Telephony Signalling Transport over SCTP applicability statement
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Abstract

This document describes the applicability of the new protocols
developed under the signalling transport framework[RFC2719]. A
description of the main issues regarding the use of the Stream
Control Transmission Protocol (SCTP)[RFC2960] and each adaptation
layer for transport of telephony signalling information over IP
infrastructure is explained.

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# 1 INTRODUCTION

This document intends to inform how to transport telephony
signalling protocols, used in classic telephony systems, over IP
networks. The whole architecture is called SIGTRAN (Signalling
Transport) as described in RFC2719 and is composed of a transport
protocol(SCTP) and several User Adaptation layers(UAL). The
transport protocol SCTP has been been developed to fulfill the
stringent requirements that telephony signalling networks have. The
set of User Adaptation layers have also been introduced to make it
possible that different signalling protocols can use the SCTP layer.

## 1.1 Scope

The scope of this document is to explain the way that user
adaptation layers and SCTP protocols have to be used to transport
Telephony signalling information over IP.

## 1.2 Terminology

The following terms are commonly identified in related work:

Association: SCTP connection between two endpoints.

Stream: A uni-directional logical channel established within an
association, within which all user messages are delivered in
sequence except for those submitted to the unordered delivery
service.

SPU: Signalling protocol user, the application on top of the User
adaptation layer.

CTSP: Classical Telephony Signalling protocol(examples: MTP level2,
MTP level 3, SCCP....).

UAL: User adaptation layer: the protocol that encapsulate the upper
layer telephony signalling protocols that are to be transported over
SCTP/IP.

ISEP: IP signalling endpoint: a IP node that implements SCTP and a
User adapatation layer.

SP: signalling point

### 1.3 Contributors

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## [2](#) SIGTRAN architecture

The SIGTRAN architecture describes the transport of signalling
information over IP infrastructure.

Telephony Signalling transport over IP normally uses the following
architecture:

```
             Telephony Signalling Application
                          |
         +-----------------------------------+
         |   Signalling Adaptation Layers    |
         +-----------------------------------+
                          |
         +-----------------------------------+
         |Stream Control Transmission Protocol|
         |              (SCTP)               |
         +-----------------------------------+
                          |
            Internet Protocol (IPv4/IPv6)
```
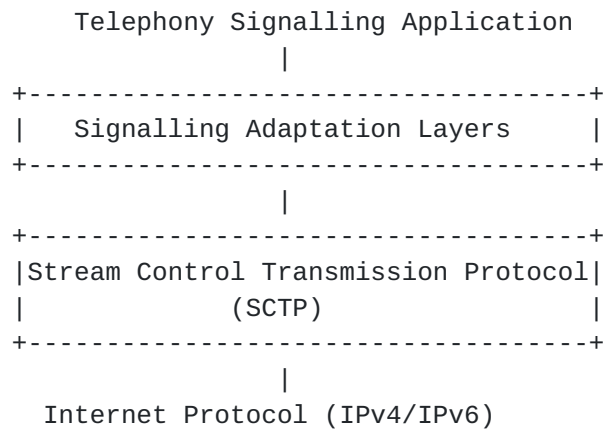
Figure 1.1: Telephony signalling transport protocol stack

The components of the protocol stack are :

(1) Adaptation modules are used when the telephony application needs
to preserve an existing primitive interface. (e.g. management
indications, data operation primitives, ... for a particular
user/application protocol).

(2) SCTP, specially configured to meet the telephony application
performance requirements.

(3) The standard Internet Protocol.

The telephony signalling protocols to be transported can be:

- SS7 MTP3 users: SCCP, ISUP, TUP...

- SS7 MTP2 users: MTP3

    - SS7 SCCP users: RANAP, MAP(+TCAP), INAP(+TCAP)...

- ISDN Q.921 users: Q.931

- V5.2/DSS1

- ....

Every classic telephony protocol can have a corresponding UAL
developed.

The user adaptation layers(UALs) are a set of protocols that
encapsulate a specific signalling protocol to be transported over
SCTP. The adapation is done in a way that the upper signalling
protocols that are relayed remain unaware that the lower layers are
different to the originail lower telephony signalling layers. In
that sense, the upper interface of the user adapatation layers need
to be the same as the upper layer interface to its original lower
layer. If a MTP user is being relayed over the IP network, the
related UAL used to transport the MTP user will have the same upper
interface as MTP has.

The Stream Control Transmission protocol was designed to fulfill the
stringent transport requirements that classical signalling protocols
have and is therefore the recommended transport protocol to use for
this purpose.

The following functions are provided by SCTP:

- Reliable Data Transfer

- Multiple streams to help avoid head-of-line blocking

- Ordered and unordered data delivery on a per-stream basis

- Bundling and fragmentation of user data

- Congestion and flow control

- Support continuous monitoring of reachability

- Graceful termination of association

- Support of multi-homing for added reliability

- Protection against blind denial-of-service attacks

- Protection against blind masquerade attacks


SCTP is used as the transport protocol for telephony signalling
applications.  Message boundaries are preserved during data

transport by SCTP and so each UAL can specify its own message
structure withing the SCTP user data. The SCTP user data can be
delivered by the order of transmission within a stream(in sequence
delivery) or unordered.

