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Management Information Base for Frame Relay DTEs Using SMIv2

1. 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.

2. Abstract

This memo defines a portion of the Management Information Base (MIB) for use with network management protocols in TCP/IP- based internets. In particular, it defines objects for managing Frame Relay interfaces on DTEs.

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3. The SNMPv2 Network Management Framework

The major components of the SNMPv2 Network Management framework are described in the documents listed below.

- RFC 1902 [1] defines the Structure of Management Information (SMI), the mechanisms used for describing and naming objects for the purpose of management.
- STD 17, RFC 1213 [2] defines MIB-II, the core set of managed objects (MO) for the Internet suite of protocols.
- RFC 1905 [3] defines the protocol used for network access to managed objects.

The framework is adaptable/extensible by defining new MIBs to suit the requirements of specific applications/protocols/situations.

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

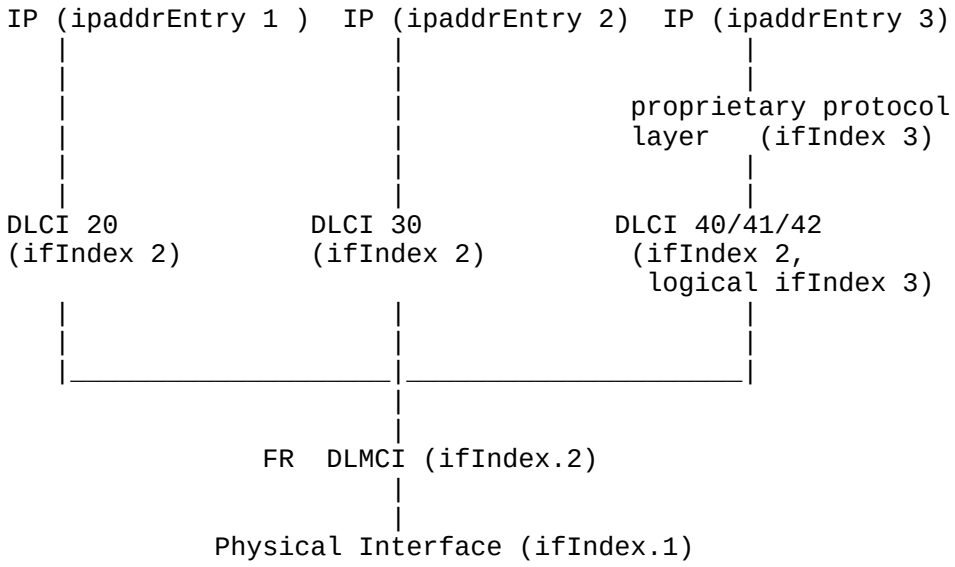
4. Overview

4.1. Frame Relay Operational Model

For the purposes of understanding this document, Frame Relay is viewed as a multi-access media, not as a group of point- to-point connections. This model proposes that Frame Relay is a single interface to the network (physical connection) with many destinations or neighbors (virtual connections). This view enables a network manager the ability to group all virtual connections with their corresponding physical connection thereby allowing simpler diagnostics and trouble shooting.

With the extension of the interfaces MIB, it is possible to configure frame relay DLCs as individual interfaces and create ifTable entries for each. This is not recommended and is not directly supported by this MIB. Additionally, in the presence of demand circuits creation of individual ifEntries for each is not possible.

Should the user wish to group DLCs together to associate them with a higher layer, or to associate a DLC with an unnumbered point-to-point service, the frame relay DTE MIB provides an entry in the frCircuitEntry record. For example, suppose one were to configure a company proprietary protocol to run above several of the frame relay VCs. The basic layering would look something like the following:



A configuration which specified that DLCI 40, 41,and 42 were associated with a proprietary protocol layer, while DLCI 20 and 30 were to run IP directly can now be expressed using a combination of frCircuitIfIndex and frCircuitLogicalIfIndex. In this particular case DLCIs 40, 41 and 42 would use frCircuitIfIndex equal to the frame relay interface level (2) while their frCircuitLogicalIfIndex would indicate the proprietary protocol (3). DLCIs 20 and 30 would have both instances set to the frame relay interface (2).

Object	Meaning for Frame Relay Interface
ifDescr	As per DESCRIPTION in RFC 1573.
ifType	The value allocated for Frame Relay Interfaces - frameRelay (32).
ifMtu	Set to maximum frame size in octets for this frame relay interface.

ifSpeed	The access rate for the frame relay interface. This could be different from the speed of the underlying physical interface, e.g. in a fractional T1 case the access rate could be 384 kbits/s (the value reported in this object) whereas the speed of the underlying interface would be 1.544 Mbits/s (the value reported in the instance of ifSpeed for the ifEntry with type ds1).
ifPhysAddress	The primary address for this interface assigned by the Frame Relay interface provider. An octet string of zero length if no address is used for this interface.
ifAdminStatus	As per DESCRIPTION in RFC 1573.
ifOperStatus	As per DESCRIPTION in RFC 1573.
ifLastChange	As per DESCRIPTION in RFC 1573.
ifInOctets	The number of received octets. This includes not only the information field (user data) but also the frame relay header and CRC.
ifInUcastPkts	The number of frames received on non-multicast DLCIs
ifInDiscards	The number of frames that were successfully received but were discarded because of format errors or because the VC was not known. Format errors, in this case, are any errors which would prevent the system from recognizing the DLCI and placing the error in the frCircuitDiscard category.
ifInErrors	The number of received frames that are discarded, because of an error. Possible errors can be the following: the frame relay frames were too long or were too short, the frames had an invalid or unrecognized DLCI values, or incorrect header values.

