

Title

SS7 introduction
&
jSS7 config in CMAP-ROUTER

SS7 intro

SS7 (Signaling System No.7) is a set of signaling protocols defined for information exchange.

The hardware and software functions of the protocol are divided into functional abstractions called "levels". These levels map loosely to the Open Systems Interconnect (OSI) 7-layer model

SS7 protocols

OSI model

7. Application

6. Presentation

5. Session

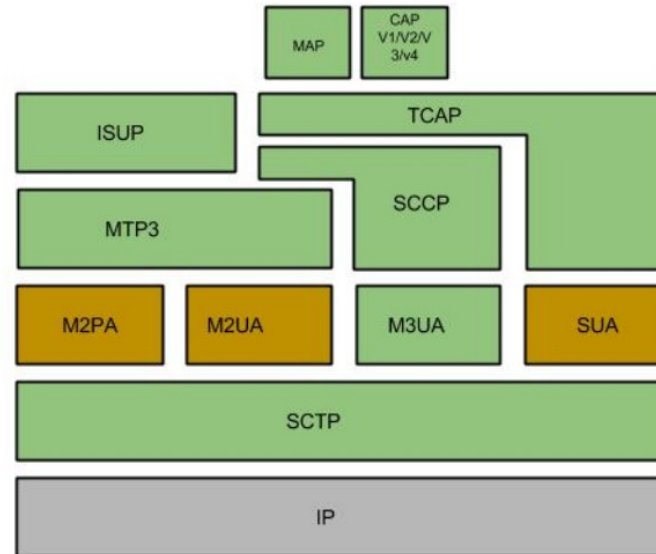
4. Transport

3. Network

2. Data link

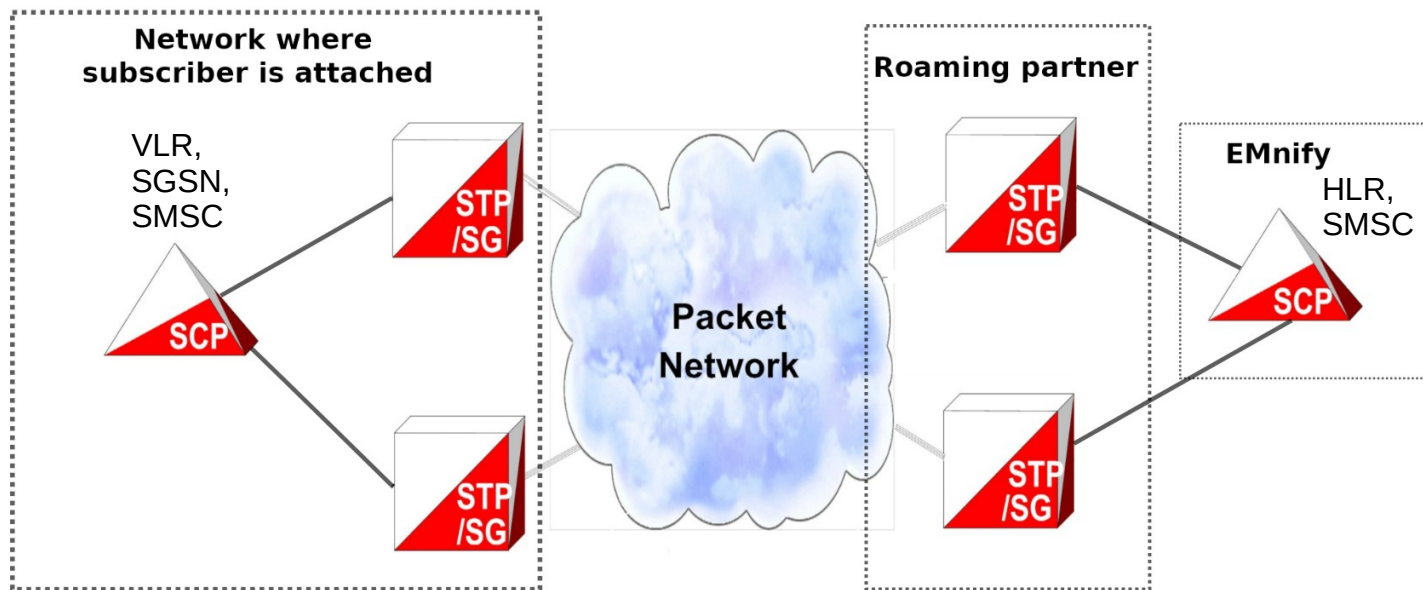
1. Physical

SIGTRAN



Deployment example

STP – Signal Transfer Point
SCP – Service Control Point



Jss7

Restcomm jSS7 is the only Open Source Java based implementation of the SS7 protocol stack. It provides implementation for MTP2, MTP3, ISUP, SCCP, TCAP, CAMEL (Phase I, Phase II, Phase III and Phase IV) and MAP.

