Network Working Group
Request for Comments: 3896
Obsoletes: 2496
Category: Standards Track

O. Nicklass, Ed.
RAD Data Communications, Ltd.

September 2004

Definitions of Managed Objects for the DS3/E3 Interface Type

Status of this Memo

Copyright Notice

Abstract

This memo defines a portion of the Management Information Base (MIB) for use with network management protocols in the Internet community. In particular, it describes objects used for managing DS3 and E3 interfaces. This document is a companion to the documents that define Managed Objects for the DS0, DS1/E1/DS2/E2 and Synchronous Optical Network/Synchronous Digital Hierarchy (SONET/SDH) Interface Types. This document obsoletes RFC 2496.

Table of Contents

1. The Internet Standard Management Framework

For a detailed overview of the documents that describe the current Internet-Standard Management Framework, please refer to section 7 of RFC 3410 [RFC3410].

Managed objects are accessed via a virtual information store, termed the Management Information Base or MIB. MIB objects are generally accessed through the Simple Network Management Protocol (SNMP). Objects in the MIB are defined using the mechanisms defined in the Structure of Management Information (SMI). This memo specifies a MIB module that is compliant to the SMIv2, which is described in STD 58, RFC 2578 [RFC2578], STD 58, RFC 2579 [RFC2579] and STD 58, RFC 2580 [RFC2580].

1.1. Changes from RFC 2496

The changes from [RFC2496] are the following:

(1) The dsx3FracIfIndex SYNTAX matches the description range.

(2) Reference was added to Circuit Identifier object.

(3) Usage of ifStackTable section was updated.

(4) Align the DESCRIPTION clauses of few statistic objects with the near end definition, the far end definition and with [RFC3593].

(5) Add new value, dsx3M13, to dsx3LineType.

1.2. Changes from RFC 1407

The changes from RFC 1407 are the following:

(1) The Fractional Table has been deprecated.

(2) This document uses SMIv2.

(3) Values are given for ifTable and ifXTable.

(4) Example usage of ifStackTable is included.

(5) dsx3IfIndex has been deprecated.

(6) The definition of valid intervals has been clarified for the case where the agent proxied for other devices. In particular, the treatment of missing intervals has been clarified.

(7) An inward loopback has been added.

(8) Additional lineStatus bits have been added for Near End in Unavailable Signal State, Carrier Equipment Out of Service.

(9) A read-write line Length object has been added.

(10) Added a lineStatus last change, trap and enabler.

(11) Textual Conventions for statistics objects have been used.

(12) A new object, dsx3LoopbackStatus, has been introduced to reflect the loopbacks established on a DS3/E3 interface and the source to the requests. dsx3LoopbackConfig continues to be the desired loopback state while dsx3LoopbackStatus reflects the actual state.

(13) A dual loopback has been added to allow the setting of an inward loopback and a line loopback at the same time.

(14) An object has been added to indicated whether or not this is a channelized DS3/E3.

(15) A new object has been added to indicate which DS1 is to set for remote loopback.

1.3. Companion Documents

This document is a companion to the documents that define Managed Objects for the DS0 [RFC2494], DS1/E1/DS2/E2 [RFC3895], and Synchronous Optical Network/Synchronous Digital Hierarchy (SONET/SDH) [RFC3592] Interface Types.

2. Overview

These objects are used when the particular media being used to realize an interface is a DS3/E3 interface. At present, this applies to these values of the ifType variable in the Internet-standard MIB:

ds3 (30)

The DS3 definitions contained herein are based on the DS3 specifications in ANSI T1.102-1987 [ANSI-T1.102], ANSI T1.107-1988 [ANSI-T1.107], ANSI T1.107a-1990 [ANSI-T1.107a], and ANSI T1.404-1989 [ANSI-T1.404]. The E3 definitions contained herein are based on the E3 specifications in CCITT G.751 [CCITT-G.751] and ETSI T/NA(91)18 [ETSI-T/NA(91)18].

2.1. Use of ifTable for DS3 Layer

Only the ifGeneralInformationGroup needs to be supported.

ifTable Object	Use for DS3 Layer
ifIndex	Interface index.
ifDescr	See interfaces MIB [RFC2863]
ifType	ds3(30)
ifSpeed	Speed of line rate DS3 - 44736000 E3 - 34368000
ifPhysAddress	The value of the Circuit Identifier. If no Circuit Identifier has been assigned this object should have an octet string with zero length.
ifAdminStatus	See interfaces MIB [RFC2863]
ifOperStatus	See interfaces MIB [RFC2863]
ifLastChange	See interfaces MIB [RFC2863]

ifName	See interfaces MIB [RFC2863]
ifLinkUpDownTrapEnable	Set to enabled(1).
ifHighSpeed	Speed of line in Mega-bits per second (either 45 or 34)
ifConnectorPresent	Set to true(1) normally, except for cases such as DS3/E3 over AAL1/ATM where false(2) is appropriate

2.2. Usage Guidelines

2.2.1. Usage of ifStackTable

The object dsx3IfIndex has been deprecated. This object previously allowed a very special proxy situation to exist for Routers and CSUs. This section now describes how to use ifStackTable to represent this relationship.

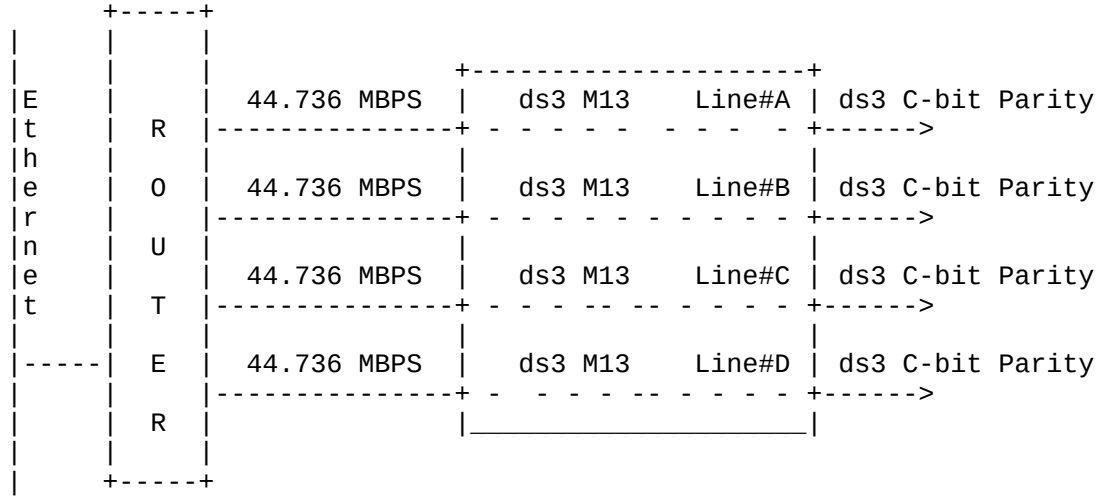
The paragraphs discussing dsx3IfIndex and dsx3LineIndex have been preserved in Appendix A for informational purposes.

The ifStackTable is used in the proxy case to represent the association between pairs of interfaces, e.g., this DS3 is attached to that DS3. This use is consistent with the use of the ifStackTable to show the association between various sub-layers of an interface. In both cases entire PDUs are exchanged between the interface pairs - in the case of a DS3, entire DS3 frames are exchanged; in the case of PPP and HDLC, entire HDLC frames are exchanged. This usage is not meant to suggest the use of the ifStackTable to represent Time Division Multiplexing (TDM) connections in general.

External&Internal interface scenario: the SNMP Agent resides on a host external from the device supporting DS3/E3 interfaces (e.g., a router). The Agent represents both the host and the DS3/E3 device.

Example:

A shelf full of CSUs connected to a Router. An SNMP Agent residing on the router proxies for itself and the CSU. The router has also an Ethernet interface:



The assignment of the index values could for example be:

ifIndex	Description
1	Ethernet
2	Line#A Router
3	Line#B Router
4	Line#C Router
5	Line#D Router
6	Line#A CSU Router
7	Line#B CSU Router
8	Line#C CSU Router
9	Line#D CSU Router
10	Line#A CSU Network
11	Line#B CSU Network
12	Line#C CSU Network
13	Line#D CSU Network

The ifStackTable is then used to show the relationships between the various DS3 interfaces.

ifStackTable Entries

HigherLayer	LowerLayer
2	6
3	7
4	8
5	9
6	10
7	11
8	12
9	13

If the CSU shelf is managed by itself by a local SNMP Agent, the situation would be identical, except the Ethernet and the 4 router interfaces are deleted. Interfaces would also be numbered from 1 to 8.

ifIndex	Description
1	Line#A CSU Router
2	Line#B CSU Router
3	Line#C CSU Router
4	Line#D CSU Router
5	Line#A CSU Network
6	Line#B CSU Network
7	Line#C CSU Network
8	Line#D CSU Network

ifStackTable Entries

HigherLayer	LowerLayer
1	5
2	6
3	7
4	8

2.2.2. Usage of Channelization for DS3, DS1, DS0

An example is given here to explain the channelization objects in the DS3, DS1, and DS0 MIBs to help the implementor use the objects correctly. Treatment of E3 and E1 would be similar, with the number of DS0s being different depending on the framing of the E1.

Assume that a DS3 (with ifIndex 1) is Channelized into DS1s (without DS2s). The object dsx3Channelization is set to enabledDs1. When this object is set to enabledDS1, 28 ifEntries of type DS1 will be created by the agent. If dsx3Channelization is set to disabled, then the DS1s are destroyed.

Assume the entries in the ifTable for the DS1s are created in channel order and the ifIndex values are 2 through 29. In the DS1 MIB, there will be an entry in the dsx1ChanMappingTable for each ds1. The entries will be as follows:

dsx1ChanMappingTable Entries

ifIndex	dsx1Ds1ChannelNumber	dsx1ChanMappedIfIndex
1	1	2
1	2	3
.....		
1	28	29

In addition, the DS1s are channelized into DS0s. The object dsx1Channelization is set to enabledDS0 for each DS1. There will be 24 DS0s in the ifTable for each DS1. Assume the entries in the ifTable are created in channel order and the ifIndex values for the DS0s in the first DS1 are 30 through 53. In the DS0 MIB [RFC2494], there will be an entry in the dsx0ChanMappingTable for each DS0. The entries will be as follows:

dsx0ChanMappingTable Entries

ifIndex	dsx0Ds0ChannelNumber	dsx0ChanMappedIfIndex
2	1	30
2	2	31
.....		
2	24	53

2.2.3. Usage of Channelization for DS3, DS2, DS1

An example is given here to explain the channelization objects in the DS3 and DS1 MIBs to help the implementor use the objects correctly.

Assume that a DS3 (with ifIndex 1) is Channelized into DS2s. The object dsx3Channelization is set to enabledDs2. There will be 7 DS2s (ifType of DS1) in the ifTable. Assume the entries in the ifTable for the DS2s are created in channel order and the ifIndex values are 2 through 8. In the DS1 MIB [RFC3895], there will be an entry in the dsx1ChanMappingTable for each DS2. The entries will be as follows:

dsx1ChanMappingTable Entries

ifIndex	dsx1Ds1ChannelNumber	dsx1ChanMappedIfIndex
1	1	2
1	2	3
.....		
1	7	8

In addition, the DS2s are channelized into DS1s. The object dsx1Channelization is set to enabledDS1 for each DS2. There will be 4 DS1s in the ifTable for each DS2. Assume the entries in the ifTable are created in channel order and the ifIndex values for the DS1s in the first DS2 are 9 through 12, then 13 through 16 for the second DS2, and so on. In the DS1 MIB, there will be an entry in the dsx1ChanMappingTable for each DS1. The entries will be as follows:

dsx1ChanMappingTable Entries

ifIndex	dsx1Ds1ChannelNumber	dsx1ChanMappedIfIndex
2	1	9
2	2	10
2	3	11
2	4	12
3	1	13
3	2	14
...		
8	4	36

2.2.4. Usage of Loopbacks

This section discusses the behaviour of objects related to loopbacks.

The object dsx3LoopbackConfig represents the desired state of loopbacks on this interface. Using this object a Manager can request:

- LineLoopback
- PayloadLoopback (if ESF framing)
- InwardLoopback
- DualLoopback (Line + Inward)
- NoLoopback

The remote end can also request lookbacks either through the FDL channel if ESF or inband if D4. The loopbacks that can be requested this way are:

- LineLoopback
- PayloadLoopback (if ESF framing)
- NoLoopback

To model the current state of loopbacks on a DS3 interface, the object dsx3LoopbackStatus defines which loopback is currently applied to an interface. This object, which is a bitmap, will have bits turned on which reflect the currently active loopbacks on the interface as well as the source of those loopbacks.

The following restrictions/rules apply to loopbacks:

The far end cannot undo loopbacks set by a manager.

A manager can undo loopbacks set by the far end.

Both a line loopback and an inward loopback can be set at the same time. Only these two loopbacks can co-exist and either one may be set by the manager or the far end. A LineLoopback request from the far end is incremental to an existing Inward loopback established by a manager. When a NoLoopback is received from the far end in this case, the InwardLoopback remains in place.

2.3. Objectives of this MIB Module

There are numerous things that could be included in a MIB for DS3/E3 signals: the management of multiplexors, CSUs, DSUs, and the like. The intent of this document is to facilitate the common management of all devices with DS3/E3 interfaces. As such, a design decision was made up front to very closely align the MIB with the set of objects that can generally be read from DS3/E3 devices that are currently deployed.

