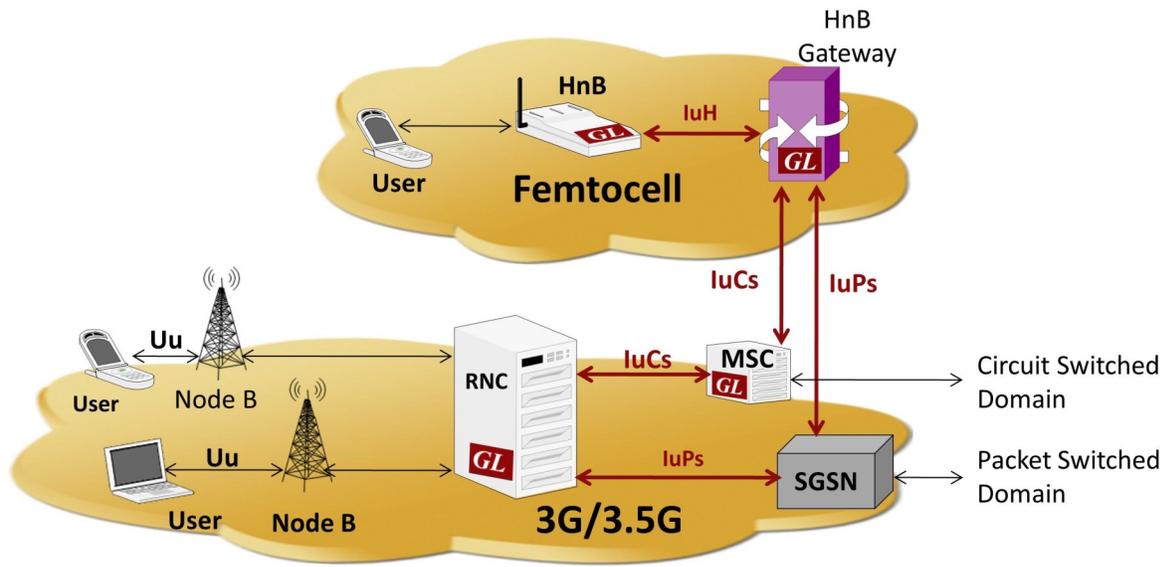


MAPS™ UMTS for IuCS, IuH Interfaces

(UMTS IuCS Emulation over IP and ATM; and IuH Emulation over IP)



MAPS™ UMTS-IuCs and IuH Emulator

Generate up to 20,000 Subscribers
Up to 2000 Simultaneous Calls



MAPS™ UMTS-IuCS and IuH Emulator HD RTP Generator Hardware

(w/ 2 x 10G cards; w/ 4 x 1G cards)
Generate up to 20,000 Subscribers
20,000 Simultaneous Calls (with RTP Traffic)

Main Features

- Simulates RNC, and MSC entities in IuCS interface over IP and ATM.
- Simulates Home NodeB (HnB) and Home NodeB Gateway (HnB GW) entities in IuH interface.
- User controlled access to Mobility Management, Session Management, RANAP, and DTAP messages
- Supports RAB Assignment, Authentication, TMSI Reallocation, Encryption, and other procedures
- Ready scripts for Mobile Originating Voice/SMS Call, Mobile Terminating Voice/SMS Call, Location Updating, Mobile to Mobile Voice/SMS Call, SMS over active voice call, Supplementary Service Call and Handover procedures for quick testing
- Supports sending/receiving SMS while the voice call is active
- Massive UE emulation (up to 20,000) with related information access directly from Database, or CSV files
- Simultaneous call emulation of up to 2,000 on regular RTP core; however with RTP HD appliance (#PKS109) up to 20,000 simultaneous calls can be achieved
- SSCOP links over which RANAP and ALCAP signaling will be carried further for making calls
- SSCOP Server (GL's WCS based server module) provides SSCOP, AAL5 and AAL2 layer services
- Supports various traffic types including Tone, Digits and File playback over AAL2
- Supports traffic over Iu UP protocol layer and also over normal RTP sessions (requires additional licenses).
- All Codec supported including - G.711, G.711 App II with VAD, G.729, G.726, G.726 with VAD, GSM, AMR NB and WB, EVRC, SMV, iLBC, SPEEX NB and WB, G722, and G722.1. Visit [Voice Codecs](#) webpage for more comprehensive information.

For more information, please visit [MAPS™ UMTS-IuCS and IuH Interface Emulation](#) webpage.



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luCS and luH over IP

GL's **MAPS™ UMTS luCs** can emulate the RNC (Radio Network Controller) and the MSC (Mobile Switching Centre) by generating RANAP and DTAP signaling messages over SCTP. It includes ready scripts to simulate Location Update, Call Control MO (Mobile Originating), Mobile Terminating (MT), Mobile-to-mobile Voice Call/ SMS, SMS over active voice call, and Handover (Relocation) procedures.

