

Network Working Group
Request for Comments: 1232

F. Baker
Advanced Computer Communications, Inc.
C. Kolb
Performance Systems International, Inc.
Editors
May 1991

Definitions of Managed Objects for the DS1 Interface Type

Status of this Memo

This memo defines objects for managing DS1 Interface objects for use with the SNMP protocol. This memo is a product of the Transmission MIB Working Group of the Internet Engineering Task Force (IETF). This RFC specifies an IAB standards track protocol for the Internet community, and requests discussion and suggestions for improvements. Please refer to the current edition of the "IAB Official Protocol Standards" for the standardization state and status of this protocol. Distribution of this memo is unlimited.

Table of Contents

1. Abstract	1
2. The Network Management Framework.....	2
3. Objects	2
3.1 Format of Definitions	3
4. Overview	3
4.1 Binding between Interfaces and CSUs	3
4.2 Objectives of this MIB Module	4
4.3 DS1 Terminology	4
5. Definitions	6
5.1 The DS1 Configuration Group	6
5.2 The DS1 Interval Group	13
5.3 The DS1 Current Group	16
5.4 The DS1 Total Group	19
5.5 The DS1 Fractional Group	22
6. Acknowledgements	25
7. References	26
8. Security Considerations.....	27
9. Authors' Addresses.....	28

1. Abstract

This memo defines an experimental portion of the Management Information Base (MIB) for use with network management protocols in TCP/IP-based internets. In particular, this memo defines MIB objects

for representing DS1 physical interfaces. Implementors should consult in addition to this memo the companion document that describes that DS3 managed objects.

2. The Network Management Framework

The Internet-standard Network Management Framework consists of three components. They are:

RFC 1155 which defines the SMI, the mechanisms used for describing and naming objects for the purpose of management. RFC 1212 defines a more concise description mechanism, which is wholly consistent with the SMI.

RFC 1156 which defines MIB-I, the core set of managed objects for the Internet suite of protocols. RFC 1213, defines MIB-II, an evolution of MIB-I based on implementation experience and new operational requirements.

RFC 1157 which defines the SNMP, the protocol used for network access to managed objects.

The Framework permits new objects to be defined for the purpose of experimentation and evaluation.

3. Objects

Managed objects are accessed via a virtual information store, termed the Management Information Base or MIB. Objects in the MIB are defined using the subset of Abstract Syntax Notation One (ASN.1) [7] defined in the SMI. In particular, each object has a name, a syntax, and an encoding. The name is an object identifier, an administratively assigned name, which specifies an object type. The object type together with an object instance serves to uniquely identify a specific instantiation of the object. For human convenience, we often use a textual string, termed the OBJECT DESCRIPTOR, to also refer to the object type.

The syntax of an object type defines the abstract data structure corresponding to that object type. The ASN.1 language is used for this purpose. However, the SMI [3] purposely restricts the ASN.1 constructs which may be used. These restrictions are explicitly made for simplicity.

The encoding of an object type is simply how that object type is represented using the object type's syntax. Implicitly tied to the notion of an object type's syntax and encoding is how the object type is represented when being transmitted on the network.

The SMI specifies the use of the basic encoding rules of ASN.1 [8], subject to the additional requirements imposed by the SNMP.

3.1. Format of Definitions

Section 5 contains the specification of all object types contained in this MIB module. The object types are defined using the conventions defined in the SMI, as amended by the extensions specified in [13].

4. Overview

These objects are used when the particular media being used to realize an interface is a DS1 physical interface. At present, this applies to these values of the ifType variable in the Internet-standard MIB:

```
ds1 (18)
e1  (19)
```

The definitions contained herein are based on the AT&T T-1 specifications and Extended Superframe (ESF) format [9, 10], the latter of which conforms to proposed ANSI specifications [14, 15]. The various T1 and E1 line disciplines are similar enough that separate MIBs are unwarranted, although there are some differences. For example, Loss of Frame is defined more rigorously in the ESF specification than in the D4 specification, but it is defined in both.

4.1. Binding between Interfaces and CSUs

It should be noted that it is possible to multiplex multiple bit streams onto a single DS1 physical interface (CSU), realizing multiple interfaces from the perspective of the Internet-standard MIB. It is also possible to concatenate physical interfaces to provide a single logical interface. As such, it is important to be able to distinguish between the indices used to identify the CSUs attached to a node and the indices used to identify an interface (in the MIB sense) attached to a node.

Each agent which resides on a host which uses DS1 physical interfaces is required to assign a small, positive integer uniquely to each CSU. This is known as the "CSUIndex", and is used to distinguish between different CSUs attached to a node. The CSUIndex is also used as the "key" when accessing tabular information about DS1 physical interfaces.

The potentially many-to-one binding between CSU indices and the

ifIndex value assigned to each MIB interface are defined in the ds1ConfigTable table defined in the next section.

4.2. Objectives of this MIB Module

There are numerous things that could be included in a MIB for DS1 Interfaces: the management of multiplexors, CSUs, DSUs, and the like. The intent of this document is to facilitate the common management of CSUs, both in-chassis and external via proxy. 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 CSUs that are currently deployed, which is to say ESF CSUs conforming to AT&T specifications. However, by simple generalization of these objects, the MIB is also made applicable to D4 and G.704 devices.

