Network Working Group   T. Brown, Editor
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                    Definitions of Managed Objects
                       for Frame Relay Service

Status of this Memo

Abstract

   This memo defines an extension to the Management Information Base
   (MIB) for use with network management protocols in TCP/IP-based
   internets. In particular, it defines objects for managing the Frame
   Relay Service.

Table of Contents

1. The SNMPv2 Network Management Framework

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

        o   RFC 1442 which defines the SMI, the mechanisms used for
              describing and naming objects for the purpose of
              management.

        o   STD 17, RFC 1213 defines MIB-II, the core set of managed
              objects for the Internet suite of protocols.

        o   RFC 1445 which defines the administrative and other
              architectural aspects of the framework.

        o   RFC 1448 which defines the protocol used for network
              access to managed objects.

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

2. Object Definitions

   Managed objects are accessed via a virtual information store, termed
   the Management Information Base or MIB.   Objects in the MIB are
   defined using the subset of Abstract Syntax Notation One (ASN.1)
   defined in the SMI.   In particular, each object object type is named
   by an OBJECT IDENTIFIER, an administratively assigned name.   The
   object type together with an object instance serves to uniquely
   identify a specific instantiation of the object.   For human
   convenience, we often use a textual string, termed the descriptor, to
   refer to the object type.

3. Overview

   These objects are used when the particular media being used to manage
   is Frame Relay Service.   At present, this applies to these values of
   the ifType variable in the Internet-standard MIB:

          frameRelayService (44)

   This section provides an overview and background of how to use this
   MIB and other potential MIBs when managing a Frame Relay Service.

   Figure 1 shows the MIB stack that could be followed for managing a
   Frame Relay Service.   This is only an example and not meant to be
   inclusive.

```
 _____
|               |               |        |        |            |
|               |               |        | SIP    | RFC1490    |
|               |               | X.25 MIB | Relay | (no applic.|
|               |               | for IW/Encap.| MIB  |  MIB)      |
|               |               |        |        |            |
|     MIB II    |---------------------------------|
|               |               |                 |
|   ifTable     |          Frame Relay Service MIB   |
|   ifXTable    |               |                 |
| ifStackTable  |_____|
|               |               |                 |        |
|               |               | Physical Layer MIBs | ATM MIB |
|               |               |  e.g., DS1/E1 MIB, |---------|
|               |               |  RS232-like MIB    | Phy.    |
|               |               |                 | Layer   |
|               |               |                 |  MIB    |
|---------------|---------------------------------|---------|
```
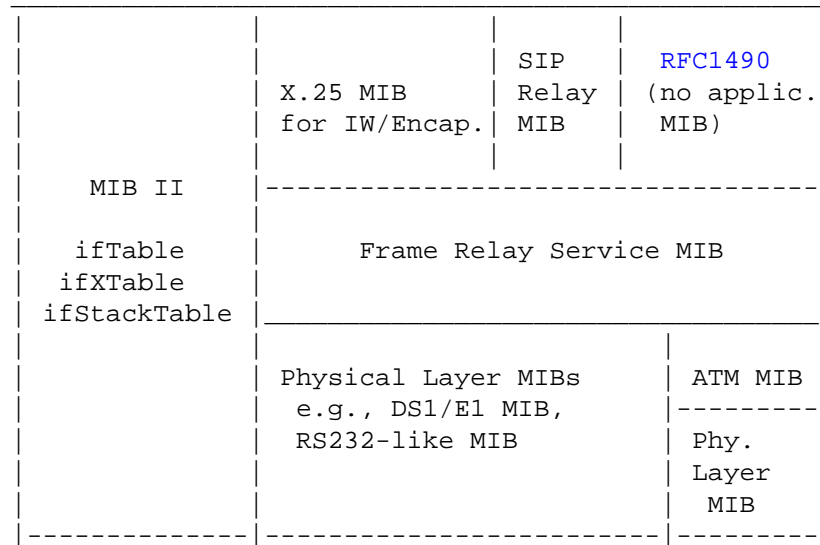
Figure 1. Frame Relay MIB Architecture

3.1. Scope of MIB

   The Frame Relay Service MIB will only manage the Frame Relay portion
   of the network. This MIB is based upon the Customer Network
   Management concepts presented in the document "Service Management
   Architecture for Virtual Connection Services" [6].

