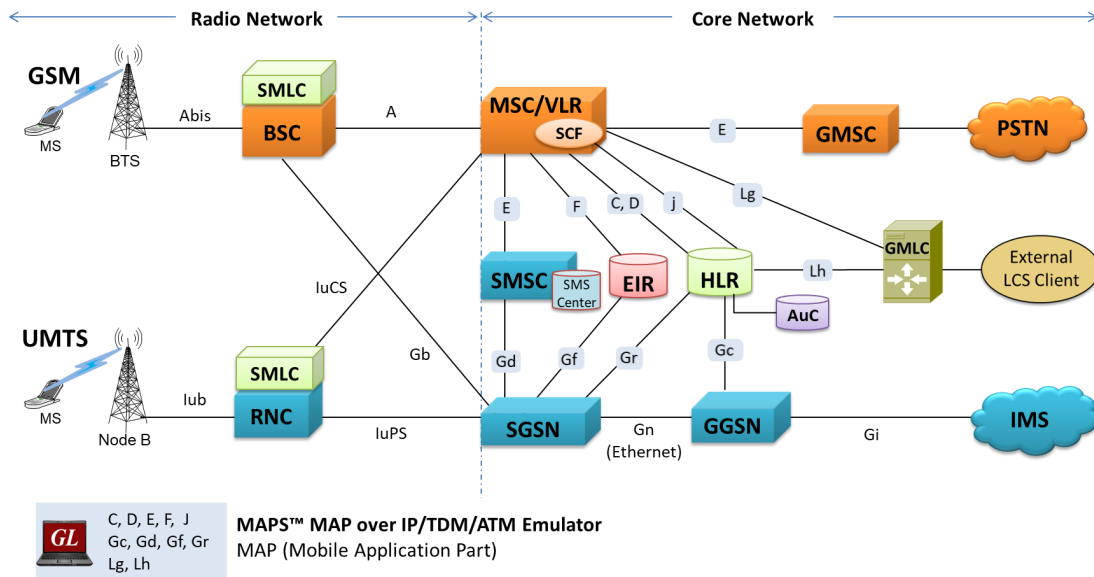# MAPS™ MAP Protocol Emulator
(Mobile Application Part Protocol Emulator over IP/TDM/ATM)

Overview

The **Mobile Application Part (MAP)** is an GSM protocol which provides application layer services to the various nodes in GSM and UMTS networks. MAP can be transported using 'traditional' SS7 protocols carried by Message Transfer Protocol (MTP) in TDM/ATM (T1 and E1) or by M2PA, M3UA, and M2UA User Adaption layer in IP using SIGTRAN.

MAPS™ MAP (Message Automation & Protocol Simulation) product is used to emulate all the GSM and UMTS MAP interfaces. **GL's MAPS™** is an advanced and versatile protocol simulator/tester that can emulate a variety of protocols It supports various procedures across the MAP interfaces including GPRS Location Update, MT and MO SMS, Location Update, MAP Authentication, Routing Information, Remote User Status, and Check IMEI Status. Additional features includes error tracking, regression testing, conformance testing, load testing and call generation.

MAPS™ MAP ATM uses SSCOP server for establishing SSCOP links over which MAP signaling will be carried further for making calls. SSCOP Server is GL's WCS based server module and provides SSCOP, and AAL5 layer services. MAPS™ MAP ATM internally uses AAL5 Traffic Generator for traffic generation. Various traffic types like Tone, Digits and File playback are supported.

MAPS™ MAP (MTP2/ATM) is enhanced to emulate [Location Services (LCS)](.) over Lg and Lh interfaces connecting GMLC <-> MSC and GMLC <-> HLR entities. Supported LCS procedures includes Provide Subscriber Location, Subscriber Location Report, and Routing Info for LCS, as per 3GPP specifications.

For more information, please visit [MAPS™ MAP Emulator](.) webpage.

Main Features

- MAP protocol simulation over IP/TDM/ATM.
- Emulator can be configured as MSC/VLR, RNC, HLR, EIR, SMSC, SGSN, GMLC and GGSN entities to emulate C, D, E, F interfaces in the GSM network and Gc, Gd, Gf, and Gr in the UMTS network.
- User-friendly GUI for configuring the MAP signaling links over IP and TDM.
- Access to all M2PA, M2UA, MTP3, M3UA, SCCP, and MAP R4 protocol fields such as TMSI, IMSI, MCC, MNC, MSIN, CCBS and more.
- Ready scripts for GPRS Location Update, MT and MO SMS, Location Update, MAP Authentication, Routing Information, Remote User Status, and Check IMEI Status procedures
- Emulates Location Service (LCS) between GMLC, MSC, and HLR entities over Lg and Lh interfaces.

