Network Working Group
Request for Comments: 2954
Obsoletes: 1604
Category: Standards Track

K. Rehbehn
Megisto Systems
D. Fowler
Syndesis Limited

October 2000

Definitions of Managed Objects for Frame Relay Service

Status of this Memo

Copyright Notice

Abstract

This memo defines an extension to the Management Information Base (MIB) for use with network management protocols in Transmission Control Protocol/Internet Protocol-based (TCP/IP) internets. In particular, it defines objects for managing the frame relay service.

This document obsoletes RFC 1604.

Table of Contents

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 STD 16, RFC 1155 [2], STD 16, RFC 1212 [3] and RFC 1215 [4]. The second version, called SMIv2, is described in STD 58, RFC 2578 [5], STD 58, RFC 2579 [6] and STD 58, RFC 2580 [7].
- Message protocols for transferring management information. The first version of the SNMP message protocol is called SNMPv1 and described in STD 15, 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 STD 15, 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

These objects are used to manage a frame relay Service. At present, this applies to the following value of the ifType variable in the IF-MIB [26]:

frameRelayService (44)

This section provides an overview and background of how to use this MIB and other potential MIBs to manage a frame relay service.

2.1. Scope of MIB

The Frame Relay Service MIB supports Customer Network Management (CNM) of a frame relay network service. Through the use of this and other related MIBs, a frame relay service customer's NMS can monitor the customer's UNI/NNI logical ports and PVCs. It provides customers with access to configuration data, performance monitoring information, and fault detection for the delivered frame relay service. As an option, an SNMP agent supporting the Frame Relay Service MIB may allow customer-initiated PVC management operations such as creation, deletion, modification, activation, and deactivation of individual PVCs. However, internal aspects of the network (e.g., switching elements, line cards, and network routing tables) are beyond the scope of this MIB.

The Frame Relay Service MIB models all interfaces and PVCs delivered by a frame relay service within a single virtual SNMP system for the purpose of comprehensively representing the customer's frame relay service. The customer's interfaces and PVCs may physically exist on one or more devices within the network topology. An SNMP agent

providing support for the Frame Relay Service MIB as well as other appropriate MIBs to model a single virtual frame relay network service is referred to as a Frame Relay Service (FRS) agent. Internal communication mechanisms between the FRS agent and individual devices within the frame relay network delivering the service are implementation specific and beyond the scope of this MIB.

The customer's NMS will typically access the SNMP agent implementing the Frame Relay Service MIB over a frame relay permanent virtual connection (PVC). SNMP access over a frame relay PVC is achieved through the use of SNMP over UDP over IP encapsulated in Frame Relay according to STD 55, RFC2427 and ITU X.36 Annex D [23]. Alternate access mechanisms and SNMP agent implementations are possible.

This MIB will NOT be implemented on user equipment (e.g., DTE). Such devices are managed using the Frame Relay DTE MIB (RFC2115[18]). However, concentrators may use the Frame Relay Service MIB instead of the Frame Relay DTE MIB.

This MIB does not define managed objects for the physical layer. Existing physical layer MIBs (e.g., DS1 MIB) and Interface MIB will be used as needed in FRS Agent implementations.

This MIB supports frame relay PVCs. This MIB may be extended at a later time to handle frame relay SVCs.

A switch implementation may support this MIB for the purpose of configuration and control of the frame relay service beyond the scope of traditional customer network management applications. A number of objects (e.g. frLportTypeAdmin) support administrative actions that impact the operation of frame relay switch equipment in the network. This is reflected in the differences between the two MIB compliance modules:

- the frame relay service compliance module (frnetservCompliance), and
- the frame relay switch compliance module (frnetSwitchCompliance).

The frame relay service compliance module does not support the administrative control objects used for switch management.

2.2. Transiting Multiple Frame Relay Networks

This MIB is only used to manage a single frame relay service offering from one network service provider. Therefore, if a customer PVC traverses multiple networks, then the customer must poll a different FRS agent within each frame relay network to retrieve the end-to-end view of service.

Figure 1 illustrates a customer ("User B") NMS accessing FRS agents in three different frame relay networks (I, J, and K).

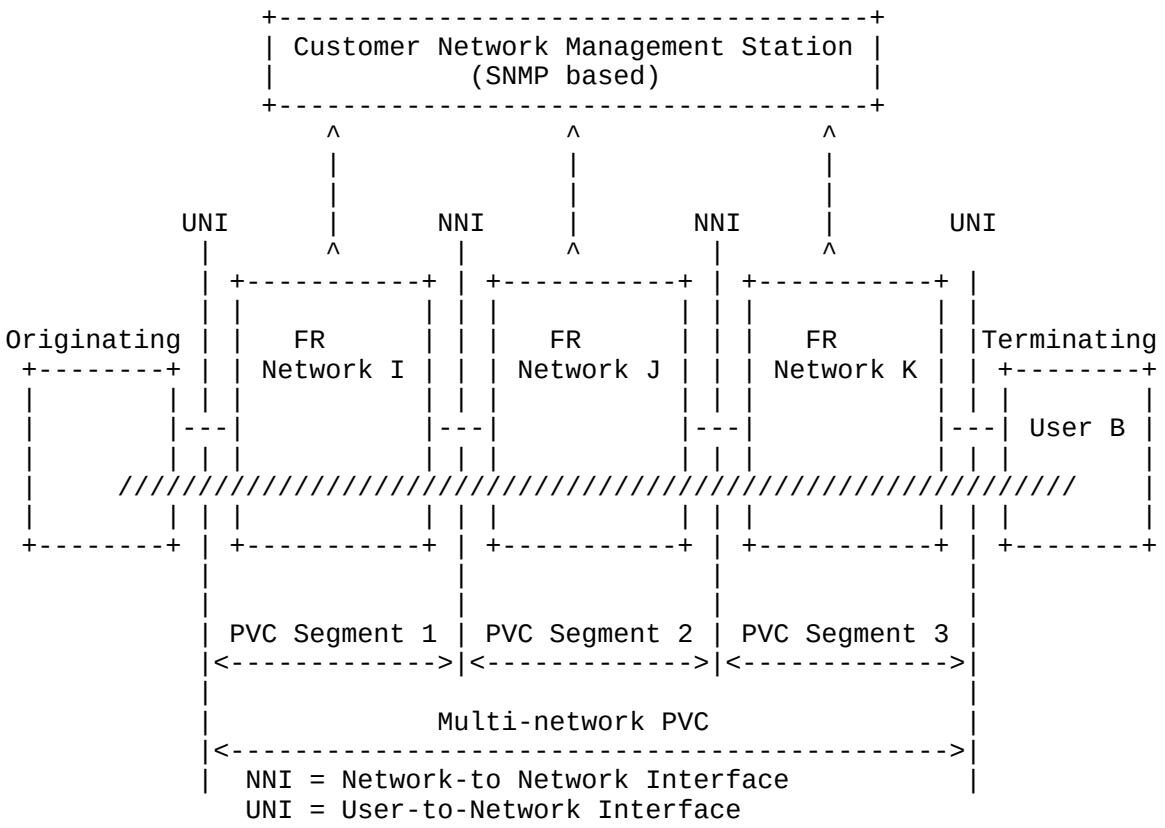


Figure 1, Multi-network PVC

2.3. Access Control

A frame relay network is shared amongst many frame relay subscribers. Each subscriber will only have access to their information (e.g., information with respect to their interfaces and PVCs). The FRS agent should provide instance level granularity for MIB views.

2.4. Frame Relay Service MIB Terminology

Access Channel - An access channel generically refers to the DS1/E1 or DS3/E3-based UNI access channel or NNI access channel across which frame relay data transits. An access channel is the access pathway for a single stream of user data.

Within a given DS1 line, an access channel can denote any one of the following:

- Unchannelized DS1 - the entire DS1 line is considered an access channel. Each access channel is comprised of 24 DS0 time slots.
- Channelized DS1 - an access channel is any one of 24 channels. Each access channel is comprised of a single DS0 time slot.
- Fractional DS1 - an access channel is a grouping of NxDS0 time slots (NX56/64 Kbps, where N = 1-23 DS0 Time slots per Fractional DS1 Access Channel) that may be assigned in consecutive or non-consecutive order.

Within a given E1 line, a channel can denote any one of the following:

- Unchannelized E1 - the entire E1 line is considered a single access channel. Each access channel is comprised of 31 E1 time slots.
- Channelized E1 - an access channel is any one of 31 channels. Each access channel is comprised of a single E1 time slot.
- Fractional E1 - an access channel is a grouping of N E1 time slots (NX64 Kbps, where N = 1-30 E1 time slots per FE1 access channel) that may be assigned in consecutive or non-consecutive order.

Within a given unformatted line, the entire unformatted line is considered an access channel. Examples include RS-232, V.35, V.36 and X.21 (non-switched), and unframed E1 (G.703 without G.704).

Access Rate - The data rate of the access channel, expressed in bits/second. The speed of the user access channel determines how rapidly the end user can inject data into the network.

Bc - The Committed Burst Size (Bc) is the maximum amount of subscriber data (expressed in bits) that the network agrees to transfer, under normal conditions, during a time interval Tc.

Be - The Excess Burst Size (Be) is the maximum amount of subscriber data (expressed in bits) in excess of Bc that the network will attempt to deliver during the time interval Tc. This data (Be) is delivered in general with a lower probability than Bc.

CIR - The Committed Information Rate (CIR) is the subscriber data rate (expressed in bits/second) that the network commits to deliver under normal network conditions. CIR is averaged over the time interval Tc (CIR = Bc/Tc).

DLCI - Data Link Connection Identifier

Logical Port - This term is used to model the frame relay "interface" on a device.

NNI - Network to Network Interface

Permanent Virtual Connection (PVC) - A virtual connection that has its end-points and bearer capabilities defined at subscription time.

Time slot (E1) - An octet within the 256-bit information field in each E1 frame is defined as a time slot. Time slots are position sensitive within the 256-bit information field. Fractional E1 service is provided in contiguous or non-contiguous time slot increments.

Time slot (DS0) - An octet within the 192-bit information field in each DS1 frame is defined as a time slot. Time slots are position sensitive within the 192-bit information field. Fractional DS1 service is provided in contiguous or non-contiguous time slot increments.

UNI - User to Network Interface

N391 - Full status (status of all PVCs) polling counter

N392 - Error threshold

N393 - Monitored events count

T391 - Link integrity verification polling timer

T392 - Polling verification timer

nT3 - Status enquiry timer

nN3 - Maximum status enquiry counter

2.5. Relation to Other MIBs

2.5.1. System Group

Use the System Group of the SNMPv2-MIB [27] to describe the Frame Relay Service (FRS) agent. The FRS agent may be monitoring many frame relay devices in one network. The System Group does not describe frame relay devices monitored by the FRS agent.

sysDescr: ASCII string describing the FRS agent. Can be up to 255 characters long. This field is generally used to indicate the network providers identification and type of service offered.

sysObjectID: Unique OBJECT IDENTIFIER (OID) for the FRS agent.

sysUpTime: Clock in the FRS agent; TimeTicks in 1/100s of a second. Elapsed type since the FRS agent came on line.

sysContact: Contact for the FRS agent. ASCII string of up to 255 characters.

sysName: Domain name of the FRS agent, for example, acme.com

sysLocation: Location of the FRS agent. ASCII string of up to 255 characters.

sysServices: Services of the managed device. The value "2", which implies that the frame relay network is providing a subnetwork level service, is recommended.

2.5.2. Interfaces Table (ifTable, ifXtable)

This specifies how the Interfaces Group defined in the IF MIB [26] shall be used for the management of frame relay based interfaces, and in conjunction with the Frame Relay Service MIB module. This memo assumes the interpretation of the evolution of the Interfaces group to be in accordance with: "The interfaces table (ifTable) contains information on the managed resource's interfaces. Each sub-layer below the internetwork layer of a network interface is considered an interface." Thus, the ifTable allows the following frame relay-based interfaces to be represented as table entries:

- Frame relay interfaces in equipment (e.g., switches, routers or networks) supporting frame relay. This level is concerned with generic frame counts and not with individual virtual connections.

In accordance with the guidelines of ifTable, frame counts per virtual connection are not covered by ifTable, and are considered interface specific and covered in the Frame Relay Service MIB module. In order to interrelate the ifEntries properly, the Interfaces Stack Group shall be supported.

Some specific interpretations of ifTable for frame relay follow.

Object	Use for the generic Frame Relay layer
ifIndex	Each frame relay port is represented by an ifEntry.
ifDescr	Description of the frame relay interface. ASCII string describing the UNI/NNI logical port. Can be up to 255 characters long.
ifType	The value allocated for Frame Relay Service is equal to 44.
ifMtu	Set to maximum frame size in octets for this frame relay logical port.
ifSpeed	Peak bandwidth in bits per second available for use. This could be the speed of the logical port and not the access rate. Actual user information transfer rate (i.e., access rate) of the UNI or NNI logical port in bits per second (this is not the clocking speed). For example, it is 1,536,000 bits per second for a DS1-based UNI/NNI logical port and 1,984,000 bits per second for an E1-based UNI/NNI logical port.
ifPhysAddress	The primary address for this logical port assigned by the frame relay interface provider. An octet string of zero length if no address is used for this logical port.
ifAdminStatus	The desired administrative status of the frame relay logical port.

ifOperStatus	The current operational status of the Frame Relay UNI or NNI logical port.
ifLastChange	The value of sysUptime at the last re-initialization of the logical port. The value of sysUpTime at the time the logical port entered its current operational state. 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.
ifInOctets	The number of received octets. This counter only counts octets from the beginning of the frame relay header field to the end of user data.
ifInUcastPkts	The number of received unerrored, unicast frames.
ifInDiscards	The number of received frames discarded. Specifically, frames discarded due to ingress buffer congestion and traffic policing.
ifInErrors	The number of received frames that are discarded because of an error. Specifically, frames that are too long or too short, frames that are not a multiple of 8 bits in length, frames with an invalid or unrecognized DLCI, frames with an abort sequence, frames with improper flag delimitation, and frame that fail FCS.
ifInUnknownProtos	The number of packets discarded because of an unknown or unsupported protocol. For Frame Relay Service interfaces, this counter will always be zero.
ifOutOctets	The number of transmitted octets. This counter only counts octets from the beginning of the frame relay header field to the end of user data.
ifOutUcastpkts	The number of unerrored, unicast frames sent.
ifOutDiscards	The number of frames discarded in the egress direction. Possible reasons are as follows: policing, congestion.

ifOutErrors	The number of frames discarded in the egress direction because of an error. Specifically, frames that are aborted due to a transmitter underrun.
ifName	This variable is not applicable for Frame Relay Service interfaces, therefore, this variable contains a zero-length string.
ifInMulticastPkts	The number of received unerrored, multicast frames.
ifInBroadcastPkts	This variable is not applicable for Frame Relay Service interfaces, therefore, this counter is always zero.
ifOutMulticastPkts	The number of sent unerrored, multicast frames.
ifOutBroadcastPkts	This variable is not applicable for Frame Relay Service interfaces, therefore, this counter is always zero.
ifHCInOctets	Only used for DS3-based (and greater) Frame Relay logical ports. The number of received octets. This counter only counts octets from the beginning of the frame relay header field to the end of user data.
ifHCOutOctets	Only used for DS3-based (and greater) Frame Relay logical ports. The number of transmitted octets. This counter only counts octets from the beginning of the frame relay header field to the end of user data.
ifLinkUpDownTrapEnable	Set to true(1). It is recommended that the underlying physical layer notifications be disabled since both are not required. Notifications are enabled at the frame relay service layer specifically because PVC notifications are not to be sent if the frame relay interface fails. Without a linkUp/linkDown notification, the management station would receive no notification of the failure.

