

Definitions of Managed Objects for the DS3/E3 Interface Type

Status of this Memo

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

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Abstract

This memo defines 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.

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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 indicate 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:

E t h e r n e t	R O U T E R	44.736 MBPS	ds3 M13	Line#A	ds3 C-bit Parity
		44.736 MBPS	ds3 M13	Line#B	ds3 C-bit Parity
		44.736 MBPS	ds3 M13	Line#C	ds3 C-bit Parity
		44.736 MBPS	ds3 M13	Line#D	ds3 C-bit Parity

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 `InwardLoopback` 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 SESCO-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 PSESSs, 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 PSESSs, then the DS3 interface unavailability starts from the onset of these PSESSs. Once unavailable, and if no failure is present, the DS3 interface becomes available at the onset of 10 contiguous seconds with no PSESSs. Once unavailable, and if a

failure is present, the DS3 interface becomes available at the onset of 10 contiguous seconds with no PSEs, 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 PSEs, 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 dsx3IntervalPSEs 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 SEs. 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 $0.2 \text{ ms} \leq T \leq 100 \text{ ms}$. 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.

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version of this MIB module is part of RFC 3896;
see the RFC itself for full legal notices."

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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.
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- (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"

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- (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 indicate 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 }

dsx3CurrentPESSs OBJECT-TYPE
    SYNTAX      PerfCurrentCount
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "The counter associated with the number of P-bit
        Errored Seconds."
    ::= { dsx3CurrentEntry 2 }

dsx3CurrentPSESSs 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 }

dsx3CurrentSEFSSs 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 }

dsx3IntervalPESSs OBJECT-TYPE
    SYNTAX  PerfIntervalCount
    MAX-ACCESS  read-only
    STATUS  current
    DESCRIPTION
        "The counter associated with the number of P-bit
        Errored Seconds."
    ::= { dsx3IntervalEntry 3 }

dsx3IntervalPSESSs 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 }

dsx3IntervalCESSs OBJECT-TYPE
    SYNTAX  PerfIntervalCount
    MAX-ACCESS  read-only
    STATUS  current
    DESCRIPTION
        "The number of C-bit Errored Seconds."
    ::= { dsx3IntervalEntry 11 }

dsx3IntervalCSESSs 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,
        dsx3TotalPSESSs     PerfTotalCount,
        dsx3TotalSEFSs      PerfTotalCount,
        dsx3TotalUASSs      PerfTotalCount,
        dsx3TotalLCVs       PerfTotalCount,
        dsx3TotalPCVs       PerfTotalCount,
        dsx3TotalLESSs      PerfTotalCount,
        dsx3TotalCCVs       PerfTotalCount,
        dsx3TotalCESs       PerfTotalCount,
        dsx3TotalCSESSs     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 }