   This MIB will NOT be implemented on User Equipment (e.g., DTE), and
   the Frame Relay DTE MIB (RFC 1315) should be used to manage those
   devices [8].

   Frame Relay Service MIB is intended to be used for Customer Network
   Management (CNM) of a Frame Relay Network Service. It provides
   information that allows end-customers to obtain performance
   monitoring, fault detection, and configuration information about
   their Frame Relay Service. It is an implementation decision as to
   whether this MIB is used to create/delete/modify PVCs and to turn
   PVCs on or off.

   By using this and other related MIBs, a customer's NMS can monitor
   their PVCs and UNI/NNI logical ports. Internal aspects of the
   network (e.g., switching elements, line cards, and network routing
   tables) are outside the scope of this MIB. The Customer's NMS will
   typically access the SNMP proxy-agent within the Frame Relay network
   using SNMP over UDP over IP with IP encapsulated in Frame Relay
   according to RFC1490/ANSI T1.617 Annex F [7,9]. The customer, thus,

has a PVC to the SNMP proxy-agent. Alternate access mechanisms and
SNMP agent implementations are possible. The service capabilities
include retrieving information and receiving TRAPs. It is beyond the
scope of this MIB to define managed objects to monitor the physical
layer. Existing physical layer MIBs (e.g., DS1 MIB) and MIB II will
be used as possible. The Frame Relay Service SNMP MIB for CNM will
not contain any managed objects to monitor the physical layer. This
MIB primarily addresses Frame Relay PVCs. This MIB may be extended
at a later time to handle Frame Relay SVCs.

