Network Working Group
INTERNET-DRAFT
Expires: August 2001

J. Pastor
M. Belinchon
Ericsson

February 20, 2001

Stream Control Transmission Protocol Management Information Base using SMIv2 <draft-ietf-sigtran-sctp-mib-03.txt>

Status of this memo

Abstract

The Stream Control Transmission Protocol (SCTP) is a reliable transport protocol operating on top of a connectionless packet network such as IP, designed to transport PSTN signaling messages over the connectionless packet network, but is capable of broader applications.

This memo defines the Management Information Base (MIB) module which describes the minimum amount of objects needed to manage the implementation of the SCTP.

Open Issues

- Remove this section.

- Remove Revision History

- Decide under which object identifier branch of the SNMP tree, SCTP will be placed (value obtained when submitted to the IETF editor).

- Update references to drafts [SIGAS].

TABLE OF CONTENTS

1. Introduction

This memo defines the Management Information Base (MIB) module which describes managed objects for implementations of the SCTP.

The document starts with a brief description of the SNMP framework and continues with the MIB explanation and security consideration among others.

The managed objects in this MIB module have been based on RFC 2012: "SNMPv2 Management Information Base for the Transmission Control Protocol using SMIv2" [RFC 2012] and "IP Version 6 Management Information Base for the Transmission Control Protocol" [RFC 2452].

Terms related to the SCTP architecture are explained in [1]. Other specific abbreviations are listed below.

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in RFC 2119 [RFC2119].

1.1 Abbreviations

DNS - Domain Name System
IANA - Internet Assigned Numbers Authority
IETF - Internet Engineering Task Force
IP - Internet Protocol
MIB - Management Information Base
RFC - Request For Comment
RTO - Retransmission Time Out
SCTP - Stream Control Transmission Protocol
SMI - Structure of Management Information
SNMP - Simple Network Management Protocol
TCB - Transmission Control Block
TCP - Transmission Control Protocol

2. The SNMP Framework

The SNMP Management Framework presently consists of five major components:

- An overall architecture, described in RFC 2271 [SNMPArch].

- Mechanisms for describing and naming objects and events for the purpose of management. The first version of this Structure of

Management Information (SMI) is called SMIv1 and described in RFC 1155 [SMIv1], RFC 1212 [SNMPv1MIBDef] and RFC 1215 [SNMPv1Traps]. The second version, called SMIv2, is described in RFC 1902 [SMIv2], RFC 1903 [SNMPv2TC] and RFC 1904 [SNMPv2Conf].

- Message protocols for transferring management information. The first version of the SNMP message protocol is called SNMPv1 nd described in RFC 1157 [SNMPv1]. A second version of the SNMP message protocol, which is not an Internet standards track protocol, is called SNMPv2c and described in RFC 1901 [SNMPv2c] and RFC 1906 [SNMPv2TM]. The third version of the message protocol is called SNMPv3 and described in RFC 1906 [SNMPv2TM], RFC 2272 [SNMPv3MP] and RFC 2574 [SNMPv3USM].

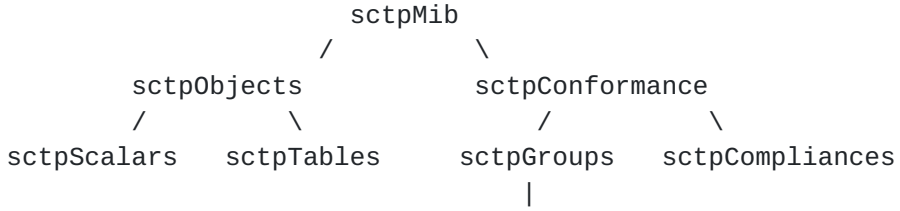
- Protocol operations for accessing management information. The first set of protocol operations and associated PDU formats is described in RFC 1157 [SNMPv1]. A second set of protocol operations and associated PDU formats is described in RFC 1905 [SNMPv2PO].

- A set of fundamental applications described in RFC 2273 [SNMPv3App] and the view-based access control mechanism described in RFC 2575 [SNMPv3VACM].

Managed objects are accessed via a virtual information store, termed the Management Information Base or MIB. Objects in the MIB are defined using the mechanisms defined in the SMI. This memo specifies a MIB module that is compliant to the SMIv2. A MIB conforming to the SMIv1 can be produced through the appropriate translations. The resulting translated MIB must be semantically equivalent, except where objects or events are omitted because no translation is possible (use of Counter64). Some machine-readable information in SMIv2 will be converted into textual descriptions in SMIv1 during the translation process. However, this loss of machine-readable information is not considered to change the semantics of the MIB.

3. Structure of the MIB

The MIB is structured in the following way:



where:

- sctpObjects, all the SCTP objects are defined under this branch.
  - sctpScalars, containing only scalars values. It can be split into:
    - General variables, listing the main SCTP variables.
    - Statistics for traffic measurements.
      - SCTP state related statistics
      - other statistics
  - sctpTables, to hold data from each association together with the main statistics (per association or transport address). Local and remote tables are included into the general association table to allow multiples IP addresses in order to support the multi-home feature.
- sctpConformance, for the Unit of Conformance.
  - sctpGroups, SCTP MIB variables have been grouped according to their function and the context they belong to (general variables, variables/statistics per association, variables per local IP address and variables/statistics per remote IP address).
  - sctpCompliances, Minimal list of objects in the SCTP MIB module that an agent developer must implement.

3.1 Objects

3.1.1 Scalars

3.1.1.1 Protocol General Variables

The first section of the MIB contains the general variables of the SCTP protocol. Maximum, minimum, values by default and initial values are listed here.

Based on the TCP MIB [RFC2012], SCTP RTO mechanism is defined in the same way. In SCTP protocol, only options 'other' and 'vanj' remain because SCTP protocol defines Van Jacobson's algorithm as the one to be used to calculate RTO. 'Other' is left for future use ('rsre' algorithm was eliminated because MIL-STD-1778 is Cancelled-No Superseding Document according to the Military Standard library and 'constant' option doesn't fulfill the SCTP protocol description).

3.1.1.2 Statistics for traffic Measurements

Statistics included here are related to the whole SCTP layer. Statistics related to a specific association, or local/remote IP addresses are defined inside its concerned table.

3.1.1.2.1 State-Related Statistics

These measures are based in the TCP model, but adapted to the SCTP states. They store the number of succeeded association attempts, how many associations have been initiated by the local or the remote SCTP layer, or just the number of associations terminated in a graceful (by means of SHUTDOWN procedure) or ungraceful way (by means of CLOSE procedure).

3.1.1.2.2 Other Statistics

There is an statistic related to the SCTP packets, i.e., the number of out of the blue packets received by the local host. The remainder statistics are based on the data unit of SCTP: the chunk. In this way, the whole picture of the SCTP layer is covered.