ifInUnknownProtos	Number of unknown or unsupported upper layer protocol frames received and discarded.
ifOutOctets	The number of received octets. This includes not only the information field (user data) but also the frame relay header and CRC.
ifOutUcastpkts	The number of frames sent.
ifOutDiscards	The number of frames discarded in the transmit direction.
ifOutErrors	The number of frames discarded in the egress direction, because of errors.
ifName	As per DESCRIPTION in RFC 1573.
ifInMulticastPkts	The number of unerrored frames received on a multicast DLCI.
ifInBroadcastPkts	Always zero (0) as there are no broadcast frames.
ifOutMulticastPkts	The number of frames transmitted over a multicast DLCI.
ifOutBroadcastPkts	Always zero (0) as there are no broadcast frames.
ifHCInOctets	Only required when ifSpeed >= 155 Mbits/s. See details for ifInOctets.
ifHCOutOctets	Only required when ifSpeed >= 155 Mbits/s. See details for ifInOctets.
ifLinkUpDownTrapEnble	As per DESCRIPTION in RFC 1573.
ifHighSpeed	The access rate of the frame relay interface measured in Mbits/s. If the access rate is less than 1 Mbits/s, this object returns 0.
ifPromiscuousMode	Set to false(2).
ifConnectorPresent	Set to false(2).

4.2. Textual Conventions

One new data type is introduced as a textual convention in this MIB document. This textual convention enhances the readability of the specification and can ease comparison with other specifications if appropriate. It should be noted that the introduction of this textual conventions has no effect on either the syntax nor the semantics of any managed objects. The use of this is merely an artifact of the explanatory method used. Objects defined in terms of one of these methods are always encoded by means of the rules that define the primitive type. Hence, no changes to the SMI or the SNMP are necessary to accommodate this textual conventions which is adopted merely for the convenience of readers and writers in pursuit of the elusive goal of clear, concise, and unambiguous MIB documents.

The new data type is DLCI. DLCI refers to the range 0..DLCINumber, and is used to refer to the valid Data Link Connection Indices. DLCINumber is, by definition, the largest possible DLCI value possible under the configured Q.922 Address Format.

4.3. Structure of MIB

The MIB is composed of three groups, one defining the Data Link Connection Management Interface (DLCMI), one describing the Circuits, and a third describing errors.

During normal operation, Frame Relay virtual circuits will be added, deleted and change availability. The occurrence of such changes is of interest to the network manager and therefore, one trap is defined, intended to be corollary to the SNMP "Link Up" and "Link Down" traps.

5. Changes from RFC 1315

Below are listed the changes from the previously published version this document, which was RFC 1315:

- The MIB module was converted from SMIv1 to SMIv2 format. Note: due to this, the table indices have access of "read-only" instead of "not-accessible", which is the typical value for index objects in SMIv2.

- The module name was changed from RFC1315-MIB to FRAME-RELAY-DTE-MIB.

- The textual convention "Index" was dropped from the MIB module and "InterfaceIndex" from the interfaces MIB module, IF-MIB, was used in its place.

- Objects frDlcmiStatus and frDlcmiRowStatus were added to table frDlcmiTable.

- Added values "itut933A(5)" (from CCITT Q933 Annex A) and "ansiT1617D1994(6)" (from ANSI T1.617a-1994 Annex D) to the enumerations for object frDlcmiState.

- The labels for the enumerated values for object frDlcmiAddressLen were renamed to remove their hyphens as required by SMIv2.

- Added clarification that the "management virtual circuit" (i.e. DLCI 0) is a member of the circuit table.

- Added the following objects to table frCircuitTable: frCircuitMulticast, frCircuitType, frCircuitDiscards, frCircuitReceivedDEs, frCircuitSentDEs, frCircuitLogicalIfIndex, and frCircuitRowStatus.

- The definition of object frCircuitReceivedOctets was clarified as to which octets were counted.

- Added the objects frErrFaults and frErrFaultTime to table frErrTable.

- Added clarification to the values of object frErrType.

- Added size on definition of object frErrData and clarified what data to capture.

- Changed identififier for OID value { frameDelayDTE 4 } from frame-relay-globals to frameRelayTrapControl.

- Added object frTrapMaxRate.

- Created object groups frPortGroup, frCircuitGroup, frTrapGroup, frErrGroup, frPortGroup0, frCircuitGroup0, frTrapGroup0, and frErrGroup0.

- Created notification group frNotificationGroup.

- Created module compliances frCompliance and frCompliance0.

- Added ranges to objects frCircuitCommittedBurst, frCircuitExcessBurst, and frCircuitThroughput.

