                      Definitions of Managed Objects
                for Frame Relay Service Level Definitions

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.

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Abstract

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

Table of Contents

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], RFC 2579 [6] and 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. Conventions

  The keywords MUST, MUST NOT, REQUIRED, SHALL, SHALL NOT, SHOULD,
  SHOULD NOT, RECOMMENDED, NOT RECOMMENDED, MAY, and OPTIONAL, when
  they appear in this document, are to be interpreted as described in
  RFC 2119 [22].

3. Overview

  This MIB module addresses the items required to manage the Frame
  Relay Forum's Implementation Agreement for Service Level Definitions
  (FRF.13 [17]). At present, this applies to these values of the
  ifType variable in the Internet-standard MIB:

  o frameRelay (32)

  o frameRelayService (44)

This section provides an overview and background of how to use this
MIB module.

3.1. Frame Relay Service Level Definitions

The frame relay service level definitions address specific
characteristics of a frame relay service that can be used to
facilitate the following tasks:

o Evaluation of frame relay service providers, offerings or
   products.

o Measurement of Quality of Service.

o Enforcement of Service Level Agreements.

o Planning or describing a frame relay network.

The following parameters are defined in FRF.13 [17] as a sufficient
set of values to accomplish the tasks previously stated.

o Delay - The amount of time elapsed, in microseconds, from the time
   a frame exits the source to the time it reaches the destination.
   NOTE: FRF.13 [17] defines this value in terms of milliseconds.

o Frame Delivery Ratio - The ratio of the number of frames delivered
   to the destination versus the number of frames sent by the source.
   This ratio can be further divided by inspecting either only the
   frames within the CIR or only the frames in excess of the CIR.

o Data Delivery Ratio - The ratio of the amount of data delivered to
   the destination versus the amount of data sent by the source.
   This ratio can be further divided by inspecting either only the
   data within the CIR or only the data in excess of the CIR.

o Service Availability - The amount of time the frame relay service
   was not available. There are three types of availability
   statistics defined in FRF.13 [17]: Mean Time to Repair, Virtual
   Connection Availability, and Mean Time Between Service Outages.
   The later two require information about the scheduled outage time.
   It is assumed that scheduled outage time information will be
   maintained by the network management software, so it is not
   included in the MIB module.

Consult FRF.13 [17] for more details.

3.2. Terminology

o 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 [18].

o DLCI - Data Link Connection Identifier [18].

o Logical Port - This term is used to model the Frame Relay
   "interface" on a device [18].

o NNI - Network to Network Interface [18].

o Permanent Virtual Connection (PVC) - A virtual connection that has
   its end-points and bearer capabilities defined at subscription
   time [18].

o Reference Point (RP) - The point of reference within the network
   model at which the calculations or data collection takes place.

o UNI - User to Network Interface [18].

3.3. Network Model

The basic model, as illustrated in figure 1 below, contains two frame
relay DTE endpoints connected to a network cloud via a frame relay
UNI interface. The network cloud can contain zero or more internal
frame relay NNI connections that interconnect multiple networks. The
calculations and data collection can be performed at any reference
point within the network.

```
+-------------+                                 +-------------+
| Frame Relay |                                 | Frame Relay |
| DTE Device  |                                 | DTE Device  |
+------+------+                                 +------+------+
       |                                               |
     UNI                                             UNI
   Connection                                      Connection
       |                                               |
+------+------+    NNI     +-------------+    NNI     +------+------+
| Network A  +------------+  Network B  +------------+  Network C  |
+------------+ Connection +-------------+ Connection +------------+
```
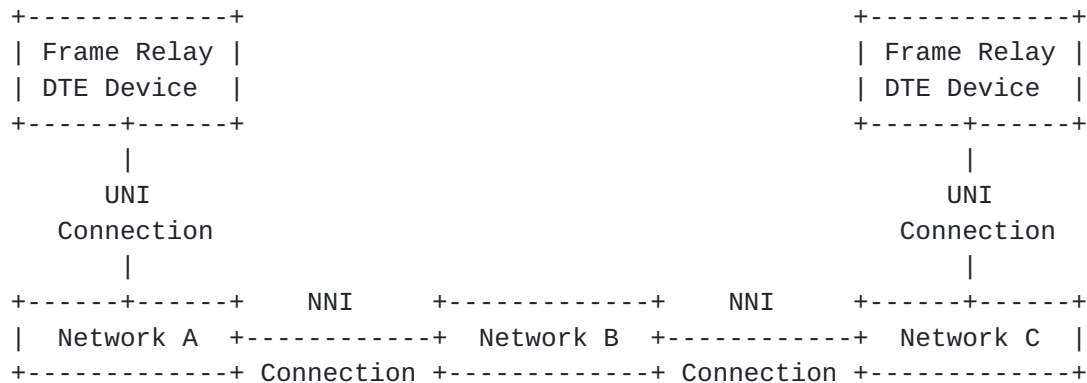
Figure 1
Frame Relay Network Reference Model

3.4. Reference Points

   The collection and calculations of the service level definitions
   apply to two reference points within the network. These two points
   are the locations where the frames are referenced in the collection
   of the service level specific information. The reference points used
   in the MIB module are shown in figure 2 below. For completeness, the
   module also allows for proprietary reference points which MAY exist
   anywhere in the network that is not a previously defined reference
   point. The meaning of the proprietary reference points is
   insignificant unless defined by the device manufacturer.

```
        +--------------------------+
       |+-----------+ +-----------+|
       ||           | |Measurement||
       ||Frame Relay---Engine     --(Source RP)----+
       ||DTE        | |(If Exists)||                |
       |+-----------+ +-----------+|                |
       +--------------------------+                 |
         Frame Relay Source                         |
        +-------------------------------------------+
        |            Frame Relay Network
        |              +----------------------------------+
        |              | +----------------------------+ |
        |              | | +---------+ +---------+     | |
        |              | | |         | | Traffic |     | |
     +--(Ingress RP)--- L1 / L2 --- Policing|     | |
        |              | | | Control | | Engine  |     | |
        |              | | +---------+ +----|----+     | |
        |              | |                  |          | |
        |              | |          (Traffic Policing RP)| |
        |              | +-----------------|-----------+ |
        |                Ingress Node      |             |
        |                |                 |             |
        |                  +-----------|-----------+ |
        |                  |  Intermediate Nodes   | |
        |                  +-----------|-----------+ |
        |                |                 |             |
        |                  Egress Node     |             |
        |              +--------------|-----------+ |
        |              | (Egress Queue Input RP)  | |
        |              |                 |        | |
        |              |      +-------+------+    | |
        |              |      | Egress Queue |    | |
        |              |      +-------+------+    | |
        |              |                 |        | |
        |              | (Egress Queue Output RP) | |
        |              +--------------|-----------+ |
        +-------------------|-------------+
          Frame Relay Destination        |
        +--------------------------+     +-----------+
       |+-----------+ +-----------+|                 |
       ||           | |Measurement||                 |
       ||Frame Relay---Engine     --(Destination RP)--+
       ||DTE        | |(If Exists)||
       |+-----------+ +-----------+|
       +--------------------------+
```

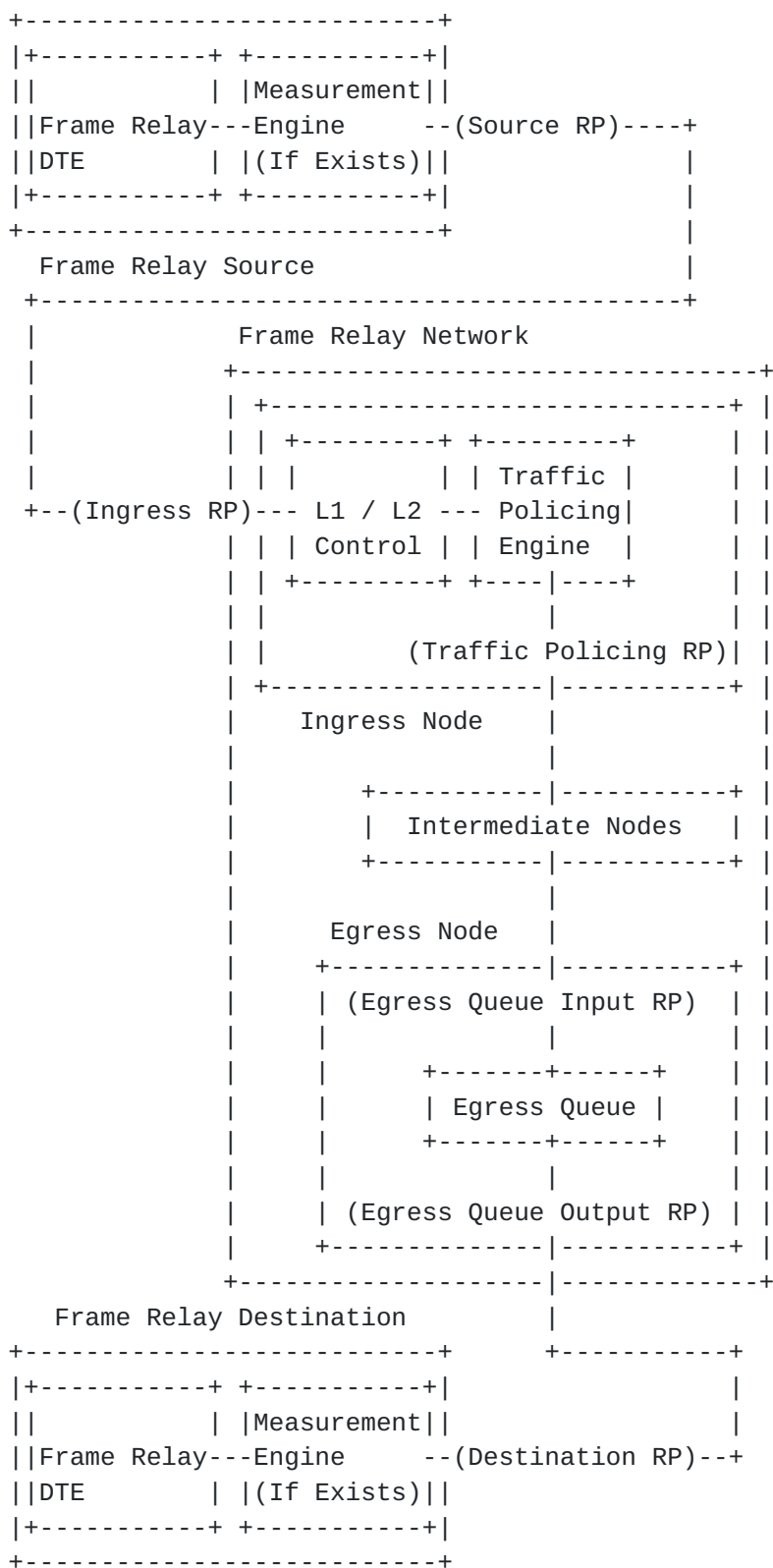   Figure 2
                 Reference Points (FRF.13 [17])

The MIB variables frsldPvcCtrlTransmitRP and frsldPvcCtrlReceiveRP
allow the user to view and configure the reference points at which
the calculations occur. These variables are specific to the device
on which they are located. Frame relay devices act as both frame
sources and frame destinations. The definitions in this MIB module
apply to the interaction of a pair of devices on the network path.
The same device can potentially use different reference points for
calculation and collection of the statistics based on whether the
referenced frame is sent or received by the device. When the device
is acting as a frame source, the value of frsldPvcCtrlTransmitRP
reflects the reference point used for all source calculations
pertaining to the specified PVC. When the device is acting as a
frame destination, the value of frsldPvcCtrlReceiveRP reflects the
reference point used for all destination calculations pertaining to
the specified PVC.

For example, FRF.13 [17] defines an Edge-to-Edge Egress Queue
measurement domain as a domain in which measurement is performed
between an Ingress Reference Point and an Egress Queue Input
Reference Point. For this domain between a source device and a
destination device, the value of frsldPvcCtrlTransmitRP for the
source device would be set to ingTxLocalRP(2) and the value of
frsldPvcCtrlReceiveRP for the destination device would be set to
eqiRxLocalRP(4). While it is usually the case that the reference
points would be equivalent on the remote device when monitoring
frames going in the opposite direction, there is no requirement for
them to be so.

It can be seen from the above example that a total of four reference
points are required in order to collect information for both
directions of traffic flow. The reference points represent the
transmit and receive directions at both ends of a PVC. If a device
has knowledge of the information from the remote device, it is
possible to collect the statistics from a single device. This is not
always the case. In most instances, two devices will need to be
monitored to capture a complete description of the service level on a
PVC. The reference points a single device is capable of monitoring
are contained in the frsldRPCaps object.

3.5. Measurement Methodology

This document neither recommends nor suggests a method of
implementation. This is left to the device manufacturer and should
be independent of the data that is actually collected.

Periodic collection of this data can be performed through either
polling of the data table, use of the sample tables or use of the
user history group of RFC 2021 [19].

3.6. **Theory of Operation**

   The following sections describe how to use this MIB module. They
   include row handling, data collection and data calculation. The
   recommendations here in are suggestions as to implementation and do
   not infer that they are the only method that can be used to perform
   such operations.