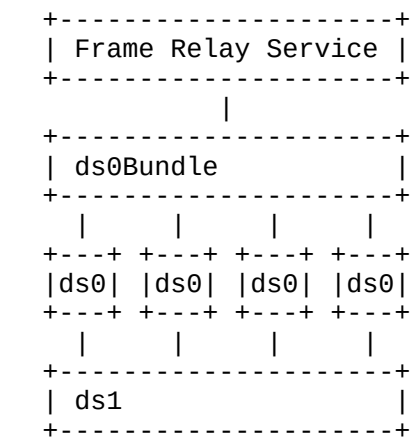
ifHighSpeed	Set to the user data rate of the frame relay logical port in millions of bits per second. If the user data rate is less than 1 Mbps, then this value is zero.
ifPromiscuousMode	Set to false(2).
ifConnectorPresent	Set to false(2).

Frame relay network service interfaces support the Interface Stack Group. Frame relay network service interfaces do not support any other groups or objects in the Interfaces group of the IF MIB.

2.5.3. Stack Table for DS1/E1 Environment

This section describes by example how to use ifStackTable to represent the relationship of frame relay service to ds0 and ds0Bundles with ds1 interfaces [20].

Example: A frame relay service is being carried on 4 ds0s of a ds1.



The assignment of the index values could for example be:

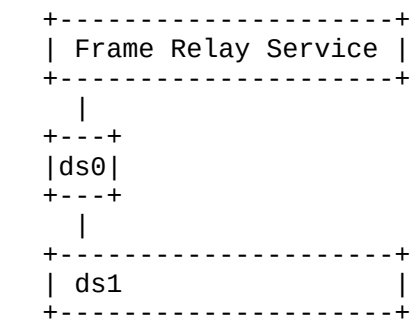
ifIndex	Description	
1	FrameRelayService	(type 44)
2	ds0Bundle	(type 82)
3	ds0 #1	(type 81)
4	ds0 #2	(type 81)
5	ds0 #3	(type 81)
6	ds0 #4	(type 81)
7	ds1	(type 18)

The ifStackTable is then used to show the relationships between the various interfaces.

ifStackTable Entries

HigherLayer	LowerLayer
0	1
1	2
2	3
2	4
2	5
2	6
3	7
4	7
5	7
6	7
7	0

In the case where the frame relay service is using a single ds0, then the ds0Bundle is not required.



The assignment of the index values could for example be:

ifIndex	Description
1	FrameRelayService (type 44)
2	ds0 (type 81)
3	ds1 (type 18)

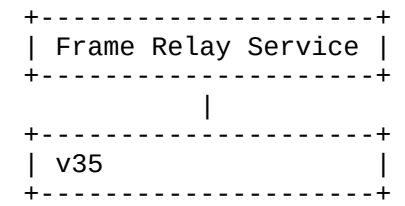
The ifStackTable is then used to show the relationships between the various interfaces.

ifStackTable Entries

HigherLayer	LowerLayer
0	1
1	2
2	3
3	0

2.5.4. Stack Table for V.35 Environments

This section describes by example how to use ifStackTable to represent the relationship of frame relay service with V.35 interfaces.



An example of index values in this case could be:

ifIndex	Description
1	FrameRelayService (type 44)
2	v35 (type 33)

Note type 33 (RS232-like MIB) is used instead of type 45 (V.35). V35 does not pertain to this environment.

The ifStackTable is then used to show the relationships between the various interfaces.

ifStackTable Entries

HigherLayer	LowerLayer
0	1
1	2
2	0

2.5.5. The Frame Relay/ATM PVC Service Interworking MIB

Connections between two frame relay endpoints are represented with an entry in the frPVCConnectTable of this MIB. Both endpoints are represented with rows in the frPVCEndptTable. The frPVCEndptConnectIdentifier object of each endpoint points to the frPVCConnectTable cross-connect table row for the connection.

In contrast, a connection that spans frame relay and ATM endpoints is represented with an entry in the frAtmIwfConnectionTable of the FR/ATM PVC Service Interworking MIB defined in [28].

In the case of an inter-worked connection, the frPVCEndptConnectIdentifier object is set to zero. Instead, the frPVCEndptAtmIwfConnIndex object is set to the index of the FR/ATM IWF cross-connect table row.

The frame relay PVC cross-connect table (frPVCConnectTable) does not contain an entry for the FR/ATM inter-worked connection.

2.6. Textual Convention Change

Version 1 of the Frame Relay Service MIB contains MIB objects defined with the DisplayString textual convention. In version 2 of this MIB, the syntax for these objects has been updated to use the (now preferred) SnmpAdminString textual convention. The new TC provides support for a greater variety of international character sets.

The working group realizes that this change is not strictly supported by SMIv2. In our judgment, the alternative of deprecating the old objects and defining new objects would have a more adverse impact on backward compatibility and interoperability, given the particular semantics of these objects.

