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Definitions of Managed Objects for Circuit to Interface Translation

Status of this Memo

This document specifies an Internet standards track protocol for the Internet community, and requests discussion and suggestions for improvements. Please refer to the current edition of the "Internet Official Protocol Standards" (STD 1) for the standardization state and status of this protocol. Distribution of this memo is unlimited.

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Abstract

This memo defines an extension of the Management Information Base (MIB) for use with network management protocols in TCP/IP-based internets. In particular, it defines objects for managing the insertion of interesting Circuit Interfaces into the ifTable. This is important for circuits that must be used within other MIB modules which require an ifEntry. It allows for integrated monitoring of circuits as well as routing to circuits using unaltered, pre-existing MIB modules.

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1. The SNMP Management Framework

The SNMP Management Framework presently consists of five major components:

- o An overall architecture, described in RFC 2571 [1].
- o Mechanisms for describing and naming objects and events for the purpose of management. The first version of this Structure of Management Information (SMI) is called SMIv1 and described in STD 16, RFC 1155 [2], STD 16, RFC 1212 [3] and RFC 1215 [4]. The second version, called SMIv2, is described in STD 58, RFC 2578 [5], RFC 2579 [6] and RFC 2580 [7].
- o Message protocols for transferring management information. The first version of the SNMP message protocol is called SNMPv1 and described in STD 15, RFC 1157 [8]. A second version of the SNMP message protocol, which is not an Internet standards track protocol, is called SNMPv2c and described in RFC 1901 [9] and RFC 1906 [10]. The third version of the message protocol is called SNMPv3 and described in RFC 1906 [10], RFC 2572 [11] and RFC 2574 [12].
- o Protocol operations for accessing management information. The first set of protocol operations and associated PDU formats is described in STD 15, RFC 1157 [8]. A second set of protocol operations and associated PDU formats is described in RFC 1905 [13].

- o A set of fundamental applications described in RFC 2573 [14] and the view-based access control mechanism described in RFC 2575 [15].

A more detailed introduction to the current SNMP Management Framework can be found in RFC 2570 [16].

Managed objects are accessed via a virtual information store, termed the Management Information Base or MIB. Objects in the MIB are defined using the mechanisms defined in the SMI.

This memo specifies a MIB module that is compliant to the SMIV2. A MIB conforming to the SMIV1 can be produced through the appropriate translations. The resulting translated MIB must be semantically equivalent, except where objects or events are omitted because no translation is possible (use of Counter64). Some machine readable information in SMIV2 will be converted into textual descriptions in SMIV1 during the translation process. However, this loss of machine readable information is not considered to change the semantics of the MIB.

2. Conventions

The keywords MUST, MUST NOT, REQUIRED, SHALL, SHALL NOT, SHOULD, SHOULD NOT, RECOMMENDED, NOT RECOMMENDED, MAY, and OPTIONAL, when they appear in this document, are to be interpreted as described in RFC 2119 [21].

3. Overview

This MIB module addresses the concept of inserting circuits, which are potentially virtual, into the ifTable. There are multiple reasons to allow circuits to be added to the ifTable. The most prevalent of which are the standard routing MIB tables such as the ipCidrRouteTable (IP-FORWARD-MIB) and the ipNetToMediaTable (IP-MIB) act on the ifIndex and the RMON MIBs (RMON-MIB and RMON2-MIB as defined in RFC 2819 [23] and RFC 2021 [19]) require the use of an ifIndex a DataSource.

There is a further need to potentially monitor or manage a circuit based on the directional flow of traffic going through it. For instance, monitoring of protocols passed on a circuit using RMON-II (RFC 2021 [19]) does not currently capture the direction of the flow. This MIB module provides the capability to define an interface based on the specific direction of the flow.

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

3.1. Circuit Concepts

There are multiple MIB modules that define circuits. Three commonly used MIB modules are FRAME-RELAY-DTE-MIB (RFC 2115) [20], FRNETSERV-MIB (RFC 2954) [18], and ATM-MIB (RFC 2515) [22]. These define management objects for frame relay DTEs, frame relay services, and ATM respectively. Each of these MIB modules contain the ability to add or delete circuits; however, none create a specific ifEntry for a circuit. The reason for this is that there are potentially multiple circuits and not every circuit needs to be managed as an individual interface. For example, not every circuit on a device needs to be monitored with RMON and not every circuit needs to be included as an individual circuit for routing. Further, the Interfaces Group MIB (RFC 2863) [17] strongly recommends that conceptual rows not be added to the ifTable for virtual circuits.