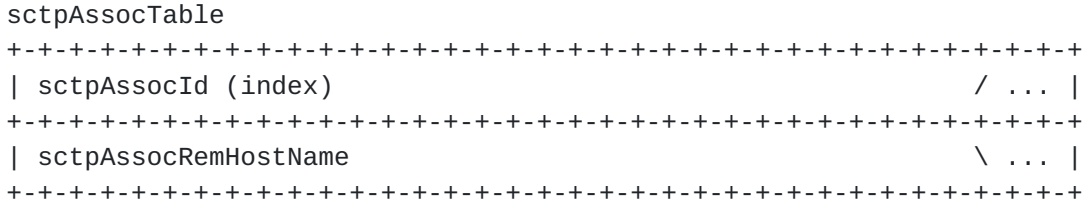
3.1.2 MIB Tables

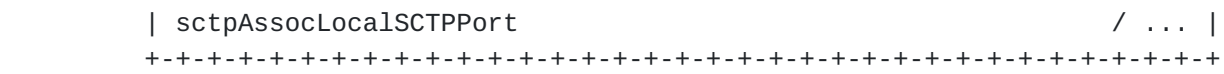
3.1.2.1 Association Table

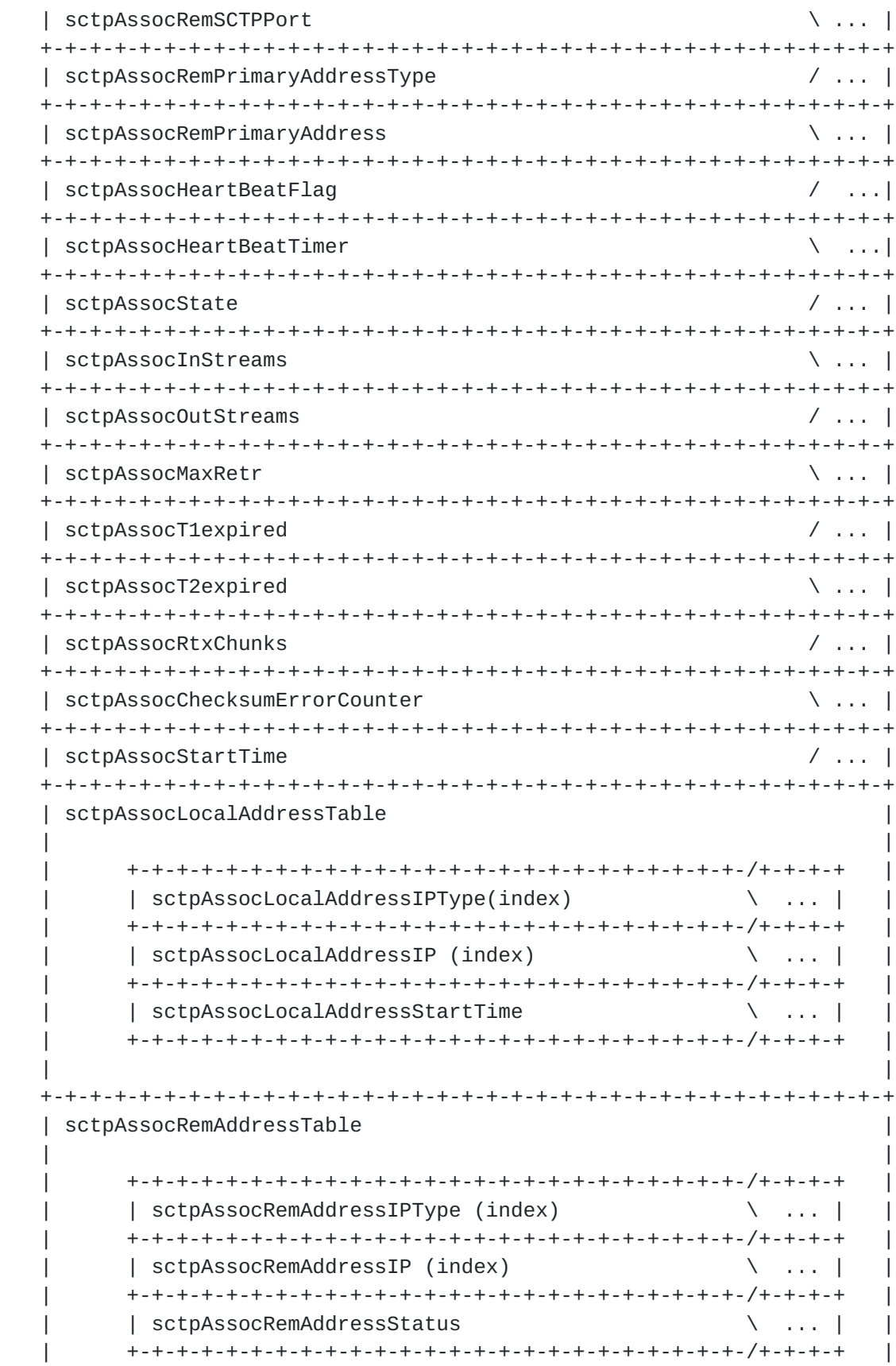
The part of the MIB to define each association is structured according to a expanded table. There is a main table (called association table, sctpAssocTable), indexed by the association identification. The association identification is a value to identify in a unique way an association.

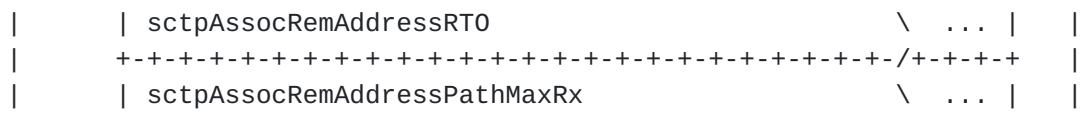
The MIB does not restrict which value must be written here. It can be the tag value, or the TCB creation time, or any other value the implementor decides.

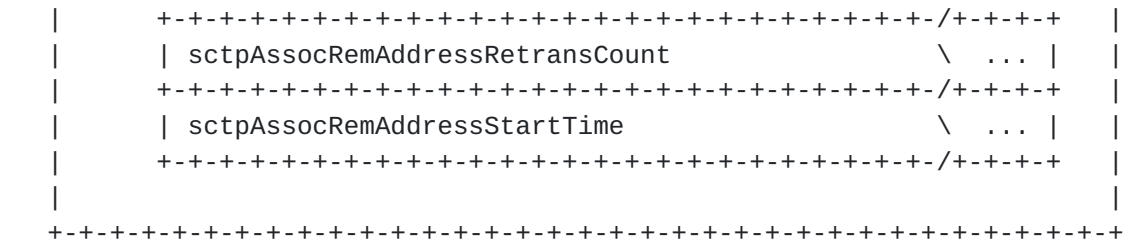
This main table contains common information for a given association and two other tables inside: local IP addresses table (sctpAssocLocalAddressTable), and remote IP addresses table (sctpRemAddressTable).




| sctpAssocLocalSCTPPort / ... |


| sctpAssocRemSCTPPort \ ... |
| sctpAssocRemPrimaryAddressType / ... |
| sctpAssocRemPrimaryAddress \ ... |
| sctpAssocHeartBeatFlag / ...|
| sctpAssocHeartBeatTimer \ ...|
| sctpAssocState / ... |
| sctpAssocInStreams \ ... |
| sctpAssocOutStreams / ... |
| sctpAssocMaxRetr \ ... |
| sctpAssocT1expired / ... |
| sctpAssocT2expired \ ... |
| sctpAssocRtxChunks / ... |
| sctpAssocChecksumErrorCounter \ ... |
| sctpAssocStartTime / ... |
| sctpAssocLocalAddressTable |
| sctpAssocLocalAddressIPType(index) \ ... |
| sctpAssocLocalAddressIP (index) \ ... |
| sctpAssocLocalAddressStartTime \ ... |
| sctpAssocRemAddressTable |
| sctpAssocRemAddressIPType (index) \ ... |
| sctpAssocRemAddressIP (index) \ ... |
| sctpAssocRemAddressStatus \ ... |


| sctpAssocRemAddressRTO \ ... |
| sctpAssocRemAddressPathMaxRx \ ... |



Every entry is explained when defining the MIB.

Note that the IP address indexing the tables is valid for IPv4, IPv6 and DNS. Therefore, IP address is defined by the Internet address type and the value of the IP address, according to the Textual Conventions for Internet Network Address [RFC2851].

However, DNS value is not being used to identify an IP address since it is only valid during initialization (once this stage is finished, both sides only use IP addresses). To keep the name of the remote peer, an entry has been created in the association table (sctpAssocRemHostName). When no DNS name is provided by the remote endpoint at init time, this value will be NULL. Otherwise, the received DNS name will be stored.

It is NOT possible to create rows in any table (sctpAssocTable, sctpAssocLocalAddressTable, sctpRemAddressTable).