6. Definitions

```
FRAME-RELAY-DTE-MIB DEFINITIONS ::= BEGIN

IMPORTS
            MODULE-IDENTITY, OBJECT-TYPE, Counter32,
            Integer32, NOTIFICATION-TYPE            FROM SNMPv2-SMI
            TEXTUAL-CONVENTION, RowStatus, TimeStamp FROM SNMPv2-TC
            MODULE-COMPLIANCE, OBJECT-GROUP,
            NOTIFICATION-GROUP                      FROM SNMPv2-CONF
            transmission                            FROM RFC1213-MIB
            InterfaceIndex                            FROM IF-MIB;

--  Frame Relay DTE MIB

frameRelayDTE MODULE-IDENTITY
    LAST-UPDATED "9705010229Z" -- Thu May  1 02:29:46 PDT 1997
    ORGANIZATION "IETF IPLPDN Working Group"
    CONTACT-INFO
       "       Caralyn Brown
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    DESCRIPTION
       "The MIB module to describe the use of a Frame Relay
       interface by a DTE."
    REVISION "9705010229Z" -- Thu May  1 02:29:46 PDT 1997
    DESCRIPTION
       "Converted from SMIv1 to SMIv2. (Thus, indices are
       read-only rather than being not-accessible.) Added
       objects and made clarifications based on implementation
       experience."

    REVISION "9204010000Z"
    DESCRIPTION
       "Published as RFC 1315, the initial version of this MIB
       module."
    ::= { transmission 32 }
```

```
--
--      the range of a Data Link Connection Identifier
--
DLCI ::= TEXTUAL-CONVENTION
    STATUS      current
    DESCRIPTION
       "The range of DLCI values.  Note that this varies by
       interface configuration; normally, interfaces may use
       0..1023, but may be configured to use ranges as large
       as 0..2^23."
    SYNTAX      Integer32(0..8388607)



--

--  Data Link Connection Management Interface

--      The variables that configure the DLC Management Interface.

frDlcmiTable OBJECT-TYPE
    SYNTAX   SEQUENCE OF FrDlcmiEntry
    MAX-ACCESS   not-accessible
    STATUS   current
    DESCRIPTION
       "The Parameters for the Data Link Connection Management
       Interface for the frame relay service on this
       interface."
    REFERENCE
       "American National Standard T1.617-1991, Annex D"
    ::= { frameRelayDTE 1 }

frDlcmiEntry OBJECT-TYPE
    SYNTAX   FrDlcmiEntry
    MAX-ACCESS   not-accessible
    STATUS   current
    DESCRIPTION
       "The Parameters for a particular Data Link Connection
       Management Interface."
    INDEX { frDlcmiIfIndex }
    ::= { frDlcmiTable 1 }
```

```
FrDlcmiEntry ::=
    SEQUENCE {
        frDlcmiIfIndex                  InterfaceIndex,
        frDlcmiState                    INTEGER,
        frDlcmiAddress                  INTEGER,
        frDlcmiAddressLen               INTEGER,
        frDlcmiPollingInterval          Integer32,
        frDlcmiFullEnquiryInterval      Integer32,
        frDlcmiErrorThreshold           Integer32,
        frDlcmiMonitoredEvents          Integer32,
        frDlcmiMaxSupportedVCs          DLCI,
        frDlcmiMulticast                INTEGER,
        frDlcmiStatus                   INTEGER,
        frDlcmiRowStatus                RowStatus
}


frDlcmiIfIndex OBJECT-TYPE

    SYNTAX   InterfaceIndex
    MAX-ACCESS   read-only
    STATUS   current
    DESCRIPTION
       "The ifIndex value of the corresponding ifEntry."
    ::= { frDlcmiEntry 1 }


frDlcmiState OBJECT-TYPE
    SYNTAX INTEGER      {
        noLmiConfigured (1),
        lmiRev1         (2),
        ansiT1617D      (3),  -- ANSI T1.617 Annex D
        ansiT1617B      (4),  -- ANSI T1.617 Annex B
        itut933A        (5),  -- CCITT Q933 Annex A
        ansiT1617D1994  (6)   -- ANSI T1.617a-1994 Annex D
    }
    MAX-ACCESS   read-create
    STATUS   current
    DESCRIPTION
       "This variable states which Data Link Connection
       Management scheme is active (and by implication, what
       DLCI it uses) on the Frame Relay interface."
    REFERENCE
       "American National Standard T1.617-1991, American
       National Standard T1.617a-1994, ITU-T Recommendation
       Q.933 (03/93)."

    ::= { frDlcmiEntry 2 }
```

```
frDlcmiAddress OBJECT-TYPE
    SYNTAX      INTEGER {
                q921           (1),  -- 13 bit DLCI
                q922March90    (2),  -- 11 bit DLCI
                q922November90 (3),  -- 10 bit DLCI
                q922           (4)   -- Final Standard
    }
    MAX-ACCESS  read-create
    STATUS  current
    DESCRIPTION
       "This variable states which address format is in use on
       the Frame Relay interface."
    ::= { frDlcmiEntry 3 }


frDlcmiAddressLen OBJECT-TYPE
    SYNTAX  INTEGER     {
            twoOctets (2),
            threeOctets (3),
            fourOctets (4)
    }
    MAX-ACCESS  read-create
    STATUS  current
    DESCRIPTION
       "This variable states the address length in octets.  In
       the case of Q922 format, the length indicates the
       entire length of the address including the control
       portion."
    ::= { frDlcmiEntry 4 }


frDlcmiPollingInterval OBJECT-TYPE
    SYNTAX   Integer32 (5..30)
    UNITS    "seconds"
    MAX-ACCESS   read-create
    STATUS   current
    DESCRIPTION
       "This is the number of seconds between successive
       status enquiry messages."
    REFERENCE
       "American National Standard T1.617-1991, Section D.7
       Timer T391."
    DEFVAL { 10 }
    ::= { frDlcmiEntry 5 }
```

```
frDlcmiFullEnquiryInterval OBJECT-TYPE
    SYNTAX   Integer32 (1..255)
    MAX-ACCESS   read-create
    STATUS   current
    DESCRIPTION
       "Number of status enquiry intervals that pass before
       issuance of a full status enquiry message."
    REFERENCE
       "American National Standard T1.617-1991, Section D.7
       Counter N391."
    DEFVAL { 6 }
    ::= { frDlcmiEntry 6 }


frDlcmiErrorThreshold OBJECT-TYPE
    SYNTAX   Integer32 (1..10)
    MAX-ACCESS   read-create
    STATUS   current
    DESCRIPTION
       "This is the maximum number of unanswered Status