SCTP can be used to provide redundancy at the
transport layer and below. Telephony applications needing this level
of redundancy can make use of SCTP's multi-homing support.

SCTP can be used for telephony applications where head-of-line
blocking is a concern. Such an application should use multiple
streams to provide independent ordering of telephony signalling
messages.

## 3 Issues for transporting telephony signalling over SCTP

Transport of telephony signalling requires special
considerations. In order to use SCTP, special care must be taken to
meet the performance, timing and failure management requirements.

### 3.1 Congestion Control

The basic mechanism of congestion control in SCTP have been
described in [RFC2960]. SCTP congestion control sometimes conflicts
with the timing requirements of telephony signalling application
messages which are transported by SCTP. During congestion, messages
may be delayed by SCTP, thus sometimes violating the timing
requirements of those telephony applications.

In an engineered network (e.g. a private intranet), in which network
capacity and maximum traffic are very well understood, some
telephony signalling applications may choose to relax the congestion
control rules of SCTP in order to satisfy the timing
requirements. In order to do this, they should employ their own
congestion control mechanisms. But this should be done without
destabilising the network, otherwise this would lead to potential
congestion collapse of the network.

Some telephony signalling applications may have their own congestion
control and flow control techniques. These techniques may interact
with the congestion control procedures in SCTP.

### 3.2 Detection of failures

Telephony systems often must have no single point of failure in

operation.

   The UAL must meet certain service availability and performance
   requirements according to the classical signalling layers they are

replacing. Those requirements may be specific for each UAL.

For example, telephony systems are often required to be able to
preserve stable calls during a component failure. Therefore error
situations at the transport layer and below must be detected quickly
so that the UAL can take approriate steps to recover and preserve the
calls. This poses special requirements on SCTP to discover
unreachablility of a destination address or a peer.

### 3.2.1 Retransmission TimeOut (RTO) calculation

The SCTP protocol parameter RTO.Min value has a direct impact on the
calculation of the RTO itself. Some telephony applications want to
lower the value of the RTO.Min to less than 1 second. This would
allow the message sender to reach the maximum
number-of-retransmission threshold faster in the case of network
failures. However, lowering RTO.Min may have a negative impact on
network behaviour [ALLMAN99].

In some rare cases, telephony applications might not want to use the
exponential timer back-off concept in RTO calculation in order to
speed up failure detection. The danger of doing this is that, when
network congestion occurs, not backing off the timer may worsen the
congestion situation. Therefore, this strategy should never be used
in public Internet.

It should be noted that not using delayed SACK will also help faster
failure detection.

### 3.2.2 Heartbeat

For faster detection of (un)availability of idle paths, the
telephony application may consider lowering the SCTP parameter
HB.interval. It should be noted this might result in a higher traffic
load.

### 3.2.3 Maximum number of retransmissions

Setting Path.Max.Retrans and Association.Max.Retrans SCTP parameters
to lower values will speed up both destination address and peer
failure detection. However, if these values are set too low, the

probability of false fault detections might increase.

## 3.3 Shorten end-to-end message delay

Telephony applications often require short end-to-end message
delays.  The method described in section 3.2.1 on lowering RTO may
be considered. The different paths within a single association will
have a different RTO, so using the path with the lowest RTO will
lead to a shorter end-to-end message delay for the application
running on top of the UAL's.

## 3.4 Bundling considerations

Bundling small telephony signalling messages at transmission helps
improve the bandwidth usage efficiency of the network. On the
downside, bundling may introduce additional delay to some of the
messages. This should be taken into consideration when end-to-end
delay is a concern.

## 3.5 Stream Usage

Telephony signalling traffic is often composed of multiple,
independent message sequences. It is highly desirable to transfer
those independent message sequences in separate SCTP streams. This
reduces the probability of head-of-line blocking in which the
retransmission of a lost message affects the delivery of other
messages not belonging to the same message sequence.

4. User Adaptation Layers

Users Adaptation Layers (UALs) are defined to encapsulate different
signalling protocols in order to transport them over SCTP/IP

There are UALs for both access signalling (DSS1) and trunk signalling
(SS7). A brief description of the standardized UALs follows in the
next sub-sections.

The delivery mechanism in the several UALs

   - Supports seamless operation of UALs user peers over an IP
      network connection.

- Supports the interface boundary that the UAL user had with the
            traditional lower layer.

- Supports management of SCTP transport associations and traffic
  between SGs and ISEPs or two ISEPs


- Supports asynchronous reporting of status changes to management.

Signalling User Adaptation Layers have been developed for both:
Access and Trunk Telephony Signalling. They are defined as follows.

Access Signalling: This is the signalling that is needed between and
  access device and an exchange in the core network in order to
  establish, manage or release the voice or data call paths. There
  are several protocols that have been developed for this purpose.

