

Network Working Group
Request for Comments: 1694
Obsoletes: 1304
Category: Standards Track

T. Brown
K. Tesink
Editors
Bell Communications Research
August 1994

Definitions of Managed Objects for SMDS Interfaces using SMIV2

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.

Abstract

This memo defines a portion of the Management Information Base (MIB) for use with network management protocols in TCP/IP-based internets. In particular, it defines objects for managing objects for SMDS access interfaces. This includes the following access protocols:

- SIP [13]
- SIP/DXI [18] and [20]
- SIP/FR [19]
- SIP/ATM [24]

This memo replaces RFC 1304 [12], and defines a MIB module which is both compliant to the SNMPv2 SMI and semantically-identical to the existing RFC 1304-based definitions.

This memo also assumes application of the MIB II Interfaces group as defined in [9].

Table of Contents

1. The SNMPv2 Network Management Framework	2
2. Objects	3
2.1 Format of Definitions	3
3. Overview	4
3.1 SIP Level 3	5
4. Object Definitions	9
4.1 The SIP Level 3 Group	10
4.2 The SIP Level 2 Group	14
4.3 The SIP PLCP Group	17

4.3.1 The DS1 PLCP Group	17
4.3.2 The DS3 PLCP Group	19
4.4 The SMDS Applications Group	20
4.4.1 The IP over SMDS Group	21
4.5 The SMDS Carrier Selection Group	22
4.6 The SIP Error Log Group	23
4.7 The Data eXchange Interface Group	27
4.8 Conformance Information	29
5. Acknowledgments	32
6. References	32
7. Security Considerations	34
8. Authors' Addresses	35

1. The SNMPv2 Network Management Framework

The SNMPv2 Network Management Framework consists of four major components. They are:

- o RFC 1442 [1] which defines the SMI, the mechanisms used for describing and naming objects for the purpose of management.
- o STD 17, RFC 1213 [6] defines MIB-II, the core set of managed objects for the Internet suite of protocols. Reference [12] defines the evolution of the Interfaces Group of MIB II in terms of extensions and precise applications of the objects.
- o RFC 1445 [4] which defines the administrative and other architectural aspects of the framework.
- o RFC 1448 [5] which defines the protocol used for network access to managed objects.

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

This specification makes also use of:

- o RFC 1443 [2] which defines textual conventions for the specification of managed objects.
- o RFC 1444 [3] which defines conformance statements for the specification of managed objects.

2. 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 RFC 1442 purposely restricts the ASN.1 constructs which may be used. These restrictions are explicitly made for simplicity.

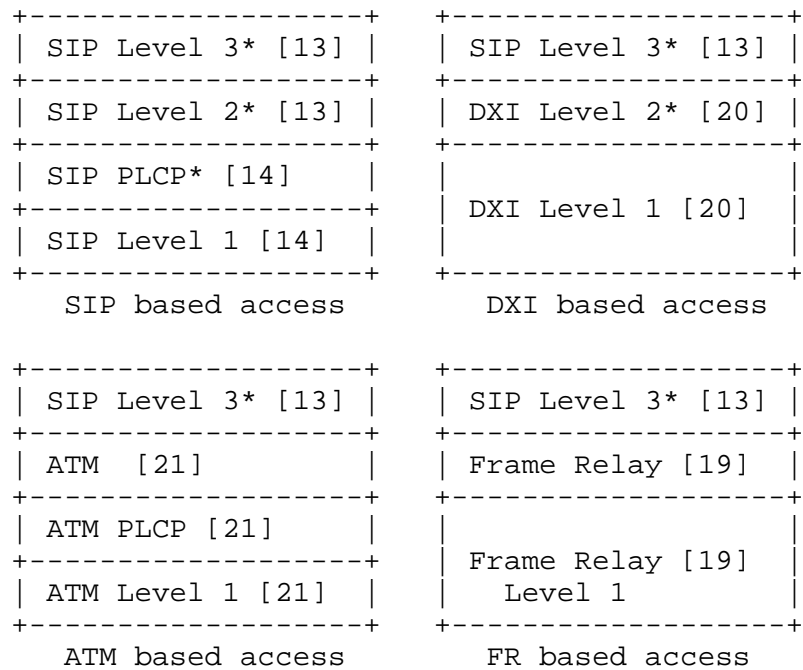
The encoding of an object type is simply how that object type is represented using the object type's syntax. Implicitly tied to the notion of an object type's syntax and encoding is how the object type is represented when being transmitted on the network. The SMI specifies the use of the basic encoding rules of ASN.1 [8], subject to the additional requirements imposed by the SNMP.

2.1. Format of Definitions

Section 4 contains 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 the SNMPv2 SMI.

3. Overview

SMDS is a service that can be provided by numerous interface protocols as shown in the following figure:



In the figure below, managed objects for the protocol levels marked with a (*) are defined in this memo. Additional managed objects that must be used to manage SMDS interfaces are defined in other MIB modules as indicated in the figure.

<pre> +-----+ SIP Level 3* +-----+ SIP Level 2* +-----+ SIP PLCP* +-----+ SIP Level 1 [10] or [11] +-----+ SIP based access </pre>	<pre> +-----+ SIP Level 3* +-----+ DXI Level 2* +-----+ DXI Level 1 [10] +-----+ DXI based access </pre>
<pre> +-----+ SIP Level 3* +-----+ ATM [22] +-----+ ATM PLCP/TC [22] +-----+ ATM Level 1 [10] [11], or [25] +-----+ ATM based access </pre>	<pre> +-----+ SIP Level 3* +-----+ Frame Relay [23] +-----+ Frame Relay Level 1 [10] or [11] +-----+ FR based access </pre>

With the improved interpretation of the MIB II interfaces group [9], some objects can be represented by ifTable. This means that these objects have been deprecated from the MIB module defined in RFC 1304, and ifTable is used instead. No semantical changes have been made to these objects. Only the object identifiers and object descriptors have been changed to the objects defined in ifTable.

Implementation experience has shown that the objects sipL3UnrecognizedIndividualDAs and sipL3UnrecognizedGAs were not supported.

3.1. SIP Level 3

Objects for SIP Level 3 apply to all methods to access SMDS shown in the figures above. With the improved interpretation of the MIB II interfaces group, most objects can be represented by ifTable. The appropriate mapping is defined below.