This MIB is only used to manage a single Frame Relay Service offering
from one network. This MIB will typically be implemented on a
service provider's SNMP proxy-agent. The SNMP proxy-agent proxies for
all Frame Relay equipment within one service provider's Frame Relay
network. (Other SNMP agent implementations are not precluded.)
Therefore, this MIB models a PVC segment through one Frame Relay
Network. See Figure 2. If the customer's PVCs traverse multiple
networks, then the customer needs to poll multiple network proxy-
agents within each Frame Relay Network to retrieve their end-to-end
view of their service. See Figure 2 and the Service Management
Architecture [6].

```
              +-------------------------------------+
              | Customer Network Management Station |
              |            (SNMP based)             |
              +-------------------------------------+
                    ^              ^              ^
                    |              |              |
                    |              |              |
          UNI       |     NNI      |     NNI      |      UNI
           |        ^      |       ^      |       ^       |
           | +----------+  | +----------+  | +----------+ |
           | |          |  | |          |  | |          | |
 Originating | |    FR    |  | |    FR    |  | |    FR    | |Terminating
   +--------+ | | Network I |  | | Network J |  | | Network K | | +--------+
   |        | | |          |  | |          |  | |          | | |        |
   |        |---|          |  |---|          |  |---|          | |---| User B |
   |        | | |          |  | |          |  | |          | | |        |
   |      ///////////////////////////////////////////////////////      |
   |        | | |          |  | |          |  | |          | | |        |
   +--------+ | +----------+  | +----------+  | +----------+ | +--------+
           |              |              |              |
           |              |              |              |
           | PVC Segment 1 | PVC Segment 2 | PVC Segment 3 |
           |<------------->|<------------->|<------------->|
           |                                              |
           |             Multi-network PVC                |
           |<-------------------------------------------->|
           |   NNI = Network-to Network Interface         |
             UNI = User-to-Network Interface
```
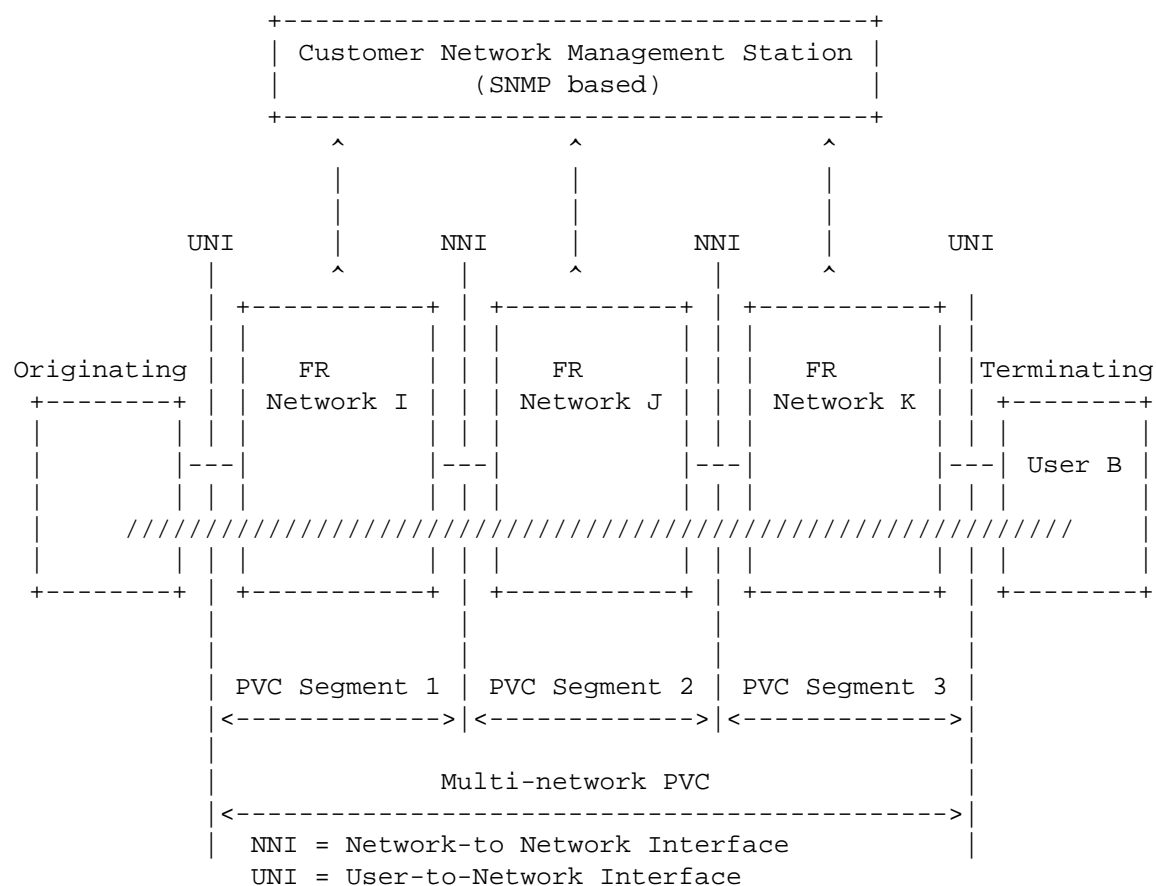
                      Figure 2. Multi-network PVC

   Also, since the Frame Relay network is a shared network amongst many
   Frame Relay subscribers, each subscriber will only have access to
   their information (e.g., information with respect to their interfaces
   and PVCs). Therefore, in order to provide this capability, the Frame
   Relay PVC CNM proxy agent should be able to support instance level
   granularity for MIB views. See the Service Management Architecture.

3.2. 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 T1 line, an access channel can denote any one of the
   following:

o   Unchannelized T1 - the entire T1 line is considered an access
     channel. Each access channel is comprised of 24 T1 time
     slots.

o   Channelized T1 - an access channel is any one of 24 channels.
     Each access channel is comprised of a single T1 time slot.

o   Fractional T1 - an access channel is a grouping of N T1 time
     slots (NX56/64 Kbps, where N = 1-23 T1 Time slots per FT1
     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:

o   Unchannelized E1 - the entire E1 line is considered a single
     access channel. Each access channel is comprised of 31 E1
     time slots.

o   Channelized E1 - an access channel is any one of 31 channels.
     Each access channel is comprised of a single E1 time slot.

o   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.

in 3 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).

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 (T1) - An octet within the 192-bit information field in
each T1 frame is defined as a time slot. Time slots are position
sensitive within the 192-bit information field. Fractional T1
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

3.3. Apply MIB II to a Frame Relay Service

Use the System Group to apply to the SNMP proxy-agent, since the
proxy-agent may be monitoring many Frame Relay devices in one
network. System Group applies to only one system. This group is
not instantiated.

        sysDescr: ASCII string describing the SNMP proxy-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 SNMP
                      proxy-agent.

