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J. Pastor
M. Belinchon
Ericsson

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**Stream Control Transmission Protocol
Management Information Base using SMIV2
<[draft-ietf-sigtran-sctp-mib-02.txt](#)>**

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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](#)].

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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

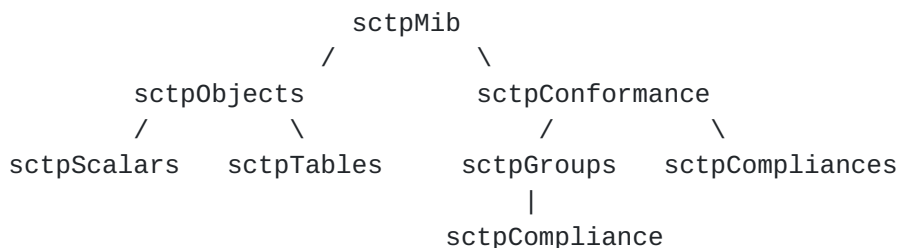
in [RFC 1902](#) [SMIV2], [RFC 1903](#) [SNMPv2TC] and [RFC 1904](#) [SNMPv2Conf].

- Message protocols for transferring management information. The first version of the SNMP message protocol is called SNMPv1 and 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 RT0 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 RT0. '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 Association Tables

The part of the MIB to define each association is structured according to a expanded table. There is a main table (called association table), 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 implementer decides.

This main table contains common information for a given association and two other tables inside:

a) 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 address.

b) 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.

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.

The variable RowStatus [ConvSMIV2] allows creating and deleting rows in the tables. In the association table, creation of entries will be performed after creating the TCB in both sides of the association. In the local and remote tables, creation of entries will be performed after the association table creation or when new IP addresses are added to the association (if this feature is enabled in the SCTP protocol).

After deleting the TCB, the local and remote table will be deleted, and then the association table. Also, it is possible to delete entries in the local and remote table when IP addresses are removed from the association context by the SCTP layer (if this feature is enabled).

EDITORS NOTE: The main purpose of the MIB and the access policy have to be agreed amongst the WG folks.

- Only providing statistics and status information about associations?
- Allow configuration of associations too?
- When to perform creation and deletion of entries in tables?

A good input will be given by the TCP MIB editors.

sctpAssocTable

```

+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+
| sctpAssocId (index)                                     / ... |
+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+
| sctpAssocRemHostName                                   \ ... |
+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+
| sctpAssocLocalSCTPPort                                 / ... |
+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+
| sctpAssocRemSCTPPort                                   \ ... |
+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+
| sctpAssocRemPrimaryAddressType                         / ... |
+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+
| sctpAssocRemPrimaryAddress                             \ ... |
+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+
| sctpAssocState                                         / ... |
+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+
| sctpAssocInStreams                                     \ ... |

```


[illegible]

Every entry is explained when defining the MIB.

[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.

-- QUIZAS LA 4A PODRIA DIVIDIRSE.HAY MUCHOS CONCEPTOS MEZCLADOS

[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,  
    mib-2
```

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

```
    MODULE-COMPLIANCE, OBJECT-GROUP
```

```
        FROM SNMPv2-CONF                -- RFC2580
```

```
    RowStatus
```

```
        FROM SNMPv2-TC                -- RFC2579
```

```
    InetAddressType, InetAddress
```

```
        FROM INET-ADDRESS-MIB          -- RFC2851
```

```
    ;
```

```
sctpMIB MODULE-IDENTITY
```

```
    LAST-UPDATED "200011060000Z"
```

```
    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 SCTP implementation."

