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                Management Information Base for Frame Relay DTEs

Status of this Memo

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

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.

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1. The Network Management Framework

   The Internet-standard Network Management Framework consists of three
   components. They are:

   RFC 1155 which defines the SMI, the mechanisms used for describing
   and naming objects for the purpose of management. RFC 1212 defines a
   more concise description mechanism, which is wholly consistent with
   the SMI.

   RFC 1156 which defines MIB-I, the core set of managed objects for the
   Internet suite of protocols. RFC 1213 defines MIB-II, an evolution
   of MIB-I based on implementation experience and new operational
   requirements.

   RFC 1157 which defines the SNMP, the protocol used for network access
   to managed objects.

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

2. Objects

   Managed objects are accessed via a virtual information store, termed
   the Management Information Base or MIB. Objects in the MIB are
   defined using the subset of Abstract Syntax Notation One (ASN.1) [7]
   defined in the SMI. In particular, each object has a name, a syntax,
   and an encoding. The name is an object identifier, an
   administratively assigned name, which specifies an object type. The
   object type together with an object instance serves to uniquely
   identify a specific instantiation of the object. For human
   convenience, we often use a textual string, termed the OBJECT
   DESCRIPTOR, to also refer to the object type.

   The syntax of an object type defines the abstract data structure
   corresponding to that object type. The ASN.1 language is used for
   this purpose. However, the SMI [3] purposely restricts the ASN.1
   constructs which may be used. These restrictions are explicitly made
   for simplicity.

   The encoding of an object type is simply how that object type is
   represented using the object type's syntax. Implicitly tied to the
   notion of an object type's syntax and encoding is how the object type
   is represented when being transmitted on the network.

   The SMI specifies the use of the basic encoding rules of ASN.1 [8],
   subject to the additional requirements imposed by the SNMP.

2.1. Format of Definitions

   Section 4 contains contains the specification of all object types
   contained in this MIB module. The object types are defined using the
   conventions defined in the SMI, as amended by the extensions
   specified in [9,10].

3. Overview

3.1. 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.

3.2. Textual Conventions

   Several new data types are introduced as a textual convention in this
   MIB document. These textual conventions enhance the readability of
   the specification and can ease comparison with other specifications
   if appropriate. It should be noted that the introduction of the
   these textual conventions has no effect on either the syntax nor the
   semantics of any managed objects. The use of these 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 these textual conventions which are
   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 types are Index and DLCI. Index refers to the range
   1..ifNumber, and is used to establish the correspondence between
   ifEntries and Frame Relay Interfaces. 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.

3.3. 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.

4. Definitions

    RFC1315-MIB DEFINITIONS ::= BEGIN

    IMPORTS
            OBJECT-TYPE
                    FROM RFC-1212
            transmission
                    FROM RFC1213-MIB
            TimeTicks
                    FROM RFC-1155
            TRAP-TYPE
                    FROM RFC-1215;

    -- Frame Relay DTE MIB

    frame-relay   OBJECT IDENTIFIER ::= { transmission 32 }

    --
    --   the range of ifIndex
    --
    Index ::= INTEGER   -- 1..ifNumber

    --
    --   the range of a Data Link Connection Identifier
    --
    DLCI ::= INTEGER   -- 0..DLCINumber

    -- Data Link Connection Management Interface

    --   The variables that configure the DLC Management Interface.