To meet a requirement not easily satisfied in other places, there is one additional group present, the Fractional DS1 group. This is intended to facilitate the use of fractional DS1 devices (i.e., devices which utilize a subset of the 8 bit channels available in the frame) over the managed CSUs.

4.3. DS1 Terminology

The terminology used in this document to describe error conditions on a T1 or E1 circuit monitored by a CSU are from references [10], [11], [14], and [15].

Out of Frame event

An Out of Frame event is declared when the receiver detects two or more framing-bit errors within a 3 millisecond period, or two or more errors out of five or less consecutive framing-bits. At this time, the framer enters the Out of Frame State, and starts searching for a correct framing pattern. The Out of Frame state ends when reframe occurs.

Loss of Signal

This event is declared upon observing 175 +/- 75 contiguous pulse positions with no pulses of either positive or negative polarity (also called keep alive).

Code Violation Error Event

A Code Violation Error Event is the occurrence of a received Cyclic Redundancy Check code that is not identical to the corresponding locally-calculated code.

Bipolar Violation

A Bipolar Violation, for B8ZS-coded signals, is the

occurrence of a received bipolar violation that is not part of a zero-substitution code. It also includes other error patterns such as: eight or more consecutive zeros and incorrect parity.

Errored Seconds

An Errored Second is a second with one or more Code Violation Error Events OR one or more Out of Frame events. In D4 and G.704 section 2.1.3.2 (eg, G.704 which does not implement the CRC), the presence of Bipolar Violations also triggers an Errored Second.

Severely Errored Seconds

A Severely Errored Second is a second with 320 or more Code Violation Error Events OR one or more Out of Frame events.

Severely Errored Framing Second

An Severely Errored Framing Second is a second with one or more Out of Frame events.

Unavailable Signal State

This state is declared at the onset of 10 consecutive Severely Errored Seconds. It is cleared at the onset of 10 consecutive seconds with no Severely Errored Second.

Unavailable Seconds

Unavailable Seconds are calculated by counting the number of seconds that the CSU is in the Unavailable Signal State, including the initial 10 seconds to enter the state but not including the 10 seconds to exit the state.

Note that any second that may be counted as an Unavailable Second may not be counted as an Errored Second, a Severely Errored Second. Since the 10 Severely Errored Seconds that comprise the transition from the available to Unavailable Signal State may also be counted as Errored Seconds, and Severely Errored Seconds previous to entering the state, these three counters are adjusted so that any second counted during this transition is then subtracted. The 10 seconds in the transition from unavailable to available may be counted as Errored Seconds.

A special case exists when the 10 or more second period crosses the 900 second statistics window boundary, as the foregoing description implies that the Severely Errored Second and Unavailable Second counters must be adjusted

when the Unavailable Signal State is entered. Clearly, successive GETs of the affected `ds1IntervalSES` and `ds1IntervalUAS` objects will return differing values if the first GET occurs during the first few seconds of the window. This is viewed as an unavoidable side-effect of selecting the presently deployed AT&T objects as a basis for this memo.

Yellow Alarm

A Yellow Alarm is declared because of an incoming Yellow Signal from the far-end. In effect, the circuit is declared to be a one way link.

Red Alarm

A Red Alarm is declared because of an incoming Loss of Signal, Loss of Framing, Alarm Indication Signal. After a Red Alarm is declared, the device sends a Yellow Signal to the far-end. The far-end, when receives the Yellow Signal, declares a Yellow Alarm.

Circuit Identifier

This is a character string specified by the circuit vendor, and is useful when communicating with the vendor during the troubleshooting process.