This document does not specify objects for the management of subscription or configuration of Subscriber-Network Interfaces (SNIs). Those objects are defined in Definitions of Managed Objects for SMDS Subscription [17]. Bellcore requirements on these objects are specified in TR-TSV-001062 [16].

ifTable Object	Use for
=====	
ifIndex	Interface index.
ifDescr	Interface description. For example, SIP Level 3 sublayer of a SNI.
ifType	Set to 31.
ifMtu	Set to 9232.
ifSpeed	Peak bandwidth in bits per second available for use as provided by the supporting Level 2 protocol. For example, 1.17 Mbps when using SIP based DS1 SNIs, and 1.536 Mbps when using DXI-based DS1 DXI-SNI.
ifPhysAddress	OCTET STRING of Size 8. Value is a 16-digit Binary Coded Decimal SMDS address that is assigned to this interface.
ifAdminStatus	The desired administrative status of the SMDS interface.
ifOperStatus	The current operational status of the SMDS interface.
ifLastChange	The elapsed time since the last re-initialization of the interface. The value of sysUpTime at the time the interface entered its current operational state. If the current state was entered prior to the last re-initialization of the local network management subsystem, then this object contains a zero value.
ifInOctets	Number of received octets at SIP Level 3. For SIP based SNIs, this is the number of sipL2ReceivedCounts multiplied by 44.

ifInUcastPkts	The total number of individually addressed SIP Level 3 PDUs received from the remote system across the SNI. The total includes only unerrored SIP Level 3 PDUs. [identical to RFC1304: sipL3ReceivedIndividualDAs]
ifInDiscards	The number of received SIP Level 3 PDUs discarded. For SMDS interfaces, this counter will always be zero.
ifInErrors	The total number of SIP Level 3 PDUs received from the remote system that were discovered to have errors (including protocol processing and bit errors but excluding addressing-related errors) and were discarded. Includes both group addressed SIP Level 3 PDUs and SIP Level 3 PDUs containing an individual destination address. [identical to RFC1304: sipL3Errors]
ifInUnknownProtos	The number of SIP Level 3 PDUs received from the remote system with a Source or Destination Address_Type subfields, (the four most significant bits of the 64 bit address field), not equal to the value 1100 or 1110. Also, an error is considered to have occurred if the Address_Type field for a Source Address is equal to 1110 (a group address). [identical to RFC1304: sipL3InvalidSMDSAddressTypes]
ifOutOctets	Number of received octets for transmission at SIP Level 3. For SIP based SNIs, this is the number of sipL2SentCounts multiplied by 44.
ifOutUcastPkts	The number of individually addressed SIP Level 3 PDUs that have been sent by this system across the interface. [identical to RFC1304: sipL3SentIndividualDAs]
ifOutDiscards	The number of SIP Level 3 PDUs discarded in the egress direction. For SMDS interfaces, this counter will always be zero.

ifOutErrors	The number of SIP Level 3 PDUs discarded in the egress direction, because of errors. For SMDS interfaces, this counter will always be zero.
ifName	The textual name of the interface. If not used, this variable contains a zero-length string.
ifInMulticastPkts	The total number of group addressed SIP Level 3 PDUs received from the remote system across the interface. The total includes only unerrored SIP Level 3 PDUs. [identical to RFC1304: sipL3ReceivedGAs]
ifInBroadcastPkts	This variable is not applicable for SMDS interfaces. Therefore, this counter is always zero.
ifOutMulticastPkts	The number of group addressed SIP Level 3 PDUs that have been sent by this system across the interface. [identical to RFC1304: sipL3SentGAs]
ifOutBroadcastPkts	This variable is not applicable for SMDS interfaces. Therefore, this counter is always zero.
ifLinkUpDownTrapEnble	The value of this object is disabled(2) for SIP Level 3 interfaces.
ifHighSpeed	Set to the user data rate of the interface in millions of bits per second. If the user data rate is less than 1 Mbps, then this value is zero.
ifPromiscuousMode	Set to false(2).
ifConnectorPresent	Set to false(2).

Consult the Evolution of the Interfaces Group [9] for when to use the HC (High Capacity) counters (e.g., ifHCInOctets is a 64-bit counter).

4. Object Definitions

```

SIP-MIB DEFINITIONS ::= BEGIN

IMPORTS
    MODULE-IDENTITY, OBJECT-TYPE, Counter32,
    Integer32, IpAddress                FROM SNMPv2-SMI
    TimeStamp, TEXTUAL-CONVENTION       FROM SNMPv2-TC
    MODULE-COMPLIANCE, OBJECT-GROUP     FROM SNMPv2-CONF
    transmission, ifIndex, mib-2        FROM RFC1213-MIB;

-- This is the MIB module for the SMDS Interface objects.

sipMIB MODULE-IDENTITY
    LAST-UPDATED "9403311818Z"
    ORGANIZATION "IETF Interfaces Working Group"
    CONTACT-INFO
        "
            Tracy Brown
            Postal: Bell Communications Research
                  331 Newman Springs Road
                  P.O. Box 7020
                  Red Bank, NJ 07701-7020
                  US

            Tel: +1 908 758-2107
            Fax: +1 908 758-4177
            E-mail: tacox@mail.bellcore.com

            Kaj Tesink
            Postal: Bell Communications Research
                  331 Newman Springs Road
                  P.O. Box 7020
                  Red Bank, NJ 07701-7020
                  US

            Tel: +1 908 758 5254
            Fax: +1 908 758 4177
            E-mail: kaj@cc.bellcore.com."
    DESCRIPTION
        "The MIB module to describe
        SMDS interfaces objects."
    ::= { mib-2 36 }

SMDSAddress ::= TEXTUAL-CONVENTION
    DISPLAY-HINT "1h:"
    STATUS      current
    DESCRIPTION
        "The 60-bit SMDS address,
```

preceded by 4 bits with the following values:
 1100 when representing an individual address
 1110 when representing a group address."
 SYNTAX OCTET STRING (SIZE (8))

IfIndex ::= TEXTUAL-CONVENTION

STATUS current

DESCRIPTION

"The value of this object identifies the interface for which this entry contains management information. The value of this object for a particular interface has the same value as the ifIndex object, defined in RFC 1213, for the same interface."