REVISION

"200011060000Z"

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 }
```

```
sctpInitialT1 OBJECT-TYPE
```

```
SYNTAX      Unsigned32
```

```
UNITS       "milliseconds"
```

```
MAX-ACCESS  read-write
```

```
STATUS      current
```

```
DESCRIPTION
```

```
    "Initial value for the Start-up T1 timer."
```

```
::= { sctpScalars 7 }
```

```
sctpInitialT2 OBJECT-TYPE
```

```
SYNTAX      Unsigned32
```

```
UNITS       "milliseconds"
```

```
MAX-ACCESS  read-write
```

```
STATUS      current
```

```
DESCRIPTION
```

```
    "Initial value for the Shutdown T2-shutdown timer."
```

```
::= { sctpScalars 8 }
```

```
-- 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 9 }
```


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 10 }

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 11 }

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 12 }

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 13 }
```

-- 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 14 }

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 15 }

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 16 }

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 17 }

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 18 }

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 19 }

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

 ::= { sctpScalars 20 }

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

-- 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 1 }
```

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,	
sctpAssocState	INTEGER,	
sctpAssocInStreams	Unsigned32,	
sctpAssocOutStreams	Unsigned32,	
sctpAssocMaxRetr	Unsigned32,	
sctpAssocT1expired	Counter32,	-- Statistic
sctpAssocT2expired	Counter32,	-- Statistic
sctpAssocRtxChunks	Counter32,	-- Statistic
sctpAssocChecksumErrorCounter	Counter64,	-- Statistic
sctpAssocRowStatus	RowStatus	

}

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	

Pastor, Belinchon

"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 }

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 7 }

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 8 }  
  
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 9 }

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 appropriate 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 10 }

-- 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 11 }

sctpAssocT2expired OBJECT-TYPE

SYNTAX Counter32

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"Number of times that T2-shutdown timer expired (shutdown timer)."

::= { sctpAssocEntry 12 }

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 13 }

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 14 }

sctpAssocRowStatus OBJECT-TYPE

SYNTAX RowStatus

MAX-ACCESS read-create

STATUS current

DESCRIPTION

"An object that allows entries in this table to be created and deleted using the RowStatus convention."

A row in this table will be created after creating the TCB in both sides of the association. The creation of this row implies the creation of at least another row (depending on the number of local and remote addresses) in the tables sctpAssocLocalAddressTable and sctpAssocRemAddressTable.

A row is deleted in sctpAssocTable when an association turns down (i.e., when the TCB is deleted according to [[sctp](#)] in both sides of the association). The deletion of a row in sctpAssocTable implies the deletion of the tables related to this association (sctpAssocLocalAddressTable and sctpAssocRemAddressTable).

Also, a row is deleted in sctpAssocTable when a set operation is received from the manager with destroy option."

::= { sctpAssocEntry 15 }

-- 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 2 }

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,

sctpAssocLocalAddressRowStatus RowStatus

}

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 }
```

sctpAssocLocalAddressRowStatus OBJECT-TYPE

SYNTAX RowStatus
MAX-ACCESS read-create
STATUS current
DESCRIPTION

"An object that allows entries in this table to be created and deleted using the RowStatus convention.

A row in this table will be created per local IP address defined for this association. The creation takes part when a new row in the sctpAssocTable is created or when a new IP address is added in the local interface (if this function is enabled by the SCTP layer).