       Enquiries the equipment shall accept before declaring
       the interface down."
    REFERENCE
       "American National Standard T1.617-1991, Section D.5.1
       Counter N392."
    DEFVAL { 3 }
    ::= { frDlcmiEntry 7 }


frDlcmiMonitoredEvents OBJECT-TYPE
    SYNTAX   Integer32 (1..10)
    MAX-ACCESS   read-create
    STATUS   current
    DESCRIPTION
       "This is the number of status polling intervals over
       which the error threshold is counted.  For example, if
       within 'MonitoredEvents' number of events the station
       receives 'ErrorThreshold' number of errors, the
       interface is marked as down."
    REFERENCE
       "American National Standard T1.617-1991, Section D.5.2
       Counter N393."
    DEFVAL { 4 }
    ::= { frDlcmiEntry 8 }
```

```
frDlcmiMaxSupportedVCs OBJECT-TYPE
    SYNTAX   DLCI
    MAX-ACCESS   read-create
    STATUS   current
    DESCRIPTION
       "The maximum number of Virtual Circuits allowed for
       this interface.  Usually dictated by the Frame Relay
       network.

       In response to a SET, if a value less than zero or
       higher than the agent's maximal capability is
       configured, the agent should respond badValue"
    ::= { frDlcmiEntry 9 }


frDlcmiMulticast OBJECT-TYPE
    SYNTAX   INTEGER    {
                nonBroadcast (1),
                broadcast (2)
                }
    MAX-ACCESS   read-create
    STATUS   current
    DESCRIPTION
       "This indicates whether the Frame Relay interface is
       using a multicast service."
    ::= { frDlcmiEntry 10 }



frDlcmiStatus OBJECT-TYPE
    SYNTAX   INTEGER    {
                running      (1),    -- init complete, system running
                fault        (2),    -- error threshold exceeded
                initializing (3)     -- system start up
                }
    MAX-ACCESS   read-only
    STATUS   current
    DESCRIPTION
       "This indicates the status of the Frame Relay interface
       as determined by the performance of the dlcmi.  If no
       dlcmi is running, the Frame Relay interface will stay
       in the running state indefinitely."
    ::= { frDlcmiEntry 11 }
```

```
    frDlcmiRowStatus OBJECT-TYPE
        SYNTAX   RowStatus
        MAX-ACCESS   read-create
        STATUS   current
        DESCRIPTION
           "SNMP Version 2 Row Status Variable.  Writable objects
           in the table may be written in any RowStatus state."
        ::= { frDlcmiEntry 12 }


    --
    -- A Frame Relay service is a multiplexing service.  Data
    -- Link Connection Identifiers enumerate virtual circuits
    -- (permanent or dynamic) which are layered onto the underlying
    -- circuit, represented by ifEntry.  Therefore, each of the entries
    -- in the Standard MIB's Interface Table with an IfType of
    -- Frame Relay represents a Q.922 interface.  Zero or more
    -- virtual circuits are layered onto this interface and provide
    -- interconnection with various remote destinations.
    -- Each such virtual circuit is represented by an entry in the
    -- circuit table.  The management virtual circuit (i.e. DLCI 0)
    -- is a virtual circuit by this definition and will be represented
    -- with an entry in the circuit table.

    --   Circuit Table

    -- The table describing the use of the DLCIs attached to
    -- each Frame Relay Interface.

    frCircuitTable OBJECT-TYPE
        SYNTAX   SEQUENCE OF FrCircuitEntry
        MAX-ACCESS   not-accessible
        STATUS   current
        DESCRIPTION
           "A table containing information about specific Data
           Link Connections (DLC) or virtual circuits."
        ::= { frameRelayDTE 2 }
```

```
frCircuitEntry OBJECT-TYPE
    SYNTAX   FrCircuitEntry
    MAX-ACCESS   not-accessible
    STATUS   current
    DESCRIPTION
       "The information regarding a single Data Link
       Connection.  Discontinuities in the counters contained
       in this table are indicated by the value in
       frCircuitCreationTime."
    INDEX { frCircuitIfIndex, frCircuitDlci }
    ::= { frCircuitTable 1 }


FrCircuitEntry ::=
    SEQUENCE {
        frCircuitIfIndex               InterfaceIndex,
        frCircuitDlci                  DLCI,
        frCircuitState                 INTEGER,
        frCircuitReceivedFECNs         Counter32,
        frCircuitReceivedBECNs         Counter32,
        frCircuitSentFrames            Counter32,
        frCircuitSentOctets            Counter32,
        frCircuitReceivedFrames        Counter32,
        frCircuitReceivedOctets        Counter32,
        frCircuitCreationTime          TimeStamp,
        frCircuitLastTimeChange        TimeStamp,
        frCircuitCommittedBurst        Integer32,
        frCircuitExcessBurst           Integer32,
        frCircuitThroughput            Integer32,
        frCircuitMulticast             INTEGER,
        frCircuitType                  INTEGER,
        frCircuitDiscards              Counter32,
        frCircuitReceivedDEs           Counter32,
        frCircuitSentDEs               Counter32,
        frCircuitLogicalIfIndex        InterfaceIndex,
        frCircuitRowStatus             RowStatus
}


frCircuitIfIndex OBJECT-TYPE
    SYNTAX   InterfaceIndex
    MAX-ACCESS   read-only
    STATUS   current
    DESCRIPTION
       "The ifIndex Value of the ifEntry this virtual circuit
       is layered onto."
    ::= { frCircuitEntry 1 }
```

```
frCircuitDlci OBJECT-TYPE
    SYNTAX   DLCI
    MAX-ACCESS   read-only
    STATUS   current
    DESCRIPTION
       "The Data Link Connection Identifier for this virtual
       circuit."
    REFERENCE
       "American National Standard T1.618-1991, Section 3.3.6"
    ::= { frCircuitEntry 2 }


frCircuitState OBJECT-TYPE
    SYNTAX   INTEGER    {

                invalid (1),
                active (2),
                inactive (3)
             }
    MAX-ACCESS   read-create
    STATUS   current
    DESCRIPTION
