Definitions of Managed Objects
for Monitoring and Controlling the
Frame Relay/ATM PVC Service Interworking Function

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Abstract

This memo defines a Management Information Base (MIB) for monitoring and controlling a service interworking function (IWF) for Permanent Virtual Connections (PVC) between Frame Relay and Asynchronous Transfer Mode (ATM) technologies.

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1. The SNMP Management Framework

The SNMP Management Framework presently consists of five major components:

- An overall architecture, described in RFC 2571 [1].
- Mechanisms for describing and naming objects and events for the purpose of management. The first version of this Structure of Management Information (SMI) is called SMIv1 and described in RFC 1155 [2], RFC 1212 [3] and RFC 1215 [4]. The second version, called SMIv2, is described in RFC 2578 [5], RFC 2579 [6] and RFC 2580 [7].
- Message protocols for transferring management information. The first version of the SNMP message protocol is called SNMPv1 and described in RFC 1157 [8]. A second version of the SNMP message protocol, which is not an Internet standards track protocol, is called SNMPv2c and described in RFC 1901 [9] and RFC 1906 [10]. The third version of the message protocol is called SNMPv3 and described in RFC 1906 [10], RFC 2572 [11] and RFC 2574 [12].
- Protocol operations for accessing management information. The first set of protocol operations and associated PDU formats is described in RFC 1157 [8]. A second set of protocol operations and associated PDU formats is described in RFC 1905 [13].
- A set of fundamental applications described in RFC 2573 [14] and the view-based access control mechanism described in RFC 2575 [15].

A more detailed introduction to the current SNMP Management Framework can be found in RFC 2570 [16].

Managed objects are accessed via a virtual information store, termed the Management Information Base or MIB. Objects in the MIB are defined using the mechanisms defined in the SMI.

This memo specifies a MIB module that is compliant to the SMIv2. A MIB conforming to the SMIv1 can be produced through the appropriate translations. The resulting translated MIB must be semantically equivalent, except where objects or events are omitted because no translation is possible (use of Counter64). Some machine readable information in SMIv2 will be converted into textual descriptions in SMIv1 during the translation process. However, this loss of machine
readable information is not considered to change the semantics of the MIB.
2. Overview

This document defines a Management Information Base (MIB) for monitoring and controlling a service interworking function (IWF) for Permanent Virtual Connections (PVC) between Frame Relay and Asynchronous Transfer Mode (ATM) technologies. The agreements on which this MIB is based were reached jointly by the Frame Relay Forum and the ATM Forum and are documented in the Frame Relay Forum Document FRF.8 [17].

2.1. Frame Relay/ATM Service Interworking Background

Frame relay to ATM interworking is a function that exchanges Protocol Data Units (PDU) between a Frame Relay service user and an ATM service user. Two types of interworking functions are specified for frame relay and ATM permanent virtual connection (PVC) service users: network interworking [20] and service interworking [17].

Network interworking provides PDU forwarding between frame relay service users inter-connected by an ATM service. Both endpoints are frame relay PVCs.

Service interworking provides PDU forwarding so that the ATM service user performs no frame relaying service-specific functions and the frame relay service user performs no ATM service-specific functions. Optionally, the service IWF translates particular higher layer protocols to satisfy the requirements of end-systems.

This MIB describes management objects used to provision, monitor, and control a Frame Relay/ATM PVC Service IWF.

Consult FRF.8 [17] for more details on the operation of a Frame Relay/ATM PVC Service IWF.

2.2. Structure of the MIB

The Frame Relay/ATM PVC Service IWF managed objects are organized in two tables:

(1) FR/ATM PVC Service IWF cross-connect table

(2) Connection description table
The IWF cross-connect table contains one or more rows for each inter-worked connection. Each inter-worked connection is uniquely identified by the frAtmIwfConnectionIndex object. In the case of point-to-point, a single row is present. In the case of point-to-multipoint, one row exists for each multipoint destination. Index objects for the ATM port, VPI, VCI, Frame Relay port, and frame relay DLCI distinguish the constituent rows used in a point-to-multipoint case.

Each inter-worked connection has attributes governing behavior of the IWF. These attributes describe how the IWF should transform a PDU during the forwarding process and provide rules for:

1. Mapping the ATM CLP bit to frame relay DE bit
2. Mapping the ATM congestion notification bit to frame relay congestion bits
3. Mapping higher protocol encapsulations between ATM and frame relay
4. Performing fragmentation and reassembly
5. Performing ARP translation between ATM and frame relay

Typically, most connections share the same attributes. The attributes are represented in this MIB by the connection description table. Each row of the connection description table contains the attribute settings common to one or more inter-worked connections. One example would be full mapping and translation. All cross-connect table entries that require full mapping and translation services set the frAtmIwfConnectionDescriptor object to the index value for the connection description table row that contains objects set to values that provide full mapping and translation services.

A notification object provides cross-connect status change alerts.

### 2.3. Relationship to Other MIBs

The Frame Relay/ATM PVC Service IWF MIB describes the cross-connections between frame relay and ATM service users. Each PVC endpoint is provisioned and managed with a technology-specific MIB as described below.
Each technology-specific MIB has a table of PVC endpoints (indexed by ifIndex and logical link address (DLCI or VPI/VCI). Typically, two endpoints are cross-connected via a technology-specific cross connect table. The introduction of the FR/ATM MIB creates the need to have multiple cross-connect tables. As an example, an ATM PVC endpoint might be connected to either:

1. another ATM PVC endpoint via the atmVcCrossConnectTable, or
2. a frame relay PVC endpoint via the frAtmIwfConnectionTable.