A row in this table will be deleted per local IP address reserved for the association when the corresponding row in sctpAssocTable is deleted or when an IP address is removed from the local interface (if this function is enabled by the SCTP layer)."

```
::= { 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 3 }
```

```
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,
```

```
  sctpAssocRemAddressRT0         Unsigned32,
```

```
  sctpAssocRemAddressHeartBeatFlag INTEGER,
```

```
  sctpAssocRemAddressHeartBeatTimer Unsigned32,
```

```
  sctpAssocRemAddressMaxPathRetrans Unsigned32,
```

```
  sctpAssocRemAddressRetransCount Counter64,      -- Statistic
```

```
  sctpAssocRemAddressRowStatus   RowStatus
```

```
}
```

```
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 Retransmission Time-Out. T3-rtx timer as defined in the protocol SCTP."

::= { sctpAssocRemAddressEntry 4 }

sctpAssocRemAddressHeartBeatFlag OBJECT-TYPE

SYNTAX INTEGER {
 active(0),
 inactive(1)
 }
 }

MAX-ACCESS
STATUS

read-create
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](#)]."

::= { sctpAssocRemAddressEntry 5 }

sctpAssocRemAddressHeartBeatTimer 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."

::= { sctpAssocRemAddressEntry 6 }

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 7 }

-- Remote Address Statistic

sctpAssocRemAddressRetransCount OBJECT-TYPE

SYNTAX Counter64

MAX-ACCESS read-only

STATUS current

DESCRIPTION

"Number of DATA retransmissions as defined in [[sctp](#)]."

::= { sctpAssocRemAddressEntry 8 }

sctpAssocRemAddressRowStatus OBJECT-TYPE
SYNTAX RowStatus

MAX-ACCESS read-create

STATUS current

DESCRIPTION

"An object that allows entries in this table to be created and deleted using the RowStatus convention.

A row in this table will be created per remote IP address defined for this association. The creation takes part when a new row in the sctpAssocTable is created or when a new IP address is added in the remote interface (if this function is enabled by the SCTP layer).

A row in this table will be deleted per remote IP address reserved for the association when the corresponding row in sctpAssocTable is deleted or when an IP address is removed from the local interface (if this function is enabled by the SCTP layer)."

::= { sctpAssocRemAddressEntry 9 }

-- 4.1 Conformance Information

sctpGroups OBJECT IDENTIFIER ::= { sctpConformance 1 }

sctpCompliances OBJECT IDENTIFIER ::= { sctpConformance 2 }

-- 4.1.1 Compliance Statements

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."

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 }

-- 4.1.2 Units of conformance

sctpGeneralVariablesGroup OBJECT-GROUP

```
OBJECTS    { sctpRtoAlgorithm, sctpRtoMin, sctpRtoMax,
              sctpRtoInitial, sctpValCookieLife, sctpMaxInitRetr,
              sctpInitialT1, sctpInitialT2
            }
STATUS     current
DESCRIPTION
    "The sctp group of objects providing for management of SCTP
    entities. Common parameters for the protocol."
```

```
::= { 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."
```

```
::= { 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
    general statistics."
```

```
::= { sctpGroups 3 }
```

sctpAssocTablesVariablesGroup OBJECT-GROUP

```
OBJECTS    {sctpAssocId, sctpAssocRemHostName,
              sctpAssocLocalSCTPPort, sctpAssocRemSCTPPort,
              sctpAssocRemPrimaryAddressType,
              sctpAssocRemPrimaryAddress, sctpAssocState,
              sctpAssocInStreams, sctpAssocOutStreams,
              sctpAssocMaxRetr, sctpAssocT1expired,
              sctpAssocT2expired, sctpAssocRtxChunks,
              sctpAssocChecksumErrorCounter, sctpAssocRowStatus,
              sctpAssocLocalAddressIPType, sctpAssocLocalAddressIP,
```

sctpAssocLocalAddressRowStatus,
sctpAssocRemAddressIPType, sctpAssocRemAddressIP,


```
        sctpAssocRemAddressStatus, sctpAssocRemAddressRT0,
        sctpAssocRemAddressHeartBeatFlag,
        sctpAssocRemAddressHeartBeatTimer,
        sctpAssocRemAddressMaxPathRetrans,
        sctpAssocRemAddressRowStatus
    }
STATUS    current
DESCRIPTION
    "The sctp group of objects to manage specific local and remote
    SCTP variables (local and remote tables)."
```

::= { 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 }

END

5. References

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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.

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8. Authors' Addresses

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

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

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

Pastor, Belinchon

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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 retransmitted 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 double-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.

9.2 Changes from <[draft-ietf-sigtran-sctp-mib-02.txt](#)>

- o sctpMaxInStreams ð ItÆs a sctp-user feature.
- o sctpStatRetransChunks ð 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.

