          Architectural Framework for Signaling Transport
             < draft-ietf-sigtran-framework-arch-01.txt >

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Abstract

This document defines an architecture framework and functional
requirements for transport of signaling information over IP. The
framework describes relationships between functional and physical
entities exchanging signaling information, such as Signaling Gateways
and Media Gateway Controllers. It identifies interfaces where
signaling transport may be used and the functional and performance
requirements that apply from existing Switched Circuit Network (SCN)
signaling protocols.

Table of Contents

1. Introduction

1.1 Overview

This document defines an architecture framework for transport of
message-based signaling protocols over IP networks. The scope of
this work includes definition of encapsulation methods, end-to-end
protocol mechanisms and use of existing IP capabilities to support
the functional and performance requirements for signaling transport.

The framework portion describes the relationships between functional
and physical entities used in signaling transport, including the
framework for control of Media Gateways, and other scenarios where
signaling transport may be required.

The requirements portion describes functional and performance

requirements for signaling transport such as flow control, in-sequence
delivery and other functions that may be required for specific SCN
signaling protocols.

1.2 Terminology

The following are general terms are used in this document:

Backhaul:

Backhaul refers to the transport of signaling from the point of interface for
the associated data stream (i.e., the MGU) back to the
point of call processing (i.e., the MGCU), if this is not local.

Common Transport Protocol (CTP):

CTP is the transport layer protocol, which provides the interface
for signaling transport across and within IP networks. CTP refers
to both the transport function and the adaptation function (required
to provide the SCN protocols with the same interface that exists
towards the lower layers today).

Switched Circuit Network (SCN):

The term SCN is used to refer to a network that carries traffic within
channelized bearers of pre-defined sizes. Examples include Public
Switched Telephone Networks (PSTNs) and Public Land Mobile Networks
(PLMNs). Examples of signaling protocols used in SCN include Q.931,
SS7 MTP Level 3 and SS7 Application/User parts.

The following are terms for functional entities relating to signaling
transport in a distributed gateway model.

Media Gateway (MG):

A MG terminates SCN media streams, packetizes the media data,, if it
is not already packetized, and delivers packetized traffic to the
packet network. It performs these functions in reverse order for media
streams flowing from the packet network to the SCN.

Media Gateway Controller (MGC):

An MGC handles the registration and management of resources at the MG.
The MGC may have the ability to authorize resource usage based on local
policy. For signaling transport purposes, the MGC serves as a possible

termination and origination point for SCN application protocols, such
as SS7 ISDN User Part and Q.931/DSS1.

Signaling Gateway (SG):

An SG is a signaling agent that receives/sends SCN native signaling at
the edge of the IP network. The SG function may relay, translate or
terminate SS7 signaling in an SS7-Internet Gateway. The SG function may
also be co-resident with the MG function to process SCN signaling associated
with line or trunk terminations controlled by the MG (e.g., signaling
backhaul).

The following are terms for physical entities relating to signaling
transport in a distributed gateway model:

INTERNET-DRAFT   draft-ietf-sigtran-framework-arch-01.txt   [4]

Media Gateway Unit (MGU)

An MG-Unit is a physical entity that contains the MG function. It may
contain other functions, esp. an SG function for handling facility-
associated signaling.

Media Gateway Control Unit (MGCU)

An MGC-Unit is a physical entity containing the MGC function.

Signaling Gateway Unit (SGU)

An SG-Unit is a physical entity containing the SG function.

Signaling End Point (SEP):

This is a node in an SS7 network that originates or terminates signaling
messages. One example is a central office switch.

Signal Transfer Point (STP):

This is a node in an SS7 network that routes signaling messages based on
their destination point code in the SS7 network

1.3 Scope

Signaling transport provides transparent transport of message-based
signaling protocols over IP networks.   The scope of this work includes
definition of encapsulation methods, end-to-end protocol mechanisms and
use of IP capabilities to support the functional and performance
requirements for signaling.

Signaling transport shall be used for transporting SCN signaling
between a Signaling Gateway Unit and Media Gateway Controller Unit.
Signaling transport may also be used for transport of message-based
signaling between a Media Gateway Unit and Media Gateway Controller
Unit, between dispersed Media Gateway Controller Units, and between two
Signaling Gateway Units connecting signaling endpoints in the SCN.

Signaling transport will be defined in such a way as to support
encapsulation and carriage of a variety of SCN protocols. It
is defined in such a way as to be independent of any protocol
translation functions taking place within the Signaling Gateway Unit or
Media Gateway Unit, since its function is limited to the transport of
the protocol.

Since the function being provided is transparent transport, the following
areas are considered outside the scope of the signaling transport work:

- definition of the SCN protocols themselves
- signaling interworking such as conversion from Channel Associated
  Signaling (CAS) to message signaling protocols
- specification of the functions taking place within the SGU or MGU - in
  particular, this work does not address whether the SGU provides
  mediation/interworking, as this is transparent to the transport
  function.

2. Signaling Transport Architecture

2.1 Gateway Component Functions

Figure 1 defines a commonly defined functional model
that separates out the functions of SG, MGC and MG. This model may be
implemented in a number of ways, with functions implemented in separate
devices or combined in single physical units.