If it is required to abort an existing association, value deleteTCB has to be written in the variable sctpAssocState. That is the only way to delete rows in any of the mentioned tables.

3.1.2.1.1 Local IP addresses Table

Table for local IP addresses information. This table stores information related to the local IP address/-es reserved for the association. It's indexed by the local IP addresses.

3.1.2.1.2 Remote IP addresses Table

Table for remote IP addresses information. This table stores information related to the remote IP address/-es reserved for the association. It's indexed by the remote IP addresses.

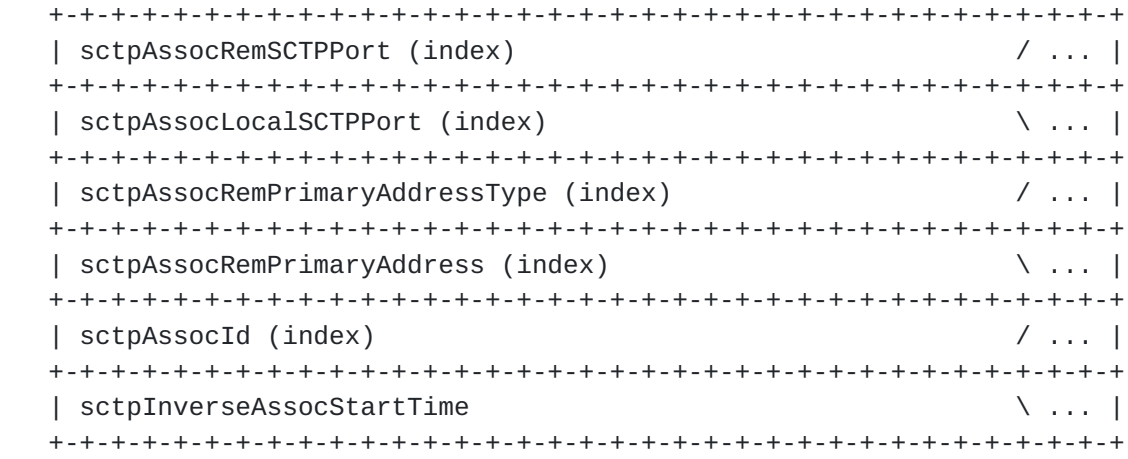
3.1.2.2 Reverse Lookup Tables

There is also one reverse lookup table . This is an optional table to help management applications efficiently access conceptual rows in other tables. This is the way for not performing expensive tree walks

through large number of associations.

It is not possible to either create or delete rows in this table.

sctpInverseAssocTable



3.2 Conformance

3.2.1 Groups

This section includes all the variables defined in the MIB grouped by function(variables or statistics) and context (SCTP general parameters,
association context, local IP address context or remote IP address context).
Therefore following groups have been created:

- General variables for the SCTP layer.
- General statistics for the states of the SCTP layer.
- General statistics for the SCTP layer.
- Variables and statistics per association, and variables per local and remote IP address.
- Statistics per remote IP address.

3.2.2 Compliance

Requirements of the SCTP MIB to be implemented.

4. Definitions

```
SCTP-MIB DEFINITIONS ::= BEGIN

IMPORTS
  MODULE-IDENTITY, OBJECT-TYPE, Unsigned32, Counter32, Counter64
```

```
        FROM SNMPv2-SMI               -- RFC2578
    TimeStamp
```

```
        FROM SNMPv2-TC                -- RFC2579
    MODULE-COMPLIANCE, OBJECT-GROUP
        FROM SNMPv2-CONF              -- RFC2580
    InetAddressType, InetAddress
        FROM INET-ADDRESS-MIB         -- RFC2851
        ;

  sctpMIB MODULE-IDENTITY
    LAST-UPDATED "200102200000Z"      -- 20th February 2001
    ORGANIZATION "IETF SIGTRAN Working Group"
    CONTACT-INFO
        "         Maria-Carmen Belinchon-Vergara
                  Jose-Javier Pastor-Balbas

        Postal:   Ericsson Espana S. A.
                  C/Retama 7
                  28045 Madrid
                  Spain

        Phones:   +34 91 339 3535
                  +34 91 339 3819

        Emails:   Maria.C.Belinchon@ericsson.com
                  J.Javier.Pastor@ericsson.com"
    DESCRIPTION
        "The MIB module for managing an SCTP implementation."
    REVISION
        "200102200000Z"               -- 20th February 2001
    DESCRIPTION
        "MIB module developed for the SIGTRAN IETF group. Based on
        SCTP, RFC2960"
    ::= { xxxx }   -- IANA needs to choose this value
                   -- when sent to the RFC editor


  -- Top-level structure of the MIB

  sctpObjects      OBJECT IDENTIFIER ::= { sctpMIB 1 }
  sctpConformance  OBJECT IDENTIFIER ::= { sctpMIB 2 }

  sctpScalars      OBJECT IDENTIFIER ::= { sctpObjects 1 }
  sctpTables       OBJECT IDENTIFIER ::= { sctpObjects 2 }



  -- PROTOCOL GENERAL VARIABLES
  -- *************************

  sctpRtoAlgorithm OBJECT-TYPE
```

```
     SYNTAX          INTEGER {
                          other(1),      -- Other new one. Future use
```

```
                    vanj(2)        -- Van Jacobson's algorithm
                  }
    MAX-ACCESS    read-only
    STATUS        current
    DESCRIPTION
         "The algorithm used to determine the timeout value (T3-rtx)
         used for re-transmitting unacknowledged chunks."

    ::= { sctpScalars 1 }


  sctpRtoMin OBJECT-TYPE
    SYNTAX        Unsigned32
    UNITS         "milliseconds"
    MAX-ACCESS    read-write
    STATUS        current
    DESCRIPTION
         "The minimum value permitted by a SCTP implementation for the
         retransmission timeout, measured in milliseconds.  More
         refined semantics for objects of this type depend upon the
         algorithm used to determine the retransmission timeout.
         Minimum recommended value is 1000 milliseconds. Some telephony
         applications could require less than 1 second, see [SIGAS] for
         further information."


    ::= { sctpScalars 2 }


  sctpRtoMax OBJECT-TYPE
    SYNTAX        Unsigned32
    UNITS         "milliseconds"
    MAX-ACCESS    read-write
    STATUS        current
    DESCRIPTION
         "The maximum value permitted by a SCTP implementation for the
         retransmission timeout, measured in milliseconds.  More
         refined semantics for objects of this type depend upon the
         algorithm used to determine the retransmission timeout.
         Recommended value is 60000 milliseconds."

      ::= { sctpScalars 3 }


  sctpRtoInitial OBJECT-TYPE
    SYNTAX        Unsigned32
    UNITS         "milliseconds"
    MAX-ACCESS    read-write
    STATUS        current
```