3. Object Definitions

```
FRNETSERV-MIB DEFINITIONS ::= BEGIN

IMPORTS
            MODULE-IDENTITY, OBJECT-TYPE,
            NOTIFICATION-TYPE, transmission,
            Counter32, Integer32            FROM SNMPv2-SMI
            TimeStamp, RowStatus            FROM SNMPv2-TC
            MODULE-COMPLIANCE, OBJECT-GROUP,
            NOTIFICATION-GROUP              FROM SNMPv2-CONF
            InterfaceIndex, ifIndex         FROM IF-MIB
            SnmpAdminString                 FROM SNMP-FRAMEWORK-MIB;

      frnetservMIB MODULE-IDENTITY
          LAST-UPDATED "200009280000Z" -- September 28, 2000
          ORGANIZATION "IETF Frame Relay Service MIB Working Group"
          CONTACT-INFO
              "WG Charter:
                 http://www.ietf.org/html.charters/frnetmib-charter
               WG-email:
                 frnetmib@sunroof.eng.sun.com
```

```
                Subscribe:
                  frnetmib-request@sunroof.eng.sun.com
                Email Archive:
                  ftp://ftp.ietf.org/ietf-mail-archive/frnetmib

                Chair:      Andy Malis
                            Vivace Networks, Inc.
                Email:      Andy.Malis@vivacenetworks.com

                WG editor:  Kenneth Rehbehn
                            Megisto Systems, Inc.
                Email:      krehbehn@megisto.com

                Co-author:  David Fowler
                            Syndesis Limited,
                EMail:      fowler@syndesis.com"

            DESCRIPTION
                "The MIB module to describe generic objects for
                 Frame Relay Network Service."

            --
            -- Revision History
            --
            REVISION "200009280000Z"
            DESCRIPTION
                "Published as RFC 2954.

                The major new features of this revision include:

                    o  Support for read-write capability to
                       provision switch components providing service,

                    o  Support for cross-connection via a frame relay
                       to ATM service interworking function,

                    o  Support for frame relay fragmentation,

                    o  Additional frame counters to track frame
                       loss.

                Refer to Appendix A for a comprehensive list of
                changes since RFC 1604."

            REVISION "199311161200Z"
            DESCRIPTION
                "Published as RFC 1604."
            ::= { transmission 44 }
```

```
            frnetservObjects
                OBJECT IDENTIFIER ::= { frnetservMIB 1 }

            frnetservTraps
                OBJECT IDENTIFIER ::= { frnetservMIB 2 }

            frnetservTrapsPrefix
                OBJECT IDENTIFIER ::= { frnetservTraps 0 }

        --
        -- The Frame Relay Service Logical Port
        --
        frLportTable OBJECT-TYPE
            SYNTAX      SEQUENCE OF FrLportEntry
            MAX-ACCESS  not-accessible
            STATUS      current
            DESCRIPTION
                    "The Frame Relay Logical Port Information table is
                    an interface-specific addendum to the generic
                    ifTable of the Interface MIB."
            ::= { frnetservObjects 1 }

        frLportEntry OBJECT-TYPE
            SYNTAX      FrLportEntry
            MAX-ACCESS  not-accessible
            STATUS      current
            DESCRIPTION
                    "An entry in the Frame Relay Logical Port
                    Information table."
            INDEX   {   ifIndex }
            ::= { frLportTable 1 }

        FrLportEntry ::=
            SEQUENCE {
                frLportNumPlan            INTEGER,
                frLportContact            SnmpAdminString,
                frLportLocation           SnmpAdminString,
                frLportType               INTEGER,
                frLportAddrDLCILen        INTEGER,
                frLportVCSigProtocol      INTEGER,
                frLportVCSigPointer       OBJECT IDENTIFIER,
                frLportDLCIIndexValue     Integer32,
                frLportTypeAdmin          INTEGER,
                frLportVCSigProtocolAdmin INTEGER,
                frLportFragControl        INTEGER,
                frLportFragSize           Integer32
        }
```

```
        frLportNumPlan OBJECT-TYPE
            SYNTAX      INTEGER {
                        other(1),
                        e164(2),
                        x121(3),
                        none(4)
                        }
            MAX-ACCESS  read-only
            STATUS      current
            DESCRIPTION
                    "The value of this object identifies the network
                    address numbering plan for this UNI/NNI logical
                    port. The network address is the object
                    ifPhysAddress. The value none(4) implies that
                    there is no ifPhysAddress.  The FRS agent will
                    return an octet string of zero length for
                    ifPhysAddress.  The value other(1) means that an
                    address has been assigned to this interface, but
                    the numbering plan is not enumerated here."
            REFERENCE   "E.164 [29]
                         X.121 [30]"
            ::= { frLportEntry 1 }

        frLportContact  OBJECT-TYPE
            SYNTAX      SnmpAdminString
            MAX-ACCESS  read-only
            STATUS      current
            DESCRIPTION
                    "The value of this object identifies the network
                    contact for this UNI/NNI logical port."
            ::= { frLportEntry 2 }

        frLportLocation OBJECT-TYPE
            SYNTAX      SnmpAdminString
            MAX-ACCESS  read-only
            STATUS      current
            DESCRIPTION
                    "The value of this object identifies the frame
                    relay network location for this UNI/NNI logical
                    port."
            ::= { frLportEntry 3 }

        frLportType     OBJECT-TYPE
            SYNTAX      INTEGER {
                        uni(1),
                        nni(2)
                        }
            MAX-ACCESS  read-only
```

```
            STATUS      current
            DESCRIPTION
                    "The value of this object identifies the type of
                    network interface for this logical port."
            ::= { frLportEntry 4 }

        frLportAddrDLCILen OBJECT-TYPE
            SYNTAX      INTEGER {
                        twoOctets10Bits(1),
                        threeOctets10Bits(2),
                        threeOctets16Bits(3),
                        fourOctets17Bits(4),
                        fourOctets23Bits(5)
                        }
            UNITS       "Octets"
            MAX-ACCESS  read-only
            STATUS      current
            DESCRIPTION
                    "The value of this object identifies the Q.922
                    Address field length and DLCI length for this
                    UNI/NNI logical port."
            REFERENCE   "Q.922 [25]"
            ::= { frLportEntry 5 }

        frLportVCSigProtocol OBJECT-TYPE
            SYNTAX      INTEGER {
                        none(1),
                        lmi(2),
                        ansiT1617D(3),
                        ansiT1617B(4),
                        ccittQ933A(5)
                        }
            MAX-ACCESS  read-only
            STATUS      current
            DESCRIPTION
                    "The value of this object identifies the Local
                    In-Channel Signaling Protocol that is used for
                    this frame relay UNI/NNI logical port.

                    none(1):        Interface does not use a PVC
                                    signaling protocol

                    lmi(2):         Interface operates the Stratacom/
                                    Nortel/DEC Local Management
                                    Interface Specification protocol

                    ansiT1617D(3):  Interface operates the ANSI T1.617
                                    Annex D PVC status protocol
```

```
                    ansiT1617B(4):  Interface operates the ANSI
T1.617
                                    Annex B procedures

                    ccittQ933A(5):  Interface operates the ITU Q.933
                                    Annex A PVC status protocol"
            REFERENCE   "LMI [24]
                         T1.617 Annex D [17],
                         Q.933 Annex A [22]"
            ::= { frLportEntry 6 }

        frLportVCSigPointer OBJECT-TYPE
            SYNTAX      OBJECT IDENTIFIER
            MAX-ACCESS  read-only
            STATUS      deprecated
            DESCRIPTION
                    "The value of this object is used as a pointer to
                    the table that contains the Local In-Channel
                    Signaling Protocol parameters and errors for this
                    UNI/NNI logical port.

                    This object has been deprecated to reflect the
                    fact that the local in-channel signaling
                    parameters are accessed from a single table
                    (frMgtVCSigTable) that includes parameters for all
                    possible signaling protocols.  Early design
                    anticipated multiple tables, one for each
                    signaling protocol."
            ::= { frLportEntry 7 }

        frLportDLCIIndexValue OBJECT-TYPE
            SYNTAX      Integer32 (16..4194303)
            MAX-ACCESS  read-only
            STATUS      current
            DESCRIPTION
                    "This object contains a hint to be used for
                    frPVCEndptDLCIIndex when creating entries in the
                    frPVCEndptTable.  The SYNTAX of this object
                    matches the SYNTAX of the frPVCEndptDLCIIndex - an
                    object that is restricted to legal Q.922 DLCI
                    values for the size of the address field.

                    The value 0 indicates that no unassigned entries
                    are available.

                    To obtain the frPVCEndptDLCIIndex 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 must
                modify the value to the next unassigned index to
                prevent assignment of the same value to multiple
                management systems.

                A management system should repeat the read to
                obtain a new value should an attempt to create the
                new row using the previously returned hint fail."
        REFERENCE   "Q.922 [25]"
        ::= { frLportEntry 8 }

    frLportTypeAdmin   OBJECT-TYPE
        SYNTAX      INTEGER {
                    uni(1),
                    nni(2)
                    }
        MAX-ACCESS  read-write
        STATUS      current
        DESCRIPTION
                "The value of this object desired identifies the
                type of network interface for this logical port."
          ::= { frLportEntry 9 }

    frLportVCSigProtocolAdmin OBJECT-TYPE
        SYNTAX      INTEGER {
                    none(1),
                    lmi(2),
                    ansiT1617D(3),
                    ansiT1617B(4),
                    ccittQ933A(5)
                    }
        MAX-ACCESS  read-write
        STATUS      current
        DESCRIPTION
                "The value of this object identifies the desired
                Local In-Channel Signaling Protocol that is used
                for this frame relay UNI/NNI logical port.  This
                value must be made the active protocol as soon as
                possible on the device.

                Refer to frLportVCSigProtocol for a description of
                each signaling protocol choices."
        REFERENCE   "LMI [24]
                     T1.617 Annex D [17],
                     Q.933 Annex A [22]"
        ::= { frLportEntry 10 }

    frLportFragControl OBJECT-TYPE
```

```
            SYNTAX      INTEGER {
                        on(1),
                        off(2)
                        }
            MAX-ACCESS  read-write
            STATUS      current
            DESCRIPTION
                    "This object controls the transmission and
                    reception of fragmentation frames for this UNI or
                    NNI interface.

                    on(1)   Frames are fragmented using the interface
                            fragmentation format
                            Note:  The customer side of the interface
                            must also be configured to fragment
                            frames.

                    off(2)  Frames are not fragmented using the
                            interface fragmentation format."
            REFERENCE   "FRF.12 [21]"
            DEFVAL { off }
            ::= { frLportEntry 11 }

        frLportFragSize OBJECT-TYPE
            SYNTAX      Integer32 (0..4096)
            UNITS       "Octets"
            MAX-ACCESS  read-write
            STATUS      current
            DESCRIPTION
                    "The value of this object is the size in octets of
                    the maximum size of each fragment to be sent when
                    fragmenting.  This object is only used by the
                    fragmentation transmitter, and the two sides of
                    the interface may differ.  The fragment size
                    includes the octets for the frame relay header,
                    the UI octet, the NLPID, the fragmentation header,
                    and the fragment payload. If frLportFragControl is
                    set to off, this value should be zero."
            REFERENCE   "FRF.12 [21]"
            DEFVAL { 0 }
            ::= { frLportEntry 12 }

        --
        -- Frame Relay Management VC Signaling
        --

        frMgtVCSigTable OBJECT-TYPE
            SYNTAX      SEQUENCE OF FrMgtVCSigEntry
```

```
            MAX-ACCESS  not-accessible
            STATUS      current
            DESCRIPTION
                    "The Frame Relay Management VC Signaling
                    Parameters and Errors table."
            ::= { frnetservObjects 2 }

        frMgtVCSigEntry OBJECT-TYPE
            SYNTAX      FrMgtVCSigEntry
            MAX-ACCESS  not-accessible
            STATUS      current
            DESCRIPTION
                    "An entry in the Frame Relay Management VC
                    Signaling Parameters Errors table."
            INDEX       { ifIndex }
            ::= { frMgtVCSigTable 1 }

        FrMgtVCSigEntry ::=
            SEQUENCE {
                frMgtVCSigProced             INTEGER,
                frMgtVCSigUserN391           INTEGER,
                frMgtVCSigUserN392           INTEGER,
                frMgtVCSigUserN393           INTEGER,
                frMgtVCSigUserT391           INTEGER,
                frMgtVCSigNetN392            INTEGER,
                frMgtVCSigNetN393            INTEGER,
                frMgtVCSigNetT392            INTEGER,
                frMgtVCSigNetnN4             INTEGER,
                frMgtVCSigNetnT3             INTEGER,
                frMgtVCSigUserLinkRelErrors  Counter32,
                frMgtVCSigUserProtErrors     Counter32,
                frMgtVCSigUserChanInactive   Counter32,
                frMgtVCSigNetLinkRelErrors   Counter32,
                frMgtVCSigNetProtErrors      Counter32,
                frMgtVCSigNetChanInactive    Counter32,
                frMgtVCSigProcedAdmin        INTEGER,
                frMgtVCSigUserN391Admin      INTEGER,
                frMgtVCSigUserN392Admin      INTEGER,
                frMgtVCSigUserN393Admin      INTEGER,
                frMgtVCSigUserT391Admin      INTEGER,
                frMgtVCSigNetN392Admin       INTEGER,
                frMgtVCSigNetN393Admin       INTEGER,
                frMgtVCSigNetT392Admin       INTEGER,
                frMgtVCSigNetnT3Admin        INTEGER
        }

        frMgtVCSigProced OBJECT-TYPE
            SYNTAX      INTEGER {
```

```
                    u2nnet(1),
                    bidirect(2),
                    u2nuser(3)
                    }
            MAX-ACCESS  read-only
            STATUS      current
            DESCRIPTION
                    "The value of this object identifies the local
                    in-channel signaling procedural role that is used
                    for this UNI/NNI logical port.  Bidirectional
                    procedures implies that both user-side and
                    network-side procedural roles are used.

                    u2nnet(1)   Logical port operates user to network
                                procedure in the role of the network
                                side

                    bidirect(2) Logical port operates the
                                bidirectional procedure (both user
                                and network side roles)

                    u2nuser(3)  Logical port operates user to network
                                procedure in the role of the user
                                side"
            REFERENCE   "Q.933 Annex A [22],
                         T1.617 Annex D [17]"
            ::= { frMgtVCSigEntry 1 }

        frMgtVCSigUserN391 OBJECT-TYPE
            SYNTAX      INTEGER (1..255)
            UNITS       "Polls"
            MAX-ACCESS  read-only
            STATUS      current
            DESCRIPTION
                    "The value of this object identifies the User-side