Trunk Signalling: This is the signalling that is used between the
  exchanges inside the core network in order to establish, manage or
  release the voice or data call paths. The most common protocols
  used for this purpose are known as the SS7 system that belongs to
  the Common Channel Signalling (CCS) philosophy. The SS7 protocol
  stack is depicted below:

```
+------+-----+--------+- -+-------+------+-----+------+
|      |     |        |   |       | MAP  | CAP | INAP |
+      |     + RANAP  |...| BSSAP +------------------+
| ISUP | TUP |        |   |       |       TCAP       |
+      |     +------------------------------------+
|      |     |                 SCCP                |
+--------------------------------------------------+
|                      MTP3                         |
+--------------------------------------------------+
|                      MTP2                         |
+--------------------------------------------------+
|                      MTP1                         |
+--------------------------------------------------+
```
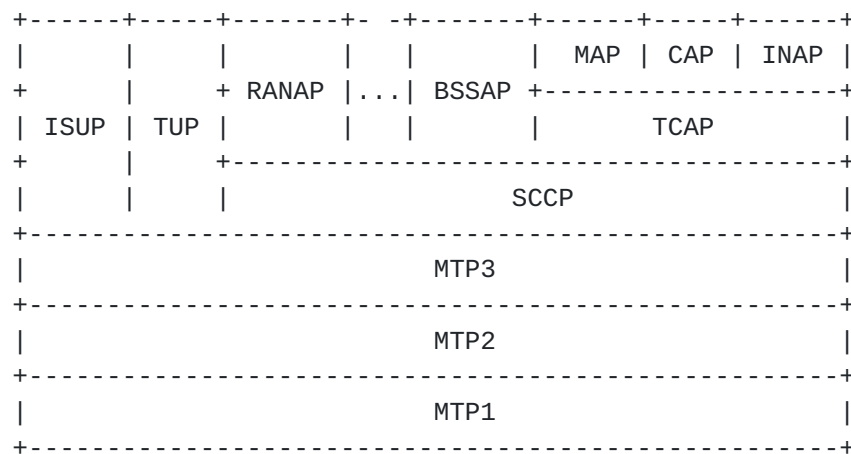
The Telephony Signalling Protocols to be transported with the already
designed UALS are:

- ISDN Q.921 Users: Q.931
- V5.2/DSS1
- DPNSS/DASS2
- SS7 MTP3 Users: SCCP, ISUP, TUP
- SS7 MTP2 Users: MTP3
- SS7 SCCP Users: TCAP, RANAP, BSSAP, ...

Two main scenarios have been developed to use the different UALS for
IP Signalling Transport:

(1) Intercommunication of traditional Signalling transport nodes and
    IP based nodes.
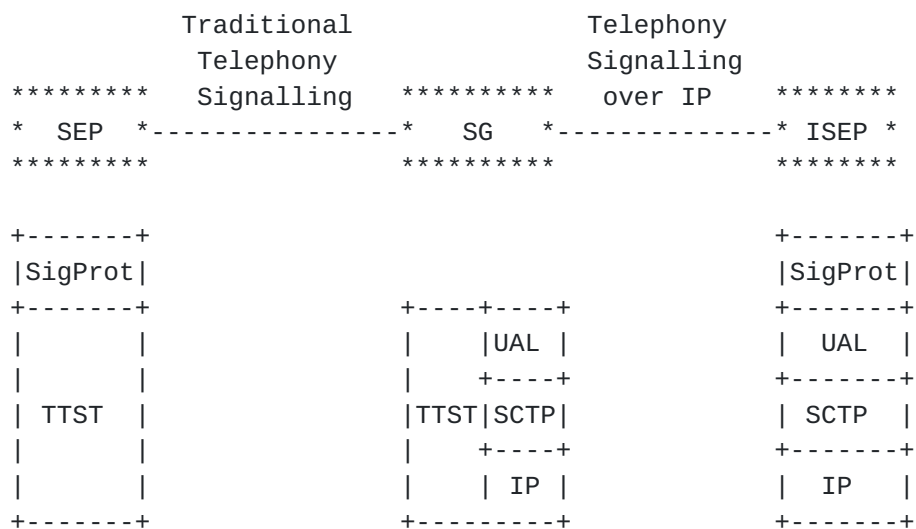
```
                  Traditional            Telephony
                  Telephony              Signalling
      *********   Signalling  **********  over IP    ********
      *  SEP  *---------------*   SG    *-------------* ISEP *
      *********               **********             ********


      +-------+                                      +-------+
      |SigProt|                                      |SigProt|
      +-------+               +----+----+            +-------+
      |       |               |    |UAL |            |  UAL  |
      |       |               |    +----+            +-------+
      | TTST  |               |TTST|SCTP|            | SCTP  |
      |       |               |    +----+            +-------+
      |       |               |    | IP |            |  IP   |
      +-------+               +---------+            +-------+


              SEP     -   Signalling Endpoint
              SG      -   Signalling Gateway
              ISEP    -   IP Signalling Endpoint
              SigProt -   Signalling Protocol
              TTST    -   Traditional Telephony Signalling Transport
              UAL     -   User Adaptation Layer
              SCTP    -   Stream Control Transport Protocol
```

It is also referred as SG to AS communication. AS I the name that
UAL usually gives to the ISEP nodes. It stands for Application
Server.