Where physical separation exists between functional entities, Signaling
Transport can be applied to ensure that SCN signaling information is
transported between entities with the required functionality and
performance.

```
        +---------------+                 +--------------+
        |               |                 |              |
```
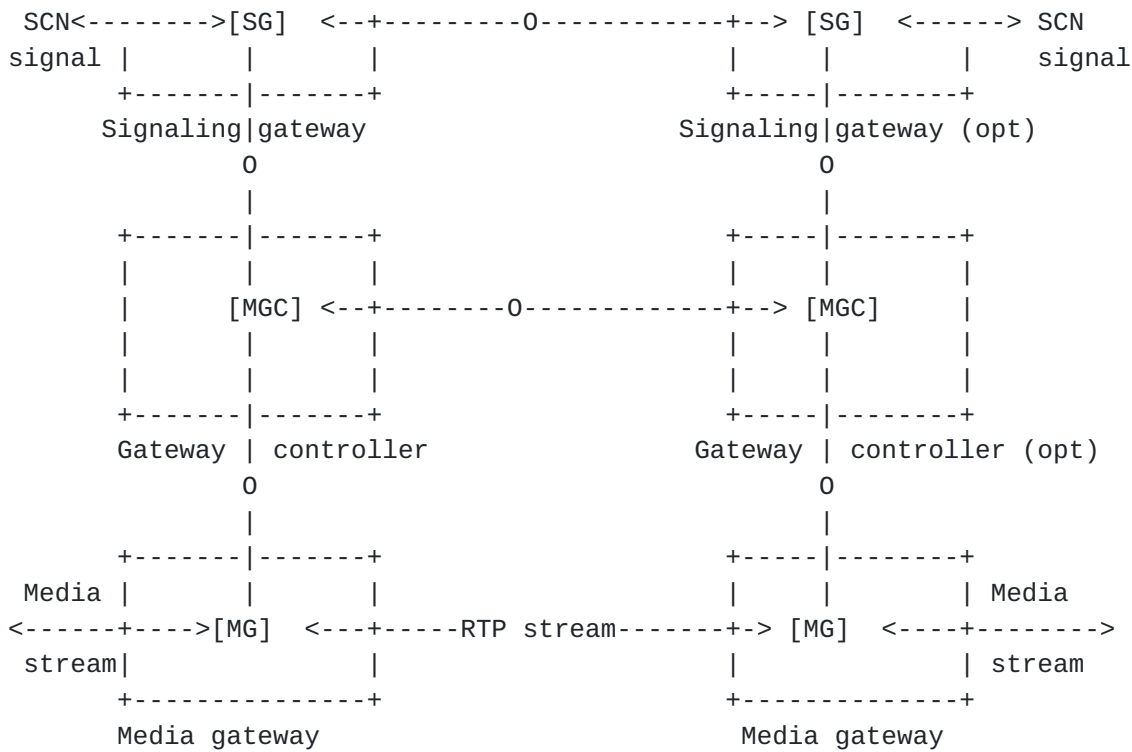
```
   SCN<--------->[SG]  <--+---------O------------+--> [SG]  <------> SCN
  signal |       |       |                       |    |       |      signal
       +-------|-------+                       +-----|--------+
        Signaling|gateway                       Signaling|gateway (opt)
              O                                       O
              |                                       |
       +-------|-------+                       +-----|--------+
       |       |       |                       |     |        |
       |     [MGC] <--+--------O------------+--> [MGC]      |
       |       |       |                       |     |        |
       |       |       |                       |     |        |
       +-------|-------+                       +-----|--------+
        Gateway | controller                   Gateway | controller (opt)
              O                                       O
              |                                       |
       +-------|-------+                       +-----|--------+
  Media |       |       |                       |     |      | Media
 <------+---->[MG]  <---+-----RTP stream-------+-> [MG]  <----+-------->
  stream|       |                              |            | stream
       +--------------+                       +-------------+
        Media gateway                          Media gateway


            Figure 1: Sigtran Functional Model
```

As discussed above, the interfaces pertaining to signaling transport
include SG to MGC, SG to SG and may potentially include MGC to MGC or
MG to MGC as well.

2.2 SS7 Interworking for Connection Control

Figure 2 below shows some example implementations of these functions in
physical entities as used for interworking of SS7 and IP networks for
Voice over IP, Voice over ATM, Network Access Servers, etc. No
recommendation is made as to functional distribution and other
implementations are possible.

For interworking with SS7-controlled SCN networks, the SG terminates the
SS7 link and transfers the signaling information to the MGC using
signaling transport. The MG terminates the interswitch trunk and
controls the trunk based on the control signaling it receives from the
MGC. As shown below in case (a), the SG, MGC and MG
may be implemented in separate physical units, or as in case (b), the
MGC and MG may be implemented in a single physical unit.

In alternative case (c), a facility-associated SS7 link is terminated
by the same device (i.e., the MGU) that terminates the interswitch trunk.

In this case, the SG function is co-located with the MG function, as shown
below, and signaling transport is used to "backhaul" control signaling to
the MGCU.