2.4. DS3/E3 Terminology

The terminology used in this document to describe error conditions on a DS3 interface as monitored by a DS3 device are based on the late but not final draft of what became the ANSI T1.231 standard [ANSI-T1.231]. If the definition in this document does not match the definition in the ANSI T1.231 document, the implementer should follow the definition described in this document.

2.4.1. Error Events

Bipolar Violation (BPV) Error Event

A bipolar violation error event, for B3ZS(HDB3)-coded signals, is the occurrence of a pulse of the same polarity as the previous pulse without being part of the zero substitution code, B3ZS(HDB3). For B3ZS(HDB3)-coded signals, a bipolar violation error event may also include other error patterns such as: three(four) or more consecutive zeros and incorrect polarity (See T1.231 section 7.1.1.1.1).

Excessive Zeros (EXZ) Error Event
An EXZ is the occurrence of any zero string length equal to or greater than 3 for B3ZS, or greater than 4 for HDB3 (See T1.231 section 7.1.1.1.2).

Line Coding Violation (LCV) Error Event
This parameter is a count of both BPVs and EXZs occurring over the accumulation period. An EXZ increments the LCV by one regardless of the length of the zero string. (Also known as CV-L. See T1.231 section 7.4.1.1.)

P-bit Coding Violation (PCV) Error Event
For all DS3 applications, a coding violation error event is a P-bit Parity Error event. A P-bit Parity Error event is the occurrence of a received P-bit code on the DS3 M-frame that is not identical to the corresponding locally-calculated code (See T1.231 section 7.1.1.2.1).

C-bit Coding Violation (CCV) Error Event
For C-bit Parity and SYNTRAN DS3 applications, this is the count of coding violations reported via the C-bits. For C-bit Parity, it is a count of CP-bit parity errors occurring in the accumulation interval. For SYNTRAN, it is a count of CRC-9 errors occurring in the accumulation interval (See T1.231 section 7.1.1.2.2).

2.4.2. Performance Parameters

All performance parameters are accumulated in fifteen minute intervals and up to 96 intervals (24 hours worth) are kept by an agent. Fewer than 96 intervals of data will be available if the agent has been restarted within the last 24 hours. In addition, there is a rolling 24-hour total of each performance parameter.

There is no requirement for an agent to ensure fixed relationship between the start of a fifteen minute interval and any wall clock; however some agents may align the fifteen minute intervals with quarter hours.

Performance parameters are of types PerfCurrentCount, PerfIntervalCount and PerfTotalCount. These textual conventions are all Gauge32, and they are used because it is possible for these objects to decrease. Objects may decrease when Unavailable Seconds occurs across a fifteen minutes interval boundary. See Unavailable Seconds discussion later in this section.

Line Errored Seconds (LES)
A Line Errored Second is a second in which one or more CV occurred OR one or more LOS defects. (Also known as ES-L. See T1.231 section 7.4.1.2.)

P-bit Errored Seconds (PES)
An PES is a second with one or more PCVs OR one or more Out of Frame defects OR a detected incoming AIS. This gauge is not incremented when UASs are counted. (Also known as ESP-P. See T1.231 section 7.4.2.2.)

P-bit Severely Errored Seconds (PSES)
A PSES is a second with 44 or more PCVs OR one or more Out of Frame defects OR a detected incoming AIS. This gauge is not incremented when UASs are counted. (Also known as SESP-P. See T1.231 section 7.4.2.5.)

C-bit Errored Seconds (CES)
An CES is a second with one or more CCVs OR one or more Out of Frame defects OR a detected incoming AIS. This count is only for the SYNTRAN and C-bit Parity DS3 applications. This gauge is not incremented when UASs are counted. (Also known as ESCP-P. See T1.231 section 7.4.2.2.)

C-bit Severely Errored Seconds (CSES)
A CSES is a second with 44 or more CCVs OR one or more Out of Frame defects OR a detected incoming AIS. This count is only for the SYNTRAN and C-bit Parity DS3 applications. This gauge is not incremented when UASs are counted. (Also known as SESCP-P. See T1.231 section 7.4.2.5.)

Severely Errored Framing Seconds (SEFS)
A SEFS is a second with one or more Out of Frame defects OR a detected incoming AIS. This item is not incremented during unavailable seconds. (Also known as SAS-P. See T1.231 section 7.4.2.6.)

Unavailable Seconds (UAS)
UAS are calculated by counting the number of seconds that the interface is unavailable. The DS3 interface is said to be unavailable from the onset of 10 contiguous PSESs, or the onset of the condition leading to a failure (see Failure States). If the condition leading to the failure was immediately preceded by one or more contiguous PSESs, then the DS3 interface unavailability starts from the onset of these PSESs. Once unavailable, and if no failure is present, the DS3 interface becomes available at the onset of 10 contiguous seconds with no PSESs. Once unavailable, and if a

failure is present, the DS3 interface becomes available at the onset of 10 contiguous seconds with no PSESs, if the failure clearing time is less than or equal to 10 seconds. If the failure clearing time is more than 10 seconds, the DS3 interface becomes available at the onset of 10 contiguous seconds with no PSESs, or the onset period leading to the successful clearing condition, whichever occurs later. With respect to the DS3 error counts, all counters are incremented while the DS3 interface is deemed available. While the interface is deemed unavailable, the only count that is incremented is UASs.

Note that this definition implies that the agent cannot determine until after a ten second interval has passed whether a given one-second interval belongs to available or unavailable time. If the agent chooses to update the various performance statistics in real time then it must be prepared to retroactively reduce the PES, PSES, CES, and CSES counts by 10 and increase the UAS count by 10 when it determines that available time has been entered. It must also be prepared to adjust the PCV, CCV, and SEFS count as necessary since these parameters are not accumulated during unavailable time. Similarly, it must be prepared to retroactively decrease the UAS count by 10 and increase the PES, CES, PCV, and CCV counts as necessary upon entering available time. A special case exists when the 10 second period leading to available or unavailable time crosses a 900 second statistics window boundary, as the foregoing description implies that the PCV, CCV, PES, CES, PSES, CSEC, SEFS, and UAS counts for the PREVIOUS interval must be adjusted. In this case successive GETs of the affected dsx3IntervalPSESs and dsx3IntervalUASs objects will return differing values if the first GET occurs during the first few seconds of the window.

The agent may instead choose to delay updates to the various statistics by 10 seconds in order to avoid retroactive adjustments to the counters. A way to do this is sketched in Appendix B.

In any case, a linkDown trap shall be sent only after the agent has determined for certain that the unavailable state has been entered, but the time on the trap will be that of the first UAS (i.e., 10 seconds earlier). A linkUp trap shall be handled similarly.

According to [ANSI-T1.231] unavailable time begins at the _onset_ of 10 contiguous severely errored seconds -- that is, unavailable time starts with the _first_ of the 10 contiguous SESs. Also, while an interface is deemed unavailable all counters for that interface are

frozen except for the UAS count. It follows that an implementation which strictly complies with this standard must _not_ increment any counters other than the UAS count -- even temporarily -- as a result of anything that happens during those 10 seconds. Since changes in the signal state lag the data to which they apply by 10 seconds, an ANSI-compliant implementation must pass the one-second statistics through a 10-second delay line prior to updating any counters. That can be done by performing the following steps at the end of each one second interval.

i) Read near/far end CV counter and alarm status flags from the hardware.

ii) Accumulate the CV counts for the preceding second and compare them to the ES and SES threshold for the layer in question. Update the signal state and shift the one-second CV counts and ES/SES flags into the 10-element delay line. Note that far-end one-second statistics are to be flagged as "absent" during any second in which there is an incoming defect at the layer in question or at any lower layer.

iii) Update the current interval statistics using the signal state from the _previous_ update cycle and the one-second CV counts and ES/SES flags shifted out of the 10-element delay line.

This approach is further described in Appendix B.

2.4.3. Performance Defects

Failure States:

The Remote Alarm Indication (RAI) failure, in SYNTRAN applications, is declared after detecting the Yellow Alarm Signal on the alarm channel. See ANSI T1.107a-1990 [ANSI-T1.107a]. The Remote Alarm Indication failure, in C-bit Parity DS3 applications, is declared as soon as the presence of either one or two alarm signals are detected on the Far End Alarm Channel. See [ANSI-T1.107]. The Remote Alarm Indication failure may also be declared after detecting the far-end SEF/AIS defect (aka yellow). The Remote Alarm Indication failure is cleared as soon as the presence of the any of the above alarms are removed.

Also, the incoming failure state is declared when a defect persists for at least 2-10 seconds. The defects are the following: Loss of Signal (LOS), an Out of Frame (OOF) or an incoming Alarm Indication Signal (AIS). The Failure State is cleared when the defect is absent for less than or equal to 20 seconds.

Far End SEF/AIS defect (aka yellow)
A Far End SEF/AIS defect is the occurrence of the two X-bits in a M-frame set to zero. The Far End SEF/AIS defect is terminated when the two X-bits in a M-frame are set to one. (Also known as SASCP-PFE. See T1.231 section 7.4.4.2.6)

Out of Frame (OOF) defect
A DS3 OOF defect is detected when any three or more errors in sixteen or fewer consecutive F-bits occur within a DS3 M-frame. An OOF defect may also be called a Severely Errored Frame (SEF) defect. An OOF defect is cleared when reframe occurs. A DS3 Loss of Frame (LOF) failure is declared when the DS3 OOF defect is consistent for 2 to 10 seconds. The DS3 OOF defect ends when reframe occurs. The DS3 LOF failure is cleared when the DS3 OOF defect is absent for 10 to 20 seconds. (See T1.231 section 7.1.2.2.1)

An E3 OOF defect is detected when four consecutive frame alignment signals have been incorrectly received in there predicted positions in an E3 signal. E3 frame alignment occurs when the presence of three consecutive frame alignment signals have been detected.

Loss of Signal (LOS) defect
The DS3 LOS defect is declared upon observing 175 +/- 75 contiguous pulse positions with no pulses of either positive or negative polarity. The DS3 LOS defect is terminated upon observing an average pulse density of at least 33% over a period of 175 +/- 75 contiguous pulse positions starting with the receipt of a pulse. (See T1.231 section 7.1.2.1.1)

Alarm Indication Signal (AIS) defect
The DS3 AIS is framed with "stuck stuffing." This implies that it has a valid M-subframe alignments bits, M-frame alignment bits, and P bits. The information bits are set to a 1010... sequence, starting with a one (1) after each M-subframe alignment bit, M-frame alignment bit, X bit, P bit, and C bit. The C bits are all set to zero giving what is called "stuck stuffing." The X bits are set to one. The DS3 AIS defect is declared after DS3 AIS is present in contiguous M-frames for a time equal to or greater than T, where 0.2 ms <= T <= 100 ms. The DS3 AIS defect is terminated after AIS is absent in contiguous M-frames for a time equal to or greater than T. (See T1.231 section 7.1.2.2.3)

The E3 binary content of the AIS is nominally a continuous stream of ones. AIS detection and the application of consequent actions, should be completed within a time limit of 1 ms.

2.4.4. Other Terms

Circuit Identifier
: This is a character string specified by the circuit vendor, and is useful when communicating with the vendor during the troubleshooting process (see M.1400 [ITU-T-M.1400] for additional information).

Proxy
: In this document, the word proxy is meant to indicate an application which receives SNMP messages and replies to them on behalf of the devices which implement the actual DS3/E3 interfaces. The proxy may have already collected the information about the DS3/E3 interfaces into its local database and may not necessarily forward the requests to the actual DS3/E3 interface. It is expected in such an application that there are periods of time where the proxy is not communicating with the DS3/E3 interfaces. In these instances the proxy will not necessarily have up-to-date configuration information and will most likely have missed the collection of some statistics data. Missed statistics data collection will result in invalid data in the interval table.