MAP Supported Interfaces and Elements

Interface	Elements	Purpose	TDM/ATM (T1/E1)	IP
B	MSC-VLR	Generally an internal interface within the MSC. Used whenever the MSC needs access to data regarding a MS located in its area.	✓	✓
C	MSC-HLR	MSC server interrogates the HLR for routing information of a subscriber for a call or SMS directed to that subscriber	✓	✓
D	VLR-HLR	Used to exchange data related to the current location of a mobile station and to the management of that subscriber	✓	✓
E	MSC-GMSC MSC-SMSC	Exchange of handover data between two adjacent MSCs for the purpose of seamless call and message flow	✓	✓
F	MSC-EIR	Used by the EIR to verify the status of the IMEI retrieved from the Mobile Station	✓	✓
G	VLR-VLR	Used to update a new VLR with IMSI and authentication info from old VLR, when a mobile subscriber moves from one VLR area to another (not shown in the diagram)	✓	✓
H	HLR-AuC	HLR requests for authentication and ciphering data from the AuC for a Mobile Subscriber.	✓	✓
Gc	GGSN-HLR	Used by the GGSN to retrieve information about the location and supported services for a mobile subscriber for packet data services (GPRS, etc.)	✓	✓
Gr	SGSN-HLR	Used to exchange data related to the current location and management of a Mobile Subscriber (MS) and Mobile Equipment (ME)	✓	✓
Gf	SGSN-EIR	Used by the EIR to verify the status of the IMEI retrieved from the Mobile Station.	✓	✓
Gd	SGSN-SMSC	Used to transfer SMS over GPRS.	✓	✓
Lg	MSC GMLC	Used in location services between MSC and GMLC to provide subscriber location and related report		✓
Lh	GMLC HLR	Used in location services between the GMLC and the HLR to retrieve the routing information needed for routing a location service request to the servicing VMSC, SGSN, MME or 3GPP AAA server		✓

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Testbed Setup Configuration

Test Bed setup is provided to establish communication between MAPS™ MAP over IP/TDM/ATM with the DUT.

MAPS™ MAP allows users to configure SCTP layer (over IP) and MTP2/ATM layer (over TDM) parameters. Once the testbed setup is configured properly, MAP messages can be transmitted and received over configured layers.

The Testbed configuration includes parameter settings such as Source and Destination node configurations such as IP addresses, Port, Point Code, and Subsystem Number.