Note: SS7 links may also be terminated directly on the MGCU by
cross-connecting at the physical level before or at the MGU.
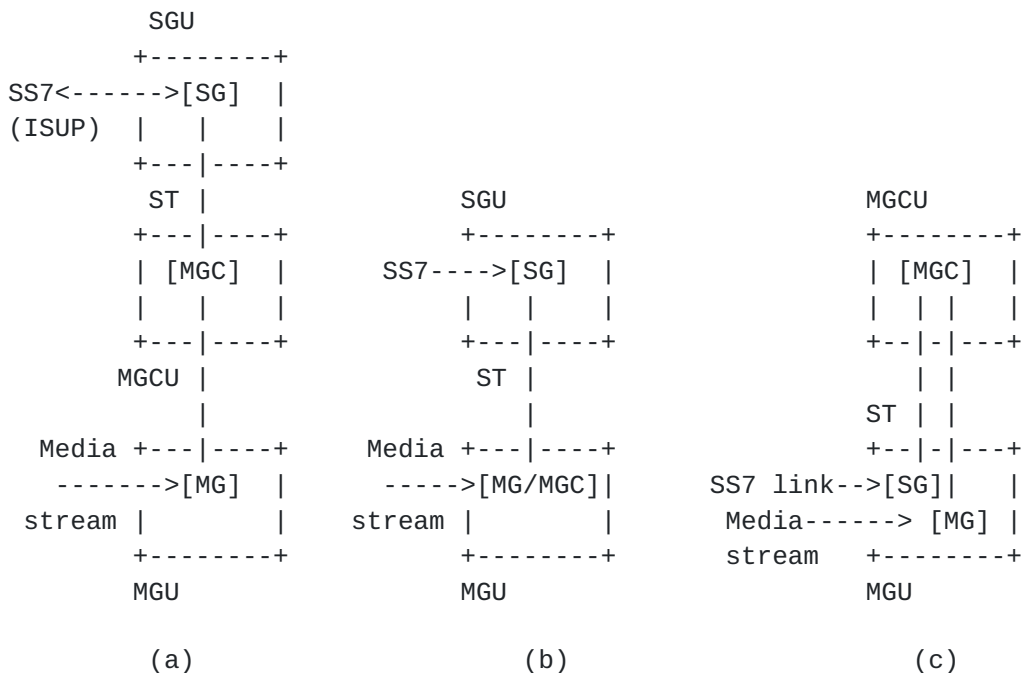
```
          SGU
        +--------+
SS7<------>[SG]  |
(ISUP)  |   |    |
        +---|----+
         ST |                  SGU                        MGCU
        +---|----+          +--------+               +--------+
        | [MGC]  |      SS7---->[SG]  |               | [MGC]  |
        |   |    |          |   |    |                |  | |   |
        +---|----+          +---|----+               +--|-|---+
         MGCU |              ST |                        | |
            |                   |                     ST | |
   Media +---|----+    Media +---|----+             +--|-|---+
    ------->[MG]  |     ----->[MG/MGC]|    SS7 link-->[SG]|   |
   stream |       |    stream |       |    Media------> [MG] |
        +--------+          +--------+     stream   +--------+
          MGU                 MGU                      MGU

          (a)                 (b)                      (c)
Notes: ST = Signaling Transport used to carry SCN signaling
```

                    Figure 2: Example Implementations

INTERNET-DRAFT   draft-ietf-sigtran-framework-arch-01.txt   [7]

In some implementations, the function of the SG may be divided into
multiple physical entities to support scaling and addressing concerns.
Thus, Signaling Transport can be used between SGs as well as from SG
to MGC. This is shown in Figure 3 below.

```
            SGU                               MGCU
          +---------+                       +---------+
          |         |          ST           |         |
          |  [SG2]-------------------------------->[MGC]  |
          |   ^ ^   |                       |         |
          +---|-|---+                       +---------+
              | |
              | |              ST
          ST| +-------------------------------+
              |                               |
```

```
               |                     |
        SS7  +---|----------+     SS7  +----|---------+
     ----------> [SG1]      |      ----------> [SG1]      |
     media   |           |       media     |          |
     ------------------->[MG] |       ------------------->[MG] |
      stream   +------------+      stream    +------------+
            MGU                        MGU
```
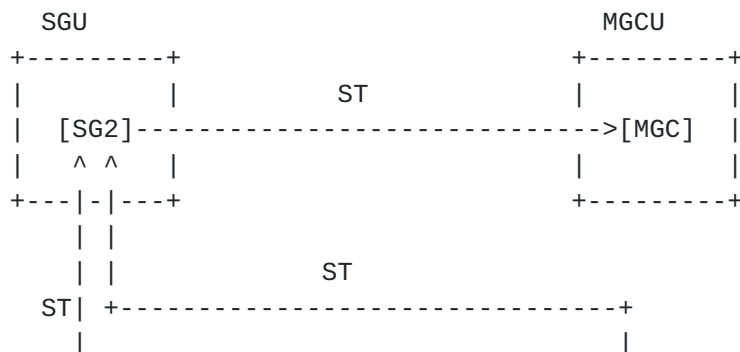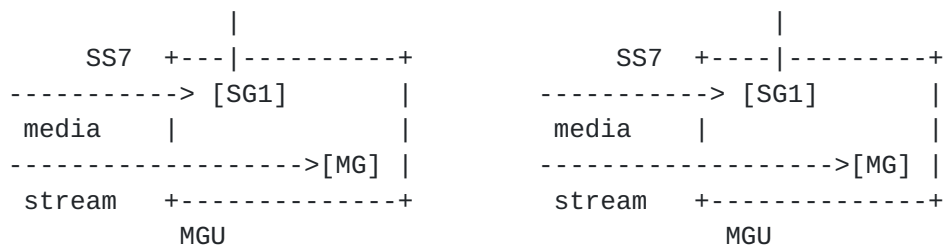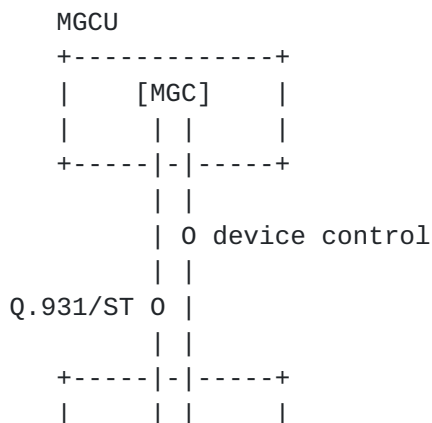
Figure 3: Multiple SG Case