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

        sysContact: Contact for the SNMP proxy-agent.
                     ASCII string of up to 255 characters.

        sysName: Domain name of the SNMP proxy-agent, for example,
                  acme.com

        sysLocation: Location of the SNMP proxy-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.

   This specifies how the Interfaces Group defined in MIB II 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 the Frame Relay equipment (e.g.,
          switches, routers or networks) with Frame Relay interfaces.
          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 elapsed time since 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.
                              Possible reasons are as follows:
                              policing, congestion.

          ifInErrors   The number of received frames that are
                              discarded, because of an error.
                              Possible errors can be the following: the
                              frame relay frames were too long or were
                              too short, the frames had an invalid or
                              unrecognized DLCI values, or incorrect
                              header values.

          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 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 errors.
                              Possible reason is transmit underruns.

          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.

              ifLinkUpDownTrapEnble The value of this object is
                                     implementation specific for Frame
                                     Relay logical ports.

              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 MIB II. Also,
   supporting the SNMP Group of MIB II is an implementation choice.

4. Object Definitions

 FRNETSERV-MIB DEFINITIONS ::= BEGIN

 IMPORTS
    MODULE-IDENTITY, OBJECT-TYPE, NOTIFICATION-TYPE,
    Counter32, Integer32,
    TimeTicks   FROM SNMPv2-SMI
    DisplayString, PhysAddress,
    TimeStamp, RowStatus   FROM SNMPv2-TC
    MODULE-COMPLIANCE, OBJECT-GROUP   FROM SNMPv2-CONF
    ifIndex, transmission   FROM RFC-1213;

 frnetservMIB MODULE-IDENTITY
     LAST-UPDATED "9311161200Z"
     ORGANIZATION "IETF Frame Relay Network MIB Working Group"
     CONTACT-INFO
            "   Tracy A. Brown
                 Bellcore
                 331 Newman Springs Rd.
                 Red Bank, NJ 07701 USA

                 Tel: 1-908-758-2107
                 Fax: 1-908-758-4177
                 E-mail: tacox@mail.bellcore.com."
     DESCRIPTION
                 "The MIB module to describe generic objects for
                 Frame Relay Network Service."
     ::= { transmission 44 }

     IfIndex ::= TEXTUAL-CONVENTION
            STATUS   current
            DESCRIPTION
                "The value of this object identifies the
                interface for which this entry contains
                management information. The value of this
                object for a particular interface has the same
                value as the ifIndex object, defined in RFC
                1213, for the same interface."
            SYNTAX Integer32

     frnetservObjects OBJECT IDENTIFIER ::= { frnetservMIB 1 }
     frnetservTraps   OBJECT IDENTIFIER ::= { frnetservMIB 2 }

 -- The Frame Relay Service Logical Port Group

 -- the Frame Relay Logical Port Group

   -- This table is an interface specific addendum
   -- to the generic ifTable from MIB-II.

frLportTable OBJECT-TYPE
 SYNTAX SEQUENCE OF FrLportEntry
 MAX-ACCESS not-accessible
 STATUS current
 DESCRIPTION
         "The Frame Relay Logical Port Information table."
 ::= { 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
           DisplayString,
       frLportLocation
           DisplayString,
       frLportType
           INTEGER,
       frLportAddrDLCILen
           INTEGER,
       frLportVCSigProtocol
           INTEGER,
       frLportVCSigPointer
           OBJECT IDENTIFIER
  }

 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 implies that there
                is no ifPhysAddress.  The SNMP proxy-agent will
                return an octet string of zero length for
                ifPhysAddress. The value other means that an
                address has been assigned to this interface, but
                the numbering plan is not enumerated here."
        ::= { frLportEntry 1 }

 frLportContact OBJECT-TYPE
        SYNTAX  DisplayString (SIZE(0..255))
        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  DisplayString (SIZE(0..255))
        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)
   }
    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."
    ::= { 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."
    ::= { frLportEntry 6 }

frLportVCSigPointer OBJECT-TYPE
    SYNTAX  OBJECT IDENTIFIER
    MAX-ACCESS  read-only
    STATUS  current
    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.  See the Frame Relay
            Management VC Signaling Parameters and Errors
            Group."
    ::= { frLportEntry 7 }