5. Definitions

```
RFC1232-MIB DEFINITIONS ::= BEGIN
```

```
IMPORTS
```

```
    experimental, Counter
        FROM RFC1155-SMI
    DisplayString
        FROM RFC1158-MIB
    OBJECT-TYPE
        FROM RFC-1212;
```

```
-- This MIB module uses the extended OBJECT-TYPE macro as
-- defined in [13].
```

```
-- this is the MIB module for ds1 objects
```

```
ds1 OBJECT IDENTIFIER ::= { experimental 2 }
```

```
-- the DS1 Configuration group
```

```
-- Although the objects in this group are read-only, at the
-- agent's discretion they may be made read-write so that the
-- management station, when appropriately authorized, may
-- change the behavior of the CSU, e.g., to place the device
-- into a loopback state or emit a QRSS BER test.
```

```
-- Implementation of this group is mandatory for all systems
-- that attach to a ds1.
```

```
ds1ConfigTable OBJECT-TYPE
    SYNTAX      SEQUENCE OF DS1ConfigEntry
    ACCESS      not-accessible
    STATUS      mandatory
    DESCRIPTION
        "The DS1 Configuration table."
    ::= { ds1 1 }
```

```
ds1ConfigEntry OBJECT-TYPE
    SYNTAX      DS1ConfigEntry
    ACCESS      not-accessible
    STATUS      mandatory
    DESCRIPTION
        "An entry in the DS1 Configuration table."
    INDEX      { ds1CSUIndex }
    ::= { ds1ConfigTable 1 }
```

```
DS1ConfigEntry ::=
    SEQUENCE {
        ds1CSUIndex
            INTEGER,
        ds1Index
            INTEGER,
        ds1TimeElapsed
            INTEGER (1..900),
        ds1ValidIntervals
            INTEGER (0..96),
        ds1LineType
            INTEGER,
        ds1ZeroCoding
            INTEGER,
        ds1Loopback
            INTEGER,
        ds1SendCode
            INTEGER,
        ds1YellowAlarm
            INTEGER,
        ds1RedAlarm
            INTEGER,
```

```
        dslCircuitIdentifier
            DisplayString (SIZE (0..255))
    }

dslCSUIndex OBJECT-TYPE
    SYNTAX  INTEGER
    ACCESS  read-only
    STATUS  mandatory
    DESCRIPTION
        "The index value which uniquely identifies the CSU
         to which this entry is applicable."
    ::= { dslConfigEntry 1 }

dslIndex OBJECT-TYPE
    SYNTAX  INTEGER
    ACCESS  read-only
    STATUS  mandatory
    DESCRIPTION
        "An index value that uniquely identifies an
         interface to a dsl.  The interface identified by a
         particular value of this index is the same
         interface as identified by the same value an
         ifIndex object instance."
    ::= { dslConfigEntry 2 }

dslTimeElapsed OBJECT-TYPE
    SYNTAX  INTEGER (1..900)
    ACCESS  read-only
    STATUS  mandatory
    DESCRIPTION
        "The number of seconds that have elapsed since the
         beginning of the current error-measurement period.
         Any fraction is rounded up."
    ::= { dslConfigEntry 3 }

dslValidIntervals OBJECT-TYPE
    SYNTAX  INTEGER (0..96)
    ACCESS  read-only
    STATUS  mandatory
    DESCRIPTION
        "The number of previous intervals for which valid
         data was collected.  The value will be 96 unless
         the CSU device was brought online within the last
         24 hours, in which case the value will be the
         number of complete 15 minute intervals the CSU has
         been online."
    ::= { dslConfigEntry 4 }
```



```

ds1LineType OBJECT-TYPE
    SYNTAX  INTEGER {
                other(1),
                ds1ESF(2),
                ds1D4(3),
                ds1ANSI-ESF(4),
                ds1G704(5),
                ds1G704-CRC(6)
            }
    ACCESS  read-only
    STATUS  mandatory
    DESCRIPTION
        "This variable indicates the variety of DS1 Line
        implementing this circuit.  The type of circuit
        affects the number of bits per second that the
        circuit can reasonably carry, as well as the
        interpretation of the usage and error statistics.

        The values, in sequence, describe:
        TITLE:          SPECIFICATION:
        ds1ESF          AT&T Extended SuperFrame DS1 [10]
        ds1D4           AT&T D4 format DS1 [16], [17]
        ds1ANSI-ESF     ANSI Extended SuperFrame format [14]
        ds1G704         CCITT Recommendation G.704 [12]
                        (section 2.1.3.2)
        ds1G704-CRC     CCITT Recommendation G.704 [12]
                        (section 2.1.3.1)
        "
    ::= { ds1ConfigEntry 5 }

ds1ZeroCoding OBJECT-TYPE
    SYNTAX  INTEGER {
                ds1JammedBit(1),
                ds1B8ZS(2),
                ds1InvertedHDL(3),
                ds1HDB3(4),
                ds1ZBT(5)
            }
    ACCESS  read-only
    STATUS  mandatory
    DESCRIPTION
        "This variable describes the variety of Zero Code
        Suppression used on the link, which in turn
        affects a number of its characteristics.

        ds1JammedBit refers the Jammed bit Zero Encoding,
        in which the AT&T specification of at least one
        pulse every 8 bit periods is literally implemented

```

by forcing a pulse in bit 8 of each channel. Thus, only seven bits per channel, or 1.344 Mbps, is available for data.

ds1B8ZS refers to the use of a specified pattern of normal bits and bipolar violations which are used to replace a sequence of eight zero bits (see [14]). In this context, all eight bits in a channel are technically available for data, but care must be taken with D4 encoded data to avoid having HDLC Flag streams imitate spurious Yellow Alarm conditions. Typically, one bit per frame is ignored to force flag streams to rotate, thereby avoiding this error type. CCITT Recommendation G.703 [11] may be referred to for further definition of these.

ds1InvertedHDLC refers to the practice, common on HDLC encoded DS1 data links, of inverting the data between the serial interface chip and the CSU. Since HDLC guarantees one zero every 6 bits in the worst case, while the standards call for (in effect) at least one pulse every eight, inverted HDLC enjoys 4/24 one's density on the line, which may improve the effective clock stability of a DS1 line. As with B8ZS, all eight bits in a channel are technically available for data, but care must be taken with D4 encoded data to avoid having HDLC Flag streams imitate spurious Yellow Alarm conditions. Typically, one bit per frame is ignored to force flag streams to rotate, thereby avoiding this error type.

ANSI Clear Channels may use ds1ZBTSI, or Zero Byte Time Slot Interchange (see [14]).

