

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

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

Copyright Notice

Copyright (C) The Internet Society (2000). All Rights Reserved.

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	2
2 Overview	3
2.1 Scope of MIB	3
2.2 Transiting Multiple Frame Relay Networks	5
2.3 Access Control	5
2.4 Frame Relay Service MIB Terminology	6
2.5 Relation to Other MIBs	8
2.5.1 System Group	8
2.5.2 Interfaces Table (ifTable, ifXtable)	8
2.5.3 Stack Table for DS1/E1 Environment	12
2.5.4 Stack Table for V.35 Environments	14
2.5.5 The Frame Relay/ATM PVC Service Interworking MIB	14
2.6 Textual Convention Change	15
3 Object Definitions	15
3.1 The Frame Relay Service Logical Port	17

3.2 Frame Relay Management VC Signaling	22
3.3 Frame Relay PVC End-Points	32
3.4 Frame Relay PVC Connections	45
3.5 Frame Relay Accounting	53
3.6 Frame Relay Network Service Notifications	56
3.7 Conformance Information	57
4 Acknowledgments	67
5 References	67
6 Security Considerations	69
7 Authors' Addresses	70
APPENDIX A Update Information	71
Intellectual Property Rights	75
Full Copyright Statement	76

1. The SNMP Management Framework

The SNMP Management Framework presently consists of five major components:

- o An overall architecture, described in RFC 2571 [1].
- o 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].
- o 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].
- o 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].
- o 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:

- o the frame relay service compliance module (frnetServCompliance), and
- o 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).