GL's MAPS™ luCS is also available in [High Density version](#) (requires a special purpose network appliance and PKS109 RTP HD licenses). This is capable of high call intensity (hundreds of calls/sec) and high volume of sustained calls (ten thousands of simultaneous calls/ platform).

MAPS™ luCS IP supports traffic over lu UP protocol layer with additional licensing. Also, supports RTP traffic emulation (requires additional licensing) including various types such as send and receive tone, digits, and voice files.

MAPS™ UMTS luH

simulates Femto Home Node B (HnB), and a Femto Home Node Gateway (HnB-GW) entities by generating RANAP signaling messages over SCTP. It includes ready scripts to simulate Location Update, Call Control MO (Mobile Originating), and Mobile Terminating (MT) Mobile-to-mobile Voice Call/ SMS, SMS over active voice call, and Supplementary service call procedures.

MAPS™ luH over IP supports RTP and GTP traffic with additional licensing. RTP traffic emulation includes automated and user-defined traffic types to send and receive tone, digits, voice files, and IVR. GTP traffic emulation includes Mobile and Gateway traffic.

For comprehensive details on the application, please visit [MAPS™ UMTS-luCS and luH Interface Emulation](#) webpage.

luCS over ATM

GL's **LightSpeed1000™** hardware platform (PCIe Card) with quad optical ports supports emulation of UMTS luCs over ATM layer on OC-3/STM-1 interface using **MAPS™ luCS ATM** application. The **LightSpeed1000™** comes with software for overall monitoring, protocol emulation and analysis, bert, recording, and playback of Unchannelized ATM, PoS, and Channelized traffic. The hardware can also be easily configured/programmed for delaying of ATM Cells or PPP packets.

MAPS™ luCS ATM uses SSCOP server for establishing SSCOP links over which RANAP, ALCAP, and DTAP signaling will be carried for making calls. SSCOP Server is a GL's WCS based server module that provides SSCOP, AAL5, and AAL2 layer services. MAPS™ luCS ATM generates AAL2 traffic including Tone, Digits and File playback types.

For comprehensive details on the application, please visit [LightSpeed1000™](#) webpage.

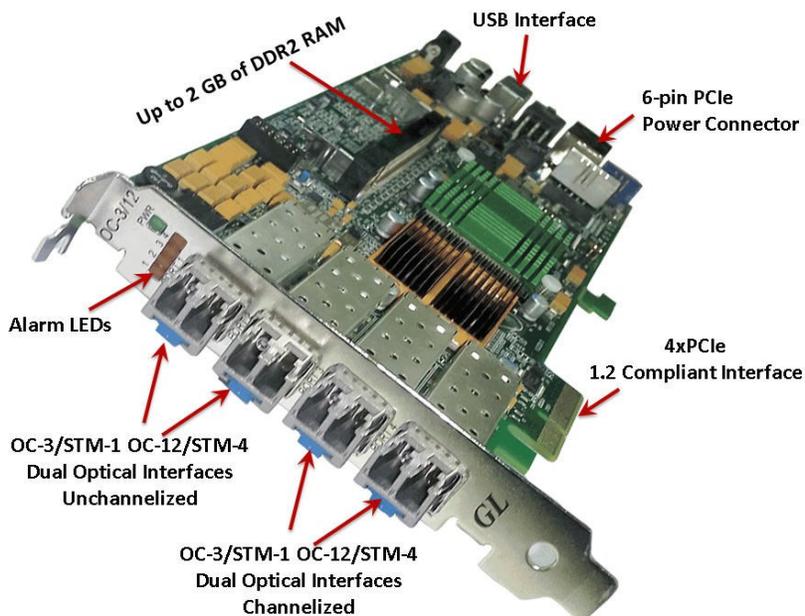


Figure: LightSpeed1000™ (PCIe Card)

Testbed Configuration

The test configuration window allows users to configure the necessary parameters in order to establish communication between MAPS™ and the DUT.

Testbed includes various parameter settings which configures the MAPS™ as the network entity. Once the transport layer is configured properly, protocol specific signaling messages and traffic can be transmitted and received successfully.