Default profile is used to configure MAPS™ MAP with HLR, MSC, SMSC, SGSN, and other supported interface end-user parameters.
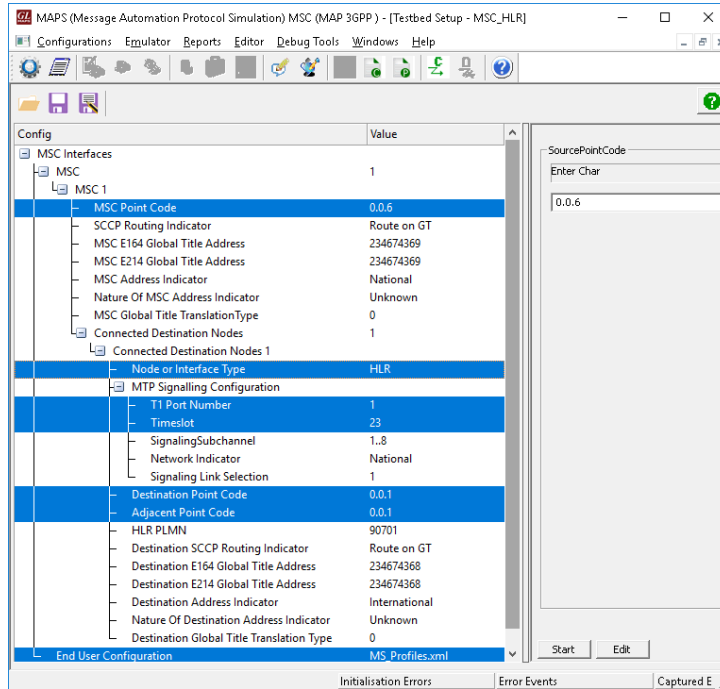
Testbed Setup for MAPS™ MAP over TDM
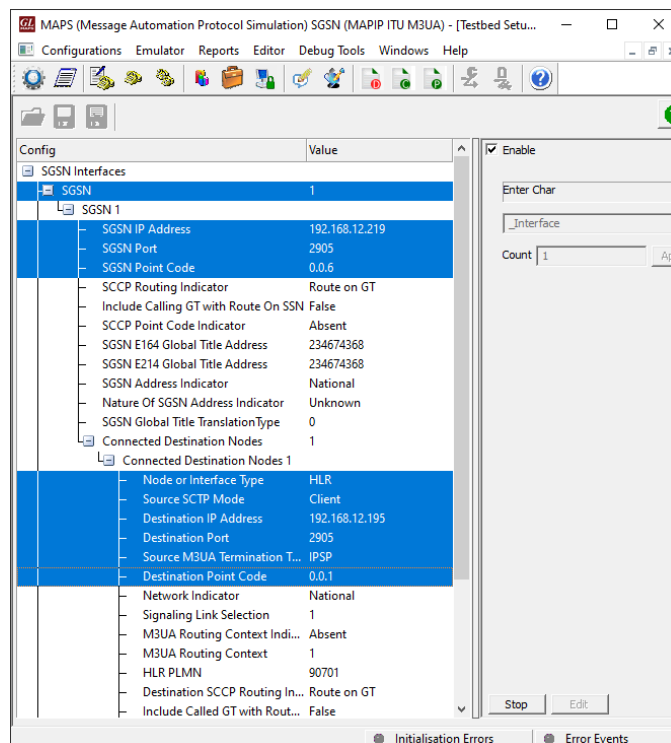
Testbed Setup for MAPS™ MAP over IP

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Pre-processing Tools

PROFILE EDITOR - This feature allows loading profile to edit the values of the variables using GUI, replacing the original value of the variables in the message template.

An XML file defines a set of multiple profiles with varying parameter values that allow users to configure call instances in call generation and to receive calls.
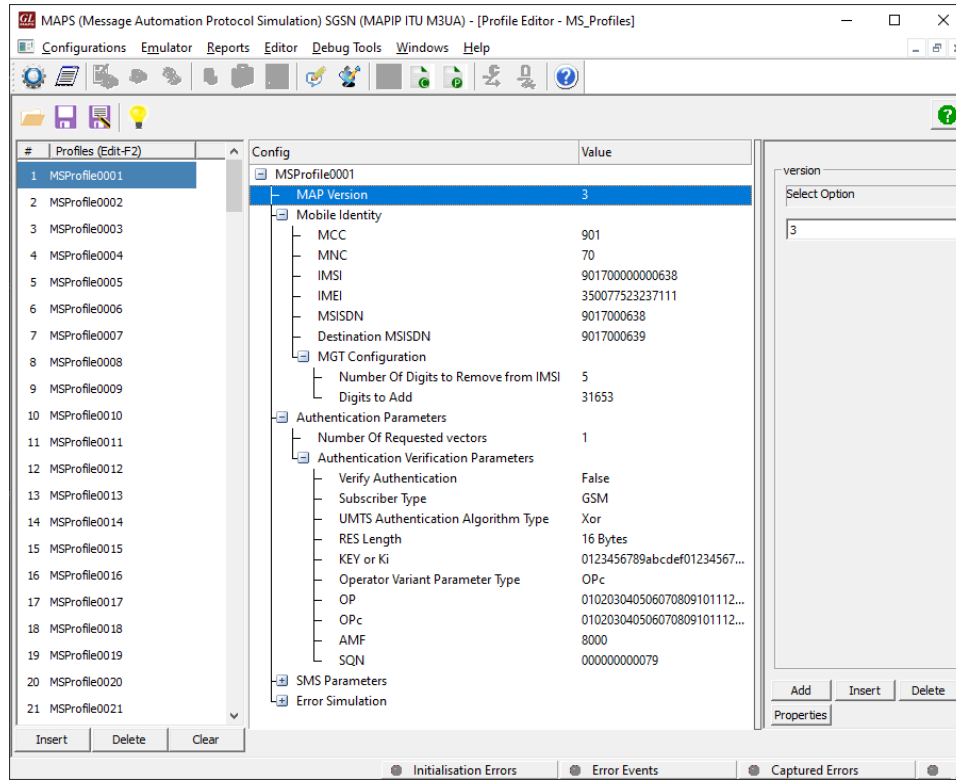
Profile Editor

SCRIPT EDITOR - The script editor allows the user to create / edit scripts and access protocol fields as variables for the message template parameters. The script uses pre-defined message templates to perform send and receive actions.