DESCRIPTION

```
          "Initial value for the Retransmission timer. Recommended value
          is 3000 milliseconds."

     ::= { sctpScalars 4 }


   sctpValCookieLife OBJECT-TYPE
     SYNTAX         Unsigned32
     UNITS          "milliseconds"
     MAX-ACCESS     read-write
     STATUS         current
     DESCRIPTION
          "Valid cookie life in the 4-way start-up handshake procedure.
          Recommended value: 60000 milliseconds."

     ::= { sctpScalars 5 }


   sctpMaxInitRetr OBJECT-TYPE
     SYNTAX         Unsigned32
     MAX-ACCESS     read-write
     STATUS         current
     DESCRIPTION
          "The maximum number of retransmissions at the start-up phase
          (INIT and COOKIE ECHO chunks). Recommended value: 8 attempts."

     ::= { sctpScalars 6 }



   -- STATE-RELATED STATISTICS

   sctpCurrEstab OBJECT-TYPE
     SYNTAX         Counter32
     MAX-ACCESS     read-only
     STATUS         current
     DESCRIPTION
          "The number of SCTP associations for which the current state
          is either ESTABLISHED, SHUTDOWN-RECEIVED or SHUTDOWN-PENDING."

     ::= { sctpScalars 7 }


   sctpActiveEstab OBJECT-TYPE
     SYNTAX         Counter32
     MAX-ACCESS     read-only
     STATUS         current
     DESCRIPTION
          "The number of times that SCTP associations have made a direct
```

transition to the ESTABLISH state from the COOKIE-ECHOED

```
          state: COOKIE-ECHOED -> ESTABLISHED. The upper layer has
          initiated the association attempt."

      ::= { sctpScalars 8 }


    sctpPassiveEstab OBJECT-TYPE
      SYNTAX         Counter32
      MAX-ACCESS     read-only
      STATUS         current
      DESCRIPTION
           "The number of times that SCTP associations have made a direct
           transition to the ESTABLISHED state from the CLOSED state:
           CLOSED -> ESTABLISHED. The remote endpoint has initiated the
           association attempt."

      ::= { sctpScalars 9 }


    sctpAborted OBJECT-TYPE
      SYNTAX         Counter32
      MAX-ACCESS     read-only
      STATUS         current
      DESCRIPTION
           "The number of times that SCTP associations have made a direct
           transition to the CLOSED state from any state using the
           primitive 'ABORT': AnyState --Abort--> CLOSED. Ungraceful
           termination of the association."

      ::= { sctpScalars 10 }


    sctpShutdowns OBJECT-TYPE
      SYNTAX         Counter32
      MAX-ACCESS     read-only
      STATUS         current
      DESCRIPTION
           "The number of times that SCTP associations have made a direct
           transition to the CLOSE state from either the SHUTDOWN-SENT
           state or the SHUTDOWN-ACK-SENT state. Graceful termination of
           the association."

      ::= { sctpScalars 11 }


    -- OTHER LAYER STATISTICS

    sctpStatOutOfBlue OBJECT-TYPE
      SYNTAX         Counter64
```

```
    MAX-ACCESS     read-only
    STATUS         current
```

```
    DESCRIPTION
         "Number of out of the blue packets (SCTP packet correctly
         formed -right checksum- but the receiver is not able to
         identify the association to which this packet belongs)
         received  by the host."

    ::= { sctpScalars 12 }


  sctpStatSentChunks OBJECT-TYPE
    SYNTAX         Counter64
    MAX-ACCESS     read-only
    STATUS         current
    DESCRIPTION
         "Number of SCTP control and data chunks, sent to the peers (no
         retransmissions included)."

    ::= { sctpScalars 13 }


  sctpStatRecChunks OBJECT-TYPE
    SYNTAX         Counter64
    MAX-ACCESS     read-only
    STATUS         current
    DESCRIPTION
         "Number of SCTP control and data chunks, received from the
         peers (no retransmissions included)."

    ::= { sctpScalars 14 }


  sctpStatOutOfOrderSentChunks OBJECT-TYPE
    SYNTAX         Counter64
    MAX-ACCESS     read-only
    STATUS         current
    DESCRIPTION
         "Number of unordered chunks (data chunks in which the U bit is
         set to 1) sent to the peers."

    ::= { sctpScalars 15 }


  sctpStatOutOfOrderRecChunks OBJECT-TYPE
    SYNTAX         Counter64
    MAX-ACCESS     read-only
    STATUS         current
    DESCRIPTION
         "Number of unordered chunks (data chunks in which the U bit is
         set to 1) received from the peers."
```

```
    ::= { sctpScalars 16 }
```

```
   sctpStatFragmentedUsrMessages OBJECT-TYPE
     SYNTAX         Counter64
     MAX-ACCESS     read-only
     STATUS         current
     DESCRIPTION
          "Number of user messages that have to be fragmented because of
          the MTU."

     ::= { sctpScalars 17 }


   sctpStatReassembledUsrMessages OBJECT-TYPE
     SYNTAX         Counter64
     MAX-ACCESS     read-only
     STATUS         current
     DESCRIPTION
          "Number of user messages reassembled."

     ::= { sctpScalars 18 }



   -- SCTP ASSOCIATION DESCRIPTION PARAMETERS
   -- **************************************

   --
   -- ASSOCIATION INVERSE TABLE
   --

   sctpInverseAssocTable OBJECT-TYPE
     SYNTAX         SEQUENCE OF SctpInverseAssocEntry
     MAX-ACCESS     not-accessible
     STATUS         current
     DESCRIPTION
          "Maps sctpAssocRemSCTPPort, sctpAssocLocalSCTPPort,
          sctpAssocRemPrimaryAddressType, sctpAssocRemHostName and
          sctpAssocRemPrimaryAddress, pairs to one or more sctpAssocId
          values, each describing a row in the sctpAssocTable. This
          makes it possible to retrieve the row in the sctpAssocTable
          corresponding to a given association without having to walk
          the entire (potentially large) table."

     ::= { sctpTables 1 }


   sctpInverseAssocEntry OBJECT-TYPE
     SYNTAX         SctpInverseAssocEntry
```

```
    MAX-ACCESS     not-accessible
    STATUS         current
```

```
    DESCRIPTION
         "Each table corresponds to exactly one entry in the
         sctpAssocTable, i.e. the entry containing the tuple
         sctpAssocRemSCTPPort, sctpAssocLocalPort,
         sctpAssocRemPrimaryAddressType, sctpAssocRemPrimaryAddress,
         sctpAssocRemHostName and sctpAssocId."
    INDEX          {sctpAssocRemSCTPPort, sctpAssocLocalSCTPPort,
                    sctpAssocRemPrimaryAddressType,
                    sctpAssocRemPrimaryAddress,
                    sctpAssocRemHostName,
                    sctpAssocId }

    ::= { sctpInverseAssocTable 1 }


  SctpInverseAssocEntry ::= SEQUENCE {
    sctpInverseAssocStartTime               TimeStamp
    }


  sctpInverseAssocStartTime OBJECT-TYPE
    SYNTAX         TimeStamp
    MAX-ACCESS     read-only
    STATUS         current
    DESCRIPTION
         "The value of SysUpTime at the time that this row was
         created."

    ::= { sctpInverseAssocEntry 1 }


  -- the SCTP Association TABLE
  -- **************************

  -- The SCTP association table contains information about each
  -- association that the local endpoint is taking part.


  sctpAssocTable OBJECT-TYPE
    SYNTAX         SEQUENCE OF SctpAssocEntry
    MAX-ACCESS     not-accessible
    STATUS         current
    DESCRIPTION
         "A table containing SCTP association-specific information."

    ::= { sctpTables 2 }


  sctpAssocEntry OBJECT-TYPE
```

```
    SYNTAX          SctpAssocEntry
    MAX-ACCESS      not-accessible
```

```
    STATUS         current
    DESCRIPTION
         "General common variables and statistics for the whole
         association."
    INDEX          { sctpAssocId }

    ::= { sctpAssocTable 1 }


  SctpAssocEntry ::= SEQUENCE {
    sctpAssocId                       Unsigned32,
    sctpAssocRemHostName              OCTET STRING,
    sctpAssocLocalSCTPPort            Unsigned32,
    sctpAssocRemSCTPPort              Unsigned32,
    sctpAssocRemPrimaryAddressType    InetAddressType,
    sctpAssocRemPrimaryAddress        InetAddress,
    sctpAssocHeartBeatFlag            INTEGER,
    sctpAssocHeartBeatTimer           Unsigned32,
    sctpAssocState                    INTEGER,
    sctpAssocInStreams                Unsigned32,
    sctpAssocOutStreams               Unsigned32,
    sctpAssocMaxRetr                  Unsigned32,
    sctpAssocT1expired                Counter32,     -- Statistic
    sctpAssocT2expired                Counter32,     -- Statistic
    sctpAssocRtxChunks                Counter32,     -- Statistic
    sctpAssocChecksumErrorCounter     Counter64,     -- Statistic
    sctpAssocStartTime                TimeStamp
    }


  sctpAssocId OBJECT-TYPE
    SYNTAX         Unsigned32
    MAX-ACCESS     not-accessible
    STATUS         current
    DESCRIPTION
         "Association Identification. Value identifying the association
         (typically the Initiate Verification Tag)."

    ::= { sctpAssocEntry 1 }


  sctpAssocRemHostName OBJECT-TYPE
    SYNTAX         OCTET STRING (SIZE(0..255))
    MAX-ACCESS     read-create
    STATUS         current
    DESCRIPTION
         "Peer's DNS name. If no DNS domain name was received at init
         time (embedded in the INIT or INIT-ACK chunk) from the peer,
         this entry will be meaningless, therefore it will contain a
```