The rationale for creating conceptual rows in the ifTable for these circuits is that there is a need for their use in either management of routing or monitoring of data. Both of these functions require mapping to an ifIndex.

This MIB module is designed such that only those circuits that require an ifIndex need be added to the ifTable. This prevents over-populating the ifTable with useless or otherwise unused indices.

While this document often refers to ATM and frame relay, it is not specifically designed for only those types of circuits. Any circuit that is defined in a MIB module but does not have its own ifIndex MAY be added with this MIB module.

3.2. Theory of Operation

3.2.1. Creation Process

In some cases, devices will automatically populate the rows of ciCircuitTable as circuits are created or discovered. 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) Locate or create the circuit that is to be added on the device.
- 2) Create a row in ciCircuitTable for each flow type that is required.

The first step above requires some knowledge of the circuits that exist on a device. Typically, logical ports have entries in the

ifTable. If, for example, the ifType for the logical port is frameRelay(32), the circuits can be located in the frCircuitTable of the Frame Relay DTE MIB (FRAME-RELAY-DTE-MIB) [18]. If, as another example, the ifType for the logical port is frameRelayService(44), the circuits can be located in the frPVCEndptTable of the Frame Relay Service MIB (FRNETSERV-MIB) [20]. If, as a final example, the ifType for the logical port is aal5(49), the circuits can be located in the aal5VccTable of the ATM MIB (ATM-MIB) [22]. An entry describing the circuit MUST exist in some table prior to creating a row in ciCircuitTable. The object identifier that MUST be used in the circuit definition is the lexicographically smallest accessible OID that fully describes the the circuit.

3.2.2. Destruction Process

3.2.2.1. Manual Row Destruction

Manual row destruction is straight forward. Any row can be destroyed and the resources allocated to it are freed by setting the value of its status object (ciCircuitStatus) to destroy(6). It should be noted that when ciCircuitStatus is set to destroy(6) all associated rows in the ifTable and in ciIfMapTable will also be destroyed. This process MAY trigger further row destruction in other tables as well.

3.2.2.2. Automatic Row Destruction

Rows in the tables MAY be destroyed automatically based on the existence of the circuit on which they rely. When a circuit no longer exists in the device, the data in the tables has no relation to anything known on the network. For this reason, rows MUST be removed from this table as soon as it is discovered that the associated circuits no longer exist. The effects of automatic row destruction are the same as manual row destruction.

3.2.3. Modification Process

Since no objects in the MIB module can be changed once rows are active, there are no modification caveats.

3.2.4. Persistence of Data

Each row in the tables of this MIB module relies on information from other MIB modules. The rules for persistence of the data SHOULD follow the same rules as those of the underlying MIB module. For example, if the circuit defined by ciCircuitObject would normally be stored in non-volatile memory, then the ciCircuitEntry SHOULD also be non-volatile.

4. Relation to Other MIB Modules

4.1. Frame Relay DTE MIB

There is no required relation to the Frame Relay DTE MIB beyond the fact that rows in the frCircuitTable MAY be referenced. However, if frCircuitLogicalIfIndex is being used to represent the same information as a ciCircuitEntry with a value of ciCircuitFlow equal to both(3), the implementation MAY use the same ifIndex.

4.2. Frame Relay Service MIB

There is no explicit relation to the Frame Relay Service MIB beyond the fact that a rows in the frPVCEndptTable MAY be referenced.

4.3. ATM MIB

There is no explicit relation to the ATM MIB beyond the fact that rows in multiple tables may be referenced.

4.4. Interfaces Group MIB

4.4.1. Interfaces Table (ifTable, ifXtable)

The following specifies how the Interfaces Group defined in the IF-MIB will be used for the management of interfaces created by this MIB module.