3. Object Definitions

```
DS3-MIB DEFINITIONS ::= BEGIN

IMPORTS
     MODULE-IDENTITY, OBJECT-TYPE,
     NOTIFICATION-TYPE, transmission
          FROM SNMPv2-SMI                    -- [RFC2578]
     DisplayString, TimeStamp, TruthValue
          FROM SNMPv2-TC                     -- [RFC2579]
     MODULE-COMPLIANCE, OBJECT-GROUP,
     NOTIFICATION-GROUP
          FROM SNMPv2-CONF                   -- [RFC2580]
     InterfaceIndex
          FROM IF-MIB                        -- [RFC2863]
     PerfCurrentCount, PerfIntervalCount,
     PerfTotalCount
          FROM PerfHist-TC-MIB;              -- [RFC3593]
```

```
   ds3 MODULE-IDENTITY
       LAST-UPDATED "200409080000Z"  -- September 08, 2004
       ORGANIZATION "IETF AToM MIB Working Group"
       CONTACT-INFO
         "WG charter:
            http://www.ietf.org/html.charters/atommib-charter.html

          Mailing Lists:
            General Discussion: atommib@research.telcordia.com
            To Subscribe: atommib-request@research.telcordia.com

          Editor: Orly Nicklass

          Postal: RAD Data Communications, Ltd.
                  Ziv Tower, 24 Roul Walenberg
                  Tel Aviv, Israel, 69719

                  Tel: +9723 765 9969
          E-mail: orly_n@rad.com"

       DESCRIPTION
            "The is the MIB module that describes
             DS3 and E3 interfaces objects.

             Copyright (c) The Internet Society (2004).  This
             version of this MIB module is part of RFC 3896;
             see the RFC itself for full legal notices."

       REVISION "200409080000Z"  -- September 08, 2004

        DESCRIPTION
             "The RFC 3896 version of this MIB module.
             The key changes made to this MIB module
             since its publication in RFC 2496 are as follows:

         (1) The dsx3FracIfIndex SYNTAX matches the description range.

         (2) Reference was added to Circuit Identifier object.

         (3) Usage of ifStackTable section was updated.

         (4) Align the DESCRIPTION clauses of few statistic objects with
             thenear end definition, the far end definition and with
             RFC 3593.

         (5) Add new value, dsx3M13, to dsx3LineType."

        REVISION "199808012130Z"
```

```
        DESCRIPTION
             "The RFC 2496 version of this MIB module.
             The key changes made to this MIB module
             since its publication in RFC 1407 are as follows:

            (1)  The Fractional Table has been deprecated.

            (2)  This document uses SMIv2.

            (3)  Values are given for ifTable and ifXTable.

            (4)  Example usage of ifStackTable is included.

            (5)  dsx3IfIndex has been deprecated.

            (6)  The definition of valid intervals has been clarified
                 for the case where the agent proxied for other devices.
                 In particular, the treatment of missing intervals has
                 been clarified.

           (7)  An inward loopback has been added.

           (8)  Additional lineStatus bits have been added for Near End
                in Unavailable Signal State, Carrier Equipment Out of
                Service.

           (9)  A read-write line Length object has been added.

           (10) Added a lineStatus last change, trap and enabler.

           (11) Textual Conventions for statistics objects have
                been used.

           (12) A new object, dsx3LoopbackStatus, has been introduced to
                reflect the loopbacks established on a DS3/E3 interface
                and the source to the requests.  dsx3LoopbackConfig
                continues to be the desired loopback state while
                dsx3LoopbackStatus reflects the actual state.

           (13) A dual loopback has been added to allow the setting of
                an inward loopback and a line loopback at the same time.

           (14) An object has been added to indicated whether or not
                this is a channelized DS3/E3.

           (15) A new object has been added to indicate which DS1 is to
                set for remote loopback."
```

```
       REVISION "199301252028Z"
       DESCRIPTION
            "Initial version, published as RFC 1407."
       ::= { transmission 30 }

   -- The DS3/E3 Near End Group

   -- The DS3/E3 Near End Group consists of four tables:
   --    DS3/E3 Configuration
   --    DS3/E3 Current
   --    DS3/E3 Interval
   --    DS3/E3 Total

   -- the DS3/E3 Configuration Table

   dsx3ConfigTable OBJECT-TYPE
        SYNTAX  SEQUENCE OF Dsx3ConfigEntry
        MAX-ACCESS  not-accessible
        STATUS  current
        DESCRIPTION
               "The DS3/E3 Configuration table."
        ::= { ds3 5 }

   dsx3ConfigEntry OBJECT-TYPE
        SYNTAX  Dsx3ConfigEntry
        MAX-ACCESS  not-accessible
        STATUS  current
        DESCRIPTION
               "An entry in the DS3/E3 Configuration table."
        INDEX   { dsx3LineIndex }
        ::= { dsx3ConfigTable 1 }

   Dsx3ConfigEntry ::=
        SEQUENCE {
            dsx3LineIndex                       InterfaceIndex,
            dsx3IfIndex                         InterfaceIndex,
            dsx3TimeElapsed                     INTEGER,
            dsx3ValidIntervals                  INTEGER,
            dsx3LineType                        INTEGER,
            dsx3LineCoding                      INTEGER,
            dsx3SendCode                        INTEGER,
            dsx3CircuitIdentifier               DisplayString,
            dsx3LoopbackConfig                  INTEGER,
            dsx3LineStatus                      INTEGER,
            dsx3TransmitClockSource             INTEGER,
            dsx3InvalidIntervals                INTEGER,
            dsx3LineLength                      INTEGER,
            dsx3LineStatusLastChange            TimeStamp,
```

```
            dsx3LineStatusChangeTrapEnable       INTEGER,
            dsx3LoopbackStatus                   INTEGER,
            dsx3Channelization                   INTEGER,
            dsx3Ds1ForRemoteLoop                 INTEGER

   }

   dsx3LineIndex OBJECT-TYPE
        SYNTAX  InterfaceIndex
        MAX-ACCESS  read-only  -- read-only since originally an
                               -- SMIv1 index

        STATUS  current
        DESCRIPTION
               "This object should be made equal to ifIndex.  The
               next paragraph describes its previous usage.
               Making the object equal to ifIndex allows proper
               use of ifStackTable.

               Previously, this object was the identifier of a
               DS3/E3 Interface on a managed device.  If there is
               an ifEntry that is directly associated with this
               and only this DS3/E3 interface, it should have the
               same value as ifIndex.  Otherwise, number the
               dsx3LineIndices with an unique identifier
               following the rules of choosing a number that is
               greater than ifNumber and numbering the inside
               interfaces (e.g., equipment side) with even
               numbers and outside interfaces (e.g., network side)
               with odd numbers."
        ::= { dsx3ConfigEntry 1 }

   dsx3IfIndex OBJECT-TYPE
        SYNTAX  InterfaceIndex
        MAX-ACCESS  read-only
        STATUS  deprecated
        DESCRIPTION
               "This value for this object is equal to the value
               of ifIndex from the Interfaces table of MIB II
               (RFC 1213)."
        ::= { dsx3ConfigEntry 2 }

   dsx3TimeElapsed OBJECT-TYPE
        SYNTAX  INTEGER (0..899)
        MAX-ACCESS  read-only
        STATUS  current
        DESCRIPTION
               "The number of seconds that have elapsed since the
```

```
                beginning of the near end current error-
                measurement period. If, for some reason, such as
                an adjustment in the system's time-of-day clock,
                the current interval exceeds the maximum value,
                the agent will return the maximum value."
        ::= { dsx3ConfigEntry 3 }

    dsx3ValidIntervals OBJECT-TYPE
        SYNTAX  INTEGER (0..96)
        MAX-ACCESS  read-only
        STATUS  current
        DESCRIPTION
                "The number of previous near end intervals for
                which data was collected.  The value will be 96
                unless the interface was brought online within the
                last 24 hours, in which case the value will be the
                number of complete 15 minute near end intervals
                since the interface has been online.  In the case
                where the agent is a proxy, it is possible that
                some intervals are unavailable.  In this case,
                this interval is the maximum interval number for
                which data is available."
        ::= { dsx3ConfigEntry 4 }

    dsx3LineType OBJECT-TYPE
        SYNTAX  INTEGER {
                    dsx3other(1),
                    dsx3M23(2),
                    dsx3SYNTRAN(3),
                    dsx3CbitParity(4),
                    dsx3ClearChannel(5),
                    e3other(6),
                    e3Framed(7),
                    e3Plcp(8),
                    dsx3M13(9)
                }
        MAX-ACCESS  read-write
        STATUS  current
        DESCRIPTION
                "This variable indicates the variety of DS3 C-bit
                or E3 application implementing this interface. The
                type of interface affects the interpretation of
                the usage and error statistics.  The rate of DS3
                is 44.736 Mbps and E3 is 34.368 Mbps.  The
                dsx3ClearChannel value means that the C-bits are
                not used except for sending/receiving AIS.  The
                values, in sequence, describe:
```

```
                              TITLE:          SPECIFICATION:
                              dsx3M23         ANSI T1.107-1988
                              dsx3SYNTRAN     ANSI T1.107-1988
                              dsx3CbitParity  ANSI T1.107a-1990
                              dsx3ClearChannel ANSI T1.102-1987
                              e3Framed        CCITT G.751
                              e3Plcp          ETSI T/NA(91)18
                              dsx3M13         ANSI T1.107a-1990."

       REFERENCE
               "American National Standard for telecommunications
                    - digital hierarchy -
                    formats specification, ANSI T1.107- 1988.
                    ANSI T1.107a-1990.
                American National Standard for telecommunications
                    - digital hierarchy -
                    electrical interfaces, ANSI T1.102- 1987.
                CCITT - Digital Multiplex Equipment Operating at
                    the Third Order Bit Rate of 34 368 Kbit/s and
                    the Forth Order Bit Rate of 139 264 Kbit/s
                    and Using Positive Justification, G.751
                European Telecommunications Standards Institute
                    -- ETS '34M' --
                    Metropolitan Area Network Physical
                    Convergence Layer Procedure for
                    34.368 Megabits per Second, T/NA(91)18,
                    May 1991."
        ::= { dsx3ConfigEntry 5 }

   dsx3LineCoding OBJECT-TYPE
        SYNTAX  INTEGER {
                   dsx3Other(1),
                   dsx3B3ZS(2),
                   e3HDB3(3)
                }
        MAX-ACCESS  read-write
        STATUS  current
        DESCRIPTION
               "This variable describes the variety of Zero Code
               Suppression used on this interface, which in turn
               affects a number of its characteristics.
               dsx3B3ZS and e3HDB3 refer to the use of specified
               patterns of normal bits and bipolar violations
               which are used to replace sequences of zero bits
               of a specified length."
        ::= { dsx3ConfigEntry 6 }

   dsx3SendCode OBJECT-TYPE
```

```
        SYNTAX  INTEGER {
                  dsx3SendNoCode(1),
                  dsx3SendLineCode(2),
                  dsx3SendPayloadCode(3),
                  dsx3SendResetCode(4),
                  dsx3SendDS1LoopCode(5),
                  dsx3SendTestPattern(6)
                  }
        MAX-ACCESS  read-write
        STATUS  current
        DESCRIPTION
                "This variable indicates what type of code is
                being sent across the DS3/E3 interface by the
                device.  (These are optional for E3 interfaces.)
                Setting this variable causes the interface to
                begin sending the code requested.
                The values mean:

                   dsx3SendNoCode
                       sending looped or normal data

                   dsx3SendLineCode
                       sending a request for a line loopback

                   dsx3SendPayloadCode
                       sending a request for a payload loopback
                       (i.e., all DS1/E1s in a DS3/E3 frame)

                   dsx3SendResetCode
                       sending a loopback deactivation request

                   dsx3SendDS1LoopCode
                       requesting to loopback a particular DS1/E1
                       within a DS3/E3 frame.  The DS1/E1 is
                       indicated in dsx3Ds1ForRemoteLoop.

                   dsx3SendTestPattern
                       sending a test pattern."
        ::= { dsx3ConfigEntry 7 }

    dsx3CircuitIdentifier OBJECT-TYPE
        SYNTAX  DisplayString (SIZE (0..255))
        MAX-ACCESS  read-write
        STATUS  current
        DESCRIPTION
                "This variable contains the transmission vendor's
                circuit identifier, for the purpose of
                facilitating troubleshooting."
```

```
        REFERENCE "ITU-T M.1400"
        ::= { dsx3ConfigEntry 8 }

   dsx3LoopbackConfig OBJECT-TYPE
        SYNTAX  INTEGER {
                    dsx3NoLoop(1),
                    dsx3PayloadLoop(2),
                    dsx3LineLoop(3),
                    dsx3OtherLoop(4),
                    dsx3InwardLoop(5),
                    dsx3DualLoop(6)
                  }
        MAX-ACCESS  read-write
        STATUS  current
        DESCRIPTION
             "This variable represents the desired loopback
             configuration of the DS3/E3 interface.
             The values mean:

             dsx3NoLoop
               Not in the loopback state.  A device that is
               not capable of performing a loopback on
               the interface shall always return this as
               its value.

             dsx3PayloadLoop
               The received signal at this interface is looped
               through the device.  Typically the received signal
               is looped back for retransmission after it has
               passed through the device's framing function.

             dsx3LineLoop
               The received signal at this interface does not
               go through the device (minimum penetration) but
               is looped back out.

             dsx3OtherLoop
               Loopbacks that are not defined here.

             dsx3InwardLoop
               The sent signal at this interface is looped back
               through the device.

             dsx3DualLoop
               Both dsx1LineLoop and dsx1InwardLoop will be
               active simultaneously."
        ::= { dsx3ConfigEntry 9 }
```

```
   dsx3LineStatus OBJECT-TYPE
        SYNTAX  INTEGER (1..4095)
        MAX-ACCESS  read-only
        STATUS  current
        DESCRIPTION
               "This variable indicates the Line Status of the
               interface.  It contains loopback state information
               and failure state information.  The dsx3LineStatus
               is a bit map represented as a sum, therefore, it
               can represent multiple failures and a loopback
               (see dsx3LoopbackConfig object for the type of
               loopback) simultaneously.  The dsx3NoAlarm must be
               set if and only if no other flag is set.

               If the dsx3loopbackState bit is set, the loopback
               in effect can be determined from the
               dsx3loopbackConfig object.
          The various bit positions are:
            1     dsx3NoAlarm         No alarm present
            2     dsx3RcvRAIFailure   Receiving Yellow/Remote
                                      Alarm Indication
            4     dsx3XmitRAIAlarm    Transmitting Yellow/Remote
                                      Alarm Indication
            8     dsx3RcvAIS          Receiving AIS failure state
           16     dsx3XmitAIS         Transmitting AIS
           32     dsx3LOF             Receiving LOF failure state