3.6.1. **Capabilities Discovery**

   Three objects are provided specifically to aid the network manager in
   discovering the capabilities of the device with respect to this MIB
   module.

   o frsldPvcCtrlWriteCaps This object reports the write capabilities
                             of the PVC Control Table. Use this object
                             to determine which objects can be modified.
                             This need only be referenced if row
                             creation or modification is to be
                             performed.

   o frsldSmplCtrlWriteCaps This object reports the write capabilities
                             of the Sample Control Table. Use this
                             object to determine which objects can be
                             modified. The group need only be
                             referenced if the sample tables will be
                             used to collect historical information.

   o frsldRPCaps   This object reports the reference points at
                             which the device is capable of collecting
                             information. This object needs to be
                             referenced if row creation is to be
                             performed in the PVC Control Table.
                             Devices can only create rows containing
                             supported reference points.

   These objects do not imply that there is no need for an Agent
   Capabilities macro for devices that do not fully support every object
   in this MIB module. They are provided specifically to aid in the
   ensured network management operations of this MIB module with respect
   to row creation and modification.

   An additional four objects are provided to report and control memory
   the utilization of this MIB module. These objects are
   frsldMaxPvcCtrls, frsldNumPvcCtrls, frsldMaxSmplCtrls are
   frsldNumSmplCtrls. Together, they allow a manager to control the

amount of memory allocated for specific utilization by this MIB
module. This is done by setting the maximum allowed allocation of
controls.

3.6.2. **Determining Reference Points for Row Creation**

The performance of a PVC is monitored by evaluating the uni-
directional flow of frames from an ingress point to an egress point.
Reference points describe where each of the two measurements are
made. Monitoring both of the uni-directional flows that make-up the
PVC frame traffic requires a total of four reference points as shown
in Figures 3 through 5. A monitoring point that evaluates traffic is
restricted to counting frames that pass the reference points hosted
locally on the monitoring point. Thus, if the monitoring point is
near the ingress point of the flow, it will count the frames entering
into the frame relay network. The complete picture of frame loss for
the uni-directional flow requires information from the downstream
reference point located at another (remote) monitoring point.

The local monitoring point MAY be implemented in such way that the
information from the downstream monitoring point is moved to the
local monitoring point using implementation-specific mechanisms. In
this case all information required to calculate frame loss becomes
available from the local measurement point. The local measurement
point agent is capable of reporting all the objects in the
FrsldPvcDataEntry row - the counts for offered frames entering the
network and delivered frames exiting the network.

Alternatively, the local monitoring point MAY be restricted to counts
of frames observed on the local device only. In this case, the
objects of the FrsldPvcDataEntry row reporting what happened on the
remote device are not available.

The following list shows the possible valid reference points for an
FRF.13 SLA from the source reference point to the destination
reference point in both directions.

o Local Information Only

      Local Device: srcLocalRP, desLocalRP
      Remote Device: srcLocalRP, desLocalRP

o Remote Information Only

      Local Device: srcRemoteRP, desRemoteRP
      Remote Device: srcRemoteRP, desRemoteRP

o Mixed Two Device Model 1 (Local Device Always Transmitter)

        Local Device: srcLocalRP, desRemoteRP
        Remote Device: srcLocalRP, desRemoteRP

o Mixed Two Device Model 2 (Local Device Always Receiver)

        Local Device: srcRemoteRP, desLocalRP
        Remote Device: srcRemoteRP, desLocalRP

o Mixed One Device Model 1 (Directional Rows)

        First Row: srcRemoteRP, desLocalRP (Receiver Row)
        Second Row: srcLocalRP, desRemoteRP (Sender Row)

o Mixed One Device Model 2 (Device Based Rows)

        First Row: srcLocalRP, desLocalRP (Local Row)
        Second Row: srcRemoteRP, desRemoteRP (Remote Row)

Each of the above combinations is valid and provides the same
information.

The following steps are recommended to find which reference points
need to be configured:

1) Locate both of the devices at either end of the PVC to be
   monitored.

2) Determine the capabilities by referencing the frsldRPCaps object
   of each device.

3) Locate the best combination of the two devices such that the
   necessary reference points are all represented.

4) If any one of the necessary reference points does not exist in the
   combination of the two devices, it is not possible to monitor the
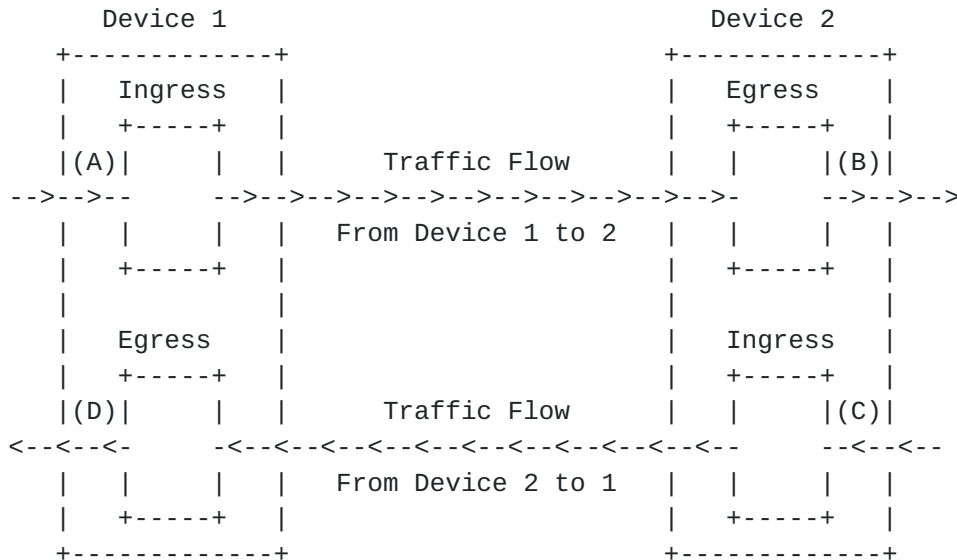   FRF.13 defined SLA between the two reference point on the PVC.

3.6.2.1. Graphical Examples of Reference Points

FRF.13 [17] defines three specific combinations of reference points:
Edge-to-Edge Interface, Edge-to-Edge Egress Queue and End-to-End.

Examples of valid reference points that may be used for each of these
are discussed in the sections below.

It is often the case that a device knows as a minimum either only
local information or both local and remote information. Because
these are two common examples, each will be illustrated below.

3.6.2.1.1. Edge-to-Edge Interface Reference Point Example

```
        Device 1                                Device 2
     +-------------+                         +-------------+
     |   Ingress   |                         |   Egress    |
     |   +-----+   |                         |   +-----+   |
     |(A)|     |   |       Traffic Flow      |   |     |(B)|
   -->-->--         -->-->-->-->-->-->-->-->-->-     -->-->-->
     |   |     |   |    From Device 1 to 2   |   |     |   |
     |   +-----+   |                         |   +-----+   |
     |             |                         |             |
     |   Egress    |                         |   Ingress   |
     |   +-----+   |                         |   +-----+   |
     |(D)|     |   |       Traffic Flow      |   |     |(C)|
    <--<--<-        -<--<--<--<--<--<--<--<--<--<--     --<--<--
     |   |     |   |    From Device 2 to 1   |   |     |   |
     |   +-----+   |                         |   +-----+   |
     +-------------+                         +-------------+


        where (A), (B), (C) and (D) are reference points
```

                            Figure 3

For devices with only local knowledge, one row is required on each
device as follows:

(A) frsldPvcCtrlTransmitRP for Device 1 = ingTxLocalRP(2)

(B) frsldPvcCtlrReceiveRP for Device 2 = eqoRxLocalRP(5)

(C) frsldPvcCtrlTransmitRP for Device 2 = ingTxLocalRP(2)

(D) frsldPvcCtlrReceiveRP for Device 1 = eqoRxLocalRP(5)

In which a single row is created on Device 1 containing reference
points (A) and (D), and a single row is created on Device 2
containing reference points (C) and (B).

For devices with both local and remote knowledge, the two rows can
exist in any combination on either device. For this example, the
transmitting devices will be responsible for information regarding
the flow for which they are the origin. Only one row is required per
device for this example.

   (A) frsldPvcCtrlTransmitRP for Device 1 = ingTxLocalRP(2)

   (B) frsldPvcCtlrReceiveRP for Device 1 = eqoRxRemoteRP(11)

   (C) frsldPvcCtrlTransmitRP for Device 2 = ingTxLocalRP(2)

   (D) frsldPvcCtlrReceiveRP for Device 2 = eqoRxRemoteRP(11)

3.6.2.1.2. Edge-to-Edge Egress Queue Reference Point Example

```
         Device 1                              Device 2
     +-------------+                        +-------------+
     |   Ingress   |                        |   Egress    |
     |   +-----+   |                        |   +-----+   |
     |(A)|     |   |     Traffic Flow       |(B)|     |   |
   -->-->--      -->-->-->-->-->-->-->-->-->-->-     -->-->-->
     |  |     |   |   From Device 1 to 2    |  |     |   |
     |   +-----+   |                        |   +-----+   |
     |             |                        |             |
     |   Egress    |                        |   Ingress   |
     |   +-----+   |                        |   +-----+   |
     |  |     |(D)|      Traffic Flow       |  |     |(C)|
   <--<--<-      -<--<--<--<--<--<--<--<--<--<--     --<--<--
     |  |     |   |   From Device 2 to 1    |  |     |   |
     |   +-----+   |                        |   +-----+   |
     +-------------+                        +-------------+
```

         where (A), (B), (C) and (D) are reference points

                              Figure 4

   For devices with only local knowledge, one row is required on each
   device as follows:

   (A) frsldPvcCtrlTransmitRP for Device 1 = ingTxLocalRP(2)

   (B) frsldPvcCtlrReceiveRP for Device 2 = eqiRxLocalRP(4)

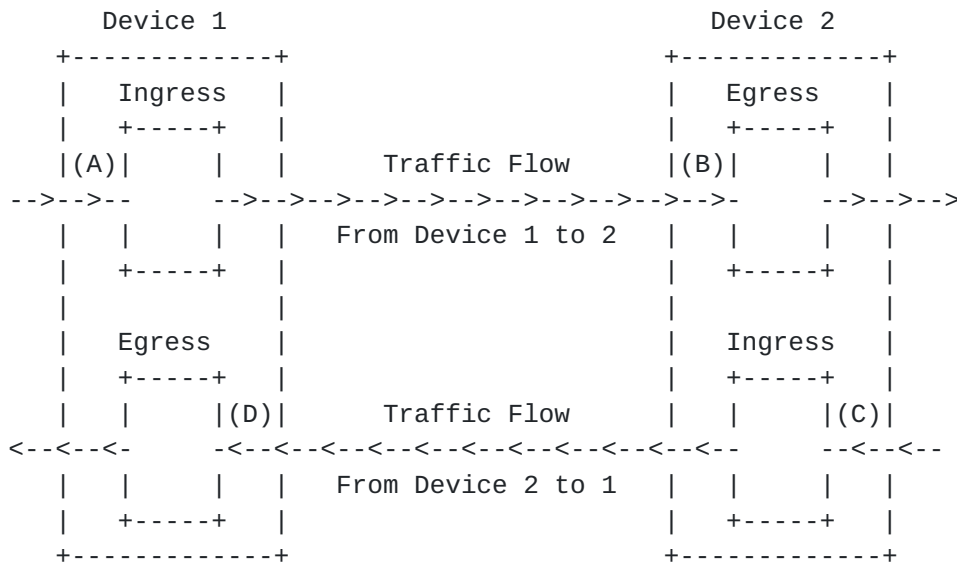   (C) frsldPvcCtrlTransmitRP for Device 2 = ingTxLocalRP(2)

   (D) frsldPvcCtlrReceiveRP for Device 1 = eqiRxLocalRP(4)

   In which a single row is created on Device 1 containing reference
   points (A) and (D), and a single row is created on Device 2
   containing reference points (C) and (B).

For devices with both local and remote knowledge, the two rows can
exist in any combination on either device. For this example, the
transmitting devices will be responsible for information regarding
the flow for which they are the origin. Only one row is required per
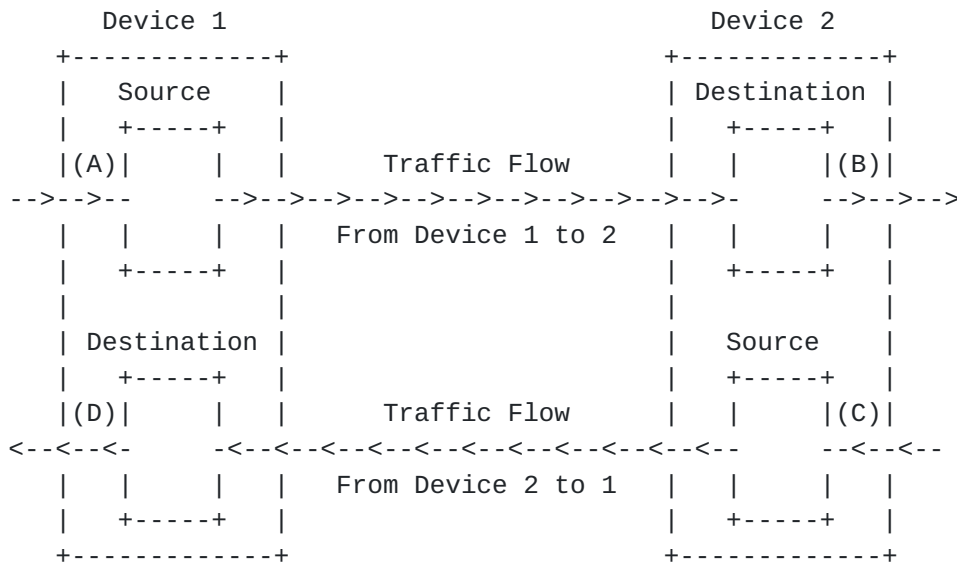device for this example.