This issue is not restricted to the case of frame relay to ATM interworking. An implementation supporting the ATM Forum Circuit Emulation Service (CES) is another example of an ATM VPI/VCI that is not cross-connected via the atmVcCrossConnectTable.

Currently, the implicit assumption is made that all PVC endpoints are cross-connected via a single cross-connect table. This restriction is being removed via the specifications of this FR/ATM PVC Service IWF MIB. (for detailed description follow the next three sections).

2.3.1. Frame Relay Service MIB

Frame relay PVC endpoints are provisioned as rows in the Frame Relay Services MIB [19] endpoint table.

The Frame Relay/ATM PVC Service IWF MIB cross-connect table is used to cross-connect the frame relay and ATM PVCs. Consequently, the frame relay PVC connect table does not contain an entry for the inter-worked connection and the object frPVCEndptConnectIdentifier is set to zero for the frame relay PVC endpoint at the initialization state. Upon completion of the IWF cross-connect creation and activation, the system will update this object to point to the cross connect index of the relevant row in the frAtmIwfConnectionTable in the FR/ATM PVC Service IWF MIB.

To remove the restriction specified above (section 2.3) one new object has been added for each PVC endpoint row, in the Frame Relay Service MIB. [EDITORS NOTE: This anticipates a future change to the Frame Relay Service MIB] The object (named frPVCIwfKind) serves to identify the cross-connect table associated with the PVC endpoint. The object has an OID value that matches the OID of the IWF MIB cross-connect table that applies (e.g., OID of frAtmIwfConnectionTable). A value of zero (or noSuchObject) indicates
cross-connection via the technology-specific cross-connect table.

2.3.2. Frame Relay DTE MIB

The Frame Relay DTE MIB described in [19] has no relevance to the FR/ATM PVC Service IWF MIB.

2.3.3. ATM MIB

ATM PVC endpoints are provisioned as rows in the ATM MIB [21] virtual connection link table.

The Frame Relay/ATM PVC Service IWF MIB cross-connect table is used to cross-connect the ATM and frame relay PVCs. Consequently, the ATM virtual connection link table does not contain an entry for the inter-worked connection and the object atmVclCrossConnectIdentifier is set to zero for the ATM PVC endpoint at the initialization state. Upon completion of the IWF cross-connect creation and activation, the system will update this object to point to the cross connect index of the relevant row in the frAtmIwfConnectionTable in the FR/ATM PVC Service IWF MIB.

To remove the restriction specified above (section 2.3) one new object has been added for each PVC endpoint row, in the ATM MIB. The object (named atmPVCIwfKind) serves to identify the cross-connect table associated with the PVC endpoint. [EDITORS NOTE: This anticipates a future change to the ATM MIB] The object has an OID value that matches the OID of the IWF MIB cross-connect table that applies (e.g., OID of frAtmIwfConnectionTable). A value of zero (or noSuchObject) indicates cross-connection via the technology-specific cross-connect table.

2.4. Point to Multipoint Considerations

This MIB supports IWF implementations providing point-to-multipoint functionality. All rows of the cross-connect table indexed by the same frAtmIwfConnectionIndex MUST utilize the same frAtmIwfConnectionDescriptor value.

A group of cross-connect table entries indexed by the same frAtmIwfConnectionIndex value MUST agree on which service the multipoint operation is offered. Two cases are possible:
(1) Many frame relay PVCs cross-connected to one ATM PVC, or
(2) One frame relay PVC cross-connected to many ATM PVCs

2.5. Theory of Operation

2.5.1. Creation Process

To successfully create a cross connect entry multiple steps are required. First the endpoints must be established and set to administrative status ‘up’. Secondly the cross connect descriptor should be defined, and last, the cross connect entry should be fully defined and set to administrative status ‘up’. The following is a descriptive example of step by step creation:

Step 1 - Create the frame relay PVC endpoint

a) Agent receives management request to create a row in frPVCEndptTable for the Frame Relay side

b) System creates the row in frPVCEndptTable with the following defaults:

- initialize frPVCEndptConnectIdentifier to zero
- initialize frPVCIWFKind to 0.0
- initialize the remaining columns as needed for DLCI X on ifIndex Y

Step 2 - Create the ATM PVC endpoint

a) Agent receives management request to create a row in atmVclTable for the ATM side

b) System creates the row in atmVclTable with the following defaults:

- initialize atmVclCrossConnectIdentifier to zero
- initialize atmVclIWFKind to 0.0
- initialize the remaining columns as needed for VPI.VCI Q.R on ifIndex S
Step 3 - Create the FR/ATM cross-connect

a) Manager requests a new cross-connect index value by reading frAtmIwfConnectionIndexNext from the agent

b) Agent receives GET request for frAtmIwfConnectionIndexNext and responds with the next available value K

c) Manager requests a new cross-connect row entry using the value K as the index

d) Agent receives SET request to create the frAtmIwfConnectionTable row entry (note: the frame relay and ATM PVC endpoints MUST exist and be specified as part of the index fields for the row ‘K.S.Q.R.Y.X’)

e) System creates a row in frAtmIwfConnectionTable for the following indices:
   - frAtmIwfConnectionIndex of K
   - frAtmIwfConnAtmPort of S
   - frAtmIwfConnVpi of Q
   - frAtmIwfConnVci of R
   - frAtmIwfConnFrPort of Y
   - frAtmIwfConnDlci of X

f) Manager defines the appropriate connection descriptor or uses one of the available entries in the connection descriptor table for the new connection.