       "Indicates whether the particular virtual circuit is
       operational.  In the absence of a Data Link Connection
       Management Interface, virtual circuit entries (rows)
       may be created by setting virtual circuit state to
       'active', or deleted by changing Circuit state to
       'invalid'.

       Whether or not the row actually disappears is left to
       the implementation, so this object may actually read as
       'invalid' for some arbitrary length of time.  It is
       also legal to set the state of a virtual circuit to
       'inactive' to temporarily disable a given circuit.

       The use of 'invalid' is deprecated in this SNMP Version
       2 MIB, in favor of frCircuitRowStatus."
    DEFVAL { active }
    ::= { frCircuitEntry 3 }
```

```
    frCircuitReceivedFECNs OBJECT-TYPE
        SYNTAX   Counter32
        MAX-ACCESS   read-only
        STATUS   current
        DESCRIPTION
           "Number of frames received from the network indicating
           forward congestion since the virtual circuit was
           created.  This occurs when the remote DTE sets the FECN
           flag, or when a switch in the network enqueues the
           frame to a trunk whose transmission queue is
           congested."
        REFERENCE
           "American National Standard T1.618-1991, Section 3.3.3"
        ::= { frCircuitEntry 4 }


    frCircuitReceivedBECNs OBJECT-TYPE
        SYNTAX   Counter32
        MAX-ACCESS   read-only


        STATUS   current
        DESCRIPTION
           "Number of frames received from the network indicating
           backward congestion since the virtual circuit was
           created.  This occurs when the remote DTE sets the BECN
           flag, or when a switch in the network receives the
           frame from a trunk whose transmission queue is
           congested."
        REFERENCE
           "American National Standard T1.618-1991, Section 3.3.4"
        ::= { frCircuitEntry 5 }


    frCircuitSentFrames OBJECT-TYPE
        SYNTAX   Counter32
        MAX-ACCESS   read-only
        STATUS   current
        DESCRIPTION
           "The number of frames sent from this virtual circuit
           since it was created."
        ::= { frCircuitEntry 6 }


    frCircuitSentOctets OBJECT-TYPE
        SYNTAX   Counter32
        MAX-ACCESS   read-only
        STATUS   current
```

```
        DESCRIPTION
           "The number of octets sent from this virtual circuit
           since it was created.  Octets counted are the full
           frame relay header and the payload, but do not include
           the flag characters or CRC."
        ::= { frCircuitEntry 7 }


    frCircuitReceivedFrames OBJECT-TYPE
        SYNTAX   Counter32
        MAX-ACCESS   read-only
        STATUS   current
        DESCRIPTION
           "Number of frames received over this virtual circuit
           since it was created."
        ::= { frCircuitEntry 8 }


    frCircuitReceivedOctets OBJECT-TYPE
        SYNTAX   Counter32
        MAX-ACCESS   read-only
        STATUS   current
        DESCRIPTION
           "Number of octets received over this virtual circuit
           since it was created.  Octets counted include the full
           frame relay header, but do not include the flag
           characters or the CRC."
        ::= { frCircuitEntry 9 }


    frCircuitCreationTime OBJECT-TYPE
        SYNTAX   TimeStamp
        MAX-ACCESS   read-only
        STATUS   current
        DESCRIPTION
           "The value of sysUpTime when the virtual circuit was
           created, whether by the Data Link Connection Management
           Interface or by a SetRequest."
        ::= { frCircuitEntry 10 }
```

```
    frCircuitLastTimeChange OBJECT-TYPE
        SYNTAX   TimeStamp
        MAX-ACCESS   read-only
        STATUS   current
        DESCRIPTION
           "The value of sysUpTime when last there was a change in
           the virtual circuit state"
        ::= { frCircuitEntry 11 }


    frCircuitCommittedBurst OBJECT-TYPE
        SYNTAX   Integer32(0..2147483647)
        MAX-ACCESS   read-create
        STATUS   current
        DESCRIPTION
           "This variable indicates the maximum amount of data, in
           bits, that the network agrees to transfer under normal
           conditions, during the measurement interval."
        REFERENCE
           "American National Standard T1.617-1991, Section
           6.5.19"
        DEFVAL   { 0 }  -- the default indicates no commitment
        ::= { frCircuitEntry 12 }


    frCircuitExcessBurst OBJECT-TYPE
        SYNTAX   Integer32(0..2147483647)
        MAX-ACCESS   read-create
        STATUS   current
        DESCRIPTION
           "This variable indicates the maximum amount of
           uncommitted data bits that the network will attempt to
           deliver over the measurement interval.

           By default, if not configured when creating the entry,
           the Excess Information Burst Size is set to the value
           of ifSpeed."
        REFERENCE
           "American National Standard T1.617-1991, Section
           6.5.19"
        ::= { frCircuitEntry 13 }


    frCircuitThroughput OBJECT-TYPE
        SYNTAX   Integer32(0..2147483647)
        MAX-ACCESS   read-create
        STATUS   current
        DESCRIPTION
```

```
            "Throughput is the average number of 'Frame Relay
            Information Field' bits transferred per second across a
            user network interface in one direction, measured over
            the measurement interval.

            If the configured committed burst rate and throughput
            are both non-zero, the measurement interval, T, is
                T=frCircuitCommittedBurst/frCircuitThroughput.

            If the configured committed burst rate and throughput
            are both zero, the measurement interval, T, is
                        T=frCircuitExcessBurst/ifSpeed."
