                      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.

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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]).

Table of Contents

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         |
    ------------------------------      ----------------------------
```
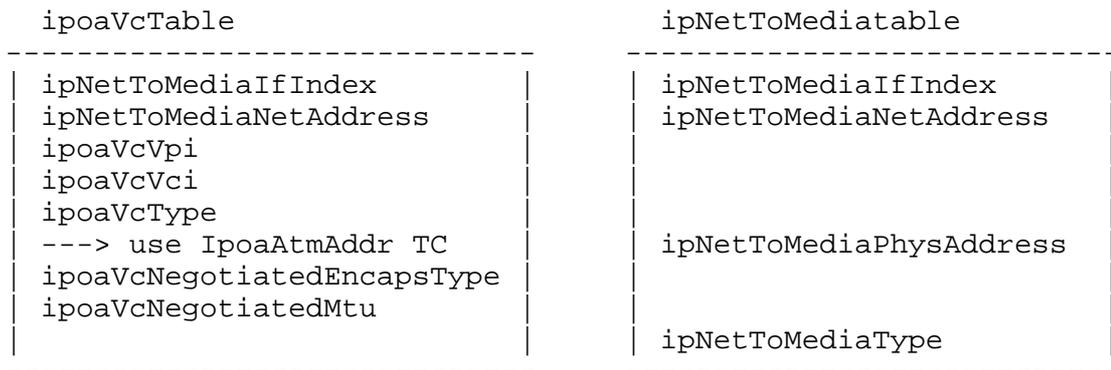
ipoaVcType indicates if the entry is for an SVC or a PVC. An
ipoaVcEntry, corresponding to an PVC, is created automatically when an
ipoaConfigPvcEntry is created and the IP Address at the end of the PVC
is discovered. The associating ipNetToMediaTable entry would have its
ipNetToMediaType set to static(4). 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)
              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:

       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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8. References

[1]   Case, J., McCloghrie, K., Rose, M., and S. Waldbusser , "Structure
      of Management Information for Version 2 of the Simple Network
      Management Protocol (SNMPv2)", RFC 1902, January 1996.

[2]   McCloghrie, K., and F. Kastenholtz, "The Interfaces Group MIB using
      SMIv2", RFC 2233, November 1997.

[3]   Laubach M., and J. Halpern, "Classical IP and ARP over ATM", RFC
      2225, April 1998.

[4]   Ahmed, M., and K. Tesink, "Definitions of Managed Objects for ATM
      Management Version 8.0 using SMIv2", RFC 1695, August 1994.

[5]   McCloghrie, K., and M. Rose, Editors, "Management Information Base
      for Network Management of TCP/IP-based internets: MIB-II", STD 17,
      RFC 1213, March 1991.

[6]   Case, J., McCloghrie, K., Rose, M., and S. Waldbusser, "Textual
      Conventions for Version 2 of the Simple Network Management Protocol
      (SNMPv2)", RFC 1903, January 1996.

[7]   Case, J., McCloghrie, K., Rose, M., and S. Waldbusser, "Protocol
      Operations for Version 2 of the Simple Network Management Protocol
      (SNMPv2)", RFC 1905, January 1996.

[8]   Case, J., McCloghrie, K., Rose, M., and S. Waldbusser, "Conformance
      Statements for Version 2 of the Simple Network Management Protocol
      (SNMPv2)", RFC 1904, January 1996.

[9]   McCloghrie K., "Management Information Base for the Internet
      Protocol using SMIv2", RFC 2011, November 1996.

[10] Bradner, S., "Key words for use in RFCs to Indicate Requirement
      Levels", BCP 14, RFC 2119, March 1997.

[11] Perez, M., Liaw, F., Mankin, A., Hoffman, E., Grossman, D. and A.
     Malis, "ATM Signaling Support for IP over ATM", RFC 1755, February
     1995.

[12] Case, J., McCloghrie, K., Rose, M., and Waldbusser, S., "Transport
     Mappings for Version 2 of the Simple Network Management Protocol
     (SNMPv2)", RFC 1906, January 1996.

[13] Case, J., McCloghrie, K., Rose, M., and Waldbusser, S., "Management
     Information Base for Version 2 of the Simple Network Management
     Protocol (SNMPv2)", RFC 1907, January 1996.

[14] Case, J., McCloghrie, K., Rose, M., and S. Waldbusser, "Coexistence
     between Version 1 and Version 2 of the Internet-standard Network
     Management Framework", RFC 1908, January 1996.

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