                    N391 full status polling cycle value for this
                    UNI/NNI logical port.  If the logical port is not
                    performing user-side (bidirectional) procedures,
                    then this object is not instantiated and an
                    attempt to read will result in the noSuchInstance
                    exception response."
            REFERENCE   "Q.933 Annex A [22],
                         T1.617 Annex D [17]"
            DEFVAL { 6 }
            ::= { frMgtVCSigEntry 2 }

        frMgtVCSigUserN392 OBJECT-TYPE
            SYNTAX      INTEGER (1..10)
```

```
            UNITS       "Events"
            MAX-ACCESS  read-only
            STATUS      current
            DESCRIPTION
                    "The value of this object identifies the User-side
                    N392 error threshold value for this UNI/NNI
                    logical port.  If the logical port is not
                    performing user-side (bidirectional) procedures,
                    then this object is not instantiated."
            REFERENCE   "Q.933 Annex A [22],
                         T1.617 Annex D [17]"
            DEFVAL { 3 }
            ::= { frMgtVCSigEntry 3 }

        frMgtVCSigUserN393 OBJECT-TYPE
            SYNTAX      INTEGER (1..10)
            UNITS       "Events"
            MAX-ACCESS  read-only
            STATUS      current
            DESCRIPTION
                    "The value of this object identifies the User-side
                    N393 monitored events count value for this UNI/NNI
                    logical port.  If the logical port is not
                    performing user-side (bidirectional) procedures,
                    then this object is not instantiated."
            REFERENCE   "Q.933 Annex A [22],
                         T1.617 Annex D [17]"
            DEFVAL { 4 }
            ::= { frMgtVCSigEntry 4 }

        frMgtVCSigUserT391 OBJECT-TYPE
            SYNTAX      INTEGER (5..30)
            UNITS       "Seconds"
            MAX-ACCESS  read-only
            STATUS      current
            DESCRIPTION
                    "The value of this object identifies the User-side
                    T391 link integrity verification polling timer
                    value for this UNI/NNI logical port.  If the
                    logical port is not performing user-side
                    procedures, then this object is not instantiated."
            REFERENCE   "Q.933 Annex A [22],
                         T1.617 Annex D [17]"
            DEFVAL { 10 }
            ::= { frMgtVCSigEntry 5 }

        frMgtVCSigNetN392 OBJECT-TYPE
            SYNTAX      INTEGER (1..10)
```

```
            UNITS       "Events"
            MAX-ACCESS  read-only
            STATUS      current
            DESCRIPTION
                    "The value of this object identifies the Network-
                    side N392 error threshold value (nN2 for LMI) for
                    this UNI/NNI logical port.  If the logical port is
                    not performing network-side procedures, then this
                    object is not instantiated."
            REFERENCE   "Q.933 Annex A [22],
                         T1.617 Annex D [17],
                         LMI [24]"
            DEFVAL { 3 }
            ::= { frMgtVCSigEntry 6 }

        frMgtVCSigNetN393 OBJECT-TYPE
            SYNTAX      INTEGER (1..10)
            UNITS       "Events"
            MAX-ACCESS  read-only
            STATUS      current
            DESCRIPTION
                    "The value of this object identifies the Network-
                    side N393 monitored events count value (nN3 for
                    LMI) for this UNI/NNI logical port.  If the
                    logical port is not performing network-side
                    procedures, then this object is not instantiated."
            REFERENCE   "Q.933 Annex A [22],
                         T1.617 Annex D [17],
                         LMI [24]"
            DEFVAL { 4 }
            ::= { frMgtVCSigEntry 7 }

        frMgtVCSigNetT392 OBJECT-TYPE
            SYNTAX      INTEGER (5..30)
            UNITS       "Seconds"
            MAX-ACCESS  read-only
            STATUS      current
            DESCRIPTION
                    "The value of this object identifies the Network-
                    side T392 polling verification timer value (nT2
                    for LMI)  for this UNI/NNI logical port.  If the
                    logical port is not performing network-side
                    procedures, then this object is not instantiated."
            REFERENCE   "Q.933 Annex A [22],
                         T1.617 Annex D [17],
                         LMI [24]"
            DEFVAL { 15 }
            ::= { frMgtVCSigEntry 8 }
```

```
        frMgtVCSigNetnN4 OBJECT-TYPE
            SYNTAX      INTEGER (5..5)
            UNITS       "Events"
            MAX-ACCESS  read-only
            STATUS      current
            DESCRIPTION
                    "The value of this object identifies the Network-
                    side nN4 maximum status enquires received value
                    for this UNI/NNI logical port.  If the logical
                    port is not performing network-side procedures or
                    is not performing LMI procedures, then this object
                    is not instantiated.

                    This object applies only to LMI and always has a
                    value of 5."
            REFERENCE   "LMI [24]"
            ::= { frMgtVCSigEntry 9 }

        frMgtVCSigNetnT3 OBJECT-TYPE
            SYNTAX      INTEGER (5 | 10 | 15 | 20 | 25 | 30)
            UNITS       "Seconds"
            MAX-ACCESS  read-only
            STATUS      current
            DESCRIPTION
                    "The value of this object identifies the Network-
                    side nT3 timer (for nN4 status enquires received)
                    value for this UNI/NNI logical port.  If the
                    logical port is not performing network-side
                    procedures or is not performing LMI procedures,
                    then this object is not instantiated.

                      This object applies only to LMI."
              REFERENCE   "LMI [24]"
              DEFVAL { 20 }
              ::= { frMgtVCSigEntry 10 }

        frMgtVCSigUserLinkRelErrors OBJECT-TYPE
            SYNTAX      Counter32
            UNITS       "Errors"
            MAX-ACCESS  read-only
            STATUS      current
            DESCRIPTION
                    "The number of user-side local in-channel
                    signaling link reliability errors (i.e., non-
                    receipt of Status/Status Enquiry messages or
                    invalid sequence numbers in a Link Integrity
                    Verification Information Element) for this UNI/NNI
                    logical port.  If the logical port is not
```

```
                    performing user-side procedures, then this object
                    is not instantiated."
            ::= { frMgtVCSigEntry 11 }

        frMgtVCSigUserProtErrors OBJECT-TYPE
            SYNTAX      Counter32
            UNITS       "Errors"
            MAX-ACCESS  read-only
            STATUS      current
            DESCRIPTION
                    "The number of user-side local in-channel
                    signaling protocol errors (i.e., protocol
                    discriminator, unnumbered information, message
                    type, call reference, and mandatory information
                    element errors) for this UNI/NNI logical port. If
                    the logical port is not performing user-side
                    procedures, then this object is not instantiated."
            ::= { frMgtVCSigEntry 12 }

      frMgtVCSigUserChanInactive OBJECT-TYPE
          SYNTAX      Counter32
          UNITS       "Events"
          MAX-ACCESS  read-only
          STATUS      current
          DESCRIPTION
                  "The number of times the user-side channel was
                  declared inactive (i.e., N392 errors in N393
                  events) for this UNI/NNI logical port. If the
                  logical port is not performing user-side
                  procedures, then this object is not instantiated."
          ::= { frMgtVCSigEntry 13 }

        frMgtVCSigNetLinkRelErrors OBJECT-TYPE
            SYNTAX      Counter32
            UNITS       "Errors"
            MAX-ACCESS  read-only
            STATUS      current
            DESCRIPTION
                    "The number of network-side local in-channel
                    signaling link reliability errors (i.e., non-
                    receipt of Status/Status Enquiry messages or
                    invalid sequence numbers in a Link Integrity
                    Verification Information Element) for this UNI/NNI
                    logical port."
            ::= { frMgtVCSigEntry 14 }

        frMgtVCSigNetProtErrors OBJECT-TYPE
            SYNTAX      Counter32
```

```
            UNITS       "Errors"
            MAX-ACCESS  read-only
            STATUS      current
            DESCRIPTION
                    "The number of network-side local in-channel
                    signaling protocol errors (i.e., protocol
                    discriminator, message type, call reference, and
                    mandatory information element errors) for this
                    UNI/NNI logical port."
            ::= { frMgtVCSigEntry 15 }

        frMgtVCSigNetChanInactive OBJECT-TYPE
            SYNTAX      Counter32
            UNITS       "Events"
            MAX-ACCESS  read-only
            STATUS      current
            DESCRIPTION
                    "The number of times the network-side channel was
                    declared inactive (i.e., N392 errors in N393
                    events) for this UNI/NNI logical port."
            ::= { frMgtVCSigEntry 16 }

        frMgtVCSigProcedAdmin OBJECT-TYPE
            SYNTAX      INTEGER {
                        u2nnet(1),
                        bidirect(2),
                        u2nuser(3)
                        }
            MAX-ACCESS  read-write
            STATUS      current
            DESCRIPTION
                    "The value of this object identifies the local
                    in-channel signaling procedural role that is used
                    for this UNI/NNI logical port.  Bidirectional
                    procedures implies that both user-side and
                    network-side procedural roles are used.

                    u2nnet(1)   Logical port operates user to network
                                procedure in the role of the network
                                side

                    bidirect(2) Logical port operates the
                                bidirectional procedure (both user
                                and network side roles)

                    u2nuser(3)  Logical port operates user to network
                                procedure in the role of the user
                                side"
```

```
            REFERENCE   "Q.933 Annex A [22],
                         T1.617 Annex D [17]"
            DEFVAL { u2nnet }
            ::= { frMgtVCSigEntry 17 }

        frMgtVCSigUserN391Admin OBJECT-TYPE
            SYNTAX      INTEGER (1..255)
            UNITS       "Polls"
            MAX-ACCESS  read-write
            STATUS      current
            DESCRIPTION
                    "The value of this object identifies the desired
                    User-side N391 full status polling cycle value for
                    this UNI/NNI logical port.  If the logical port is
                    not performing user-side (bidirectional)
                    procedures, then this object is not instantiated."
            REFERENCE   "Q.933 Annex A [22],
                         T1.617 Annex D [17]"
            ::= { frMgtVCSigEntry 18 }

        frMgtVCSigUserN392Admin OBJECT-TYPE
            SYNTAX      INTEGER (1..10)
            UNITS       "Events"
            MAX-ACCESS  read-write
            STATUS      current
            DESCRIPTION
                    "The value of this object identifies the desired
                    User-side N392 error threshold value for this
                    UNI/NNI logical port.  If the logical port is not
                    performing user-side (bidirectional) procedures,
                    then this object is not instantiated."
            REFERENCE   "Q.933 Annex A [22],
                         T1.617 Annex D [17]"
            ::= { frMgtVCSigEntry 19 }

        frMgtVCSigUserN393Admin OBJECT-TYPE
            SYNTAX      INTEGER (1..10)
            UNITS       "Events"
            MAX-ACCESS  read-write
            STATUS      current
            DESCRIPTION
                    "The value of this object identifies the desired
                    User-side N393 monitored events count value for
                    this UNI/NNI logical port.  If the logical port is
                    not performing user-side (bidirectional)
                    procedures, then this object is not instantiated."
            REFERENCE   "Q.933 Annex A [22],
                         T1.617 Annex D [17]"
```

```
            ::= { frMgtVCSigEntry 20 }

        frMgtVCSigUserT391Admin OBJECT-TYPE
            SYNTAX      INTEGER (5..30)
            UNITS       "Seconds"
            MAX-ACCESS  read-write
            STATUS      current
            DESCRIPTION
                    "The value of this object identifies the desired
                    User-side T391 link integrity verification polling
                    timer value for this UNI/NNI logical port.  If the
                    logical port is not performing user-side
                    procedures, then this object is not instantiated."
            REFERENCE   "Q.933 Annex A [22],
                         T1.617 Annex D [17]"
            ::= { frMgtVCSigEntry 21 }

        frMgtVCSigNetN392Admin OBJECT-TYPE
            SYNTAX      INTEGER (1..10)
            UNITS       "Events"
            MAX-ACCESS  read-write
            STATUS      current
            DESCRIPTION
                    "The value of this object identifies the desired
                    Network-side N392 error threshold value (nN2 for
                    LMI) for this UNI/NNI logical port.  If the
                    logical port is not performing network-side
                    procedures, then this object is not instantiated."
            REFERENCE   "Q.933 Annex A [22],
                         T1.617 Annex D [17],
                         LMI [24]"
            ::= { frMgtVCSigEntry 22 }

        frMgtVCSigNetN393Admin OBJECT-TYPE
            SYNTAX      INTEGER (1..10)
            UNITS       "Events"
            MAX-ACCESS  read-write
            STATUS      current
            DESCRIPTION
                    "The value of this object identifies the desired
                    Network-side N393 monitored events count value
                    (nN3 for LMI) for this UNI/NNI logical port.  If
                    the logical port is not performing network-side
                    procedures, then this object is not instantiated."
            REFERENCE   "Q.933 Annex A [22],
                         T1.617 Annex D [17],
                         LMI [24]"
            ::= { frMgtVCSigEntry 23 }
```

```
        frMgtVCSigNetT392Admin OBJECT-TYPE
            SYNTAX      INTEGER (5..30)
            UNITS       "Seconds"
            MAX-ACCESS  read-write
            STATUS      current
            DESCRIPTION
                    "The value of this object identifies the desired
                    Network-side T392 polling verification timer value
                    (nT2 for LMI)  for this UNI/NNI logical port. If
                    the logical port is not performing network-side
                    procedures, then this object is not instantiated."
            REFERENCE   "Q.933 Annex A [22],
                         T1.617 Annex D [17],
                         LMI [24]"
            ::= { frMgtVCSigEntry 24 }

        frMgtVCSigNetnT3Admin OBJECT-TYPE
            SYNTAX      INTEGER (5 | 10 | 15 | 20 | 25 | 30)
            UNITS       "Seconds"
            MAX-ACCESS  read-write
            STATUS      current
            DESCRIPTION
                    "The value of this object identifies the desired
                    Network-side nT3 timer (for nN4 status enquires
                    received) value for this UNI/NNI logical port. If
                    the logical port is not performing network-side
                    procedures or is not performing LMI procedures,
                    then this object is not instantiated.  This object
                    applies only to LMI."
            REFERENCE   "LMI [24]"
            ::= { frMgtVCSigEntry 25 }

        --
        -- Frame Relay PVC End-points
        --

        frPVCEndptTable OBJECT-TYPE
            SYNTAX      SEQUENCE OF FrPVCEndptEntry
            MAX-ACCESS  not-accessible
            STATUS      current
            DESCRIPTION
                    "The Frame Relay PVC End-Point table.  This table
                    is used to model a PVC end-point.  This table
                    contains the traffic parameters and statistics for
                    a PVC end-point.

                    This table is used to identify the traffic
                    parameters for a bi-directional PVC segment end-
```