(A) frsldPvcCtrlTransmitRP for Device 1 = ingTxLocalRP(2)

(B) frsldPvcCtlrReceiveRP for Device 1 = eqiRxRemoteRP(10)

(C) frsldPvcCtrlTransmitRP for Device 2 = ingTxLocalRP(2)

(D) frsldPvcCtlrReceiveRP for Device 2 = eqiRxRemoteRP(10)

3.6.2.1.3. End-to-End Using Reference Point Example

```
         Device 1                              Device 2
    +-------------+                       +-------------+
    |   Source    |                       | Destination |
    |   +-----+   |                       |   +-----+   |
    |(A)|     |   |      Traffic Flow      |   |     |(B)|
  -->-->--     -->-->-->-->-->-->-->-->-->-->-     -->-->-->
    |  |     |  |    From Device 1 to 2   |  |     |  |
    |   +-----+   |                       |   +-----+   |
    |             |                       |             |
    | Destination |                       |   Source    |
    |   +-----+   |                       |   +-----+   |
    |(D)|     |   |      Traffic Flow      |   |     |(C)|
  <--<--<-     -<--<--<--<--<--<--<--<--<--<--     --<--<--
    |  |     |  |    From Device 2 to 1   |  |     |  |
    |   +-----+   |                       |   +-----+   |
    +-------------+                       +-------------+
```

       where (A), (B), (C) and (D) are reference points

                             Figure 5

For devices with only local knowledge, one row is required on each
device as follows:

(A) frsldPvcCtrlTransmitRP for Device 1 = srcLocalRP(1)

(B) frsldPvcCtlrReceiveRP for Device 2 = desLocalRP(1)

(C) frsldPvcCtrlTransmitRP for Device 2 = srcLocalRP(1)

(D) frsldPvcCtlrReceiveRP for Device 1 = desLocalRP(1)

   In which a single row is created on Device 1 containing reference
   points (A) and (D), and a single row is created on Device 2
   containing reference points (C) and (B).

   For devices with both local and remote knowledge, the two rows can
   exist in any combination on either device. For this example, the
   transmitting devices will be responsible for information regarding
   the flow for which they are the origin. Only one row is required per
   device for this example.

   (A) frsldPvcCtrlTransmitRP for Device 1 = srcLocalRP(1)

   (B) frsldPvcCtlrReceiveRP for Device 1 = desRemoteRP(7)

   (C) frsldPvcCtrlTransmitRP for Device 2 = srcLocalRP(1)

   (D) frsldPvcCtlrReceiveRP for Device 2 = desRemoteRP(7)

3.6.3. Creation Process

   In some cases, devices will automatically populate the rows of PVC
   Control Table and potentially the Sample Control Table. However, in
   many cases, it may be necessary for a network manager to manually
   create rows.

   Manual creation of rows requires the following steps:

   1) Ensure the PVC exists between the two devices.

   2) Determine the necessary reference points for row creation.

   3) Create the row(s) in each device as needed.

   4) Create the row(s) in the sample control tables if desired.

3.6.4. Destruction Process

3.6.4.1. Manual Row Destruction

   Manual row destruction is straight forward. Any row can be destroyed
   and the resources allocated to it are freed by setting the value of
   its status object (either frsldPvcCtrlStatus or frsldSmplCtrlStatus)
   to destroy(6). It should be noted that when frsldPvcCtrlStatus is
   set to destroy(6) all associated sample control, sample and data
   table rows will also be destroyed. Similarly, when
   frsldSmplCtrlStatus is set to destroy(6) all sample rows will also be

destroyed. The frsldPvcCtrlPurge objects do not apply to manual row
destruction. If the row is set to destroy(6) manually, the rows are
destroyed as part of the set.

3.6.4.2. Automatic Row Destruction

Rows is the tables may be destroyed automatically based on the
existence of the DLCI on which they rely. This behavior is
controlled by the frsldPvcCtrlPurge and frsldPvcCtrlDeleteOnPurge
objects. When a DLCI no longer exists in the device, the data in the
tables has no relation to anything known on the network. However,
there may be some need to keep the historic information active for a
short period after the destruction or removal of a DLCI. If the
basis for the row no longer exists, the row will be destroyed at the
end of the purge interval that is controlled by frsldPvcCtrlPurge.

The effects of automatic row destruction are the same as manual row
destruction.

3.6.5. Modification Process

All read-create items in this MIB module can be modified at any time
if they are fully supported. Write access is not required. To
simplify the use of the MIB frsldPvcCtrlWriteCaps and
frsldSmplCtrlWriteCaps state which of the read-create variables can
actually be written on a particular device.

3.6.6. Collection Process

3.6.6.1. Remote Polling

This MIB module supports data collection through remote polling of
the free running counters in the PVC Data Table. Remote polling is a
common method used to capture real-time statistics. A remote
management station polls the device to collect the desired
information. It is recommended all statistics for a single PVC be
collected in a single PDU.

The following objects are designed around the concept of real-time
polling:

o frsldPvcDataMissedPolls
o frsldPvcDataFrDeliveredC
o frsldPvcDataFrDeliveredE
o frsldPvcDataFrOfferedC
o frsldPvcDataFrOfferedE
o frsldPvcDataDataDeliveredC
o frsldPvcDataDataDeliveredE

       o frsldPvcDataDataOfferedC
       o frsldPvcDataDataOfferedE
       o frsldPvcDataHCFrDeliveredC
       o frsldPvcDataHCFrDeliveredE
       o frsldPvcDataHCFrOfferedC
       o frsldPvcDataHCFrOfferedE
       o frsldPvcDataHCDataDeliveredC
       o frsldPvcDataHCDataDeliveredE
       o frsldPvcDataHCDataOfferedC
       o frsldPvcDataHCDataOfferedE
       o frsldPvcDataUnavailableTime
       o frsldPvcDataUnavailables

3.6.6.2. Sampling

   The sample tables provide the ability to historically sample data
   without requiring the additional overhead of polling. At key
   periods, a network management station can collect the samples needed.
   This method allows the manager to perform the collection of data at
   times that will least affect the active network traffic.

   The sample data can be collected using a series of SNMP getNext or
   getBulk operations. The value of frsldPvcSmplIdx increments with
   each new collection bucket. This allows the managers to skip
   information that has already been collected. However, care should be
   taken in that the value can roll over after a long period of time.

   The start and end times of a collection period allow the manager to
   know what the actual period of collection was. It is possible for
   there to be discontinuities in the sample table, so both start and
   end should be referenced.

3.6.6.3. User History

   User history, as defined in RFC 2021 [19], is an alternative
   mechanism that can be used to get the same benefits as the sample
   table by using the objects provided for real-time polling. Some
   devices MAY have the ability to use user history and opt not to
   support the sample tables. If this is the case, the information from
   the data table can be used to define a group of user history objects.

3.6.7. Use of MIB Module in Calculation of Service Level Definitions

   The objects in this MIB module can be used to calculate the
   statistics defined in FRF.13 [17]. The description below describes
   the calculations for one direction of the data flow, i.e., data sent
   from local transmitter to a remote receiver. A complete set of
   bidirectional information would require calculations based on both

directions. For the purposes of this description, the reference
points used SHOULD consistently represent data that is sent by one
device and received by the other.

A complete evaluation requires the combination of two uni-directional
flows. It is possible for a management station to combine all of the
calculated information into one conceptual row. Doing this requires
that each of the metrics are collected for both flow directions and
grouped by direction If the information is split between two
devices, the management station must know which two devices to
communicate with for the collection of all information. The grouping
of information SHOULD be from ingress to egress in each flow
direction.

The calculations below use the following terminology:

o DelayAvg

      The average delay on the PVC. This is represented within the
      MIB module by frsldPvcSmplDelayAvg.

o FrDeliveredC

      The number of frames received by the receiving device through
      the receive reference point that were delivered within CIR.
      This is represented within the MIB module by one of
      frsldPvcDataFrDeliveredC, frsldPvcDataHCFrDeliveredC,
      frsldPvcSmplFrDeliveredC, or frsldPvcSmplHCFrDeliveredC.

o FrDeliveredE

      The number of frames received by the receiving device through
      the receive reference point that were delivered in excess of
      CIR. This is represented within the MIB module by one of
      frsldPvcDataFrDeliveredE, frsldPvcDataHCFrDeliveredE,
      frsldPvcSmplFrDeliveredE, or frsldPvcSmplHCFrDeliveredE.

o FrOfferedC

      The number of frames offered by the transmitting device through
      the transmit reference point that were sent within CIR. This
      is represented within the MIB module by one of
      frsldPvcDataFrOfferedC, frsldPvcDataHCFrOfferedC,
      frsldPvcSmplFrOfferedC, or frsldPvcSmplHCFrOfferedC.

o FrOfferedE

        The number of frames offered by the transmitting device through
        the transmit reference point that were sent in excess of CIR.
        This is represented within the MIB module by one of
        frsldPvcDataFrOfferedE, frsldPvcDataHCFrOfferedE,
        frsldPvcSmplFrOfferedE, or frsldPvcSmplHCFrOfferedE.

o DataDeliveredC

        The number of octets received by the receiving device through
        the receive reference point that were delivered within CIR.
        This is represented within the MIB module by one of
        frsldPvcDataDataDeliveredC, frsldPvcDataHCDataDeliveredC,
        frsldPvcSmplDataDeliveredC, or frsldPvcSmplHCDataDeliveredC.

o DataDeliveredE

        The number of octets received by the receiving device through
        the receive reference point that were delivered in excess of
        CIR. This is represented within the MIB module by one of
        frsldPvcDataDataDeliveredE, frsldPvcDataHCDataDeliveredE,
        frsldPvcSmplDataDeliveredE, or frsldPvcSmplHCDataDeliveredE.

o DataOfferedC

        The number of octets offered by the transmitting device through
        the transmit reference point that were sent within CIR. This
        is represented within the MIB module by one of
        frsldPvcDataDataOfferedC, frsldPvcDataHCDataOfferedC,
        frsldPvcSmplDataOfferedC, or frsldPvcSmplHCDataOfferedC.

o DataOfferedE

        The number of octets offered by the transmitting device through
        the transmit reference point that were sent in excess of CIR.
        This is represented within the MIB module by one of
        frsldPvcDataDataOfferedE, frsldPvcDataHCDataOfferedE,
        frsldPvcSmplDataOfferedE, or frsldPvcSmplHCDataOfferedE.

o UnavailableTime

        The amount of time the PVC was not available during the
        interval of interest. This is represented within the MIB
        module by either frsldPvcDataUnavailableTime or
        frsldPvcSmplUnavailableTime.

o Unavailables

> The number of times the PVC was declared to be unavailable
> during the interval of interest. This is represented within
> the MIB module by either frsldPvcDataUnavailables or
> frsldPvcSmplUnavailables.

[3.6.8](#). Delay

The frame transfer delay is defined as the amount of time elapsed, in
microseconds, from the time a frame exits the source to the time it
reaches the destination. The average delay can be found using the
MIB variable described in DelayAvg above. The delay may be
calculated as either round trip or one way, and this information is
held in the frsldPvcCtrlDelayType MIB variable. If the delay be
calculated as round trip, the value of DelayAvg represents the
average of the total delays of the round trips. In this case, the
manager SHOULD divide the value returned by the agent by two to
obtain the frame transfer delay. In the case that
frsldPvcCtrlDelayType is oneWay, the value of DelayAvg represents the
average of the frame transfer delays and SHOULD be used as is.

[3.6.9](#). Frame Delivery Ratio

The frame delivery ratio is defined as the total number of frames
delivered to the destination divided by the frames offered by the
source. The destination values can be obtained using FrDeliveredC
and FrDeliveredE. The source values can be obtained using FrOfferedC
and FrOfferedE.

```
                         FrDeliveredC + FrDeliveredE
   Frame Delivery Ratio = ---------------------------
                           FrOfferedC + FrOfferedE


                                 FrDeliveredC
   Committed Frame Delivery Ratio =  ------------
                                  FrOfferedC


                               FrDeliveredE
   Excess Frame Delivery Ratio =  ------------
                                FrOfferedE
```

3.6.10. Data Delivery Ratio

   The data delivery ratio is defined as the total amount of data
   delivered to the destination divided by the data offered by the
   source. The destination values can be obtained using DataDeliveredC
   and DataDeliveredE. The source values can be obtained using
   DataOfferedC and DataOfferedE.

```
                         DataDeliveredC + DataDeliveredE
   Data Delivery Ratio = -------------------------------
                          DataOfferedC + DataOfferedE


                                    DataDeliveredC
   Committed Data Delivery Ratio = --------------
                                     DataOfferedC


                                 DataDeliveredE
   Excess Data Delivery Ratio = --------------
                                  DataOfferedE
```

3.6.11. Service Availability

   Some forms of service availability measurement defined in FRF.13 [17]
   require knowledge of the amount of time the network is allowed to be
   unavailable during the period of measurement. This is called the
   excluded outage time and will be represented in the measurements
   below as ExcludedTime. It is assumed that the management software
   will maintain this information in that it often relates to specific
   times and dates that many devices are not capable of maintaining.
   Further, it may change based on a moving maintenance window that the
   device cannot track well.