Script Editor

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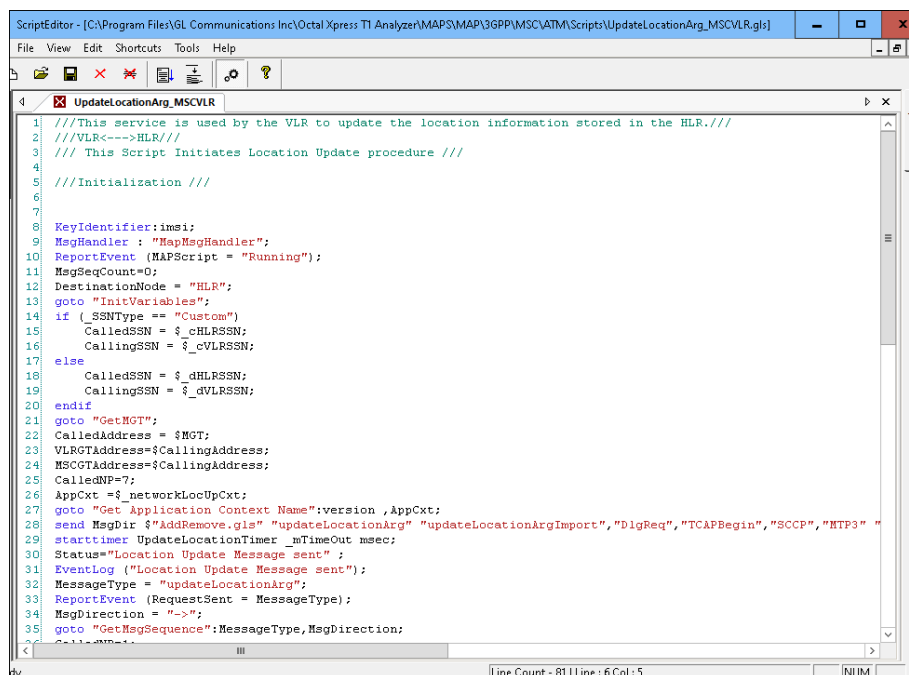
Pre-processing Tools

MESSAGE EDITOR - With message editor, users can build a template for each protocol message type. The value for each field may be changed in the message template prior to testing. The protocol fields comprises of mandatory fixed parameters, mandatory variable parameters, and optional variable parameters.
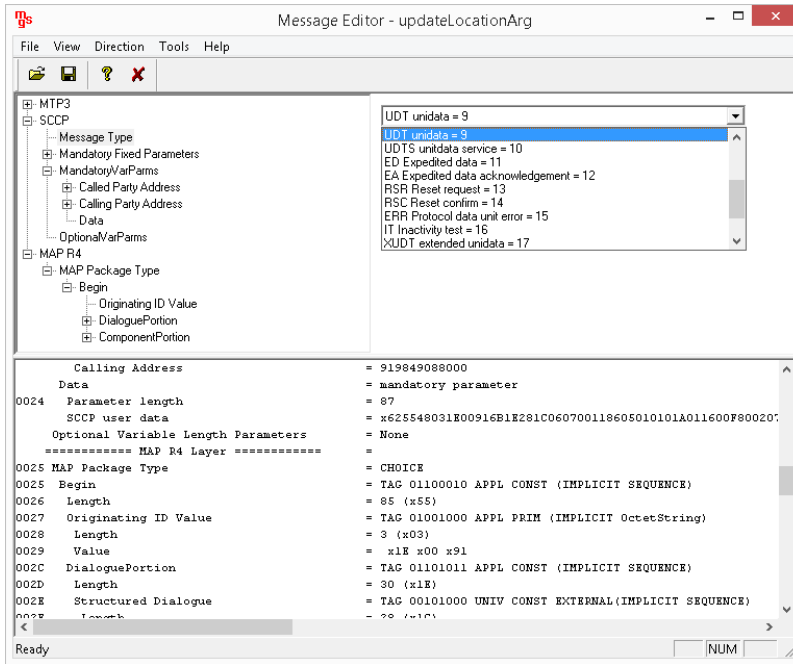
Message Editor

Call Generation and Reception

In call generation, MAPS™ is configured for the out going messages, while in call receive mode, it is configured to respond to incoming messages. Tests can be configured to run once, multiple iterations and continuously. Also, allows users to create multiple entries using quick configuration feature.