SYNTAX Integer32

sip OBJECT IDENTIFIER ::= { transmission 31 }
 sipMIBObjects OBJECT IDENTIFIER ::= { sipMIB 1 }

-- The SIP Level 3 Group

sipL3Table OBJECT-TYPE

SYNTAX SEQUENCE OF SipL3Entry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"This table contains SIP L3 parameters and state variables, one entry per SIPL3 interface."

::= { sip 1 }

sipL3Entry OBJECT-TYPE

SYNTAX SipL3Entry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"This list contains SIP L3 parameters and state variables."

INDEX { sipL3Index }

::= { sipL3Table 1 }

SipL3Entry ::= SEQUENCE {

sipL3Index	IfIndex,
sipL3ReceivedIndividualDAs	Counter32,
sipL3ReceivedGAs	Counter32,
sipL3UnrecognizedIndividualDAs	Counter32,
sipL3UnrecognizedGAs	Counter32,

```

        sipL3SentIndividualDAs      Counter32,
        sipL3SentGAs                Counter32,
        sipL3Errors                  Counter32,
        sipL3InvalidSMDSAddressTypes Counter32,
        sipL3VersionSupport          Integer32
    }

sipL3Index OBJECT-TYPE
    SYNTAX      IfIndex
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "The value of this object identifies the SIP
        L3 interface for which this entry contains
        management information. "
    ::= { sipL3Entry 1 }

sipL3ReceivedIndividualDAs OBJECT-TYPE
    SYNTAX      Counter32
    MAX-ACCESS  read-only
    STATUS      deprecated
    -- Moved to ifTable
    -- ifInUcastPkts defined in [9] must be used instead.
    DESCRIPTION
        "The total number of individually addressed SIP
        Level 3 PDUs received from the remote system
        across the SNI. The total includes only
        unerrored L3PDUs."
    ::= { sipL3Entry 2 }

sipL3ReceivedGAs OBJECT-TYPE
    SYNTAX      Counter32
    MAX-ACCESS  read-only
    STATUS      deprecated
    -- Moved to ifTable
    -- ifInMulticastPkts defined in [9] must be used instead.
    DESCRIPTION
        "The total number of group addressed SIP Level 3
        PDUs received from the remote system across the
        SNI. The total includes only unerrored L3PDUs."
    ::= { sipL3Entry 3 }

sipL3UnrecognizedIndividualDAs OBJECT-TYPE
    SYNTAX      Counter32
    MAX-ACCESS  read-only
    STATUS      deprecated
    DESCRIPTION
        "The number of SIP Level 3 PDUs received from the

```

```

        remote system with invalid or unknown individual
        destination addresses (Destination Address
        Screening violations are not included).  See SMDS
        Subscription MIB module."
 ::= { sipL3Entry 4 }

sipL3UnrecognizedGAs OBJECT-TYPE
    SYNTAX      Counter32
    MAX-ACCESS  read-only
    STATUS      deprecated
    DESCRIPTION
        "The number of SIP Level 3 PDUs received from the
        remote system with invalid or unknown group
        addresses.  (Destination Address Screening
        violations are not included).  See SMDS
        Subscription MIB module."
 ::= { sipL3Entry 5 }

sipL3SentIndividualDAs OBJECT-TYPE
    SYNTAX      Counter32
    MAX-ACCESS  read-only
    STATUS      deprecated
    -- Moved to ifTable
    -- ifOutUcastPkts defined in [9] must be used instead.
    DESCRIPTION
        "The number of individually addressed SIP Level 3
        PDUs that have been sent by this system across the
        SNI."
 ::= { sipL3Entry 6 }

sipL3SentGAs OBJECT-TYPE
    SYNTAX      Counter32
    MAX-ACCESS  read-only
    STATUS      deprecated
    -- Moved to ifTable
    -- ifOutMulticastPkts defined in [9] must be used instead.
    DESCRIPTION
        "The number of group addressed SIP L3PDUs that
        have been sent by this system across the SNI."
 ::= { sipL3Entry 7 }

-- The total number of SIP L3PDU errors can be calculated as
-- (Syntactic errors + Semantic Service errors )
-- Syntactic errors include:
--     sipL3Errors
-- Latest occurrences of syntactic error types are logged in
--     sipL3PDUErrorTable.
-- Semantic Service errors include:

```

```

-- sipL3UnrecognizedIndividualDAs
-- sipL3UnrecognizedGAs
-- sipL3InvalidSMDSAddressTypes
-- Note that public networks supporting SMDS may discard
-- SIP L3PDUs due to subscription violations. Related
-- managed objects are defined in Definitions of Managed
-- Objects for SMDS Subscription.

sipL3Errors OBJECT-TYPE
    SYNTAX      Counter32
    MAX-ACCESS  read-only
    STATUS      deprecated
-- Moved to ifTable
-- ifInErrors defined in [9] must be used instead.
    DESCRIPTION
        "The total number of SIP Level 3 PDUs received
        from the remote system that were discovered to
        have errors (including protocol processing and bit
        errors but excluding addressing-related errors)
        and were discarded. Includes both group addressed
        L3PDUs and L3PDUs containing an individual
        destination address."
    ::= { sipL3Entry 8 }

sipL3InvalidSMDSAddressTypes OBJECT-TYPE
    SYNTAX      Counter32
    MAX-ACCESS  read-only
    STATUS      deprecated
-- Moved to ifTable
-- ifInUnknownProtos defined in [9] must be used instead.
    DESCRIPTION
        "The number of SIP Level 3 PDUs received from the
        remote system that had the Source or Destination
        Address_Type subfields, (the four most significant
        bits of the 64 bit address field), not equal to
        the value 1100 or 1110. Also, an error is
        considered to have occurred if the Address_Type
        field for a Source Address, the four most
        significant bits of the 64 bits, is equal to 1110
        (a group address)."
    ::= { sipL3Entry 9 }

sipL3VersionSupport OBJECT-TYPE
    SYNTAX      Integer32
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "A value which indicates the version(s) of SIP

```

that this interface supports. The value is a sum. This sum initially takes the value zero. For each version, V, that this interface supports, 2 raised to (V - 1) is added to the sum. For example, a port supporting versions 1 and 2 would have a value of $(2^{(1-1)} + 2^{(2-1)}) = 3$. The sipL3VersionSupport is effectively a bit mask with Version 1 equal to the least significant bit (LSB)."

```
::= { sipL3Entry 10 }
```