   Mean Time to Repair (FRMTTR) = 0 if Unavailables is 0.

```
                     UnavailableTime
   Otherwise, FRMTTR = ---------------
                        Unavailables
```

   Virtual Connection Availability (FRVCA) = 0 if IntervalTime equals
                                             ExcludedTime.

```
                     IntervalTime - ExcludedTime - UnavailableTime
   Otherwise, FRVCA = --------------------------------------------- *100
                            IntervalTime - ExcludedTime
```

   Mean Time Between Service Outages (FRMTBSO) = 0 if Unavailables is 0.

Otherwise, FRMTBSO = IntervalTime - ExcludedTime - UnavailableTime
                     ----
                                    Unavailables

4. Relation to Other MIB Modules

There is no explicit relation to any other frame relay MIB module nor
are any required to implement this MIB module. However, there is a
need for knowledge of ifIndexes and some understanding of DLCIs. The
ifIndex information can be found in the IF-MIB [21] which is
required. The DLCI information can be found in either the Frame
Relay DTE MIB (RFC 2115) [20] or the Frame Relay Network Services MIB
(RFC 2954) [18]; however, neither is required.

Upon setting of frsldPvcCtrlStatus in the frsldPvcCtrlTable to
active(1) the system can be in one of the following three states:

(1) The respective DLCI is known and is active. This corresponds to
    a state in which frPVCEndptRowStatus is active(1) and
    frPVCEndptRcvdSigStatus is either active(2) or none(4) for the
    Frame Relay Network Services MIB (RFC 2954) [18]. For the Frame
    Relay DTE MIB, the same state is shown by frCircuitRowStatus of
    active(1) and frCircuitState of active(2).

(2) The respective DLCI has not been created. This corresponds to a
    state in which the row with either frPVCEndptDLCIIndex or
    frCircuitDlci equal to the respective DLCI does not exist in
    either the frPVCEndptTable or the frCircuitTable respectively.

(3) The respective DLCI has just been removed. This corresponds to a
    state in which either frPVCEndptRowStatus is no longer active(1)
    or frPVCEndptRcvdSigStatus is no longer active(2) or none(4) for
    the Frame Relay Network Services MIB (RFC 2954) [18]. For the
    Frame Relay DTE MIB, the same state is shown when either
    frCircuitRowStatus is no longer active(1) or frCircuitState is no
    longer active(2).

For the first case, the row in the frsldPvcDataTable will be filled.
If frsldSmplCtrlStatus in the frsldSmplCtrlTable for the respective
DLCI is also `active' the frsldPvcSampleTable will be filled as well.

For the second case, the respective rows will not be added to any of
the data or sample tables and frsldPvcCtrlStatus SHOULD report
notReady(3).

For the third case, frsldPvcCtrlDeleteOnPurge should direct the
behavior of the system. If all tables are purged, this case will be
equivalent to the second case above. Otherwise, frsldPvcCtrlStatus
SHOULD remain active(1).

[5](#). Structure of the MIB Module

The FRSLD-MIB consists of the following components:

o   frsldPvcCtrlTable

o   frsldSmplCtrlTable

o   frsldPvcDataTable

o   frsldPvcSampleTable

o   frsldCapabilities

Refer to the compliance statement defined within for a definition of
what objects MUST be implemented.

[5.1](#). frsldPvcCtrlTable

The frsldPvcCtrlTable is the central control table for operations of
the Frame Relay Service Level Definitions MIB. It provides variables
to control the parameters required to calculate the objects in the
other tables.

A row in this table MUST exist in order for a row to exist in any
other table in this MIB module.

[5.2](#). frsldSmplCtrlTable

This is an optional table to allow control of sampling of the data in
the data table.

[5.3](#). frsldPvcDataTable

This table contains the calculated data. It relies on configuration
from the control table.

[5.4](#). **frsldPvcSampleTable**

   This table contains samples of the delivery and availability
   information from the data table as well as delay information
   calculated over the sample period. It relies on configuration from
   both the control table and the sample control table.

[5.5](#). **frsldCapabilities**

   This is a group of objects that define write capabilities of the
   read-create objects in the tables above.

[6](#). **Persistence of Data**

   The data in frsldPvcCtrlTable and frsldSmplCtrlTable SHOULD persist
   through power cycles. Note, however, that the symantics of readiness
   for the rows still applies. This means that it is possible for a row
   to be reprovisioned as notReady(3) if the underlying DLCI does not
   persist. The data collected in the other tables SHOULD NOT persist
   through power cycles in that the reference TimeStamp is no longer
   valid.

[7](#). **Object Definitions**

```
FRSLD-MIB DEFINITIONS ::= BEGIN

IMPORTS
    MODULE-IDENTITY, OBJECT-TYPE,
    Counter32, Gauge32, Integer32,
    Counter64, TimeTicks, mib-2          FROM SNMPv2-SMI
    CounterBasedGauge64                  FROM HCNUM-TC
    TEXTUAL-CONVENTION, RowStatus,
    TimeStamp                            FROM SNMPv2-TC
    MODULE-COMPLIANCE, OBJECT-GROUP      FROM SNMPv2-CONF
    ifIndex                              FROM IF-MIB
    DLCI                                 FROM FRAME-RELAY-DTE-MIB;

    frsldMIB MODULE-IDENTITY
        LAST-UPDATED "200201030000Z" -- January 3, 2002
        ORGANIZATION "IETF Frame Relay Service MIB Working Group"
        CONTACT-INFO
          "IETF Frame Relay Service MIB (frnetmib) Working Group

          WG Charter:     http://www.ietf.org/html.charters/
                                frnetmib-charter.html
          WG-email:       frnetmib@sunroof.eng.sun.com
          Subscribe:      frnetmib-request@sunroof.eng.sun.com
          Email Archive: ftp://ftp.ietf.org/ietf-mail-archive/frnetmib
```

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            Co-author: Orly Nicklass
                          RAD Data Communications Ltd.
            EMail: Orly_n@rad.co.il"
        DESCRIPTION
            "The MIB module to describe generic objects for
             FRF.13 Frame Relay Service Level Definitions."
        REVISION "200201030000Z" -- January 3, 2002
        DESCRIPTION
            "Initial version, published as [RFC 3202](#)"
        ::= { mib-2 95 }

   --
   -- Textual Conventions
   --
   FrsldTxRP ::= TEXTUAL-CONVENTION
        STATUS current
        DESCRIPTION
            "The reference point a PVC uses for calculation
             of transmitter related statistics.

             The valid values for this type of object are as follows:
                - srcLocalRP(1) for the local source
                - ingTxLocalRP(2) for the local ingress queue input
                - tpTxLocalRP(3) for the local traffic policing
                - eqiTxLocalRP(4) for the local egress queue input
                - eqoTxLocalRP(5) for the local egress queue output
                - otherTxLocalRP(6) for any other local transmit point
                - srcRemoteRP(7) for the remote source
                - ingTxLocalRP(8) for the remote ingress queue input
                - tpTxLocalRP(9) for the remote traffic policing
                - eqiTxRemoteRP(10) for the remote egress queue input
                - eqoTxRemoteRP(11) for the remote egress queue output
                - otherTxRemoteRP(12) for any other remote xmit point"
        REFERENCE
            "FRF.13: [Section 2.3](#)"
        SYNTAX   INTEGER {
                        srcLocalRP(1),
                        ingTxLocalRP(2),
                        tpTxLocalRP(3),

```
                    eqiTxLocalRP(4),
                    eqoTxLocalRP(5),
                    otherTxLocalRP(6),
                    srcRemoteRP(7),
                    ingTxRemoteRP(8),
                    tpTxRemoteRP(9),
                    eqiTxRemoteRP(10),
                    eqoTxRemoteRP(11),
                    otherTxRemoteRP(12)
                }

    FrsldRxRP ::= TEXTUAL-CONVENTION
        STATUS      current
        DESCRIPTION
            "The reference point a PVC uses for calculation
             of receiver related statistics.

             The valid values for this object are as follows:
                - desLocalRP(1) for the local destination
                - ingRxLocalRP(2) for the local ingress queue input
                - tpRxLocalRP(3) for the local traffic policing
                - eqiRxLocalRP(4) for the local egress queue input
                - eqoRxLocalRP(5) for the local egress queue output
                - otherRxLocalRP(6) for any other local receive point
                - desRemoteRP(7) for the remote destination
                - ingRxRemoteRP(8) for the remote ingress input
                - tpRxRemoteRP(9) for the remote traffic policing
                - eqiRxRemoteRP(10) for the remote egress queue input
                - eqoRxRemoteRP(11) for the remote egress queue output
                - otherRxRemoteRP(12) for any other remote receive point"
        REFERENCE
            "FRF.13: Section 2.3"
        SYNTAX      INTEGER {
                    desLocalRP(1),
                    ingRxLocalRP(2),
                    tpRxLocalRP(3),
                    eqiRxLocalRP(4),
                    eqoRxLocalRP(5),
                    otherRxLocalRP(6),
                    desRemoteRP(7),
                    ingRxRemoteRP(8),
                    tpRxRemoteRP(9),
                    eqiRxRemoteRP(10),
                    eqoRxRemoteRP(11),
                    otherRxRemoteRP(12)
                }

    --
```

```
     -- Base Objects
     ---

     frsldObjects      OBJECT IDENTIFIER ::= { frsldMIB 1 }
     frsldCapabilities OBJECT IDENTIFIER ::= { frsldMIB 2 }
     frsldConformance  OBJECT IDENTIFIER ::= { frsldMIB 3 }

     -- The Frame Relay Service Level Definitions PVC Control Table
     --
     -- This table is used to define and display the parameters of
     -- service level definitions on individual PVCs.

     frsldPvcCtrlTable  OBJECT-TYPE
         SYNTAX      SEQUENCE OF FrsldPvcCtrlEntry
         MAX-ACCESS  not-accessible
         STATUS      current
         DESCRIPTION
             "The Frame Relay Service Level Definitions
              PVC control table."
         ::= { frsldObjects 1 }

     frsldPvcCtrlEntry OBJECT-TYPE
         SYNTAX      FrsldPvcCtrlEntry
         MAX-ACCESS  not-accessible
         STATUS      current
         DESCRIPTION
             "An entry in the Frame Relay Service Level
              Definitions PVC control table."
         INDEX    { ifIndex, frsldPvcCtrlDlci,
                     frsldPvcCtrlTransmitRP, frsldPvcCtrlReceiveRP}
         ::= { frsldPvcCtrlTable 1 }

     FrsldPvcCtrlEntry ::=
         SEQUENCE {
             --
             -- Index Control Variables
             --
             frsldPvcCtrlDlci              DLCI,
             frsldPvcCtrlTransmitRP        FrsldTxRP,
             frsldPvcCtrlReceiveRP         FrsldRxRP,
             frsldPvcCtrlStatus            RowStatus,
             --
             -- Service Level Definitions Setup Variables
             --
             frsldPvcCtrlPacketFreq        Integer32,
             --
             -- Delay Specific Setup Variables
             --
```

```
        frsldPvcCtrlDelayFrSize         Integer32,
        frsldPvcCtrlDelayType           INTEGER,
        frsldPvcCtrlDelayTimeOut        Integer32,
        --
        -- Data Persistence Control Variables
        --
        frsldPvcCtrlPurge               Integer32,
        frsldPvcCtrlDeleteOnPurge       INTEGER,
        frsldPvcCtrlLastPurgeTime       TimeStamp
    }

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

frsldPvcCtrlTransmitRP OBJECT-TYPE
    SYNTAX      FrsldTxRP
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "The reference point this PVC uses for calculation
         of transmitter related statistics.  This object
         together with frsldPvcCtrlReceiveRP define the
         measurement domain."
    REFERENCE
        "FRF.13: Section 2.3"
    ::= { frsldPvcCtrlEntry 2 }

frsldPvcCtrlReceiveRP OBJECT-TYPE
    SYNTAX      FrsldRxRP
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "The reference point this PVC uses for calculation
         of receiver related statistics.  This object
         together with frsldPvcCtrlTransmitRP define the
         measurement domain."
    ::= { frsldPvcCtrlEntry 3 }

frsldPvcCtrlStatus OBJECT-TYPE
    SYNTAX      RowStatus
    MAX-ACCESS  read-create
    STATUS      current
```

```
        DESCRIPTION
            "The status of the current row.  This object is
             used to add, delete, and disable rows in this
             table.  When the status changes to active(1) for the
             first time, a row will also be added to the data
             table below.  This row SHOULD not be removed until
             the status is changed to deleted.

             When this object is set to destroy(6), all associated
             sample and data table rows will also be deleted.
             When this object is changed from active(1) to any
             other valid value, the defined purge behavior will
             affect the data and sample tables.

             The rows added to this table MUST have a valid
             ifIndex and an ifType related to frame relay.  Further,
             the reference points referred to by frsldPvcCtrlTransmitRP
             and frsldPvcCtrlReceiveRP MUST be supported (see the
             frsldRPCaps object).

             If at any point the row is not in the active(1) state
             and the DLCI no longer exists, the state SHOULD
             report notReady(3).

             The data in this table SHOULD persist through power
             cycles.  The symantics of readiness for the rows still
             applies.  This means that it is possible for a row to be
             reprovisioned as notReady(3) if the underlying DLCI does
             not persist."
        ::= { frsldPvcCtrlEntry 4 }

    frsldPvcCtrlPacketFreq OBJECT-TYPE
        SYNTAX      Integer32 (0..3600)
        UNITS       "seconds"
        MAX-ACCESS  read-create
        STATUS      current
        DESCRIPTION
            "The frequency in seconds between initiation of
             specialized packets used to collect delay and / or
             delivery information as supported by the device.
             A value of zero indicates that no packets will
             be sent."
        DEFVAL { 60 }
        ::= { frsldPvcCtrlEntry 5 }

    frsldPvcCtrlDelayFrSize OBJECT-TYPE
        SYNTAX      Integer32 (1..8188)
        UNITS       "octets"
```