g) System establishes the appropriate connection descriptor for the IWF (specified by manager in the SET request of frAtmIwfConnectionDescriptor for the relevant row)

Step 4 - Point the frame relay PVC endpoint row to the FR/ATM cross-connect row (Note: The system may perform these actions as a side-effect of Step 3)

a) System sets frPVCEndptConnectIdentifier to K
b) System sets frPVCIWFKind to OID of frAtmIwfConnectionTable to
point to the FR/ATM PVC IWF cross-connect table

Step 5 - Point the ATM PVC endpoint row to the FR/ATM cross-connect
row (Note: The system may perform these actions as a side-effect of
Step 3)

a) System sets atmVclCrossConnectIdentifier to K
b) System sets atmVclIWFKind to frAtmIwfConnectionTable

Step 6 - Manager signals activation by issuing a SET for the
frAtmIwfConnAdminStatus object using the value of ‘up’

Step 7 - Agent receives SET request for frAtmIwfConnAdminStatus and
executes internal system mechanisms to activate each PVC segment and
the IWF cross-connect. The successful activation permits the agent to
respond with ‘active’ when a GET request is received for the
following fields:

- frAtmIwfConnAtm2FrOperStatus
- frAtmIwfConnFr2AtmOperStatus
- atmVclOperStatus (Note: there is no comparable FRS MIB object)

2.5.2. Destruction Process

Destruction operation of a cross connect entry is simple in terms of
NMS required operation. However, it carries additional implementation
specific side effects of system clean up with respect to the removed
cross connect. The following are the steps that should be carried
thereafter:

Step 1 - Agent receives SET request for frAtmIwfConnRowStatus of the
relevant entry to ‘destroy’ and executes internal system clean up
mechanisms
Step 2 - System removes the relevant cross connect pointer from the frame relay PVC endpoint

a) System sets frPVCEndptConnectIdentifier to 0

b) System sets frPVCIWFKind to 0.0

Step 3 - System removes the relevant cross connect pointer from the ATM PVC endpoint

a) System sets atmVclCrossConnectIdentifier to 0

b) System sets atmVclIWFKind to 0.0

Step 4 - System can set atmVclOperStatus to ‘down’ (Note: there is no comparable FRS MIB object)

The FR PVC endpoint, the ATM PVC endpoint and the frAtmIwfcConnectionDescriptor entries can continue to exist after the cross connect removal.

2.5.3. Failure Conditions

2.5.3.1. Creation and Destruction

The frame relay service MIB must contain an endpoint connection table entry for the frame relay side of the interworked connection before the interworked connection can be activated in this MIB. The same is true for the ATM endpoint connection table.

In addition, the connection descriptor table entry must exist before being referenced by the FR/ATM IWF connection table entry.

If required table rows do not exist when the connection table is activated, the request will fail as described in the frAtmIwfConnRowStatus object.

Destruction of objects must occur in the reverse order of creation.
2.5.3.2. PDU Translation Errors

When a PDU translation error occurs (e.g. an unknown protocol ID is encountered), the frAtmIwfTransErrCount object is incremented and information about the failure is stored in objects that report the effected connection, direction of travel, and initial octets in the PDU header.
3. 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.

FR-ATM-PVC-SERVICE-INTERWORKING-MIB DEFINITIONS ::= BEGIN

IMPORTS

MODULE-IDENTITY, OBJECT-TYPE,
NOTIFICATION-TYPE,
experimental, Integer32, BITS, Counter32 FROM SNMPv2-SMI

TEXTUAL-CONVENTION, RowStatus,
TimeStamp FROM SNMPv2-TC

MODULE-COMPLIANCE, OBJECT-GROUP,
NOTIFICATION-GROUP FROM SNMPv2-CONF

AtmVpIdentifier, AtmVcIdentifier FROM ATM-TC-MIB

InterfaceIndex FROM IF-MIB;

frAtmIwfMIB MODULE-IDENTITY
LAST-UPDATED "9906180000Z"
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Expires December 1999
DESCRIPTION
"The MIB module for monitoring and controlling the
Frame Relay/ATM PVC Service Interworking
Function."

-- Revision History
--
REVISION "9906180000Z"
DESCRIPTION
"Published as draft-ietf-frnetmib-atmiwf-02
  o Added new PDU translation error group
  o Clarified theory of operation and relationship
to the ATM and Frame Relay Service MIBs
  o Update MIB boilerplate to conform to the
Operations and Management Area requirements
for MIBs"

REVISION "9902200000Z"
DESCRIPTION
"Published as draft-ietf-frnetmib-atmiwf-01
  o Isolated connection description objects
    in frAtmIwfConnectionDescriptorTable
  o Improved text for a number of objects
  o Added OperStatus objects to Notification
    for both frame and ATM sides
  o Set OID values
  o Clean smicng compile"

REVISION "9611250000Z"
DESCRIPTION

Expires December 1999
"Published as draft-ietf-frnetmib-atmiwf-00"
 ::= { experimental 97 }

-- Object Identifiers
--
frAtmIwfMIBObjects OBJECT IDENTIFIER
 ::= { frAtmIwfMIB 1 }
frAtmIwfTraps OBJECT IDENTIFIER
 ::= { frAtmIwfMIB 2 }
frAtmIwfTrapsPrefix OBJECT IDENTIFIER
 ::= { frAtmIwfTraps 0 }
frAtmIwfConformance OBJECT IDENTIFIER
 ::= { frAtmIwfConformance 3 }
frAtmIwfGroups OBJECT IDENTIFIER
 ::= { frAtmIwfConformance 1 }
frAtmIwfCompliances OBJECT IDENTIFIER
 ::= { frAtmIwfConformance 2 }