In this configuration, there may be more than one MGU handling
facility associated signaling (i.e. more than one containing it's
own SG function), and only a single SGU. It will therefore be
possible to transport one SS7 layer between SG1 and SG2, and
another SS7 layer between SG2 and MGC. For example, SG1 could
transport MTP3 to SG2, and SG2 could transport ISUP to MGC.

2.3 ISDN Interworking for Connection Control

In ISDN access signaling, the signaling channel is carried along with
data channels, so that the SG function for handling Q.931 signaling
is co-located with the MG function for handling the data stream. Where
Q.931 is then transported to the MGC for call processing, signaling
transport would be used between the SG function and MGC. This is shown
in Figure 3 below.

```
        MGCU
        +-------------+
        |    [MGC]    |
        |     | |     |
        +-----|-|-----+
              | |
              | O device control
              | |
       Q.931/ST O |
              | |
        +-----|-|-----+
        |     | |     |
```

```
   Q.931---->[SG]|      |
  signals|         |      |
         |         |      |
Media---->[MG]    |
stream    |                |
         +-------------+
         MGU
```
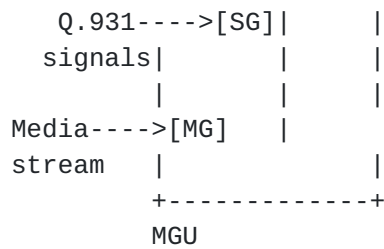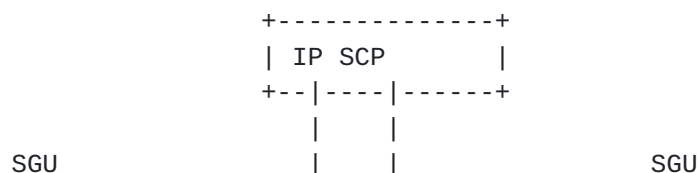
        Figure 4: Q.931 transport model

2.4 Architecture for Database Access

Transaction Capabilities (TCAP) is the application part within SS7
that is used for non-circuit-related signaling.

TCAP signaling within IP networks may be used for cross-access between
entities in the SS7 domain and the IP domain, such as:
- access from an SS7 network to a Service Control Point (SCP) in IP
- access from an SS7 network to an MGC
- access from an MGC to an SS7 network element
- access from an IP SCP to an SS7 network element

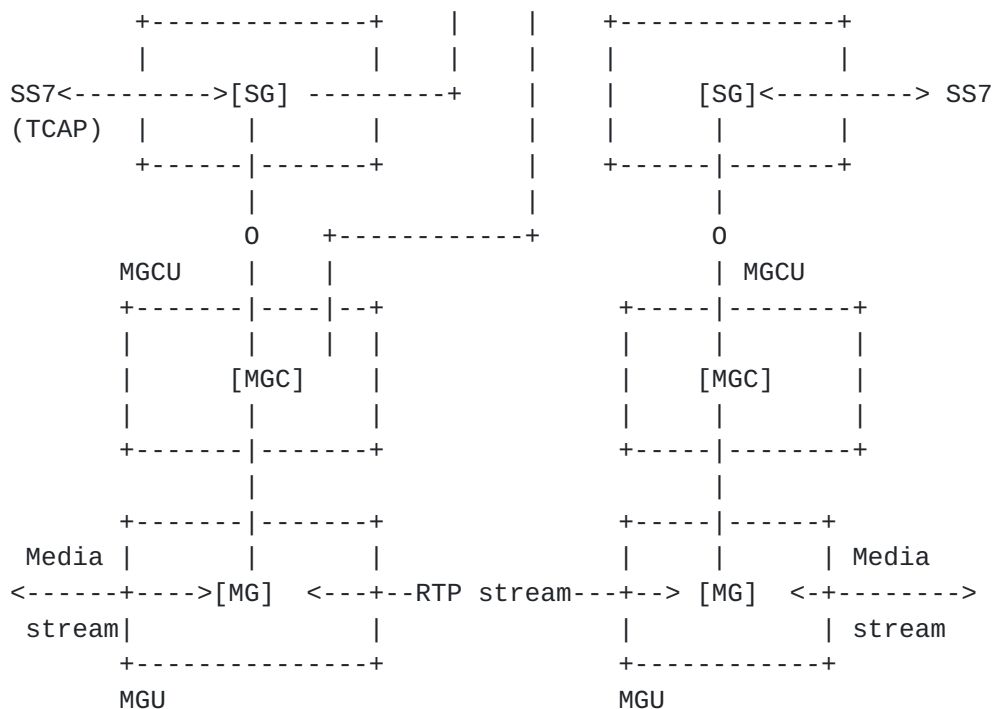A basic functional model for TCAP over IP is shown in Figure 4.

```
                    +--------------+
                    | IP SCP       |
                    +--|----|------+
                       |    |
         SGU           |    |                    SGU
```

```
      +--------------+    |    |    +--------------+
      |              |    |    |    |              |
 SS7<--------->[SG] ---------+   |    |    [SG]<---------> SS7
 (TCAP)  |      |         |    |    |      |       |
      +------|-------+    |    +------|-------+
             |                 |           |
             O    +-----------+          O
      MGCU   |    |                  | MGCU
      +-------|----|--+        +-----|--------+
      |       |    | |         |     |        |
      |     [MGC]    |         |   [MGC]      |
      |       |      |         |     |        |
      +-------|------+         +-----|--------+
              |                      |
      +-------|-------+        +-----|------+
 Media |       |       |        |     |      | Media
 <------+----->[MG]  <---+--RTP stream---+--> [MG]  <-+-------->
  stream|              |        |            | stream
      +--------------+          +-----------+
        MGU                       MGU
```