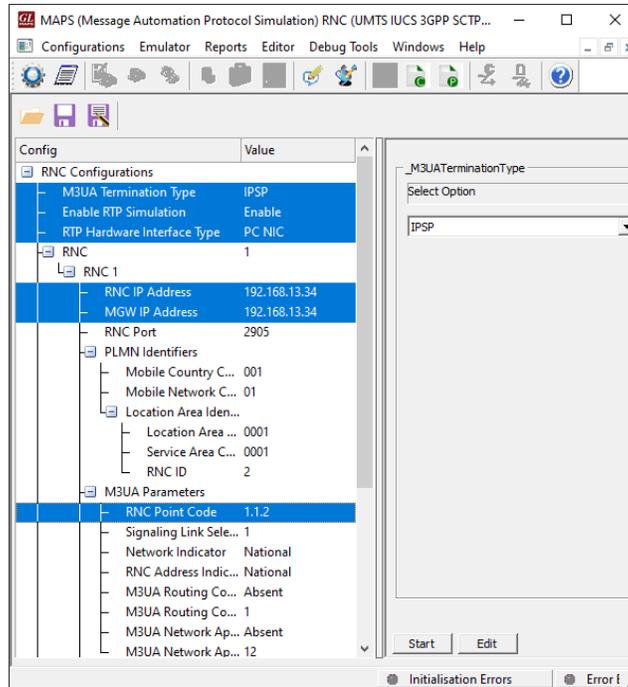


Figure: Testbed Configuration

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.

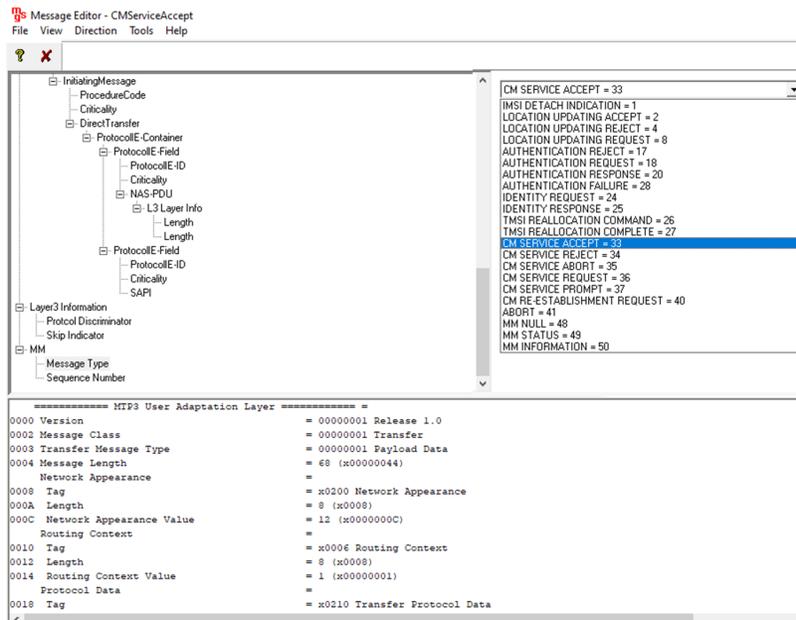


Figure: Message Editor

Pre-processing Tools (Contd.)

Script Editor

The script editor allows the user to create / edit scripts and also import/export files that define variables for the message template parameters. The script uses pre-defined message templates to perform send and receive actions.

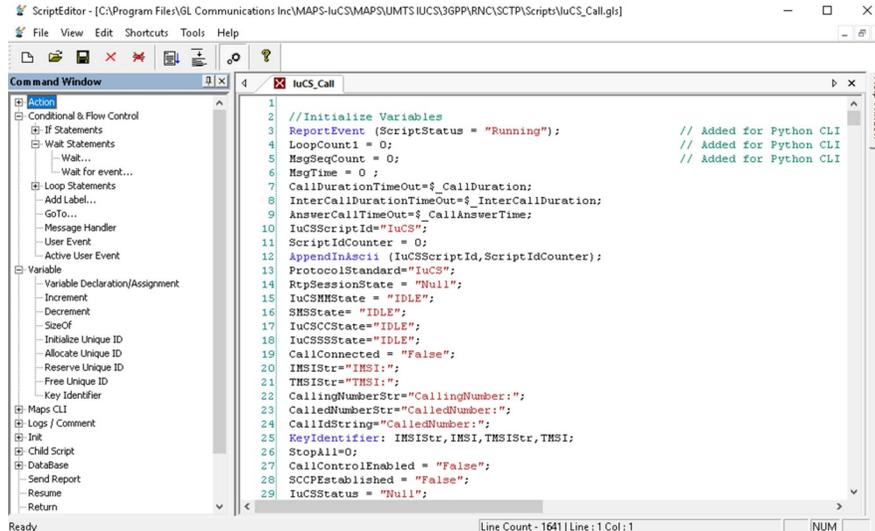


Figure: Script Editor

Profile Editor

The profile editor allows user to edit or create profiles in order to define values to the variables for the message templates. The users can edit the values of the variables thus 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.

Users can configure the traffic options for Auto traffic type or User-defined traffic type. Supported traffic configuration includes Send/Receive file, DTMF/MF digits, and Single/Dual tones.