Configuration files vs. CLI ???

SCTP

SCTP (Stream Control Transmission Protocol)

<https://tools.ietf.org/html/rfc4960>

SCTP is a reliable transport protocol that operates on top of a connectionless packet network such as IP, and operates at the same layer as TCP. It establishes a connection between two endpoints, called an association, for transmission of user messages.

To establish an association between SCTP endpoints, one endpoint provides the other with a list of its transport addresses (one or more IP addresses in combination with an SCTP port)

<https://tools.ietf.org/html/rfc4960>

SCTP jSS7 config

```
<?xml version="1.0" encoding="UTF-8" ?>  
<connectdelay value="500"/>  
<servers/>
```

```
<associations>  
  <name value="A1_STP_Wien"/>  
  <association name="A1_STP_Wien_assoc" assoctype="CLIENT"  
hostAddress="127.0.0.1" hostPort="2905" peerAddress="10.0.0.1" peerPort="2905"  
serverName="" ipChannelType="0" extraHostAdresseSize="0"/>  
</associations>
```

M3UA

M3UA is used to transport MTP3 payloads across IP networks (it logically replaces MTP3 in a SIGTRAN network).

Elements:

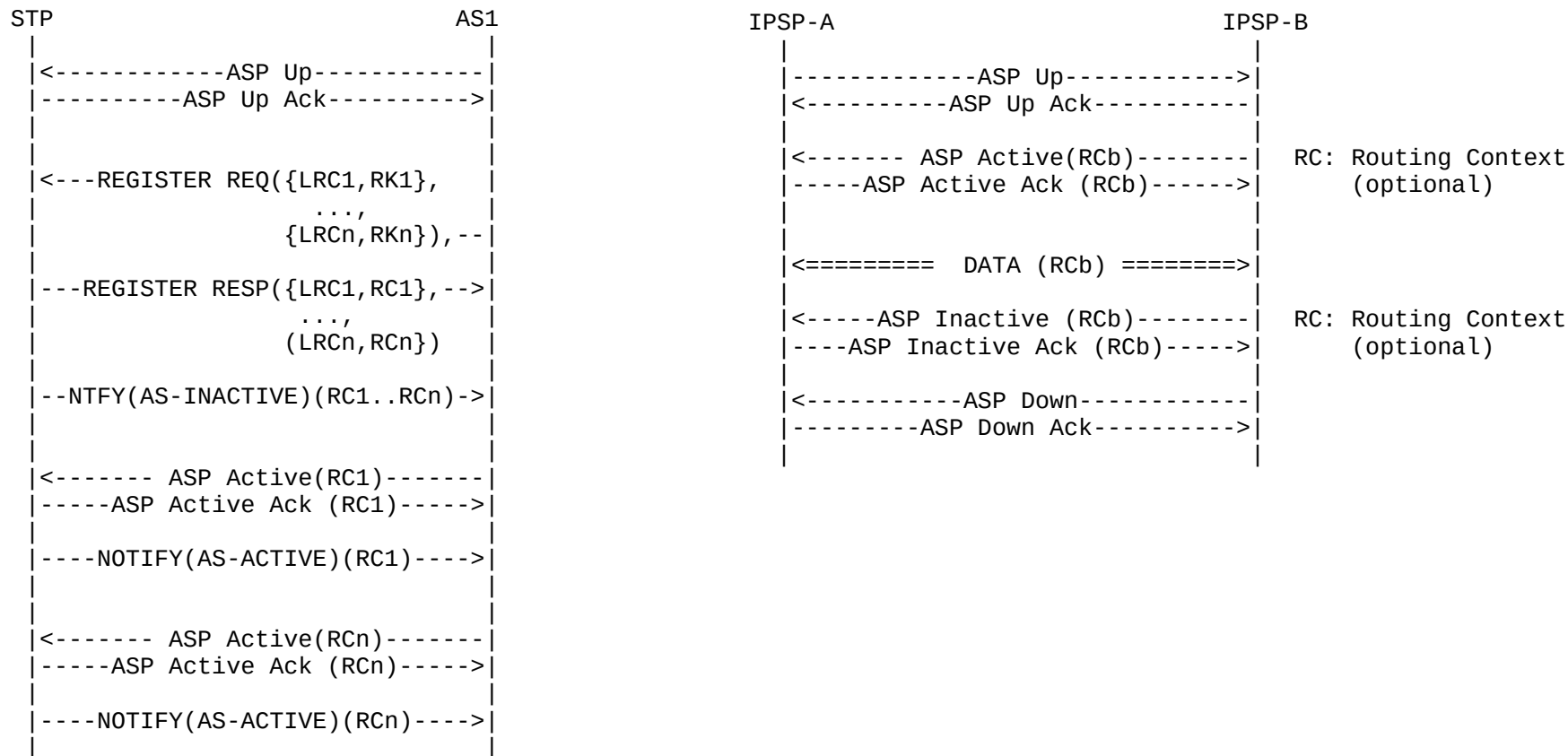
Application Server (AS) - An example of an Application Server is a virtual switch element handling all call processing for a signalling relation, identified by an SS7 DPC/OPC.