                 Figure 5: TCAP Signaling over IP

3. Protocol Architecture

This section provides a series of examples of protocol architecture
for the use of Signaling Transport Common Transport Protocol (CTP).

3.1. SS7 access for Media Gateway Control

This section provides a protocol architecture for signaling transport
supporting SS7 access for Media Gateway Control.


```
 ******    SS7  ******* SS7  ******     IP     *******
 *SEP *--------* STP *------* SG*------------* MGC*
 ******        *******      ******          *******


 +----+                                     +-----+
 |ISUP|                                     | ISUP|
 +----+        +-----+      +---------+      +-----+
 |MTP |        |MTP  |      |MTP | CTP|      | CTP |
 +    +        +     +      +    +----+      +-----+
 |    |        |     |      |    | IP |      | IP  |
 +----+        +-----+      +---------+      +-----+
```
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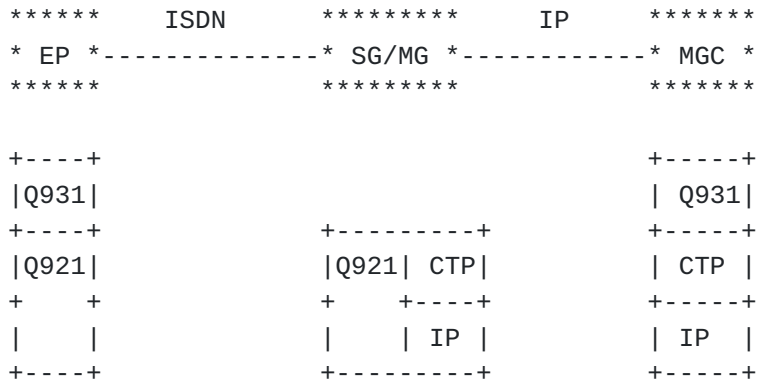

 STP - Signal Transfer Point   SEP - Signaling End Point
 SG - Signaling Gateway   CTP - Common Transport Protocol
 MGC - Media Gateway Controller

Figure 6: SS7 Access to MGC

3.2. Q.931 Access to MGC

This section provides a protocol architecture for signaling transport
supporting ISDN point-to-point access (Q.931) for Media Gateway Control.


```
******      ISDN        *********      IP      *******
* EP *--------------* SG/MG *------------* MGC *
******                *********                *******


+----+                                    +-----+
|Q931|                                    | Q931|
+----+                +---------+         +-----+
|Q921|                |Q921| CTP|         | CTP |
+    +                +    +----+         +-----+
|    |                |    | IP |         | IP  |
+----+                +---------+         +-----+
```

MG/SG - Media Gateway with SG function for backhaul
EP - ISDN End Point

                  Figure 7: ISDN Access

3.3. SS7 Access to IP/SCP

This section provides a protocol architecture for database
access, for example providing signaling between two IN
nodes or two mobile network nodes. There are a number of
scenarios for the protocol stacks and the functionality
contained in the CTP, depending on the SS7 application.

In the diagrams, SS7 Application Part (S7AP) is used for
generality to cover all Application Parts (e.g. MAP, IS-41,
INAP, etc). Depending on the protocol being transported, S7AP may or
may not include TCAP. The interface to the SS7 layer below
S7AP can be either the TC-user interface or the SCCP-user
interface.

Figure 8a shows the scenario where SCCP is the signaling
protocol being transported between the SG and an IP Signaling
Endpoint (ISEP), that is, an IP destination supporting some
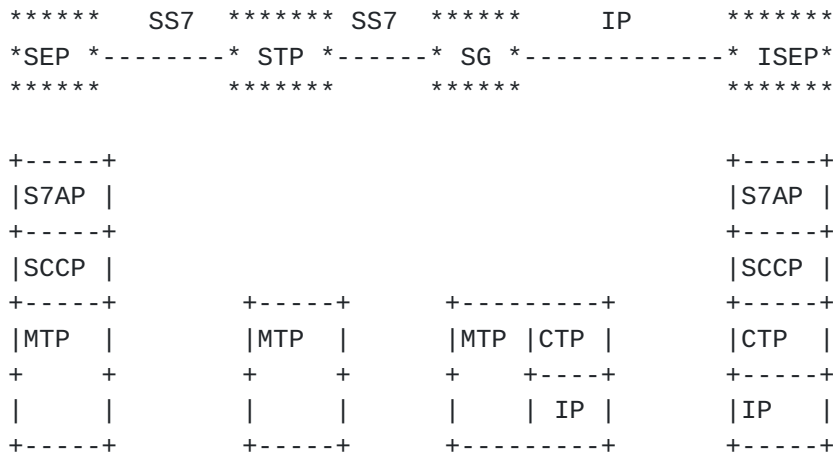SS7 application protocols.

```
******    SS7  ******* SS7  ******      IP       *******
*SEP *--------* STP *------* SG *-------------* ISEP*
******         *******      ******           *******


+-----+                                      +-----+
|S7AP |                                      |S7AP |
+-----+                                      +-----+
|SCCP |                                      |SCCP |
+-----+         +-----+      +---------+     +-----+
|MTP  |         |MTP  |      |MTP |CTP |     |CTP  |
+     +         +     +      +    +----+     +-----+
|     |         |     |      |    | IP |     |IP   |
+-----+         +-----+      +---------+     +-----+
```