The editor allows to run the added scripts sequentially (order in which the scripts are added in the window) or randomly (any script from the list of added script as per the call flow requirements). The test scripts may be started manually or they can be automatically triggered by incoming messages.

Call Generation

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Call Generation and Reception

Call Reception

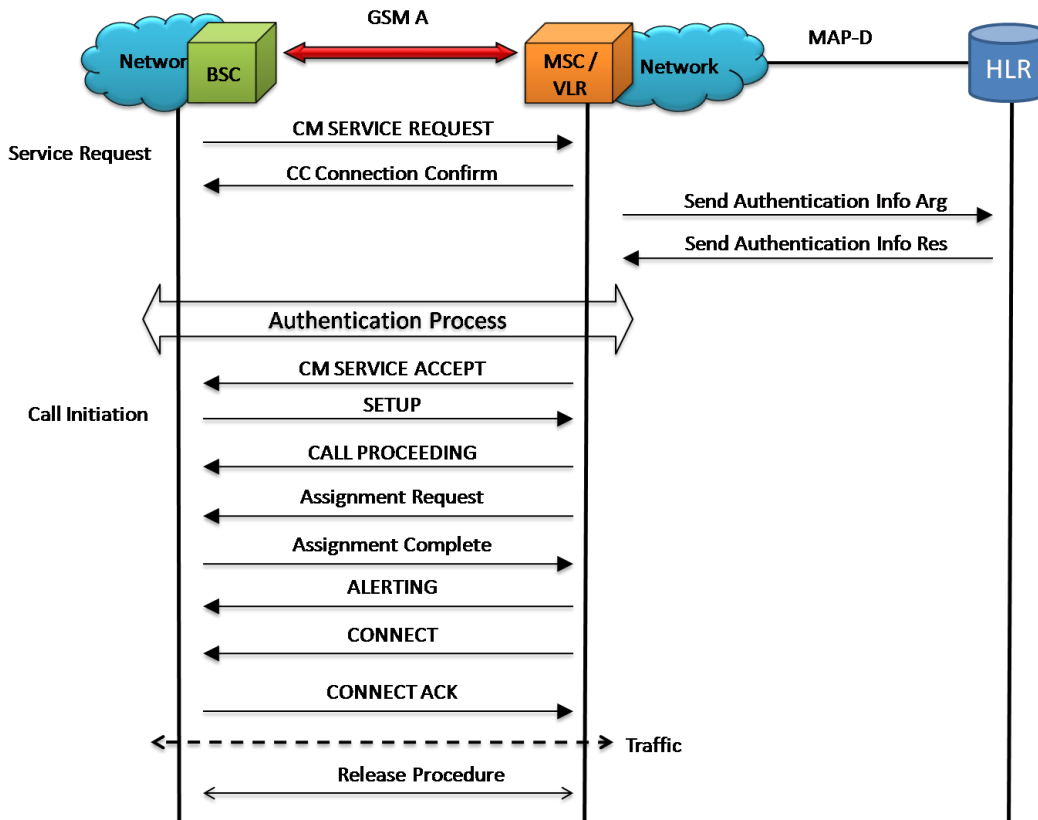
Event Log

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Typical MAP Interface Call Procedures

Shown below are some of the typical call procedures in GSM MAP over IP/TDM/ATM layers.

