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                                                       April 1998

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

Status of this Memo

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

Abstract

   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:

         o 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:

```
        ipoaVcTable                      ipNetToMediatable
   ------------------------------    ----------------------------
   | ipNetToMediaIfIndex        |    | ipNetToMediaIfIndex      |
   | ipNetToMediaNetAddress     |    | ipNetToMediaNetAddress   |
   | ipoaVcVpi                  |    |                          |
   | ipoaVcVci                  |    |                          |
   | ipoaVcType                 |    |                          |
   | ---> use IpoaAtmAddr TC    |    | ipNetToMediaPhysAddress  |
   | ipoaVcNegotiatedEncapsType |    |                          |
   | ipoaVcNegotiatedMtu        |    |                          |
   |                            |    | ipNetToMediaType         |
   ------------------------------    ----------------------------
```
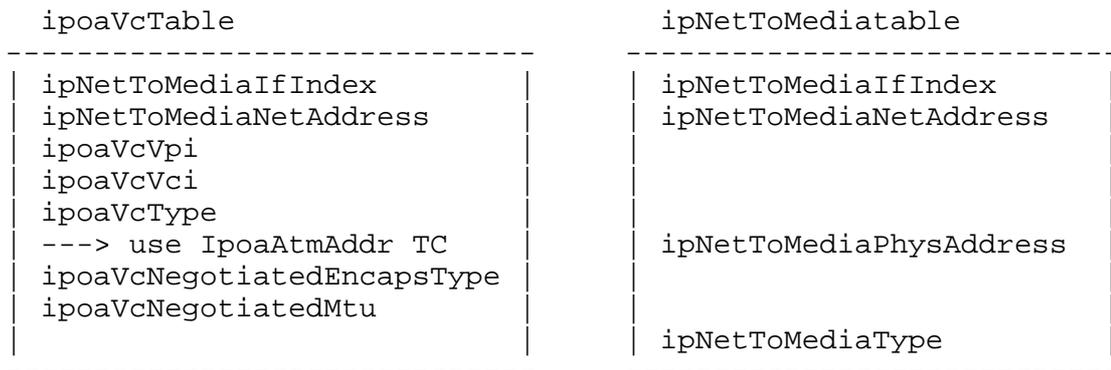
ipoaVcType indicates if the entry is for an SVC or a PVC. An
ipoaVcEntry, corresponding to an PVC, is created automatically when an
ipoaConfigPvcEntry is created and the IP Address at the end of the PVC
is discovered. The associating ipNetToMediaTable entry would have its
ipNetToMediaType set to static(4). 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:

      o use the ATM-MIB, reference [4], to create the PVC
      o 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:

```
         ipoaVcTable                            ipoaConfigPvcTable
    ------------------------------       ----------------------------
   | ipNetToMediaIfIndex          |     | ipNetToMediaIfIndex        |
   | ipNetToMediaNetAddress       |     |                            |
   | ipoaVcVpi                    |     | ipoaConfigPvcVpi           |
   | ipoaVcVci                    |     | ipoaConfigPvcVci           |
   | ipoaVcType                   |     |                            |
   |                              |     | ipoaConfigPvcDefaultMtu    |
   | ipoaVcNegotiatedEncapsType   |     |                            |
   | ipoaVcNegotiatedMtu          |     |                            |
   |                              |     | ipoaConfigPvcRowStatus     |
    ------------------------------       ----------------------------
```

   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:

```
        ipoaArpClientTable                       ipAddrTable
    ----------------------------------    ------------------------
    |  ipAdEntAddr                   |    |  ipAdEntAddr         |
    |                                |    |  ipAdEntNetMask      |
    |                                |    |  ipAdEntIfIndex      |
    |  ipoaArpClientAtmAddr          |    |                      |
    |  ipoaArpClientSrvrInUse        |    |                      |
    |  ipoaArpClientInArpInReqs      |    |                      |
    |  ipoaArpClientInArpOutReqs     |    |                      |
    |  ipoaArpClientInArpInReplies   |    |                      |
    |  ipoaArpClientInArpOutReplies  |    |                      |
    |  ipoaArpClientInArpInvalidInReqs |  |                      |
    |  ipoaArpClientInArpInvalidOutReqs| |                      |
    |  ipoaArpClientArpInReqs        |    |                      |
    |  ipoaArpClientArpOutReqs       |    |                      |
    |  ipoaArpClientArpInReplies     |    |                      |
    |  ipoaArpClientArpOutReplies    |    |                      |
    |  ipoaArpClientArpInNaks        |    |                      |
    |  ipoaArpClientArpOutNaks       |    |                      |
    |  ipoaArpClientArpUnknownOps    |    |                      |
    |  ipoaArpClientArpNoSrvrResps   |    |                      |
    |  ipoaArpClientRowStatus        |    |                      |
    |                                |    |  ipAdEntBcastAddr    |
    |                                |    |  ipAdEntReasmMaxSize |
    ----------------------------------    ------------------------
```

   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:

        o ipoaDuplicateIpAddress
        o ipoaLisCreate
        o 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)
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            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:

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

       o 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.
       o ipoaConfigPvcDefaultMtu
       o ipoaLisRowStatus
       o ipoaArpClientRowStatus
       o ipoaArpRemoteSrvrRowStatus
       o ipoaArpSrvrRowStatus
       o ipoaConfigPvcRowStatus
       o ipoaLisIfMappingRowStatus

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