Values of specific ifTable objects for circuit interfaces are as follows:

Object Name	Value of Object
=====	=====
ifIndex	Each entry in the circuit table is represented by an ifEntry. The value of ifIndex is defined by the agent such that it complies with any internal numbering scheme.
ifType	The value of ifType is specific to the type of circuit desired. For example, the value for frame relay virtual circuits is frDlciEndPt(193) and the value for ATM virtual circuits is atmVciEndPt(194). If the circuit is to be used in RMON, propVirtual(53) SHOULD NOT be used.

ifMtu	Set to the size in octets of the largest packet, frame or PDU supported on the circuit. If this is not known to the ifMtu object shall be set to zero. If the circuit is not modeled as a packet-oriented interface, this object SHOULD NOT be supported and result in noSuchInstance.
ifSpeed	The peak bandwidth in bits per second available for use. This will equal either the ifSpeed of the logical link if policing is not enforced or the maximum information rate otherwise. If neither is known, the ifSpeed object shall be set to zero.
ifPhysAddress	This will always be an octet string of zero length.
ifInOctets	The number of octets received by the network (ingress) for this circuit. This counter should count only octets included the header information and user data. If the device does not support statistics on the circuit, this object MUST NOT be supported and result in noSuchInstance.
ifInUcastPkts	The unerrored number of frames, packets or PDUs received by the network (ingress) for this circuit. If the device does not support statistics on the circuit, this object MUST NOT be supported and result in noSuchInstance.
ifInDiscards	The number of received frames, packets or PDUs for this circuit discarded due to ingress buffer congestion and traffic policing. If the device does not support statistics on the circuit, this object MUST NOT be supported and result in noSuchInstance.
ifInErrors	The number of received frames, packets or PDUs for this circuit that are discarded because of an error. If the device does not support statistics on the circuit, this object MUST NOT be supported and result in noSuchInstance.
ifOutOctets	The number of octets sent by the network (egress) for this circuit. This counter should count only octets included the header information and user data. If the device does not support statistics on the circuit, this object MUST NOT be supported and result in noSuchInstance.

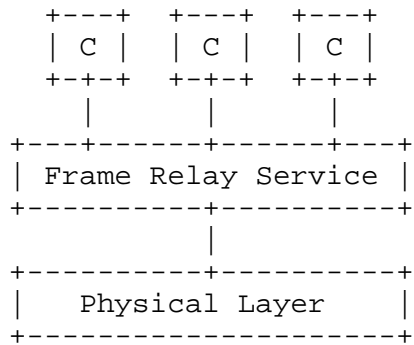
- ifOutUcastPkts** The number of unerrored frames, packets or PDUs sent by the network (egress) for this circuit. If the device does not support statistics on the circuit, this object MUST NOT be supported and result in noSuchInstance.
- ifOutDiscards** The number of frames, packets or PDUs discarded in the egress direction for this circuit. Possible reasons are as follows: policing, congestion. If the device does not support statistics on the circuit, this object MUST NOT be supported and result in noSuchInstance.
- ifOutErrors** The number of frames, packets or PDUs discarded for this circuit in the egress direction because of an error. If the device does not support statistics on the circuit, this object MUST NOT be supported and result in noSuchInstance.
- ifInBroadcastPkts**
If the device does not support statistics on the circuit, this object MUST NOT be supported and result in noSuchInstance.
- ifOutBroadcastPkts**
If the device does not support Broadcast packets on the circuit, this object should not be supported and result in noSuchInstance.
- ifLinkUpDownTrapEnable**
Set to false(2). Circuits often have a predefined notification mechanism. In such instances, the number of notification sent would be doubled if this were enabled.
- ifPromiscuousMode**
Set to false(2). If the circuit is not modeled as a packet-oriented interface, this object SHOULD NOT be supported and result in noSuchInstance.
- ifConnectorPresent**
Set to false(2).

All other values are supported as stated in the IF-MIB documentation.

4.4.2. Stack Table (ifStackTable)

This section describes by example how to use ifStackTable to represent the relationship between circuit and logical link interfaces.

Example 1: Circuits (C) on a frame relay logical link.



The assignment of the index values could for example be (for a V35 physical interface):

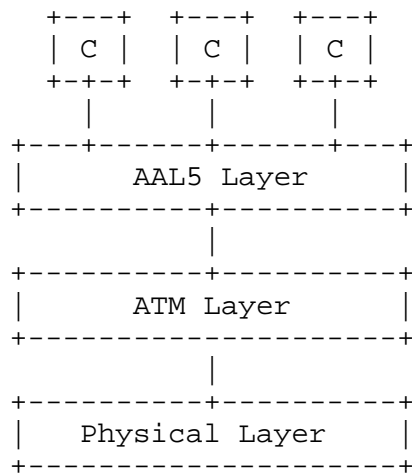
ifIndex	Description	
=====	=====	
1	frDlciEndPt	(type 193)
2	frDlciEndPt	(type 193)
3	frDlciEndPt	(type 193)
4	frameRelayService	(type 44)
5	v35	(type 33)

The ifStackTable is then used to show the relationships between each interface.