           64     dsx3LOS             Receiving LOS failure state
          128     dsx3LoopbackState   Looping the received signal
          256     dsx3RcvTestCode     Receiving a Test Pattern
          512     dsx3OtherFailure    any line status not defined
                                      here
         1024     dsx3UnavailSigState Near End in Unavailable
                                      Signal State
         2048     dsx3NetEquipOOS     Carrier Equipment Out of
                                      Service"
        ::= { dsx3ConfigEntry 10 }

   dsx3TransmitClockSource OBJECT-TYPE
        SYNTAX  INTEGER {
                   loopTiming(1),
                   localTiming(2),
                   throughTiming(3)
               }
        MAX-ACCESS  read-write
        STATUS  current
        DESCRIPTION
               "The source of Transmit Clock.
```

```
                loopTiming indicates that the recovered receive
                clock is used as the transmit clock.

                localTiming indicates that a local clock source is
                used or that an external clock is attached to the
                box containing the interface.

                throughTiming indicates that transmit clock is
                derived from the recovered receive clock of
                another DS3 interface."
        ::= { dsx3ConfigEntry 11 }

    dsx3InvalidIntervals OBJECT-TYPE
        SYNTAX  INTEGER (0..96)
        MAX-ACCESS  read-only
        STATUS  current
        DESCRIPTION
                " The number of intervals in the range from 0 to
                dsx3ValidIntervals for which no data is available.
                This object will typically be zero except in cases
                where the data for some intervals are not
                available (e.g., in proxy situations)."
        ::= { dsx3ConfigEntry 12 }

    dsx3LineLength OBJECT-TYPE
        SYNTAX  INTEGER (0..64000)
        UNITS "meters"
        MAX-ACCESS  read-write
        STATUS  current
        DESCRIPTION
                "The length of the ds3 line in meters.  This
                object provides information for line build out
                circuitry if it exists and can use this object to
                adjust the line build out."
        ::= { dsx3ConfigEntry 13 }

    dsx3LineStatusLastChange OBJECT-TYPE
        SYNTAX  TimeStamp
        MAX-ACCESS  read-only
        STATUS  current
        DESCRIPTION
                "The value of MIB II's sysUpTime object at the
                time this DS3/E3 entered its current line status
                state.  If the current state was entered prior to
                the last re-initialization of the proxy-agent,
                then this object contains a zero value."
        ::= { dsx3ConfigEntry 14 }
```

```
   dsx3LineStatusChangeTrapEnable  OBJECT-TYPE
        SYNTAX      INTEGER {
                       enabled(1),
                       disabled(2)
                    }
        MAX-ACCESS  read-write
        STATUS      current
        DESCRIPTION
               "Indicates whether dsx3LineStatusChange traps
               should be generated for this interface."
        DEFVAL { disabled }
        ::= { dsx3ConfigEntry 15 }

   dsx3LoopbackStatus  OBJECT-TYPE
        SYNTAX      INTEGER (1..127)
        MAX-ACCESS  read-only
        STATUS      current
        DESCRIPTION
               "This variable represents the current state of the
               loopback on the DS3 interface.  It contains
               information about loopbacks established by a
               manager and remotely from the far end.

               The dsx3LoopbackStatus is a bit map represented as
               a sum, therefore is can represent multiple
               loopbacks simultaneously.

               The various bit positions are:
                1  dsx3NoLoopback
                2  dsx3NearEndPayloadLoopback
                4  dsx3NearEndLineLoopback
                8  dsx3NearEndOtherLoopback
               16  dsx3NearEndInwardLoopback
               32  dsx3FarEndPayloadLoopback
               64  dsx3FarEndLineLoopback"
        ::= { dsx3ConfigEntry 16 }

   dsx3Channelization  OBJECT-TYPE
        SYNTAX      INTEGER {
                       disabled(1),
                       enabledDs1(2),
                       enabledDs2(3)
                    }
        MAX-ACCESS  read-write
        STATUS      current
        DESCRIPTION
               "Indicates whether this ds3/e3 is channelized or
               unchannelized.  The value of enabledDs1 indicates
```

```
               that this is a DS3 channelized into DS1s.  The
               value of enabledDs3 indicated that this is a DS3
               channelized into DS2s.  Setting this object will
               cause the creation or deletion of DS2 or DS1
               entries in the ifTable.  "
          ::= { dsx3ConfigEntry 17 }

     dsx3Ds1ForRemoteLoop  OBJECT-TYPE
          SYNTAX      INTEGER (0..29)
          MAX-ACCESS  read-write
          STATUS      current
          DESCRIPTION
                 "Indicates which DS1/E1 on this DS3/E3 will be
                 indicated in the remote ds1 loopback request.  A
                 value of 0 means no DS1 will be looped.  A value
                 of 29 means all DS1s/E1s will be looped."
          ::= { dsx3ConfigEntry 18 }

     -- the DS3/E3 Current Table


     dsx3CurrentTable OBJECT-TYPE
          SYNTAX  SEQUENCE OF Dsx3CurrentEntry
          MAX-ACCESS  not-accessible
          STATUS  current
          DESCRIPTION
                 "The DS3/E3 current table contains various
                 statistics being collected for the current 15
                 minute interval."
          ::= { ds3 6 }

     dsx3CurrentEntry OBJECT-TYPE
          SYNTAX  Dsx3CurrentEntry
          MAX-ACCESS  not-accessible
          STATUS  current
          DESCRIPTION
                 "An entry in the DS3/E3 Current table."
          INDEX   { dsx3CurrentIndex }
          ::= { dsx3CurrentTable 1 }

     Dsx3CurrentEntry ::=
          SEQUENCE {
              dsx3CurrentIndex           InterfaceIndex,
              dsx3CurrentPESs            PerfCurrentCount,
              dsx3CurrentPSESs           PerfCurrentCount,
              dsx3CurrentSEFSs           PerfCurrentCount,
              dsx3CurrentUASs            PerfCurrentCount,
              dsx3CurrentLCVs            PerfCurrentCount,
```

```
            dsx3CurrentPCVs            PerfCurrentCount,
            dsx3CurrentLESs            PerfCurrentCount,
            dsx3CurrentCCVs            PerfCurrentCount,
            dsx3CurrentCESs            PerfCurrentCount,
            dsx3CurrentCSESs           PerfCurrentCount
        }

    dsx3CurrentIndex OBJECT-TYPE
         SYNTAX  InterfaceIndex
         MAX-ACCESS  read-only  -- read-only since originally an
                                -- SMIv1 index
         STATUS  current
         DESCRIPTION
                "The index value which uniquely identifies the
                DS3/E3 interface to which this entry is
                applicable.  The interface identified by a
                particular value of this index is the same
                interface as identified by the same value an
                dsx3LineIndex object instance."
         ::= { dsx3CurrentEntry 1 }

    dsx3CurrentPESs OBJECT-TYPE
         SYNTAX  PerfCurrentCount
         MAX-ACCESS  read-only
         STATUS  current
         DESCRIPTION
                "The counter associated with the number of P-bit
                Errored Seconds."
         ::= { dsx3CurrentEntry 2 }

    dsx3CurrentPSESs OBJECT-TYPE
         SYNTAX  PerfCurrentCount
         MAX-ACCESS  read-only
         STATUS  current
         DESCRIPTION
                "The counter associated with the number of P-bit
                Severely Errored Seconds."
         ::= { dsx3CurrentEntry 3 }

    dsx3CurrentSEFSs OBJECT-TYPE
         SYNTAX  PerfCurrentCount
         MAX-ACCESS  read-only
         STATUS  current
         DESCRIPTION
                "The counter associated with the number of
                Severely Errored Framing Seconds."
         ::= { dsx3CurrentEntry 4 }
```

```
   dsx3CurrentUASs OBJECT-TYPE
        SYNTAX  PerfCurrentCount
        MAX-ACCESS  read-only
        STATUS  current
        DESCRIPTION
               "The counter associated with the number of
               Unavailable Seconds."
        ::= { dsx3CurrentEntry 5 }

   dsx3CurrentLCVs OBJECT-TYPE
        SYNTAX  PerfCurrentCount
        MAX-ACCESS  read-only
        STATUS  current
        DESCRIPTION
               "The counter associated with the number of Line
               Coding Violations."
        ::= { dsx3CurrentEntry 6 }

   dsx3CurrentPCVs OBJECT-TYPE
        SYNTAX  PerfCurrentCount
        MAX-ACCESS  read-only
        STATUS  current
        DESCRIPTION
               "The counter associated with the number of P-bit
               Coding Violations."
        ::= { dsx3CurrentEntry 7 }

   dsx3CurrentLESs OBJECT-TYPE
        SYNTAX  PerfCurrentCount
        MAX-ACCESS  read-only
        STATUS  current
        DESCRIPTION
               "The number of Line Errored Seconds."
        ::= { dsx3CurrentEntry 8 }

   dsx3CurrentCCVs OBJECT-TYPE
        SYNTAX  PerfCurrentCount
        MAX-ACCESS  read-only
        STATUS  current
        DESCRIPTION
               "The number of C-bit Coding Violations."
        ::= { dsx3CurrentEntry 9 }

   dsx3CurrentCESs OBJECT-TYPE
        SYNTAX  PerfCurrentCount
        MAX-ACCESS  read-only
        STATUS  current
        DESCRIPTION
```

```
                "The number of C-bit Errored Seconds."
        ::= { dsx3CurrentEntry 10 }

    dsx3CurrentCSESs OBJECT-TYPE
        SYNTAX  PerfCurrentCount
        MAX-ACCESS  read-only
        STATUS  current
        DESCRIPTION
                "The number of C-bit Severely Errored Seconds."
        ::= { dsx3CurrentEntry 11 }

    -- the DS3/E3 Interval Table

    dsx3IntervalTable OBJECT-TYPE
        SYNTAX  SEQUENCE OF Dsx3IntervalEntry
        MAX-ACCESS  not-accessible
        STATUS  current
        DESCRIPTION
                "The DS3/E3 Interval Table contains various
                statistics collected by each DS3/E3 Interface over
                the previous 24 hours of operation.  The past 24
                hours are broken into 96 completed 15 minute
                intervals.  Each row in this table represents one
                such interval (identified by dsx3IntervalNumber)
                and for one specific interface (identified by
                dsx3IntervalIndex)."
        ::= { ds3 7 }

    dsx3IntervalEntry OBJECT-TYPE
        SYNTAX  Dsx3IntervalEntry
        MAX-ACCESS  not-accessible
        STATUS  current
        DESCRIPTION
                "An entry in the DS3/E3 Interval table."
        INDEX   { dsx3IntervalIndex, dsx3IntervalNumber }
        ::= { dsx3IntervalTable 1 }

    Dsx3IntervalEntry ::=
        SEQUENCE {
            dsx3IntervalIndex           InterfaceIndex,
            dsx3IntervalNumber          INTEGER,
            dsx3IntervalPESs            PerfIntervalCount,
            dsx3IntervalPSESs           PerfIntervalCount,
            dsx3IntervalSEFSs           PerfIntervalCount,
            dsx3IntervalUASs            PerfIntervalCount,
            dsx3IntervalLCVs            PerfIntervalCount,
            dsx3IntervalPCVs            PerfIntervalCount,
            dsx3IntervalLESs            PerfIntervalCount,
```

```
            dsx3IntervalCCVs            PerfIntervalCount,
            dsx3IntervalCESs            PerfIntervalCount,
            dsx3IntervalCSESs           PerfIntervalCount,
            dsx3IntervalValidData       TruthValue
        }

    dsx3IntervalIndex OBJECT-TYPE
        SYNTAX  InterfaceIndex
        MAX-ACCESS  read-only  -- read-only since originally an
                               -- SMIv1 index
        STATUS  current
        DESCRIPTION
                "The index value which uniquely identifies the
                DS3/E3 interface to which this entry is
                applicable.  The interface identified by a
                particular value of this index is the same
                interface as identified by the same value an
                dsx3LineIndex object instance."
        ::= { dsx3IntervalEntry 1 }

    dsx3IntervalNumber OBJECT-TYPE
        SYNTAX  INTEGER (1..96)
        MAX-ACCESS  read-only  -- read-only since originally an
                               -- SMIv1 index
        STATUS  current
        DESCRIPTION
                "A number between 1 and 96, where 1 is the most
                recently completed 15 minute interval and 96 is
                the 15 minutes interval completed 23 hours and 45
                minutes prior to interval 1."
        ::= { dsx3IntervalEntry 2 }

    dsx3IntervalPESs OBJECT-TYPE
        SYNTAX  PerfIntervalCount
        MAX-ACCESS  read-only
        STATUS  current
        DESCRIPTION
                "The counter associated with the number of P-bit
                Errored Seconds."
        ::= { dsx3IntervalEntry 3 }

    dsx3IntervalPSESs OBJECT-TYPE
        SYNTAX  PerfIntervalCount
        MAX-ACCESS  read-only
        STATUS  current
        DESCRIPTION
                "The counter associated with the number of P-bit
                Severely Errored Seconds."
```

```
        ::= { dsx3IntervalEntry 4 }

   dsx3IntervalSEFSs OBJECT-TYPE
        SYNTAX  PerfIntervalCount
        MAX-ACCESS  read-only
        STATUS  current
        DESCRIPTION
               "The counter associated with the number of
               Severely Errored Framing Seconds."
        ::= { dsx3IntervalEntry 5 }

   dsx3IntervalUASs OBJECT-TYPE
        SYNTAX  PerfIntervalCount
        MAX-ACCESS  read-only
        STATUS  current
        DESCRIPTION
               "The counter associated with the number of
               Unavailable Seconds.  This object may decrease if
               the occurrence of unavailable seconds occurs across
               an interval boundary."
        ::= { dsx3IntervalEntry 6 }

   dsx3IntervalLCVs OBJECT-TYPE
        SYNTAX  PerfIntervalCount
        MAX-ACCESS  read-only
        STATUS  current
        DESCRIPTION
               "The counter associated with the number of Line
               Coding Violations."
        ::= { dsx3IntervalEntry 7 }

   dsx3IntervalPCVs OBJECT-TYPE
        SYNTAX  PerfIntervalCount
        MAX-ACCESS  read-only
        STATUS  current
        DESCRIPTION
               "The counter associated with the number of P-bit
               Coding Violations."
        ::= { dsx3IntervalEntry 8 }

   dsx3IntervalLESs OBJECT-TYPE
        SYNTAX  PerfIntervalCount
        MAX-ACCESS  read-only
        STATUS  current
        DESCRIPTION
               "The number of Line Errored  Seconds  (BPVs  or
               illegal  zero  sequences)."
        ::= { dsx3IntervalEntry 9 }
```

```
    dsx3IntervalCCVs OBJECT-TYPE
         SYNTAX  PerfIntervalCount
         MAX-ACCESS  read-only
         STATUS  current
         DESCRIPTION
                "The number of C-bit Coding Violations."
         ::= { dsx3IntervalEntry 10 }

    dsx3IntervalCESs OBJECT-TYPE
         SYNTAX  PerfIntervalCount
         MAX-ACCESS  read-only
         STATUS  current
         DESCRIPTION
                "The number of C-bit Errored Seconds."
         ::= { dsx3IntervalEntry 11 }

    dsx3IntervalCSESs OBJECT-TYPE
         SYNTAX  PerfIntervalCount
         MAX-ACCESS  read-only
         STATUS  current
         DESCRIPTION
                "The number of C-bit Severely Errored Seconds."
         ::= { dsx3IntervalEntry 12 }

    dsx3IntervalValidData OBJECT-TYPE
         SYNTAX  TruthValue
         MAX-ACCESS read-only
         STATUS current
         DESCRIPTION
                " This variable indicates if the data for this
                interval is valid."
         ::= { dsx3IntervalEntry 13 }

   -- the DS3/E3 Total

   dsx3TotalTable OBJECT-TYPE
        SYNTAX  SEQUENCE OF Dsx3TotalEntry
        MAX-ACCESS  not-accessible
        STATUS  current
        DESCRIPTION
               "The DS3/E3 Total Table contains the cumulative
               sum of the various statistics for the 24 hour
               period preceding the current interval."
        ::= { ds3 8 }

   dsx3TotalEntry OBJECT-TYPE
        SYNTAX  Dsx3TotalEntry
        MAX-ACCESS  not-accessible
```

```
        STATUS  current
        DESCRIPTION
                "An entry in the DS3/E3 Total table."
            INDEX   { dsx3TotalIndex }
        ::= { dsx3TotalTable 1 }

    Dsx3TotalEntry ::=
        SEQUENCE {
            dsx3TotalIndex      InterfaceIndex,
            dsx3TotalPESs       PerfTotalCount,
            dsx3TotalPSESs      PerfTotalCount,
            dsx3TotalSEFSs      PerfTotalCount,
            dsx3TotalUASs       PerfTotalCount,