-- Textual Conventions
--

Dlci ::= TEXTUAL-CONVENTION
 STATUS current
 DESCRIPTION "This data type is a DLCI for a PVC segment end-point."
 SYNTAX Integer32
frAtmIwfConnIndexNext OBJECT-TYPE
SYNTAX Integer32 (0..2147483647)
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"This object contains an appropriate value to be used for frAtmIwfConnIndex when creating entries in the frAtmIwfConnectionTable. The value 0 indicates that no unassigned entries are available. To obtain the frAtmIwfConnIndexNext value for a new entry, the manager issues a management protocol retrieval operation to obtain the current value of this object. After each retrieval, the agent should modify the value to the next unassigned index."
::= { frAtmIwfMIBObjects 1 }

frAtmIwfConnectionTable OBJECT-TYPE
SYNTAX SEQUENCE OF FrAtmIwfConnectionEntry
MAX-ACCESS not-accessible
STATUS current
DESCRIPTION
"A table in which each row represents a Frame Relay/ATM interworking connection."
::= { frAtmIwfMIBObjects 2 }

frAtmIwfConnectionEntry OBJECT-TYPE
SYNTAX FrAtmIwfConnectionEntry
MAX-ACCESS not-accessible
STATUS current
DESCRIPTION
"The FrAtmIwfConnectionEntry provides an entry for an interworking connection between a Frame Relay PVC and one or more ATM PVCs, or an ATM PVC and one or more Frame Relay PVCs. A single Frame Relay PVC connected to a single ATM PVC is referred to as a ‘point-to-point’ connection and
is represented by a single row in the FR/ATM IWF Connection Table. The case of a single Frame Relay PVC connected to multiple ATM PVCs (or single ATM PVC connected to multiple Frame Relay PVCs) is referred to as a 'point-to-multipoint' connection and is represented by multiple rows in the FR/ATM IWF Connection Table.

The object frAtmIwfConnIndex uniquely identifies each point-to-point or point-to-multipoint connection. The manager obtains the frAtmIwfConnIndex value by reading the frAtmIwfConnIndexNext object.

After a frAtmIwfConnIndex is assigned for the connection, the manager creates one or more rows in the Cross Connect Table; one for each cross-connection between the frame relay PVC and an ATM PVC. In the case of 'point-to-multipoint' connections, all rows are indexed by the same frAtmIwfConnIndex value and MUST refer to the same frame relay PVC or ATM PVC respectively. An entry can be created only when at least one pair of Frame Relay and ATM PVCs exist.

A row can be established by one-step set-request with all required parameter values and frAtmIwfConnRowStatus set to createAndGo(4). The Agent should perform all error checking as needed. A pair of cross-connected PVCs, as identified by a particular value of the indexes, is released by setting frAtmIwfConnRowStatus to destroy(6). The Agent may release all associated resources. The manager may remove the related PVCs thereafter. Indexes are persistent across reboots of the system.

INDEX
{ frAtmIwfConnIndex,
  frAtmIwfConnAtmPort,
  frAtmIwfConnVpi,
  frAtmIwfConnVci,
  frAtmIwfConnFrPort,
  frAtmIwfConnDlci
}
::= { frAtmIwfConnectionTable 1 }
FrAtmIwfConnectionEntry ::= SEQUENCE {
    frAtmIwfConnIndex                      Integer32,
    frAtmIwfConnAtmPort                    InterfaceIndex,
    frAtmIwfConnVpi                        AtmVpIdentifier,
    frAtmIwfConnVci                        AtmVcIdentifier,
    frAtmIwfConnFrPort                     InterfaceIndex,
    frAtmIwfConnDlci                       Dlci,
    frAtmIwfConnRowStatus                  RowStatus,
    frAtmIwfConnAdminStatus                INTEGER,
    frAtmIwfConnAtm2FrOperStatus           INTEGER,
    frAtmIwfConnAtm2FrLastChange           TimeStamp,
    frAtmIwfConnFr2AtmOperStatus           INTEGER,
    frAtmIwfConnFr2AtmLastChange           TimeStamp,
    frAtmIwfConnectionDescriptor           Integer32
}

frAtmIwfConnIndex  OBJECT-TYPE
SYNTAX      Integer32
MAX-ACCESS  not-accessible
STATUS      current
DESCRIPTION
   "A unique index to identify this interworking connection."
 ::= { frAtmIwfConnectionEntry 1 }

frAtmIwfConnAtmPort OBJECT-TYPE
SYNTAX      InterfaceIndex
MAX-ACCESS  not-accessible
STATUS      current
DESCRIPTION
   "The index in the ifTable that identifies the ATM port for this interworking connection."
 ::= { frAtmIwfConnectionEntry 2 }

frAtmIwfConnVpi OBJECT-TYPE
SYNTAX      AtmVpIdentifier
MAX-ACCESS  not-accessible
STATUS      current
DESCRIPTION
   "The VPI of the ATM PVC end point for this interworking connection."
 ::= { frAtmIwfConnectionEntry 3 }

frAtmIwfConnVci OBJECT-TYPE
SYNTAX AtmVcIdentifier
MAX-ACCESS not-accessible
STATUS current
DESCRIPTION
"The VCI of the ATM PVC end point for this interworking connection."
 ::= { frAtmIwfConnectionEntry 4 }

frAtmIwfConnFrPort OBJECT-TYPE
SYNTAX InterfaceIndex
MAX-ACCESS not-accessible
STATUS current
DESCRIPTION
"The index in the ifTable that identifies the Frame Relay port for this interworking connection."
 ::= { frAtmIwfConnectionEntry 5 }

frAtmIwfConnDlci OBJECT-TYPE
SYNTAX Dlci
MAX-ACCESS not-accessible
STATUS current
DESCRIPTION
"The DLCI that identifies the Frame Relay PVC end point for this interworking connection."
 ::= { frAtmIwfConnectionEntry 6 }

frAtmIwfConnRowStatus OBJECT-TYPE
SYNTAX RowStatus
MAX-ACCESS read-create
STATUS current
DESCRIPTION
"The table row may be created with ‘createAndWait’ or ‘createAndGo’. 