    frDlcmiTable OBJECT-TYPE
        SYNTAX   SEQUENCE OF FrDlcmiEntry
        ACCESS   not-accessible
        STATUS   mandatory
        DESCRIPTION
            "The Parameters for the Data Link Connection Management
            Interface for the frame relay service on this
            interface."
        REFERENCE

```
                "Draft American National Standard T1.617-1991, Annex D"
         ::= { frame-relay 1 }

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

         FrDlcmiEntry ::=
             SEQUENCE {
                 frDlcmiIfIndex
                     Index,
                 frDlcmiState
                     INTEGER,
                 frDlcmiAddress
                     INTEGER,
                 frDlcmiAddressLen
                     INTEGER,
                 frDlcmiPollingInterval
                     INTEGER,
                 frDlcmiFullEnquiryInterval
                     INTEGER,
                 frDlcmiErrorThreshold
                     INTEGER,
                 frDlcmiMonitoredEvents
                     INTEGER,
                 frDlcmiMaxSupportedVCs
                     INTEGER,
                 frDlcmiMulticast
                     INTEGER
             }


         frDlcmiIfIndex OBJECT-TYPE
             SYNTAX    Index
             ACCESS    read-only
             STATUS    mandatory
             DESCRIPTION
                "The ifIndex value of the  corresponding  ifEn-
                try."
             ::= { frDlcmiEntry 1 }
```

```
        frDlcmiState OBJECT-TYPE
            SYNTAX INTEGER {
                noLmiConfigured (1),
                lmiRev1         (2),
                ansiT1-617-D    (3),  -- ANSI T1.617 Annex D
                ansiT1-617-B    (4)   -- ANSI T1.617 Annex B
            }
            ACCESS   read-write
            STATUS   mandatory
            DESCRIPTION
              "This variable states which Data  Link  Connec-
              tion Management scheme is active (and by impli-
              cation, what DLCI it uses) on the  Frame  Relay
              interface."
           REFERENCE
              "Draft American National Standard T1.617-1991"
          ::= { 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
            }
            ACCESS   read-write
            STATUS   mandatory
            DESCRIPTION
              "This variable states which address  format  is
              in use on the Frame Relay interface."
          ::= { frDlcmiEntry 3 }


        frDlcmiAddressLen OBJECT-TYPE
            SYNTAX   INTEGER {
                      two-octets (2),
                      three-octets (3),
                      four-octets (4)
            }
            ACCESS   read-write
            STATUS   mandatory
            DESCRIPTION
              "This variable states which address  length  in
              octets.  In the case of Q922 format, the length
              indicates the entire length of the address  in-
              cluding the control portion."
```

```
        ::= { frDlcmiEntry 4 }



    frDlcmiPollingInterval OBJECT-TYPE
        SYNTAX   INTEGER (5..30)
        ACCESS   read-write
        STATUS   mandatory
        DESCRIPTION
          "This is the number of seconds between  succes-
          sive status enquiry messages."
        REFERENCE
          "Draft American National  Standard  T1.617-1991,
          Section D.7 Timer T391."
      DEFVAL { 10 }
      ::= { frDlcmiEntry 5 }


    frDlcmiFullEnquiryInterval OBJECT-TYPE
        SYNTAX   INTEGER (1..255)
        ACCESS   read-write
        STATUS   mandatory
        DESCRIPTION
          "Number of status enquiry intervals  that  pass
          before  issuance  of a full status enquiry mes-
          sage."
        REFERENCE
          "Draft American National  Standard  T1.617-1991,
          Section D.7 Counter N391."
      DEFVAL { 6 }
      ::= { frDlcmiEntry 6 }



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

```
frDlcmiMonitoredEvents OBJECT-TYPE
    SYNTAX   INTEGER (1..10)
    ACCESS   read-write
    STATUS   mandatory
    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
       "Draft American National  Standard  T1.617-1991,
        Section D.5.2 Counter N393."
    DEFVAL { 4 }
    ::= { frDlcmiEntry 8 }


frDlcmiMaxSupportedVCs OBJECT-TYPE
    SYNTAX   INTEGER
    ACCESS   read-write
    STATUS   mandatory
    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  bad-
        Value"
    ::= { frDlcmiEntry 9 }


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

    -- 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.

    --   Circuit Table

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

    frCircuitTable OBJECT-TYPE
        SYNTAX   SEQUENCE OF FrCircuitEntry
        ACCESS   not-accessible
        STATUS   mandatory
        DESCRIPTION
           "A table containing information about specific Data
           Link Connection Identifiers and corresponding virtual
           circuits."
        ::= { frame-relay 2 }

        frCircuitEntry OBJECT-TYPE
            SYNTAX   FrCircuitEntry
            ACCESS   not-accessible
            STATUS   mandatory
            DESCRIPTION
               "The information regarding a single Data Link
               Connection Identifier."
            INDEX { frCircuitIfIndex, frCircuitDlci }
            ::= { frCircuitTable 1 }

        FrCircuitEntry ::=
            SEQUENCE {
                frCircuitIfIndex
                    Index,
                frCircuitDlci
                    DLCI,
                frCircuitState
                    INTEGER,
                frCircuitReceivedFECNs
                    Counter,
                frCircuitReceivedBECNs

```
                    Counter,
            frCircuitSentFrames
                    Counter,
            frCircuitSentOctets
                    Counter,
            frCircuitReceivedFrames
                    Counter,
            frCircuitReceivedOctets
                    Counter,
            frCircuitCreationTime
                    TimeTicks,
            frCircuitLastTimeChange
                    TimeTicks,
            frCircuitCommittedBurst
                    INTEGER,
            frCircuitExcessBurst
                    INTEGER,
            frCircuitThroughput
                    INTEGER
        }


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


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

```
        frCircuitState OBJECT-TYPE
            SYNTAX   INTEGER {
                    invalid (1),
                    active (2),
                    inactive (3)
                }
            ACCESS   read-write
            STATUS   mandatory
            DESCRIPTION
                "Indicates whether the particular virtual  cir-
                cuit  is operational.  In the absence of a Data
                Link Connection Management  Interface,  virtual
                circuit  entries  (rows) may be created by set-
                ting 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."
            DEFVAL { active }
            ::= { frCircuitEntry 3 }


        frCircuitReceivedFECNs OBJECT-TYPE
            SYNTAX   Counter
            ACCESS   read-only
            STATUS   mandatory
            DESCRIPTION
                "Number of frames received from the network in-
                dicating  forward  congestion since the virtual
                circuit was created."
            REFERENCE
                "Draft American National  Standard  T1.618-1991,
                Section 3.3.3"
          ::= { frCircuitEntry 4 }


        frCircuitReceivedBECNs OBJECT-TYPE
            SYNTAX   Counter
            ACCESS   read-only
            STATUS   mandatory
            DESCRIPTION
                "Number of frames received from the network in-
                dicating  backward congestion since the virtual
                circuit was created."
```