dsx3TotalPSESSs 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 }
```

dsx3TotalLEs 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,
        dsx3FarEndCurrentCSEs        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 }

dsx3FarEndIntervalCESSs 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 }

dsx3FarEndIntervalCSESSs 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,
               dsx3CurrentPSEs,
               dsx3CurrentSEFSs,
               dsx3CurrentUASs,
               dsx3CurrentLCVs,
               dsx3CurrentPCVs,
               dsx3CurrentLESs,
               dsx3CurrentCCVs,
               dsx3CurrentCESs,
               dsx3CurrentCSEs,
               dsx3IntervalIndex,
               dsx3IntervalNumber,
               dsx3IntervalPESs,
               dsx3IntervalPSEs,
               dsx3IntervalSEFSs,
               dsx3IntervalUASs,
               dsx3IntervalLCVs,
               dsx3IntervalPCVs,
               dsx3IntervalLESs,
               dsx3IntervalCCVs,
```

```

        dsx3IntervalCESS,
        dsx3IntervalCSESS,
        dsx3IntervalValidData,
        dsx3TotalIndex,
        dsx3TotalPESs,
        dsx3TotalPSESSs,
        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 of 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 a 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:

E t h e r n e t		+-----+			
	R O U T	44.736 MBPS	ds3 M13	Line#A	ds3 C-bit Parity
		----->			
		44.736 MBPS	ds3 M13	Line#B	ds3 C-bit Parity
		----->			
	44.736 MBPS	ds3 M13	Line#C	ds3 C-bit Parity	
----->					
-----	E	44.736 MBPS	ds3 M13	Line#D	ds3 C-bit Parity
	R	----->			
		+-----+			

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 a 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.

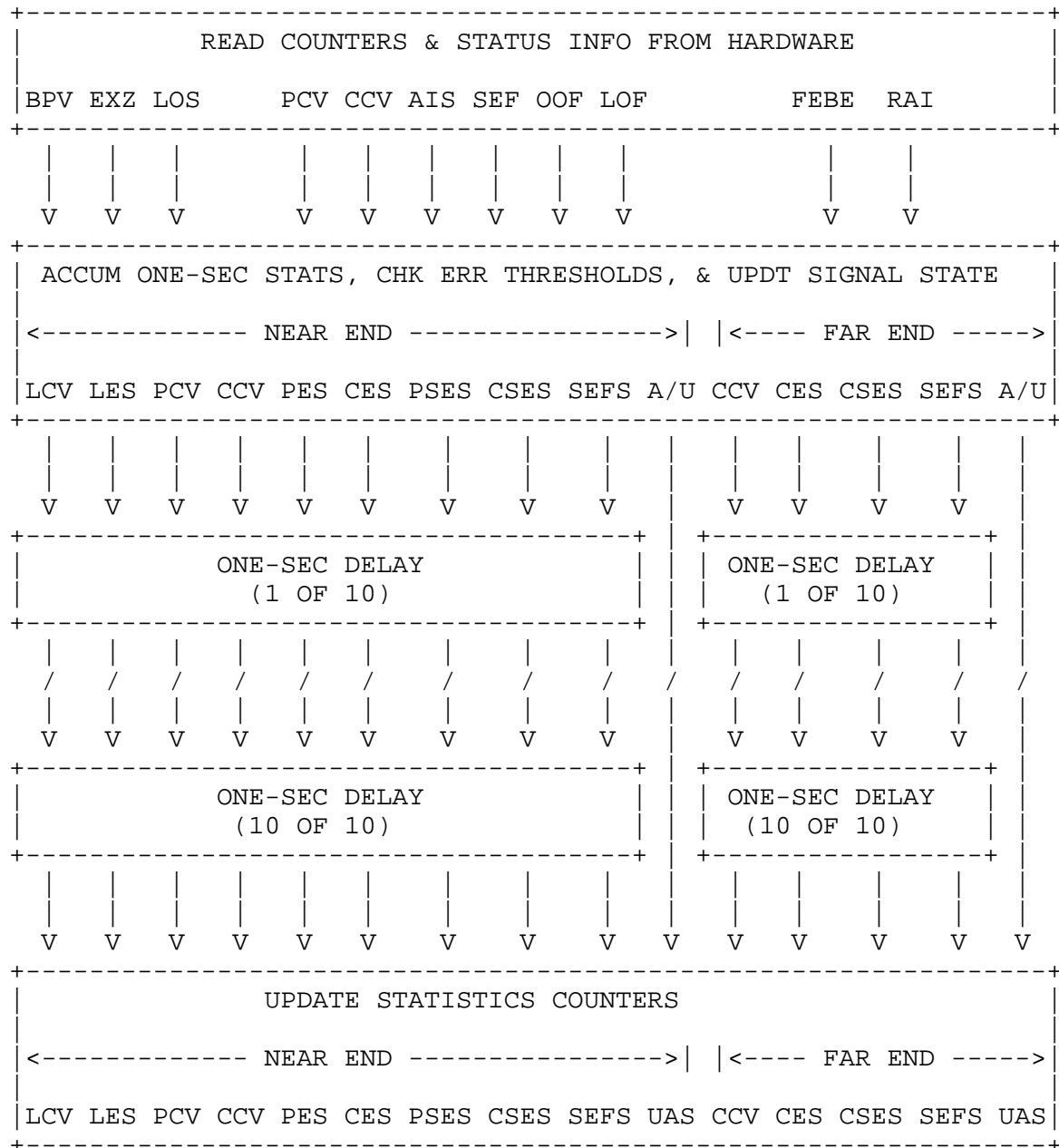
If the CSU shelf is managed by itself by a local SNMP Agent, the situation would be:

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 Unavailable 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.

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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

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