HigherLayer	LowerLayer
=====	=====
0	1
0	2
0	3
1	4
2	4
3	4
4	5
5	0

In the above example the frame relay logical link could just as easily be of type frameRelay(32) instead.

Example 2: Circuits (C) on a AAL5 logical link.



The assignment of the index values could for example be (for a DS3 physical interface):

ifIndex	Description
=====	=====
1	atmVciEndPt (type 194)
2	atmVciEndPt (type 194)
3	atmVciEndPt (type 194)
4	aal5 (type 49)
5	atm (type 37)
6	ds3 (type 30)

The ifStackTable is then used to show the relationships between each interface.

HigherLayer	LowerLayer
=====	=====
0	1
0	2
0	3
1	4
2	4
3	4
4	5
5	6
6	0

4.5. Other MIB Modules

There is no explicit relation to any other media specific MIB module beyond the fact that rows in multiple tables may be referenced.

5. Structure of the MIB Module

The CIRCUIT-IF-MIB consists of the following components:

- o ciCircuitTable
- o ciIfMapTable

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

5.1. ciCircuitTable

The ciCircuitTable is the central control table for operations of the Circuit Interfaces MIB. It provides a means of mapping a circuit to its ifIndex as well as forcing the insertion of an ifIndex into the ifTable. The agent is responsible for managing the ifIndex itself such that no device dependent indexing scheme is violated.

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

5.2. ciIfMapTable

This table maps the ifIndex back to the circuit that it is associated with.

6. Object Definitions

```
CIRCUIT-IF-MIB DEFINITIONS ::= BEGIN
```

```
IMPORTS
```

```
    MODULE-IDENTITY, OBJECT-TYPE,
    mib-2, Gauge32                               FROM SNMPv2-SMI
    TEXTUAL-CONVENTION, RowStatus,
    TimeStamp, RowPointer, StorageType           FROM SNMPv2-TC
    MODULE-COMPLIANCE, OBJECT-GROUP              FROM SNMPv2-CONF
    ifIndex, InterfaceIndex                     FROM IF-MIB;
```

```
    circuitIfMIB 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](http://www.ietf.org/html.charters/frnetmib-charter.html)
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DESCRIPTION

"The MIB module to allow insertion of selected circuit into
 the ifTable."

REVISION "200201030000Z" -- January 3, 2002

DESCRIPTION

"Initial version, published as RFC 3201"

::= { mib-2 94 }

-- Textual Conventions

CiFlowDirection ::= TEXTUAL-CONVENTION

STATUS current

DESCRIPTION

"The direction of data flow thru a circuit."

transmit(1) - Only transmitted data
 receive(2) - Only received data
 both(3) - Both transmitted and received data."

SYNTAX INTEGER {
 transmit(1),
 receive(2),
 both(3)
 }

ciObjects OBJECT IDENTIFIER ::= { circuitIfMIB 1 }
 ciCapabilities OBJECT IDENTIFIER ::= { circuitIfMIB 2 }
 ciConformance OBJECT IDENTIFIER ::= { circuitIfMIB 3 }

```
-- The Circuit Interface Circuit Table
--
-- This table is used to define and display the circuits that
-- are added to the ifTable. It maps circuits to their respective
-- ifIndex values.
```

```
ciCircuitTable OBJECT-TYPE
    SYNTAX      SEQUENCE OF CiCircuitEntry
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "The Circuit Interface Circuit Table."
    ::= { ciObjects 1 }
```

```
ciCircuitEntry OBJECT-TYPE
    SYNTAX      CiCircuitEntry
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "An entry in the Circuit Interface Circuit Table."
    INDEX      { ciCircuitObject, ciCircuitFlow }
    ::= { ciCircuitTable 1 }
```