NULL value. Otherwise, the remote host name received at init time will be stored."

```
    ::= { sctpAssocEntry 2 }


  sctpAssocLocalSCTPPort OBJECT-TYPE
    SYNTAX         Unsigned32
    MAX-ACCESS     read-create
    STATUS         current
    DESCRIPTION
         "Local SCTP port number used for this association."

    ::= { sctpAssocEntry 3 }


  sctpAssocRemSCTPPort OBJECT-TYPE
    SYNTAX         Unsigned32
    MAX-ACCESS     read-create
    STATUS         current
    DESCRIPTION
         "Remote SCTP port number used for this association."

    ::= { sctpAssocEntry 4 }


  sctpAssocRemPrimaryAddressType OBJECT-TYPE
    SYNTAX         InetAddressType
    MAX-ACCESS     read-create
    STATUS         current
    DESCRIPTION
         "Internet type of primary destination IP address.
         -  unknown (0) An unknown address type. This value MUST be
            used if the value of the corresponding InetAddress object
            is a zero-length string. It may also be used to indicate an
            IP address different from IPv4 or IPv6. This value is used
            in this MIB for error conditions.

         -  ipv4 (1): An IPv4 address as defined by the InetAddressIPv4
            textual convention [RFC2851].

         -  ipv6 (2): An IPv6 address as defined by the InetAddressIPv6
            textual convention [RFC2851]."

    ::= { sctpAssocEntry 5 }

  sctpAssocRemPrimaryAddress OBJECT-TYPE
    SYNTAX         InetAddress
    MAX-ACCESS     read-create
    STATUS         current
    DESCRIPTION
```

```
        "Primary destination IP address. An InetAddress value is
        always interpreted within the context of an InetAddressType
```

```
          value. This value will be filled in after INIT or INIT ACK
          messages have been received (when the primary path is selected
          by SCTP)."

     ::= { sctpAssocEntry 6 }


   sctpAssocHeartBeatFlag OBJECT-TYPE
     SYNTAX         INTEGER {
                         active(0),
                         inactive(1)
                     }
     MAX-ACCESS     read-create
     STATUS         current
     DESCRIPTION
          "The optional Heartbeat associated to one destination
          transport address could be active or not (value equal to 1 or
          0, respectively).

          An active destination transport address is the one considered
          available by a peer endpoint for receiving SCTP packets, as it
          is described in [sctp]."

     ::= { sctpAssocEntry 7 }


   sctpAssocHeartBeatTimer OBJECT-TYPE
     SYNTAX         Unsigned32
     UNITS          "milliseconds"
     MAX-ACCESS     read-create
     STATUS         current
     DESCRIPTION
          "The current heartbeat time-out. The recommended default value
          is 30000 milliseconds."

     ::= { sctpAssocEntry 8 }


   sctpAssocState OBJECT-TYPE
     SYNTAX         INTEGER {
                         closed(1),
                         cookieWait(2),
                         cookieEchoed(3),
                         established(4),
                         shutdownPending(5),
                         shutdownSent(6),
                         shutdownReceived(7),
                         shutdownAckSent(8),
                         deleteTCB(9)
```

```
                    }
    MAX-ACCESS      read-create
```

```
    STATUS         current
    DESCRIPTION
         "The state of this SCTP association.
         As in TCP, the only value which may be set by a management
         station is deleteTCB. Accordingly, it is appropriate for an
         agent to return a 'badValue' response if a management station
         attempts to set this object to any other value.
         If a management station sets this object to the value
         deleteTCB(9), then this has the effect of deleting the TCB (as
         defined in SCTP) of the corresponding association on the
         managed node, resulting in immediate termination of the
         association.
         As an implementation-specific option, an ABORT chunk may be
         sent from the managed node to the other SCTP endpoint."

    ::= { sctpAssocEntry 9 }


  sctpAssocInStreams OBJECT-TYPE
    SYNTAX         Unsigned32
    MAX-ACCESS     read-only
    STATUS         current
    DESCRIPTION
         "Inbound Streams according to the negotiation at association
         start up. This parameter has to be read-only by the manager."

    ::= { sctpAssocEntry 10 }

  sctpAssocOutStreams OBJECT-TYPE
    SYNTAX         Unsigned32
    MAX-ACCESS     read-only
    STATUS         current
    DESCRIPTION
         "Outbound Streams according to the negotiation at association
         start up. This parameter has to be read-only by the manager."

    ::= { sctpAssocEntry 11 }


  sctpAssocMaxRetr OBJECT-TYPE
    SYNTAX         Unsigned32
    MAX-ACCESS     read-create
    STATUS         current
    DESCRIPTION
         "The maximum number of data retransmissions. This value is
         specific for each association and the upper layer can be able
         to change it calling the appropiate primitives. This value has
         to be smaller than the addition of all the maximum number for
         all the paths (sctpAssocRemAddressMaxPathRetrans).
```