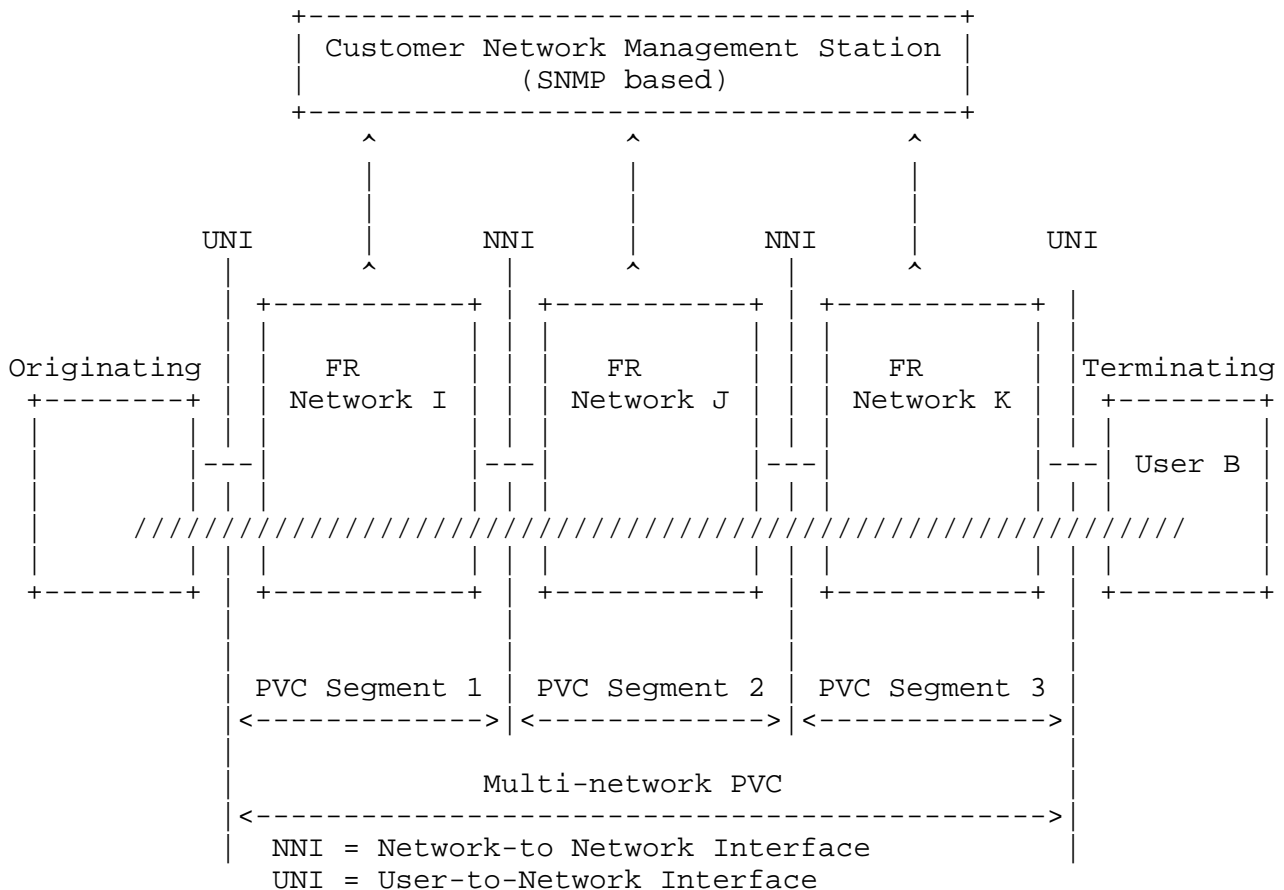


Figure 1, Multi-network PVC

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:

- o **Unchannelized DS1** - the entire DS1 line is considered an access channel. Each access channel is comprised of 24 DS0 time slots.
- o **Channelized DS1** - an access channel is any one of 24 channels. Each access channel is comprised of a single DS0 time slot.
- o **Fractional DS1** - an access channel is a grouping of $N \times \text{DS0}$ time slots ($N \times 56/64$ 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:

- 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 ($N \times 64$ 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 T_c .

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.
ifHCOctets	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.

```

+-----+
| Frame Relay Service |
+-----+
      |
+-----+
| ds0Bundle           |
+-----+
      |      |      |      |
+---+ +---+ +---+ +---+
|ds0| |ds0| |ds0| |ds0|
+---+ +---+ +---+ +---+
      |      |      |      |
+-----+
| ds1                |
+-----+

```

The assignment of the index values could for example be:

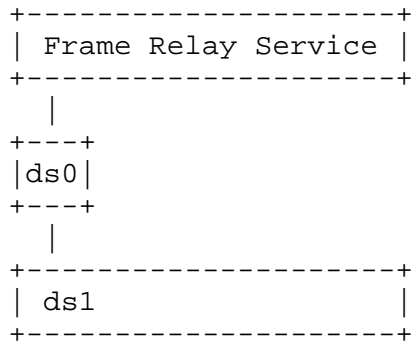
ifIndex	Description
1	FrameRelayService (type 44)
2	ds0Bundle (type 82)
3	ds0 #1 (type 81)
4	ds0 #2 (type 81)
5	ds0 #3 (type 81)
6	ds0 #4 (type 81)
7	ds1 (type 18)

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)

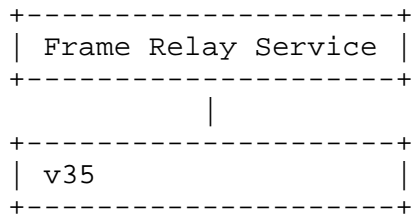
The ifStackTable is then used to show the relationships between the various interfaces.

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 frPVCCConnectTable of this MIB. Both endpoints are represented with rows in the frPVCEndptTable. The frPVCEndptConnectIdentifier object of each endpoint points to the frPVCCConnectTable 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

```

T1.617

ansiT1617B(4): Interface operates the ANSI
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.

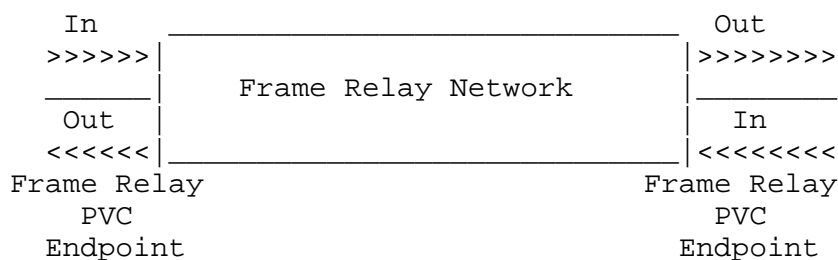


Figure 2, PVC Terminology

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,
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 frPVCCConnectIndex, which is used as one of the indices into the frPVCCConnectTable.

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 endpoint."

::= { 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

--

frPVCCConnectIndexValue OBJECT-TYPE

SYNTAX INTEGER (0..2147483647)

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"This object returns a hint to be used for frPVCCConnectIndex when creating entries in the frPVCCConnectTable."

The value 0 indicates that no unassigned entries are available.

To obtain the frPVCCConnectIndex 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 }

frPVCCConnectTable OBJECT-TYPE

SYNTAX SEQUENCE OF FrPVCCConnectEntry

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 frPVCCConnectIndex 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 frPVCCEndptTable are created, the following step are used to associate the PVC end-points as belonging to one PVC connection:

- 1) Obtain a unique frPVCCConnectIndex using the frPVCCConnectIndexValue object.
- 2) Connect the PVC segment endpoints together with the applicable frPVCCConnectIndex value obtained via frPVCCConnectIndexValue. The entries in this table are created by using the frPVCCConnectRowStatus object.
- 3) The agent will provide the value of the corresponding instances of frPVCCEndptConnectIdentifier with the frPVCCConnectIndex value.
- 4) Set frPVCCConnectAdminStatus 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.

Frame Relay Network Low Port	Frame Relay Network 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 frPVCCConnectL2hOperStatus and frPVCCConnectH2lOperStatus 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 }
```