point, and it also provides statistics for a PVC segment end-point.

A PVC segment end-point is identified by a UNI/NNI logical port index value and DLCI index value.

If the frame relay service provider allows the frame relay CNM subscriber to create, modify or delete PVCs using SNMP, then this table is used to identify and reserve the requested traffic parameters of each PVC segment end-point. The Connection table is used to 'connect' the end-points together. Not all implementations will support the capability of creating/modifying/deleting PVCs using SNMP as a feature of frame relay CNM service.

Uni-directional PVCs are modeled with zero valued traffic parameters in one of the directions (In or Out direction) in this table.

To create a PVC, the following procedures shall be followed:

1) Create the entries for the PVC segment endpoints in the frPVCEndptTable by specifying the traffic parameters for the bi-directional PVC segment endpoints. As shown in figure 2, a point-to-point PVC has two endpoints, thus two entries in this table. Uni-directional PVCs are modeled with zero valued traffic parameters in one direction; all the 'In' direction parameters for one frame relay PVC End-point or all the 'Out' direction parameters for the other frame relay PVC Endpoint.

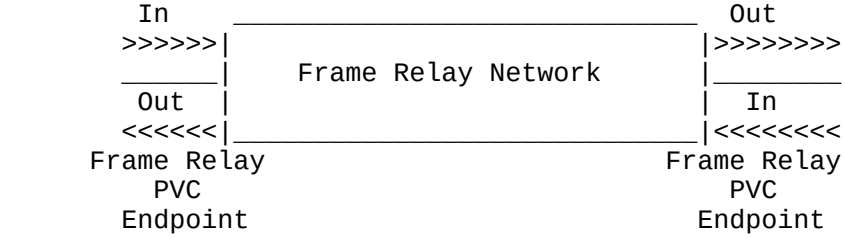


Figure 2, PVC Terminology

```
                2)  Go to the Frame Relay Connection Group."
        ::= { frnetservObjects 3 }

    frPVCEndptEntry OBJECT-TYPE
        SYNTAX      FrPVCEndptEntry
        MAX-ACCESS  not-accessible
        STATUS      current
        DESCRIPTION
                "An entry in the Frame Relay PVC Endpoint table."
        INDEX   { ifIndex, frPVCEndptDLCIIndex }
        ::= { frPVCEndptTable 1 }

    FrPVCEndptEntry ::=
        SEQUENCE {
            frPVCEndptDLCIIndex            Integer32,
            frPVCEndptInMaxFrameSize       Integer32,
            frPVCEndptInBc                 Integer32,
            frPVCEndptInBe                 Integer32,
            frPVCEndptInCIR                Integer32,
            frPVCEndptOutMaxFrameSize      Integer32,
            frPVCEndptOutBc                Integer32,
            frPVCEndptOutBe                Integer32,
            frPVCEndptOutCIR               Integer32,
            frPVCEndptConnectIdentifier    Integer32,
            frPVCEndptRowStatus            RowStatus,
            frPVCEndptRcvdSigStatus        INTEGER,
            frPVCEndptInFrames             Counter32,
            frPVCEndptOutFrames            Counter32,
            frPVCEndptInDEFrames           Counter32,
            frPVCEndptInExcessFrames       Counter32,
            frPVCEndptOutExcessFrames      Counter32,
            frPVCEndptInDiscards           Counter32,
            frPVCEndptInOctets             Counter32,
            frPVCEndptOutOctets            Counter32,
            frPVCEndptInDiscardsDESet      Counter32,
            frPVCEndptInFramesFECNSet      Counter32,
            frPVCEndptOutFramesFECNSet     Counter32,
            frPVCEndptInFramesBECNSet      Counter32,
            frPVCEndptOutFramesBECNSet     Counter32,
            frPVCEndptInCongDiscards       Counter32,
            frPVCEndptInDECongDiscards     Counter32,
            frPVCEndptOutCongDiscards      Counter32,
            frPVCEndptOutDECongDiscards    Counter32,
            frPVCEndptOutDEFrames          Counter32,
            frPVCEndptAtmIwfConnIndex      Integer32

        }
```

```
        frPVCEndptDLCIIndex OBJECT-TYPE
            SYNTAX      Integer32 (16..4194303)
            MAX-ACCESS  not-accessible
            STATUS      current
            DESCRIPTION
                    "The value of this object is equal to the DLCI
                    value for this PVC end-point.

                    The values are restricted to the legal range for
                    the size of address field supported by the logical
                    port (frLportAddrDLCILen)."
            REFERENCE   "Q.922 [25]"
            ::= { frPVCEndptEntry 1 }

        frPVCEndptInMaxFrameSize OBJECT-TYPE
            SYNTAX      Integer32 (1..4096)
            UNITS       "Octets"
            MAX-ACCESS  read-create
            STATUS      current
            DESCRIPTION
                    "The value of this object is the size in octets of
                    the largest frame relay information field for this
                    PVC end-point in the ingress direction (into the
                    frame relay network).  The value of
                    frPVCEndptInMaxFrameSize must be less than or
                    equal to the corresponding ifMtu for this frame
                    relay UNI/NNI logical port."
            REFERENCE   "FRF.1 [31]
                         Q.922 [25]
                         Q.933 [22]"
            DEFVAL { 1600 }
            ::= { frPVCEndptEntry 2 }

        frPVCEndptInBc OBJECT-TYPE
            SYNTAX      Integer32 (1..2147483647)
            UNITS       "Bits"
            MAX-ACCESS  read-create
            STATUS      current
            DESCRIPTION
                    "The value of this object is equal to the
                    committed burst size (Bc) parameter (measured in
                    bits) for this PVC end-point in the ingress
                    direction (into the frame relay network).

                    Note that the max value of this range is lower
                    than the max value allowed by Q.933 (16383 *
                    10**6).
```

```
                    Note that the value is encoded in bits whilst the
                    Q.933 Link layer core parameters information
                    element encodes this information using octet
                    units."
            REFERENCE   "Q.933 [22]"
            ::= { frPVCEndptEntry 3 }

        frPVCEndptInBe OBJECT-TYPE
            SYNTAX      Integer32 (1..2147483647)
            UNITS       "Bits"
            MAX-ACCESS  read-create
            STATUS      current
            DESCRIPTION
                    "The value of this object is equal to the excess
                    burst size (Be) parameter (measured in bits) for
                    this PVC end-point in the ingress direction (into
                    the frame relay network).

                    Note that the max value of this range is lower
                    than the max value allowed by Q.933 (16383 *
                    10**6).

                    Note that the value is encoded in bits whilst the
                    Q.933 Link layer core parameters information
                    element encodes this information using octet
                    units."
            REFERENCE   "Q.933 [22]"
            ::= { frPVCEndptEntry 4 }

        frPVCEndptInCIR OBJECT-TYPE
            SYNTAX      Integer32 (1..2147483647)
            UNITS       "Bits per Second"
            MAX-ACCESS  read-create
            STATUS      current
            DESCRIPTION
                    "The value of this object is equal to the
                    committed information rate (CIR) parameter
                    (measured in bits per second) for this PVC end-
                    point in the ingress direction (into the frame
                    relay network).

                    Note that the max value of this range is lower
                    than the max value allowed by Q.933 (2047 *
                    10**6)."
            REFERENCE   "Q.933 [22]"
            ::= { frPVCEndptEntry 5 }

        frPVCEndptOutMaxFrameSize OBJECT-TYPE
```

```
            SYNTAX      Integer32 (1..4096)
            UNITS       "Octets"
            MAX-ACCESS  read-create
            STATUS      current
            DESCRIPTION
                    "The value of this object is the size in octets of
                    the largest frame relay information field for this
                    PVC end-point in the egress direction (out of the
                    frame relay network).  The value of
                    frPVCEndptOutMaxFrameSize must be less than or
                    equal to the corresponding ifMtu for this frame
                    relay UNI/NNI logical port."
            REFERENCE   "FRF.1 [31]
                         Q.922 [25]
                         Q.933 [22]"
            DEFVAL { 1600 }
            ::= { frPVCEndptEntry 6 }

        frPVCEndptOutBc OBJECT-TYPE
            SYNTAX      Integer32 (1..2147483647)
            UNITS       "Bits"
            MAX-ACCESS  read-create
            STATUS      current
            DESCRIPTION
                    "The value of this object is equal to the
                    committed burst size (Bc) parameter (measured in
                    bits) for this PVC end-point in the egress
                    direction (out of the frame relay network).

                    Note that the max value of this range is lower
                    than the max value allowed by Q.933 (16383 *
                    10**6).

                    Note that the value is encoded in bits whilst the
                    Q.933 Link layer core parameters information
                    element encodes this information using octet
                    units."
            REFERENCE   "Q.933 [22]"
            ::= { frPVCEndptEntry 7 }

        frPVCEndptOutBe OBJECT-TYPE
            SYNTAX      Integer32 (1..2147483647)
            UNITS       "Bits"
            MAX-ACCESS  read-create
            STATUS      current
            DESCRIPTION
                    "The value of this object is equal to the excess
                    burst size (Be) parameter (measured in bits) for
```

```
                this PVC end-point in the egress direction (out of
                the frame relay network).

                Note that the max value of this range is lower
                than the max value allowed by Q.933 (16383 *
                10**6).

                Note that the value is encoded in bits whilst the
                Q.933 Link layer core parameters information
                element encodes this information using octet
                units."
        REFERENCE   "Q.933 [22]"
        ::= { frPVCEndptEntry 8 }

    frPVCEndptOutCIR OBJECT-TYPE
        SYNTAX      Integer32 (1..2147483647)
        UNITS       "Bits per Second"
        MAX-ACCESS  read-create
        STATUS      current
        DESCRIPTION
                "The value of this object is equal to the
                committed information rate (CIR) parameter
                (measured in bits per second) for this PVC end-
                point in the egress direction (out of the frame
                relay network).

                Note that the max value of this range is lower
                than the max value allowed by Q.933 (2047 *
                10**6)."
        REFERENCE   "Q.933 [22]"
        ::= { frPVCEndptEntry 9 }

    frPVCEndptConnectIdentifier OBJECT-TYPE
        SYNTAX      Integer32 (0..2147483647)
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
                "This object is used to associate PVC end-points
                as being part of one PVC segment connection. This
                value of this object is equal to the value of
                frPVCConnectIndex, which is used as one of the
                indices into the frPVCConnectTable.

                A connection that has been cross-connected via the
                FR/ATM PVC Service IWF cross-connect table will
                return the value zero when this object is read. In
                case of these interworked connections, the
                frPVCEndptAtmIwfConnIndex object must be accessed
```

```
                    to select the entry in the FR/ATM PVC Service IWF
                    cross-connect table.

                    The value of this object is provided by the agent,
                    after the associated entries in the
                    frPVCConnectTable or frAtmIwfConnectionTable have
                    been created."
            ::= { frPVCEndptEntry 10 }

        frPVCEndptRowStatus OBJECT-TYPE
            SYNTAX      RowStatus
            MAX-ACCESS  read-create
            STATUS      current
            DESCRIPTION
                    "This object is used to create new rows in this
                    table, modify existing rows, and to delete
                    existing rows.  To create a new PVC, the entries
                    for the PVC segment end-points in the
                    frPVCEndptTable must first be created.  Next, the
                    frPVCConnectTable is used to associate the frame
                    relay PVC segment end-points.  In order for the
                    manager to have the necessary error diagnostics,
                    the frPVCEndptRowStatus object must initially be
                    set to 'createAndWait(5)'.  While the
                    frPVCEndptRowStatus object is in the
                    'createAndWait(5)' state, the manager can set each
                    columnar object and get the necessary error
                    diagnostics.  The frPVCEndptRowStatus object may
                    not be set to 'active(1)' unless the following
                    columnar objects exist in this row:
                    frPVCEndptInMaxFrameSize, frPVCEndptInBc,
                    frPVCEndptInBe, frPVCEndptInCIR,
                    frPVCEndptOutMaxFrameSize, frPVCEndptOutBc,
                    frPVCEndptOutBe, and frPVCEndptOutCIR."
            ::= { frPVCEndptEntry 11 }

        frPVCEndptRcvdSigStatus OBJECT-TYPE
            SYNTAX      INTEGER {
                        deleted(1),
                        active(2),
                        inactive(3),
                        none(4)
                        }
            MAX-ACCESS  read-only
            STATUS      current
            DESCRIPTION
                    "The value of this object identifies the PVC
                    status received via the local in-channel signaling
```

```
                    procedures for this PVC end-point.  This object is
                    only pertinent for interfaces that perform the
                    bidirectional procedures.

                    Each value has the following meaning:
                      deleted(1):  This PVC is not listed in the full
                                   status reports received from the
                                   user device.  The object retains
                                   this value for as long as the PVC
                                   is not listed in the full status
                                   reports

                    active(2):   This PVC is reported as active, or
                                   operational, by the user device.

                      inactive(3): This PVC is reported as inactive,
                                   or non-operational, by the user
                                   device.

                      none(4):     This interface is only using the
                                   network-side in-channel signaling
                                   procedures, so this object does
                                   not apply."
            ::= { frPVCEndptEntry 12 }

        frPVCEndptInFrames OBJECT-TYPE
            SYNTAX      Counter32
            UNITS       "Frames"
            MAX-ACCESS  read-only
            STATUS      current
            DESCRIPTION
                    "The number of frames received by the network
                    (ingress) for this PVC end-point. This includes
                    any frames discarded by the network due to
                    submitting more than Bc + Be data or due to any
                    network congestion recovery procedures."
            ::= { frPVCEndptEntry 13 }

        frPVCEndptOutFrames OBJECT-TYPE
            SYNTAX      Counter32
            UNITS       "Frames"
            MAX-ACCESS  read-only
            STATUS      current
            DESCRIPTION
                    "The number of frames sent by the network (egress)
                    regardless of whether they are Bc or Be frames for
                    this PVC end-point."
            ::= { frPVCEndptEntry 14 }
```

```
        frPVCEndptInDEFrames OBJECT-TYPE
            SYNTAX      Counter32
            UNITS       "Frames"
            MAX-ACCESS  read-only
            STATUS      current
            DESCRIPTION
                    "The number of frames received by the network
                    (ingress) with the DE bit set to (1) for this PVC
                    end-point."
            ::= { frPVCEndptEntry 15 }

        frPVCEndptInExcessFrames OBJECT-TYPE
            SYNTAX      Counter32
            UNITS       "Frames"
            MAX-ACCESS  read-only
            STATUS      current
            DESCRIPTION
                    "The number of frames received by the network
                    (ingress) for this PVC end-point which were
                    treated as excess traffic.  Frames which are sent
                    to the network with DE set to zero are treated as
                    excess when more than Bc bits are submitted to the
                    network during the Committed Information Rate
                    Measurement Interval (Tc).  Excess traffic may or
                    may not be discarded at the ingress if more than
                    Bc + Be bits are submitted to the network during
                    Tc.  Traffic discarded at the ingress is not
                    recorded in frPVCEndptInExcessFrames.  Frames
                    which are sent to the network with DE set to one
                    are also treated as excess traffic."
            ::= { frPVCEndptEntry 16 }

        frPVCEndptOutExcessFrames OBJECT-TYPE
            SYNTAX      Counter32
            UNITS       "Frames"
            MAX-ACCESS  read-only
            STATUS      current
            DESCRIPTION
                    "The number of frames sent by the network (egress)
                    for this PVC end-point which were treated as
                    excess traffic.  (The DE bit may be set to one.)"
            ::= { frPVCEndptEntry 17 }

        frPVCEndptInDiscards OBJECT-TYPE
            SYNTAX      Counter32
            UNITS       "Frames"
            MAX-ACCESS  read-only
            STATUS      current
```

```
            DESCRIPTION
                    "The number of frames received by the network
                    (ingress) that were discarded due to traffic
                    enforcement for this PVC end-point.  Congestion
                    discards are not counted in this object."
            ::= { frPVCEndptEntry 18 }

        frPVCEndptInOctets OBJECT-TYPE
            SYNTAX      Counter32
            UNITS       "Octets"
            MAX-ACCESS  read-only
            STATUS      current
            DESCRIPTION
                    "The number of octets received by the network
                    (ingress) for this PVC end-point.  This counter
                    should only count octets from the beginning of the
                    frame relay header field to the end of user data.
                    If the network supporting frame relay can not
                    count octets, then this count should be an
                    approximation."
            ::= { frPVCEndptEntry 19 }

        frPVCEndptOutOctets OBJECT-TYPE
            SYNTAX      Counter32
            UNITS       "Octets"
            MAX-ACCESS  read-only
            STATUS      current
            DESCRIPTION
                    "The number of octets sent by the network (egress)
                    for this PVC end-point.  This counter should only
                    count octets from the beginning of the frame relay
                    header field to the end of user data.  If the
                    network supporting frame relay can not count
                    octets, then this count should be an
                    approximation."
            ::= { frPVCEndptEntry 20 }

        frPVCEndptInDiscardsDESet OBJECT-TYPE
            SYNTAX      Counter32
            UNITS       "Frames"
            MAX-ACCESS  read-only
            STATUS      current
            DESCRIPTION
                    "The number of frames received by the network
                    (ingress) that were discarded with the DE bit set
                    due to traffic enforcement for this PVC end-point.
                    Congestion discards are not counted in this
                    object."
```

```
            ::= { frPVCEndptEntry 21 }

        frPVCEndptInFramesFECNSet OBJECT-TYPE
            SYNTAX      Counter32
            UNITS       "Frames"
            MAX-ACCESS  read-only
            STATUS      current
            DESCRIPTION
                    "The number of frames received by the network
                    (ingress) that have the FECN bit set for this PVC
                    end-point."
            ::= { frPVCEndptEntry 22 }

        frPVCEndptOutFramesFECNSet OBJECT-TYPE
            SYNTAX      Counter32
            UNITS       "Frames"
            MAX-ACCESS  read-only
            STATUS      current
            DESCRIPTION
                    "The number of frames sent by the network (egress)
                    that have the FECN bit set for this PVC end-
                    point."
            ::= { frPVCEndptEntry 23 }

        frPVCEndptInFramesBECNSet OBJECT-TYPE
            SYNTAX      Counter32
            UNITS       "Frames"
            MAX-ACCESS  read-only
            STATUS      current
            DESCRIPTION
                    "The number of frames received by the network
                    (ingress) that have the BECN bit set for this PVC
                    end-point."
            ::= { frPVCEndptEntry 24 }

        frPVCEndptOutFramesBECNSet OBJECT-TYPE
            SYNTAX      Counter32
            UNITS       "Frames"
            MAX-ACCESS  read-only
            STATUS      current
            DESCRIPTION
                    "The number of frames sent by the network (egress)
                    that have the BECN bit set for this PVC end-
                    point."
            ::= { frPVCEndptEntry 25 }

        frPVCEndptInCongDiscards OBJECT-TYPE
            SYNTAX      Counter32
```

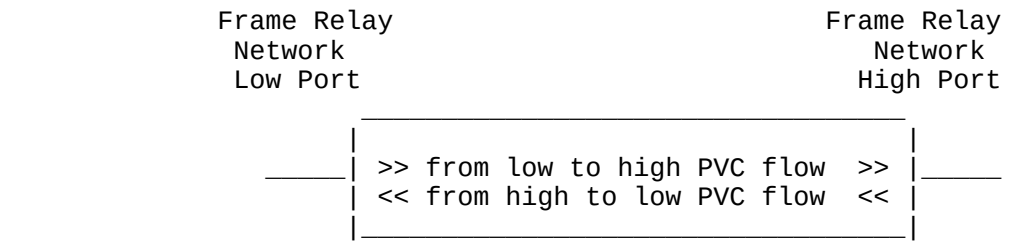
```
            UNITS       "Frames"
            MAX-ACCESS  read-only
            STATUS      current
            DESCRIPTION
                    "The number of frames received by the network
                    (ingress) that were discarded due to input buffer
                    congestion, rather than traffic enforcement, for
                    this PVC end-point."
            ::= { frPVCEndptEntry 26 }

        frPVCEndptInDECongDiscards OBJECT-TYPE
            SYNTAX      Counter32
            UNITS       "Frames"
            MAX-ACCESS  read-only
            STATUS      current
            DESCRIPTION
                    "The number of frames counted by
                    frPVCEndptInCongDiscards with the DE bit set to
                    (1)."
            ::= { frPVCEndptEntry 27 }

        frPVCEndptOutCongDiscards OBJECT-TYPE
            SYNTAX      Counter32
            UNITS       "Frames"
            MAX-ACCESS  read-only
            STATUS      current
            DESCRIPTION
                    "The number of frames sent by the network (egress)
                    that were discarded due to output buffer
                    congestion for this PVC end-point."
            ::= { frPVCEndptEntry 28 }

        frPVCEndptOutDECongDiscards OBJECT-TYPE
            SYNTAX      Counter32
            UNITS       "Frames"
            MAX-ACCESS  read-only
            STATUS      current
            DESCRIPTION
                    "The number of frames counted by
                    frPVCEndptOutCongDiscards with the DE bit set to
                    (1)."
            ::= { frPVCEndptEntry 29 }

        frPVCEndptOutDEFrames OBJECT-TYPE
            SYNTAX      Counter32
            UNITS       "Frames"
            MAX-ACCESS  read-only
            STATUS      current
```

```
            DESCRIPTION
                    "The number of frames sent by the network (egress)
                    with the DE bit set to (1) for this PVC end-
                    point."
            ::= { frPVCEndptEntry 30 }

        frPVCEndptAtmIwfConnIndex OBJECT-TYPE
            SYNTAX      Integer32  (0..2147483647)
            MAX-ACCESS  read-only
            STATUS      current
            DESCRIPTION
                    "This object contains the index value of the
                    FR/ATM cross-connect table entry used to link the
                    frame relay PVC with an ATM PVC.

                    Each row of the frPVCEndptTable that is not
                    cross-connected with an ATM PVC must return the
                    value zero when this object is read.

                    The value of this object is initialized by the
                    agent after the associated entries in the
                    frAtmIwfConnectionTable have been created.

                    The value of this object is reset to zero
                    following destruction of the associated entry in
                    the frAtmIwfConnectionTable"
            ::= { frPVCEndptEntry 31 }

        --
        -- Frame Relay PVC Connections
        --

        frPVCConnectIndexValue OBJECT-TYPE
            SYNTAX      INTEGER (0..2147483647)
            MAX-ACCESS  read-only
            STATUS      current
            DESCRIPTION
                    "This object returns a hint to be used for
                    frPVCConnectIndex when creating entries in the
                    frPVCConnectTable.

                    The value 0 indicates that no unassigned entries
                    are available.

                    To obtain the frPVCConnectIndex 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 must
```

```
                    modify the value to the next unassigned index to
                    prevent assignment of the same value to multiple
                    management systems.

                    A management system should repeat the read to
                    obtain a new value should an attempt to create the
                    new row using the previously returned hint fail."
            ::= { frnetservObjects 4 }

        frPVCConnectTable OBJECT-TYPE
            SYNTAX      SEQUENCE OF FrPVCConnectEntry
            MAX-ACCESS  not-accessible
            STATUS      current
            DESCRIPTION
                    "The Frame Relay PVC Connect Table is used to
                    model the bi-directional PVC segment flows
                    including:  point-to-point PVCs, point-to-
                    multipoint PVCs, and multipoint-to-multipoint
                    PVCs.

                    This table has read-create access and is used to
                    associate PVC end-points together as belonging to
                    one connection.  The frPVCConnectIndex is used to
                    associate all the bi-directional flows.  Not all
                    implementations will support the capability of
                    creating/modifying/deleting PVCs using SNMP as a
                    feature of frame relay CNM service.

                    Once the entries in the frPVCEndptTable are
                    created, the following step are used to associate
                    the PVC end-points as belonging to one PVC
                    connection:

                    1)  Obtain a unique frPVCConnectIndex
                        using the frPVCConnectIndexValue object.

                    2)  Connect the PVC segment endpoints together
                        with the applicable frPVCConnectIndex value
                        obtained via  frPVCConnectIndexValue.  The
                        entries in this table are created by using
                        the frPVCConnectRowStatus object.

                    3)  The agent will provide the value of the
                        corresponding instances of
                        frPVCEndptConnectIdentifier with the
                        frPVCConnectIndex value.

                    4)  Set frPVCConnectAdminStatus to 'active(1)' in
```

