Definitions of Managed Objects
for Frame Relay Service Level Definitions

Status of this Memo

This document specifies an Internet standards track protocol for the
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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.

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1. The SNMP Management Framework

The SNMP Management Framework presently consists of five major components:

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

- 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].

- 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...
The third version of the message protocol is called SNMPv3 and described in RFC 1906 [10], RFC 2572 [11] and RFC 2574 [12].

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].

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:

- frameRelay (32)
- 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:

- Evaluation of frame relay service providers, offerings or products.
- Measurement of Quality of Service.
- Enforcement of Service Level Agreements.
- 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.

- **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.

- **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.

- **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.

- **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

- **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].

- **DLCI** - Data Link Connection Identifier [18].

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

- **NNI** - Network to Network Interface [18].

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

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

- **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     |
    |     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.
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.

- **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.

- **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.

- **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 utilization of this MIB module. These objects are **frsldMaxPvcCtrls**, **frsldNumPvcCtrls**, **frsldMaxSmplCtrls** and **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.

- Local Information Only
  
  Local Device: srcLocalRP, desLocalRP
  Remote Device: srcLocalRP, desLocalRP

- 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


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

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

(A) frsldPvcCtrlTransmitRP for Device 1 = ingTxLocalRP(2)
(B) frsldPvcCtrlReceiveRP for Device 2 = eqoRxLocalRP(5)
(C) frsldPvcCtrlTransmitRP for Device 2 = ingTxLocalRP(2)
(D) frsldPvcCtrlReceiveRP 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) frsldPvcCtrlReceiveRP for Device 1 = eqoRxRemoteRP(11)

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

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

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

<table>
<thead>
<tr>
<th>Device 1</th>
<th>Device 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ingress</td>
<td>Egress</td>
</tr>
<tr>
<td>+--------+----------</td>
<td></td>
</tr>
<tr>
<td>(A)</td>
<td>Traffic Flow</td>
</tr>
<tr>
<td>--&gt;--     --&gt;-- --&gt;-- --&gt;-- --&gt;-- --&gt;-- --&gt;-- --&gt;-- --&gt;-- --&gt;--</td>
<td></td>
</tr>
<tr>
<td>+--------+          +--------+          +--------+          +--------+</td>
<td></td>
</tr>
<tr>
<td>Egress</td>
<td>Ingress</td>
</tr>
<tr>
<td>+--------+          +--------+          +--------+          +--------+</td>
<td></td>
</tr>
<tr>
<td>(D)</td>
<td>Traffic Flow</td>
</tr>
<tr>
<td>&lt;--&lt;-     &lt;--&lt;- &lt;--&lt;- &lt;--&lt;- &lt;--&lt;- &lt;--&lt;- &lt;--&lt;- &lt;--&lt;- --&gt;---&gt;     --&gt;---&gt;</td>
<td></td>
</tr>
<tr>
<td>+--------+          +--------+          +--------+          +--------+</td>
<td></td>
</tr>
<tr>
<td>From Device 2 to 1</td>
<td>From Device 1 to 2</td>
</tr>
</tbody>
</table>

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) frsldPvcCtrlReceiveRP for Device 2 = eqiRxLocalRP(4)

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

(D) frsldPvcCtrlReceiveRP 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

<table>
<thead>
<tr>
<th>Source</th>
<th>Traffic Flow</th>
<th>Destination</th>
</tr>
</thead>
<tbody>
<tr>
<td>(A)</td>
<td></td>
<td>(B)</td>
</tr>
</tbody>
</table>

#### Device 2

<table>
<thead>
<tr>
<th>Traffic Flow</th>
<th>Source</th>
<th>Destination</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(B)</td>
<td>(C)</td>
</tr>
</tbody>
</table>

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 straightforward. 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:

- frsldPvcDataMissedPolls
- frsldPvcDataFrDeliveredC
- frsldPvcDataFrDeliveredE
- frsldPvcDataFrOfferedC
- frsldPvcDataFrOfferedE
- frsldPvcDataDataDeliveredC
- frsldPvcDataDataDeliveredE
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:

- **DelayAvg**
  
  The average delay on the PVC. This is represented within the MIB module by `frsldPvcSmplDelayAvg`.

- **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`.

- **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`.