frPVCCConnectEntry OBJECT-TYPE

SYNTAX FrPVCCConnectEntry

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 { frPVCCConnectIndex,
frPVCCConnectLowIfIndex,

```

frPVCCConnectLowDLCIIndex,
frPVCCConnectHighIfIndex,
frPVCCConnectHighDLCIIndex }
 ::= { frPVCCConnectTable 1 }

```

```
FrPVCCConnectEntry ::=
```

```

SEQUENCE {
    frPVCCConnectIndex          Integer32,
    frPVCCConnectLowIfIndex     InterfaceIndex,
    frPVCCConnectLowDLCIIndex   Integer32,
    frPVCCConnectHighIfIndex    InterfaceIndex,
    frPVCCConnectHighDLCIIndex  Integer32,
    frPVCCConnectAdminStatus    INTEGER,
    frPVCCConnectL2hOperStatus  INTEGER,
    frPVCCConnectH2lOperStatus  INTEGER,
    frPVCCConnectL2hLastChange  TimeStamp,
    frPVCCConnectH2lLastChange  TimeStamp,
    frPVCCConnectRowStatus      RowStatus,
    frPVCCConnectUserName       SnmpAdminString,
    frPVCCConnectProviderName    SnmpAdminString
}

```

```
frPVCCConnectIndex OBJECT-TYPE
```

```
SYNTAX          Integer32 (0..2147483647)
```

```
MAX-ACCESS      not-accessible
```

```
STATUS          current
```

```
DESCRIPTION
```

"The value of this object is equal to the
frPVCCConnectIndexValue obtained to uniquely
identify this PVC segment connection."

```
 ::= { frPVCCConnectEntry 1 }
```

```
frPVCCConnectLowIfIndex 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."
 ::= { frPVCCConnectEntry 2 }

frPVCCConnectLowDLCIIndex 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]"
    ::= { frPVCCConnectEntry 3 }

frPVCCConnectHighIfIndex 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."
    ::= { frPVCCConnectEntry 4 }

frPVCCConnectHighDLCIIndex 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]"
    ::= { frPVCCConnectEntry 5 }

frPVCCConnectAdminStatus 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 frPVCCConnectRowStatus object is set to 'active(1)' (and the corresponding/associated entries in the frPVCEndptTable have their frPVCEndptRowStatus object set to 'active(1)'), the frPVCCConnectAdminStatus object may be set to 'active(1)' to turn on the PVC segment connection."

```
::= { frPVCCConnectEntry 6 }
```

```
frPVCCConnectL2hOperStatus 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."
 ::= { frPVCCConnectEntry 7 }

frPVCCConnectH2lOperStatus 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."

::= { frPVCCConnectEntry 8 }

frPVCCConnectL2hLastChange 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."

```
::= { frPVCCConnectEntry 9 }
```

```
frPVCCConnectH2lLastChange 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."

```
::= { frPVCCConnectEntry 10 }
```

```
frPVCCConnectRowStatus OBJECT-TYPE
```

```
SYNTAX          RowStatus
```

```
MAX-ACCESS      read-create
```

```
STATUS          current
```

```
DESCRIPTION
```

"The status of this entry in the frPVCCConnectTable. 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: frPVCCConnectAdminStatus. The agent also supplies the associated value of frPVCCConnectIndex for the frPVCEndptConnectIdentifier instances. To turn on a PVC segment connection, the frPVCCConnectAdminStatus is set to 'active(1)'."

```
::= { frPVCCConnectEntry 11 }
```

```
frPVCCConnectUserName OBJECT-TYPE
```

```
SYNTAX          SnmpAdminString
```

```
MAX-ACCESS      read-create
```

```
STATUS          current
```

```
DESCRIPTION
```

"This is a service user assigned textual representation of a PVC."