Supporting procedures include GPRS Location Update, MT and MO SMS, Location Update, MAP Authentication, Routing Information, Remote User Status, & Check IMEI Status procedures.
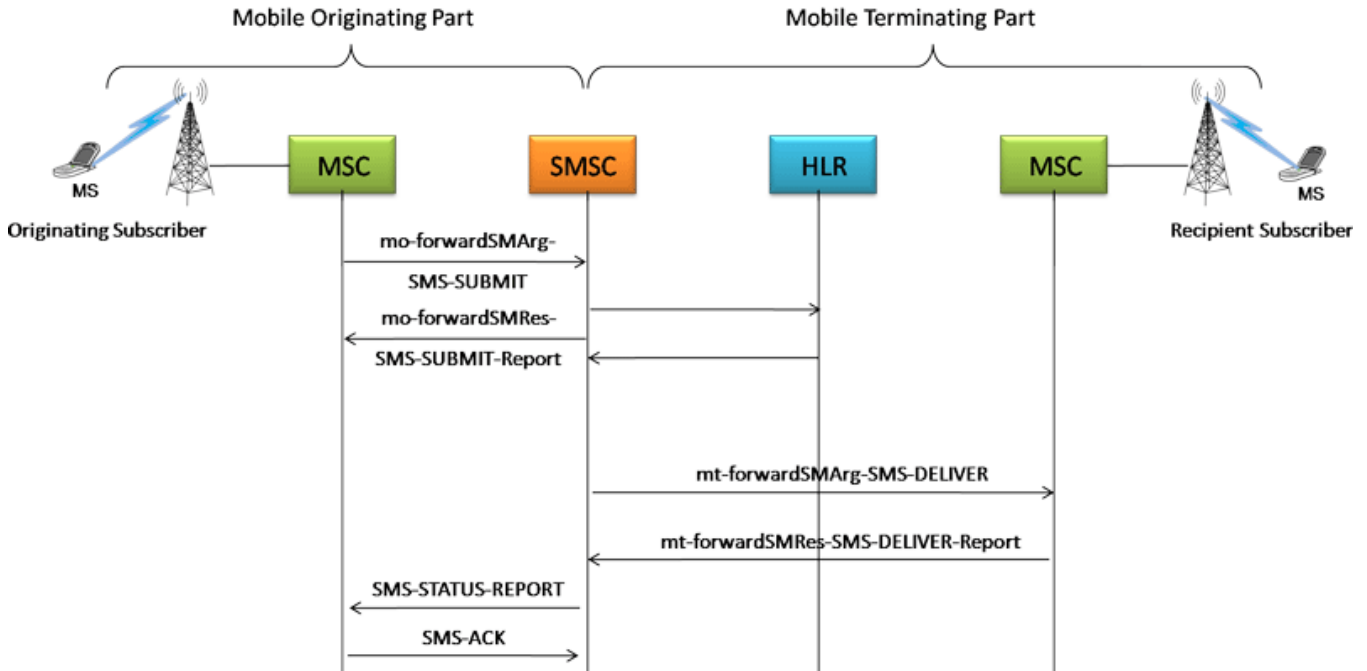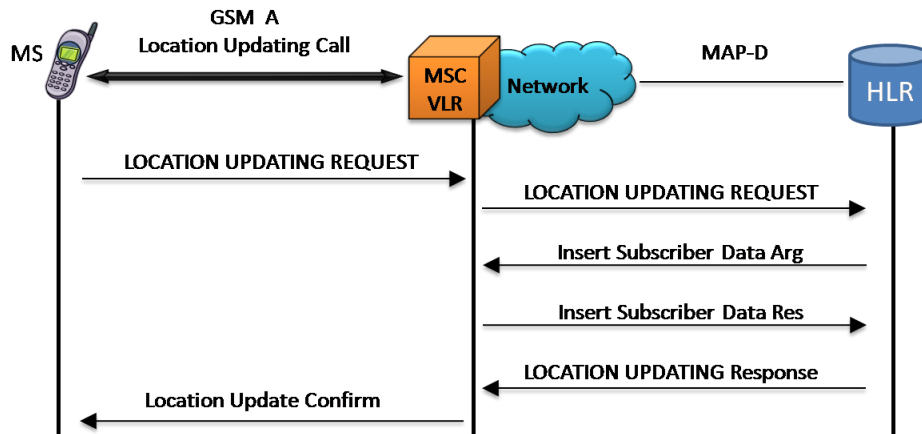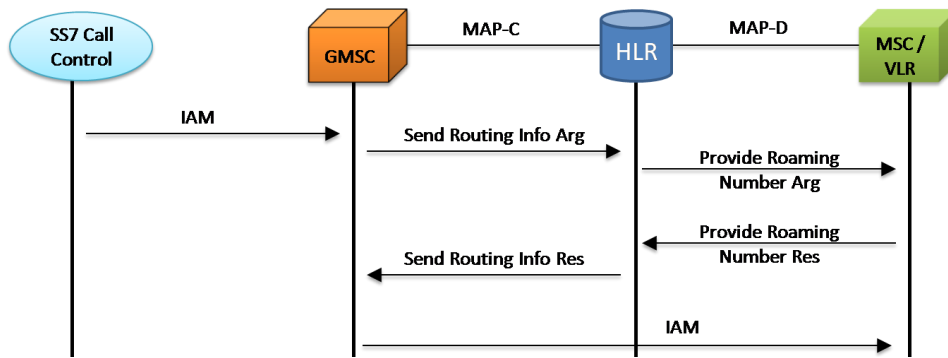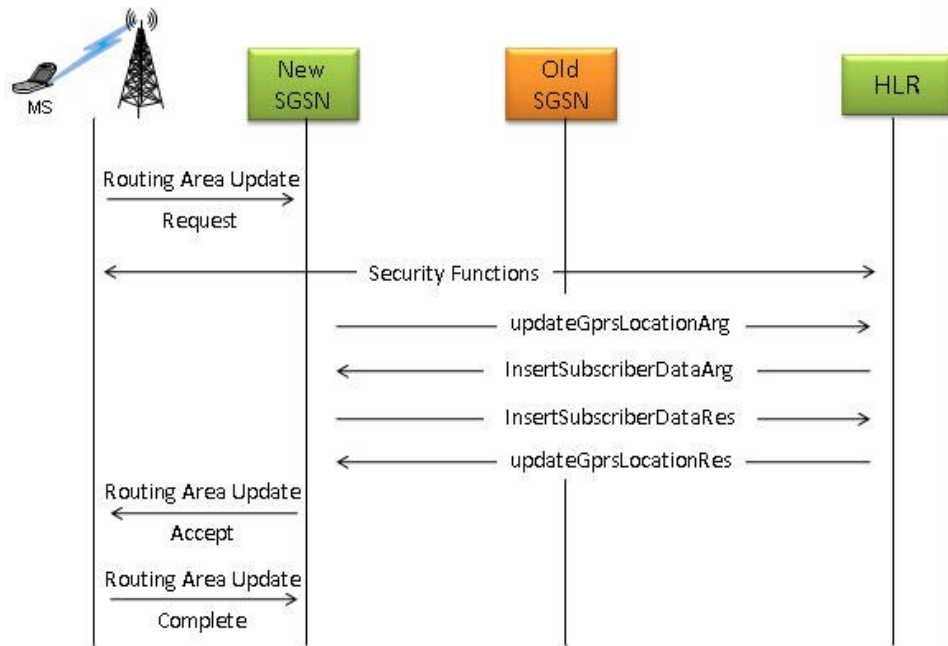