         MAX-ACCESS read-create
         STATUS   current
         DESCRIPTION
             "The size of the payload in the frame used for
              calculation of network delay."
         DEFVAL { 128 }
         ::= { frsldPvcCtrlEntry 6 }

     frsldPvcCtrlDelayType OBJECT-TYPE
         SYNTAX   INTEGER {
                         oneWay(1),
                         roundTrip(2)
                     }
         MAX-ACCESS read-create
         STATUS   current
         DESCRIPTION
                 "The type of delay measurement performed."
         REFERENCE
             "FRF.13: [Section 3](#)"
         ::= { frsldPvcCtrlEntry 7 }

     frsldPvcCtrlDelayTimeOut OBJECT-TYPE
         SYNTAX   Integer32 (1..3600)
         UNITS   "seconds"
         MAX-ACCESS read-create
         STATUS   current
         DESCRIPTION
             "A delay frame will count as a missed poll if
              it is not updated in the time specified by
              frsldPvcCtrlDelayTimeOut."
         DEFVAL { 60 }
         ::= { frsldPvcCtrlEntry 8 }

     frsldPvcCtrlPurge OBJECT-TYPE
         SYNTAX   Integer32 (0..172800) -- up to 48 hours
         UNITS   "seconds"
         MAX-ACCESS read-create
         STATUS   current
         DESCRIPTION
             "This object defines the amount of time the device
              will wait, after discovering that a DLCI does not exist,
              the DLCI was deleted or the value of frsldPvcCtrlStatus
              changes from active(1) to either notInService(2) or
              notReady(3), prior to automatically purging the history
              in the sample tables and resetting the data in the data
              tables to all zeroes. If frsldPvcCtrlStatus is manually
              set to destroy(6), this object does not apply."
         DEFVAL { 0 }

          ::= { frsldPvcCtrlEntry 9 }

    frsldPvcCtrlDeleteOnPurge OBJECT-TYPE
        SYNTAX   INTEGER {
                      none(1),
                      sampleContols(2),
                      all(3)
                    }
        MAX-ACCESS read-create
        STATUS   current
        DESCRIPTION
            "This object defines whether rows will
             automatically be deleted from the tables
             when the information is purged.

              - A value of none(1) indicates that no rows
                will deleted. The last known values will
                be preserved.
              - A value of sampleControls(2) indicates
                that all associated sample control rows
                will be deleted.
              - A value of all(3) indicates that all
                associated rows SHOULD be deleted."
        DEFVAL { all }
        ::= { frsldPvcCtrlEntry 10 }

    frsldPvcCtrlLastPurgeTime OBJECT-TYPE
        SYNTAX   TimeStamp
        MAX-ACCESS read-only
        STATUS   current
        DESCRIPTION
            "This object returns the value of sysUpTime
             at the time the information was last purged.
             This value SHOULD be set to the sysUpTime
             upon setting frsldPvcCtrlStatus to active(1)
             for the first time. Each time a
             discontinuity in the counters occurs, this
             value MUST be set to the sysUpTime.

             If frsldPvcCtrlStatus has never been active(1),
             this object SHOULD return 0.

             This object SHOULD be used as the discontinuity
             timer for the counters in frsldPvcDataTable."
        ::= { frsldPvcCtrlEntry 11 }

    -- The Frame Relay Service Level Definitions Sampling Control
    -- Table

```
     --
     -- This table is used to define the sample control parameters
     -- of service level definitions on individual PVCs.

     frsldSmplCtrlTable  OBJECT-TYPE
         SYNTAX       SEQUENCE OF FrsldSmplCtrlEntry
         MAX-ACCESS   not-accessible
         STATUS       current
         DESCRIPTION
             "The Frame Relay Service Level Definitions
              sampling control table."
         ::= { frsldObjects 2 }

     frsldSmplCtrlEntry OBJECT-TYPE
         SYNTAX       FrsldSmplCtrlEntry
         MAX-ACCESS   not-accessible
         STATUS       current
         DESCRIPTION
             "An entry in the Frame Relay Service Level
              Definitions sample control table."
         INDEX    { ifIndex, frsldPvcCtrlDlci,
                    frsldPvcCtrlTransmitRP, frsldPvcCtrlReceiveRP,
                    frsldSmplCtrlIdx }
         ::= { frsldSmplCtrlTable 1 }

     FrsldSmplCtrlEntry ::=
         SEQUENCE {
             --
             -- Index Control Variables
             --
             frsldSmplCtrlIdx               Integer32,
             frsldSmplCtrlStatus            RowStatus,
             --
             -- Collection Control Variables
             --
             frsldSmplCtrlColPeriod        Integer32,
             frsldSmplCtrlBuckets          Integer32,
             frsldSmplCtrlBucketsGranted    Integer32
         }

     frsldSmplCtrlIdx OBJECT-TYPE
         SYNTAX  Integer32 (1..256)
         MAX-ACCESS not-accessible
         STATUS  current
         DESCRIPTION
             "The unique index for this row in the
              sample control table."
         ::= { frsldSmplCtrlEntry 1 }
```

       frsldSmplCtrlStatus OBJECT-TYPE
           SYNTAX   RowStatus
           MAX-ACCESS   read-create
           STATUS   current
           DESCRIPTION
               "The status of the current row. This object is
                used to add, delete, and disable rows in this
                table. This row SHOULD NOT be removed until the
                status is changed to destroy(6). When the status
                changes to active(1), the collection in the sample
                tables below will be activated.

                The rows added to this table MUST have a valid
                ifIndex, an ifType related to frame relay,
                frsldPvcCtrlDlci MUST exist for the specified
                ifIndex and frsldPvcCtrlStatus MUST have a
                value of active(1).

                The value of frsldPvcCtrlStatus MUST be active(1)
                to transition this object to active(1). If
                the value of frsldPvcCtrlStatus becomes anything
                other than active(1) when the state of this object
                is not active(1), this object SHOULD be set to
                notReady(3).

                The data in this table SHOULD persist through power
                cycles. The symantics of readiness for the rows still
                applies. This means that it is possible for a row to be
                reprovisioned as notReady(3) if the underlying DLCI does
                not persist."
           ::= { frsldSmplCtrlEntry 2 }

       frsldSmplCtrlColPeriod OBJECT-TYPE
           SYNTAX   Integer32 (1..2147483647)
           UNITS   "seconds"
           MAX-ACCESS   read-create
           STATUS   current
           DESCRIPTION
               "The amount of time in seconds that defines a
                period of collection for the statistics.
                At the end of each period, the statistics will be
                sampled and a row is added to the sample table."
           ::= { frsldSmplCtrlEntry 3 }

       frsldSmplCtrlBuckets OBJECT-TYPE
           SYNTAX   Integer32 (1..65535)
           MAX-ACCESS   read-create
           STATUS   current

          DESCRIPTION
              "The number of discrete buckets over which the
               data statistics are sampled.

               When this object is created or modified, the device
               SHOULD attempt to set the frsldSmplCtrlBuckets-
               Granted to a value as close as is possible
               depending upon the implementation and the available
               resources."
          DEFVAL { 60 }
          ::= { frsldSmplCtrlEntry 4 }

      frsldSmplCtrlBucketsGranted OBJECT-TYPE
          SYNTAX   Integer32 (0..65535)
          MAX-ACCESS   read-only
          STATUS   current
          DESCRIPTION
              "The number of discrete buckets granted. This
               object will return 0 until frsldSmplCtrlStatus is
               set to active(1). At that time the buckets will be
               allocated depending upon implementation and
               available resources."
           ::= { frsldSmplCtrlEntry 5 }

      -- The Frame Relay Service Level Definitions PVC Data Table
      --
      -- This table contains the accumulated values of
      -- the collected data. This table is the table that should
      -- be referenced by external polling mechanisms if time
      -- based polling be desired.

       frsldPvcDataTable OBJECT-TYPE
          SYNTAX   SEQUENCE OF FrsldPvcDataEntry
          MAX-ACCESS   not-accessible
          STATUS   current
          DESCRIPTION
              "The Frame Relay Service Level Definitions
               data table.

               This table contains accumulated values of the
               collected data. It is the table that should be
               referenced by external polling mechanisms if
               time based polling be desired."
           ::= { frsldObjects 3 }

      frsldPvcDataEntry OBJECT-TYPE
          SYNTAX   FrsldPvcDataEntry
          MAX-ACCESS   not-accessible

          STATUS   current
          DESCRIPTION
              "An entry in the Frame Relay Service Level
               Definitions data table."
          INDEX   { ifIndex, frsldPvcCtrlDlci,
                     frsldPvcCtrlTransmitRP, frsldPvcCtrlReceiveRP}
          ::= { frsldPvcDataTable 1 }

      FrsldPvcDataEntry ::=
          SEQUENCE {
              frsldPvcDataMissedPolls   Counter32,
              frsldPvcDataFrDeliveredC   Counter32,
              frsldPvcDataFrDeliveredE   Counter32,
              frsldPvcDataFrOfferedC   Counter32,
              frsldPvcDataFrOfferedE   Counter32,
              frsldPvcDataDataDeliveredC   Counter32,
              frsldPvcDataDataDeliveredE   Counter32,
              frsldPvcDataDataOfferedC   Counter32,
              frsldPvcDataDataOfferedE   Counter32,
              frsldPvcDataHCFrDeliveredC   Counter64,
              frsldPvcDataHCFrDeliveredE   Counter64,
              frsldPvcDataHCFrOfferedC   Counter64,
              frsldPvcDataHCFrOfferedE   Counter64,
              frsldPvcDataHCDataDeliveredC Counter64,
              frsldPvcDataHCDataDeliveredE Counter64,
              frsldPvcDataHCDataOfferedC   Counter64,
              frsldPvcDataHCDataOfferedE   Counter64,
              frsldPvcDataUnavailableTime   TimeTicks,
              frsldPvcDataUnavailables   Counter32
          }

      frsldPvcDataMissedPolls OBJECT-TYPE
          SYNTAX   Counter32
          MAX-ACCESS read-only
          STATUS   current
          DESCRIPTION
              "The total number of polls that have been determined
               to be missed. These polls are typically associated
               with the calculation of delay but may also be
               used for the calculation of other statistics. If an
               anticipated poll is not received in a reasonable
               amount of time, it should be counted as missed.
               The value used to determine the reasonable amount
               of time is contained in frsldPvcCtrlDelayTimeOut.

               Discontinuities in the value of this counter can
               occur at re-initialization of the management system
               and at other times as indicated by

                 frsldPvcCtrlLastPurgeTime."
            ::= { frsldPvcDataEntry 1 }

        frsldPvcDataFrDeliveredC OBJECT-TYPE
            SYNTAX   Counter32
            MAX-ACCESS   read-only
            STATUS   current
            DESCRIPTION
                "The number of frames that were received at
                 frsldPvcCtrlReceiveRP and determined to have been
                 sent within CIR.

                 Discontinuities in the value of this counter can
                 occur at re-initialization of the management system
                 and at other times as indicated by
                 frsldPvcCtrlLastPurgeTime."
            REFERENCE
                "FRF.13: Section 4.1 (FramesDeliveredc)"
            ::= { frsldPvcDataEntry 2 }

        frsldPvcDataFrDeliveredE OBJECT-TYPE
            SYNTAX   Counter32
            MAX-ACCESS   read-only
            STATUS   current
            DESCRIPTION
                "The number of frames that were received at
                 frsldPvcCtrlReceiveRP and determined to have been
                 sent in excess of the CIR.

                 Discontinuities in the value of this counter can
                 occur at re-initialization of the management system
                 and at other times as indicated by
                 frsldPvcCtrlLastPurgeTime."
            REFERENCE
                "FRF.13: Section 4.1 (FramesDeliverede)"
            ::= { frsldPvcDataEntry 3 }

        frsldPvcDataFrOfferedC OBJECT-TYPE
            SYNTAX   Counter32
            MAX-ACCESS   read-only
            STATUS   current
            DESCRIPTION
                "The number of frames that were offered through
                 frsldPvcCtrlTransmitRP within CIR.

                 Discontinuities in the value of this counter can
                 occur at re-initialization of the management system
                 and at other times as indicated by

                frsldPvcCtrlLastPurgeTime."
          REFERENCE
               "FRF.13: Section 4.1 (FramesOfferedc)"
          ::= { frsldPvcDataEntry 4 }

     frsldPvcDataFrOfferedE OBJECT-TYPE
          SYNTAX   Counter32
          MAX-ACCESS   read-only
          STATUS   current
          DESCRIPTION
               "The number of frames that were offered through
                frsldPvcCtrlTransmitRP in excess of the CIR.

                Discontinuities in the value of this counter can
                occur at re-initialization of the management system
                and at other times as indicated by
                frsldPvcCtrlLastPurgeTime."
          REFERENCE
               "FRF.13: Section 4.1 (FramesOfferede)"
          ::= { frsldPvcDataEntry 5 }

     frsldPvcDataDataDeliveredC OBJECT-TYPE
          SYNTAX   Counter32
          MAX-ACCESS   read-only
          STATUS   current
          DESCRIPTION
               "The number of octets that were received at
                frsldPvcCtrlReceiveRP and determined to have been
                sent within CIR.