Application Server Process (ASP) - A process instance of an Application Server. An Application Server Process serves as an active or backup process of an Application Server (e.g., part of a distributed virtual switch or database). An ASP contains an SCTP endpoint and may be configured to process signaling traffic within more than one Application Server.

M3UA jss7 config

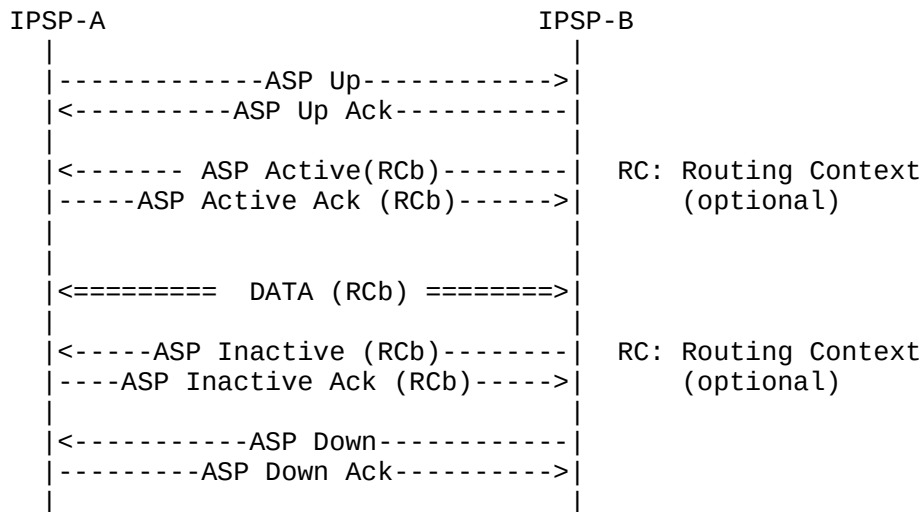
```
<aspFactoryList>
  <aspFactory name="ASP1" assocName="A1_STP_Wien_assoc" started="true" maxseqnumber="256" aspid="2"
heartbeat="false"/>
</aspFactoryList>
<asList>
  <as name="AS1" minAspActiveForLb="1" functionality="AS" exchangeType="SE" ipspType="CLIENT">
    <routingContext size="1">
      <rc value="100"/>
    </routingContext>
    <trafficMode mode="2"/>
    <defTrafficMode mode="2"/>
    <asps>
      <asp name="ASP1"/>
    </asps>
  </as>
</asList>
<route>
  <key value="2001:1001:-1"/>
  <routeAs trafficModeType="2" as="AS1"/>
</route>
```