   Figure 8a: SS7 Access to IP node - SCCP being transported

Figure 8b shows the scenario where S7AP is the signaling
protocol being transported between SG and ISEP. Depending on
the usage case, S7AP may or may not include TCAP, which implies
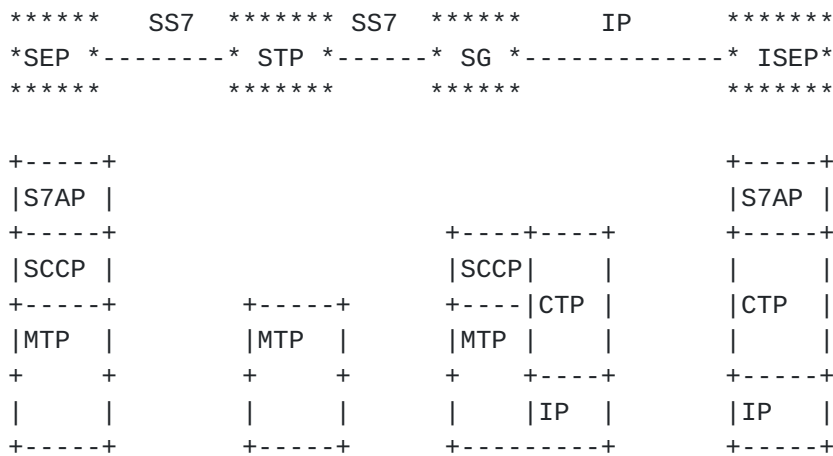that CTP must be able to support both the TC-user and the
SCCP-user interfaces.

```
******    SS7  ******* SS7  ******      IP       *******
*SEP *--------* STP *------* SG *-------------* ISEP*
******         *******      ******           *******

+-----+                                      +-----+
|S7AP |                                      |S7AP |
+-----+                      +----+----+     +-----+
|SCCP |                      |SCCP|    |     |     |
+-----+         +-----+      +----|CTP |     |CTP  |
|MTP  |         |MTP  |      |MTP |    |     |     |
+     +         +     +      +    +----+     +-----+
|     |         |     |      |    |IP  |     |IP   |
+-----+         +-----+      +---------+     +-----+
```

   Figure 8b: SS7 Access to IP node - S7AP being transported
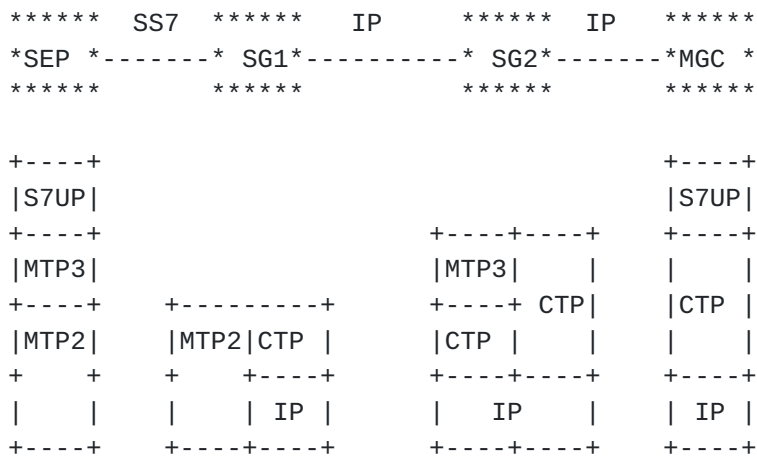

3.4. SG to SG

This section identifies a protocol architecture for support of

signaling between two endpoints in an SCN signaling
network, using signaling transport directly between two SGs.

The following figure describes protocol architecture for a
scenario with two SGs providing different levels of function
for interworking of SS7 and IP. This corresponds to the scenario
given in Figure 3.

The SS7 User Part (S7UP) shown is an SS7 protocol using MTP directly
for transport within the SS7 network, for example, ISUP.