            dsx3TotalLCVs       PerfTotalCount,
            dsx3TotalPCVs       PerfTotalCount,
            dsx3TotalLESs       PerfTotalCount,
            dsx3TotalCCVs       PerfTotalCount,
            dsx3TotalCESs       PerfTotalCount,
            dsx3TotalCSESs      PerfTotalCount
        }

    dsx3TotalIndex OBJECT-TYPE
        SYNTAX  InterfaceIndex
        MAX-ACCESS  read-only  -- read-only since originally an
                               -- SMIv1 index
        STATUS  current
        DESCRIPTION
                "The index value which uniquely identifies the
                DS3/E3 interface to which this entry is
                applicable.  The interface identified by a
                particular value of this index is the same
                interface as identified by the same value an
                dsx3LineIndex object instance."
        ::= { dsx3TotalEntry 1 }

    dsx3TotalPESs OBJECT-TYPE
        SYNTAX  PerfTotalCount
        MAX-ACCESS  read-only
        STATUS  current
        DESCRIPTION
                "The counter associated with the number of P-bit
                Errored Seconds, encountered by a DS3 interface in
                the previous 24 hour interval. Invalid 15 minute
                intervals count as 0."
        ::= { dsx3TotalEntry 2 }

    dsx3TotalPSESs OBJECT-TYPE
        SYNTAX  PerfTotalCount
```

```
        MAX-ACCESS  read-only
        STATUS  current
        DESCRIPTION
                "The counter associated with the number of P-bit
                Severely Errored Seconds, encountered by a DS3
                interface in the previous 24 hour interval.
                Invalid 15 minute intervals count as 0."
        ::= { dsx3TotalEntry 3 }

    dsx3TotalSEFSs OBJECT-TYPE
        SYNTAX  PerfTotalCount
        MAX-ACCESS  read-only
        STATUS  current
        DESCRIPTION
                "The counter associated with the number of
                Severely Errored Framing Seconds, encountered by a
                DS3/E3 interface in the previous 24 hour interval.
                Invalid 15 minute intervals count as 0."
        ::= { dsx3TotalEntry 4 }

    dsx3TotalUASs OBJECT-TYPE
        SYNTAX  PerfTotalCount
        MAX-ACCESS  read-only
        STATUS  current
        DESCRIPTION
                "The counter associated with the number of
                Unavailable Seconds, encountered by a DS3
                interface in the previous 24 hour interval.
                Invalid 15 minute intervals count as 0."
        ::= { dsx3TotalEntry 5 }

    dsx3TotalLCVs OBJECT-TYPE
        SYNTAX  PerfTotalCount
        MAX-ACCESS  read-only
        STATUS  current
        DESCRIPTION
                "The counter associated with the number of Line
                Coding Violations encountered by a DS3/E3
                interface in the previous 24 hour interval.
                Invalid 15 minute intervals count as 0."
        ::= { dsx3TotalEntry 6 }

    dsx3TotalPCVs OBJECT-TYPE
        SYNTAX  PerfTotalCount
        MAX-ACCESS  read-only
        STATUS  current
        DESCRIPTION
                "The counter associated with the number of P-bit
```

```
                Coding Violations, encountered by a DS3 interface
                in the previous 24 hour interval. Invalid 15
                minute intervals count as 0."
        ::= { dsx3TotalEntry 7 }

    dsx3TotalLESs OBJECT-TYPE
        SYNTAX  PerfTotalCount
        MAX-ACCESS  read-only
        STATUS  current
        DESCRIPTION
                "The number of Line Errored  Seconds  (BPVs  or
                illegal  zero  sequences) encountered by a DS3/E3
                interface in the previous 24 hour interval.
                Invalid 15 minute intervals count as 0."
        ::= { dsx3TotalEntry 8 }

    dsx3TotalCCVs OBJECT-TYPE
        SYNTAX  PerfTotalCount
        MAX-ACCESS  read-only
        STATUS  current
        DESCRIPTION
                "The number of C-bit Coding Violations encountered
                by a DS3 interface in the previous 24 hour
                interval. Invalid 15 minute intervals count as 0."
        ::= { dsx3TotalEntry 9 }

    dsx3TotalCESs OBJECT-TYPE
        SYNTAX  PerfTotalCount
        MAX-ACCESS  read-only
        STATUS  current
        DESCRIPTION
                "The number of C-bit Errored Seconds encountered
                by a DS3 interface in the previous 24 hour
                interval. Invalid 15 minute intervals count as 0."
        ::= { dsx3TotalEntry 10 }

    dsx3TotalCSESs OBJECT-TYPE
        SYNTAX  PerfTotalCount
        MAX-ACCESS  read-only
        STATUS  current
        DESCRIPTION
                "The number of C-bit Severely Errored Seconds
                encountered by a DS3 interface in the previous 24
                hour interval. Invalid 15 minute intervals count
                as 0."
        ::= { dsx3TotalEntry 11 }
```

```
   -- The DS3 Far End Group

   -- The DS3 Far End Group consists of four tables :
   --   DS3 Far End Configuration
   --   DS3 Far End Current
   --   DS3 Far End Interval
   --   DS3 Far End Total

   -- The DS3 Far End Configuration Table

   dsx3FarEndConfigTable OBJECT-TYPE
        SYNTAX  SEQUENCE OF Dsx3FarEndConfigEntry
        MAX-ACCESS  not-accessible
        STATUS  current
        DESCRIPTION
               "The DS3 Far End Configuration Table contains
               configuration information reported in the C-bits
               from the remote end."
        ::= { ds3 9 }

   dsx3FarEndConfigEntry OBJECT-TYPE
        SYNTAX  Dsx3FarEndConfigEntry
        MAX-ACCESS  not-accessible
        STATUS  current
        DESCRIPTION
               "An entry in the DS3 Far End Configuration table."
       INDEX   { dsx3FarEndLineIndex }
        ::= { dsx3FarEndConfigTable 1 }

   Dsx3FarEndConfigEntry ::=
        SEQUENCE {
           dsx3FarEndLineIndex          InterfaceIndex,
           dsx3FarEndEquipCode           DisplayString,
           dsx3FarEndLocationIDCode      DisplayString,
           dsx3FarEndFrameIDCode         DisplayString,
           dsx3FarEndUnitCode            DisplayString,
           dsx3FarEndFacilityIDCode      DisplayString
        }

   dsx3FarEndLineIndex OBJECT-TYPE
        SYNTAX  InterfaceIndex
        MAX-ACCESS  read-only  -- read-only since originally an
                               -- SMIv1 index
        STATUS  current
        DESCRIPTION
               "The index value which uniquely identifies the DS3
               interface to which this entry is applicable.  The
               interface identified by a particular value of this
```

```
                index is the same interface as identified by the
                same value an dsx3LineIndex object instance."
        ::= { dsx3FarEndConfigEntry 1 }

    dsx3FarEndEquipCode OBJECT-TYPE
         SYNTAX  DisplayString (SIZE (0..10))
         MAX-ACCESS  read-write
         STATUS  current
         DESCRIPTION
                "This is the Far End Equipment Identification code
                that describes the specific piece of equipment.
                It is sent within the Path Identification
                Message."
         ::= { dsx3FarEndConfigEntry 2 }

    dsx3FarEndLocationIDCode OBJECT-TYPE
         SYNTAX  DisplayString (SIZE (0..11))
         MAX-ACCESS  read-write
         STATUS  current
         DESCRIPTION
                "This is the Far End Location Identification code
                that describes the specific location of the
                equipment.  It is sent within the Path
                Identification Message."
         ::= { dsx3FarEndConfigEntry 3 }

    dsx3FarEndFrameIDCode OBJECT-TYPE
         SYNTAX  DisplayString (SIZE (0..10))
         MAX-ACCESS  read-write
         STATUS  current
         DESCRIPTION
                "This is the Far End Frame Identification code
                that identifies where the equipment is located
                within a building at a given location.  It is sent
                within the Path Identification Message."
         ::= { dsx3FarEndConfigEntry 4 }

    dsx3FarEndUnitCode OBJECT-TYPE
         SYNTAX  DisplayString (SIZE (0..6))
         MAX-ACCESS  read-write
         STATUS  current
         DESCRIPTION
                "This is the Far End code that identifies the
                equipment location within a bay.  It is sent
                within the Path Identification Message."
         ::= { dsx3FarEndConfigEntry 5 }

    dsx3FarEndFacilityIDCode OBJECT-TYPE
```

```
        SYNTAX  DisplayString (SIZE (0..38))
        MAX-ACCESS  read-write
        STATUS  current
        DESCRIPTION
               "This code identifies a specific Far End DS3 path.
               It is sent within the Path Identification
               Message."
        ::= { dsx3FarEndConfigEntry 6 }

   -- The DS3 Far End Current

   dsx3FarEndCurrentTable OBJECT-TYPE
        SYNTAX  SEQUENCE OF Dsx3FarEndCurrentEntry
        MAX-ACCESS  not-accessible
        STATUS  current
        DESCRIPTION
               "The DS3 Far End Current table contains various
               statistics being collected for the current 15
               minute interval.  The statistics are collected
               from the far end block error code within the C-
               bits."
        ::= { ds3 10 }

   dsx3FarEndCurrentEntry OBJECT-TYPE
        SYNTAX  Dsx3FarEndCurrentEntry
        MAX-ACCESS  not-accessible
        STATUS  current
        DESCRIPTION
               "An entry in the DS3 Far End Current table."
        INDEX   { dsx3FarEndCurrentIndex }
        ::= { dsx3FarEndCurrentTable 1 }

   Dsx3FarEndCurrentEntry ::=
        SEQUENCE {
            dsx3FarEndCurrentIndex        InterfaceIndex,
            dsx3FarEndTimeElapsed         INTEGER,
            dsx3FarEndValidIntervals      INTEGER,
            dsx3FarEndCurrentCESs         PerfCurrentCount,
            dsx3FarEndCurrentCSESs        PerfCurrentCount,
            dsx3FarEndCurrentCCVs         PerfCurrentCount,
            dsx3FarEndCurrentUASs         PerfCurrentCount,
            dsx3FarEndInvalidIntervals    INTEGER
        }

    dsx3FarEndCurrentIndex OBJECT-TYPE
        SYNTAX  InterfaceIndex
        MAX-ACCESS  read-only  -- read-only since originally an
                               -- SMIv1 index
```

```
        STATUS  current
        DESCRIPTION
                "The index value which uniquely identifies the DS3
                interface to which this entry is applicable.  The
                interface identified by a particular value of this
                index is identical to the interface identified by
                the same value of dsx3LineIndex."
        ::= { dsx3FarEndCurrentEntry 1 }

    dsx3FarEndTimeElapsed OBJECT-TYPE
        SYNTAX  INTEGER (0..899)
        MAX-ACCESS  read-only
        STATUS  current
        DESCRIPTION
                "The number of seconds that have elapsed since the
                beginning of the far end current error-measurement
                period. If, for some reason, such as an adjustment
                in the system's time-of-day clock, the current
                interval exceeds the maximum value, the agent will
                return the maximum value."
        ::= { dsx3FarEndCurrentEntry 2 }

    dsx3FarEndValidIntervals OBJECT-TYPE
        SYNTAX  INTEGER (0..96)
        MAX-ACCESS  read-only
        STATUS  current
        DESCRIPTION
                "The number of previous far end intervals for
                which data was collected.  The value will be 96
                unless the interface was brought online within the
                last 24 hours, in which case the value will be the
                number of complete 15 minute far end intervals
                since the interface has been online. In the case
                where the agent is a proxy, it is possible that
                some intervals are unavailable.  In this case,
                this interval is the maximum interval number for
                which data is available."
        ::= { dsx3FarEndCurrentEntry 3 }

    dsx3FarEndCurrentCESs OBJECT-TYPE
        SYNTAX  PerfCurrentCount
        MAX-ACCESS  read-only
        STATUS  current
        DESCRIPTION
                "The counter associated with the number of Far End
                C-bit Errored Seconds."
        ::= { dsx3FarEndCurrentEntry 4 }
```

```
   dsx3FarEndCurrentCSESs OBJECT-TYPE
        SYNTAX  PerfCurrentCount
        MAX-ACCESS  read-only
        STATUS  current
        DESCRIPTION
               "The counter associated with the number of Far End
               C-bit Severely Errored Seconds."
        ::= { dsx3FarEndCurrentEntry 5 }

   dsx3FarEndCurrentCCVs OBJECT-TYPE
        SYNTAX  PerfCurrentCount
        MAX-ACCESS  read-only
        STATUS  current
        DESCRIPTION
               "The counter associated with the number of Far End
               C-bit Coding Violations reported via the far end
               block error count."
        ::= { dsx3FarEndCurrentEntry 6 }

   dsx3FarEndCurrentUASs OBJECT-TYPE
        SYNTAX  PerfCurrentCount
        MAX-ACCESS  read-only
        STATUS  current
        DESCRIPTION
               "The counter associated with the number of Far End
               unavailable seconds."
        ::= { dsx3FarEndCurrentEntry 7 }

   dsx3FarEndInvalidIntervals OBJECT-TYPE
        SYNTAX  INTEGER (0..96)
        MAX-ACCESS  read-only
        STATUS  current
        DESCRIPTION
               " The number of intervals in the range from 0 to
               dsx3FarEndValidIntervals for which no data is
               available.  This object will typically be zero
               except in cases where the data for some intervals
               are not available (e.g., in proxy situations)."
        ::= { dsx3FarEndCurrentEntry 8 }

   -- The DS3 Far End Interval Table

   dsx3FarEndIntervalTable OBJECT-TYPE
        SYNTAX  SEQUENCE OF Dsx3FarEndIntervalEntry
        MAX-ACCESS  not-accessible
        STATUS  current
        DESCRIPTION
               "The DS3 Far End Interval Table contains various
```

```
               statistics collected by each DS3 interface over
               the previous 24 hours of operation.  The past 24
               hours are broken into 96 completed 15 minute
               intervals."
         ::= { ds3 11 }

   dsx3FarEndIntervalEntry OBJECT-TYPE
        SYNTAX  Dsx3FarEndIntervalEntry
        MAX-ACCESS  not-accessible
        STATUS  current
        DESCRIPTION
               "An entry in the DS3 Far End Interval table."
        INDEX   { dsx3FarEndIntervalIndex,
                  dsx3FarEndIntervalNumber }
        ::= { dsx3FarEndIntervalTable 1 }

   Dsx3FarEndIntervalEntry ::=
        SEQUENCE {
             dsx3FarEndIntervalIndex      InterfaceIndex,
             dsx3FarEndIntervalNumber     INTEGER,
             dsx3FarEndIntervalCESs       PerfIntervalCount,
             dsx3FarEndIntervalCSESs      PerfIntervalCount,
             dsx3FarEndIntervalCCVs       PerfIntervalCount,
             dsx3FarEndIntervalUASs       PerfIntervalCount,
             dsx3FarEndIntervalValidData  TruthValue
        }

   dsx3FarEndIntervalIndex OBJECT-TYPE
        SYNTAX  InterfaceIndex
        MAX-ACCESS  read-only  -- read-only since originally an
                               -- SMIv1 index
        STATUS  current
        DESCRIPTION
               "The index value which uniquely identifies the DS3
               interface to which this entry is applicable.  The
               interface identified by a particular value of this
               index is identical to the interface identified by
               the same value of dsx3LineIndex."
        ::= { dsx3FarEndIntervalEntry 1 }

   dsx3FarEndIntervalNumber OBJECT-TYPE
       SYNTAX  INTEGER (1..96)
       MAX-ACCESS  read-only  -- read-only since originally an
                              -- SMIv1 index
       STATUS  current
       DESCRIPTION
               "A number between 1 and 96, where 1 is the most
               recently completed 15 minute interval and 96 is
```

```
                the 15 minutes interval completed 23 hours and 45
                minutes prior to interval 1."
        ::= { dsx3FarEndIntervalEntry 2 }

    dsx3FarEndIntervalCESs OBJECT-TYPE
        SYNTAX  PerfIntervalCount
        MAX-ACCESS  read-only
        STATUS  current
        DESCRIPTION
                "The counter associated with the number of Far End
                C-bit Errored Seconds encountered by a DS3
                interface in one of the previous 96, individual 15
                minute, intervals. In the case where the agent is
                a proxy and data is not available, return
                noSuchInstance."
        ::= { dsx3FarEndIntervalEntry 3 }

    dsx3FarEndIntervalCSESs OBJECT-TYPE
        SYNTAX  PerfIntervalCount
        MAX-ACCESS  read-only
        STATUS  current