To activate a connection entry, a valid connection descriptor MUST be established in the frAtmIwfConnectionDescriptor object and the AdminStatus of the corresponding endpoints MUST be ‘up’ & ‘active’.

This object is set to ‘destroy’ to delete the table row. To deactivate a connection entry, the AdminStatus of the corresponding endpoints MUST be
'down' & operation MUST fail (error code 'inconsistentValue')."

 ::= { frAtmIwfConnectionEntry 7 }

frAtmIwfConnAdminStatus OBJECT-TYPE
SYNTAX INTEGER { up(1), down(2) }
MAX-ACCESS read-create
STATUS current
DESCRIPTION "The desired operational state for this interworking connection."
 ::= { frAtmIwfConnectionEntry 8 }

frAtmIwfConnAtm2FrOperStatus OBJECT-TYPE
SYNTAX INTEGER { up(1), down(2) }
MAX-ACCESS read-only
STATUS current
DESCRIPTION "The current operational state of this interworking connection in the direction from ATM to FR end."
 ::= { frAtmIwfConnectionEntry 9 }

frAtmIwfConnAtm2FrLastChange OBJECT-TYPE
SYNTAX TimeStamp
MAX-ACCESS read-only
STATUS current
DESCRIPTION "The value of sysUpTime at the time this interworking connection entered its current operational state in the ATM to FR direction. If the current state was entered prior to the last re-initialization of the local network management subsystem, then this object contains a zero value."
 ::= { frAtmIwfConnectionEntry 10 }

frAtmIwfConnFr2AtmOperStatus OBJECT-TYPE
SYNTAX INTEGER { up(1), down(2) }
MAX-ACCESS read-only
STATUS current
DESCRIPTION "The current operational state of this interworking connection in the direction from FR to ATM end."
::= { frAtmIwfConnectionEntry 11 }

frAtmIwfConnFr2AtmLastChange  OBJECT-TYPE
SYNTAX    TimeStamp
MAX-ACCESS read-only
STATUS    current
DESCRIPTION
"The value of sysUpTime at the time this
interworking connection entered its current
operational state in the FR to ATM direction. If
the current state was entered prior to the last
re-initialization of the local network management
subsystem, then this object contains a zero
value."
::= { frAtmIwfConnectionEntry 12 }

frAtmIwfConnectionDescriptor  OBJECT-TYPE
SYNTAX    Integer32
MAX-ACCESS read-create
STATUS    current
DESCRIPTION
"The value represents a pointer to the relevant
descriptor in the IWF descriptor table. An
attempt to set this value to an inactive or non-
existent row in the Connection Descriptor Table
MUST fail (error code 'inconsistentValue')."
::= { frAtmIwfConnectionEntry 13 }
-- The FR/ATM PVC Service IWF Connection Descriptor Group

-- The Frame Relay/ATM PVC Service Interworking Function
-- Connection Descriptor table. A descriptor provides the
-- attributes for a type of interworked connection.

frAtmIwfConnectionDescriptorIndexNext OBJECT-TYPE
SYNTAX      Integer32 (0..2147483647)
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION
  "This object contains an appropriate value to be
  used for frAtmIwfConnectionDescriptorIndex when
  creating entries in the
  frAtmIwfConnectionDescriptorTable. The value 0
  indicates that no unassigned entries are
  available. To obtain the
  frAtmIwfConnectionDescriptorIndexNext value for a
  new entry, the manager issues a management
  protocol retrieval operation to obtain the current
  value of this object. After each retrieval, the
  agent should modify the value to the next
  unassigned index."
::= { frAtmIwfMIBObjects 3 }

frAtmIwfConnectionDescriptorTable OBJECT-TYPE
SYNTAX      SEQUENCE OF FrAtmIwfConnectionDescriptorEntry
MAX-ACCESS  not-accessible
STATUS      current
DESCRIPTION
  "A table in which each row represents a descriptor
  for one type of Frame Relay/ATM interworking
  connection. A descriptor may be assigned to zero
  or more FR/ATM PVC service IWF connections."
::= { frAtmIwfMIBObjects 4 }

frAtmIwfConnectionDescriptorEntry OBJECT-TYPE
SYNTAX      FrAtmIwfConnectionDescriptorEntry
MAX-ACCESS  not-accessible
STATUS      current
DESCRIPTION
  "An entry for a descriptor in an interworking
  connection between a Frame Relay PVC and an ATM
PVC."
INDEX  {  frAtmIwfConnectionDescriptorIndex  }
::=  {  frAtmIwfConnectionDescriptorTable 1  }