In this scenario, there are two different usage cases of CTP,
one which transports MTP3 signaling, the other which transports
ISUP signaling.

```
******  SS7  ******    IP      ******  IP   ******
*SEP *-------* SG1*----------* SG2*-------*MGC *
******        ******          ******       ******


+----+                                   +----+
|S7UP|                                   |S7UP|
+----+                      +----+----+  +----+
|MTP3|                      |MTP3|    |  |    |
+----+     +---------+      +----+ CTP|  |CTP |
|MTP2|     |MTP2|CTP |      |CTP |    |  |    |
+     +    +    +----+      +----+----+  +----+
|    |     |    | IP |      |   IP    |  | IP |
+----+     +----+----+      +----+----+  +----+

S7UP - SS7 User Part
```

              Figure 9: SG to SG Case 1

The following figure describes a more generic use of
SS7-IP interworking for transport of SS7 upper layer
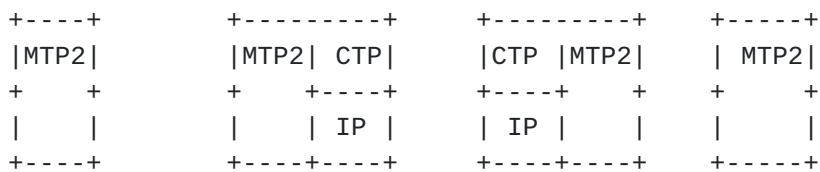signaling across an IP network, where the endpoints are
both SS7 SEPs.

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


+----+                                   +-----+
|S7UP|                                   | S7UP|
+----+                                   +-----+
|MTP3|                                   | MTP3|
```