        DESCRIPTION
                "The counter associated with the number of Far End
                C-bit Severely Errored Seconds."
         ::= { dsx3FarEndIntervalEntry 4 }

    dsx3FarEndIntervalCCVs OBJECT-TYPE
         SYNTAX  PerfIntervalCount
         MAX-ACCESS  read-only
         STATUS  current
         DESCRIPTION
                "The counter associated with the number of Far End
                C-bit Coding Violations reported via the far end
                block error count."
         ::= { dsx3FarEndIntervalEntry 5 }

    dsx3FarEndIntervalUASs OBJECT-TYPE
         SYNTAX  PerfIntervalCount
         MAX-ACCESS  read-only
         STATUS  current
         DESCRIPTION
                "The counter associated with the number of Far End
                unavailable seconds."
         ::= { dsx3FarEndIntervalEntry 6 }

    dsx3FarEndIntervalValidData OBJECT-TYPE
         SYNTAX  TruthValue
         MAX-ACCESS  read-only
```

```
        STATUS  current
        DESCRIPTION
                " This variable indicates if the data for this
                interval is valid."
        ::= { dsx3FarEndIntervalEntry 7 }

   -- The DS3 Far End Total

   dsx3FarEndTotalTable OBJECT-TYPE
        SYNTAX  SEQUENCE OF Dsx3FarEndTotalEntry
        MAX-ACCESS  not-accessible
        STATUS  current
        DESCRIPTION
                "The DS3 Far End Total Table contains the
                cumulative sum of the various statistics for the
                24 hour period preceding the current interval."
        ::= { ds3 12 }

   dsx3FarEndTotalEntry OBJECT-TYPE
        SYNTAX  Dsx3FarEndTotalEntry
        MAX-ACCESS  not-accessible
        STATUS  current
        DESCRIPTION
                "An entry in the DS3 Far End Total table."
        INDEX   { dsx3FarEndTotalIndex }
        ::= { dsx3FarEndTotalTable 1 }

   Dsx3FarEndTotalEntry ::=
        SEQUENCE {
            dsx3FarEndTotalIndex       InterfaceIndex,
            dsx3FarEndTotalCESs        PerfTotalCount,
            dsx3FarEndTotalCSESs       PerfTotalCount,
            dsx3FarEndTotalCCVs        PerfTotalCount,
            dsx3FarEndTotalUASs        PerfTotalCount
        }

   dsx3FarEndTotalIndex OBJECT-TYPE
       SYNTAX  InterfaceIndex
       MAX-ACCESS  read-only  -- read-only since originally an
                              -- SMIv1 index
       STATUS  current
       DESCRIPTION
               "The index value which uniquely identifies the DS3
               interface to which this entry is applicable.  The
               interface identified by a particular value of this
               index is identical to the interface identified by
               the same value of dsx3LineIndex."
       ::= { dsx3FarEndTotalEntry 1 }
```

```
   dsx3FarEndTotalCESs OBJECT-TYPE
       SYNTAX  PerfTotalCount
       MAX-ACCESS  read-only
       STATUS  current
       DESCRIPTION
               "The counter associated with the number of Far End
               C-bit Errored Seconds encountered by a DS3
               interface in the previous 24 hour interval.
               Invalid 15 minute intervals count as 0."
       ::= { dsx3FarEndTotalEntry 2 }

   dsx3FarEndTotalCSESs OBJECT-TYPE
       SYNTAX  PerfTotalCount
       MAX-ACCESS  read-only
       STATUS  current
       DESCRIPTION
               "The counter associated with the number of Far End
               C-bit Severely Errored Seconds encountered by a
               DS3 interface in the previous 24 hour interval.
               Invalid 15 minute intervals count as 0."
       ::= { dsx3FarEndTotalEntry 3 }

   dsx3FarEndTotalCCVs OBJECT-TYPE
       SYNTAX  PerfTotalCount
       MAX-ACCESS  read-only
       STATUS  current
       DESCRIPTION
               "The counter associated with the number of Far End
               C-bit Coding Violations reported via the far end
               block error count encountered by a DS3 interface
               in the previous 24 hour interval. Invalid 15
               minute intervals count as 0."
       ::= { dsx3FarEndTotalEntry 4 }

   dsx3FarEndTotalUASs OBJECT-TYPE
       SYNTAX  PerfTotalCount
       MAX-ACCESS  read-only
       STATUS  current
       DESCRIPTION
               "The counter associated with the number of Far End
               unavailable seconds encountered by a DS3 interface
               in the previous 24 hour interval.  Invalid 15
               minute intervals count as 0."
       ::= { dsx3FarEndTotalEntry 5 }

   -- the DS3/E3 Fractional Table

   -- This table is deprecated.
```

```
   dsx3FracTable OBJECT-TYPE
       SYNTAX  SEQUENCE OF Dsx3FracEntry
       MAX-ACCESS  not-accessible
       STATUS  deprecated
       DESCRIPTION
               "This table is deprecated in favour of using
               ifStackTable.

               Implementation of this table was optional.  It was
               designed for those systems dividing a DS3/E3 into
               channels containing different data streams that
               are of local interest.

               The DS3/E3 fractional table identifies which
               DS3/E3 channels associated with a CSU are being
               used to support a logical interface, i.e., an
               entry in the interfaces table from the Internet-
               standard MIB.

               For example, consider a DS3 device with 4 high
               speed links carrying router traffic, a feed for
               voice, a feed for video, and a synchronous channel
               for a non-routed protocol.  We might describe the
               allocation of channels, in the dsx3FracTable, as
               follows:
               dsx3FracIfIndex.2. 1 = 3  dsx3FracIfIndex.2.15 = 4
               dsx3FracIfIndex.2. 2 = 3  dsx3FracIfIndex.2.16 = 6
               dsx3FracIfIndex.2. 3 = 3  dsx3FracIfIndex.2.17 = 6
               dsx3FracIfIndex.2. 4 = 3  dsx3FracIfIndex.2.18 = 6
               dsx3FracIfIndex.2. 5 = 3  dsx3FracIfIndex.2.19 = 6
               dsx3FracIfIndex.2. 6 = 3  dsx3FracIfIndex.2.20 = 6
               dsx3FracIfIndex.2. 7 = 4  dsx3FracIfIndex.2.21 = 6
               dsx3FracIfIndex.2. 8 = 4  dsx3FracIfIndex.2.22 = 6
               dsx3FracIfIndex.2. 9 = 4  dsx3FracIfIndex.2.23 = 6
               dsx3FracIfIndex.2.10 = 4  dsx3FracIfIndex.2.24 = 6
               dsx3FracIfIndex.2.11 = 4  dsx3FracIfIndex.2.25 = 6
               dsx3FracIfIndex.2.12 = 5  dsx3FracIfIndex.2.26 = 6
               dsx3FracIfIndex.2.13 = 5  dsx3FracIfIndex.2.27 = 6
               dsx3FracIfIndex.2.14 = 5  dsx3FracIfIndex.2.28 = 6
               For dsx3M23, dsx3 SYNTRAN, dsx3CbitParity, and
               dsx3ClearChannel  there are 28 legal channels,
               numbered 1 through 28.

               For e3Framed there are 16 legal channels, numbered
               1 through 16.  The channels (1..16) correspond
               directly to the equivalently numbered time-slots."
        ::= { ds3 13 }
```

```
   dsx3FracEntry OBJECT-TYPE
        SYNTAX  Dsx3FracEntry
        MAX-ACCESS  not-accessible
        STATUS  deprecated
        DESCRIPTION
                        "An entry in the DS3 Fractional table."
       INDEX   { dsx3FracIndex, dsx3FracNumber }
       ::= { dsx3FracTable 1 }

   Dsx3FracEntry ::=
        SEQUENCE {
            dsx3FracIndex     INTEGER,
            dsx3FracNumber    INTEGER,
            dsx3FracIfIndex   INTEGER
       }

   dsx3FracIndex OBJECT-TYPE
       SYNTAX  INTEGER (1..'7fffffff'h)
       MAX-ACCESS  read-only -- read-only since originally an
                                -- SMIv1 index
       STATUS  deprecated
       DESCRIPTION
               "The index value which uniquely identifies  the
               DS3  interface  to which this entry is applicable
               The interface identified by a  particular value
               of  this  index is the same interface as
               identified by the same value  an  dsx3LineIndex
               object instance."
       ::= { dsx3FracEntry 1 }

   dsx3FracNumber OBJECT-TYPE
       SYNTAX  INTEGER (1..31)
       MAX-ACCESS  read-only  -- read-only since originally an
                               -- SMIv1 index
       STATUS  deprecated
       DESCRIPTION
               "The channel number for this entry."
      ::= { dsx3FracEntry 2 }

   dsx3FracIfIndex OBJECT-TYPE
      SYNTAX  INTEGER (0..'7fffffff'h)
      MAX-ACCESS  read-write
      STATUS  deprecated
      DESCRIPTION
              "An index value that uniquely identifies an
              interface.  The interface identified by a
              particular value of this index is the same
              interface as  identified by the same value an
```

```
            ifIndex object instance. If no interface is
            currently using a channel, the value should be
            zero.  If a single interface occupies more  than
            one  time slot,  that ifIndex value will be found
            in multiple time slots."
      ::= { dsx3FracEntry 3 }

    -- DS3 TRAPS

   ds3Traps OBJECT IDENTIFIER ::= { ds3 15 }

   dsx3LineStatusChange NOTIFICATION-TYPE
       OBJECTS { dsx3LineStatus,
                 dsx3LineStatusLastChange }
       STATUS  current
       DESCRIPTION
               "A dsx3LineStatusChange trap is sent when the
               value of an instance of dsx3LineStatus changes. It
               can be utilized by an NMS to trigger polls.  When
               the line status change results in a lower level
               line status change (i.e., ds1), then no traps for
               the lower level are sent."
        ::= { ds3Traps 0 1 }

   -- conformance information

   ds3Conformance OBJECT IDENTIFIER ::= { ds3 14 }
   ds3Groups      OBJECT IDENTIFIER ::= { ds3Conformance 1 }
   ds3Compliances OBJECT IDENTIFIER ::= { ds3Conformance 2 }

   -- compliance statements

   ds3Compliance MODULE-COMPLIANCE
       STATUS  current
       DESCRIPTION
               "The compliance statement for DS3/E3 interfaces."
       MODULE  -- this module
           MANDATORY-GROUPS { ds3NearEndConfigGroup,
                              ds3NearEndStatisticsGroup }

           GROUP       ds3FarEndGroup
           DESCRIPTION
               "Implementation of this group is optional for all
               systems that attach to a DS3 Interface.  However,
               only C-bit Parity and SYNTRAN DS3 applications
               have the capability (option) of providing this
               information."
           GROUP       ds3NearEndOptionalTrapGroup
```

```
            DESCRIPTION
                "Implementation of this group is optional for all
                systems that attach to a DS3 Interface.  If it is
                implemented then ds3NearEndOptionalConfigGroup
                should also be implemented."
            GROUP       ds3NearEndOptionalConfigGroup
            DESCRIPTION
                "Implementation of this group is optional for all
                systems that attach to a DS3 interface."

            OBJECT      dsx3LineType
            MIN-ACCESS  read-only
            DESCRIPTION
                "Write access for the line type is not required."

            OBJECT      dsx3LineCoding
            MIN-ACCESS  read-only
            DESCRIPTION
                "Write access for the line coding is not
                required."

            OBJECT      dsx3SendCode
            MIN-ACCESS  read-only
            DESCRIPTION
                "Write access for the send code is not required."

            OBJECT      dsx3LoopbackConfig
            MIN-ACCESS  read-only
            DESCRIPTION
                "Write access for loopbacks is not required."

            OBJECT      dsx3TransmitClockSource
            MIN-ACCESS  read-only
            DESCRIPTION
                "Write access for the transmit clock source is not
                required."

            OBJECT      dsx3LineLength
            MIN-ACCESS  read-only
            DESCRIPTION
                "Write access for the line length is not
                required."

            OBJECT      dsx3Channelization
            MIN-ACCESS  read-only
            DESCRIPTION
                "Write access for the channelization is not
                required."
```

```
        ::= { ds3Compliances 1 }

    -- units of conformance

    ds3NearEndConfigGroup  OBJECT-GROUP
        OBJECTS { dsx3LineIndex,
                  dsx3TimeElapsed,
                  dsx3ValidIntervals,
                  dsx3LineType,
                  dsx3LineCoding,
                  dsx3SendCode,
                  dsx3CircuitIdentifier,
                  dsx3LoopbackConfig,
                  dsx3LineStatus,
                  dsx3TransmitClockSource,
                  dsx3InvalidIntervals,
                  dsx3LineLength,
                  dsx3LoopbackStatus,
                  dsx3Channelization,
                  dsx3Ds1ForRemoteLoop}
        STATUS  current
        DESCRIPTION
                "A collection of objects providing configuration
                information applicable to all DS3/E3 interfaces."
        ::= { ds3Groups 1 }

    ds3NearEndStatisticsGroup OBJECT-GROUP
        OBJECTS { dsx3CurrentIndex,
                  dsx3CurrentPESs,
                  dsx3CurrentPSESs,
                  dsx3CurrentSEFSs,
                  dsx3CurrentUASs,
                  dsx3CurrentLCVs,
                  dsx3CurrentPCVs,
                  dsx3CurrentLESs,
                  dsx3CurrentCCVs,
                  dsx3CurrentCESs,
                  dsx3CurrentCSESs,
                  dsx3IntervalIndex,
                  dsx3IntervalNumber,
                  dsx3IntervalPESs,
                  dsx3IntervalPSESs,
                  dsx3IntervalSEFSs,
                  dsx3IntervalUASs,
                  dsx3IntervalLCVs,
                  dsx3IntervalPCVs,
                  dsx3IntervalLESs,
                  dsx3IntervalCCVs,
```

```
                dsx3IntervalCESs,
                dsx3IntervalCSESs,
                dsx3IntervalValidData,
                dsx3TotalIndex,
                dsx3TotalPESs,
                dsx3TotalPSESs,
                dsx3TotalSEFSs,
                dsx3TotalUASs,
                dsx3TotalLCVs,
                dsx3TotalPCVs,
                dsx3TotalLESs,
                dsx3TotalCCVs,
                dsx3TotalCESs,
                dsx3TotalCSESs }
        STATUS  current
        DESCRIPTION
                "A collection of objects providing statistics
                information applicable to all DS3/E3 interfaces."
        ::= { ds3Groups 2 }

    ds3FarEndGroup  OBJECT-GROUP
        OBJECTS { dsx3FarEndLineIndex,
                  dsx3FarEndEquipCode,
                  dsx3FarEndLocationIDCode,
                  dsx3FarEndFrameIDCode,
                  dsx3FarEndUnitCode,
                  dsx3FarEndFacilityIDCode,
                  dsx3FarEndCurrentIndex,
                  dsx3FarEndTimeElapsed,
                  dsx3FarEndValidIntervals,
                  dsx3FarEndCurrentCESs,
                  dsx3FarEndCurrentCSESs,
                  dsx3FarEndCurrentCCVs,
                  dsx3FarEndCurrentUASs,
                  dsx3FarEndInvalidIntervals,
                  dsx3FarEndIntervalIndex,
                  dsx3FarEndIntervalNumber,
                  dsx3FarEndIntervalCESs,
                  dsx3FarEndIntervalCSESs,
                  dsx3FarEndIntervalCCVs,
                  dsx3FarEndIntervalUASs,
                  dsx3FarEndIntervalValidData,
                  dsx3FarEndTotalIndex,
                  dsx3FarEndTotalCESs,
                  dsx3FarEndTotalCSESs,
                  dsx3FarEndTotalCCVs,
                  dsx3FarEndTotalUASs }
        STATUS  current
```

```
        DESCRIPTION
                "A collection of objects providing remote
                configuration and statistics information
                applicable to C-bit Parity and SYNTRAN DS3
                interfaces."
        ::= { ds3Groups 3 }

    ds3DeprecatedGroup OBJECT-GROUP

        OBJECTS { dsx3IfIndex,
                  dsx3FracIndex,
                  dsx3FracNumber,
                  dsx3FracIfIndex }
        STATUS  deprecated
        DESCRIPTION
                "A collection of obsolete objects that may be
                implemented for backwards compatibility."
        ::= { ds3Groups 4 }

    ds3NearEndOptionalConfigGroup OBJECT-GROUP
        OBJECTS { dsx3LineStatusLastChange,
                  dsx3LineStatusChangeTrapEnable }

        STATUS    current
        DESCRIPTION
                "A collection of objects that may be implemented
                on DS3/E3 interfaces."
        ::= { ds3Groups 5 }

    ds3NearEndOptionalTrapGroup NOTIFICATION-GROUP
        NOTIFICATIONS { dsx3LineStatusChange }
        STATUS    current
        DESCRIPTION
                "A collection of notifications that may be
                implemented on DS3/E3 interfaces."
        ::= { ds3Groups 6 }

    END
```