Recommended value: 10 attempts."

```
    ::= { sctpAssocEntry 12 }



  -- Association Statistics

  sctpAssocT1expired OBJECT-TYPE
    SYNTAX         Counter32
    MAX-ACCESS     read-only
    STATUS         current
    DESCRIPTION
         "Number of times that T1 timer expired (timer for sending
         either INIT or COOKIE-ECHO chunks and receiving an
         acknowledgment)."

    ::= { sctpAssocEntry 13 }

  sctpAssocT2expired OBJECT-TYPE
    SYNTAX         Counter32
    MAX-ACCESS     read-only
    STATUS         current
    DESCRIPTION
         "Number of times that T2-shutdown timer expired (shutdown
         timer)."

    ::= { sctpAssocEntry 14 }


  sctpAssocRtxChunks OBJECT-TYPE
    SYNTAX         Counter32
    MAX-ACCESS     read-only
    STATUS         current
    DESCRIPTION
         "Number of data chunks retransmitted to the peer in the
         current association."

    ::= { sctpAssocEntry 15 }


  sctpAssocChecksumErrorCounter OBJECT-TYPE
    SYNTAX         Counter64
    MAX-ACCESS     read-only
    STATUS         current
    DESCRIPTION
         "Number of SCTP packets received from the peers with an
         invalid checksum."

    ::= { sctpAssocEntry 16 }
```

```
   sctpAssocStartTime OBJECT-TYPE
     SYNTAX         TimeStamp
     MAX-ACCESS     read-only
     STATUS         current
     DESCRIPTION
          "The value of SysUpTime at the time that this row was
          created."

     ::= { sctpAssocEntry 17 }



   -- Expanded tables: Including Multi-home feature

   -- Local Address TABLE
   -- ******************

   sctpAssocLocalAddressTable OBJECT-TYPE
     SYNTAX         SEQUENCE OF SctpAssocLocalAddressEntry
     MAX-ACCESS     not-accessible
     STATUS         current
     DESCRIPTION
          "Expanded table of sctpAssocTable based on the AssocId index.
          It shows several interesting data for each local address which
          takes part in this association."

     ::= { sctpTables 3 }

   sctpAssocLocalAddressEntry OBJECT-TYPE
     SYNTAX         SctpAssocLocalAddressEntry
     MAX-ACCESS     not-accessible
     STATUS         current
     DESCRIPTION
          "Local information about the available addresses."
     INDEX     {    sctpAssocId,   -- shared index
                    sctpAssocLocalAddressIPType,
                    sctpAssocLocalAddressIP }

     ::= { sctpAssocLocalAddressTable 1 }


   SctpAssocLocalAddressEntry ::= SEQUENCE {
     sctpAssocLocalAddressIPType        InetAddressType,
     sctpAssocLocalAddressIP            InetAddress,
     sctpAssocLocalAddressStartTime     TimeStamp
     }


   sctpAssocLocalAddressIPType OBJECT-TYPE
```

```
    SYNTAX          InetAddressType
    MAX-ACCESS      not-accessible
```

```
    STATUS        current
    DESCRIPTION
         "Internet type of local IP address used for this association.
         -  unknown (0) An unknown address type. This value MUST be
            used if the value of the corresponding InetAddress object
            is a zero-length string. It may also be used to indicate an
            IP address different from IPv4 or IPv6. This value is used
            in this MIB for error conditions.

         -  ipv4 (1): An IPv4 address as defined by the InetAddressIPv4
            textual convention [RFC2851].

         -  ipv6 (2): An IPv6 address as defined by the InetAddressIPv6
            textual convention [RFC2851]."

    ::= { sctpAssocLocalAddressEntry 1 }


  sctpAssocLocalAddressIP OBJECT-TYPE
    SYNTAX        InetAddress
    MAX-ACCESS    not-accessible
    STATUS        current
    DESCRIPTION
         "The value of a local IP address available for this
         association. An InetAddress value is always interpreted within
         the context of an InetAddressType value. If SCTP are using DNS
         names, the mapping to IP address-es will be done at reception
         of INIT or INIT_ACK messages."

    ::= { sctpAssocLocalAddressEntry 2 }


  sctpAssocLocalAddressStartTime OBJECT-TYPE
    SYNTAX        TimeStamp
    MAX-ACCESS    read-only
    STATUS        current
    DESCRIPTION
         "The value of SysUpTime at the time that this row was
         created."

    ::= { sctpAssocLocalAddressEntry 3 }



  -- Remote Addresses TABLE
  -- **********************

  sctpAssocRemAddressTable OBJECT-TYPE
    SYNTAX        SEQUENCE OF SctpAssocRemAddressEntry
```

```
    MAX-ACCESS     not-accessible
    STATUS         current
```

```
    DESCRIPTION
         "Expanded table of sctpAssocTable based on the AssocId index.
         It shows several interesting data for each remote peer IP
         address which is used in this association."

    ::= { sctpTables 4 }


  sctpAssocRemAddressEntry OBJECT-TYPE
    SYNTAX         SctpAssocRemAddressEntry
    MAX-ACCESS     not-accessible
    STATUS         current
    DESCRIPTION
         "Information about THE most important variables for every
         remote IP address "
    INDEX   { sctpAssocId,   -- shared index
              sctpAssocRemAddressIPType,
              sctpAssocRemAddressIP }

    ::= { sctpAssocRemAddressTable 1 }


  SctpAssocRemAddressEntry ::= SEQUENCE {
    sctpAssocRemAddressIPType          InetAddressType,
    sctpAssocRemAddressIP              InetAddress,
    sctpAssocRemAddressStatus          INTEGER,
    sctpAssocRemAddressRTO             Unsigned32,
    sctpAssocRemAddressMaxPathRetrans  Unsigned32,
    sctpAssocRemAddressRetransCount    Counter64,     -- Statistic
    sctpAssocRemAddressStartTime       TimeStamp
    }


  sctpAssocRemAddressIPType OBJECT-TYPE
    SYNTAX         InetAddressType
    MAX-ACCESS     not-accessible
    STATUS         current
    DESCRIPTION
         "Internet type of a remote IP address available for this
         association.
         -  unknown (0) An unknown address type. This value MUST be
            used if the value of the corresponding InetAddress object
            is a zero-length string. It may also be used to indicate an
            IP address different from IPv4 or IPv6. This value is used
            in this MIB for error conditions.

         -  ipv4 (1): An IPv4 address as defined by the InetAddressIPv4
            textual convention [RFC2851].
```

- ipv6 (2): An IPv6 address as defined by the InetAddressIPv6 textual convention [RFC2851]."

```
    ::= { sctpAssocRemAddressEntry 1 }


  sctpAssocRemAddressIP OBJECT-TYPE
    SYNTAX         InetAddress
    MAX-ACCESS     not-accessible
    STATUS         current
    DESCRIPTION
         "The value of a remote IP address available for this
         association. An InetAddress value is always interpreted within
         the context of an InetAddressType value."

    ::= { sctpAssocRemAddressEntry 2 }


  sctpAssocRemAddressStatus OBJECT-TYPE
    SYNTAX         INTEGER {
                        active(0),
                        inactive(1)
                   }
    MAX-ACCESS     read-only
    STATUS         current
    DESCRIPTION
         "The current status of the remote transport address, according
         to [SCTP].
         Active means that the threshold of no answer received from
         this IP address has not been reached. Inactive means that
         either no heartbeat was received from this address, or any
         other message, reaching the threshold defined by the
         protocol."

    ::= { sctpAssocRemAddressEntry 3 }


  sctpAssocRemAddressRTO OBJECT-TYPE   -- T3-rtx- Timer
    SYNTAX         Unsigned32
    UNITS          "milliseconds"
    MAX-ACCESS     read-only
    STATUS         current
    DESCRIPTION
         "The current Retransmision Time-Out. T3-rtx timer as defined
         in the protocol SCTP."

    ::= { sctpAssocRemAddressEntry 4 }


  sctpAssocRemAddressMaxPathRetrans OBJECT-TYPE
    SYNTAX         Unsigned32
```

```
    MAX-ACCESS     read-create
    STATUS         current
```

```
      DESCRIPTION
           "Maximum number of DATA retransmissions allowed to a remote IP
           address before it is considered inactive, as defined in
           [sctp]. Recommended value 5 attempts."

      ::= { sctpAssocRemAddressEntry 5 }


   -- Remote Address Statistic

   sctpAssocRemAddressRetransCount OBJECT-TYPE
     SYNTAX         Counter64
     MAX-ACCESS     read-only
     STATUS         current
     DESCRIPTION
          "Number of DATA retransmissions as defined in [sctp]."

     ::= { sctpAssocRemAddressEntry 6 }

   sctpAssocRemAddressStartTime OBJECT-TYPE
     SYNTAX         TimeStamp
     MAX-ACCESS     read-only
     STATUS         current
     DESCRIPTION
          "The value of SysUpTime at the time that this row was
          created."

     ::= { sctpAssocRemAddressEntry 7 }




   -- 4.1 Conformance Information

   sctpGroups       OBJECT IDENTIFIER ::= { sctpConformance 1 }
   sctpCompliances  OBJECT IDENTIFIER ::= { sctpConformance 2 }


   -- 4.1.1 Units of conformance

   --
   -- MODULE GROUPS
   --


   sctpGeneralVariablesGroup OBJECT-GROUP
     OBJECTS   { sctpRtoAlgorithm,
                 sctpRtoMin,
```

```
                sctpRtoMax,
```

```
                sctpRtoInitial,
                sctpValCookieLife,
                sctpMaxInitRetr
              }
    STATUS    current
    DESCRIPTION
         "Common parameters for all the associations. They can usually
         be referred as configuration parameters"

    ::= { sctpGroups 1 }


  sctpStateStatGroup OBJECT-GROUP
    OBJECTS   {sctpCurrEstab,
                sctpActiveEstab,
                sctpPassiveEstab,
                sctpAborted,
                sctpShutdowns
              }
    STATUS    current
    DESCRIPTION
         "The sctp group of objects to control state changes in the
         SCTP protocol local layer. They include the data for all the
         associations."

    ::= { sctpGroups 2 }


  sctpOtherStatGroup OBJECT-GROUP
    OBJECTS   {sctpStatOutOfBlue,
                sctpStatSentChunks,
                sctpStatRecChunks,
                sctpStatOutOfOrderSentChunks,
                sctpStatOutOfOrderRecChunks,
                sctpStatFragmentedUsrMessages,
                sctpStatReassembledUsrMessages
              }
    STATUS    current
    DESCRIPTION
         "The sctp group of objects providing for management of SCTP
         most common statistics for the local SCTP layer."

    ::= { sctpGroups 3 }


  sctpAssocTablesVariablesGroup OBJECT-GROUP
    OBJECTS   {sctpAssocRemHostName,
                sctpAssocLocalSCTPPort,
                sctpAssocRemSCTPPort,
```

```
                sctpAssocRemPrimaryAddressType,
                sctpAssocRemPrimaryAddress,
```

```
                sctpAssocHeartBeatFlag,
                sctpAssocHeartBeatTimer,
                sctpAssocState,
                sctpAssocInStreams,
                sctpAssocOutStreams,
                sctpAssocMaxRetr,
                sctpAssocT1expired,
                sctpAssocT2expired,
                sctpAssocRtxChunks,
                sctpAssocChecksumErrorCounter,
                sctpAssocStartTime,
                sctpAssocLocalAddressStartTime,
                sctpAssocRemAddressStatus,
                sctpAssocRemAddressRTO,
                sctpAssocRemAddressMaxPathRetrans,
                sctpAssocRemAddressStartTime
              }
    STATUS    current
    DESCRIPTION
         "The sctp group of objects to manage specific local and remote
         SCTP variables (local and remote tables). These variables
         include all the SCTP basic features."

    ::= { sctpGroups 4 }


  sctpAssocStatGroup OBJECT-GROUP
    OBJECTS   {sctpAssocRemAddressRetransCount
              }
    STATUS    current
    DESCRIPTION
         "The sctp group of objects to manage SCTP statistics related
         to the remote endpoint."

    ::= { sctpGroups 5 }

  sctpInverseGroup OBJECT-GROUP
    OBJECTS   {sctpInverseAssocStartTime
              }
    STATUS    current
    DESCRIPTION
         "Objects used in the inverse lookup table."

    ::= { sctpGroups 6 }



  -- 4.1.2 Compliance Statements
```