FrAtmIwfConnectionDescriptorEntry ::=  
SEQUENCE  {
  frAtmIwfConnectionDescriptorIndex      Integer32,
  frAtmIwfConnDescriptorRowStatus        RowStatus,
  frAtmIwfConnDeToClpMappingMode         INTEGER,
  frAtmIwfConnClpToDeMappingMode         INTEGER,
  frAtmIwfConnCongestionMappingMode      INTEGER,
  frAtmIwfConnEncapsulationMappingMode   INTEGER,
  frAtmIwfConnEncapsulationMappings      BITS,
  frAtmIwfConnFragAndReassEnabled        INTEGER,
  frAtmIwfConnArpTranslationEnabled      INTEGER
}

frAtmIwfConnectionDescriptorIndex OBJECT-TYPE
SYNTAX      Integer32
MAX-ACCESS  not-accessible
STATUS      current
DESCRIPTION
  "A unique value to identify a descriptor in the 
  table."
::=  {  frAtmIwfConnectionDescriptorEntry 1  }

frAtmIwfConnDescriptorRowStatus OBJECT-TYPE
SYNTAX      RowStatus
MAX-ACCESS  read-create
STATUS      current
DESCRIPTION
  "The status of this table row.  This object is 
  used to create or delete an entry in the 
  descriptor table.

  Creation of the row requires a row index (see 
  frAtmIwfConnectionDescriptorIndexNext).  If not 
  explicitly set or in existence, all other columns 
  of the row will be created and initialized to the 
  default value. During creation, this object MAY 
  be set to The object MUST contain the value 
  ‘active’ before any connection table entry 
  references the row.

  To destroy a row in this table, this object is set
to the 'destroy' action. Row destruction MUST fail (error code 'inconsistentValue') if any connection references the row.

::= { frAtmIwfConnectionDescriptorEntry 2 }

frAtmIwfConnDeToClpMappingMode OBJECT-TYPE
SYNTAX INTEGER {
    mode1(1),
    mode2Const0(2),
    mode2Const1(3)
}
MAX-ACCESS read-create
STATUS current
DESCRIPTION "This object describes which mode of translation is in use for loss priority mapping in the Frame Relay to ATM direction.

    mode1 = the DE field in the Q.922 core frame shall be mapped to the ATM CLP filed of every cell generated by the segmentation process of the AAL5 PDU containing the information of that frame.

    mode2Contst0 = the ATM CLP filed of every cell generated by the segmentation process of the AAL5 PDU containing the information of that frame shall be set to constant 0.

    mode2Contst1 = the ATM CLP filed of every cell generated by the segmentation process of the AAL5 PDU containing the information of that frame shall be set to constant 1."

REFERENCE "FRF.8 [17], Section 4.2.1"
DEFVAL { mode1 }
::= { frAtmIwfConnectionDescriptorEntry 3 }

frAtmIwfConnClpToDeMappingMode OBJECT-TYPE
SYNTAX INTEGER {
    model1(1),
    mode2Const0(2),

mode2Const1(3)
}
MAX-ACCESS  read-create
STATUS      current
DESCRIPTION
"This object describes which mode of translation
is in use for loss priority mapping in the ATM to
Frame Relay direction.

mode1       = if one or more cells in a frame has its CLP
field set, the DE field of the Q.922 core
frame should be set.

mode2Const0 = the DE field of the Q.922 core frame should
be set to constant 0.

mode2Const1 = the DE field of the Q.922 core frame should
be set to constant 1."

REFERENCE
"FRF.8 [17], Section 4.2.2"
DEFVAL { mode1 }
::= { frAtmIwfConnectionDescriptorEntry 4 }

frAtmIwfConnCongestionMappingMode OBJECT-TYPE
SYNTAX      INTEGER {
    mode1(1),
    mode2(2)
}
MAX-ACCESS  read-create
STATUS      current
DESCRIPTION
"This object describes which mode of translation
is in use for forward congestion indication
mapping in the Frame Relay to ATM direction.

model = The FECN field in the Q.922 core frame shall be
mapped to the ATM EFCI field of every cell
generated by the segmentation process of the
AAL5 PDU containing the information of that
frame.

mode2 = The FECN field in the Q.922 core frame shall not
be mapped to the ATM EFCI field of cells
generated by the segmentation process of the AAL5
PDU containing the information of that frame. The EFCI field is always set to 'congestion not experienced'.

In both of the modes above, if there is congestion in the forward direction in the ATM layer within the IWF, then the IWF can set the EFCI field to 'congestion experienced'."

REFERENCE
"FRF.8 [17], Section 4.3.1.1"

DEFVAL
{ mode1 }
::= { frAtmIwfConnectionDescriptorEntry 5 }

frAtmIwfConnEncapsulationMappingMode OBJECT-TYPE
SYNTAX      INTEGER {
    transparentMode(1),
    translationMode(2)
}
MAX-ACCESS  read-create
STATUS      current
DESCRIPTION
"This object indicates whether the mapping of upper layer protocol encapsulation is enabled on this interworking connection.

transparentMode = Forward the encapsulations unaltered.

translationMode = Perform mapping between the two encapsulations due to the incompatibilities of the two methods."

REFERENCE
"FRF.8 [17], Section 5.3"