(2) Communication inside the IP network.

```
                        Telephony
                        Signalling
            *********    over IP     *********
            * ISEP  *----------------*  ISEP *
            *********                *********


            +-------+                +-------+
            |SigProt|                |SigProt|
            +-------+                +-------+
            |  UAL  |                |  UAL  |
            +-------+                +-------+
            | SCTP  |                | SCTP  |
            +-------+                +-------+
            |  IP   |                |  IP   |
```

```
                    +-------+                      +-------+
```
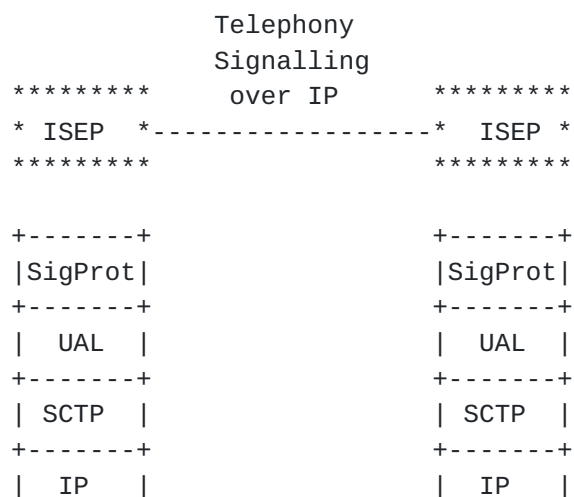
        This is also referred to as IPSP communication. IPSP is the name

of the role that an UAL plays on an IP-based node. It stands for
IP Signalling Point.

The first scenario is applied for both types of signalling (access
and trunk signalling). On the other hand the peer to peer basis can
only be used for trunk signalling.


4.1  Access Signalling

The SIGTRAN WG have developed UALs to transport the following Access
Signalling protocols:

- ISDN Q.931
- V5.2
- DPNSS/DASS2


4.1.1  ISDN Q.931 over IP

UAL: IUA (ISDN Q.921 User Adaptation)

This document supports both ISDN Primary Rate Access (PRA) as well as
Basic Rate Access (BRA) including the support for both point-to-point
and point-to-multipoint modes of communication.  This support
includes Facility Associated Signalling (FAS), Non-Facility
Associated Signalling (NFAS) and NFAS with backup D channel.

It implements the client/server architecture. The default orientation
would be for the SG to take on the role of server while the ISEP is
the client. The SCTP (and UDP/TCP) Registered User Port Number
Assignment for IUA is 9900.

Examples of the upper layers to be transported would be Q.931 and
QSIG.

The main scenario supported by this UAL is the SG to ISEP
communication where the ISEP role is typically played by a node
called MGC defined in [RFC2719].

```
                ******    ISDN         ******        IP      *******
                *PBX *---------------* SG *--------------* MGC *
                ******                ******                *******


                +-----+                                      +-----+
                |Q.931|              (NIF)                    |Q.931|
                +-----+           +----------+               +-----+
                |     |           |    | IUA|                | IUA |
                |     |           |    +----+               +-----+
                |Q.921|           |Q.921|SCTP|               |SCTP |
```
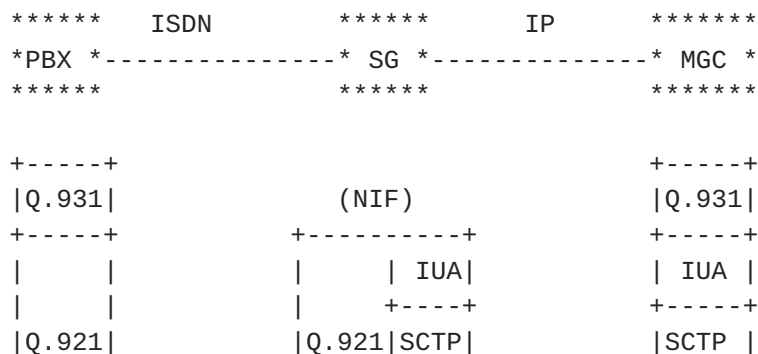
```
      |     |            |      +----+           +-----+
      |     |            |      | IP |           | IP  |
      +-----+            +-----+----+           +-----+
```

                 NIF  - Nodal Interworking Function
                 PBX  - Private Branch Exchange
                 SCTP - Stream Control Transmission Protocol
                 IUA  - ISDN User Adaptation Layer Protocol


   The SCTP (and UDP/TCP) Registered User Port Number Assignment for IUA
   is 9900.