all rows for this PVC segment to turn the PVC on.

For example, the Frame Relay PVC Connection Group models a bi-directional, point-to-point PVC segment as one entry in this table.



The terms low and high are chosen to represent numerical ordering of a PVC segment's endpoints for representation in this table. That is, the endpoint with the lower value of ifIndex is termed 'low', while the opposite endpoint of the segment is termed 'high'. This terminology is to provide directional information; for example the frPVCConnectL2hOperStatus and frPVCConnectH2lOperStatus as illustrated above.

If the Frame Relay Connection table is used to model a unidirectional PVC, then one direction (either from low to high or from high to low) has its Operational Status equal to down.

A PVC segment is a portion of a PVC that traverses one Frame Relay Network, and a PVC segment is identified by its two end-points (UNI/NNI logical port index value and DLCI index value) through one Frame Relay Network."

```
    ::= { frnetservObjects 5 }

frPVCConnectEntry OBJECT-TYPE
    SYNTAX      FrPVCConnectEntry
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
            "An entry in the Frame Relay PVC Connect table.
            This entry is used to model a PVC segment in two
            directions."
    INDEX { frPVCConnectIndex,
            frPVCConnectLowIfIndex,
```

```
                frPVCConnectLowDLCIIndex,
                frPVCConnectHighIfIndex,
                frPVCConnectHighDLCIIndex }
        ::= { frPVCConnectTable 1 }

    FrPVCConnectEntry ::=
        SEQUENCE {
            frPVCConnectIndex           Integer32,
            frPVCConnectLowIfIndex      InterfaceIndex,
            frPVCConnectLowDLCIIndex    Integer32,
            frPVCConnectHighIfIndex     InterfaceIndex,
            frPVCConnectHighDLCIIndex   Integer32,
            frPVCConnectAdminStatus     INTEGER,
            frPVCConnectL2hOperStatus   INTEGER,
            frPVCConnectH2lOperStatus   INTEGER,
            frPVCConnectL2hLastChange   TimeStamp,
            frPVCConnectH2lLastChange   TimeStamp,
            frPVCConnectRowStatus       RowStatus,
            frPVCConnectUserName        SnmpAdminString,
            frPVCConnectProviderName    SnmpAdminString
    }

      frPVCConnectIndex OBJECT-TYPE
          SYNTAX      Integer32 (0..2147483647)
          MAX-ACCESS  not-accessible
          STATUS      current
          DESCRIPTION
                  "The value of this object is equal to the
                  frPVCConnectIndexValue obtained to uniquely
                  identify this PVC segment connection."
          ::= { frPVCConnectEntry 1 }

    frPVCConnectLowIfIndex OBJECT-TYPE
        SYNTAX      InterfaceIndex
        MAX-ACCESS  not-accessible
        STATUS      current
        DESCRIPTION
                "The value of this object is equal to IF-MIB
                ifIndex value of the UNI/NNI logical port for this
                PVC segment.  The term low implies that this PVC
                segment end-point has the numerically lower
                ifIndex value than the connected/associated PVC
                segment end-point.

                RFC 1604 permitted a zero value for this object to
                identify termination at a non-frame relay
                interface.  However, this cross-connect table is
                limited to frame relay connections.  See the frame
```

```
                relay/ATM IWF MIB [28] for the cross-connect table
                used for those types of connections."
        ::= { frPVCConnectEntry 2 }

    frPVCConnectLowDLCIIndex OBJECT-TYPE
        SYNTAX      Integer32 (16..4194303)
        MAX-ACCESS  not-accessible
        STATUS      current
        DESCRIPTION
                "The value of this object is equal to the DLCI
                value for this end-point of the PVC segment."
        REFERENCE   "Q.922 [25]"
        ::= { frPVCConnectEntry 3 }

    frPVCConnectHighIfIndex OBJECT-TYPE
        SYNTAX      InterfaceIndex
        MAX-ACCESS  not-accessible
        STATUS      current
        DESCRIPTION
                "The value of this object is equal to IF-MIB
                ifIndex value for the UNI/NNI logical port for
                this PVC segment.  The term high implies that this
                PVC segment end-point has the numerically higher
                ifIndex value than the connected/associated PVC
                segment end-point."
        ::= { frPVCConnectEntry 4 }

    frPVCConnectHighDLCIIndex OBJECT-TYPE
        SYNTAX      Integer32 (16..4194303)
        MAX-ACCESS  not-accessible
        STATUS      current
        DESCRIPTION
                "The value of this object is equal to the egress
                DLCI value for this end-point of the PVC segment."
        REFERENCE   "Q.922 [25]"
        ::= { frPVCConnectEntry 5 }

    frPVCConnectAdminStatus OBJECT-TYPE
        SYNTAX      INTEGER {
                    active(1),
                    inactive(2),
                    testing(3)
                    }
        MAX-ACCESS  read-create
        STATUS      current
        DESCRIPTION
                "The value of this object identifies the desired
                administrative status of this bi-directional PVC
```

```
                segment.  The active(1) state means the PVC
                segment is currently operational; the inactive(2)
                state means the PVC segment is currently not
                operational; the testing(3) state means the PVC
                segment is currently undergoing a test.  This
                state is set by an administrative entity.  This
                value affects the PVC status indicated across the
                ingress NNI/UNI of both end-points of the bi-
                directional PVC segment.  When a PVC segment
                connection is created using this table, this
                object is initially set to 'inactive(2)'.  After
                the frPVCConnectRowStatus object is set to
                'active(1)' (and the corresponding/associated
                entries in the frPVCEndptTable have their
                frPVCEndptRowStatus object set to 'active(1)'),
                the frPVCConnectAdminStatus object may be set to
                'active(1)' to turn on the PVC segment
                connection."
        ::= { frPVCConnectEntry 6 }

    frPVCConnectL2hOperStatus OBJECT-TYPE
        SYNTAX      INTEGER {
                    active(1),
                    inactive(2),
                    testing(3),
                    unknown(4)
                    }
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
                "The value of this object identifies the current
                operational status of the PVC segment connection
                in one direction; (i.e., in the low to high
                direction). This value affects the PVC status
                indicated across the ingress NNI/UNI (low side) of
                the PVC segment.

                The values mean:

                active(1)   - PVC is currently operational

                inactive(2) - PVC is currently not operational.
                              This may be because of an underlying
                              LMI or DS1 failure.

                testing(3)  - PVC is currently undergoing a test.
                              This may be because of an underlying
                              frLport or DS1 undergoing a test.
```

```
                unknown(4)  - the status of the PVC currently can
                              not be determined."
        ::= { frPVCConnectEntry 7 }

    frPVCConnectH2lOperStatus OBJECT-TYPE
        SYNTAX      INTEGER {
                    active(1),
                    inactive(2),
                    testing(3),
                    unknown(4)
                    }
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
                "The value of this object identifies the current
                operational status of the PVC segment connection
                in one direction; (i.e., in the high to low
                direction)..  This value affects the PVC status
                indicated across the ingress NNI/UNI (high side)
                of the PVC segment.

                The values mean:

                active(1)   - PVC is currently operational

                inactive(2) - PVC is currently not operational.
                              This may be because of an underlying
                              LMI or DS1 failure.

                testing(3)  - PVC is currently undergoing a test.
                              This may be because of an underlying
                              frLport or DS1 undergoing a test.

                unknown(4)  - the status of the PVC currently can
                              not be determined."
        ::= { frPVCConnectEntry 8 }

    frPVCConnectL2hLastChange OBJECT-TYPE
        SYNTAX      TimeStamp
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
                "The value of the Interface MIB's sysUpTime object
                at the time this PVC segment entered its current
                operational state in the low to high direction.
                If the current state was entered prior to the last
                re-initialization of the FRS agent, then this
                object contains a zero value."
```

```
            ::= { frPVCConnectEntry 9 }

        frPVCConnectH2lLastChange OBJECT-TYPE
            SYNTAX      TimeStamp
            MAX-ACCESS  read-only
            STATUS      current
            DESCRIPTION
                    "The value of the Interface MIB's sysUpTime object
                    at the time this PVC segment entered its current
                    operational state in the high to low direction.
                    If the current state was entered prior to the last
                    re-initialization of the FRS agent, then this
                    object contains a zero value."
            ::= { frPVCConnectEntry 10 }

        frPVCConnectRowStatus OBJECT-TYPE
            SYNTAX      RowStatus
            MAX-ACCESS  read-create
            STATUS      current
            DESCRIPTION
                    "The status of this entry in the
                    frPVCConnectTable.  This variable is used to
                    create new connections for the PVC end-points and
                    to change existing connections of the PVC end-
                    points.  This object must be initially set to
                    'createAndWait(5)'. In this state, the agent
                    checks the parameters in the associated entries in
                    the frPVCEndptTable to verify that the PVC end-
                    points can be connected (i.e., the In parameters
                    for one PVC end-point are equal to the Out
                    parameters for the other PVC end-point).  This
                    object can not be set to 'active(1)' unless the
                    following columnar object exists in this row:
                    frPVCConnectAdminStatus.  The agent also supplies
                    the associated value of frPVCConnectIndex for the
                    frPVCEndptConnectIdentifier instances.  To turn on
                    a PVC segment connection, the
                    frPVCConnectAdminStatus is set to 'active(1)'."
            ::= { frPVCConnectEntry 11 }

        frPVCConnectUserName OBJECT-TYPE
            SYNTAX      SnmpAdminString
            MAX-ACCESS  read-create
            STATUS      current
            DESCRIPTION
                    "This is a service user assigned textual
                    representation of a PVC."
            ::= { frPVCConnectEntry 12 }
```

```
        frPVCConnectProviderName OBJECT-TYPE
            SYNTAX      SnmpAdminString
            MAX-ACCESS  read-create
            STATUS      current
            DESCRIPTION
                    "This is a system supplied textual representation
                    of PVC.  It is assigned by the service provider."
            ::= { frPVCConnectEntry 13 }

        --
        -- The Frame Relay Accounting
        --

        frAccountPVCTable OBJECT-TYPE
            SYNTAX      SEQUENCE OF FrAccountPVCEntry
            MAX-ACCESS  not-accessible
            STATUS      current
            DESCRIPTION
                    "The Frame Relay Accounting PVC table.  This table
                    is used to perform accounting on a PVC segment
                    end-point basis."
            ::= { frnetservObjects 6 }

        frAccountPVCEntry OBJECT-TYPE
            SYNTAX      FrAccountPVCEntry
            MAX-ACCESS  not-accessible
            STATUS      current
            DESCRIPTION
                    "An entry in the Frame Relay Accounting PVC
                    table."
            INDEX   {   ifIndex,
                        frAccountPVCDLCIIndex }
            ::= { frAccountPVCTable 1 }

        FrAccountPVCEntry ::=
            SEQUENCE {
                frAccountPVCDLCIIndex           Integer32,
                frAccountPVCSegmentSize         Integer32,
                frAccountPVCInSegments          Counter32,
                frAccountPVCOutSegments         Counter32
            }

        frAccountPVCDLCIIndex OBJECT-TYPE
            SYNTAX      Integer32 (16..4194303)
            MAX-ACCESS  not-accessible
            STATUS      current
            DESCRIPTION
                    "The value of this object is equal to the DLCI
```

```
                value for this PVC segment end-point."
        REFERENCE   "Q.922 [25]"
        ::= { frAccountPVCEntry 1 }

    frAccountPVCSegmentSize OBJECT-TYPE
        SYNTAX      Integer32
        UNITS       "Octets"
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
                "The value of this object is equal to the Segment
                Size for this PVC segment end-point."
        ::= { frAccountPVCEntry 2 }

    frAccountPVCInSegments OBJECT-TYPE
        SYNTAX      Counter32
        UNITS       "Segments"
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
                "The value of this object is equal to the number
                of segments received by this PVC segment end-
                point."
        ::= { frAccountPVCEntry 3 }

    frAccountPVCOutSegments OBJECT-TYPE
        SYNTAX      Counter32
        UNITS       "Segments"
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
                "The value of this object is equal to the number
                of segments sent by this PVC segment end-point."
        ::= { frAccountPVCEntry 4 }

    --
    -- Accounting on a Frame Relay Logical Port
    --

    frAccountLportTable OBJECT-TYPE
        SYNTAX      SEQUENCE OF FrAccountLportEntry
        MAX-ACCESS  not-accessible
        STATUS      current
        DESCRIPTION
                "The Frame Relay Accounting Logical Port table.
                This table is used to perform accounting on a
                UNI/NNI Logical Port basis."
        ::= { frnetservObjects 7 }
```

```
        frAccountLportEntry OBJECT-TYPE
            SYNTAX      FrAccountLportEntry
            MAX-ACCESS  not-accessible
            STATUS      current
            DESCRIPTION
                    "An entry in the Frame Relay Accounting Logical
                    Port table."
            INDEX   {   ifIndex }
            ::= { frAccountLportTable 1 }

        FrAccountLportEntry ::=
            SEQUENCE {
                frAccountLportSegmentSize
                    Integer32,
                frAccountLportInSegments
                    Counter32,
                frAccountLportOutSegments
                    Counter32
            }

        frAccountLportSegmentSize OBJECT-TYPE
            SYNTAX      Integer32
            UNITS       "Octets"
            MAX-ACCESS  read-only
            STATUS      current
            DESCRIPTION
                    "The value of this object is equal to the Segment
                    Size for this UNI/NNI logical port."
            ::= { frAccountLportEntry 1 }

        frAccountLportInSegments OBJECT-TYPE
            SYNTAX      Counter32
            UNITS       "Segments"
            MAX-ACCESS  read-only
            STATUS      current
            DESCRIPTION
                    "The value of this object is equal to the number
                    of segments received by this UNI/NNI logical
                    port."
            ::= { frAccountLportEntry 2 }

        frAccountLportOutSegments OBJECT-TYPE
            SYNTAX      Counter32
            UNITS       "Segments"
            MAX-ACCESS  read-only
            STATUS      current
            DESCRIPTION
                    "The value of this object is equal to the number
```

```
                of segments sent by this UNI/NNI logical port."
        ::= { frAccountLportEntry 3 }

      --
      -- Frame Relay Network Service Notifications
      --

    frPVCConnectStatusChange  NOTIFICATION-TYPE
        OBJECTS { frPVCConnectIndex,
                  frPVCConnectLowIfIndex,
                  frPVCConnectLowDLCIIndex,
                  frPVCConnectHighIfIndex,
                  frPVCConnectHighDLCIIndex,
                  frPVCConnectL2hOperStatus,
                  frPVCConnectH2lOperStatus,
                  frPVCEndptRcvdSigStatus }
        STATUS  deprecated
        DESCRIPTION
                "Refer to the description of the
                frPVCConnectStatusNotif notification that has
                replaced this notification.  The notification is
                deprecated due to the incorrect inclusion of index
                values and to take advantage of the trap prefix
                for automatic conversion from SMIv2 to SMIv1 by
                making the one but last sub-ID a zero (i.e. the
                so-called trap prefix)."
        ::= { frnetservTraps 1 }

    frPVCConnectStatusNotif  NOTIFICATION-TYPE
        OBJECTS { frPVCConnectL2hOperStatus,
                  frPVCConnectH2lOperStatus,
                  frPVCEndptRcvdSigStatus }
        STATUS  current
        DESCRIPTION
                "This notification indicates that the indicated
                PVC has changed state.

                This notification is not sent if an FR-UNI changes
                state; a linkDown or linkUp notification should be
                sent instead.  The first instance of
                frPVCEndptRcvdSigStatus is for the endpoint with
                LowIfIndex, LowDLCIIndex.  The second instance of
                frPVCEndptRcvdSigStatus is for the endpoint with
                HighIfIndex, HighDLCIIndex"
        ::= { frnetservTrapsPrefix 2 }

    -- Conformance Information
```

```
        frnetservConformance  OBJECT IDENTIFIER
            ::= { frnetservMIB 3 }

        frnetservGroups       OBJECT IDENTIFIER
            ::= { frnetservConformance 1 }
        frnetservCompliances  OBJECT IDENTIFIER
            ::= { frnetservConformance 2 }


        --
        --  Service (Read-only) Modules
        --
        frnetservCompliance2 MODULE-COMPLIANCE
            STATUS      current
            DESCRIPTION
                    "The compliance statement for SNMP entities which
                    have Frame Relay Network Service Interfaces.

                    The distinction between 'service' and 'switch' is
                    that a 'switch' is configured via this MIB.
                    Hence, the various read/write objects have write
                    capability.  A 'service' represents a passive
                    monitor-only customer network management
                    interface.  The various read/write objects are
                    restricted to read-only capability."
            MODULE -- this module
                MANDATORY-GROUPS { frnetservLportGroup2,
                                   frnetservMgtVCSigGroup,
                                   frnetservPVCEndptGroup,
                                   frnetservPVCEndptGroup2,
                                   frnetservPVCConnectGroup,
                                   frnetservPVCConnectNamesGroup,
                                   frnetservPVCNotifGroup2 }

                GROUP       frnetservAccountPVCGroup
                DESCRIPTION
                    "This group is optional for frame relay
                    interfaces.  It is mandatory if and only if
                    accounting is performed on a PVC basis this frame
                    relay interface."
                GROUP       frnetservAccountLportGroup
                DESCRIPTION
                    "This group is optional for frame relay
                    interfaces.  It is mandatory if and only if
                    accounting is performed on a logical port basis
                    this frame relay interface."

                OBJECT      frPVCEndptInMaxFrameSize
```