        REFERENCE
            "American National Standard T1.617-1991, Section
            6.5.19"
        DEFVAL {0}  -- the default value of Throughput is
                    -- "no commitment".
        ::= { frCircuitEntry 14 }


    frCircuitMulticast OBJECT-TYPE
        SYNTAX   INTEGER    {
                    unicast   (1),
                    oneWay    (2),
                    twoWay    (3),
                    nWay      (4)
                    }
        MAX-ACCESS   read-create
        STATUS   current
        DESCRIPTION
            "This indicates whether this VC is used as a unicast VC
            (i.e. not multicast) or the type of multicast service
            subscribed to"
        REFERENCE
            "Frame Relay PVC Multicast Service and Protocol
            Description Implementation: FRF.7 Frame Relay Forum
            Technical Committe October 21, 1994"
              DEFVAL {unicast}
                          -- the default value of frCircuitMulticast is
                          -- "unicast" (not a multicast VC).
              ::= { frCircuitEntry 15 }


    frCircuitType OBJECT-TYPE
        SYNTAX   INTEGER    {
                    static  (1),
                    dynamic (2)
                 }
```

```
        MAX-ACCESS   read-only
        STATUS   current
        DESCRIPTION
           "Indication of whether the VC was manually created
           (static), or dynamically created (dynamic) via the data
           link control management interface."
        ::= { frCircuitEntry 16 }


    frCircuitDiscards OBJECT-TYPE
        SYNTAX   Counter32
        MAX-ACCESS   read-only
        STATUS   current
        DESCRIPTION
           "The number of inbound frames dropped because of format
           errors, or because the VC is inactive."
        ::= { frCircuitEntry 17 }


    frCircuitReceivedDEs OBJECT-TYPE
        SYNTAX   Counter32
        MAX-ACCESS   read-only
        STATUS   current
        DESCRIPTION
           "Number of frames received from the network indicating
           that they were eligible for discard since the virtual
           circuit was created.  This occurs when the remote DTE
           sets the DE flag, or when in remote DTE's switch
           detects that the frame was received as Excess Burst
           data."
        REFERENCE
           "American National Standard T1.618-1991, Section 3.3.4"
        ::= { frCircuitEntry 18 }


    frCircuitSentDEs OBJECT-TYPE
        SYNTAX   Counter32
        MAX-ACCESS   read-only
        STATUS   current
        DESCRIPTION
           "Number of frames sent to the network indicating that
           they were eligible for discard since the virtual
           circuit was created.   This occurs when the local DTE
           sets the DE flag, indicating that during Network
           congestion situations those frames should be discarded
           in preference of other frames sent without the DE bit
           set."
        REFERENCE
```

```
            "American National  Standard  T1.618-1991, Section
            3.3.4"
        ::= { frCircuitEntry 19 }

    frCircuitLogicalIfIndex OBJECT-TYPE
        SYNTAX  InterfaceIndex
        MAX-ACCESS read-create
        STATUS  current
        DESCRIPTION
            "Normally the same value as frDlcmiIfIndex, but
            different when an implementation associates a virtual
            ifEntry with a DLC or set of DLCs in order to associate
            higher layer objects such as the ipAddrEntry with a
            subset of the virtual circuits on a Frame Relay
            interface. The type of such ifEntries is defined by the
            higher layer object; for example, if PPP/Frame Relay is
            implemented, the ifType of this ifEntry would be PPP.
            If it is not so defined, as would be the case with an
            ipAddrEntry, it should be of type Other."
        ::= { frCircuitEntry 20 }

    frCircuitRowStatus OBJECT-TYPE
        SYNTAX   RowStatus
        MAX-ACCESS   read-create
        STATUS   current
        DESCRIPTION
            "This object is used to create a new row or modify or
            destroy an existing row in the manner described in the
            definition of the RowStatus textual convention.
            Writable objects in the table may be written in any
            RowStatus state."
        ::= { frCircuitEntry 21 }


    --
    --  Error Table

    -- The table describing errors encountered on each Frame
    -- Relay Interface.

    frErrTable OBJECT-TYPE
        SYNTAX   SEQUENCE OF FrErrEntry
        MAX-ACCESS   not-accessible
        STATUS   current
        DESCRIPTION
            "A table containing information about Errors on the
            Frame Relay interface.  Discontinuities in the counters
            contained in this table are the same as apply to the
```

```
           ifEntry associated with the Interface."
       ::= { frameRelayDTE 3 }

   frErrEntry OBJECT-TYPE
       SYNTAX   FrErrEntry
       MAX-ACCESS   not-accessible
       STATUS   current
       DESCRIPTION
          "The error information for a single frame relay
          interface."
       INDEX { frErrIfIndex }
       ::= { frErrTable 1 }


   FrErrEntry ::=
       SEQUENCE {
           frErrIfIndex            InterfaceIndex,
           frErrType               INTEGER,
           frErrData               OCTET STRING,
           frErrTime               TimeStamp,
           frErrFaults             Counter32,
           frErrFaultTime          TimeStamp
   }


   frErrIfIndex OBJECT-TYPE
       SYNTAX   InterfaceIndex
       MAX-ACCESS   read-only
       STATUS   current
       DESCRIPTION
          "The ifIndex Value of the corresponding ifEntry."
       ::= { frErrEntry 1 }


       frErrType OBJECT-TYPE
           SYNTAX   INTEGER    {
                       unknownError(1),
                       receiveShort(2),
