

          OBJECT ipoaConfigPvcRowStatus
          SYNTAX   INTEGER {
                             active(1) -- subset of RowStatus
                           }
          MIN-ACCESS read-only
          DESCRIPTION
              "Write access is not required, and only one
              of the six enumerated values for the
              RowStatus textual convention need be
              supported, specifically: active(1)."

          OBJECT ipoaArpClientArpOutNaks
          MIN-ACCESS  not-accessible
          DESCRIPTION
              "Classic IP and ARP over ATM does not require
              an ATMARP client to transmit an ATMARP_NAK
              upon receipt of an ATMARP request from another
              ATMARP client.  This object should be
              implemented when an ATMARP client supports the
              transmission of ATMARP_NAKs."

      ::= { ipoaCompliances 1 }

  -- units of conformance

  ipoaGeneralGroup OBJECT-GROUP
      OBJECTS {
          ipoaVcType,
          ipoaVcNegotiatedEncapsType,
          ipoaVcNegotiatedMtu,
          ipoaConfigPvcDefaultMtu,
          ipoaConfigPvcRowStatus
      }
      STATUS  current
      DESCRIPTION
          "This group is mandatory for all IP over ATM entities."
      ::= { ipoaGroups 1 }
```

```
  ipoaClientGroup OBJECT-GROUP
      OBJECTS {
          ipoaArpClientAtmAddr,
          ipoaArpClientSrvrInUse,
          ipoaArpClientInArpInReqs,
          ipoaArpClientInArpOutReqs,
          ipoaArpClientInArpInReplies,
          ipoaArpClientInArpOutReplies,
          ipoaArpClientInArpInvalidInReqs,
          ipoaArpClientInArpInvalidOutReqs,
          ipoaArpClientArpInReqs,
          ipoaArpClientArpOutReqs,
          ipoaArpClientArpInReplies,
          ipoaArpClientArpOutReplies,
          ipoaArpClientArpInNaks,
          ipoaArpClientArpOutNaks,
          ipoaArpClientArpUnknownOps,
          ipoaArpClientArpNoSrvrResps,
          ipoaArpClientRowStatus
        }
      STATUS  current
      DESCRIPTION
          "This group is mandatory for all hosts where an IP
          over ATM client is present."
      ::= { ipoaGroups 2 }

  ipoaSrvrGroup OBJECT-GROUP
      OBJECTS {
          ipoaArpSrvrLis,
          ipoaArpSrvrInArpInReqs,
          ipoaArpSrvrInArpOutReqs,
          ipoaArpSrvrInArpInReplies,
          ipoaArpSrvrInArpOutReplies,
          ipoaArpSrvrInArpInvalidInReqs,
          ipoaArpSrvrInArpInvalidOutReqs,
          ipoaArpSrvrArpInReqs,
          ipoaArpSrvrArpOutReplies,
          ipoaArpSrvrArpOutNaks,
          ipoaArpSrvrArpDupIpAddrs,
          ipoaArpSrvrArpUnknownOps,
          ipoaArpSrvrRowStatus
       }
      STATUS  current
      DESCRIPTION
          "This group is mandatory for all hosts where ATMARP
          Servers are present."
      ::= { ipoaGroups 3 }
```

```
  ipoaBasicNotificationsGroup NOTIFICATION-GROUP
      NOTIFICATIONS {
            ipoaMtuExceeded
         }
      STATUS        current
      DESCRIPTION
          "The notification which an IP over ATM entity
          is required to implement."
      ::= { ipoaGroups 4 }

  ipoaSrvrNotificationsGroup NOTIFICATION-GROUP
      NOTIFICATIONS {
            ipoaDuplicateIpAddress
         }
      STATUS        current
      DESCRIPTION
              "The notification which an IP over ATM ATMARP
              Server is required to implement."
      ::= { ipoaGroups 5 }

  ipoaLisNotificationsGroup NOTIFICATION-GROUP
      NOTIFICATIONS {
            ipoaLisCreate,
            ipoaLisDelete
         }
      STATUS        current
      DESCRIPTION
              "The LIS-related notifications which are required
              to be implemented by an IP over ATM ATMARP server,
              as well as by any IP over ATM client which allows
              ipoaLisTrapEnable to be set to enabled(1)."
      ::= { ipoaGroups 6 }

  ipoaLisTableGroup OBJECT-GROUP
      OBJECTS {
          ipoaLisTrapEnable,
          ipoaLisSubnetAddr,
          ipoaLisDefaultMtu,
          ipoaLisDefaultEncapsType,
          ipoaLisInactivityTimer,
          ipoaLisMinHoldingTime,
          ipoaLisQDepth,
          ipoaLisMaxCalls,
          ipoaLisCacheEntryAge,
          ipoaLisRetries,
          ipoaLisTimeout,
          ipoaLisDefaultPeakCellRate,
          ipoaLisActiveVcs,
```

```
            ipoaLisRowStatus,
            ipoaLisIfMappingRowStatus,
            ipoaArpRemoteSrvrRowStatus,
            ipoaArpRemoteSrvrIpAddr,
            ipoaArpRemoteSrvrAdminStatus,
            ipoaArpRemoteSrvrOperStatus
        }
        STATUS  current
        DESCRIPTION
            "This group is mandatory for all entities which
            support IP over ATM SVCs.  Support of objects in
            this group by IP over ATM clients which only
            support IP over ATM PVCs is optional."
        ::= { ipoaGroups 7 }

    END
```

5. Security Considerations

Certain management information defined in this MIB MAY be considered sensitive in some network environments. Therefore, authentication of received SNMP requests and controlled access to management information SHOULD be employed in such environments. The method for this authentication is a function of the SNMP Administrative Framework, and has not been expanded by this MIB.

Several objects in this MIB allow write access or provide for row creation. Allowing this support in a non-secure environment can have a negative effect on network operations. It is RECOMMENDED that implementers seriously consider whether set operations or row creation be allowed without providing, at a minimum, authentication of request origin. It is RECOMMENDED that without such support that the following objects be implemented as read-only:

- ipoaLisDefaultMtu
- ipoaLisDefaultEncapsType
- ipoaLisInactivityTimer
- ipoaLisMinHoldingTime
- ipoaLisQDepth
- ipoaLisMaxCalls
- ipoaLisCacheEntryAge
- ipoaLisRetries
- ipoaLisTimeout
- ipoaLisDefaultPeakCellRate
- ipoaArpClientAtmAddr
- ipoaArpSrvrLis

- ipoaArpRemoteSrvrAdminStatus, show status as being either up(1) when a VC exists to the Remote ATMARP Server or otherwise down(2). Don't allow set support. ipoaArpRemoteSrvrOperStatus would have the same value as ipoaArpRemoteSrvrAdminStatus.
- ipoaConfigPvcDefaultMtu
- ipoaLisRowStatus
- ipoaArpClientRowStatus
- ipoaArpRemoteSrvrRowStatus
- ipoaArpSrvrRowStatus
- ipoaConfigPvcRowStatus
- ipoaLisIfMappingRowStatus

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