-- The SIP Level 2 Group

```
sipL2Table OBJECT-TYPE
    SYNTAX      SEQUENCE OF SipL2Entry
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "This table contains SIP L2PDU parameters and
         state variables, one entry per SIP L2 interface."
    ::= { sip 2 }
```

```
sipL2Entry OBJECT-TYPE
    SYNTAX      SipL2Entry
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "This list contains SIP L2 parameters and state
         variables."
    INDEX       { sipL2Index }
    ::= { sipL2Table 1 }
```

```
SipL2Entry ::= SEQUENCE {
    sipL2Index                IfIndex,
    sipL2ReceivedCounts       Counter32,
    sipL2SentCounts           Counter32,
    sipL2HcsOrCRCErrors       Counter32,
    sipL2PayloadLengthErrors  Counter32,
    sipL2SequenceNumberErrors Counter32,
    sipL2MidCurrentlyActiveErrors Counter32,
    sipL2BomOrSSMsMIDErrors   Counter32,
    sipL2EomsMIDErrors        Counter32
}
```

```
sipL2Index OBJECT-TYPE
    SYNTAX      IfIndex
    MAX-ACCESS  read-only
```

```

STATUS      current
DESCRIPTION
    "The value of this object identifies the SIP
    interface for which this entry contains management
    information."
 ::= { sipL2Entry 1 }

sipL2ReceivedCounts OBJECT-TYPE
SYNTAX      Counter32
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION
    "The number of SIP Level 2 PDUs received from the
    remote system across the SNI. The total includes
    only unerrored L2PDUs."
 ::= { sipL2Entry 2 }

sipL2SentCounts OBJECT-TYPE
SYNTAX      Counter32
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION
    "The number of SIP Level 2 PDUs that have been
    sent by this system across the SNI."
 ::= { sipL2Entry 3 }

-- The following error types are counted, and
-- preclude sipL2ReceivedCounts to be incremented:
--     sipL2HcsOrCRCErrors
--     sipL2PayloadLengthErrors
--     sipL2SequenceNumberErrors
--     sipL2BomOrSSMsMIDErrors
--     sipL2EomsMIDErrors
-- The receipt of SIP Level 2 PDUs which are BOMs and
-- for with a MID that is already active will cause
-- sipL2MidCurrentlyActiveErrors to increment.
-- Any already accumulated (correct) segmentation
-- units are discarded. The sipL2ReceivedCounts
-- is incremented by 1. Thus,
-- sipL2ReceivedCounts defines the number of
-- correct SIP Level 2 PDUs delivered to the reassembly
-- process.

sipL2HcsOrCRCErrors OBJECT-TYPE
SYNTAX      Counter32
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION

```

"The number of received SIP Level 2 PDUs that were discovered to have either a Header Check Sequence error or a Payload CRC violation."
 ::= { sipL2Entry 4 }

sipL2PayloadLengthErrors OBJECT-TYPE

SYNTAX Counter32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The number of received SIP Level 2 PDUs that had Payload Length errors that fall in the following specifications:

- SSM L2_PDU payload length field value less than 28 octets or greater than 44 octets,

- BOM or COM L2_PDU payload length field not equal to 44 octets,

- EOM L2_PDU payload length field value less than 4 octets or greater than 44 octets."

::= { sipL2Entry 5 }

sipL2SequenceNumberErrors OBJECT-TYPE

SYNTAX Counter32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The number of received SIP Level 2 PDUs that had a sequence number within the L2PDU not equal to the expected sequence number of the SMDS SS receive process."

::= { sipL2Entry 6 }

sipL2MidCurrentlyActiveErrors OBJECT-TYPE

SYNTAX Counter32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The number of received SIP Level 2 PDUs that are BOMs for which an active receive process is already started."

::= { sipL2Entry 7 }

sipL2BomOrSSMsMIDErrors OBJECT-TYPE

SYNTAX Counter32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"The number of received SIP Level 2 PDUs that are
SSMs with a MID not equal to zero or are BOMs with
MIDs equal to zero."
::= { sipL2Entry 8 }

sipL2EomsMIDErrors OBJECT-TYPE
SYNTAX Counter32
MAX-ACCESS read-only
STATUS current
DESCRIPTION
"The number of received SIP Level 2 PDUs that are
EOMs for which there is no active receive process
for the MID (i.e., the receipt of an EOM which
does not correspond to a BOM) OR the EOM has a MID
equal to zero."
::= { sipL2Entry 9 }

-- The SIP PLCP Group

sipPLCP OBJECT IDENTIFIER ::= { sip 3 }

-- The DS1 PLCP Group

sipDS1PLCPTable OBJECT-TYPE
SYNTAX SEQUENCE OF SipDS1PLCPEntry
MAX-ACCESS not-accessible
STATUS current
DESCRIPTION
"This table contains SIP DS1 PLCP parameters and
state variables, one entry per SIP port."
::= { sipPLCP 1 }

sipDS1PLCPEntry OBJECT-TYPE
SYNTAX SipDS1PLCPEntry
MAX-ACCESS not-accessible
STATUS current
DESCRIPTION
"This list contains SIP DS1 PLCP parameters and
state variables."
INDEX { sipDS1PLCPIndex }
::= { sipDS1PLCPTable 1 }

SipDS1PLCPEntry ::= SEQUENCE {
sipDS1PLCPIndex IfIndex,
sipDS1PLCPSEFSS Counter32,
sipDS1PLCPAlarmState INTEGER,

```

sipDS1PLCPUAss      Counter32
}

sipDS1PLCPIndex OBJECT-TYPE
    SYNTAX      IfIndex
    MAX-ACCESS   read-only
    STATUS       current
    DESCRIPTION
        "The value of this object identifies the
         interface for which this entry contains management
         information. "
    ::= { sipDS1PLCPEntry 1 }

sipDS1PLCPSEFSs OBJECT-TYPE
    SYNTAX      Counter32
    MAX-ACCESS   read-only
    STATUS       current
    DESCRIPTION
        "A DS1 Severely Errored Framing Second (SEFS) is a
         count of one-second intervals containing one or
         more SEF events. A Severely Errored Framing (SEF)
         event is declared when an error in the A1 octet
         and an error in the A2 octet of a framing octet
         pair (i.e., errors in both framing octets), or two
         consecutive invalid and/or nonsequential Path
         Overhead Identifier octets are detected."
    ::= { sipDS1PLCPEntry 2 }

sipDS1PLCPAlarmState OBJECT-TYPE
    SYNTAX      INTEGER {
                    noAlarm (1),
                    receivedFarEndAlarm (2),
                    incomingLOF (3)
                }
    MAX-ACCESS   read-only
    STATUS       current
    DESCRIPTION
        "This variable indicates if there is an alarm
         present for the DS1 PLCP. The value
         receivedFarEndAlarm means that the DS1 PLCP has
         received an incoming Yellow Signal, the value
         incomingLOF means that the DS1 PLCP has declared a
         loss of frame (LOF) failure condition, and the
         value noAlarm means that there are no alarms
         present. See TR-TSV-000773 for a description of
         alarm states."
    ::= { sipDS1PLCPEntry 3 }