M3UA – AS vs. IPSP functionality

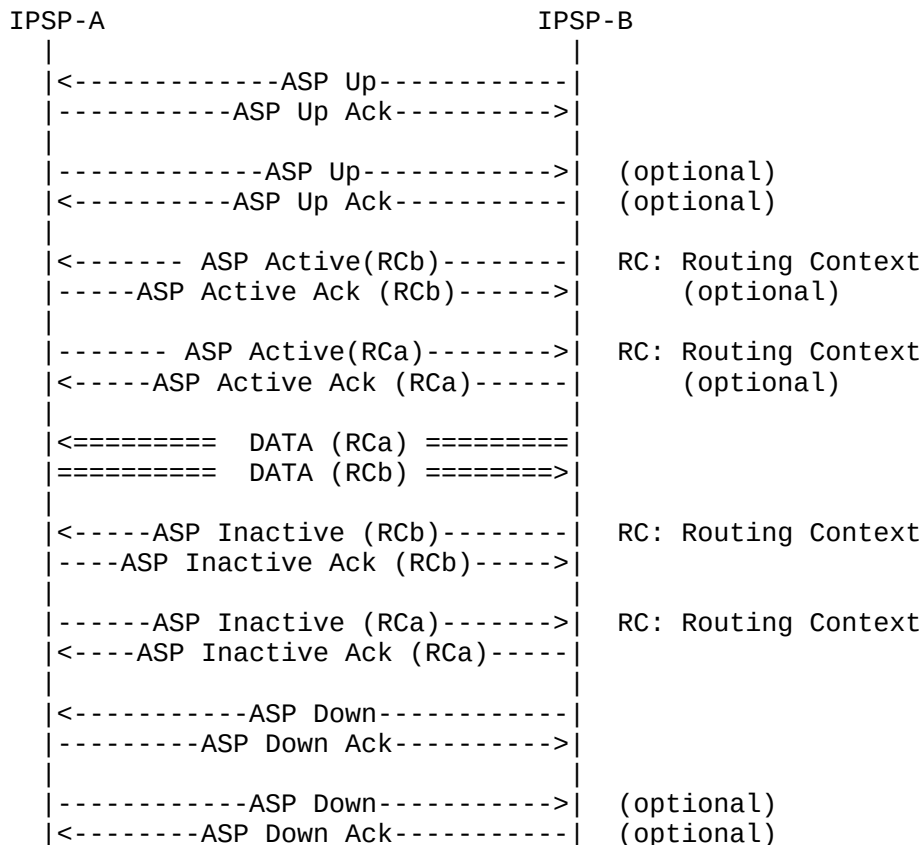


M3UA – IPSP SE vs. DE

Single Exchange - SE



Double Exchange - DE



SCCP

The Signalling Connection Control Part (SCCP) is a network layer protocol that provides extended routing, flow control, segmentation, connection-orientation, and error correction facilities in Signaling System 7 telecommunications networks. SCCP relies on the services of MTP for basic routing and error detection.

Although MTP provides routing capabilities based upon the Point Code, SCCP allows routing using a Point Code and Subsystem number or a Global Title.

A Point Code is used to address a particular node on the network, whereas a Subsystem number addresses a specific application available on that node. SCCP employs a process called Global Title Translation to determine Point Codes from Global Titles so as to instruct MTP on where to route messages.