-- the Frame Relay Management VC Signaling Group

-- This Group contains managed objects for the
-- Local In-Channel Signaling Parameters and
-- for signaling errors.
```

 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
 }

 frMgtVCSigProced OBJECT-TYPE
     SYNTAX   INTEGER {
                u2nnet(1),
                bidirect(2)
              }
     MAX-ACCESS read-only
     STATUS   current
     DESCRIPTION
             "The value of this object identifies the Local
             In-Channel Signaling Procedure that is used for
             this UNI/NNI logical port. The UNI/NNI logical
             port can be performing only user-to-network
             network-side procedures or bidirectional
             procedures."
     ::= { frMgtVCSigEntry 1 }

 frMgtVCSigUserN391 OBJECT-TYPE
     SYNTAX   INTEGER (1..255)
     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 procedures, then this value
             is equal to noSuchName. This object applies to
             Q.933 Annex A and T1.617 Annex D."
     DEFVAL { 6 }
     ::= { frMgtVCSigEntry 2 }

 frMgtVCSigUserN392 OBJECT-TYPE
     SYNTAX   INTEGER (1..10)
     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 procedures, then this value
             is equal to noSuchName. This object applies to

                Q.933 Annex A and T1.617 Annex D."
        DEFVAL { 3 }
        ::= { frMgtVCSigEntry 3 }

 frMgtVCSigUserN393 OBJECT-TYPE
        SYNTAX   INTEGER (1..10)
        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 procedures, then this value
                is equal to noSuchName. This object applies to
                Q.933 Annex A and T1.617 Annex D."
        DEFVAL { 4 }
        ::= { frMgtVCSigEntry 4 }

 frMgtVCSigUserT391 OBJECT-TYPE
        SYNTAX   INTEGER (5..30)
        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 value is equal to
                noSuchName. This object applies to Q.933 Annex A
                and T1.617 Annex D."
        DEFVAL { 10 }
        ::= { frMgtVCSigEntry 5 }

 frMgtVCSigNetN392 OBJECT-TYPE
        SYNTAX   INTEGER (1..10)
        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
                value is equal to noSuchName. This object applies
                to Q.933 Annex A, T1.617 Annex D and LMI."
        DEFVAL { 3 }
        ::= { frMgtVCSigEntry 6 }

 frMgtVCSigNetN393 OBJECT-TYPE

```
     SYNTAX   INTEGER (1..10)
     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 value is equal to
             noSuchName. This object applies to Q.933 Annex A,
             T1.617 Annex D and LMI."
     DEFVAL { 4 }
     ::= { frMgtVCSigEntry 7 }

 frMgtVCSigNetT392 OBJECT-TYPE
     SYNTAX   INTEGER (5..30)
     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 value is equal to
             noSuchName. This object applies to Q.933 Annex A,
             T1.617 Annex D and LMI."
     DEFVAL { 15 }
     ::= { frMgtVCSigEntry 8 }

 frMgtVCSigNetnN4 OBJECT-TYPE
     SYNTAX   INTEGER (5..5)
     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 value
             is equal to noSuchName. This object applies only
             to LMI and always has a value of 5."
     ::= { frMgtVCSigEntry 9 }

 frMgtVCSigNetnT3 OBJECT-TYPE
     SYNTAX   INTEGER (5 | 10 | 15 | 20 | 25 | 30)
     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 value is equal to noSuchName. This
             object applies only to LMI."
       DEFVAL { 20 }
       ::= { frMgtVCSigEntry 10 }

 frMgtVCSigUserLinkRelErrors OBJECT-TYPE
       SYNTAX   Counter32
       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 value
             is equal to noSuchName."
       ::= { frMgtVCSigEntry 11 }

 frMgtVCSigUserProtErrors OBJECT-TYPE
       SYNTAX   Counter32
       MAX-ACCESS   read-only
       STATUS   current
       DESCRIPTION
             "The number of user-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. If the logical port is not
             performing user-side procedures, then this value
             is equal to noSuchName."
       ::= { frMgtVCSigEntry 12 }