G.704 links, with or without CRC, use ds1HDB3 (see [11]). "

```
::= { ds1ConfigEntry 6 }
```

```
ds1Loopback OBJECT-TYPE
```

```
SYNTAX INTEGER {
    ds1NoLoop(1),
    ds1LocalLoopbackLocalSide(2),
    ds1LocalLoopbackRemoteSide(3),
    ds1RemoteLoopbackLocalSide(4),
    ds1RemoteLoopbackRemoteSide(5)
}
```

ACCESS read-only

STATUS mandatory

DESCRIPTION

"This variable represents the loopback state of the CSU. Devices supporting read/write access should return badValue in response to a requested loopback state that the CSU does not support. The values mean:

dslNoLoop

Not in the loopback state. A device that is not capable of performing a loopback on either interface shall always return this as it's value.

dslLocalLoopbackLocalSide

Signal received from the local side of the device is looped back at the local connector (eg, without involving the CSU).

dslLocalLoopbackRemoteSide

Signal received from the local side of the device is looped back at the remote connector (eg, through the CSU).

dslRemoteLoopbackLocalSide

Signal received from the remote side of the device is looped back at the local connector (eg, through the CSU).

dslRemoteLoopbackRemoteSide

Signal received from the remote side of the device is looped back at the remote connector (eg, without involving the CSU)."

::= { dslConfigEntry 7 }

dslSendCode OBJECT-TYPE

SYNTAX INTEGER {
 dslOtherTest(1),
 dslSendNoCode(2),
 dslSendSetCode(3),
 dslSendResetCode(4),
 dslSendQRSS(5)

```

    }
ACCESS   read-only
STATUS   mandatory
DESCRIPTION
    "This variable indicates what type of code is
    being sent across the DS1 circuit by the CSU.  The
    values mean:

    ds1SendNoCode      sending looped or normal data
    ds1SendSetCode     sending a loopback request
    ds1SendResetCode   sending a loopback termination request
    ds1SendQRSS        sending the BERT pattern described in
                        ANSI T1.403-1989 section 5.6
    ds1OtherTest       sending a different BERT/BLERT pattern,
                        such as all zeroes, all ones, etc."
::= { ds1ConfigEntry 8 }

ds1YellowAlarm OBJECT-TYPE
SYNTAX   INTEGER {
            ds1NoYellowAlarm (1),
            ds1YellowAlarm (2)
        }
ACCESS   read-only
STATUS   mandatory
DESCRIPTION
    "This variable indicates if a Yellow Alarm
    condition exists.

    Note that G.704 interfaces do not support Yellow
    Alarms.  Accordingly, such agents should return
    the value ds1NoYellowAlarm."
::= { ds1ConfigEntry 9 }

ds1RedAlarm OBJECT-TYPE
SYNTAX   INTEGER {
            ds1NoRedAlarm (1),
            ds1RedAlarm (2)
        }
ACCESS   read-only
STATUS   mandatory
DESCRIPTION
    "This variable indicates if a Red Alarm condition
    exists.

    Note that G.704 interfaces do not support Red
    Alarms.  Accordingly, such agents should return
    the value ds1NoRedAlarm."
::= { ds1ConfigEntry 10 }

```

```

dslCircuitIdentifier OBJECT-TYPE
    SYNTAX  DisplayString (SIZE (0..255))
    ACCESS  read-only
    STATUS  mandatory
    DESCRIPTION
        "This variable contains the transmission vendor's
        circuit identifier, for the purpose of
        facilitating troubleshooting."
    ::= { dslConfigEntry 11 }

-- the DS1 Interval group

-- Implementation of this group is mandatory for all systems
-- that attach to a dsl.

-- It is recognized that some currently deployed CSUs do not
-- record the entire set of statistics specified in this
-- group. Accordingly, some agents queried for these objects
-- may treat these objects as having an ACCESS clause value
-- of not-accessible.

-- The DS1 Interval Table contains various statistics
-- collected by each CSU over the previous 24 hours of
-- operation. The past 24 hours are broken into 96 completed
-- 15 minute intervals.

dslIntervalTable OBJECT-TYPE
    SYNTAX  SEQUENCE OF DS1IntervalEntry
    ACCESS  not-accessible
    STATUS  mandatory
    DESCRIPTION
        "The DS1 Interval table."
    ::= { dsl 2 }

dslIntervalEntry OBJECT-TYPE
    SYNTAX  DS1IntervalEntry
    ACCESS  not-accessible
    STATUS  mandatory
    DESCRIPTION
        "An entry in the DS1 Interval table."
    INDEX   { dslIntervalIndex, dslIntervalNumber }
    ::= { dslIntervalTable 1 }

DS1IntervalEntry ::=
    SEQUENCE {
        dslIntervalIndex
            INTEGER,

```

```

        ds1IntervalNumber
            INTEGER (1..96),
        ds1IntervaleSs
            Counter,
        ds1IntervalSESS
            Counter,
        ds1IntervalSEFSS
            Counter,
        ds1IntervalUASs
            Counter,
        ds1IntervalCSSs
            Counter,
        ds1IntervalBPVs
            Counter,
        ds1IntervalCVs
            Counter
    }

ds1IntervalIndex OBJECT-TYPE
    SYNTAX  INTEGER
    ACCESS  read-only
    STATUS  mandatory
    DESCRIPTION
        "The index value which uniquely identifies the CSU
        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 ds1CSUIndex object instance."
    ::= { ds1IntervalEntry 1 }

ds1IntervalNumber OBJECT-TYPE
    SYNTAX  INTEGER (1..96)
    ACCESS  read-only
    STATUS  mandatory
    DESCRIPTION
        "A number between 1 and 96, where 1 is the most
        recently completed 15 minute interval and 96 is
        the least recently completed 15 minute interval
        (assuming that all 96 intervals are valid)."
    ::= { ds1IntervalEntry 2 }

ds1IntervaleSs OBJECT-TYPE
    SYNTAX  Counter
    ACCESS  read-only
    STATUS  mandatory
    DESCRIPTION
        "The counter associated with the number of Errored
        Seconds, as defined by ANSI Draft Standard