   The value assigned by IANA for the Payload Protocol Identifier in the
   SCTP Payload Data chunk is ô1ö



 4.1.2  V5UA over IP

   UAL: V5UA (V5.2-User Adaptation)

   It is an extension from the IUA layer with the modifications needed
   to support the differences between Q.921 / Q.931, and V5.2 layer 2 /
   layer 3. It supports analog telephone access, ISDN basic rate access
   and ISDN primary rate access over a V5.2 interface. It is basically
   implemented in an interworking scenario with SG.


```
         ******    V5.2          ******       IP      *******
         * AN *---------------* SG *--------------* MGC *
         ******                ******              *******


         +-----+                              +-----+
         |V5.2 |              (NIF)           |V5.2 |
         +-----+          +----------+        +-----+
         |     |          |     |V5UA|        |V5UA |
         |     |          |     +----+        +-----+
         |LAPV5|          |LAPV5|SCTP|        |SCTP |
         |     |          |     +----+        +-----+
         |     |          |     | IP +        | IP  |
         +-----+          +-----+----+        +-----+



         AN    û Access Network
         NIF   û Nodal Interworking Function
         LAPV5 û Link Access Protocol for the V5 channel
         SCTP  - Stream Control Transmission Protocol
```
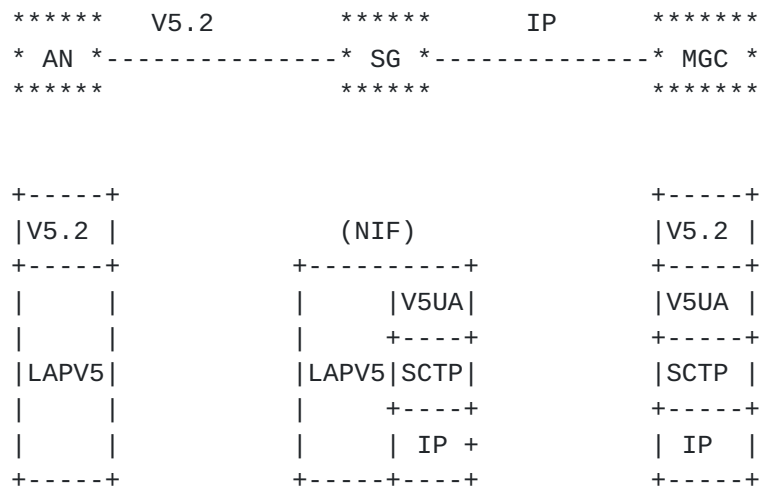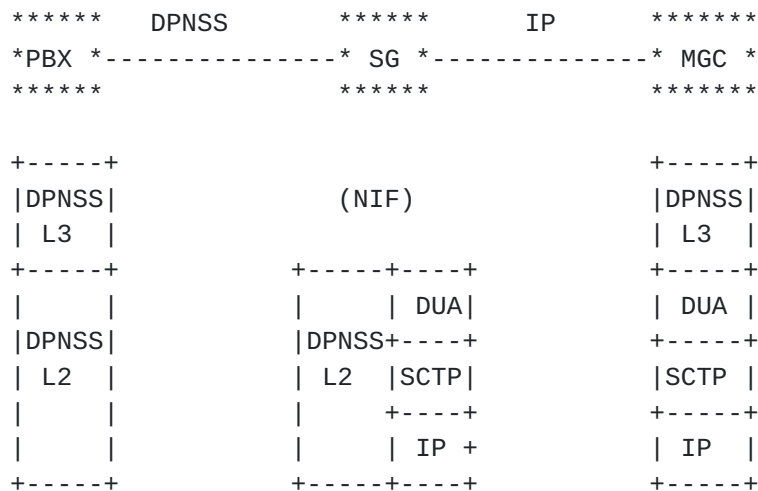
The SCTP (and UDP/TCP) Registered User Port Number Assignment for
V5UA is 5675.

The value assigned by IANA for the Payload Protocol Identifier in the
SCTP Payload Data chunk is "6".

4.1.3  DPNSS/DASS2 over IP

UAL: DUA (DPNSS/DASS2 User Adaptation)

The DUA is built on top of IUA defining the necessary extensions to
IUA for a DPNSS/DASS2 transport. DPNSS stands for Digital Private
Network Signalling System and DASS2 for Digital Access Signalling
System No 2

```
           ******    DPNSS        ******        IP      *******
           *PBX *---------------* SG *--------------* MGC *
           ******                ******                *******

           +-----+                                    +-----+
           |DPNSS|               (NIF)                |DPNSS|
           | L3  |                                    | L3  |
           +-----+           +-----+----+             +-----+
           |     |           |     | DUA|             | DUA |
           |DPNSS|           |DPNSS+----+             +-----+
           | L2  |           | L2  |SCTP|             |SCTP |
           |     |           |     +----+             +-----+
           |     |           |     | IP +             | IP  |
           +-----+           +-----+----+             +-----+


           PBX  - Private Branch eXchange
           NIF  - Nodal Interworking function
           SCTP - Stream Control Transmission Protocol
           DUA  - DPNSS User Adaptation Layer Protocol
```

The value assigned by IANA for the Payload Protocol Identifier in the
SCTP Payload Data chunk is "TBD".