 frMgtVCSigUserChanInactive OBJECT-TYPE
       SYNTAX   Counter32
       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 value is equal to
                noSuchName."
        ::= { frMgtVCSigEntry 13 }

  frMgtVCSigNetLinkRelErrors OBJECT-TYPE
        SYNTAX   Counter32
        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.  If the logical port is not
                performing network-side procedures, then this
                value is equal to noSuchName."
        ::= { frMgtVCSigEntry 14 }

  frMgtVCSigNetProtErrors OBJECT-TYPE
        SYNTAX   Counter32
        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.  If the logical port is not
                performing network-side procedures, then this
                value is equal to noSuchName."
        ::= { frMgtVCSigEntry 15 }

  frMgtVCSigNetChanInactive OBJECT-TYPE
        SYNTAX   Counter32
        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.  If the
                logical port is not performing network-side
                procedures, then this value is equal to
                noSuchName."
        ::= { frMgtVCSigEntry 16 }
```

    -- The PVC End-Point Group

    -- 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 the figure, 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
    --   End-point.

```
--      In    _____ Out
--     >>>>>>|                                    |>>>>>>>>
--     _____| Frame Relay Network                |_____
--     Out   |                                    |   In
--     <<<<<<|                                    |<<<<<<<
--           |_____|
--  Frame Relay PVC                            Frame Relay
--   End-point                               PVC  End-point

-- 2). Go to the Frame Relay Connection Group.
--


-- The Frame Relay PVC End-point Table

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."
    ::= { 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
   }


frPVCEndptDLCIIndex OBJECT-TYPE
    SYNTAX  Integer32
    MAX-ACCESS  not-accessible
    STATUS  current
    DESCRIPTION
            "The value of this object is equal to the DLCI
            value for this PVC end-point."
    ::= { frPVCEndptEntry 1 }

frPVCEndptInMaxFrameSize OBJECT-TYPE
    SYNTAX  Integer32
    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."
              ::= { frPVCEndptEntry 2 }

  frPVCEndptInBc OBJECT-TYPE
       SYNTAX   Integer32
       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)."
       ::= { frPVCEndptEntry 3 }

  frPVCEndptInBe OBJECT-TYPE
       SYNTAX   Integer32
       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)."
       ::= { frPVCEndptEntry 4 }

  frPVCEndptInCIR OBJECT-TYPE
       SYNTAX   Integer32
       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)."
       ::= { frPVCEndptEntry 5 }

  frPVCEndptOutMaxFrameSize OBJECT-TYPE
       SYNTAX   Integer32
       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."
           ::= { frPVCEndptEntry 6 }

    frPVCEndptOutBc OBJECT-TYPE
        SYNTAX   Integer32
        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)."
           ::= { frPVCEndptEntry 7 }

    frPVCEndptOutBe OBJECT-TYPE
        SYNTAX   Integer32
        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)."
           ::= { frPVCEndptEntry 8 }

    frPVCEndptOutCIR OBJECT-TYPE
        SYNTAX   Integer32
        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)."
           ::= { frPVCEndptEntry 9 }

    frPVCEndptConnectIdentifier OBJECT-TYPE
        SYNTAX   Integer32
        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. The value of
                   this object is provided by the agent, after the
                   associated entries in the frPVCConnectTable 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'. While the
                   frPVCEndptRowStatus object is in the
                   'createAndWait' state, the manager can set each
                   columnar object and get the necessary error
                   diagnostics. The frPVCEndptRowStatus object may
                   not be set to 'active' 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. For user-to-network
            network side procedures, the value of this object
            should be none."
    ::= { frPVCEndptEntry 12 }

 frPVCEndptInFrames OBJECT-TYPE
    SYNTAX   Counter32
    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
    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
    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
    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
         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
         MAX-ACCESS   read-only
         STATUS   current
         DESCRIPTION
                   "The number of frames received by the the network
                   (ingress) that were discarded due to traffic
                   enforcement for this PVC end-point."
         ::= { frPVCEndptEntry 18 }

     frPVCEndptInOctets OBJECT-TYPE
         SYNTAX   Counter32
         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
         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 }

 -- The Frame Relay PVC Connection Group

 -- The Frame Relay PVC Connection Group
 -- is used to model the bi-directional
 -- PVC segment flows;
 -- 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
 --   the frPVCConnectIndex value.
 -- 4). Set frPVCConnectAdminStatus to 'active' 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.