                Discontinuities in the value of this counter can
                occur at re-initialization of the management system
                and at other times as indicated by
                frsldPvcCtrlLastPurgeTime."
          REFERENCE
               "FRF.13: Section 5.1 (DataDeliveredc)"
          ::= { frsldPvcDataEntry 6 }

     frsldPvcDataDataDeliveredE OBJECT-TYPE
          SYNTAX   Counter32
          MAX-ACCESS   read-only
          STATUS   current
          DESCRIPTION
               "The number of octets that were received at
                frsldPvcCtrlReceiveRP and determined to have been
                sent in excess of the CIR.

                Discontinuities in the value of this counter can

```
            occur at re-initialization of the management system
            and at other times as indicated by
            frsldPvcCtrlLastPurgeTime."
        REFERENCE
            "FRF.13: Section 5.1 (DataDeliverede)"
        ::= { frsldPvcDataEntry 7 }

    frsldPvcDataDataOfferedC OBJECT-TYPE
        SYNTAX       Counter32
        MAX-ACCESS   read-only
        STATUS       current
        DESCRIPTION
            "The number of octets that were offered through
            frsldPvcCtrlTransmitRP within CIR.

            Discontinuities in the value of this counter can
            occur at re-initialization of the management system
            and at other times as indicated by
            frsldPvcCtrlLastPurgeTime."
        REFERENCE
            "FRF.13: Section 5.1 (DataOfferedc)"
        ::= { frsldPvcDataEntry 8 }

    frsldPvcDataDataOfferedE OBJECT-TYPE
        SYNTAX       Counter32
        MAX-ACCESS   read-only
        STATUS       current
        DESCRIPTION
            "The number of octets that were offered through
            frsldPvcCtrlTransmitRP in excess of the CIR.

            Discontinuities in the value of this counter can
            occur at re-initialization of the management system
            and at other times as indicated by
            frsldPvcCtrlLastPurgeTime."
        REFERENCE
            "FRF.13: Section 5.1 (DataOfferede)"
        ::= { frsldPvcDataEntry 9 }

    frsldPvcDataHCFrDeliveredC OBJECT-TYPE
        SYNTAX       Counter64
        MAX-ACCESS   read-only
        STATUS       current
        DESCRIPTION
            "The number of frames that were received at
            frsldPvcCtrlReceiveRP and determined to have been
            sent within CIR.  This object is a 64-bit version
            of frsldPvcDataFrDeliveredC.
```

```
              Discontinuities in the value of this counter can
              occur at re-initialization of the management system
              and at other times as indicated by
              frsldPvcCtrlLastPurgeTime."
         REFERENCE
              "FRF.13: Section 4.1 (FramesDeliveredc)"
         ::= { frsldPvcDataEntry 10 }

     frsldPvcDataHCFrDeliveredE OBJECT-TYPE
         SYNTAX      Counter64
         MAX-ACCESS  read-only
         STATUS      current
         DESCRIPTION
              "The number of frames that were received at
              frsldPvcCtrlReceiveRP and determined to have been
              sent in excess of the CIR.  This object is a 64-bit
              version of frsldPvcDataFrDeliveredE.

              Discontinuities in the value of this counter can
              occur at re-initialization of the management system
              and at other times as indicated by
              frsldPvcCtrlLastPurgeTime."
         REFERENCE
              "FRF.13: Section 4.1 (FramesDeliverede)"
         ::= { frsldPvcDataEntry 11 }

     frsldPvcDataHCFrOfferedC OBJECT-TYPE
         SYNTAX      Counter64
         MAX-ACCESS  read-only
         STATUS      current
         DESCRIPTION
              "The number of frames that were offered through
              frsldPvcCtrlTransmitRP within CIR.  This object is
              a 64-bit version of frsldPvcDataFrOfferedC.

              Discontinuities in the value of this counter can
              occur at re-initialization of the management system
              and at other times as indicated by
              frsldPvcCtrlLastPurgeTime."
         REFERENCE
              "FRF.13: Section 4.1 (FramesOfferedc)"
         ::= { frsldPvcDataEntry 12 }

     frsldPvcDataHCFrOfferedE OBJECT-TYPE
         SYNTAX      Counter64
         MAX-ACCESS  read-only
         STATUS      current
         DESCRIPTION
```

            "The number of frames that were offered through
             frsldPvcCtrlTransmitRP in excess of the CIR. This
             object is a 64-bit version of frsldPvcDataFrOfferedE.

             Discontinuities in the value of this counter can
             occur at re-initialization of the management system
             and at other times as indicated by
             frsldPvcCtrlLastPurgeTime."
        REFERENCE
            "FRF.13: Section 4.1 (FramesOfferede)"
        ::= { frsldPvcDataEntry 13 }

    frsldPvcDataHCDataDeliveredC OBJECT-TYPE
        SYNTAX   Counter64
        MAX-ACCESS read-only
        STATUS   current
        DESCRIPTION
            "The number of octets that were received at
             frsldPvcCtrlReceiveRP and determined to have been
             sent within CIR. This object is a 64-bit version of
             frsldPvcDataDataDeliveredC.

             Discontinuities in the value of this counter can
             occur at re-initialization of the management system
             and at other times as indicated by
             frsldPvcCtrlLastPurgeTime."
        REFERENCE
            "FRF.13: Section 5.1 (DataDeliveredc)"
        ::= { frsldPvcDataEntry 14 }

    frsldPvcDataHCDataDeliveredE OBJECT-TYPE
        SYNTAX   Counter64
        MAX-ACCESS read-only
        STATUS   current
        DESCRIPTION
            "The number of octets that were received at
             frsldPvcCtrlReceiveRP and determined to have been
             sent in excess of the CIR. This object is a 64-bit
             version of frsldPvcDataDataDeliveredE.

             Discontinuities in the value of this counter can
             occur at re-initialization of the management system
             and at other times as indicated by
             frsldPvcCtrlLastPurgeTime."
        REFERENCE
            "FRF.13: Section 5.1 (DataDeliverede)"
        ::= { frsldPvcDataEntry 15 }

     frsldPvcDataHCDataOfferedC OBJECT-TYPE
         SYNTAX   Counter64
         MAX-ACCESS read-only
         STATUS   current
         DESCRIPTION
             "The number of octets that were offered through
              frsldPvcCtrlTransmitRP within CIR. This object is
              a 64-bit version of frsldPvcDataDataOfferedC.

              Discontinuities in the value of this counter can
              occur at re-initialization of the management system
              and at other times as indicated by
              frsldPvcCtrlLastPurgeTime."
         REFERENCE
             "FRF.13: [Section 5.1](…) (DataOfferedc)"
         ::= { frsldPvcDataEntry 16 }

     frsldPvcDataHCDataOfferedE OBJECT-TYPE
         SYNTAX   Counter64
         MAX-ACCESS read-only
         STATUS   current
         DESCRIPTION
             "The number of octets that were offered through
              frsldPvcCtrlTransmitRP in excess of the CIR.
              This object is a 64-bit version of
              frsldPvcDataDataOfferedE.

              Discontinuities in the value of this counter can
              occur at re-initialization of the management system
              and at other times as indicated by
              frsldPvcCtrlLastPurgeTime."
         REFERENCE
             "FRF.13: [Section 5.1](…) (DataOfferede)"
         ::= { frsldPvcDataEntry 17 }

     frsldPvcDataUnavailableTime OBJECT-TYPE
         SYNTAX   TimeTicks
         MAX-ACCESS read-only
         STATUS   current
         DESCRIPTION
             "The amount of time this PVC was declared unavailable
              for any reason since this row was created."
         REFERENCE
             "FRF.13: [Section 6.1](…) (OutageTime)"
         ::= { frsldPvcDataEntry 18 }

     frsldPvcDataUnavailables OBJECT-TYPE
         SYNTAX   Counter32

        MAX-ACCESS read-only
        STATUS   current
        DESCRIPTION
            "The number of times this PVC was declared unavailable
             for any reason since this row was created.

             Discontinuities in the value of this counter can
             occur at re-initialization of the management system
             and at other times as indicated by
             frsldPvcCtrlLastPurgeTime."
        REFERENCE
            "FRF.13: Section 6.1 (OutageCount)"
        ::= { frsldPvcDataEntry 19 }

-- The Frame Relay Service Level Definitions PVC Sample Table
--
-- This table contains the sampled delay, delivery and
-- availability information.

frsldPvcSampleTable OBJECT-TYPE
    SYNTAX   SEQUENCE OF FrsldPvcSampleEntry
    MAX-ACCESS not-accessible
    STATUS   current
    DESCRIPTION
        "The Frame Relay Service Level Definitions
         sample table."
    ::= { frsldObjects 4 }

frsldPvcSampleEntry OBJECT-TYPE
    SYNTAX   FrsldPvcSampleEntry
    MAX-ACCESS not-accessible
    STATUS   current
    DESCRIPTION
        "An entry in the Frame Relay Service Level
         Definitions data sample table."
    INDEX   { ifIndex, frsldPvcCtrlDlci,
                 frsldPvcCtrlTransmitRP, frsldPvcCtrlReceiveRP,
                 frsldSmplCtrlIdx, frsldPvcSmplIdx }
    ::= { frsldPvcSampleTable 1 }

FrsldPvcSampleEntry ::=
    SEQUENCE {
        frsldPvcSmplIdx   Integer32,
        frsldPvcSmplDelayMin   Gauge32,
        frsldPvcSmplDelayMax   Gauge32,
        frsldPvcSmplDelayAvg   Gauge32,
        frsldPvcSmplMissedPolls   Gauge32,
        frsldPvcSmplFrDeliveredC   Gauge32,

```
            frsldPvcSmplFrDeliveredE      Gauge32,
            frsldPvcSmplFrOfferedC        Gauge32,
            frsldPvcSmplFrOfferedE        Gauge32,
            frsldPvcSmplDataDeliveredC    Gauge32,
            frsldPvcSmplDataDeliveredE    Gauge32,
            frsldPvcSmplDataOfferedC      Gauge32,
            frsldPvcSmplDataOfferedE      Gauge32,
            frsldPvcSmplHCFrDeliveredC    CounterBasedGauge64,
            frsldPvcSmplHCFrDeliveredE    CounterBasedGauge64,
            frsldPvcSmplHCFrOfferedC      CounterBasedGauge64,
            frsldPvcSmplHCFrOfferedE      CounterBasedGauge64,
            frsldPvcSmplHCDataDeliveredC CounterBasedGauge64,
            frsldPvcSmplHCDataDeliveredE CounterBasedGauge64,
            frsldPvcSmplHCDataOfferedC    CounterBasedGauge64,
            frsldPvcSmplHCDataOfferedE    CounterBasedGauge64,
            frsldPvcSmplUnavailableTime   TimeTicks,
            frsldPvcSmplUnavailables      Gauge32,
            frsldPvcSmplStartTime         TimeStamp,
            frsldPvcSmplEndTime           TimeStamp
        }

    frsldPvcSmplIdx OBJECT-TYPE
        SYNTAX       Integer32 (1..2147483647)
        MAX-ACCESS   not-accessible
        STATUS       current
        DESCRIPTION
            "The bucket index of the current sample.  This
             increments once for each new bucket in the
             table."
        ::= { frsldPvcSampleEntry 1 }

    frsldPvcSmplDelayMin OBJECT-TYPE
        SYNTAX       Gauge32
        UNITS        "microseconds"
        MAX-ACCESS   read-only
        STATUS       current
        DESCRIPTION
            "The minimum delay reported in microseconds measured
             for any information packet that arrived during this
             interval.

             A value of zero means that no data is available."
        REFERENCE
            "FRF.13: Section 3.1 (FTD)"
        ::= { frsldPvcSampleEntry 2 }

    frsldPvcSmplDelayMax OBJECT-TYPE
        SYNTAX       Gauge32
```

```
         UNITS        "microseconds"
      MAX-ACCESS   read-only
      STATUS       current
      DESCRIPTION
          "The largest delay reported in microseconds measured
           for any information packet that arrived during this
           interval.

           A value of zero means that no data is available."
      REFERENCE
          "FRF.13: Section 3.1 (FTD)"
      ::= { frsldPvcSampleEntry 3 }

   frsldPvcSmplDelayAvg OBJECT-TYPE
      SYNTAX       Gauge32
      UNITS        "microseconds"
      MAX-ACCESS   read-only
      STATUS       current
      DESCRIPTION
          "The average delay reported in microseconds measured
           for all delay packets that arrived during this
           interval.

           A value of zero means that no data is available."
      REFERENCE
          "FRF.13: Section 3.1 (FTD)"
      ::= { frsldPvcSampleEntry 4 }

   frsldPvcSmplMissedPolls OBJECT-TYPE
      SYNTAX       Gauge32
      MAX-ACCESS   read-only
      STATUS       current
      DESCRIPTION
          "The total number of polls that were missed during
           this interval."
      ::= { frsldPvcSampleEntry 5 }

   frsldPvcSmplFrDeliveredC OBJECT-TYPE
      SYNTAX       Gauge32
      MAX-ACCESS   read-only
      STATUS       current
      DESCRIPTION
          "The number of frames that were received at
           frsldPvcCtrlReceiveRP and determined to have been
           sent within CIR during this interval.

           If it is the case that the high capacity counters
           are also used, this MUST report the value of the
```

```
            lower 32 bits of the CounterBasedGauge64 value of
            frsldPvcSmplHCFrDeliveredC."
        REFERENCE
            "FRF.13: Section 4.1 (FramesDeliveredc)"
        ::= { frsldPvcSampleEntry 6 }

    frsldPvcSmplFrDeliveredE OBJECT-TYPE
        SYNTAX        Gauge32
        MAX-ACCESS  read-only
        STATUS        current
        DESCRIPTION
            "The number of frames that were received at
            frsldPvcCtrlReceiveRP and determined to have been
            sent in excess of the CIR during this interval.

            If it is the case that the high capacity counters
            are also used, this MUST report the value of the
            lower 32 bits of the CounterBasedGauge64 value of
            frsldPvcSmplHCFrDeliveredE."
        REFERENCE
            "FRF.13: Section 4.1 (FramesDeliverede))"
        ::= { frsldPvcSampleEntry 7 }

    frsldPvcSmplFrOfferedC OBJECT-TYPE
        SYNTAX        Gauge32
        MAX-ACCESS  read-only
        STATUS        current
        DESCRIPTION
            "The number of frames that were offered through
            frsldPvcCtrlTransmitRP within CIR during this
            interval.

            If it is the case that the high capacity counters
            are also used, this MUST report the value of the
            lower 32 bits of the CounterBasedGauge64 value of
            frsldPvcSmplHCFrOfferedC."
        REFERENCE
            "FRF.13: Section 4.1 (FramesOfferedc)"
        ::= { frsldPvcSampleEntry 8 }

    frsldPvcSmplFrOfferedE OBJECT-TYPE
        SYNTAX        Gauge32
        MAX-ACCESS  read-only
        STATUS        current
        DESCRIPTION
            "The number of frames that were offered through
            frsldPvcCtrlTransmitRP in excess of the CIR
            during this interval.
```