```

```

sipDS1PLCPUAss OBJECT-TYPE
    SYNTAX      Counter32
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "The counter associated with the number of
        Unavailable Seconds, as defined by TR-TSV-000773,
        encountered by the PLCP."
    ::= { sipDS1PLCPEntry 4 }

-- The DS3 PLCP Group

sipDS3PLCPTable OBJECT-TYPE
    SYNTAX      SEQUENCE OF SipDS3PLCPEntry
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "This table contains SIP DS3 PLCP parameters and
        state variables, one entry per SIP port."
    ::= { sipPLCP 2 }

sipDS3PLCPEntry OBJECT-TYPE
    SYNTAX      SipDS3PLCPEntry
    MAX-ACCESS  not-accessible
    STATUS      current
    DESCRIPTION
        "This list contains SIP DS3 PLCP parameters and
        state variables."
    INDEX      { sipDS3PLCPIndex }
    ::= { sipDS3PLCPTable 1 }

SipDS3PLCPEntry ::= SEQUENCE {
    sipDS3PLCPIndex      IfIndex,
    sipDS3PLCPSEFSS      Counter32,
    sipDS3PLCPAlarmState INTEGER,
    sipDS3PLCPUAss       Counter32
}

sipDS3PLCPIndex OBJECT-TYPE
    SYNTAX      IfIndex
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "The value of this object identifies the
        interface for which this entry contains management
        information.  "
    ::= { sipDS3PLCPEntry 1 }

```

```

sipDS3PLCPSEFSs OBJECT-TYPE
    SYNTAX      Counter32
    MAX-ACCESS   read-only
    STATUS       current
    DESCRIPTION
        "A DS3 Severely Errored Framing Second (SEFS) is a
        count of one-second intervals containing one or
        more SEF events. A Severely Errored Framing (SEF)
        event is declared when an error in the A1 octet
        and an error in the A2 octet of a framing octet
        pair (i.e., errors in both framing octets), or two
        consecutive invalid and/or nonsequential Path
        Overhead Identifier octets are detected."
    ::= { sipDS3PLCPEntry 2 }

```

```

sipDS3PLCPAlarmState OBJECT-TYPE
    SYNTAX      INTEGER {
                    noAlarm (1),
                    receivedFarEndAlarm (2),
                    incomingLOF (3)
                }
    MAX-ACCESS   read-only
    STATUS       current
    DESCRIPTION
        "This variable indicates if there is an alarm
        present for the DS3 PLCP. The value
        receivedFarEndAlarm means that the DS3 PLCP has
        received an incoming Yellow Signal, the value
        incomingLOF means that the DS3 PLCP has declared a
        loss of frame (LOF) failure condition, and the
        value noAlarm means that there are no alarms
        present. See TR-TSV-000773 for a description of
        alarm states."
    ::= { sipDS3PLCPEntry 3 }

```

```

sipDS3PLCPUASs OBJECT-TYPE
    SYNTAX      Counter32
    MAX-ACCESS   read-only
    STATUS       current
    DESCRIPTION
        "The counter associated with the number of
        Unavailable Seconds, as defined by TR-TSV-000773,
        encountered by the PLCP."
    ::= { sipDS3PLCPEntry 4 }

```

```

-- The SMDS Applications group
-- Applications that have been identified for this group are:

```

-- * IP-over-SMDS (details are specified in RFC 1209)

smdsApplications OBJECT IDENTIFIER ::= { sip 4 }

ipOverSMDS OBJECT IDENTIFIER ::= { smdsApplications 1 }

-- 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 addressing information related to the
 -- configuration of a logical IP subnetwork implemented on
 -- top of SMDS.

-- This table is necessary to support RFC1209 (IP-over-SMDS)
 -- and gives information on the Group Addresses and ARP
 -- Addresses used in the Logical IP subnetwork.
 -- One SMDS address may be associated with multiple IP
 -- addresses. One SNI may be associated with multiple LISs.

ipOverSMDSTable OBJECT-TYPE

SYNTAX SEQUENCE OF IpOverSMDSEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"The table of addressing information relevant to
 this entity's IP addresses."

::= { ipOverSMDS 1 }

ipOverSMDSEntry OBJECT-TYPE

SYNTAX IpOverSMDSEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"The addressing information for one of this
 entity's IP addresses."

INDEX { ipOverSMDSTable, ipOverSMDSTable }
 ::= { ipOverSMDSTable 1 }

IpOverSMDSEntry ::=

SEQUENCE {

ipOverSMDSTable	IfIndex,
ipOverSMDSTable	IpAddress,
ipOverSMDSTable	SMDSAddress,
ipOverSMDSTable	SMDSAddress,
ipOverSMDSTable	SMDSAddress

ipOverSMDSTable OBJECT-TYPE

```

SYNTAX      IfIndex
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION
    "The value of this object identifies the
    interface for which this entry contains management
    information. "
 ::= { ipOverSMDSEntry 1 }

ipOverSMDSAddress OBJECT-TYPE
SYNTAX      IpAddress
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION
    "The IP address to which this entry's addressing
    information pertains."
 ::= { ipOverSMDSEntry 2 }

ipOverSMDSHA OBJECT-TYPE
SYNTAX      SMDSAddress
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION
    "The SMDS Individual address of the IP station."
 ::= { ipOverSMDSEntry 3 }

ipOverSMDSLISGA OBJECT-TYPE
SYNTAX      SMDSAddress
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION
    "The SMDS Group Address that has been configured
    to identify the SMDS Subscriber-Network Interfaces
    (SNIs) of all members of the Logical IP Subnetwork
    (LIS) connected to the network supporting SMDS."
 ::= { ipOverSMDSEntry 4 }

ipOverSMDSARPreq OBJECT-TYPE
SYNTAX      SMDSAddress
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION
    "The SMDS address (individual or group) to which
    ARP Requests are to be sent."
 ::= { ipOverSMDSEntry 5 }

-- The SMDS Carrier Selection group