4. Appendix A - Use of dsx3IfIndex and dsx3LineIndex

This Appendix exists to document the previous use if dsx3IfIndex and dsx3LineIndex and to clarify the relationship of dsx3LineIndex as defined in RFC 1407 with the dsx3LineIndex as defined in this document.

The following shows the old and new definitions and the relationship:

[New Definition]: "This object should be made equal to ifIndex. The next paragraph describes its previous usage. Making the object equal to ifIndex allows proper use of ifStackTable.

[Old Definition]: "this object is the identifier of a DS3/E3 Interface on a managed device. If there is an ifEntry that is directly associated with this and only this DS3/E3 interface, it should have the same value as ifIndex. Otherwise, number the dsx3LineIndices with an unique identifier following the rules of choosing a number that is greater than ifNumber and numbering the inside interfaces (e.g., equipment side) with even numbers and outside interfaces (e.g, network side) with odd numbers."

When the "Old Definition" was created, it was described this way to allow a manager to treat the value _as if_ it were an ifIndex, i.e., the value would either be: 1) an ifIndex value or 2) a value that was guaranteed to be different from all valid ifIndex values.

The new definition is a subset of that definition, i.e., the value is always an ifIndex value.

The following is Section 3.1 from [RFC1407]:

Different physical configurations for the support of SNMP with DS3/E3 equipment exist. To accommodate these scenarios, two different indices for DS3/E3 interfaces are introduced in this MIB. These indices are dsx3IfIndex and dsx3LineIndex.

External interface scenario: the SNMP Agent represents all managed DS3/E3 lines as external interfaces (for example, an Agent residing on the device supporting DS3/E3 interfaces directly):

For this scenario, all interfaces are assigned an integer value equal to ifIndex, and the following applies:

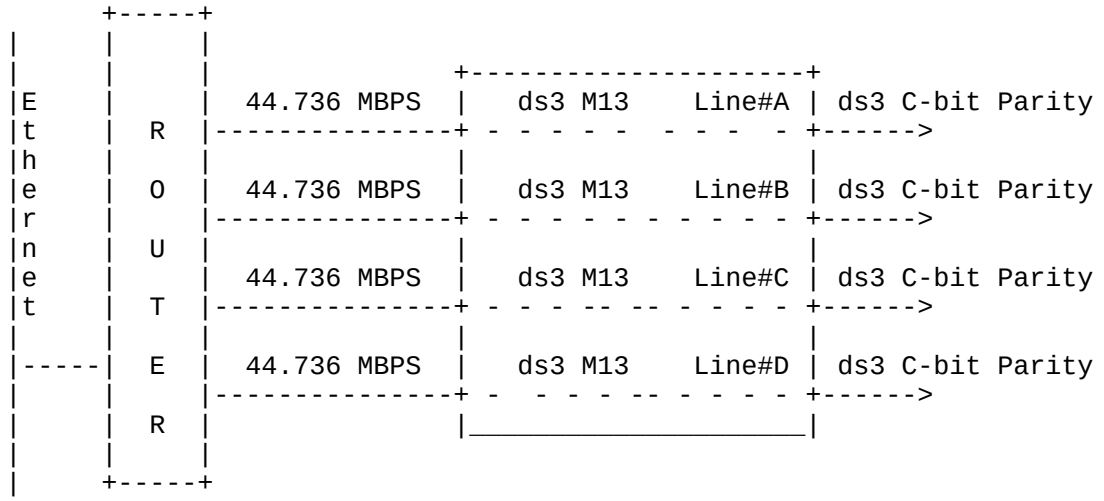
ifIndex=dsx3IfIndex=dsx3LineIndex for all interfaces.