DEFVAL
{ transparentMode }
::= { frAtmIwfConnectionDescriptorEntry 6 }

frAtmIwfConnEncapsulationMappings OBJECT-TYPE
SYNTAX      BITS {
    none (0),          -- Transparent mode operation
    bridgedPdus(1),    -- PID: 0x00-01,-07,-02 or -08
    bridged802dot6(2), -- PID: 0x00-0B
    bPdus(3),          -- PID: 0x00-0E or -0F
    routedIp(4),      -- NLPID: OxCC
    routedOsi(5),      -- NLPID: 0x81, 0x82 or 0x83
    otherRouted(6),    --
x25Iso8202(7), --
q933q2931(8)
MAX-ACCESS  read-create
STATUS      current
DESCRIPTION
"If upper layer protocol encapsulation mapping is
enabled on this interworking connection, then this
attribute enumerates which of the encapsulation
mappings are supported."
REFERENCE
"FRF.8 [17], Section 5.3.1"
DEFVAL      { { none } }
::= { frAtmIwfConnectionDescriptorEntry 7 }

frAtmIwfConnFragAndReassEnabled OBJECT-TYPE
SYNTAX      INTEGER { enabled(1),  disabled(2)}
MAX-ACCESS  read-create
STATUS      current
DESCRIPTION
"The attribute indicates whether fragmentation and
reassembly is enabled for this connection."
REFERENCE
"FRF.8 [17], Section 5.3.1.4"
DEFVAL      { disabled }
::= { frAtmIwfConnectionDescriptorEntry 8 }

frAtmIwfConnArpTranslationEnabled OBJECT-TYPE
SYNTAX      INTEGER { enabled(1),  disabled(2)}
MAX-ACCESS  read-create
STATUS      current
DESCRIPTION
"The attribute indicates whether ARP translation
is enabled for this connection."
REFERENCE
"FRF.8 [17], Section 5.4"
DEFVAL      { disabled }
::= { frAtmIwfConnectionDescriptorEntry 9 }
-- The PDU Translation Error Group

-- This set of scalars tracks PDU translation errors while in
-- translation mode. When a PDU is discarded due when the
-- protocol is not supported by the IWF, all five objects in
-- this group are updated simultaneously. A read of the five
-- objects in single GET request MUST return information about
-- the last invalid translation incident. A manager MUST NOT
-- access different objects of this group in different GET
-- requests when attempting to report the last translation
-- error.

frAtmIwfTransErrCount OBJECT-TYPE
SYNTAX Counter32
UNITS "Frames"
MAX-ACCESS read-only
STATUS current
DESCRIPTION "A count of translation error incidents. This
count MUST be incremented when an invalid PDU is
discard."
::= { frAtmIwfMIBObjects 5 }

frAtmIwfTransErrConnIndex OBJECT-TYPE
SYNTAX Integer32
MAX-ACCESS read-only
STATUS current
DESCRIPTION "The connection receiving the last invalid PDU.
If no error has occurred, then the value zero is
returned."
::= { frAtmIwfMIBObjects 6 }

frAtmIwfTransErrDirection OBJECT-TYPE
SYNTAX INTEGER { noTransErr(0), fr2Atm(1), atm2Fr(2) }
MAX-ACCESS read-only
STATUS current
DESCRIPTION "The direction of PDU travel. If no error has
occurred, then noTransErr MUST be returned."
::= { frAtmIwfMIBObjects 7 }

frAtmIwfTransErrTime OBJECT-TYPE
SYNTAX      TimeStamp
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION
"The value of sysUpTime at the time this
interworking connection processed an invalid PDU.
If no error has occurred, then the value zero is
returned."
::= { frAtmIwfMIBObjects 8 }

frAtmIwfTransErrDump OBJECT-TYPE
SYNTAX      OCTET STRING (SIZE(8))
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION
"A dump of the first 8 octets of the last
unknown/invalid PDU header. The dump begins with
the first octet after the frame relay or ATM
header. Inspection of this dump will reveal the
SNAP encapsulation or NLPID that was not
translated. If no error has occurred, then an
octet string of zeroes is returned. If the
payload is shorter than 8 octets, then the string
is padded with zeroes."
::= { frAtmIwfMIBObjects 9 }
frAtmIwfConnStatusChange NOTIFICATION-TYPE
  OBJECTS { frAtmIwfConnAdminStatus,
            frAtmIwfConnAtm2FrOperStatus,
            frAtmIwfConnFr2AtmOperStatus
  }
  STATUS current
  DESCRIPTION "An indication that the status of this
               interworking connection has changed."
  ::= { frAtmIwfTrapsPrefix 1 }
frAtmIwfEquipmentCompliance MODULE-COMPLIANCE
 STATUS current
 DESCRIPTION "The compliance statement for equipment that implements the FR/ATM Interworking MIB."

MODULE -- this module
 MANDATORY-GROUPS { frAtmIwfBasicGroup,
 frAtmIwfConnectionDescriptorGroup,
 frAtmIwfTransErrGroup,
 frAtmIwfNotificationsGroup }

OBJECT frAtmIwfConnDeToClpMappingMode
 SYNTAX INTEGER { mode1(1) }
 DESCRIPTION "Only support for Mode 1 is required."

OBJECT frAtmIwfConnClpToDeMappingMode
 SYNTAX INTEGER { mode1(1) }
 DESCRIPTION "Only support for Mode 1 is required."

OBJECT frAtmIwfConnCongestionMappingMode
 SYNTAX INTEGER { mode1(1) }
 DESCRIPTION "Only support for Mode 1 is required."

OBJECT frAtmIwfConnEncapsulationMappingMode
 SYNTAX INTEGER { transparentMode(1) }
 DESCRIPTION "Support for Translation Mode is not required."

OBJECT frAtmIwfConnEncapsulationMappings
 SYNTAX BITS { none(0) }
 DESCRIPTION "The IWF may provide one, some or none of the encapsulation translations defined in section
OBJECT     frAtmIwfConnFragAndReassEnabled
SYNTAX     INTEGER { disabled(2) }
DESCRIPTION
    "Only support for Mode 1 is required."

OBJECT     frAtmIwfConnArpTranslationEnabled
SYNTAX     INTEGER { disabled(2) }
DESCRIPTION
    "Support for ARP Translation is not required."