```
          REFERENCE
             "Draft American National  Standard  T1.618-1991,
             Section 3.3.4"
        ::= { frCircuitEntry 5 }



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



     frCircuitSentOctets OBJECT-TYPE
         SYNTAX    Counter
         ACCESS    read-only
         STATUS    mandatory
         DESCRIPTION
            "The number of octets sent  from  this  virtual
            circuit since it was created."
        ::= { frCircuitEntry 7 }



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



     frCircuitReceivedOctets OBJECT-TYPE
         SYNTAX    Counter
         ACCESS    read-only
         STATUS    mandatory
         DESCRIPTION
            "Number of octets received  over  this  virtual
            circuit since it was created."
        ::= { frCircuitEntry 9 }
```

```
        frCircuitCreationTime OBJECT-TYPE
            SYNTAX   TimeTicks
            ACCESS   read-only
            STATUS   mandatory
            DESCRIPTION
               "The value of sysUpTime when the  virtual  cir-
               cuit was created, whether by the Data Link Con-
               nection Management Interface  or  by  a  SetRe-
               quest."
         ::= { frCircuitEntry 10 }



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



        frCircuitCommittedBurst OBJECT-TYPE
            SYNTAX   INTEGER
            ACCESS   read-write
            STATUS   mandatory
            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
               "Draft American National  Standard  T1.617-1991,
               Section 6.5.19"
          DEFVAL   { 0 }  -- the default indicates no commitment
          ::= { frCircuitEntry 12 }



        frCircuitExcessBurst OBJECT-TYPE
            SYNTAX   INTEGER
            ACCESS   read-write
            STATUS   mandatory
            DESCRIPTION
               "This variable indicates the maximum amount  of
               uncommitted data bits that the network will at-
```

tempt 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
                 "Draft American National Standard T1.617-1991,
                 Section 6.5.19"
                     ::= { frCircuitEntry 13 }

        frCircuitThroughput OBJECT-TYPE
            SYNTAX   INTEGER
            ACCESS   read-write
            STATUS   mandatory
            DESCRIPTION
                "Throughput is the average number of 'Frame Re-
                lay Information Field' bits transferred per
                second across a user network interface in one
                direction, measured over the measurement inter-
                val.

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

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

    -- Error Table

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

    frErrTable OBJECT-TYPE
        SYNTAX   SEQUENCE OF FrErrEntry
        ACCESS   not-accessible

```
            STATUS   mandatory
            DESCRIPTION
              "A table containing information about Errors on the
              Frame Relay interface."
            ::= { frame-relay 3 }

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


            FrErrEntry ::=
                SEQUENCE {
                    frErrIfIndex
                        Index,
                    frErrType
                        INTEGER,
                    frErrData
                        OCTET STRING,
                    frErrTime
                        TimeTicks
            }


            frErrIfIndex OBJECT-TYPE
                SYNTAX   Index
                ACCESS   read-only
                STATUS   mandatory
                DESCRIPTION
                    "The ifIndex Value of the  corresponding  ifEn-
                    try."
                ::= { frErrEntry 1 }


            frErrType OBJECT-TYPE
                SYNTAX   INTEGER {
                        unknownError(1),
                        receiveShort(2),
                        receiveLong(3),
```

```
                        illegalDLCI(4),
                        unknownDLCI(5),
                        dlcmiProtoErr(6),
                        dlcmiUnknownIE(7),
                        dlcmiSequenceErr(8),
                        dlcmiUnknownRpt(9),
                        noErrorSinceReset(10)
                    }
            ACCESS    read-only
            STATUS    mandatory
            DESCRIPTION
                "The type of error that was last seen  on  this
                interface."
            ::= { frErrEntry 2 }



        frErrData OBJECT-TYPE
            SYNTAX    OCTET STRING
            ACCESS    read-only
            STATUS    mandatory
            DESCRIPTION
                "An octet string containing as much of the  er-
                ror  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 in-
                formation up to the PDU."
            ::= { frErrEntry 3 }



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


        -- Frame Relay Globals

        frame-relay-globals OBJECT IDENTIFIER ::= { frame-relay 4 }

        frTrapState OBJECT-TYPE
            SYNTAX  INTEGER { enabled(1), disabled(2) }
            ACCESS    read-write
```

```
                 STATUS    mandatory
                 DESCRIPTION
                    "This variable  indicates  whether  the  system
                     produces the frDLCIStatusChange trap."
                 DEFVAL { disabled }
                 ::= { frame-relay-globals 1 }


          --  Data Link Connection Management Interface Related Traps

          frDLCIStatusChange TRAP-TYPE
                 ENTERPRISE frame-relay
                 VARIABLES  { frCircuitIfIndex, frCircuitDlci, frCircuitState }
                 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."
                 ::= 1

        END
```

5. Acknowledgements

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6. References

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7. Security Considerations

   Security issues are not discussed in this memo.

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