--

```
   -- MODULE COMPLIANCES
   --


   sctpCompliance MODULE-COMPLIANCE
     STATUS  current
     DESCRIPTION
          "The compliance statement for SNMPv3 entities which implement
          SCTP."

     MODULE  -- this module

          MANDATORY-GROUPS    {  sctpGeneralVariablesGroup,
                                 sctpAssocTablesVariablesGroup
                              }

          GROUP sctpStateStatGroup
          DESCRIPTION
               "The sctp group of objects to control state changes in
               the SCTP protocol."

          GROUP sctpOtherStatGroup
          DESCRIPTION
               "The sctp group of objects providing for management of
               SCTP general statistics."

          GROUP sctpAssocStatGroup
          DESCRIPTION
               "The sctp group of objects to manage SCTP statistics
               related to the remote endpoint."

          GROUP sctpInverseGroup
          DESCRIPTION
               "Objects used in inverse lookup tables. This should be
               implemented for easier lookups in the association
               tables."


          OBJECT  sctpAssocRemPrimaryAddressType
          SYNTAX  InetAddressType { ipv4(1), ipv6(2) }
          DESCRIPTION
               "It is only required to have IPv4 and IPv6 addresses to
               be stored since the use of the host names is limited to
               first stage, when the association is being established."

          OBJECT  sctpAssocRemPrimaryAddress
          SYNTAX  InetAddress (SIZE(4|16))
          DESCRIPTION
               "It is only required to support IPv4 and unique IPv6
```

addresses."

```
        OBJECT  sctpAssocLocalAddressIPType
        SYNTAX  InetAddressType { ipv4(1), ipv6(2) }
        DESCRIPTION
             "It is only required to have IPv4 and IPv6 addresses to
             be stored since the use of the host names is limited to
             first stage, when the association is being established."

        OBJECT  sctpAssocLocalAddressIP
        SYNTAX  InetAddress (SIZE(4|16))
        DESCRIPTION
             "It is only required to support IPv4 and unique IPv6
             addresses."

        OBJECT  sctpAssocRemAddressIPType
        SYNTAX  InetAddressType { ipv4(1), ipv6(2) }
        DESCRIPTION
             "It is only required to have IPv4 and IPv6 addresses to
             be stored since the use of the host names is limited to
             first stage, when the association is being established."

        OBJECT  sctpAssocRemAddressIP
        SYNTAX  InetAddress (SIZE(4|16))
        DESCRIPTION
             "It is only required to support IPv4 and unique IPv6
             addresses."

    ::= { sctpCompliances 1 }


END
```

5. References

[sctp] R. Stewart, Q. Xie, K. Morneault, C. Sharp, H. J. Schwarzbauer, T. Taylor, I. Rytina, M. Kalla, L. Zhang, V. Paxson, "Stream Control Transmission Protocol", RFC 2960, October 2000.

[SIGAS] "Telephony Signaling Transport over SCTP Applicability Statement", <draft-ietf-sigtran-signalling-over-sctp-applic-02.txt>. Work in progress.

[MIBMPLS] Cucchiara et al. "Definnitions of Managed Objects for the Multiprotocol Label Switching, Label Distribution Protocol (LDP)", Internet Draf <draft-ietf-mpls-ldp-mib-04.txt>, January 2000.

[SecSNMP] Stallings, W., "SNMP3: A Security Enhancement for SNMP",
IEEE Communication Surveys, Forth quarter 1998, Vol. 1 No. 1.

[Cong] Jacobson, V., "Congestion Avoidance and Control", SIGCOMM 1988, Stanford, California.

[RFC2012] K. McCloghrie, "SNMPv2 Management Information Base for the Transmission Control Protocol using SMIv2", RFC 2012, November 1996.

[RFC2571] Harrington, D., Presuhn, R., and B. Wijnen, "An Architecture for Describing SNMP Management Frameworks", RFC 2571, April 1999.

[RFC1155] Rose, M., and K. McCloghrie, "Structure and Identification of Management Information for TCP/IP-based Internets", STD 16, RFC 1155, May 1990.

[RFC1212] Rose, M., and K. McCloghrie, "Concise MIB Definitions", STD 16, RFC 1212, March 1991.

[RFC1215] M. Rose, "A Convention for Defining Traps for use with the SNMP", RFC 1215, March 1991.

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

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

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

[RFC1157] Case, J., Fedor, M., Schoffstall, M., and J. Davin, "Simple Network Management Protocol", STD 15, RFC 1157, May 1990.

[RFC1901] Case, J., McCloghrie, K., Rose, M., and S. Waldbusser, "Introduction to Community-based SNMPv2", RFC 1901, January 1996.

[RFC1906] Case, J., McCloghrie, K., Rose, M., and S. Waldbusser, "Transport Mappings for Version 2 of the Simple Network Management Protocol (SNMPv2)", RFC 1906, January 1996.

[RFC2452] M. Daniele, "IP Version 6 Management Information Base for the Transmission Control Protocol", RFC 2452, December 1998

[RFC2572] Case, J., Harrington D., Presuhn R., and B. Wijnen,

"Message Processing and Dispatching for the Simple Network Management Protocol (SNMP)", RFC 2572, April 1999.

[RFC2574] Blumenthal, U., and B. Wijnen, "User-based Security Model (USM) for version 3 of the Simple Network Management Protocol (SNMPv3)", RFC 2574, April 1999.