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

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

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

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

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

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

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

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

                OBJECT      frPVCEndptRowStatus
              -- subset of RowStatus
                SYNTAX      INTEGER { active(1) }
                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      frPVCConnectAdminStatus
                MIN-ACCESS  read-only
                DESCRIPTION
                     "Write access is not required."

                OBJECT      frPVCConnectRowStatus
              -- subset of RowStatus
                SYNTAX      INTEGER { active(1) }
                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      frLportFragControl
                MIN-ACCESS  read-only
                DESCRIPTION
                      "Write access is not required."

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

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

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

               ::= { frnetservCompliances 2 }

        --
        -- Switch (Configuration) Compliance
        --
        frnetSwitchCompliance MODULE-COMPLIANCE
            STATUS      current
            DESCRIPTION
                    "The compliance statement for SNMP entities which
                    have Frame Relay Network Switch objects.

                    The distinction between 'service' and 'switch' is
                    that a 'switch' is configured via this MIB.
```

```
                    Hence, the various read/write objects have write
                    capability.  A 'service' represents a passive
                    monitor-only customer network management
                    interface.  The various read/write objects are
                    restricted to read-only capability."
                MODULE -- this module
                    MANDATORY-GROUPS { frnetservLportGroup2,
                                       frnetservLportAdminGroup,
                                       frnetservMgtVCSigGroup,
                                       frnetservMgtVCSigAdminGroup,
                                       frnetservPVCEndptGroup,
                                       frnetservPVCEndptGroup2,
                                       frnetservPVCConnectGroup,
                                       frnetservPVCConnectNamesGroup,
                                       frnetservPVCNotifGroup2 }

                    GROUP       frnetservAccountPVCGroup
                    DESCRIPTION
                        "This group is optional for frame relay
                        interfaces.  It is mandatory if and only if
                        accounting is performed on a PVC basis this frame
                        relay interface."
                    GROUP       frnetservAccountLportGroup
                    DESCRIPTION
                        "This group is optional for frame relay
                        interfaces.  It is mandatory if and only if
                        accounting is performed on a logical port basis
                        this frame relay interface."

                  ::= { frnetservCompliances 3 }

             --
             -- Historical RFC 1604 Compliance Modules
             --

            frnetservCompliance MODULE-COMPLIANCE
                STATUS  deprecated
                DESCRIPTION
                        "The compliance statement for SNMP entities which
                        have Frame Relay Network Service Interfaces.

                        This compliance statement has been deprecated in
                        favor of frnetservCompliance2.  The new compliance
                        module expands the mandatory groups to include
                        notification and other new objects."

                MODULE -- this module
                    MANDATORY-GROUPS { frnetservLportGroup,
```

```
                        frnetservMgtVCSigGroup,
                        frnetservPVCEndptGroup,
                        frnetservPVCConnectGroup }

                GROUP       frnetservAccountPVCGroup
                DESCRIPTION
                    "This group is optional for Frame Relay
                    interfaces.  It is mandatory if and only if
                    accounting is performed on a PVC basis this Frame
                    Relay interface."

                GROUP       frnetservAccountLportGroup
                DESCRIPTION
                    "This group is optional for Frame Relay
                    interfaces.  It is mandatory if and only if
                    accounting is performed on a logical port basis
                    this Frame Relay interface."

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

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

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

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

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

                OBJECT      frPVCEndptOutBe
```

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

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

                OBJECT      frPVCEndptRowStatus
              -- subset of RowStatus
                SYNTAX      INTEGER { active(1) }
                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      frPVCConnectAdminStatus
                MIN-ACCESS  read-only
                DESCRIPTION
                    "Write access is not required."

                OBJECT      frPVCConnectRowStatus
              -- subset of RowStatus
                SYNTAX      INTEGER { active(1) }
                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)."
            ::= { frnetservCompliances 1 }

        --
        -- Frame Relay Service MIB Object Groups
        --
        frnetservLportGroup  OBJECT-GROUP
            OBJECTS { frLportNumPlan, frLportContact, frLportLocation,
                      frLportType,
                      frLportAddrDLCILen, frLportVCSigProtocol,
                      frLportVCSigPointer }
            STATUS  deprecated
            DESCRIPTION
                    "A collection of objects providing information
                    applicable to a Frame Relay Logical Port.  This
                    group has been deprecated to eliminate reference
```

```
                    to the object frLportVCSigPointer.

                    Use the new group frnetservLportGroup2 as a
                    replacement for this group."
             ::= { frnetservGroups 1 }

        frnetservMgtVCSigGroup  OBJECT-GROUP
            OBJECTS { frMgtVCSigProced,
                      frMgtVCSigUserN391,
                      frMgtVCSigUserN392,
                      frMgtVCSigUserN393,
                      frMgtVCSigUserT391,
                      frMgtVCSigNetN392,
                      frMgtVCSigNetN393,
                      frMgtVCSigNetT392,
                      frMgtVCSigNetnN4,
                      frMgtVCSigNetnT3,
                      frMgtVCSigUserLinkRelErrors,
                      frMgtVCSigUserProtErrors,
                      frMgtVCSigUserChanInactive,
                      frMgtVCSigNetLinkRelErrors,
                      frMgtVCSigNetProtErrors,
                      frMgtVCSigNetChanInactive }
            STATUS  current
            DESCRIPTION
                    "A collection of objects providing information
                    applicable to the Local In-Channel Signaling
                    Procedures used for a UNI/NNI logical port."
            ::= { frnetservGroups 2 }

        frnetservPVCEndptGroup  OBJECT-GROUP
            OBJECTS { frPVCConnectIndexValue,
                      frPVCEndptInMaxFrameSize,
                      frPVCEndptInBc,
                      frPVCEndptInBe,
                      frPVCEndptInCIR,
                      frPVCEndptOutMaxFrameSize,
                      frPVCEndptOutBc,
                      frPVCEndptOutBe,
                      frPVCEndptOutCIR,
                      frPVCEndptConnectIdentifier,
                      frPVCEndptRowStatus,
                      frPVCEndptRcvdSigStatus,
                      frPVCEndptInFrames,
                      frPVCEndptOutFrames,
                      frPVCEndptInDEFrames,
                      frPVCEndptInExcessFrames,
                      frPVCEndptOutExcessFrames,
```

```
                    frPVCEndptInDiscards,
                    frPVCEndptInOctets,
                    frPVCEndptOutOctets }
            STATUS  current
            DESCRIPTION
                    "A collection of objects providing information
                    applicable to a Frame Relay PVC end-point."
            ::= { frnetservGroups 3 }

        frnetservPVCConnectGroup  OBJECT-GROUP
            OBJECTS { frPVCConnectAdminStatus,
                      frPVCConnectL2hOperStatus,
                      frPVCConnectH2lOperStatus,
                      frPVCConnectL2hLastChange,
                      frPVCConnectH2lLastChange,
                      frPVCConnectRowStatus }
            STATUS  current
            DESCRIPTION
                    "A collection of objects providing information
                    applicable to a Frame Relay PVC connection."
            ::= { frnetservGroups 4 }

        frnetservAccountPVCGroup  OBJECT-GROUP
            OBJECTS { frAccountPVCSegmentSize,
                      frAccountPVCInSegments,
                      frAccountPVCOutSegments }
            STATUS  current
            DESCRIPTION
                    "A collection of objects providing accounting
                    information application to a Frame Relay PVC end-
                    point."
            ::= { frnetservGroups 5 }

        frnetservAccountLportGroup  OBJECT-GROUP
            OBJECTS { frAccountLportSegmentSize,
                      frAccountLportInSegments,
                      frAccountLportOutSegments }
            STATUS  current
            DESCRIPTION
                    "A collection of objects providing accounting
                    information application to a Frame Relay logical
                    port."
            ::= { frnetservGroups 6 }

        frnetservLportGroup2  OBJECT-GROUP
            OBJECTS { frLportNumPlan,
                      frLportContact,
                      frLportLocation,
```

```
                    frLportType,
                    frLportAddrDLCILen,
                    frLportVCSigProtocol,
                    frLportFragControl,
                    frLportFragSize }
            STATUS  current
            DESCRIPTION
                    "A collection of objects providing information
                    applicable to a Frame Relay Logical Port.

                    This new version of the Logical Port Group
                    eliminates the frLportVCSigPointer and adds
                    support for fragmentation."
            ::= { frnetservGroups 7 }

        frnetservPVCEndptGroup2  OBJECT-GROUP
              OBJECTS { frPVCEndptInDiscardsDESet,
                        frPVCEndptInFramesFECNSet,
                        frPVCEndptOutFramesFECNSet,
                        frPVCEndptInFramesBECNSet,
                        frPVCEndptOutFramesBECNSet,
                        frPVCEndptInCongDiscards,
                        frPVCEndptInDECongDiscards,
                        frPVCEndptOutCongDiscards,
                        frPVCEndptOutDECongDiscards,
                        frPVCEndptOutDEFrames,
                        frPVCEndptAtmIwfConnIndex }
              STATUS  current
              DESCRIPTION
                    "Additions to the PVC end-point group.  These
                    additions provide new frame counters to track
                    frame loss.  In addition, the new FR/ATM IWF MIB
                    cross-connect index is included."
              ::= { frnetservGroups 8 }

        frnetservPVCConnectNamesGroup  OBJECT-GROUP
              OBJECTS { frPVCConnectUserName,
                        frPVCConnectProviderName }
              STATUS  current
              DESCRIPTION
                    "Additions to the PVC Connect Group."
              ::= { frnetservGroups 9 }

        frnetservLportAdminGroup OBJECT-GROUP
              OBJECTS { frLportDLCIIndexValue,
                        frLportTypeAdmin,
                        frLportVCSigProtocolAdmin }
              STATUS  current
```

```
            DESCRIPTION
                  "Administrative (R/W) objects for creating a
                  switch logical port."
            ::= { frnetservGroups 10 }

      frnetservMgtVCSigAdminGroup OBJECT-GROUP
            OBJECTS { frMgtVCSigProcedAdmin,
                      frMgtVCSigUserN391Admin,
                      frMgtVCSigUserN392Admin,
                      frMgtVCSigUserN393Admin,
                      frMgtVCSigUserT391Admin,
                      frMgtVCSigNetN392Admin,
                      frMgtVCSigNetN393Admin,
                      frMgtVCSigNetT392Admin,
                      frMgtVCSigNetnT3Admin }
            STATUS  current
            DESCRIPTION

                  "A collection of objects providing information
                  applicable to the Local In-Channel Signaling
                  Procedures used for a UNI/NNI logical port."
            ::= { frnetservGroups 11 }

      frnetservPVCNotifGroup NOTIFICATION-GROUP
            NOTIFICATIONS { frPVCConnectStatusChange }
            STATUS    deprecated
            DESCRIPTION
                  "Deprecated notification group.  The
                  frPVCConnectStatusChange notification was flawed
                  because it included redundant indexes and was not
                  properly encoded for SMIv1 conversion."
          ::= { frnetservGroups 12 }

      frnetservPVCNotifGroup2 NOTIFICATION-GROUP
            NOTIFICATIONS { frPVCConnectStatusNotif }
            STATUS    current
            DESCRIPTION
                  "A collection of notifications that apply to frame
                  relay PVC Connections "
          ::= { frnetservGroups 13 }

      END
```