```

```

        T1M1.3/90 - 027R2[15], encountered by a DS1 CSU
        during one of the previous 96 fifteen minute
        intervals."
 ::= { dslIntervalEntry 3 }

dslIntervalSESSs OBJECT-TYPE
    SYNTAX Counter
    ACCESS read-only
    STATUS mandatory
    DESCRIPTION
        "The counter associated with the number of
        Severely Errored Seconds, as defined by ANSI Draft
        Standard T1M1.3/90 - 027R2[15], encountered by a
        DS1 CSU during one of the previous 96 fifteen
        minute intervals."
 ::= { dslIntervalEntry 4 }

dslIntervalSEFSSs OBJECT-TYPE
    SYNTAX Counter
    ACCESS read-only
    STATUS mandatory
    DESCRIPTION
        "The counter associated with the number of
        Severely Errored Framing Seconds, as defined by
        ANSI Draft Standard T1M1.3/90 - 027R2[15],
        encountered by a DS1 CSU during one of the
        previous 96 fifteen minute intervals."
 ::= { dslIntervalEntry 5 }

dslIntervalUASSs OBJECT-TYPE
    SYNTAX Counter
    ACCESS read-only
    STATUS mandatory
    DESCRIPTION
        "The counter associated with the number of
        Unavailable Seconds, as defined by ANSI Draft
        Standard T1M1.3/90 - 027R2[15], encountered by a
        DS1 CSU during one of the previous 96 fifteen
        minute intervals."
 ::= { dslIntervalEntry 6 }

dslIntervalCSSs OBJECT-TYPE
    SYNTAX Counter
    ACCESS read-only
    STATUS mandatory
    DESCRIPTION
        "The counter associated with the number of
        Controlled Slip Seconds, as defined by ANSI Draft
```

Standard T1M1.3/90 - 027R2[15], encountered by a DS1 CSU during one of the previous 96 fifteen minute intervals."
 ::= { dslIntervalEntry 7 }

dslIntervalBPVs OBJECT-TYPE

SYNTAX Counter
 ACCESS read-only
 STATUS mandatory
 DESCRIPTION

"The counter associated with the number of Bipolar Violations, as defined by ANSI Draft Standard T1M1.3/90 - 027R2[15], encountered by a DS1 CSU during one of the previous 96 fifteen minute intervals."

::= { dslIntervalEntry 8 }

dslIntervalCVs OBJECT-TYPE

SYNTAX Counter
 ACCESS read-only
 STATUS mandatory
 DESCRIPTION

"The counter associated with the number of Code Violation Error Events, as defined by ANSI Draft Standard T1M1.3/90 - 027R2[15], encountered by a DS1 CSU during one of the previous 96 fifteen minute intervals."

Note that D4 and G.704 (section 2.1.3.2) interfaces do not support Code Violation Error Events. Accordingly, such agents may treat this object as having an ACCESS clause value of not-accessible."

::= { dslIntervalEntry 9 }

-- the DS1 Current group

-- Implementation of this group is mandatory for all systems
 -- that attach to a ds1.

-- It is recognized that some currently deployed CSUs do not
 -- record the entire set of statistics specified in this
 -- group. Accordingly, some agents queried for these objects
 -- may treat these objects as having an ACCESS clause value
 -- of not-accessible.