[RFC1905] Case, J., McCloghrie, K., Rose, M., and S. Waldbusser, "Protocol Operations for Version 2 of the Simple Network Management Protocol (SNMPv2)", RFC 1905, January 1996.

[RFC2573] Levi, D., Meyer, P., and B. Stewart, "SNMPv3 Applications", RFC 2573, April 1999.

[RFC2575] Wijnen, B., Presuhn, R., and K. McCloghrie, "View-based Access Control Model (VACM) for the Simple Network Management Protocol (SNMP)", RFC 2575, April 1999.

[RFC2570] Case, J., Mundy, R., Partain, D., and B. Stewart, "Introduction to Version 3 of the Internet-standard Network Management Framework", RFC 2570, April 1999.

[RFC2851] Textual Conventions for Internet Network Addresses ,RFC 2851, June 2000.

[RFC2119] Bradner, S., "Key words for use in RFCs to Indicate Requirement Levels", BCP 14, RFC 2119, Harvard University, March 1997

6. Security Consideration

There are a number of management objects defined in this MIB that have a MAX-ACCESS clause of read-write and/or read-create. Such objects may be considered sensitive or vulnerable in some network environments. The support for SET operations in a non-secure environment without proper protection can have a negative effect on network operations.

It is thus important to control even GET access to these objects and possibly to even encrypt the values of these object when sending them over the network via SNMP. Not all versions of SNMP provide features for such a secure environment.

SNMPv1 by itself is not a secure environment. Even if security measures are taken (e.g., using IPSEC), there is no per-user control as to who (once an IPSEC association is established between hosts) is allowed to GET or SET the objects in this MIB

It is recommended that the implementers consider the security features as provided by the SNMPv3 framework. Specifically, the use of the User-based Security Model RFC 2574 [RFC2574] and the View-

based Access Control Model RFC 2575 [RFC2575] is recommended.

It is then a customer/user responsibility to ensure that the SNMP entity giving access to an instance of this MIB, is properly configured to give access to the objects only to those principals (users) that have legitimate rights to indeed GET or SET (change/create/delete) them.

7. Acknowledgments

The authors wish to thank David Partain, Ed Yarwood and Shyamal Prasad for their invaluable comments.

8. Authors' Addresses

Javier Pastor
Ericsson Espana S.A.
Network Communication Services
Retama 7, 5th floor
Madrid, 28045
Spain
Tel: +34-91-339-3819
eMail: J.Javier.Pastor@ericsson.com

Maria-Carmen Belinchon
Ericsson Espana S.A.
Network Communication Services
Retama 7, 5th floor
Madrid, 28045
Spain
Tel: +34-91-339-3535
eMail: Maria.C.Belinchon@ericsson.com

9. Revision History

9.1 Changes from <SCTP-MIB-predraft-01.txt>

o Open issues updated

o Section 2: Reference to RFC227x changed to RFC257x

o Section 4: Inside the sctpRtoAlgorithm definition has been put "other" first
rather than last. That way, it won't end up in the middle of things when new
enumerations are added later.

9.2 Changes from <draft-ietf-sigtran-sctp-mib-00.txt>

o Change of "Simple" word to "Stream" word in SCTP acronyms

o Version of the MIB based on SCTPv10

o Section 2: Update SNMP Framework to include the standard explanation

o New Structure for the MIB:

```
            sctpMIB
          \- sctpObjects
                \- sctpScalars
                \- sctpTables
          \- sctpConformance
```

o Section 4.1.2: Unit of Conformance updated (functional structure).

o MAX-ACCESS clauses reviewed

o The general statistics has been re-ordered, placed before the tables.

o In SMIv2, indexes should be not-accessible (= the object type is a column in a table used as index and may not be used as an operand in any
operation != SMIv1) (pp109-110 in [])

o IPv6 compatible:
- Change of Primary/Local/Remote addresses
- PENDING: check "MODULE-COMPLIANCE"

o Row Status included in AssocTable, AssocLocal and AssocRem to create,
modify and delete rows in the tables.

o SCTP general statistics changed from Counter32 to Counter64 since it supports
more data changes.

o sctpCurrEstab ("State-related variables and statistics" section) variable
changed from Gauge32 to Counter32.

o sctpAssocRemAddressT1expired and sctpAssocRemAddressT2expired have been
removed from the remote table and added in the general association data
since they are variables per association (not per IP address).

o sctpAssocDropDatag statistic has been removed from the general association
statistics since it had an ambiguous meaning.

o Explained the meaning of the unordered chunks (chunks in which the U bit is
set to 1) in sctpStatOutOfOrderSentChunks and sctpStatOutOfOrderRecChunks.

o Added sctpChecksumErrorCounter to collect information about wrong checksums
received from the peer.

o Specify that sctpStatSentChunks and sctpStatRecChunks does not contain
retransmission chunks.

o Reword the Security Considerations chapter pointing out that IPsec does
not secure the network but it provides end-to-end security over a network.

o sctpAssocRemAddressRtxChunks replaced as a variable per association,
meaning the number of chunks retransmited to the peer in the current association.

o sctpHeartBeatMisses and sctpMaxRetr have been replaced from the general
SCTP statistics to the remote IP address table (sctpHeartBeatMisses) and
in the association table (sctpMaxRetr).

o Specify that the retransmissions in the general SCTP statistics include
control plus data chunks.

o Included heartbeat timer for remote IP address.

o Removed sctpAssocRemAddressHeartBeatMisses variable from the remote IP
address table.

o Removed sctpAssocRemAddressT3expired variable from the remote IP address table.

o Updated variables to the new SCTP states defined in v10.

9.3 Changes from <draft-ietf-sigtran-sctp-mib-01.txt>

o sctpRtoMin - stray "." outside the double-quotes in the DESCRIPTION clause.

o sctpRtoMax - stray "." outside the double-quotes in the DESCRIPTION clause.

o sctpAssocRemHostName - the type OCTECT STRING should be OCTET STRING.

o sctpAssocRemPrimaryAddress - the DESCRIPTION clause is missing its closing ouble-quote.

o sctpConformance - this is defined as { sctpMIB 2 }, then never used; instead sctpMIBConformance (which is undefined) is used in the definition of sctpMIBGroups and sctpMIBCompliances.

o Reworded the MIB organization

o Removed maximum number of concurrent associations

o In sctpMIBCompliance, removed a missing comma in MANDATORY-GROUPS.

o In sctpAssocTablesVariablesGroup and sctpAssocStatGroup, removed extra commas at end of OBJECTS list.

o sctpAssocInStreams. ACCESS changed from read-create to read-only.

o sctpAssocRemAddressHeartBeatFlag and sctpAssocRemAddressHBTimer changed from per remote IP address to per association.

o Comment on sctpAssocRemAddressHBTimer specifies now that the manager can change it.

o ACCESS on sctpAssocRemAddressHBTimer changed from read-only to read-write.

o ACCESS on sctpAssocRemAddressRetransCount changed from read-write to read-only.

o Move sctpStatChecksumErrorCounter from general statistics to per association.

o sctpMaxInStreams û ItÆs a sctp-user feature.

o sctpStatRetransChunks û ItÆs more useful to have this statistic in a association basis

o sctpAssocRemAddressHeartBeatFlag and sctpAssocRemAddressHBTimer have been created again instead of per association in order to follow the draft. If some implementations want to have the same value for all the associations they have, they should set all the variables in the different remote addresses to the same value.

9.3 Changes from <draft-ietf-sigtran-sctp-mib-02.txt>

o Deleting all the RowStatus Structure. Associated text rewording in Tables section.

o Variable StartTime added in all the tables in order to specify the creation time.

o Adding the Association reverse lookup table for easier management. Associated text rewording in tables section.

o Remove sctpInitialT1 and sctpInitialT2, since these values are equal to RTO.

o Change of the Heartbeats to a per-association basis

o Conformance up-to-date with all of this.