```

-- This group is used as a place holder
 -- for carrier selection objects.

smdsCarrierSelection OBJECT IDENTIFIER ::= { sip 5 }

-- The SIP Error Log

sipErrorLog OBJECT IDENTIFIER ::= { sip 6 }

sipL3PDUErrTable OBJECT-TYPE

SYNTAX SEQUENCE OF SipL3PDUErrEntry

MAX-ACCESS not-accessible

STATUS current

DESCRIPTION

"A table that contains the latest occurrence of
 the following syntactical SIP L3PDU errors:

- Destination Address Field Format Error,

The following pertains to the 60 least significant bits of the 64 bit address field. The 60 bits contained in the address subfield can be used to represent addresses up to 15 decimal digits. Each decimal digit shall be encoded into four bits using Binary Coded Decimal (BCD), with the most significant digit occurring left-most. If not all 15 digits are required, then the remainder of this field shall be padded on the right with bits set to one. An error is considered to have occurred:

a). if the first four bits of the address subfield are not BCD, OR b). if the first four bits of the address subfield are populated with the country code value 0001, AND the 40 bits which follow are not Binary Coded Decimal (BCD) encoded values of the 10 digit addresses, OR the remaining 16 least significant bits are not populated with 1's, OR c). if the address subfield is not correct according to another numbering plan which is dependent upon the carrier assigning the numbers and offering SMDS.

- Source Address Field Format Error,

The description of this parameter is the same as the description of the Destination Address Field Format Error.

- Invalid BAsize Field Value,

An error is considered to have occurred when the BAsize field of an SIP L3PDU contains a value less than 32, greater than 9220 octets without the CRC32 field present, greater than 9224 octets with the CRC32 field present, or not equal to a multiple of 4 octets,

- Invalid Header Extension Length Field Value,

An error is considered to have occurred when the Header Extension Length field value is not equal 3.

- Invalid Header Extension - Element Length,

An error is considered to have occurred when the Header Extension - Element Length is greater than 12.

- Invalid Header Extension - Version Element Position, Length, or Value,

An error is considered to have occurred when a Version element with Length=3, Type=0, and Value=1 does not appear first within the Header Extension, or an element Type=0 appears somewhere other than within the first three octets in the Header Extension.

- Invalid Header Extension - Carrier Selection Element Position, Length, Value or Format,

An error is considered to have occurred when a Carrier Selection element does not appear second within the Header Extension, if the Element Type does not equal 1, the Element Length does not equal 4, 6, or 8, the Element Value field is not four BCD encoded decimal digits used in specifying the Carrier Identification Code (CIC), or the identified CIC code is invalid.

- Header Extension PAD Error

An error is considered to have occurred when the Header Extension PAD is 9 octets in length, or if the Header Extension PAD is greater than zero

octets in length and the Header Extension PAD does not follow all Header Extension elements or does not begin with at least one octet of all zeros.

- BEtag Mismatch Error,

An error is considered to have occurred when the Beginning-End Tags in the SIP L3PDU header and trailer are not equal.

- BAsize Field not equal to Length Field Error,

An error is considered to have occurred when the value of the BAsize Field does not equal the value of the Length Field.

- Incorrect Length Error, and

An error is considered to have occurred when the the Length field value is not equal to the portion of the SIP L3PDU which extends from the Destination Address field up to and including the CRC32 field (if present) or up to and including the PAD field (if the CRC32 field is not present). As an optional check, an error is considered to have occurred when the length of a partially received SIP L3PDU exceeds the BAsize value.

- MRI Timeout Error.

An error is considered to have occurred when the elapsed time between receipt of BOM and corresponding EOM exceeds the value of the MRI (Message Receive Interval) for a particular transport signal format.

An entry is indexed by interface number and error type, and contains Source Address, Destination Address and a timestamp. All these errors are counted in the sipL3Errors counter. When sipL3PDUErrorTimeStamp is equal to zero, the SipL3PDUErrorEntry does not contain any valid information."

```
::= { sipErrorLog 1 }
```

```
sipL3PDUErrorEntry OBJECT-TYPE
    SYNTAX      SipL3PDUErrorEntry
    MAX-ACCESS  not-accessible
```

```

STATUS      current
DESCRIPTION
    "An entry in the service disagreement table."
INDEX      { sipL3PDUErrIndex, sipL3PDUErrType }
::= { sipL3PDUErrTable 1 }

SipL3PDUErrEntry ::= SEQUENCE {
    sipL3PDUErrIndex      IfIndex,
    sipL3PDUErrType      INTEGER,
    sipL3PDUErrSA        SMDSAddress,
    sipL3PDUErrDA        SMDSAddress,
    sipL3PDUErrTimeStamp  TimeStamp
}

sipL3PDUErrIndex OBJECT-TYPE
    SYNTAX      IfIndex
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "The value of this object identifies the
         interface for which this entry contains management
         information."
    ::= { sipL3PDUErrEntry 1 }

sipL3PDUErrType OBJECT-TYPE
    SYNTAX  INTEGER {
        erroredDAFieldFormat (1),
        erroredSAFieldFormat (2),
        invalidBAsizeFieldValue (3),
        invalidHdrExtLength (4),
        invalidHdrExtElementLength (5),
        invalidHdrExtVersionElementPositionLenthOrValue (6),
        invalidHdrExtCarSelectElementPositionLenghtValueOrFormat (7),
        hePADError (8),
        beTagMismatch (9),
        baSizeFieldNotEqualToLengthField (10),
        incorrectLength (11),
        mriTimeout (12)
    }
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "The type of error."
    ::= { sipL3PDUErrEntry 2 }

sipL3PDUErrSA OBJECT-TYPE
    SYNTAX      SMDSAddress
    MAX-ACCESS  read-only