-- Frame Relay Network                    Frame Relay Network
--   Low Port _____ High Port
--            |                                      |
--     _____| >> from low to high PVC flow   >> |_____
--            | << from high to low PVC flow   << |
--            |_____|
--
```

```
-- 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.


frPVCConnectIndexValue OBJECT-TYPE
     SYNTAX  INTEGER (0..2147483647)
     MAX-ACCESS  read-only
     STATUS  current
     DESCRIPTION
            "This object contains an appropriate value 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
            should modify the value to the next unassigned
            index."
```

        ::= { frnetservObjects 4 }

 -- The Frame Relay PVC Connection Table

 frPVCConnectTable OBJECT-TYPE
     SYNTAX   SEQUENCE OF FrPVCConnectEntry
     MAX-ACCESS not-accessible
     STATUS   current
     DESCRIPTION
             "The Frame Relay PVC Connect table. A bi-
             directional PVC segment is modeled as one entry in
             this table."
     ::= { 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
             IfIndex,
         frPVCConnectLowDLCIIndex
             Integer32,
         frPVCConnectHighIfIndex
             IfIndex,
         frPVCConnectHighDLCIIndex
             Integer32,
         frPVCConnectAdminStatus
             INTEGER,
         frPVCConnectL2hOperStatus
             INTEGER,
         frPVCConnectH2lOperStatus
             INTEGER,
         frPVCConnectL2hLastChange
             TimeStamp,
         frPVCConnectH2lLastChange

```
                  TimeStamp,
            frPVCConnectRowStatus
                  RowStatus
 }

 frPVCConnectIndex OBJECT-TYPE
     SYNTAX  Integer32
     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  IfIndex
     MAX-ACCESS  not-accessible
     STATUS  current
     DESCRIPTION
             "The value of this object is equal to MIB II's
             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.  If the value is equal to zero,
             then this logical port is not a Frame Relay
             UNI/NNI logical port."
     ::= { frPVCConnectEntry 2 }

 frPVCConnectLowDLCIIndex OBJECT-TYPE
     SYNTAX  Integer32
     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.  If
             the value is equal to zero, then this endpoint of
             the PVC segment is not a Frame Relay connection."
     ::= { frPVCConnectEntry 3 }

 frPVCConnectHighIfIndex OBJECT-TYPE
     SYNTAX  IfIndex
     MAX-ACCESS  not-accessible
     STATUS  current
     DESCRIPTION
             "The value of this object is equal to MIB II's
             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
        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."
        ::= { 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 state means the PVC segment
               is currently operational; the inactive state means
               the PVC segment is currently not operational; the
               testing 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'. After the frPVCConnectRowStatus
               object is set to 'active' (and the
               corresponding/associated entries in the
               frPVCEndptTable have their frPVCEndptRowStatus
               object set to 'active'), the
               frPVCConnectAdminStatus object may be set to
               'active' 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).  The active state means it is
              currently operational; the inactive state means it
              is currently not operational; the testing state
              means it is currently undergoing a test; the
              unknown state means the status of it currently can
              not be determined.  This value affects the PVC
              status indicated across the ingress NNI/UNI (low
              side) of the PVC segment."
      ::= { 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).  The active state means it is
              currently operational; the inactive state means it
              is currently not operational; the testing state
              means it is currently undergoing a test; the
              unknown state means the status of it currently can
              not be determined.  This value affects the PVC
              status indicated across the ingress NNI/UNI (high
              side) of the PVC segment."
      ::= { frPVCConnectEntry 8 }

 frPVCConnectL2hLastChange OBJECT-TYPE
      SYNTAX  TimeStamp
      MAX-ACCESS  read-only
      STATUS  current
      DESCRIPTION
```

                    "The value of MIB II'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 proxy-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 MIB II'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 proxy-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'. 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' unless the following columnar
                    object exist 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'."
          ::= { frPVCConnectEntry 11 }

  -- The Frame Relay Accounting Groups

  -- The groups are the following:
  -- Accounting on a PVC basis
  -- Accounting on an Interface/Logical Port basis

  -- The Accounting on a Frame Relay PVC basis Group

  -- The accounting information is collected for a PVC
  -- segment end-point.

  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
      MAX-ACCESS not-accessible
      STATUS   current