                If it is the case that the high capacity counters
                are also used, this MUST report the value of the
                lower 32 bits of the CounterBasedGauge64 value of
                frsldPvcSmplHCFrOfferedE."
        REFERENCE
            "FRF.13: Section 4.1 (FramesOfferede)"
        ::= { frsldPvcSampleEntry 9 }

    frsldPvcSmplDataDeliveredC OBJECT-TYPE
        SYNTAX   Gauge32
        MAX-ACCESS read-only
        STATUS   current
        DESCRIPTION
            "The number of octets that were received at
             frsldPvcCtrlReceiveRP and determined to have been
             sent within CIR during this interval.

             If it is the case that the high capacity counters
             are also used, this MUST report the value of the
             lower 32 bits of the CounterBasedGauge64 value of
             frsldPvcSmplHCDataDeliveredC."
        REFERENCE
            "FRF.13: Section 5.1 (DataDeliveredc)"
        ::= { frsldPvcSampleEntry 10 }

    frsldPvcSmplDataDeliveredE OBJECT-TYPE
        SYNTAX   Gauge32
        MAX-ACCESS read-only
        STATUS   current
        DESCRIPTION
            "The number of octets that were received at
             frsldPvcCtrlDeliveredRP and determined to have been
             sent in excess of the CIR during this interval.

             If it is the case that the high capacity counters
             are also used, this MUST report the value of the
             lower 32 bits of the CounterBasedGauge64 value of
             frsldPvcSmplHCDataDeliveredE."
        REFERENCE
            "FRF.13: Section 5.1 (DataDeliverede)"
        ::= { frsldPvcSampleEntry 11 }

    frsldPvcSmplDataOfferedC OBJECT-TYPE
        SYNTAX   Gauge32
        MAX-ACCESS read-only
        STATUS   current
        DESCRIPTION
            "The number of octets that were offered through

                frsldPvcCtrlTransmitRP within CIR during this
                interval.

                If it is the case that the high capacity counters
                are also used, this MUST report the value of the
                lower 32 bits of the CounterBasedGauge64 value of
                frsldPvcSmplHCDataOfferredC."
        REFERENCE
                "FRF.13: Section 5.1 (DataOfferedc)"
        ::= { frsldPvcSampleEntry 12 }

    frsldPvcSmplDataOfferedE OBJECT-TYPE
        SYNTAX   Gauge32
        MAX-ACCESS read-only
        STATUS   current
        DESCRIPTION
                "The number of octets that were offered through
                 frsldPvcCtrlTransmitRP in excess of the CIR
                 during this interval.

                 If it is the case that the high capacity counters
                 are also used, this MUST report the value of the
                 lower 32 bits of the CounterBasedGauge64 value of
                 frsldPvcSmplHCDataOfferedE."
        REFERENCE
                "FRF.13: Section 5.1 (DataOfferede)"
        ::= { frsldPvcSampleEntry 13 }

    frsldPvcSmplHCFrDeliveredC OBJECT-TYPE
        SYNTAX   CounterBasedGauge64
        MAX-ACCESS read-only
        STATUS   current
        DESCRIPTION
                "The number of frames that were received at
                 frsldPvcCtrlReceiveRP and determined to have been
                 sent within CIR during this interval. This object
                 is a 64-bit version of frsldPvcSmplFrDeliveredC."
        REFERENCE
                "FRF.13: Section 4.1 (FramesDeliveredc)"
        ::= { frsldPvcSampleEntry 14 }

    frsldPvcSmplHCFrDeliveredE OBJECT-TYPE
        SYNTAX   CounterBasedGauge64
        MAX-ACCESS read-only
        STATUS   current
        DESCRIPTION
                "The number of frames that were received at
                 frsldPvcCtrlReceiveRP and determined to have been

                    sent in excess of the CIR during this interval.
                    This object is a 64-bit version of frsldPvcSmpl-
                    FrDeliveredE."
               REFERENCE
                   "FRF.13: Section 4.1 (FramesDeliverede)"
            ::= { frsldPvcSampleEntry 15 }

       frsldPvcSmplHCFrOfferedC OBJECT-TYPE
           SYNTAX   CounterBasedGauge64
           MAX-ACCESS read-only
           STATUS   current
           DESCRIPTION
               "The number of frames that were offered through
                frsldPvcCtrlTransmitRP within CIR during this
                interval. This object is a 64-bit version of
                frsldPvcSmplFrOfferedC."
           REFERENCE
               "FRF.13: Section 4.1 (FramesOfferedc)"
           ::= { frsldPvcSampleEntry 16 }

       frsldPvcSmplHCFrOfferedE OBJECT-TYPE
           SYNTAX   CounterBasedGauge64
           MAX-ACCESS read-only
           STATUS   current
           DESCRIPTION
               "The number of frames that were offered through
                frsldPvcCtrlTransmitRP in excess of the CIR
                during this interval. This object is a 64-bit
                version of frsldPvcSmplFrOfferedE."
           REFERENCE
               "FRF.13: Section 4.1 (FramesOfferede)"
           ::= { frsldPvcSampleEntry 17 }

       frsldPvcSmplHCDataDeliveredC OBJECT-TYPE
           SYNTAX   CounterBasedGauge64
           MAX-ACCESS read-only
           STATUS   current
           DESCRIPTION
               "The number of octets that were received at
                frsldPvcCtrlReceiveRP and determined to have been
                sent within CIR during this interval. This value
                is a 64-bit version of frsldPvcSmplDataDeliveredC."
           REFERENCE
               "FRF.13: Section 5.1 (DataDeliveredc)"
           ::= { frsldPvcSampleEntry 18 }

       frsldPvcSmplHCDataDeliveredE OBJECT-TYPE
           SYNTAX   CounterBasedGauge64

```
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
            "The number of octets that were received at
             frsldPvcCtrlReceiveRP and determined to have been
             sent in excess of the CIR during this interval.  This
             value is a 64-bit version of frsldPvcSmplData-
             DeliveredE."
        REFERENCE
            "FRF.13: Section 5.1 (DataDeliverede)"
        ::= { frsldPvcSampleEntry 19 }

    frsldPvcSmplHCDataOfferedC OBJECT-TYPE
        SYNTAX      CounterBasedGauge64
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
            "The number of octets that were offered through
             frsldPvcCtrlTransmitRP within CIR during this
             interval.  This value is a 64-bit version of
             frsldPvcSmplDataOfferedC."
        REFERENCE
            "FRF.13: Section 5.1 (DataOfferedc)"
        ::= { frsldPvcSampleEntry 20 }

    frsldPvcSmplHCDataOfferedE OBJECT-TYPE
        SYNTAX      CounterBasedGauge64
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
            "The number of octets that were offered through
             frsldPvcCtrlTransmitRP in excess of the CIR
             during this interval.  This object is a 64-bit
             version of frsldPvcSmplDataOfferedE."
        REFERENCE
            "FRF.13: Section 5.1 (DataOfferede)"
        ::= { frsldPvcSampleEntry 21 }

    frsldPvcSmplUnavailableTime OBJECT-TYPE
        SYNTAX  TimeTicks
        MAX-ACCESS  read-only
        STATUS  current
        DESCRIPTION
            "The amount of time this PVC was declared
             unavailable for any reason during this interval."
        REFERENCE
            "FRF.13: Section 6.1 (OutageTime)"
        ::= { frsldPvcSampleEntry 22 }
```

       frsldPvcSmplUnavailables OBJECT-TYPE
           SYNTAX   Gauge32
           MAX-ACCESS   read-only
           STATUS   current
           DESCRIPTION
               "The number of times this PVC was declared
                unavailable for any reason during this interval."
           REFERENCE
               "FRF.13: Section 6.1 (OutageCount)"
           ::= { frsldPvcSampleEntry 23 }

       frsldPvcSmplStartTime OBJECT-TYPE
           SYNTAX   TimeStamp
           MAX-ACCESS   read-only
           STATUS   current
           DESCRIPTION
               "The value of sysUpTime when this sample interval
                started."
           ::= { frsldPvcSampleEntry 24 }

       frsldPvcSmplEndTime OBJECT-TYPE
           SYNTAX   TimeStamp
           MAX-ACCESS   read-only
           STATUS   current
           DESCRIPTION
               "The value of sysUpTime when this sample interval
                ended. No data will be reported and the row will
                not appear in the table until the sample has
                been collected."
            ::= { frsldPvcSampleEntry 25 }

       -- Capabilities Group
       -- This group provides capabilities objects for the tables
       -- that control configuration.

       frsldPvcCtrlWriteCaps OBJECT-TYPE
           SYNTAX   BITS {
                   frsldPvcCtrlStatus(0),
                   frsldPvcCtrlPacketFreq(1),
                   frsldPvcCtrlDelayFrSize(2),
                   frsldPvcCtrlDelayType(3),
                   frsldPvcCtrlDelayTimeOut(4),
                   frsldPvcCtrlPurge(5),
                   frsldPvcCtrlDeleteOnPurge(6)
           }
           MAX-ACCESS   read-only
           STATUS   current
           DESCRIPTION

            "This object specifies the write capabilities
             for the read-create objects of the PVC Control
             table. If the corresponding bit is enabled (1),
             the agent supports writes to that object."
        ::= { frsldCapabilities 1 }

    frsldSmplCtrlWriteCaps OBJECT-TYPE
        SYNTAX BITS {
                frsldSmplCtrlStatus(0),
                frsldSmplCtrlBuckets(1)
        }
        MAX-ACCESS read-only
        STATUS current
        DESCRIPTION
            "This object specifies the write capabilities
             for the read-create objects of the Sample Control
             table. If the corresponding bit is enabled (1),
             the agent supports writes to that object."
        ::= { frsldCapabilities 2 }

    frsldRPCaps OBJECT-TYPE
        SYNTAX BITS {
                srcLocalRP(0),
                ingTxLocalRP(1),
                tpTxLocalRP(2),
                eqiTxLocalRP(3),
                eqoTxLocalRP(4),
                otherTxLocalRP(5),
                srcRemoteRP(6),
                ingTxRemoteRP(7),
                tpTxRemoteRP(8),
                eqiTxRemoteRP(9),
                eqoTxRemoteRP(10),
                otherTxRemoteRP(11),
                desLocalRP(12),
                ingRxLocalRP(13),
                tpRxLocalRP(14),
                eqiRxLocalRP(15),
                eqoRxLocalRP(16),
                otherRxLocalRP(17),
                desRemoteRP(18),
                ingRxRemoteRP(19),
                tpRxRemoteRP(20),
                eqiRxRemoteRP(21),
                eqoRxRemoteRP(22),
                otherRxRemoteRP(23)
        }
        MAX-ACCESS read-only

           STATUS current
           DESCRIPTION
               "This object specifies the reference points that
                the agent supports. This object allows the management
                application to discover which rows can be created on
                a specific device."
           ::= { frsldCapabilities 3 }

       frsldMaxPvcCtrls   OBJECT-TYPE
           SYNTAX   Integer32 (0..2147483647)
           MAX-ACCESS read-write
           STATUS   current
           DESCRIPTION
               "The maximum number of control rows that can be created
                in frsldPvcCtrlTable. Sets to this object lower than
                the current value of frsldNumPvcCtrls should result in
                inconsistentValue."
           ::= { frsldCapabilities 4 }

       frsldNumPvcCtrls   OBJECT-TYPE
           SYNTAX   Gauge32
           MAX-ACCESS read-only
           STATUS   current
           DESCRIPTION
               "The current number of rows in frsldPvcCtrlTable."
           ::= { frsldCapabilities 5 }

       frsldMaxSmplCtrls   OBJECT-TYPE
           SYNTAX   Integer32 (0..2147483647)
           MAX-ACCESS read-write
           STATUS   current
           DESCRIPTION
               "The maximum number of control rows that can be created
                in frsldSmplCtrlTable. Sets to this object lower than
                the current value of frsldNumSmplCtrls should result in
                inconsistentValue."
           ::= { frsldCapabilities 6 }

       frsldNumSmplCtrls   OBJECT-TYPE
           SYNTAX   Gauge32
           MAX-ACCESS read-only
           STATUS   current
           DESCRIPTION
               "The current number of rows in frsldSmplCtrlTable."
           ::= { frsldCapabilities 7 }

       -- Conformance Information

```
     frsldMIBGroups      OBJECT IDENTIFIER ::= { frsldConformance 1 }
     frsldMIBCompliances OBJECT IDENTIFIER ::= { frsldConformance 2 }


     --
     -- Compliance Statements
     --

     frsldCompliance MODULE-COMPLIANCE
         STATUS  current
         DESCRIPTION
             "The compliance statement for SNMP entities
              which support with Frame Relay Service Level
              Definitions.  This group defines the minimum
              level of support required for compliance."
         MODULE -- this module
             MANDATORY-GROUPS { frsldPvcReqCtrlGroup,
                                frsldPvcReqDataGroup,
                                frsldCapabilitiesGroup}

             GROUP       frsldPvcHCFrameDataGroup
             DESCRIPTION
                "This group is mandatory only for those network
                 interfaces with corresponding instance of ifSpeed
                  greater than 650,000,000 bits/second."

             GROUP       frsldPvcHCOctetDataGroup
             DESCRIPTION
                "This group is mandatory only for those network
                 interfaces with corresponding instance of ifSpeed
                 greater than 650,000,000 bits/second."

             GROUP       frsldPvcPacketGroup
             DESCRIPTION
                "This group is optional.  Network interfaces that
                 allow control of the packets used to collect
                 information are encouraged to implement this
                 group."

             GROUP       frsldPvcDelayCtrlGroup
             DESCRIPTION
                "This group is optional.  Network interfaces that
                 offer control of the delay measurement are
                 strongly encouraged to implement this group."


             GROUP       frsldPvcSampleCtrlGroup
             DESCRIPTION
                 "This group is mandatory only for those network
```

                    interfaces that allow data sampling."