```

```

STATUS      current
DESCRIPTION
    "A rejected SMDS source address."
::= { sipL3PDUErrEntry 3 }

sipL3PDUErrDA OBJECT-TYPE
SYNTAX      SMDSAddress
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION
    "A rejected SMDS destination address."
::= { sipL3PDUErrEntry 4 }

sipL3PDUErrTimeStamp OBJECT-TYPE
SYNTAX      TimeStamp
MAX-ACCESS  read-only
STATUS      current
DESCRIPTION
    "The timestamp for the service disagreement.  The
    timestamp contains the value of sysUpTime at the
    latest occurrence of this type of service
    disagreement.  See textual description under
    sipL3PDUErrTable for boundary conditions."
::= { sipL3PDUErrEntry 5 }

```

-- The DXI Group

```

sipDxiTable OBJECT-TYPE
SYNTAX      SEQUENCE OF SipDxiEntry
MAX-ACCESS  not-accessible
STATUS      current
DESCRIPTION
    "The DXI table."
::= { sipMIBObjects 1 }

sipDxiEntry OBJECT-TYPE
SYNTAX      SipDxiEntry
MAX-ACCESS  not-accessible
STATUS      current
DESCRIPTION
    "An entry in the DXI table."
INDEX { ifIndex }
::= { sipDxiTable 1 }

SipDxiEntry ::=
SEQUENCE {
    sipDxiCrc

```

```

        INTEGER,
        sipDxiOutDiscards
            Counter32,
        sipDxiInErrors
            Counter32,
        sipDxiInAborts
            Counter32,
        sipDxiInTestFrames
            Counter32,
        sipDxiOutTestFrames
            Counter32,
        sipDxiHbpNoAcks
            Counter32
    }

sipDxiCrc    OBJECT-TYPE
    SYNTAX   INTEGER {
                crc16(1),
                crc32(2)
            }
    MAX-ACCESS read-only
    STATUS    current
    DESCRIPTION
        "The value of this object indicates the type
        of Frame Checksum used by DXI.  Current
        choices include CCITT CRC16 or CRC32."
    ::= { sipDxiEntry 1 }

sipDxiOutDiscards    OBJECT-TYPE
    SYNTAX            Counter32
    MAX-ACCESS        read-only
    STATUS            current
    DESCRIPTION
        "The number of outbound frames discarded
        because of congestion."
    ::= { sipDxiEntry 2 }

sipDxiInErrors    OBJECT-TYPE
    SYNTAX            Counter32
    MAX-ACCESS        read-only
    STATUS            current
    DESCRIPTION
        "The number of inbound frames discarded
        because of errors such as frame checksum
        (CRC) violations,
        non-integral number of octets, address
        and control field violations, and frame
        size errors."

```

```
 ::= { sipDxiEntry 3 }

sipDxiInAborts OBJECT-TYPE
    SYNTAX      Counter32
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "The number of inbound frames discarded
        because of an abort bit sequence (1111111)
        received before closing flag."
    ::= { sipDxiEntry 4 }

sipDxiInTestFrames OBJECT-TYPE
    SYNTAX      Counter32
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "The number of unerrored,
        inbound Test frames received
        (generally as part of Heart
        Beat Poll procedure)."
    ::= { sipDxiEntry 5 }

sipDxiOutTestFrames OBJECT-TYPE
    SYNTAX      Counter32
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "The number of unerrored,
        outbound Test frames sent
        (generally as part of Heart
        Beat Poll procedure)."
    ::= { sipDxiEntry 6 }

sipDxiHbpNoAcks OBJECT-TYPE
    SYNTAX      Counter32
    MAX-ACCESS  read-only
    STATUS      current
    DESCRIPTION
        "The number of Heart Beat
        Poll (HBP) No Ack timeouts."
    ::= { sipDxiEntry 7 }

-- conformance information

smdsConformance OBJECT IDENTIFIER ::= { sipMIB 2 }
```

```

smDsGroups      OBJECT IDENTIFIER ::= { smDsConformance 1 }
smDsCompliances OBJECT IDENTIFIER ::= { smDsConformance 2 }

-- compliance statements

smDsCompliance MODULE-COMPLIANCE
    STATUS current
    DESCRIPTION
        "The compliance statement for SMDS interfaces."

    MODULE -- this module
        MANDATORY-GROUPS { sipLevel3Stuff }

        GROUP      sipLevel2Stuff
        DESCRIPTION
            "This group is mandatory only for those
            interfaces (SNIs) which run SIP Level 2."

        GROUP      sipDS1PLCPStuff
        DESCRIPTION
            "This group is mandatory only for those
            interfaces (SNIs) which run the DS1 PLCP."

        GROUP      sipDS3PLCPStuff
        DESCRIPTION
            "This group is mandatory only for those
            interfaces (SNIs) which run the DS3 PLCP."

        GROUP      sipIPApplicationsStuff
        DESCRIPTION
            "This group is mandatory only for interfaces
            operating IP over SMDS in accordance with
            RFC1209."

        GROUP      sipDxiStuff
        DESCRIPTION
            "This group is mandatory only for those interfaces
            (DXI-SNI)
            which run the DXI protocol."
    ::= { smDsCompliances 1 }

-- units of conformance

sipLevel3Stuff      OBJECT-GROUP
    OBJECTS { sipL3Index,
               sipL3VersionSupport, sipL3PDUErrorIndex,
               sipL3PDUErrorType,

```

```

        sipL3PDUErrorsSA, sipL3PDUErrorsDA,
        sipL3PDUErrorsTimeStamp }
STATUS    current
DESCRIPTION
    "A collection of objects providing information
    applicable to all SMDS interfaces."
::= { smdsGroups 1 }

sipLevel2Stuff    OBJECT-GROUP
OBJECTS { sipL2Index, sipL2HcsOrCRCErrors,
          sipL2PayloadLengthErrors,
          sipL2SequenceNumberErrors,
          sipL2MidCurrentlyActiveErrors,
          sipL2BomOrSSMsMIDErrors,
          sipL2EomsMIDErrors }
STATUS    current
DESCRIPTION
    "A collection of objects providing information
    specific to interfaces using the SIP Level 2."
::= { smdsGroups 2 }

sipDS1PLCPStuff    OBJECT-GROUP
OBJECTS { sipDS1PLCPIndex, sipDS1PLCPSEFSS,
          sipDS1PLCPAlarmState, sipDS1PLCPUASS }
STATUS    current
DESCRIPTION
    "A collection of objects providing information
    specific to interfaces using the DS1 PLCP."
::= { smdsGroups 3 }

sipDS3PLCPStuff    OBJECT-GROUP
OBJECTS { sipDS3PLCPIndex, sipDS3PLCPSEFSS,
          sipDS3PLCPAlarmState, sipDS3PLCPUASS }
STATUS    current
DESCRIPTION
    "A collection of objects providing information
    specific to interfaces using the DS3 PLCP."
::= { smdsGroups 4 }

sipIPApplicationsStuff    OBJECT-GROUP
OBJECTS { ipOverSMDSIndex, ipOverSMDSAddress,
          ipOverSMDSHA, ipOverSMDSLISGA, ipOverSMDSARPreq }
STATUS    current
DESCRIPTION
    "A collection of objects providing information
    for running IP over SMDS."
::= { smdsGroups 5 }

