Definitions of Managed Objects
for Frame Relay Service Level Definitions

Status of this Memo

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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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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 SMIIv2, 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       |     | 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.
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
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

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

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) \text{frsldPvcCtrlTransmitRP} for Device 1 = \text{ingTxLocalRP}(2)

(B) \text{frsldPvcCtrlReceiveRP} for Device 2 = \text{eqoRxLocalRP}(5)

(C) \text{frsldPvcCtrlTransmitRP} for Device 2 = \text{ingTxLocalRP}(2)

(D) \text{frsldPvcCtrlReceiveRP} for Device 1 = \text{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.
3.6.2.1.2.  Edge-to-Edge Egress Queue 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)  frsldPvcCtlrReceiveRP for Device 1 = eqiRxLocalRP(4)
(C)  frsldPvcCtrlTransmitRP for Device 2 = ingTxLocalRP(2)
(D)  frsldPvcCtlrReceiveRP for Device 2 = 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
+-------------+                        +-------------+
|   Source    |                        | Destination |
| +-----+      |                        |   +-----+    |
| (A)  |     |   |      Traffic Flow      |   |     |(B) |
|--->-->--  |--->-->--->-->--->-->--->-->--->-->--->--->--->-->--->--->--->
|     |     |   |   From Device 1 to 2   |   |     |   |
| +-----+      |                        |   +-----+    |
| Destination |                        |   Source    |
| +-----+      |      Traffic Flow      |   +-----+    |
| (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 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 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.

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

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

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

\[
\text{UnavailableTime}
\]

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

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

\[
\text{IntervalTime} - \text{ExcludedTime} - \text{UnavailableTime}
\]

Otherwise, \( \text{FRVCA} = \frac{\text{IntervalTime} - \text{ExcludedTime} - \text{UnavailableTime}}{\text{IntervalTime} - \text{ExcludedTime}} \) * 100

Mean Time Between Service Outages (FRMTBSO) = 0 if Unavailables is 0.
Otherwise, \( \text{FRMTBSO} = \text{IntervalTime} - \text{ExcludedTime} - \text{UnavailableTime} \)

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 \text{frsldPvcCtrlStatus} in the \text{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 \text{frPVCEndptRowStatus} is active(1) and \text{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 \text{frCircuitRowStatus} of active(1) and \text{frCircuitState} of active(2).

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

3. The respective DLCI has just been removed. This corresponds to a state in which either \text{frPVCEndptRowStatus} is no longer active(1) or \text{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 \text{frCircuitRowStatus} is no longer active(1) or \text{frCircuitState} is no longer active(2).

For the first case, the row in the \text{frsldPvcDataTable} will be filled. If \text{frsldSmplCtrlStatus} in the \text{frsldSmplCtrlTable} for the respective DLCI is also ‘active’ the \text{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 \text{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:

- 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]
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
  --}
rfslDvcCtrlDelayFrSize  INTEGER32,
rfslDvcCtrlDelayType    INTEGER,
rfslDvcCtrlDelayTimeOut Integer32,

-- Data Persistence Control Variables
--
rfslDvcCtrlPurge        INTEGER32,
rfslDvcCtrlDeleteOnPurge INTEGER,
rfslDvcCtrlLastPurgeTime TimeStamp

rfslDvcCtrlDlci 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."
::= { frslDvcCtrlEntry 1 }

rfslDvcCtrlTransmitRP 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 rfslDvcCtrlReceiveRP define the
  measurement domain."
REFERENCE
 "FRF.13: Section 2.3"
::= { frslDvcCtrlEntry 2 }

rfslDvcCtrlReceiveRP 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 rfslDvcCtrlTransmitRP define the
  measurement domain."
::= { frslDvcCtrlEntry 3 }

rfslDvcCtrlStatus 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),
  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 be 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 frsldSmplCtrlBucketsGranted 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
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 (FramesOfferedc)"
::= { 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 (FramesDelivered)"
::= { 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 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 within CIR during this interval. This object is a 64-bit version of frsldPvcSmplFrDeliveredE."
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
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."
-- 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 {
  frsldPvcSmplHCDDataDeliveredC,
  frsldPvcSmplHCDDataDeliveredE,
  frsldPvcSmplHCDDataOfferedC,
  frsldPvcSmplHCDDataOfferedE
}
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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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.

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