4.2  Network Signalling

The SIGTRAN WG have developed UALs to transport the following SS7
protocols:

- MTP2 Users: MTP3
- MTP3 Users: ISUP, TUP, SCCP

- SCCP Users: TCAP, RNSAP, RANAP, BSSAP, ...
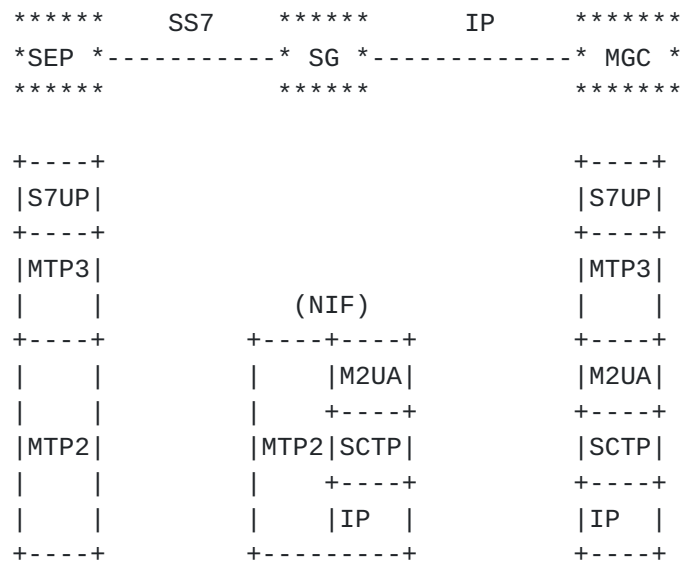

 4.2.1      MTP lvl3 over IP

UALs:

- M2UA (SS7 MTP2 User Adaptation)
- M2PA (SS7 MTP2-User Peer-to-Peer Adaptation)


4.2.1.1   M2UA (SS7 MTP2 User Adaptation)

M2UA protocol is mainly used between a Signalling Gateway (SG) and
Media Gateway Controller (MGC). The SG will terminate up to MTP Level
2 and the MGC will terminate MTP Level 3 and above.  In other words,
the SG will transport MTP Level 3 messages over an IP network to a
MGC.

The only SS7 MTP2 User is MTP3 that is the protocol transported by
this UAL.

The SG provides a interworking of transport functions with the IP
transport, in order to transfer the MTP2-User signalling messages to
and from an Application Server (e.g. MGC) where the peer MTP2-
User protocol layer exists.

```
              ******    SS7     ******         *******
              *SEP *-----------* SG *-------------* MGC *
              ******           ******         *******


              +----+                          +----+
              |S7UP|                          |S7UP|
              +----+                          +----+
              |MTP3|                          |MTP3|
              |    |          (NIF)           |    |
              +----+     +----+----+          +----+
              |    |     |    |M2UA|          |M2UA|
              |    |     |    +----+          +----+
              |MTP2|     |MTP2|SCTP|          |SCTP|
              |    |     |    +----+          +----+
              |    |     |    |IP  |          |IP  |
              +----+     +---------+          +----+


              MGC  - Media Gateway Controler
              SG   - Signalling Gateway
              SEP  - SS7 Signalling Endpoint
              NIF  - Nodal Interworking Function
              IP   - Internet Protocol
              SCTP - Stream Control Transmission Protocol
```

The SCTP (and UDP/TCP) Registered User Port Number Assignment for
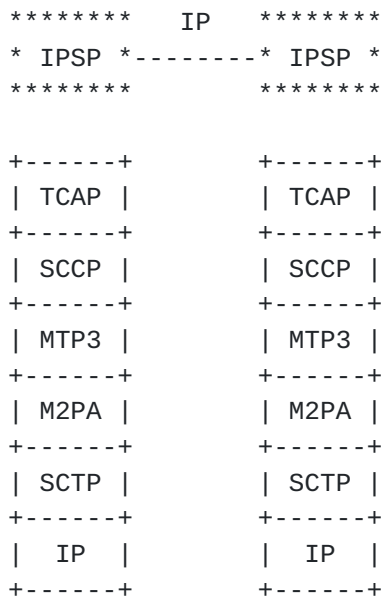M2UA is 2904.

The value assigned by IANA for the Payload Protocol Identifier in the
SCTP Payload Data chunk is "2"

4.2.1.2  M2PA (SS7 MTP2-User Peer-to-Peer Adaptation) Layer

M2PA protocol is used between SS7 Signalling Points employing the MTP
Level 3 protocol. The SS7 Signalling Points may also employ standard
SS7 links using the SS7 MTP Layer 2 to provide transport of MTP Layer
3 signalling messages.