-- The DS1 current table contains various statistics being

-- collected for the current 15 minute interval.

```
ds1CurrentTable OBJECT-TYPE
    SYNTAX  SEQUENCE OF DS1CurrentEntry
    ACCESS  not-accessible
    STATUS  mandatory
    DESCRIPTION
        "The DS1 Current table."
    ::= { ds1 3 }
```

```
ds1CurrentEntry OBJECT-TYPE
    SYNTAX  DS1CurrentEntry
    ACCESS  not-accessible
    STATUS  mandatory
    DESCRIPTION
        "An entry in the DS1 Current table."
    INDEX   { ds1CurrentIndex }
    ::= { ds1CurrentTable 1 }
```

```
DS1CurrentEntry ::=
    SEQUENCE {
        ds1CurrentIndex
            INTEGER,
        ds1CurrentESS
            Counter,
        ds1CurrentSESS
            Counter,
        ds1CurrentSEFSs
            Counter,
        ds1CurrentUASs
            Counter,
        ds1CurrentCSSs
            Counter,
        ds1CurrentBPVs
            Counter,
        ds1CurrentCVs
            Counter
    }
```

```
ds1CurrentIndex OBJECT-TYPE
    SYNTAX  INTEGER
    ACCESS  read-only
    STATUS  mandatory
    DESCRIPTION
        "The index value which uniquely identifies the CSU
        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 dslCSUIndex object instance."
 ::= { dslCurrentEntry 1 }

dslCurrentESS OBJECT-TYPE
    SYNTAX Counter
    ACCESS read-only
    STATUS mandatory
    DESCRIPTION
        "The counter associated with the number of Errored
        Seconds, as defined by ANSI Draft Standard
        T1M1.3/90 - 027R2[15], encountered by a DS1 CSU in
        the current 15 minute interval."
 ::= { dslCurrentEntry 2 }

dslCurrentSESS OBJECT-TYPE
    SYNTAX Counter
    ACCESS read-only
    STATUS mandatory
    DESCRIPTION
        "The counter associated with the number of
        Severely Errored Seconds, as defined by ANSI Draft
        Standard T1M1.3/90 - 027R2[15], encountered by a
        DS1 CSU in the current 15 minute interval."
 ::= { dslCurrentEntry 3 }

dslCurrentSEFSS OBJECT-TYPE
    SYNTAX Counter
    ACCESS read-only
    STATUS mandatory
    DESCRIPTION
        "The counter associated with the number of
        Severely Errored Framing Seconds, as defined by
        ANSI Draft Standard T1M1.3/90 - 027R2[15],
        encountered by a DS1 CSU in the current 15 minute
        interval."
 ::= { dslCurrentEntry 4 }

dslCurrentUASS OBJECT-TYPE
    SYNTAX Counter
    ACCESS read-only
    STATUS mandatory
    DESCRIPTION
        "The counter associated with the number of
        Unavailable Seconds, as defined by ANSI Draft
        Standard T1M1.3/90 - 027R2[15], encountered by a
        DS1 CSU in the current 15 minute interval."
 ::= { dslCurrentEntry 5 }
```

`ds1CurrentCSSs OBJECT-TYPE``SYNTAX Counter``ACCESS read-only``STATUS mandatory``DESCRIPTION`

"The counter associated with the number of Controlled Slip Seconds, as defined by ANSI Draft Standard T1M1.3/90 - 027R2[15], encountered by a DS1 CSU in the current 15 minute interval."

`::= { ds1CurrentEntry 6 }``ds1CurrentBPVs OBJECT-TYPE``SYNTAX Counter``ACCESS read-only``STATUS mandatory``DESCRIPTION`

"The counter associated with the number of Bipolar Violations, as defined by ANSI Draft Standard T1M1.3/90 - 027R2[15], encountered by a DS1 CSU in the current 15 minute interval."

`::= { ds1CurrentEntry 7 }``ds1CurrentCVs OBJECT-TYPE``SYNTAX Counter``ACCESS read-only``STATUS mandatory``DESCRIPTION`

"The counter associated with the number of Code Violation Error Events, as defined by ANSI Draft Standard T1M1.3/90 - 027R2[15], encountered by a DS1 CSU in the current 15 minute interval."

Note that D4 and G.704 (section 2.1.3.2) interfaces do not support Code Violation Error Events. Accordingly, such agents may treat this object as having an ACCESS clause value of not-accessible."

`::= { ds1CurrentEntry 8 }`

-- the DS1 Total group

-- Implementation of this group is mandatory for all systems
-- that attach to a ds1.

-- It is recognized that some currently deployed CSUs do not
-- record the entire set of statistics specified in this
-- group. Accordingly, some agents queried for these objects

```
-- may treat these objects as having an ACCESS clause value
-- of not-accessible.
```

```
-- The DS1 Total Table contains the cumulative sum of the
-- various statistics for the 24 hour interval preceding the
-- first valid interval in the ds1CurrentTable.
```

```
ds1TotalTable OBJECT-TYPE
    SYNTAX  SEQUENCE OF DS1TotalEntry
    ACCESS  not-accessible
    STATUS  mandatory
    DESCRIPTION
        "The DS1 Total table.  24 hour interval."
    ::= { ds1 4 }
```

```
ds1TotalEntry OBJECT-TYPE
    SYNTAX  DS1TotalEntry
    ACCESS  not-accessible
    STATUS  mandatory
    DESCRIPTION
        "An entry in the DS1 Total table."
    INDEX   { ds1TotalIndex }
    ::= { ds1TotalTable 1 }
```

```
DS1TotalEntry ::=
    SEQUENCE {
        ds1TotalIndex
            INTEGER,
        ds1TotalESS
            Counter,
        ds1TotalSESS
            Counter,
        ds1TotalSEFSS
            Counter,
        ds1TotalUASS
            Counter,
        ds1TotalCSSS
            Counter,
        ds1TotalBPVs
            Counter,
        ds1TotalCVs
            Counter
    }
```

```
ds1TotalIndex OBJECT-TYPE
    SYNTAX  INTEGER
    ACCESS  read-only
    STATUS  mandatory
```