```
::= { frPVCCConnectEntry 12 }
```

```

frPVCCConnectProviderName 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."
    ::= { frPVCCConnectEntry 13 }

--
-- The Frame Relay Accounting
--

frAccountPVCTable OBJECT-TYPE
    SYNTAX      SEQUENCE OF FrAccountPVCEntity
    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 }

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

FrAccountPVCEntity ::=
    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

--

frPVCCConnectStatusChange NOTIFICATION-TYPE

OBJECTS { frPVCCConnectIndex,
 frPVCCConnectLowIfIndex,
 frPVCCConnectLowDLCIIndex,
 frPVCCConnectHighIfIndex,
 frPVCCConnectHighDLCIIndex,
 frPVCCConnectL2hOperStatus,
 frPVCCConnectH2lOperStatus,
 frPVCEndptRcvdSigStatus }

STATUS deprecated

DESCRIPTION

"Refer to the description of the
 frPVCCConnectStatusNotif 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 }

frPVCCConnectStatusNotif NOTIFICATION-TYPE

OBJECTS { frPVCCConnectL2hOperStatus,
 frPVCCConnectH2lOperStatus,
 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,
                            frnetservPVCCConnectGroup,
                            frnetservPVCCConnectNamesGroup,
                            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      frPVCCConnectAdminStatus
MIN-ACCESS  read-only
DESCRIPTION
    "Write access is not required."

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

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

OBJECT      frPVCCConnectRowStatus
-- 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 frnetserveLportGroup2 as a replacement for this group."

```
::= { frnetserveGroups 1 }
```

```
frnetserveMgtVCSigGroup 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."

```
::= { frnetserveGroups 2 }
```

```
frnetservePVCEndptGroup 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 }

frnetservPVCCConnectGroup OBJECT-GROUP
OBJECTS { frPVCCConnectAdminStatus,
          frPVCCConnectL2hOperStatus,
          frPVCCConnectH2lOperStatus,
          frPVCCConnectL2hLastChange,
          frPVCCConnectH2lLastChange,
          frPVCCConnectRowStatus }
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 }

frnetservPVCCConnectNamesGroup OBJECT-GROUP
    OBJECTS { frPVCCConnectUserName,
               frPVCCConnectProviderName }
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 { frPVCCConnectStatusChange }

STATUS deprecated

DESCRIPTION

"Deprecated notification group. The frPVCCConnectStatusChange notification was flawed because it included redundant indexes and was not properly encoded for SMIV1 conversion."

::= { frnetservGroups 12 }

frnetservPVCNotifGroup2 NOTIFICATION-GROUP

NOTIFICATIONS { frPVCCConnectStatusNotif }

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:

frPVCCConnectUserName
frPVCCConnectProviderName

- (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

frnetservPVCCConnectNamesGroup - 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 frPVCCConnectStatusChange notification

frnetservPVCNotifGroup2 - New group added with w/ frPVCCConnectStatusNotif

- (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) frPVConnect{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) frPVCCConnectIndex - Added a range to the SYNTAX clause
- (20) frPVCCConnect{L2h|H2l}OperStatus - Added DESCRIPTION text for each enumerated value.
- (21) frAccountPVCDLCIIndex - Added a range to the SYNTAX clause
- (22) frPVCCConnectStatusChange Notification - STATUS change to deprecated. Obsoleted to eliminate inappropriate inclusion of index objects
- (23) frPVCCConnectStatusNotif Notification - Replaces frPVCCConnectStatusChange. 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

Copyright (C) The Internet Society (2000). All Rights Reserved.

This document and translations of it may be copied and furnished to others, and derivative works that comment on or otherwise explain it or assist in its implementation may be prepared, copied, published and distributed, in whole or in part, without restriction of any kind, provided that the above copyright notice and this paragraph are included on all such copies and derivative works. However, this document itself may not be modified in any way, such as by removing the copyright notice or references to the Internet Society or other Internet organizations, except as needed for the purpose of developing Internet standards in which case the procedures for copyrights defined in the Internet Standards process must be followed, or as required to translate it into languages other than English.

The limited permissions granted above are perpetual and will not be revoked by the Internet Society or its successors or assigns.

This document and the information contained herein is provided on an "AS IS" basis and THE INTERNET SOCIETY AND THE INTERNET ENGINEERING TASK FORCE DISCLAIMS ALL WARRANTIES, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO ANY WARRANTY THAT THE USE OF THE INFORMATION HEREIN WILL NOT INFRINGE ANY RIGHTS OR ANY IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.

Acknowledgement

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