```

```

sipDxiStuff      OBJECT-GROUP
  OBJECTS { sipDxiCrc, sipDxiOutDiscards,
             sipDxiInErrors, sipDxiInAborts,
             sipDxiInTestFrames, sipDxiOutTestFrames,
             sipDxiHbpNoAcks }
  STATUS      current
  DESCRIPTION
    "A collection of objects providing information
     specific to interfaces using the DXI protocol."
    ::= { smdsGroups 6 }

END
```

5. Acknowledgments

This specification is a product of the ifMIB Working Group.

6. References

- [1] Case, J., McCloghrie, K., Rose, M., and S. Waldbusser, "Structure of Management Information for version 2 of the Simple Network Management Protocol (SNMPv2)", RFC 1442, SNMP Research, Inc., Hughes LAN Systems, Dover Beach Consulting, Inc., Carnegie Mellon University, April 1993.
- [2] Case, J., McCloghrie, K., Rose, M., and S. Waldbusser, "Textual Conventions for version 2 of the the Simple Network Management Protocol (SNMPv2)", RFC 1443, SNMP Research, Inc., Hughes LAN Systems, Dover Beach Consulting, Inc., Carnegie Mellon University, April 1993.
- [3] Case, J., McCloghrie, K., Rose, M., and S. Waldbusser, "Conformance Statements for version 2 of the the Simple Network Management Protocol (SNMPv2)", RFC 1444, SNMP Research, Inc., Hughes LAN Systems, Dover Beach Consulting, Inc., Carnegie Mellon University, April 1993.
- [4] Galvin, J., and K. McCloghrie, "Administrative Model for version 2 of the Simple Network Management Protocol (SNMPv2)", RFC 1445, Trusted Information Systems, Hughes LAN Systems, April 1993.
- [5] Case, J., McCloghrie, K., Rose, M., and S. Waldbusser, "Protocol Operations for version 2 of the Simple Network Management Protocol (SNMPv2)", RFC 1448, SNMP Research, Inc., Hughes LAN Systems, Dover Beach Consulting, Inc., Carnegie Mellon University, April 1993.

- [6] McCloghrie, K., and M. Rose, Editors, "Management Information Base for Network Management of TCP/IP-based internets: MIB-II", STD 17, RFC 1213, Hughes LAN Systems, Inc., 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] McCloghrie, K., and F. Kastenholz, "Evolution of Interfaces Group of MIB-II", RFC 1573, Hughes LAN Systems, FTP Software, January 1994.
- [10] Cox, T., and K. Tesink, Editors, "Definitions of Managed Objects for the DS3/E3 Interface Type", RFC 1407, Bellcore, January 1993.
- [11] Baker, F., and J. Watt, Editors, "Definitions of Managed Objects for the DS1/E1 Interface Type", RFC 1406, Advanced Computer Communications, Newbridge Networks Corporation, January 1993.
- [12] Cox, T., and K. Tesink, Editors, "Definition of Managed Objects for the SMDS Interface Type", RFC 1304, Bellcore, February 1992.
- [13] "Generic System Requirements in Support of Switched Multi-megabit Data Service", Bellcore Technical Reference, TR-TSV-000772, Issue 1, May 1991.
- [14] "Local Access System Generic Requirements, Objectives, and Interfaces in Support of Switched Multi-megabit Data Service", Bellcore Technical Reference, TR-TSV-000773, Issue 1, June 1990.
- [15] Piscitello, D., and J. Lawrence, Editors, "The Transmission of IP Datagrams over the SMDS Service", RFC 1209, Bell Communications Research, March 1991.
- [16] "Generic Requirements For SMDS Customer Network Management Service", Bellcore TR-TSV-001062, Issue 1, March 1993, and Supplement 1, December 1993.
- [17] Cox, R., and K. Tesink, "Definitions of Managed Objects for SMDS Subscription", Version 2.1, Bellcore, August 1992.

- [18] Frame Based Interface Protocol for SMDS Networks - Data Exchange Interface / Subscriber Network Interface Revision 1.0 - SMDS Interest Group SIG-TS-005/1993, February 2, 1993.
- [19] Frame Based Interface Protocol for SMDS Networks - SIP Relay Interface Revision 1.0 - SMDS Interest Group SIG-TS-006/1993, February 2, 1993.
- [20] "Generic Requirements For Low Speed SMDS Access", Bellcore TR-TSV-001239, Issue 1, December 1993.
- [21] ATM Forum, "ATM User Network Interface Specification", Version 3.0, September 1993.
- [22] Ahmed, M., and K. Tesink, Editors, "Definitions of Managed Objects for ATM Management", RFC 1695, Bellcore, August 1994.
- [23] Brown, R., Editor, "Definitions of Managed Objects for Frame Relay Service", RFC 1604, Bellcore, March 1994.
- [24] Specification for Implementation of SMDS over an ATM-based Public UNI - Cedric Druce, Max Figueroa, Bellcore - SIG TWG-1993/043, SMDS Interest Group Technical Working Group, Work in Progress, August 24, 1993.
- [25] Brown, T. and K. Tesink, Editors), "Definitions of Managed Objects for the SONET Interface Type, RFC 1595, Bellcore, March 1994.

7. Security Considerations

Security issues are not discussed in this memo.

8. Authors' Addresses

Tracy A. Brown
Bell Communications Research
331 Newman Springs Road
P.O. Box 7020
Red Bank, NJ 07701-7020

Phone: (908) 758-2107
EMail: tacox@mail.bellcore.com

Kaj Tesink
Bell Communications Research
331 Newman Springs Road
P.O. Box 7020
Red Bank, NJ 07701-7020

Phone: (908) 758-5254
EMail: kaj@cc.bellcore.com