MT and MO SMS Procedure

MAP Authentication Procedure

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Typical MAP Interface Call Procedures

MAP/D Location Update Procedure

Retrieval Routing Information Procedure

GPRS Location Update Procedure

Location Services over IP
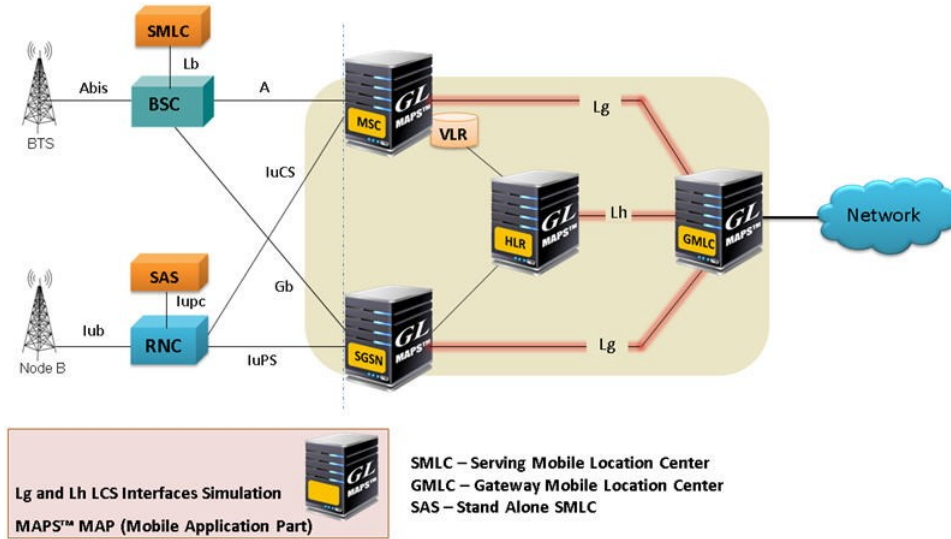
LCS Network Architecture

MAP over IP network also includes LCS specific elements and entities, their functionalities, interfaces, as well as communication messages, necessary to implement the positioning functionality in a cellular network. The LCS architecture follows a client/server model with the gateway mobile location center (GMLC) acting as the server providing information to External LCS Clients.