Both configurations: intercommunication of SS7 and IP with SG and
communication between ISEPs are possible.
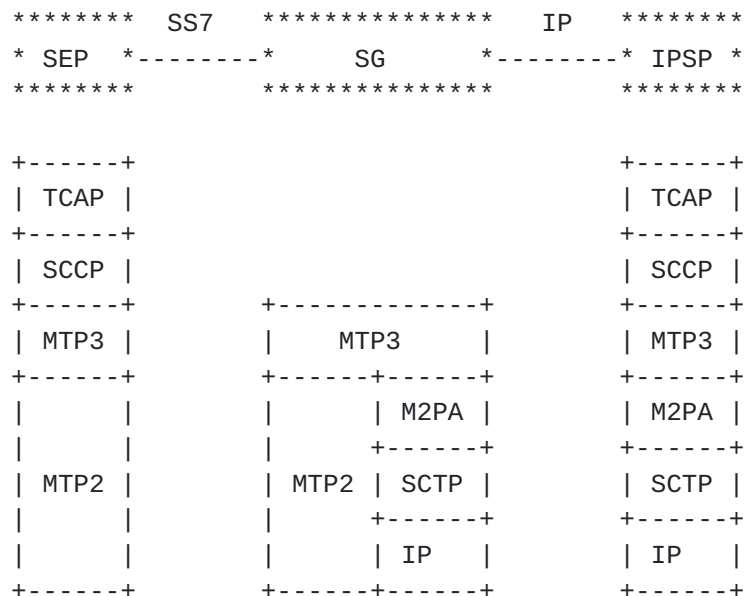
Communication between two IP nodes:

```
                    ********    IP   ********
                    * IPSP *--------* IPSP *
                    ********        ********

                    +------+        +------+
                    | TCAP |        | TCAP |
                    +------+        +------+
                    | SCCP |        | SCCP |
                    +------+        +------+
                    | MTP3 |        | MTP3 |
                    +------+        +------+
                    | M2PA |        | M2PA |
                    +------+        +------+
                    | SCTP |        | SCTP |
                    +------+        +------+
                    |  IP  |        |  IP  |
                    +------+        +------+


             IP    - Internet Protocol
             IPSP  - IP Signalling Point
             SCTP  - Stream Control Transmission Protocol
```

Interconnection of SS7 and IP nodes:

```
        ********   SS7   ***************   IP   ********
        * SEP  *--------*      SG      *--------* IPSP *
        ********         ***************         ********


        +------+                              +------+
        | TCAP |                              | TCAP |
        +------+                              +------+
        | SCCP |                              | SCCP |
        +------+       +-------------+        +------+
        | MTP3 |       |    MTP3     |        | MTP3 |
        +------+       +------+------+        +------+
        |      |       |      | M2PA |        | M2PA |
        |      |       |      +------+        +------+
        | MTP2 |       | MTP2 | SCTP |        | SCTP |
        |      |       |      +------+        +------+
        |      |       |      | IP   |        | IP   |
        +------+       +------+------+        +------+


            SEP   - SS7 Signalling Endpoint
```

These figures are only an example. Other configurations are possible.
For example, IPSPs without traditional SS7 links could use the
protocol layers MTP3/M2PA/SCTP/IP to route SS7 messages in a network
with all IP links.

Another example is that two SGs could be connected over an IP network
to form an SG mated pair similar to the way STPs are provisioned in
traditional SS7 networks.

The SCTP (and UDP/TCP) Registered User Port Number Assignment for
M2PA is TBD.

The value assigned by IANA for the Payload Protocol Identifier in the
SCTP Payload Data chunk is TBD


4.2.1.3  Main differences between M2PA and M2UA:

   a. M2PA: IPSP processes MTP3/MTP2 primitives.
      M2UA: MGC transports MTP3/MTP2 primitives between the SG's MTP2
            and the MGC's MTP3 (via the NIF) for processing.

   b. M2PA: SG-IPSP connection is an SS7 link.
      M2UA: SG-MGC connection is not an SS7 link. It is an
            extension of MTP to a remote entity.

   c. M2PA: SG is an SS7 node with a point code.

M2UA: SG is not an SS7 node and has no point code.

    d. M2PA: SG can have upper SS7 layers, e.g., SCCP.
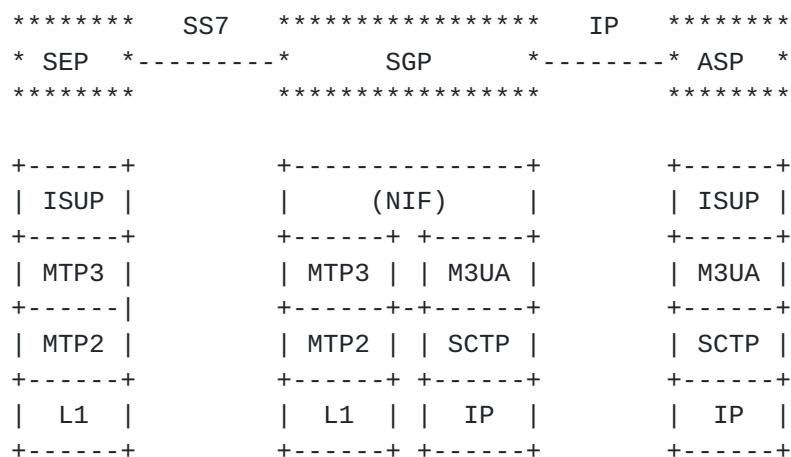       M2UA: SG does not have upper SS7 layers since it has no MTP3.

e. M2PA: relies on MTP3 for management procedures.
   M2UA: uses M2UA management procedures.