```
    DESCRIPTION
            "The value of this object is equal to the DLCI
            value for this PVC segment end-point."
    ::= { frAccountPVCEntry 1 }

frAccountPVCSegmentSize OBJECT-TYPE
    SYNTAX   Integer32
    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
    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
    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 }


-- The Accounting on a Frame Relay Logical Port basis Group


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
          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
          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
          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 TRAPS

 frPVCConnectStatusChange NOTIFICATION-TYPE
     OBJECTS { frPVCConnectIndex,
               frPVCConnectLowIfIndex, frPVCConnectLowDLCIIndex,
               frPVCConnectHighIfIndex, frPVCConnectHighDLCIIndex,
               frPVCConnectL2hOperStatus, frPVCConnectH2lOperStatus,
               frPVCEndptRcvdSigStatus }
     STATUS   current
     DESCRIPTION
             "This trap indicates that the indicated PVC has
             changed state. This trap is not sent if an FR-UNI
             changes state; a linkDown or linkUp trap should be
             sent instead."
     ::= { frnetservTraps 1 }

 -- Conformance Information

 frnetservConformance OBJECT IDENTIFIER ::= { frnetservMIB 3 }

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

 -- Compliance Statements

 frnetservCompliance MODULE-COMPLIANCE
       STATUS   current
       DESCRIPTION
         "The compliance statement for SNMPv2 entities
          which have Frame Relay Network Service Interfaces."

       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
        SYNTAX      Integer32
        MIN-ACCESS  read-only
        DESCRIPTION
              "Write access is not required."

        OBJECT      frPVCEndptInBc
        SYNTAX      Integer32
        MIN-ACCESS  read-only
        DESCRIPTION
              "Write access is not required."

        OBJECT      frPVCEndptInBe
        SYNTAX      Integer32
        MIN-ACCESS  read-only
        DESCRIPTION
              "Write access is not required."

        OBJECT      frPVCEndptInCIR
        SYNTAX      Integer32
        MIN-ACCESS  read-only
        DESCRIPTION
              "Write access is not required."

        OBJECT      frPVCEndptOutMaxFrameSize
        SYNTAX      Integer32
        MIN-ACCESS  read-only
        DESCRIPTION
              "Write access is not required."

        OBJECT      frPVCEndptOutBc
        SYNTAX      Integer32
        MIN-ACCESS  read-only
        DESCRIPTION
              "Write access is not required."

        OBJECT      frPVCEndptOutBe
        SYNTAX      Integer32
        MIN-ACCESS  read-only
        DESCRIPTION
```

```
              "Write access is not required."

      OBJECT       frPVCEndptOutCIR
      SYNTAX       Integer32
      MIN-ACCESS   read-only
      DESCRIPTION
              "Write access is not required."

      OBJECT       frPVCEndptConnectIdentifier
      SYNTAX       Integer32
      MIN-ACCESS   read-only
      DESCRIPTION
              "Write access is not required."

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

      OBJECT       frPVCConnectAdminStatus
      SYNTAX       INTEGER {
                      active(1),
                      inactive(2),
                      testing(3)
                   }
      MIN-ACCESS   read-only
      DESCRIPTION
              "Write access is not required."

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

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

 -- Units of Conformance

 frnetservLportGroup OBJECT-GROUP
       OBJECTS { frLportNumPlan, frLportContact, frLportLocation,
                 frLportType,
                 frLportAddrDLCILen, frLportVCSigProtocol,
                 frLportVCSigPointer }
       STATUS current
       DESCRIPTION
             "A collection of objects providing information applicable
             to a Frame Relay Logical Port."
       ::= { 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 application
              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 }


 END
```

7. Acknowledgments

   This document was produced jointly by the Frame Relay Forum Technical
   Committee MIB Working Group and the Frame Relay Service MIB Working
   Group.

8. References

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9. Security Considerations

    Security issues are not discussed in this memo.

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