MS initiated Location Report Procedure is supported over Lg Interface between GMLC and MSC and Network Initiated Location Retrieval Procedure over Lh Interface between GMLC and HLR

Lg interface:

The **Lg interface** implements the following Mobile Application Services:

MAP-Provide-Subscriber-Location - used by a GMLC to request the location and optionally, velocity, of a target UE;

MAP-Subscriber-Location-Report – used by a SGSN/MSC to provide the location of a target UE to a GMLC.
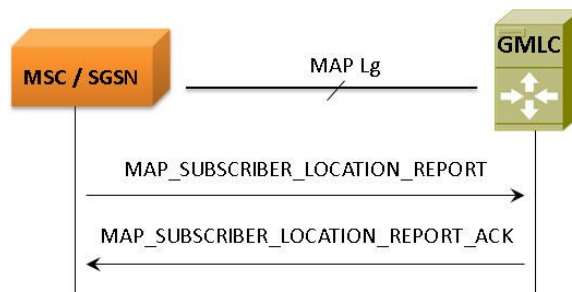
Lg Interface-LCS Procedure

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Lh interface:

The GMLC initiates location requests on behalf of external clients. The E.164 address of the GMLC is provided to an HLR when the GMLC requests a serving MSC address or SGSN address from the HLR for a target MS. The E.164 address of the GMLC is also provided to a serving MSC or SGSN when the GMLC requests the location of a target MS served by this MSC or SGSN

MAP-SEND-ROUTING-INFO-FOR-LCS, used by GMLC to retrieve the routing information from HLR, required to route a location service request to the serving VMSC, SGSN, MME or 3GPP AAA server.

Network Initiated Location Retrieval Procedure

Lg and Lh Interface Call Generation

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Supported Protocol Standards

MAP
TCAP
SCCP
MTP3
T D M

MAP
TCAP
SCCP
MTP3b
SSCOP
AAL5
ATM
Physical Layer
MAP over ATM

Supported Protocols	Standard / Specification Used
TDM	
MAPR4	3GPP TS 29.002 V4.18.0 (2007-09)
TCAP	ANSI T1.114-1996
SCCP	Q.713, CCITT (ITU-T) Blue Book
MTP3	Q.703, ITU-T Blue Book
ATM	
MAPR4	3GPP TS 29.002 V4.18.0 (2007-09)
TCAP	ANSI T1.114-1996
SCCP	Q.713, CCITT (ITU-T) Blue Book
MTP3	Q.703, ITU-T Blue Book
SSCOP	ITU-T Q.2110
MTP3b	ITU-T Recommendation Q.2210
AAL5	Class C & D (ITU-T I.363.5)
ATM	ITU-T I.361

MAP			
TCAP			
SCCP			
MTP3		M3UA	SUA
M2PA	M2UA		
SCTP			
IP			

Supported Protocols	Standard / Specification Used
MAPR4	3GPP TS 29.002 V4.18.0 (2007-09)
TCAP	ANSI T1.114-1996
SCCP	Q.713, CCITT (ITU-T) Blue Book
MTP3	ITU-T Q.782
M2PA	RFC 4165
M3UA	RFC 3332
M2UA	RFC 3331
SUA	RFC 3868
SCTP	RFC 4960

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Buyer's Guide

Item No	Product Description
PKS132	MAPS™ MAP over IP Protocol Emulation
XX694	MAPS™ MAP Protocol Emulation

Item No	Related Software
PKS130	MAPS™ SIGTRAN (SS7 over IP)
PKV105	SIGTRAN Protocol Analyzer
XX649	MAPS™ SS7 Protocol Emulation
XX165	T1 or E1 UMTS Protocol Analyzer
PKS140	MAPS™ LTE - S1 Interface

Note: PCs which include GL hardware/software require Intel or AMD processors for compliance.

For more information, please visit signaling and traffic simulator webpage.