SCCP diagram

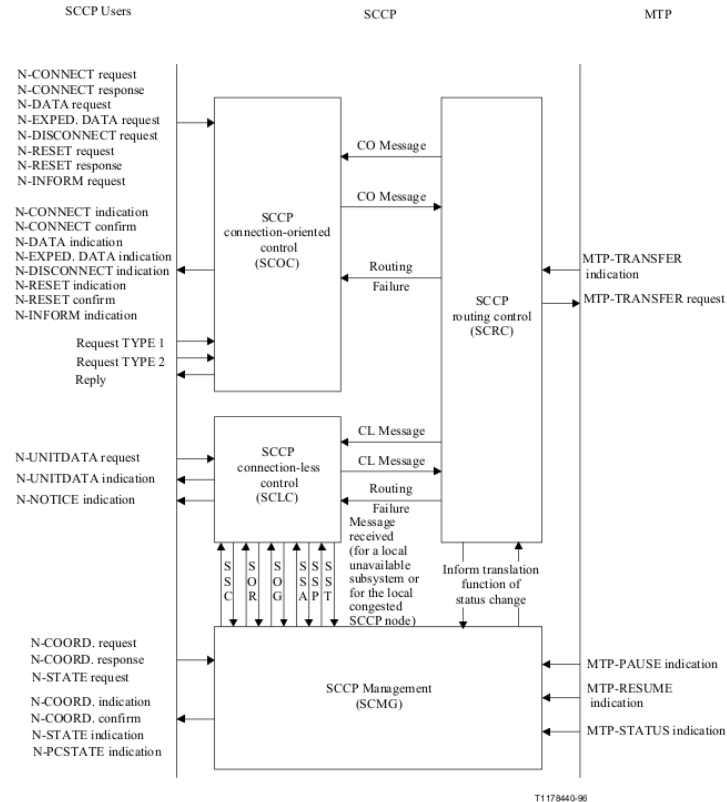


Figure 1/Q.714 – SCCP overview

SCCP jSS7 SAP

SAP

```
<sap>
  <id value="1"/>
  <value mtp3Id="1" opc="1001" ni="2" networkId="0">
    <mtp3DestinationMap>
      <id value="1"/>
      <value firstDpc="2001" lastDpc="2010" firstSls="0" lastSls="255" slsMask="255"/>
    </mtp3DestinationMap>
  </value>
</sap>

<sap>
  <id value="2"/>
  <value mtp3Id="1" opc="6062" ni="2" networkId="0">
    <mtp3DestinationMap>
      <id value="1"/>
      <value firstDpc="4616" lastDpc="4618" firstSls="0" lastSls="255" slsMask="255"/>
    </mtp3DestinationMap>
  </value>
</sap>
```

SCCP jSS7 Rule

Rule

```
<rule>
  <id value="1"/>
  <value ruleType="Solitary" loadSharingAlgo="Undefined" originatingType="LocalOriginated" mask="K" paddress="1"
saddress="-1" networkId="0">
    <patternSccpAddress pc="0" ssn="0">
      <ai value="16"/>
      <gt type="GT0100" tt="0" es="1" np="1" nai="4" digits="*/"/>
    </patternSccpAddress>
  </value>

  <id value="2"/>
  <value ruleType="Loadbalanced" loadSharingAlgo="Bit0" originatingType="RemoteOriginated" mask="K/K" paddress="2"
saddress="3" networkId="0">
    <patternSccpAddress pc="0" ssn="0">
      <ai value="18"/>
      <gt type="GT0100" tt="0" es="1" np="1" nai="4" digits="1234/*"/>
    </patternSccpAddress>
  </value>
</rule>
```

SCCP jSS7 Address

Address

```
<routingAddress>
  <id value="1"/>
  <sccpAddress pc="1001" ssn="0">
    <ai value="17"/>
    <gt type="GT0100" tt="0" es="1" np="7" nai="4" digits="-"/>
  </sccpAddress>
  <id value="2"/>
  <sccpAddress pc="4616" ssn="0">
    <ai value="17"/>
    <gt type="GT0100" tt="0" es="1" np="1" nai="4" digits="-/-"/>
  </sccpAddress>
  <id value="3"/>
  <sccpAddress pc="4618" ssn="0">
    <ai value="17"/>
    <gt type="GT0100" tt="0" es="1" np="1" nai="4" digits="-/-"/>
  </sccpAddress>
</routingAddress>
```


TCAP

Transaction Capabilities Application Part, from ITU-T recommendations Q.771-Q.775 is a protocol for Signalling System 7 networks. Its primary purpose is to facilitate multiple concurrent dialogs between the same sub-systems on the same machines, using Transaction IDs to differentiate these, similar to the way TCP ports facilitate multiplexing connections between the same IP addresses on the Internet.

TCAP uses ASN.1 BER encoding, as well as the protocols it encapsulates, namely MAP in mobile phone networks or INAP in Intelligent Networks.

MAP

The Mobile Application Part (MAP) is an SS7 protocol that provides an application layer for the various nodes in GSM and UMTS mobile core networks and GPRS core networks to communicate with each other in order to provide services to users. The Mobile Application Part is the application-layer protocol used to access the Home Location Register, Visitor Location Register, Mobile Switching Center, Equipment Identity Register, Authentication Centre, Short message service center and Serving GPRS Support Node (SGSN).

MAP facilities

The primary facilities provided by MAP are:

Mobility Services: location management (to support roaming), authentication, managing service subscription information, fault recovery,

Operation and Maintenance: subscriber tracing, retrieving a subscriber's IMSI

Call Handling: routing, managing calls whilst roaming, checking that a subscriber is available to receive calls

Supplementary Services

Short Message Service

Packet Data Protocol (PDP) services for GPRS: providing routing information for GPRS connections

Location Service Management Services: obtaining the location of subscriber