```
CiCircuitEntry ::=
    SEQUENCE {
        --
        -- Index Control Variables
        --
        ciCircuitObject      RowPointer,
        ciCircuitFlow        CiFlowDirection,
        ciCircuitStatus      RowStatus,
        --
        -- Data variables
        --
        ciCircuitIfIndex      InterfaceIndex,
        ciCircuitCreateTime   TimeStamp,
        --
        -- Data Persistence
        --
        ciCircuitStorageType  StorageType
    }
```

```
ciCircuitObject OBJECT-TYPE
    SYNTAX      RowPointer
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "This value contains the RowPointer that uniquely
```

describes the circuit that is to be added to this table. Any RowPointer that will force the size of OBJECT IDENTIFIER of the row to grow beyond the legal limit MUST be rejected.

The purpose of this object is to point a network manager to the table in which the circuit was created as well as define the circuit on which the interface is defined.

Valid tables for this object include the frCircuitTable from the Frame Relay DTE MIB (FRAME-RELAY-DTE-MIB), the frPVCEndptTable from the Frame Relay Service MIB (FRNETSERV-MIB), and the aal5VccTable from the ATM MIB (ATM MIB). However, including circuits from other MIB tables IS NOT prohibited."

```
::= { ciCircuitEntry 1 }
```

ciCircuitFlow OBJECT-TYPE

SYNTAX CiFlowDirection

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"The direction of data flow through the circuit for which the virtual interface is defined. The following define the information that the virtual interface will report.

```
transmit(1) - Only transmitted frames
receive(2)  - Only received frames
both(3)     - Both transmitted and received frames.
```

It is recommended that the ifDescr of the circuit interfaces that are not both(3) SHOULD have text warning the operators that the particular interface represents only half the traffic on the circuit."

```
::= { ciCircuitEntry 2 }
```

ciCircuitStatus 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), a row will also be added to the interface map table below and a row will be added to the ifTable. These rows SHOULD not be removed until the status is changed from active(1). The value of ifIndex for the row that

is added to the ifTable is determined by the agent and MUST follow the rules of the ifTable. The value of ifType for that interface will be frDlciEndPt(193) for a frame relay circuit, atmVciEndPt(194) for an ATM circuit, or another ifType defining the circuit type for any other circuit.

When this object is set to destroy(6), the associated row in the interface map table will be removed and the ifIndex will be removed from the ifTable. Removing the ifIndex MAY initiate a chain of events that causes changes to other tables as well.

The rows added to this table MUST have a valid object identifier for ciCircuitObject. This means that the referenced object must exist and it must be in a table that supports circuits.

The object referenced by ciCircuitObject MUST exist prior to transitioning a row to active(1). If at any point the object referenced by ciCircuitObject does not exist or the row containing it is not in the active(1) state, the status SHOULD either age out the row or report notReady(3). The effects transitioning from active(1) to notReady(3) are the same as those caused by setting the status to destroy(6).

Each row in this table relies on information from other MIB modules. The rules persistence of data SHOULD follow the same rules as those of the underlying MIB module. For example, if the circuit defined by ciCircuitObject would normally be stored in non-volatile memory, then the row SHOULD also be non-volatile."

```
::= { ciCircuitEntry 3 }
```

```
ciCircuitIfIndex OBJECT-TYPE
```

```
    SYNTAX      InterfaceIndex
```

```
    MAX-ACCESS  read-only
```

```
    STATUS      current
```

```
    DESCRIPTION
```

```
        "The ifIndex that the agent assigns to this row."
```

```
::= { ciCircuitEntry 4 }
```

```
ciCircuitCreateTime OBJECT-TYPE
```

```
    SYNTAX      TimeStamp
```

```
    MAX-ACCESS  read-only
```

```
    STATUS      current
```

```
    DESCRIPTION
```

```

        "This object returns the value of sysUpTime at the time
        the value of ciCircuitStatus last transitioned to
        active(1).  If ciCircuitStatus has never been active(1),
        this object SHOULD return 0."
 ::= { ciCircuitEntry 5 }

ciCircuitStorageType OBJECT-TYPE
    SYNTAX      StorageType
    MAX-ACCESS   read-create
    STATUS      current
    DESCRIPTION
        "The storage type used for this row."
 ::= { ciCircuitEntry 6 }

-- The Circuit Interface Map Table
--
-- This table maps the ifIndex values that are assigned to
-- rows in the circuit table back to the objects that define
-- the circuits.