                       receiveLong(3),
                       illegalAddress(4),
                       unknownAddress(5),
                       dlcmiProtoErr(6),
                       dlcmiUnknownIE(7),
                       dlcmiSequenceErr(8),
                       dlcmiUnknownRpt(9),
                       noErrorSinceReset(10)
                    }
```

```
        MAX-ACCESS   read-only
        STATUS   current
        DESCRIPTION
    "The type of error that was last seen  on  this interface:

    receiveShort: frame was not long enough to allow
           demultiplexing - the address field was incomplete,
           or for virtual circuits using Multiprotocol over
           Frame Relay, the protocol identifier was missing
           or incomplete.

    receiveLong: frame exceeded maximum length configured for this
                 interface.

    illegalAddress: address field did not match configured format.

    unknownAddress: frame received on a virtual circuit which was not
                    active or administratively disabled.

    dlcmiProtoErr: unspecified error occurred when attempting to
                   interpret link maintenance frame.

    dlcmiUnknownIE: link maintenance frame contained an Information
                    Element type which is not valid for the
                    configured link maintenance protocol.

    dlcmiSequenceErr: link maintenance frame contained a sequence
                      number other than the expected value.

    dlcmiUnknownRpt: link maintenance frame contained a Report Type
                     Information Element whose value was not valid
                     for the configured link maintenance protocol.

    noErrorSinceReset: no errors have been detected since the last
                       cold start or warm start."
        ::= { frErrEntry 2 }


    frErrData OBJECT-TYPE
        SYNTAX   OCTET STRING (SIZE(1..1600))
        MAX-ACCESS   read-only
        STATUS   current
        DESCRIPTION
           "An octet string containing as much of the error packet
           as possible.  As a minimum, it must contain the Q.922
           Address or as much as was delivered.  It is desirable
           to include all header and demultiplexing information."
        ::= { frErrEntry 3 }
```

```
frErrTime OBJECT-TYPE
    SYNTAX   TimeStamp
    MAX-ACCESS   read-only
    STATUS   current
    DESCRIPTION
       "The value of sysUpTime at which the error was
       detected."
    ::= { frErrEntry 4 }


frErrFaults OBJECT-TYPE
    SYNTAX   Counter32
    MAX-ACCESS   read-only
    STATUS   current
    DESCRIPTION
       "The number of times the interface has gone down since
       it was initialized."
    ::= { frErrEntry 5 }


frErrFaultTime OBJECT-TYPE
    SYNTAX   TimeStamp
    MAX-ACCESS   read-only
    STATUS   current
    DESCRIPTION
       "The value of sysUpTime at the time when the interface
       was taken down due to excessive errors.  Excessive
       errors is defined as the time when a DLCMI exceeds the
       frDlcmiErrorThreshold number of errors within
       frDlcmiMonitoredEvents. See FrDlcmiEntry for further
       details."
    ::= { frErrEntry 6 }


--

-- Frame Relay Trap Control

frameRelayTrapControl OBJECT IDENTIFIER ::= { frameRelayDTE 4 }

-- the following highly unusual OID is as it is for compatibility
-- with RFC 1315, the SNMP V1 predecessor of this document.
frameRelayTraps OBJECT IDENTIFIER ::= { frameRelayDTE 0 }
```

```
    frTrapState OBJECT-TYPE
        SYNTAX  INTEGER     { enabled(1), disabled(2) }
        MAX-ACCESS   read-write
        STATUS   current
        DESCRIPTION
           "This variable indicates whether the system produces
           the frDLCIStatusChange trap."
        DEFVAL { disabled }
        ::= { frameRelayTrapControl 1 }

    frTrapMaxRate OBJECT-TYPE
        SYNTAX  Integer32 (0..3600000)
        MAX-ACCESS   read-write
        STATUS   current
        DESCRIPTION
           "This variable indicates the number of milliseconds
           that must elapse between trap emissions.  If events
           occur more rapidly, the impementation may simply fail
           to trap, or may queue traps until an appropriate time."
        DEFVAL { 0 }        -- no minimum elapsed period is specified
        ::= { frameRelayTrapControl 2 }



    --  Data Link Connection Management Interface Related Traps

    frDLCIStatusChange NOTIFICATION-TYPE
        OBJECTS  { frCircuitState }
        STATUS      current


        DESCRIPTION
           "This trap indicates that the indicated Virtual Circuit
           has changed state.  It has either been created or
           invalidated, or has toggled between the active and
           inactive states.  If, however, the reason for the state
           change is due to the DLCMI going down, per-DLCI traps
           should not be generated."
    ::= { frameRelayTraps 1 }
    -- conformance information

    frConformance OBJECT IDENTIFIER ::= { frameRelayDTE 6 }

    frGroups      OBJECT IDENTIFIER ::= { frConformance 1 }
    frCompliances OBJECT IDENTIFIER ::= { frConformance 2 }

    -- compliance statements
```

```
    frCompliance MODULE-COMPLIANCE
        STATUS  current
        DESCRIPTION
           "The compliance statement "
        MODULE  -- this module
        MANDATORY-GROUPS { frPortGroup, frCircuitGroup }

        GROUP       frErrGroup
        DESCRIPTION
           "This optional group is used for debugging Frame Relay
           Systems."

        GROUP       frTrapGroup
        DESCRIPTION
           "This optional group is used for the management of
           asynchronous notifications by Frame Relay Systems."

        GROUP       frNotificationGroup
        DESCRIPTION
           "This optional group defines the asynchronous
           notifications generated by Frame Relay Systems."

        OBJECT      frDlcmiRowStatus
        MIN-ACCESS  read-only