- **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.
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 frsldPvCTrlDelayType 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 frsldPvCTrlDelayType 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.

\[
\text{Frame Delivery Ratio} = \frac{\text{FrDeliveredC} + \text{FrDeliveredE}}{\text{FrOfferedC} + \text{FrOfferedE}}
\]

\[
\text{Committed Frame Delivery Ratio} = \frac{\text{FrDeliveredC}}{\text{FrOfferedC}}
\]

\[
\text{Excess Frame Delivery Ratio} = \frac{\text{FrDeliveredE}}{\text{FrOfferedE}}
\]
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.

\[
\text{Data Delivery Ratio} = \frac{\text{DataDeliveredC} + \text{DataDeliveredE}}{\text{DataOfferedC} + \text{DataOfferedE}}
\]

\[
\text{Committed Data Delivery Ratio} = \frac{\text{DataDeliveredC}}{\text{DataOfferedC}}
\]

\[
\text{Excess Data Delivery Ratio} = \frac{\text{DataDeliveredE}}{\text{DataOfferedE}}
\]

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.

\[
\text{Mean Time to Repair} = \frac{\text{UnavailableTime}}{\text{Unavailables}}
\]

Otherwise, FRMTTR = \frac{\text{UnavailableTime}}{\text{Unavailables}}

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

\[
\text{Virtual Connection Availability} = \frac{\text{IntervalTime} - \text{ExcludedTime} - \text{UnavailableTime}}{\text{IntervalTime} - \text{ExcludedTime}} \times 100
\]

Otherwise, FRVCA = \frac{\text{IntervalTime} - \text{ExcludedTime} - \text{UnavailableTime}}{\text{IntervalTime} - \text{ExcludedTime}} \times 100

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 ifIndex 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 FRSDL-MIB consists of the following components:

- frsldPvcCtrlTable
- frsldSmplCtrlTable
- frsldPvcDataTable
- frsldPvcSampleTable
- 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 semantics 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

Steinberger & Nicklass Standards Track [Page 24]
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 semantics 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"
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 }
::= { frsldPvcCtrlEntry 9 }

frsldPvcCtrlDeleteOnPurge OBJECT-TYPE
SYNTAX INTEGER {
   none(1),
   sampleControls(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 semantics 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 (DataDeliveredc)"
::= { 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 (FramesDeliveredc)"
::= { 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 }
frsIdPvcDataHCDataOfferedC OBJECT-TYPE
SYNTAX Counter64
MAX-ACCESS read-only
STATUS current
DESCRIPTION "The number of octets that were offered through
frsIdPvcCtrlTransmitRP within CIR. This object is
a 64-bit version of frsIdPvcDataDataOfferedC.

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

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

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

frsIdPvcDataUnavailableTime 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)"
::= { frsIdPvcDataEntry 18 }

frsIdPvcDataUnavailables 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 frsldPvcSmplHCDataDeliveredC."

REFERENCE
"FRF.13: Section 4.1 (FramesOfferedc)"
::= { frsldPvcSampleEntry 9 }\n
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 frsldPvcSmplHCDataOfferedC.

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 frsldPvcSmplFrDeliveredE.
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}
The number of times this PVC was declared unavailable for any reason during this interval.

"FRF.13: Section 6.1 (OutageCount)"

The value of sysUpTime when this sample interval started.

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.

The group provides capabilities objects for the tables that control configuration.

The number of times this PVC was declared unavailable for any reason during this interval.

"FRF.13: Section 6.1 (OutageCount)"
"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    frsldPvcSampleHCOctetDataGroup
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 {
  frsldPvcDataHCFrameDeliveredC,
  frsldPvcDataHCFrameDeliveredE,
  frsldPvcDataHCFrameOfferedC,
  frsldPvcDataHCFrameOfferedE
}
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 {
  frsldPvcDataHCOctetDeliveredC,
  frsldPvcDataHCOctetDeliveredE,
  frsldPvcDataHCOctetOfferedC,
  frsldPvcDataHCOctetOfferedE
}
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,
frsldPvcSampleFrFrameGroup  OBJECT-GROUP
OBJECTS {
  frsldPvcSmplFrFrameDeliveredC,
  frsldPvcSmplFrFrameDeliveredE,
  frsldPvcSmplFrFrameOfferedC,
  frsldPvcSmplFrFrameOfferedE
}
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 {
  frsldPvcSmplHCFrFrameDeliveredC,
  frsldPvcSmplHCFrFrameDeliveredE,
  frsldPvcSmplHCFrFrameOfferedC,
  frsldPvcSmplHCFrFrameOfferedE
}
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 }

frsldPvcSampleHCDatagramGroup  OBJECT-GROUP
OBJECTS {
  frsldPvcSmplHCDatagramDeliveredC,
  frsldPvcSmplHCDatagramDeliveredE,
  frsldPvcSmplHCDatagramOfferedC,
  frsldPvcSmplHCDatagramOfferedE
}
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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- Ken Rehbehn, Visual Networks
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9. References


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

Robert Steinberger  
Fujitsu Network Communications  
2801 Telecom Parkway  
Richardson, TX 75082  
Phone: 1-972-479-4739  
EMail: robert.steinberger@fnc.fujitsu.com

Orly Nicklass, Ph.D  
RAD Data Communications Ltd.  
12 Hanechoshet Street  
Tel Aviv, Israel 69710  
Phone: 972 3 7659969  
EMail: Orly_n@rad.co.il
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