::= { frAtmIwfCompliances 1 }
-- Compliance Statement For Service (CNM Interface)

frAtmIwfServiceCompliance MODULE-COMPLIANCE
STATUS current
DESCRIPTION
"The compliance statement for a CNM interface that implements the FR/ATM Interworking MIB."

MODULE -- this module
MANDATORY-GROUPS { frAtmIwfBasicGroup,
frAtmIwfConnectionDescriptorGroup,
frAtmIwfTransErrGroup,
frAtmIwfNotificationsGroup }

-- Exceptions for each object type implemented for a CNM view of the FR/ATM Interworking MIB
--

OBJECT frAtmIwfConnAdminStatus
MIN-ACCESS read-only
DESCRIPTION
"Write access is not required."

OBJECT frAtmIwfConnDeToClpMappingMode
SYNTAX INTEGER { mode1(1) }
MIN-ACCESS read-only
DESCRIPTION
"Support for Mode 1 is required. Other modes are optional. Write access is not required."

OBJECT frAtmIwfConnClpToDeMappingMode
SYNTAX INTEGER { mode1(1) }
MIN-ACCESS read-only
DESCRIPTION
"Support for Mode 1 is required. Other modes are optional. Write access is not required."

OBJECT frAtmIwfConnCongestionMappingMode
SYNTAX INTEGER { mode1(1) }
MIN-ACCESS read-only
DESCRIPTION
"Support for Mode 1 is required. Other modes are optional. Write access is not required."
OBJECT  frAtmIwfConnEncapsulationMappingMode
SYNTAX   INTEGER { transparentMode(1) }
MIN-ACCESS  read-only
DESCRIPTION
   "Support for Transparent Mode is required. Translation Mode is optional. Write access is not required."

OBJECT  frAtmIwfConnEncapsulationMappings
SYNTAX   BITS { none(0) }
MIN-ACCESS  read-only
DESCRIPTION
   "The IWF may provide one, some or none of the encapsulation translations defined in section 5.3.1 of FRF.8 [17]. Write access is not required."

OBJECT  frAtmIwfConnFragAndReassEnabled
SYNTAX   INTEGER { disabled(2) }
MIN-ACCESS  read-only
DESCRIPTION
   "Support for Fragmentation and Reassembly is not required. Write access is not required."

OBJECT  frAtmIwfConnArpTranslationEnabled
SYNTAX   INTEGER { disabled(2) }
MIN-ACCESS  read-only
DESCRIPTION
   "Support for ARP Translation is not required. Write access is not required."

OBJECT  frAtmIwfConnRowStatus
MIN-ACCESS  read-only
DESCRIPTION
   "Write access is not required."

::= { frAtmIwfCompliances 2 }
-- Units of Conformance

-- Basic FR/ATM IWF PVC Connection Group

frAtmIwfBasicGroup  OBJECT-GROUP
  OBJECTS { frAtmIwfConnIndexNext, frAtmIwfConnAdminStatus, frAtmIwfConnAtm2FrOperStatus, frAtmIwfConnAtm2FrLastChange, frAtmIwfConnFr2AtmOperStatus, frAtmIwfConnFr2AtmLastChange, frAtmIwfConnectionDescriptor, frAtmIwfConnRowStatus }
  STATUS  current
  DESCRIPTION
     "The collection of basic objects for configuration and control of FR/ATM interworking connections."
  ::= { frAtmIwfGroups 1 }

-- FR/ATM IWF PVC Connection Descriptor Group

frAtmIwfConnectionDescriptorGroup  OBJECT-GROUP
  OBJECTS { frAtmIwfConnectionDescriptorIndexNext, frAtmIwfConnDeToClpMappingMode, frAtmIwfConnClpToDeMappingMode, frAtmIwfConnCongestionMappingMode, frAtmIwfConnEncapsulationMappingMode, frAtmIwfConnEncapsulationMappings, frAtmIwfConnFragAndReassEnabled, frAtmIwfConnArpTranslationEnabled, frAtmIwfConnDescriptorRowStatus }
  STATUS  current
  DESCRIPTION
     "The collection of basic objects for specification of FR/ATM interworking connection descriptors."
  ::= { frAtmIwfGroups 2 }

Expires December 1999
-- The PDU Translation Error Group
--

frAtmIwfTransErrGroup    OBJECT-GROUP
OBJECTS {
    frAtmIwfTransErrCount,
    frAtmIwfTransErrConnIndex,
    frAtmIwfTransErrDirection,
    frAtmIwfTransErrTime,
    frAtmIwfTransErrDump
}
STATUS  current
DESCRIPTION
    "The collection of objects for reporting on the
    last PDU translation error."
::= { frAtmIwfGroups 3 }

--
-- Notification Group
--

frAtmIwfNotificationsGroup NOTIFICATION-GROUP
NOTIFICATIONS { frAtmIwfConnStatusChange }
STATUS  current
DESCRIPTION
    "The notification for FR/ATM interworking status
    change."
::= { frAtmIwfGroups 4 }
END
7. Acknowledgments

This document was produced by the Frame Relay Service MIB Working Group.
8. References


9. Security Considerations

There are a number of management objects defined in this MIB that have a MAX-ACCESS clause of read-write and/or read-create. Such objects may be considered sensitive or vulnerable in some network environments. The support for SET operations in a non-secure environment without proper protection can have a negative effect on network operations.

No managed objects in this MIB contain sensitive information.

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

It is recommended that the implementers consider the security features as provided by the SNMPv3 framework. Specifically, the use of the User-based Security Model RFC 2574 [12] and the View-based Access Control Model RFC 2575 [15] is recommended.

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

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