        DESCRIPTION
           "Row creation is not required for the frDlcmiTable."

        OBJECT      frCircuitRowStatus

        MIN-ACCESS  read-only
        DESCRIPTION
           "Row creation is not required for the frCircuitTable."

        ::= { frCompliances 1 }

    frCompliance0 MODULE-COMPLIANCE
        STATUS  current
        DESCRIPTION
           "The compliance statement for objects and the trap
           defined in RFC 1315."
        MODULE  -- this module
        MANDATORY-GROUPS { frPortGroup0, frCircuitGroup0 }

        GROUP       frErrGroup0
        DESCRIPTION
           "This optional group is used for debugging Frame Relay
           Systems."
```

```
        GROUP       frTrapGroup0
        DESCRIPTION
           "This optional group is used for the management of
           asynchronous notifications by Frame Relay Systems."

        GROUP       frNotificationGroup
        DESCRIPTION
           "This optional group defines the asynchronous
           notifications generated by Frame Relay Systems."

        ::= { frCompliances 2 }

    -- units of conformance

    frPortGroup    OBJECT-GROUP
        OBJECTS {
                  frDlcmiIfIndex, frDlcmiState, frDlcmiAddress,
                  frDlcmiAddressLen, frDlcmiPollingInterval,
                  frDlcmiFullEnquiryInterval, frDlcmiErrorThreshold,
                  frDlcmiMonitoredEvents, frDlcmiMaxSupportedVCs,
                  frDlcmiMulticast, frDlcmiStatus, frDlcmiRowStatus
                }
        STATUS  current
        DESCRIPTION
           "The objects necessary to control the Link Management
           Interface for a Frame Relay Interface as well as
           maintain the error statistics on this interface."
        ::= { frGroups 1 }

    frCircuitGroup    OBJECT-GROUP
        OBJECTS {
                  frCircuitIfIndex, frCircuitDlci, frCircuitState,
                  frCircuitReceivedFECNs, frCircuitReceivedBECNs,
                  frCircuitSentFrames, frCircuitSentOctets,
                  frCircuitReceivedFrames, frCircuitReceivedOctets,
                  frCircuitCreationTime, frCircuitLastTimeChange,
                  frCircuitCommittedBurst, frCircuitExcessBurst,
                  frCircuitThroughput, frCircuitMulticast,
                  frCircuitType, frCircuitDiscards,
                  frCircuitReceivedDEs, frCircuitSentDEs,
                  frCircuitLogicalIfIndex, frCircuitRowStatus
                }
        STATUS  current
        DESCRIPTION
           "The objects necessary to control the Virtual Circuits
           layered onto a Frame Relay Interface."
        ::= { frGroups 2 }
```

```
    frTrapGroup    OBJECT-GROUP
        OBJECTS { frTrapState, frTrapMaxRate }
        STATUS  current
        DESCRIPTION
           "The objects necessary to control a Frame Relay
           Interface's notification messages."
        ::= { frGroups 3 }

    frErrGroup    OBJECT-GROUP
        OBJECTS {
                  frErrIfIndex, frErrType, frErrData, frErrTime,
                  frErrFaults, frErrFaultTime
                }
        STATUS  current
        DESCRIPTION
           "Objects designed to assist in debugging Frame Relay
           Interfaces."
        ::= { frGroups 4 }

    frNotificationGroup NOTIFICATION-GROUP
        NOTIFICATIONS { frDLCIStatusChange }
        STATUS  current
        DESCRIPTION
           "Traps which may be used to enhance event driven
           management of the interface."
        ::= { frGroups 5 }

    frPortGroup0    OBJECT-GROUP
        OBJECTS {
                  frDlcmiIfIndex, frDlcmiState, frDlcmiAddress,
                  frDlcmiAddressLen, frDlcmiPollingInterval,
                  frDlcmiFullEnquiryInterval, frDlcmiErrorThreshold,
                  frDlcmiMonitoredEvents, frDlcmiMaxSupportedVCs,
                  frDlcmiMulticast
                }
        STATUS  current
        DESCRIPTION
           "The objects necessary to control the Link Management
           Interface for a Frame Relay Interface as well as
           maintain the error statistics on this interface from
           RFC 1315."
        ::= { frGroups 6 }

    frCircuitGroup0    OBJECT-GROUP
        OBJECTS {
                  frCircuitIfIndex, frCircuitDlci, frCircuitState,
                  frCircuitReceivedFECNs, frCircuitReceivedBECNs,
                  frCircuitSentFrames, frCircuitSentOctets,
```

```
                  frCircuitReceivedFrames, frCircuitReceivedOctets,
                  frCircuitCreationTime, frCircuitLastTimeChange,
                  frCircuitCommittedBurst, frCircuitExcessBurst,
                  frCircuitThroughput
                }
        STATUS  current
        DESCRIPTION
           "The objects necessary to control the Virtual Circuits
           layered onto a Frame Relay Interface from RFC 1315."
        ::= { frGroups 7 }

    frErrGroup0    OBJECT-GROUP
        OBJECTS {
                  frErrIfIndex, frErrType, frErrData, frErrTime
                }
        STATUS  current
        DESCRIPTION
           "Objects designed to assist in debugging Frame Relay
           Interfaces from RFC 1315."
        ::= { frGroups 8 }


    frTrapGroup0    OBJECT-GROUP
        OBJECTS { frTrapState }
        STATUS  current
        DESCRIPTION
           "The objects necessary to control a Frame Relay
           Interface's notification messages from RFC 1315."
        ::= { frGroups 9 }

    END
```

7. Security Issues

Security issues for this MIB are entirely covered by the SNMP Security Architecture, and have not been expanded within the contents of this MIB.

8. Acknowledgments

This document was originally produced by the IP Over Large Public Data Networks (IPLPDN) Working Group, and has since been carried on in the PPP Working Group, sort of. Currently, the Ion Working Group is its host.

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