            GROUP   frsldPvcDelayDataGroup
            DESCRIPTION
               "This group is only mandatory when
                frsldPvcDelayCtrlGroup is implemented. It is
                strongly encouraged that any device capable
                of measuring delay implement this group."

            GROUP   frsldPvcSampleDelayGroup
            DESCRIPTION
               "This group is only mandatory when both
                frsldPvcSampleCtrlGroup and frsldPvcDelayDataGroup
                are supported."

            GROUP   frsldPvcSampleDataGroup
            DESCRIPTION
               "This group is mandatory whenever
                frsldPvcSampleCtrlGroup is supported."

            GROUP   frsldPvcSampleHCFrameGroup
            DESCRIPTION
               "This group is mandatory whenever both
                frsldPvcSampleCtrlGroup and frsldPvcHCFrameDataGroup
                are supported."

            GROUP   frsldPvcSampleHCDataGroup
            DESCRIPTION
               "This group is mandatory whenever both
                frsldPvcSampleCtrlGroup and frsldPvcHCOctetDataGroup
                are supported."

            GROUP   frsldPvcSampleAvailGroup
            DESCRIPTION
               "This group is mandatory whenever
                frsldPvcSampleCtrlGroup is supported."

            GROUP   frsldPvcSampleGeneralGroup
            DESCRIPTION
               "This group is mandatory whenever
                frsldPvcSampleCtrlGroup is supported."

            OBJECT   frsldPvcCtrlStatus
            SYNTAX   RowStatus { active(1) } -- subset of RowStatus
            MIN-ACCESS read-only
            DESCRIPTION
               "Row creation can be done outside of the scope of
                the SNMP protocol. If this object is implemented

                     with max-access of read-only, then the only value
                     that MUST be returned is active(1) and
                     frsldPvcCtrlWriteCaps MUST return 0 for the
                     frsldPvcCtrlStatus(0) bit."

              OBJECT   frsldPvcCtrlPurge
              MIN-ACCESS read-only
              DESCRIPTION
                  "Write access is not required. If this object is
                   implemented with a max-access of read-only, then
                   the frsldPvcCtrlPurge(5) bit must return 0."

              OBJECT   frsldPvcCtrlDeleteOnPurge
              MIN-ACCESS read-only
              DESCRIPTION
                  "Write access is not required. If this object is
                   implemented with a max-access of read-only, then
                   the frsldPvcCtrlDeleteOnPurge(6) bit must return
                   0."

              OBJECT   frsldMaxPvcCtrls
              MIN-ACCESS read-only
              DESCRIPTION
                  "Write access is not required if the device either
                   dynamically allocates memory or statically allocates
                   a fixed number of entries. In the case of static
                   allocation, the device should always report the
                   correct maximum number of controls. In the case
                   of dynamic allocation, the device SHOULD always
                   report a number greater than frsldNumPvcCtrls
                   when allocation is possible and a number equal to
                   frsldNumPvcCtrls when allocation is not possible."
              OBJECT   frsldMaxSmplCtrls
              MIN-ACCESS read-only
              DESCRIPTION
                  "Write access is not required if the device either
                   dynamically allocates memory or statically allocates
                   a fixed number of entries. In the case of static
                   allocation, the device should always report the
                   correct maximum number of controls. In the case
                   of dynamic allocation, the device SHOULD always
                   report a number greater than frsldNumSmplCtrls
                   when allocation is possible and a number equal to
                   frsldNumSmplCtrls when allocation is not possible."

       ::= { frsldMIBCompliances 1 }

       --

     -- Units of Conformance
     --
     frsldPvcReqCtrlGroup OBJECT-GROUP
        OBJECTS {
             frsldPvcCtrlStatus,
             frsldPvcCtrlPurge,
             frsldPvcCtrlDeleteOnPurge,
             frsldPvcCtrlLastPurgeTime
        }
        STATUS current
        DESCRIPTION
            "A collection of required objects providing
             control information applicable to a PVC which
             implements Service Level Definitions."
        ::= { frsldMIBGroups 1 }

     frsldPvcPacketGroup OBJECT-GROUP
        OBJECTS {
             frsldPvcCtrlPacketFreq
        }
        STATUS current
        DESCRIPTION
            "A collection of optional objects providing packet
             level control information applicable to a PVC which
             implements Service Level Definitions."
        ::= { frsldMIBGroups 2 }

     frsldPvcDelayCtrlGroup OBJECT-GROUP
        OBJECTS {
             frsldPvcCtrlDelayFrSize,
             frsldPvcCtrlDelayType,
             frsldPvcCtrlDelayTimeOut
        }
        STATUS current
        DESCRIPTION
            "A collection of optional objects providing delay
             control information applicable to a PVC which
             implements Service Level Definitions.

             If this group is implemented, frsldPvcPacketGroup
             and frsldPvcDelayDataGroup MUST also be implemented."
        ::= { frsldMIBGroups 3 }

     frsldPvcSampleCtrlGroup OBJECT-GROUP
        OBJECTS {
             frsldSmplCtrlStatus,
             frsldSmplCtrlColPeriod,
             frsldSmplCtrlBuckets,

                    frsldSmplCtrlBucketsGranted
            }
            STATUS current
            DESCRIPTION
                "A collection of optional objects providing sample
                 control information applicable to a PVC which
                 implements Service Level Definitions.

                 If this group is implemented, frsldPvcReqDataGroup
                 and frsldPvcSampleGeneralGroup MUST also be
                 implemented."
            ::= { frsldMIBGroups 4 }

        frsldPvcReqDataGroup OBJECT-GROUP
            OBJECTS {
                    frsldPvcDataFrDeliveredC,
                    frsldPvcDataFrDeliveredE,
                    frsldPvcDataFrOfferedC,
                    frsldPvcDataFrOfferedE,
                    frsldPvcDataDataDeliveredC,
                    frsldPvcDataDataDeliveredE,
                    frsldPvcDataDataOfferedC,
                    frsldPvcDataDataOfferedE,
                    frsldPvcDataUnavailableTime,
                    frsldPvcDataUnavailables
            }
            STATUS current
            DESCRIPTION
                "A collection of required objects providing data
                 collected on a PVC which implements Service
                 Level Definitions."
            ::= { frsldMIBGroups 5 }

        frsldPvcDelayDataGroup OBJECT-GROUP
            OBJECTS {
                    frsldPvcDataMissedPolls
            }
            STATUS current
            DESCRIPTION
                "A collection of optional objects providing delay
                 data collected on a PVC which implements Service
                 Level Definitions.

                 If this group is implemented, frsldPvcDelayCtrlGroup
                 MUST also be implemented."
            ::= { frsldMIBGroups 6 }

        frsldPvcHCFrameDataGroup OBJECT-GROUP

```
        OBJECTS {
             frsldPvcDataHCFrDeliveredC,
             frsldPvcDataHCFrDeliveredE,
             frsldPvcDataHCFrOfferedC,
             frsldPvcDataHCFrOfferedE
        }
        STATUS  current
        DESCRIPTION
            "A collection of optional objects providing high
             capacity frame data collected on a PVC which
             implements Service Level Definitions."
        ::= { frsldMIBGroups 7 }

    frsldPvcHCOctetDataGroup  OBJECT-GROUP
        OBJECTS {
             frsldPvcDataHCDataDeliveredC,
             frsldPvcDataHCDataDeliveredE,
             frsldPvcDataHCDataOfferedC,
             frsldPvcDataHCDataOfferedE
        }
        STATUS  current
        DESCRIPTION
            "A collection of optional objects providing high
             capacity octet data collected on a PVC which
             implements Service Level Definitions."
        ::= { frsldMIBGroups 8 }

    frsldPvcSampleDelayGroup  OBJECT-GROUP
        OBJECTS {
             frsldPvcSmplDelayMin,
             frsldPvcSmplDelayMax,
             frsldPvcSmplDelayAvg,
             frsldPvcSmplMissedPolls
        }
        STATUS  current
        DESCRIPTION
            "A collection of optional objects providing delay
             sample data collected on a PVC which implements
             Service Level Definitions.

             If this group is implemented, frsldPvcDelayCtrlGroup
             MUST also be implemented."
        ::= { frsldMIBGroups 9 }

    frsldPvcSampleDataGroup  OBJECT-GROUP
        OBJECTS {
             frsldPvcSmplFrDeliveredC,
             frsldPvcSmplFrDeliveredE,
```

                frsldPvcSmplFrOfferedC,
                frsldPvcSmplFrOfferedE,
                frsldPvcSmplDataDeliveredC,
                frsldPvcSmplDataDeliveredE,
                frsldPvcSmplDataOfferedC,
                frsldPvcSmplDataOfferedE
            }
        STATUS   current
        DESCRIPTION
            "A collection of optional objects providing data
             and frame delivery sample data collected on a PVC
             which implements Service Level Definitions.

             If this group is implemented, frsldPvcReqDataGroup
             MUST also be implemented."
        ::= { frsldMIBGroups 10 }

    frsldPvcSampleHCFrameGroup OBJECT-GROUP
        OBJECTS {
                frsldPvcSmplHCFrDeliveredC,
                frsldPvcSmplHCFrDeliveredE,
                frsldPvcSmplHCFrOfferedC,
                frsldPvcSmplHCFrOfferedE
            }
        STATUS   current
        DESCRIPTION
            "A collection of optional objects providing high
             capacity frame delivery sample data collected on a PVC
             which implements Service Level Definitions.

             If this group is implemented, frsldPvcHCFrameDataGroup
             MUST also be implemented."
        ::= { frsldMIBGroups 11 }

    frsldPvcSampleHCDataGroup OBJECT-GROUP
        OBJECTS {
                frsldPvcSmplHCDataDeliveredC,
                frsldPvcSmplHCDataDeliveredE,
                frsldPvcSmplHCDataOfferedC,
                frsldPvcSmplHCDataOfferedE
            }
        STATUS   current
        DESCRIPTION
            "A collection of optional objects providing high
             capacity data delivery sample data collected on a PVC
             which implements Service Level Definitions.

             If this group is implemented, frsldPvcHCOctetDataGroup

                 MUST also be implemented."
             ::= { frsldMIBGroups 12 }

        frsldPvcSampleAvailGroup OBJECT-GROUP
            OBJECTS {
                frsldPvcSmplUnavailableTime,
                frsldPvcSmplUnavailables
            }
            STATUS current
            DESCRIPTION
                "A collection of optional objects providing
                 availability sample data collected on a PVC which
                 implements Service Level Definitions.

                 If this group is implemented, frsldPvcReqDataGroup
                 MUST also be implemented."
             ::= { frsldMIBGroups 13 }

        frsldPvcSampleGeneralGroup OBJECT-GROUP
            OBJECTS {
                frsldPvcSmplStartTime,
                frsldPvcSmplEndTime
            }
            STATUS current
            DESCRIPTION
                "A collection of optional objects providing
                 general sample data collected on a PVC which
                 implements Service Level Definitions."
             ::= { frsldMIBGroups 14 }

        frsldCapabilitiesGroup OBJECT-GROUP
            OBJECTS {
                frsldPvcCtrlWriteCaps,
                frsldSmplCtrlWriteCaps,
                frsldRPCaps,
                frsldMaxPvcCtrls,
                frsldNumPvcCtrls,
                frsldMaxSmplCtrls,
                frsldNumSmplCtrls
            }
            STATUS current
            DESCRIPTION
                "A collection of required objects providing
                 capability information and control for this
                 MIB module."
             ::= { frsldMIBGroups 15 }
    END

8. Acknowledgments

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10. 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.

   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.

11. Authors' Addresses

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12. Full Copyright Statement

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