DESCRIPTION
 "The index value which uniquely identifies the CSU 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 dslCSUIndex object instance."
::= { dslTotalEntry 1 }

dslTotalESS OBJECT-TYPE
SYNTAX Counter
ACCESS read-only
STATUS mandatory
DESCRIPTION
 "The counter associated with the number of Errored Seconds, as defined by ANSI Draft Standard T1M1.3/90 - 027R2[15], encountered by a DS1 CSU in the previous 24 hour interval"
::= { dslTotalEntry 2 }

dslTotalSESS OBJECT-TYPE
SYNTAX Counter
ACCESS read-only
STATUS mandatory
DESCRIPTION
 "The counter associated with the number of Severely Errored Seconds, as defined by ANSI Draft Standard T1M1.3/90 - 027R2[15], encountered by a DS1 CSU in the previous 24 hour interval."
::= { dslTotalEntry 3 }

dslTotalSEFSS OBJECT-TYPE
SYNTAX Counter
ACCESS read-only
STATUS mandatory
DESCRIPTION
 "The counter associated with the number of Severely Errored Framing Seconds, as defined by ANSI Draft Standard T1M1.3/90 - 027R2[15], encountered by a DS1 CSU in the previous 24 hour interval."
::= { dslTotalEntry 4 }

dslTotalUASS OBJECT-TYPE
SYNTAX Counter
ACCESS read-only
STATUS mandatory
DESCRIPTION
 "The counter associated with the number of

Unavailable Seconds, as defined by ANSI Draft
Standard T1M1.3/90 - 027R2[15], encountered by a
DS1 CSU in the previous 24 hour interval."
::= { ds1TotalEntry 5 }

ds1TotalCSSs OBJECT-TYPE

SYNTAX Counter
ACCESS read-only
STATUS mandatory
DESCRIPTION

"The counter associated with the number of
Controlled Slip Seconds, as defined by ANSI Draft
Standard T1M1.3/90 - 027R2[15], encountered by a
DS1 CSU in the previous 24 hour interval."
::= { ds1TotalEntry 6 }

ds1TotalBPVs OBJECT-TYPE

SYNTAX Counter
ACCESS read-only
STATUS mandatory
DESCRIPTION

"The counter associated with the number of Bipolar
Violations, as defined by ANSI Draft Standard
T1M1.3/90 - 027R2[15], encountered by a DS1 CSU in
the previous 24 hour interval."
::= { ds1TotalEntry 7 }

ds1TotalCVs OBJECT-TYPE

SYNTAX Counter
ACCESS read-only
STATUS mandatory
DESCRIPTION

"The counter associated with the number of Code
Violation Error Events, as defined by ANSI Draft
Standard T1M1.3/90 - 027R2[15], encountered by a
DS1 CSU in the previous 24 hour interval.

Note that D4 and G.704 (section 2.1.3.2)
interfaces do not support Code Violation Error
Events. Accordingly, such agents may treat this
object as having an ACCESS clause value of not-
accessible."
::= { ds1TotalEntry 8 }

-- the DS1 Fractional group

-- Implementation of this group is mandatory for those

```

-- systems utilizing a fractional DS1 capability

-- The DS1 fractional table contains identifies which DS1
-- 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 Clear Channel
-- implementations, exactly one ifTable entry corresponds to
-- the CSU being managed. In this very typical case, the
-- variable ds1Index indicates the value of ifIndex which
-- corresponds to the interface being supported by a
-- particular CSU.

-- However, for fractional DS1 implementations, the
-- correspondent value of ds1Index is 0, and for each DS1
-- channel supporting a logical interface, there is an entry
-- in the DS1 fractional table which names a value for
-- ifIndex.
--
-- For ds1ESF, ds1D4, and ds1ANSI-ESF, there are 24 legal
-- channels, numbered 1 through 24.
--
-- For G.704, there are 32 legal channels, numbered 1
-- through 32. ds1G704 can carry user data in channels 2
-- through 32, channel 1 being an overhead channel.
-- ds1G704-CRC can carry user data in channels 2 through
-- 16 and 18 through 32, channels 1 and 17 being overhead
-- channels.

ds1FracTable OBJECT-TYPE
    SYNTAX SEQUENCE OF DS1FracEntry
    ACCESS not-accessible
    STATUS mandatory
    DESCRIPTION
        "The DS1 Fractional table."
    ::= { ds1 5 }

ds1FracEntry OBJECT-TYPE
    SYNTAX DS1FracEntry
    ACCESS not-accessible
    STATUS mandatory
    DESCRIPTION
        "An entry in the DS1 Fractional table."
    INDEX { ds1FracIndex, ds1FracNumber }
    ::= { ds1FracTable 1 }

DS1FracEntry ::=
    SEQUENCE {

```

```
        dslFracIndex
            INTEGER,
        dslFracNumber
            INTEGER (1..32),
        dslFracIfIndex
            INTEGER
    }

dslFracIndex OBJECT-TYPE
    SYNTAX  INTEGER
    ACCESS  read-only
    STATUS  mandatory
    DESCRIPTION
        "The index value which uniquely identifies the CSU
        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 dslCSUIndex object instance."
    ::= { dslFracEntry 1 }

dslFracNumber OBJECT-TYPE
    SYNTAX  INTEGER (1..32)
    ACCESS  read-only
    STATUS  mandatory
    DESCRIPTION
        "The channel number for this entry."
    ::= { dslFracEntry 2 }

dslFracIfIndex OBJECT-TYPE
    SYNTAX  INTEGER
    ACCESS  read-only
    STATUS  mandatory
    DESCRIPTION
        "An index value that uniquely identifies an
        interface to a dsl.  The interface identified by a
        particular value of this index is the same
        interface as identified by the same value an
        ifIndex object instance."
    ::= { dslFracEntry 3 }

END
```


6. Acknowledgements

This document was produced by the SNMP and the Transmission MIB Working Groups:

Anne Ambler, Spider
Karl Auerbach, Sun
Fred Baker, ACC
Ken Brinkerhoff
Ron Broersma, NOSC
Jack Brown, US Army
Theodore Brunner, Bellcore
Jeffrey Buffum, HP
Jeffrey D. Case, UTK
Chris Chiptasso, Spartacus
Paul Ciarfella, DEC
Bob Collet
Tracy Cox, Bellcore
James R. Davin, MIT-LCS
Kurt Dobbins, Cabletron
Nadya El-Afandi, Network Systems
Gary Ellis, HP
Fred Engle
Mike Erlinger
Richard Fox, Synoptics
Karen Frisa, CMU
Chris Gunner, DEC
Ken Hibbard, Xylogics
Ole Jacobsen, Interop
Ken Jones
Satish Joshi, Synoptics
Frank Kastenholz, Racal-Interlan
Shimshon Kaufman, Spartacus
Jim Kinder, Fibercom
Alex Koifman, BBN
Christopher Kolb, PSI
Cheryl Krupczak, NCR
Peter Lin, Vitalink
John Lunny, TWG
Carl Malamud
Keith McCloghrie, HLS
Donna McMaster, David Systems
Lynn Monsanto, Sun
Dave Perkins, 3COM
Jim Reinstedler, Ungerman Bass
Anil Rijsinghani, DEC
Kary Robertson
Marshall T. Rose, PSI (chair)

L. Michael Sabo, NCSC
Jon Saperia, DEC
John Seligson
Fei Shu, NEC
Sam Sjogren, TGV
Mark Sleeper, Sparta
Lance Sprung
Mike St.Johns
Bob Stewart, Xyplex
Emil Sturniold
Kaj Tesink, Bellcore
Dean Throop, Data General
Bill Townsend, Xylogics
Maurice Turcotte
Kannan Varadhou
Sudhanshu Verma, HP
Warren Vik, Interactive Systems
David Waitzman, BBN
Steve Waldbusser, CMU
Dan Wintringhan
David Wood
Jeff Young, Cray Research

7. References

- [1] Cerf, V., "IAB Recommendations for the Development of Internet Network Management Standards", RFC 1052, NRI, April 1988.
- [2] Cerf, V., "Report of the Second Ad Hoc Network Management Review Group", RFC 1109, NRI, August 1989.
- [3] Rose M., and K. McCloghrie, "Structure and Identification of Management Information for TCP/IP-based internets", RFC 1155, Performance Systems International, Hughes LAN Systems, May 1990.
- [4] McCloghrie K., and M. Rose, "Management Information Base for Network Management of TCP/IP-based internets", RFC 1156, Hughes LAN Systems, Performance Systems International, May 1990.
- [5] Case, J., Fedor, M., Schoffstall, M., and J. Davin, "Simple Network Management Protocol", RFC 1157, SNMP Research, Performance Systems International, Performance Systems International, MIT Laboratory for Computer Science, May 1990.
- [6] McCloghrie K., and M. Rose, Editors, "Management Information Base for Network Management of TCP/IP-based internets", RFC 1213, Performance Systems International, March 1991.

- [7] Information processing systems - Open Systems Interconnection - Specification of Abstract Syntax Notation One (ASN.1), International Organization for Standardization, International Standard 8824, December 1987.
- [8] Information processing systems - Open Systems Interconnection - Specification of Basic Encoding Rules for Abstract Notation One (ASN.1), International Organization for Standardization, International Standard 8825, December 1987.
- [9] AT&T Information Systems, AT&T ESF DS1 Channel Service Unit User's Manual, 999-100-305, February 1988.
- [10] AT&T Technical Reference, Requirements for Interfacing Digital Terminal Equipment to Services Employing the Extended Superframe Format, Publication 54016, May 1988.
- [11] CCITT Specifications Volume III, Recommendation G.703, Physical/Electrical Characteristics of Hierarchical Digital Interfaces, July 1988.
- [12] CCITT Specifications Volume III, Recommendation G.704, Synchronous frame structures used at primary and secondary hierarchical levels, July 1988.
- [13] Rose, M., and K. McCloghrie, Editors, "Concise MIB Definitions", RFC 1212, Performance Systems International, Hughes LAN Systems, March 1991.
- [14] ANSI T1.403-1989 American National Standard for Telecommunications -- Carrier-to-Customer Installation -- DS1 Metallic Interface.
- [15] ANSI T1M1.3/90 - 027R2 Draft Proposed Standard -- Description of Installation and Maintenance Parameters for Digital Circuits, Facilities, and Networks.
- [16] Bell System Technical Reference, Publication 62411, High Capacity Digital Service Channel Interface Specification, September 1983.
- [17] Bell System Technical Reference, Publication 43801, "Digital Channel Bank Requirements and Objectives", November 1982.

8. Security Considerations

Security issues are not discussed in this memo.

9. Authors' Addresses

Fred Baker
Advanced Computer Communications, Inc.
720 Santa Barbara Street
Santa Barbara, California 93101

Phone: (805) 963 9431

EMail: fbaker@acc.com

Christopher P. Kolb
Performance Systems International, Inc.
Reston International Center
11800 Sunrise Valley Drive
Suite 1100
Reston, VA 22091

Phone: (703) 620-6651

EMail: kolb@psi.com