```
+----+          +---------+     +---------+     +-----+
|MTP2|          |MTP2| CTP|     |CTP |MTP2|     | MTP2|
+    +          +    +----+     +----+    +     +     +
|    |          |    | IP |     | IP |    |     |     |
+----+          +----+----+     +----+----+     +-----+
```

                    Figure 10: SG to SG Case 2

4. Functional Requirements

Signaling transport provides for the transport of native SCN protocol
messages over a packet switched network.

Signaling transport shall:

1) Transport of a variety of SCN protocol types, such as the application
and user parts of SS7 (including MTP Level 3, ISUP, SCCP, TCAP, MAP, INAP,
IS-41, etc.) and layer 3 of the DSS1/PSS1 protocols (i.e. Q.931 and QSIG).

2) Provide a means to identify the particular SCN protocol being
transported.

3) Provide a common base protocol defining header formats, security
extensions and procedures for signaling transport, and support
extensions as necessary to add individual SCN protocols if and when
required.

4) In conjunction with the underlying network protocol (IP) and transport
protocol (CTP), provide the relevant functionality as defined
by the appropriate SCN lower layer.

   Relevant functionality may include (according to the protocol being
transported):

- flow control
- in sequence delivery of signaling messages within a control stream
- logical identification of the entities on which the signaling messages
  originate or terminate
- logical identification of the physical interface controlled by the
  signaling message
- error detection
- recovery from failure of components in the transit path
- retransmission and other error correcting methods
- detection of unavailability of peer entities.

For example:

- if the native SCN protocol is ISUP or SCCP, the relevant functionality

provided by MTP2/3 shall be provided.
- if the native SCN protocol is TCAP, the relevant functionality
  provided by SCCP and MTP 2/3 shall be supported.
- if the native SCN protocol is Q.931, the relevant functionality
  provided by Q.921 shall be supported.
- if the native SCN protocol is MTP3, the relevant functionality of MTP2
  shall be supported.

5) Support the ability to multiplex several higher layer SCN sessions on
one underlying signaling transport session. This allows, for example,
several DSS1 D-Channel sessions to be carried in one signaling
transport session.

In general, in-sequence delivery is required for signaling messages
within a single control stream, but is not necessarily required
for messages that belong to different control streams. The protocol
should if possible take advantage of this property to avoid blocking
delivery of messages in one control stream due to sequence error within
another control stream. However, the SG will not be required to process
the SCN application protocol in order to identify control streams.

6) Be able to transport complete messages of greater length than the
underlying SCN segmentation/reassembly limitations. For example,
signaling transport should not be constrained by the length limitations
defined for SS7 lower layer protocol (e.g. 272 bytes in the case of
narrowband SS7) but should be capable of carrying longer messages
without requiring segmentation.

7) Allow for a range of suitably robust security schemes to protect
signaling information being carried across networks. For example,
signaling transport shall be able to operate over proxyable sessions,
and be able to be transported through firewalls.

8) Provide for congestion avoidance on the Internet, by supporting
appropriate controls on signaling traffic generation (including
signaling generated in SCN) and reaction to network congestion.

4.2 Performance of SCN Signaling Protocols

This section provides basic values regarding performance requirements
of key SCN protocols to be transported. Currently only messaged based
SCN protocols are considered. Failure to meet these requirements
is likely to result in adverse and undesirable signaling and call
behavior.

4.2.1 SS7 MTP requirements

The performance requirements below have been specified for

transport of MTP Level 3 network management messages. The requirements
given here are only applicable if all MTP Level 3 messages are to be
transported over the IP network.

- Message Delay
  - MTP Level 3 peer-to-peer procedures require response within
     500 to 1200 ms when terrestrial signaling links are used. This
     value includes round trip time and processing at the remote end.
     Failure to meet this limitation will result in the initiation of
     error procedures for specific timers, e.g., timer T4 of ITU-T
     Recommendation Q.704.

4.2.2 SS7 MTP Level 3 requirements

The performance requirements below have been specified for transport of
MTP Level 3 user part messages as part of ITU-T SS7 Recommendations [SS7].

INTERNET-DRAFT   draft-ietf-sigtran-framework-arch-01.txt   [15]

- Message Loss
  - no more than 1 in 10E+7 messages will be lost due to transport
    failure

- Sequence Error
  - no more than 1 in 10E+10 messages will be delivered out-of-sequence
    (including duplicated messages) due to transport failure

- Message Errors
  - no more than 1 in 10E+10 messages will contain an error that is
    undetected by the transport protocol (requirement is 10E+9 for
    ANSI specifications)

- Availability
  - availability of any signaling route set is 99.9998% or better,
    i.e., downtime 10 min/year or less. A signaling route set is
    the complete set of allowed signaling paths from a given
    signaling point towards a specific destination.

- Message length (payload accepted from SS7 user parts)
  - 272 bytes for narrowband SS7, 4091 bytes for broadband SS7

4.2.3 SS7 User Part Requirements

  ISUP Message Delay - Protocol Timer Requirements

  - to be provided.

  ISUP Message Delay - End-to-End Requirements

  - to be provided.

TCAP Requirements - End-to-End Requirements

- to be provided.

4.2.4 ISDN Signaling Requirements

Q.931 Message Delay

- round-trip delay should not exceed 4 seconds.
  A timer of this length is used for a number of procedures, esp.
  RELEASE/RELEASE COMPLETE and CONNECT/CONNECT ACK where
  excessive delay may result in management action on the
  channel, or release of a call being set up. Note: while this
  value is indicated by protocol timer specifications, faster
  response time is normally expected by the user.

- 12 sec. timer (T309) is used to maintain an active call
  in case of loss of the data link, pending re-establishment.
  The related ETSI documents specify a maximum value of 4 seconds
  while ANSI specifications [T1.607] default to 90 seconds.

5. Management

Operations, Administration & Management (OA&M) of IP networks or SCN
networks is outside the scope of SIGTRAN. Examples of OA&M include
legacy telephony management systems or IETF SNMP managers. OA&M
implementors and users should be aware of the functional interactions
of the SG, MGC and MG and the physical units they occupy.

6. Security

6.1 Security requirements

When SCN related signaling is transported over an IP network
two possible network scenarios can be distinguished:

- Signaling transported only within an Intranet;
    Security measures are applied at the discretion of the network
    owner.

- Signaling transported, at least to some extent, in the public
  Internet;
    The public Internet should be regarded generally as an "insecure"
     network and usage of security measures is required.

Generally security comprises several aspects

- Authentication:
    It is required to ensure that the information is sent to/from a known
    and trusted partner.

- Integrity:
    It is required to ensure that the information hasn't been modified
    while in transit.

- Confidentiality:
    It might be sometimes required to ensure that the transported
    information is encrypted to avoid illegal use.

- Availability:
    It is required that the communicating endpoints remain in
    service for authorized use even if under attack.

6.2 Security mechanisms currently available in IP networks

Several security mechanisms are currently available for use in IP networks.

- IPSEC ([RFC2401]):
    IPSEC provides security services at the IP layer that address the above
    mentioned requirements. It defines the two protocols AH and ESP
    respectively that
    essentially provide data integrity and data
    confidentiality services.

    The ESP mechanism can be used in two different modes:
      - Transport mode;
      - Tunnel mode.
    In Transport mode IPSEC protects the higher layer protocol data
    portion of an IP packet, while in Tunnel mode a complete IP packet
    is encapsulated in a secure IP tunnel.

    If the CTP embeds any IP addresses outside of the SA/DA in the IP
    header, passage through a NAT function will cause problems. The same
    is true for using IPsec in general, unless an IPsec ready RSIP
    function is used as described in draft-ietf-nat-terminology-02.txt.

    The use of IPSEC does not hamper the use of TCP or UDP as the
    underlying basis of CTP. If automated distribution of keys is
    required the IKE protocol (RFC[2409]) can be applied.

- SSL, TLS ([RFC2246]):
    SSL and TLS also provide appropriate security services but operate on
    top of TCP/IP only.

It is not required to define new security mechanisms in CTP, as the
use of currently available mechanisms is sufficient to provide the
necessary security. It is recommended that IPSEC or some equivalent
method be used, especially when transporting SCN signaling over
public Internet.

7. Abbreviations

CAS   Channel-Associated Signaling
CTP   Common Transport Protocol
DSS1   Digital Subscriber Signaling
INAP   Intelligent Network Application Part
ISEP   IP Signaling End Point
ISUP   Signaling System 7 ISDN User Part
MAP   Mobile Application Part
MG   Media Gateway
MGU   Media Gateway Unit
MGC   Media Gateway Controller
MGCU   Media Gateway Controller Unit
MTP   Signaling System 7 Message Transfer Part
PLMN   Public Land Mobile Network
PSTN   Public Switched Telephone Network
S7AP   SS7 Application Part
S7UP   SS7 User Part
SCCP   SS7 Signaling Connection Control Part
SCN   Switched Circuit Network
SEP   Signaling End Point
SG   Signaling Gateway
SS7   Signaling System No. 7
TCAP   Signaling System 7 Transaction Capabilities Part

INTERNET-DRAFT   draft-ietf-sigtran-framework-arch-01.txt   [18]

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9. References

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and Protocol (QSIG-BC)

[Q.931/DSS1] ITU-T Recommendation Q.931, ISDN user-network interface layer 3
specification (5/98)

[SS7] ITU-T Recommendations Q.700-775, Signalling System No. 7

[SS7 MTP] ITU-T Recommendations Q.701-6, Message Transfer Part of SS7

[T1.607] ANSI T1.607-1998, Digital Subscriber Signaling System Number 1 (DSS1)
 - Layer 3 Signaling Specification for Circuit-Switched Bearer Services

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