The dsx3IfIndex column of the DS3/E3 Configuration table relates each DS3/E3 interface to its corresponding interface (ifIndex) in the Internet-standard MIB (MIB-II STD 17, [RFC1213]).

External&Internal interface scenario: the SNMP Agents resides on an host external from the device supporting DS3/E3 interfaces (e.g., a router). The Agent represents both the host and the DS3/E3 device. The index dsx3LineIndex is used to not only represent the DS3/E3 interfaces external from the host/DS3/E3-device combination, but also the DS3/E3 interfaces connecting the host and the DS3/E3 device. The index dsx3IfIndex is always equal to ifIndex.

Example:

A shelf full of CSUs connected to a Router. An SNMP Agent residing on the router proxies for itself and the CSU. The router has also an Ethernet interface:



The assignment of the index values could for example be:

ifIndex (= dsx3IfIndex)			dsx3LineIndex
1	NA		NA (Ethernet)
2	Line#A	Router Side	6
2	Line#A	Network Side	7
3	Line#B	Router Side	8
3	Line#B	Network Side	9
4	Line#C	Router Side	10
4	Line#C	Network Side	11
5	Line#D	Router Side	12
5	Line#D	Network Side	13

For this example, ifNumber is equal to 5. Note the following description of dsx3LineIndex: the dsx3LineIndex identifies a DS3/E3 Interface on a managed device. If there is an ifEntry that is directly associated with this and only this DS3/E3 interface, it should have the same value as ifIndex. Otherwise, number the dsx3LineIndices with an unique identifier following the rules of choosing a number greater than ifNumber and numbering inside interfaces (e.g., equipment side) with even numbers and outside interfaces (e.g., network side) with odd numbers.

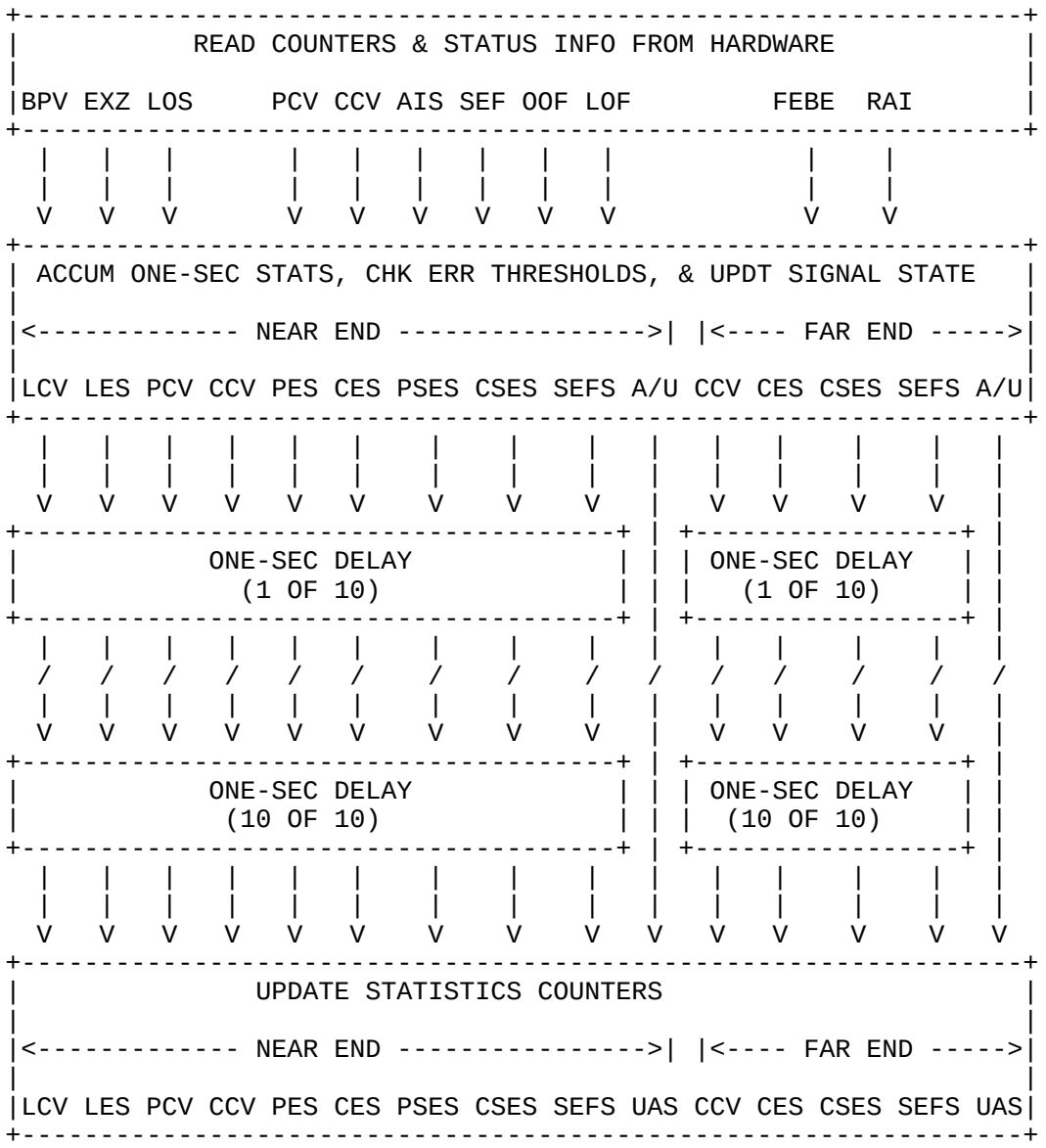
If the CSU shelf is managed by itself by a local SNMP Agent, the situation would be:

ifIndex (= dsx3IfIndex)			dsx3LineIndex
1	Line#A	Network Side	1
2	Line#A	RouterSide	2
3	Line#B	Network Side	3
4	Line#B	RouterSide	4
5	Line#C	Network Side	5
6	Line#C	Router Side	6
7	Line#D	Network Side	7
8	Line#D	Router Side	8

5. Appendix B - The delay approach to Unavialable Seconds.

This procedure is illustrated below for a DS3 C-Bit parity application. Similar rules would apply for other interfaces covered by this MIB. The procedure guarantees that the statistical counters are correctly updated at all times, although they lag real time by 10 seconds. At the end of each 15 minutes interval the current interval counts are transferred to the most recent interval entry and each interval is shifted up by one position, with the oldest being discarded if necessary in order to make room. The current interval

counts then start over from zero. Note, however, that the signal state calculation does not start afresh at each interval boundary; rather, signal state information is retained across interval boundaries.



Note that if such a procedure is adopted there is no current interval data for the first ten seconds after a system comes up.

noSuchInstance must be returned if a management station attempts to access the current interval counters during this time.

It is an implementation-specific matter whether an agent assumes that the initial state of the interface is available or unavailable.

6. Acknowledgments

This document was produced by the AToM MIB Working Group. The Editor would like to dedicate a special thanks to C. Mike Heard for providing a top notch doctor review and many helpful suggestions, and to acknowledge D. Fowler, Editor of RFC 2496, T. Cox and K. Tesink Editors of RFC 1407.

7. References

7.1. Normative References

[RFC2578] McCloghrie, K., Perkins, D., and J. Schoenwaelder, "Structure of Management Information Version 2 (SMIv2)", STD 58, RFC 2578, April 1999.

[RFC2579] McCloghrie, K., Perkins, D., and J. Schoenwaelder, "Textual Conventions for SMIv2", STD 58, RFC 2579, April 1999.

[RFC2580] McCloghrie, K., Perkins, D., and J. Schoenwaelder, "Conformance Statements for SMIv2", STD 58, RFC 2580, April 1999.

[RFC2863] McCloghrie, K. and F. Kastenholz, "The Interfaces Group MIB", RFC 2863, June 2000.

[ANSI-T1.102] American National Standard for telecommunications - digital hierarchy - electrical interfaces, ANSI T1.102-1987.

[ANSI-T1.107] American National Standard for telecommunications - digital hierarchy - formats specification, ANSI T1.107- 1988.

[ANSI-T1.107a] ANSI T1.107a-1990.

[ANSI-T1.404] American National Standard for telecommunications - Carrier-to-Customer Installation - DS3 Metallic Interface, ANSI T1.404-1989.

[ANSI-T1.231] American National Standard for Telecommunications -- Layer 1 In- Service Digital Transmission Performance Monitoring T1.231, Sept 1993.

[CCITT-G.751] CCITT - Digital Multiplex Equipment Operating at the Third Order Bit Rate of 34 368 Kbit/s and the Forth Order Bit Rate of 139 264 Kbit/s and Using Positive Justification, G.751

[ETSI-T/NA(91)18] European Telecommunications Standards Institute -- ETS "34M" -- Metropolitan Area Network Physical Convergence Layer Procedure for 34.368 Megabits per Second, T/NA(91)18, May 1991.

[RFC3593] Tesink, K., "Textual Conventions for MIB Modules Using Performance History Based on 15 Minute Intervals", RFC 3593, September 2003.

[ITU-T-M.1400] ITU-T M.1400: Designation For Interconnections Among Network Operators, October 2001.

7.2. Informative References

[RFC1213] McCloghrie, K. and M. Rose, "Management Information Base for Network Management of TCP/IP-based internets:MIB-II", STD 17, RFC 1213, March 1991.

[RFC1407] Cox, T. and K. Tesink, "Definitions of Managed Objects for the DS3/E3 Interface Type", RFC 1407, January 1993.

[RFC2496] Fowler, D., "Definitions of Managed Object for the DS3/E3 Interface Type", RFC 2496, January 1999.

[RFC3895] Nicklass, O., Ed., "Definitions of Managed Objects for the DS1, E1, DS2, and E2 Interface Types", RFC 3895, September 2004.

[RFC3592] Tesink, K., "Definitions of Managed Objects for the Synchronous Optical Network/Synchronous Digital Hierarchy (SONET/SDH) Interface Type", RFC 3592, September 2003.

[RFC2494] Fowler, D., "Definitions of Managed Objects for the DS0 and DS0 Bundle Interface Type", RFC 2494, January 1999.

[RFC3410] Case, J., Mundy, R., Partain, D., and B. Stewart, "Introduction and Applicability Statements for Internet-Standard Management Framework", RFC 3410, December 2002.

8. Security Considerations

There are a number of management objects defined in this MIB module with a MAX-ACCESS clause of read-write. 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. The specific the objects and their sensitivities/vulnerabilities are as follows.

Setting the following objects to incorrect values may result in traffic interruptions:

- dsx3LineType
- dsx3LineCoding
- dsx3SendCode
- dsx3LoopbackConfig
- dsx3TransmitClockSource
- dsx3LineLength
- dsx3Channelization
- dsx3Ds1ForRemoteLoop

In the case of dsx3LineType, for example, both ends of a DS3/E3 must have the same value in order for traffic to flow. In the case of dsx3SendCode and dsx3LoopbackConfig, for another example, traffic may stop transmitting when particular loopbacks are applied.

Setting the following objects to an incorrect value will result in the remote end receiving an incorrect Path Identification message, which may result in a connectivity inconsistency:

- dsx3FarEndEquipCode
- dsx3FarEndLocationIDCode
- dsx3FarEndFrameIDCode
- dsx3FarEndUnitCode
- dsx3FarEndFacilityIDCode

Setting the following object to an incorrect value will not harm the traffic, but it may cause a circuit to be mis-identified and thereby create difficulties for service personnel when attempting to troubleshoot a problem:

dsx3CircuitIdentifier

Setting the following object can cause an increase in the number of traps received by the network management station:

dsx3LineStatusChangeTrapEnable

The readable objects in this MIB module (i.e., the objects with a MAX-ACCESS other than not-accessible) may be considered sensitive in some environments since, collectively, they provide extensive information about the performance of interfaces in DS3/E3 equipment or networks and can reveal some aspects of their configuration. In such environments it is important to control even GET and NOTIFY access to these objects and possibly to encrypt the values of these objects when sending them over the network via SNMP.

SNMP versions prior to SNMPv3 did not include adequate security. 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 module.

It is RECOMMENDED that implementers consider the security features as provided by the SNMPv3 framework (see [RFC3410], section 8), including full support for the SNMPv3 cryptographic mechanisms (for authentication and privacy).

Further, deployment of SNMP versions prior to SNMPv3 is NOT RECOMMENDED. Instead, it is RECOMMENDED to deploy SNMPv3 and to enable cryptographic security. It is then a customer/operator responsibility to ensure that the SNMP entity giving access to an instance of this MIB module 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.

9. Author's Address

Orly Nicklass (editor)
RAD Data Communications, Ltd.
Ziv Tower, 24 Roul Walenberg
Tel Aviv, Israel, 69719

Phone: 9723-765-9969
EMail: orly_n@rad.com

10. Full Copyright Statement

Intellectual Property

Acknowledgement

Funding for the RFC Editor function is currently provided by the Internet Society.