4. Acknowledgments

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

The working group thanks Bert Wijnen, David Perkins, and Bob Stewart for their assistance in reviewing the MIB.

5. References

[1] Harrington, D., Presuhn, R. and B. Wijnen, "An Architecture for Describing SNMP Management Frameworks", RFC 2571, April 1999.

[2] Rose, M. and K. McCloghrie, "Structure and Identification of Management Information for TCP/IP-based Internets", STD 16, RFC 1155, May 1990.

[3] Rose, M. and K. McCloghrie, "Concise MIB Definitions", STD 16, RFC 1212, March 1991.

[4] Rose, M., "A Convention for Defining Traps for use with the SNMP", RFC 1215, March 1991.

[5] McCloghrie, K., Perkins, D., Schoenwaelder, J., Case, J., Rose, M. and S. Waldbusser, "Structure of Management Information Version 2 (SMIv2)", STD 58, RFC 2578, April 1999.

[6] McCloghrie, K., Perkins, D., Schoenwaelder, J., Case, J., Rose, M. and S. Waldbusser, "Textual Conventions for SMIv2", STD 58, RFC 2579, April 1999.

[7] McCloghrie, K., Perkins, D., Schoenwaelder, J., Case, J., Rose, M. and S. Waldbusser, "Conformance Statements for SMIv2", STD 58, RFC 2580, April 1999.

[8] Case, J., Fedor, M., Schoffstall, M. and J. Davin, "Simple Network Management Protocol", STD 15, RFC 1157, May 1990.

[9] Case, J., McCloghrie, K., Rose M., and S. Waldbusser, "Introduction to Community-based SNMPv2", RFC 1901, January 1996.

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

[11] Case, J., Harrington D., Presuhn R. and B. Wijnen, "Message Processing and Dispatching for the Simple Network Management Protocol (SNMP)", RFC 2572, April 1999.

[12] Blumenthal, U. and B. Wijnen, "User-based Security Model (USM) for version 3 of the Simple Network Management Protocol (SNMPv3)", RFC 2574, April 1999.

[13] 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.

[14] Levi, D., Meyer, P. and B. Stewart, "SNMPv3 Applications", RFC 2573, April 1999.

[15] Wijnen, B., Presuhn, R. and K. McCloghrie, "View-based Access Control Model (VACM) for the Simple Network Management Protocol (SNMP)", RFC 2575, April 1999.

[16] Case, J., Mundy, R., Partain, D. and B. Stewart, "Introduction to Version 3 of the Internet-standard Network Management Framework", RFC 2570, April 1999.

[17] ANSI T1.617-1991, American National Standard for Telecommunications - Integrated Services Digital Network (ISDN) - Digital Subscriber Signaling System No. 1 (DSS1) - Signaling Specification for Frame Relay Bearer Service.

[18] Brown, C. and F. Baker, "Management Information Base for Frame Relay DTEs", RFC 2115, September 1997.

[19] Brown, C. and A. Malis, "Multi-Protocol Interconnect over Frame Relay", STD 55, RFC 2427, September 1998.

[20] Fowler, D, "Definitions of Managed Objects for the DS0 and DS0 Bundle Interface Types", RFC 2494, January 1999.

[21] Frame Relay Forum, "Frame Relay Fragmentation Implementation Agreement", FRF.12, December 1997.

[22] ITU-T Recommendation Q.933,Integrated Services Digital Network (ISDN) Digital Subscriber Signalling System No. 1 (DSS 1) - Signalling Specifications for Frame Mode Switched and Permanent Virtual Connection Control and Status Monitoring, December 1995

[23] ITU-T Recommendation X.36, Interface Between Data Terminal Equipment (DTE) and Data Circuit-Terminating Equipment (DCE) For Public Data Networks Providing Frame Relay Data Transmission Service By Dedicated Circuit, April 1995

[24] Digital Equipment Corporation, et. al., "Frame Relay Specification with Extensions Based on Proposed T1S1 Standards", Revision 1.0, September 18, 1990

[25] ITU-T Recommendation Q.922, Integrated Services Digital Network (ISDN) Data Link Layer Specification For Frame Mode Bearer Services, February 1992

[26] McCloghrie, K. and F. Kastenholz, "The Interfaces Group MIB", RFC 2863, June 2000.

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

[28] Rehbehn, K., Nicklass, O. and G. Mouradian, "Definitions of Managed Objects for Monitoring and Controlling the Frame Relay/ATM PVC Service Interworking Function", RFC 2955, October 2000.

[29] ITU-T Recommendation E.164/I.331, The International Public Telecommunication Numbering Plan, May 1997

[30] ITU-T Recommendation X.121, International Numbering Plan For Public Data Networks, October 1996

[31] Frame Relay Forum, "The Frame Relay Forum User-to-Network Implementation Agreement (UNI)", FRF 1.2, July 2000.

6. 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.

7. Authors' Addresses

Kenneth Rehbehn
Megisto Systems, Inc.
20251 Century Boulevard
Germantown, MD, USA 20874

Phone: (301) 515-3672
EMail: krehbehn@megisto.com

David Fowler
Syndesis Limited
28 Fulton Way
Richmond Hill, Ontario, Canada L4B 1J5

Phone: (905) 886-7818
EMail: fowler@syndesis.com

APPENDIX A Update Information

The changes from RFC 1604 are the following:

(1) Added the object frLportDLCIIndexValue to automatically generate index values for new DLC rows.

(2) Add the following objects to support manager writing to objects:

Logical Port Objects
- frLportTypeAdmin
- frLportVCSigProtocolAdmin

VC Objects
- frMgtVCSigProcedAdmin
- frMgtVCSigUserN391Admin
- frMgtVCSigUserN392Admin
- frMgtVCSigUserN393Admin
- frMgtVCSigUserT391Admin
- frMgtVCSigNetN392Admin
- frMgtVCSigNetN393Admin
- frMgtVCSigNetT392Admin
- frMgtVCSigNetnT3Admin

(3) Add objects to control fragmentation:

frLportFragControl frLportFragSize

(4) Added objects to track frames offered to network (in) and delivered (out) for increased visibility into policing-driven discards, congestion-driven discards, DE-bit setting, and congestion bit setting:

- frPVCEndptInDiscardsDESet
- frPVCEndptInFramesFECNSet
- frPVCEndptOutFramesFECNSet
- frPVCEndptInFramesBECNSet
- frPVCEndptOutFramesBECNSet
- frPVCEndptInCongDiscards
- frPVCEndptInDECongDiscards
- frPVCEndptOutCongDiscards
- frPVCEndptOutDECongDiscards
- frPVCEndptOutDEFrames

(5) Added the PVC object frPVCEndptAtmIwfConnIndex to identify the type of connection, frame relay or ATM IWF; and to identify the cross-connect row of the FR/ATM IWF MIB.

(6) Added objects to provide printable names of the connection user and service provider:

frPVCConnectUserName
frPVCConnectProviderName

(7) Added a new notification to correct flaws in the RFC1604 trap. The flaws include improper OID suffix (SMIv1 compatibility issue) and the inclusion of redundant index fields

(8) Updated compliance modules and object groups to reflect the new objects and notification:

frnetservCompliance2 -	New service-centric (read-only) compliance module
frnetSwitchCompliance -	New switch-centric (read-write) compliance module
frnetservCompliance -	Original RFC 1604 Module, now deprecated
frnetservLportGroup -	Original RFC 1604 logical port group, now deprecated
frnetservLportGroup2 -	Replacement logical port group
frnetservPVCEndptGroup2 -	Extension objects with this revision of the MIB
frnetservPVCConnectNamesGroup -	New group w/ display names for connections
frnetservLportAdminGroup -	New group w/ read-write objects for the logical port
frnetservMgtVCSigAdminGroup -	New group w/ read-write objects for the signaling protocol
frnetservPVCNotifGroup -	Group deprecated to eliminate obsolete frPVCConnectStatusChange notification
frnetservPVCNotifGroup2 -	New group added with w/ frPVCConnectStatusNotif

(9) Added UNITS and REFERENCE clauses for objects that needed the clarification.

(10) Changed references to "proxy-agent" to "FRS agent" to avoid confusion with other proxy-agent terminology.

(11) Changed objects using the DisplayString TC to use the SnmpAdminString TC.

(12) frMgtVCSigProced - Expanded to include the u2nuser(3) enumeration for the UNI protocol operation where the logical port operates in the user role.

(13) DESCRIPTION text added to specify agent response when object is not instantiated for the following objects:

frMgtVCSigUserN391
frMgtVCSigUserN393
frMgtVCSigUserT391
frMgtVCSigUserN392
frMgtVCSigNetN391
frMgtVCSigNetN393
frMgtVCSigNetT391
frMgtVCSigNetN392
frMgtVCSigNetnN4
frMgtVCSigNetnT3
frMgtVCSigUserLinkRelErrors
frMgtVCSigUserProtErrors
frMgtVCSigUserChanInactive

(14) DESCRIPTION text addressing case of logical port not performing network-side procedures was removed from following objects:

frMgtVCSigNetLinkRelErrors
frMgtVCSigNetChanInactive
frMgtVCSigNetProtErrors

(15) frPVCEndptConnectIdentifier - Operation described for the case of FR/ATM IWF cross-connect operation.

(16) frPVCEndptRcvdSigStatus - Added description of enumerated values.

(17) frPVCEndptInDiscards - Clarified DESCRIPTION to state that congestion discards are not counted by object.

(18) frPVCConnect{Low|High}IfIndex - Changed to use InterfaceIndex TC and changed reference to MIB-II to the new IF-MIB. Removed statement asserting that a zero value means the port is not a FR logical port.

(19) frPVCConnectIndex - Added a range to the SYNTAX clause

(20) frPVCConnect{L2h|H2l}OperStatus - Added DESCRIPTION text for each enumerated value.

(21) frAccountPVCDLCIIndex - Added a range to the SYNTAX clause

(22) frPVCCOnnectStatusChange Notification - STATUS change to deprecated. Obsoleted to eliminate inappropriate inclusion of index objects

(23) frPVCConnectStatusNotif Notification - Replaces frPVCConnectStatusChange. In addition, the notification now requires 2 instances of the frPVCEndptRcvdSigStatus object, one for each endpoint of the connection.

(24) Guidance added to recommend ifLinkUpDownTrapEnable be set on.

(25) Behavior of the PVC status and endpoint signaling status is clarified for the case of underlying layer failure.

(26) Overview text re-written for clarity.

(27) Clarified role of system group.

(28) Established maximum frame size of 4096 and default value of 1600.

(29) Clarified that DLC index range is restricted to valid range for the specific length of address field used on the logical port.

(30) Figure 1 and accompanying text was removed to eliminate a confusing "MIB stack" concept. See the section titled "Relation to Other MIBs" for replacement text.

Intellectual Property Rights

The IETF takes no position regarding the validity or scope of any intellectual property or other rights that might be claimed to pertain to the implementation or use of the technology described in this document or the extent to which any license under such rights might or might not be available; neither does it represent that it has made any effort to identify any such rights. Information on the IETF's procedures with respect to rights in standards-track and standards-related documentation can be found in BCP-11. Copies of claims of rights made available for publication and any assurances of licenses to be made available, or the result of an attempt made to obtain a general license or permission for the use of such proprietary rights by implementers or users of this specification can be obtained from the IETF Secretariat.

The IETF invites any interested party to bring to its attention any copyrights, patents or patent applications, or other proprietary rights which may cover technology that may be required to practice this standard. Please address the information to the IETF Executive Director.

Full Copyright Statement

Acknowledgement

Funding for the RFC Editor function is currently provided by the Internet Society.