4.3  MTP lvl3-Users (ISUP, TUP, SCCP) over IP

   UAL: M3UA (SS7 MTP3 User Adaptation)

   M3UA protocol supports the transport of any SS7 MTP3-User signalling
   such as TUP, ISUP and SCCP over IP using the services of SCTP.

   Interconnection of SS7 and IP nodes:

```
        ********   SS7   ****************   IP   ********
        * SEP   *---------*      SGP      *--------* ASP   *
        ********         ****************         ********


        +------+         +---------------+        +------+
        | ISUP |         |     (NIF)     |        | ISUP |
        +------+         +------+ +------+        +------+
        | MTP3 |         | MTP3 | | M3UA |        | M3UA |
        +------|         +------+-+------+        +------+
        | MTP2 |         | MTP2 | | SCTP |        | SCTP |
        +------+         +------+ +------+        +------+
        | L1   |         | L1   | | IP   |        | IP   |
        +------+         +------+ +------+        +------+


            SEP  - SS7 Signalling End Point
            SCTP - Stream Control Transmission Protocol
            NIF  - Nodal Interworking Function
```

Communication between two IP nodes:

```
                         ********     IP     ********
                         * IPSP *----------* IPSP *
                         ********          ********


                         +------+          +------+
                         |SCCP- |          |SCCP- |
                         | User |          | User |
                         +------+          +------+
                         | SCCP |          | SCCP |
                         +------+          +------+
                         | M3UA |          | M3UA |
                         +------+          +------+
                         | SCTP |          | SCTP |
                         +------+          +------+
                         |  IP  |          |  IP  |
                         +------+          +------+
```

It works using the client-server philosophy. ISEP is recommended to
be client when talking with a SG. The reserved port by IANA is 2905
to listen to possible client connections.

The assigned payload protocol identifier for the SCTP DATA chunks is
ô3ö.

4.4  SCCP-Users over IP

UAL: SUA (SS7 SCCP User Adaptation)

SUA protocol supports the transport of any SS7 SCCP-User signalling
such as MAP, INAP, SMS, BSSAP, RANAP over IP using the services of
SCTP. SUA can support only non-call related signalling.

SUA does not pose stringent timing constraints on SCTP due to the
fact that SUA applications have broad timing requirement (from 10 of
seconds to hours) which the applications guard themselves and the
timing supervision of the application is end-to-end, not hop-by-
hop(as with ISUP).

Possible configurations are showed in the pictures below.

- Interconnection of SS7 and IP:

```
        ********          ***************        ********
        * SEP  *    IP    *             *   IP   *      *
        *  or  *---------*      SG      *--------* ASP  *
        * STP  *          *             *        *      *
        ********          ***************        ********


        +------                                   +------+
        | SUAP |                                   | SUAP |
        +------+          +------+------+          +------+
        | SCCP |          | SCCP | SUA  |          | SUA  |
        +------+          +------+------+          +------+
        |      |          |      |      |          |      |
        | MTP3 |          | MTP3 | SCTP |          | SCTP |
        |      |          |      |      |          |      |
        +------+          +------+------+          +------+
        | MTP2 |          | MTP2 | IP   |          |  IP  |
        +------+          +------+------+          +------+


        SUAP - SCCP/SUA User Protocol (TCAP, for example)
        STP  - SS7 Signalling Transfer Point
```

- IP Node to IP Node communication:

```
                ********          ********
                *      *    IP    *      *
                * IPSP *--------* IPSP *
                *      *          *      *
                ********          ********


                +------+          +------+
                | SUAP |          | SUAP |
                +------+          +------+
                | SUA  |          | SUA  |
                +------+          +------+
                | SCTP |          | SCTP |
                +------+          +------+
                |  IP  |          |  IP  |
                +------+          +------+
```

   IANA has registered SCTP Port Number 14001 for SUA.  It is
   recommended that SGs use this SCTP port number for listening for new
   connections. The payload protocol identifier for the SCTP DATA chunks
   is "4".

5 Security considerations

   UALs are designated to carry signalling messages for telephony
   services. As such, UALs must involve the security needs of several
   parties: the end users of the services; the network providers and
   the applications involved.  Additional requirements may come from
   local regulation.  While having some overlapping security needs, any
   security solution should fulfill all of the different parties'
   needs.  See specific Security considerations in each UAL technical
   specification.

   SCTP only tries to increase the availability of a network. SCTP does
   not contain any protocol mechanisms which are directly related to
   user message authentication, integrity and confidentiality
   functions. For such features, it depends on the IPSEC protocols and
   architecture and/or on security features of its user protocols.

   Mechanisms for reducing the risk of blind denial-of-service attacks
   and masquerade attacks are built into SCTP protocol. See RFC2960,
   section 11 for detailed information.

   Currently the IPSEC working group is investigating the support of
   multihoming by IPSEC protocols. At the present time to use IPSEC,
   one must use 2 * N * M security associations if one endpoint uses N
   addresses and the other M addresses.

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