ciIfMapTable OBJECT-TYPE
    SYNTAX      SEQUENCE OF CiIfMapEntry
    MAX-ACCESS   not-accessible
    STATUS      current
    DESCRIPTION
        "The Circuit Interface Map Table."
 ::= { ciObjects 2 }

ciIfMapEntry OBJECT-TYPE
    SYNTAX      CiIfMapEntry
    MAX-ACCESS   not-accessible
    STATUS      current
    DESCRIPTION
        "An entry in the Circuit Interface Map Table."
    INDEX      { ifIndex }
 ::= { ciIfMapTable 1 }

CiIfMapEntry ::=
    SEQUENCE {
        --
        -- Mapped Object Variables
        --
        ciIfMapObject      RowPointer,
        ciIfMapFlow        CiFlowDirection
    }

ciIfMapObject OBJECT-TYPE
    SYNTAX      RowPointer

```



```
MAX-ACCESS    read-only
STATUS        current
DESCRIPTION
    "This value contains the value of RowPointer that
    corresponds to the current ifIndex."
 ::= { ciIfMapEntry 1 }

ciIfMapFlow    OBJECT-TYPE
SYNTAX        CiFlowDirection
MAX-ACCESS    read-only
STATUS        current
DESCRIPTION
    "The value contains the value of ciCircuitFlow that
    corresponds to the current ifIndex."
 ::= { ciIfMapEntry 2 }

-- Change tracking metrics

ciIfLastChange OBJECT-TYPE
SYNTAX        TimeStamp
MAX-ACCESS    read-only
STATUS        current
DESCRIPTION
    "The value of sysUpTime at the most recent change to
    ciCircuitStatus for any row in ciCircuitTable."
 ::= { ciObjects 3 }

ciIfNumActive   OBJECT-TYPE
SYNTAX        Gauge32
MAX-ACCESS    read-only
STATUS        current
DESCRIPTION
    "The number of active rows in ciCircuitTable."
 ::= { ciObjects 4 }

-- Conformance Information

ciMIBGroups      OBJECT IDENTIFIER ::= { ciConformance 1 }
ciMIBCompliances OBJECT IDENTIFIER ::= { ciConformance 2 }

--
-- Compliance Statements
--

ciCompliance MODULE-COMPLIANCE
STATUS        current
DESCRIPTION
    "The compliance statement for SNMP entities
```

which support of the Circuit Interfaces MIB module.
This group defines the minimum level of support
required for compliance."

MODULE -- this module

MANDATORY-GROUPS { ciCircuitGroup,
 ciIfMapGroup,
 ciStatsGroup }

OBJECT ciCircuitStatus

SYNTAX INTEGER { 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)."

OBJECT ciCircuitStorageType

MIN-ACCESS read-only

DESCRIPTION

"It is legal to support ciCircuitStorageType as read-
only as long as the value reported is consistent
with the actual storage mechanism employed within the
agent."

::= { ciMIBCompliances 1 }

--

-- Units of Conformance

--

ciCircuitGroup OBJECT-GROUP

OBJECTS {
 ciCircuitStatus,
 ciCircuitIfIndex,
 ciCircuitCreateTime,
 ciCircuitStorageType
}

STATUS current

DESCRIPTION

"A collection of required objects providing
information from the circuit table."

::= { ciMIBGroups 1 }

ciIfMapGroup OBJECT-GROUP

OBJECTS {
 ciIfMapObject,
 ciIfMapFlow
}

```
STATUS    current
DESCRIPTION
    "A collection of required objects providing
    information from the interface map table."
::= { ciMIBGroups 2 }
```

```
ciStatsGroup OBJECT-GROUP
    OBJECTS {
        ciIfLastChange,
        ciIfNumActive
    }
STATUS    current
DESCRIPTION
    "A collection of statistical metrics used to help manage
    the ciCircuitTable."
::= { ciMIBGroups 3 }
```

END

7. Acknowledgments

This document was produced by the Frame Relay Service MIB Working Group.

8. References

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9. 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 2274 [12] and the View-based Access Control Model RFC 2275 [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.

10. IANA Considerations

New ifTypes defined specifically for use in this MIB module SHOULD be in the form of ***EndPt. This is similar to frDlciEndPt(193) and atmVciEndPt(194) which are already defined.

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