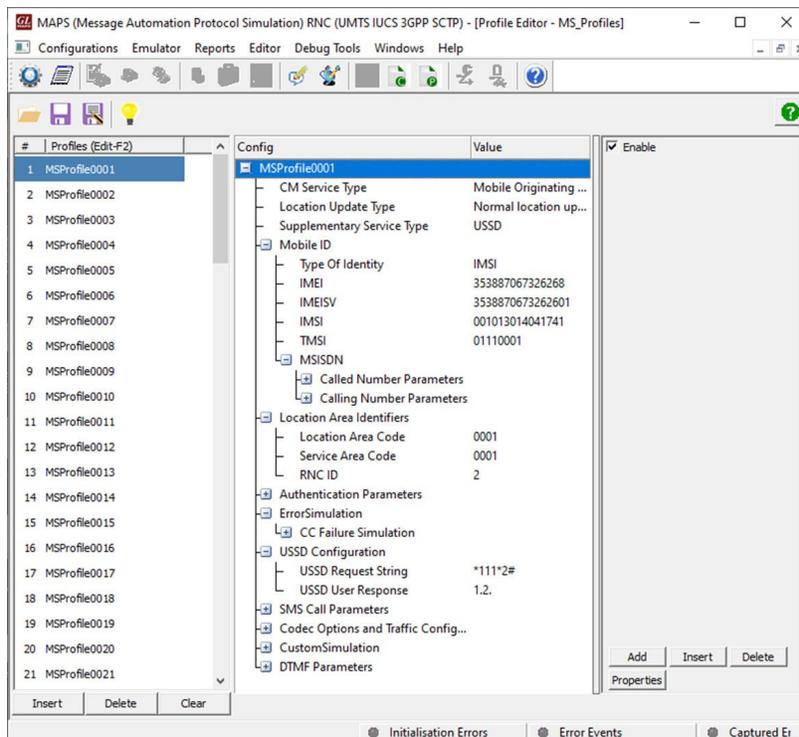


Figure: Profile Editor

MAPS™ luCS IP Call emulation

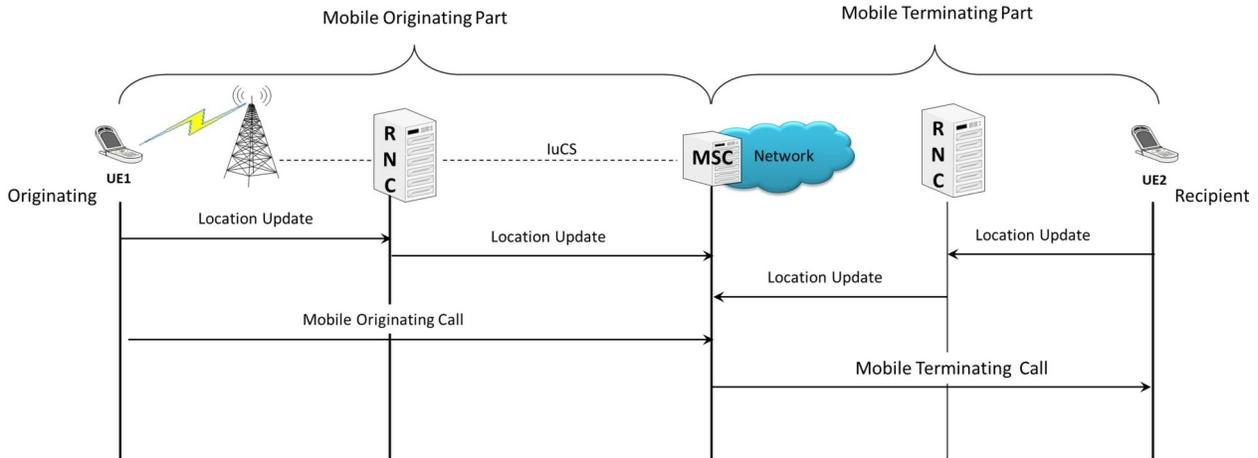
Mobile-to-Mobile Voice Call Procedure

The Mobile-to-Mobile call is initiated by the User Equipment (UE). On receiving the Location Update Request, the UE initiates the call by sending the location update message to network and on receiving acknowledgement, the LU call gets terminated.

Once the location update is successful, Call Control Mobile Originating (MO) procedure is initiated from UE towards the network.

The Mobile Terminating Call is initiated by Network by sending Paging message towards UE. Here, the UE is the receiver of a call. UE will send the Paging Response message, thus completing the mobile-to-mobile call via the network.

The following procedure flow illustrates the Mobile Originating (MO) call towards the network and the Mobile Terminating (MT) call initiated from the network towards the UE.

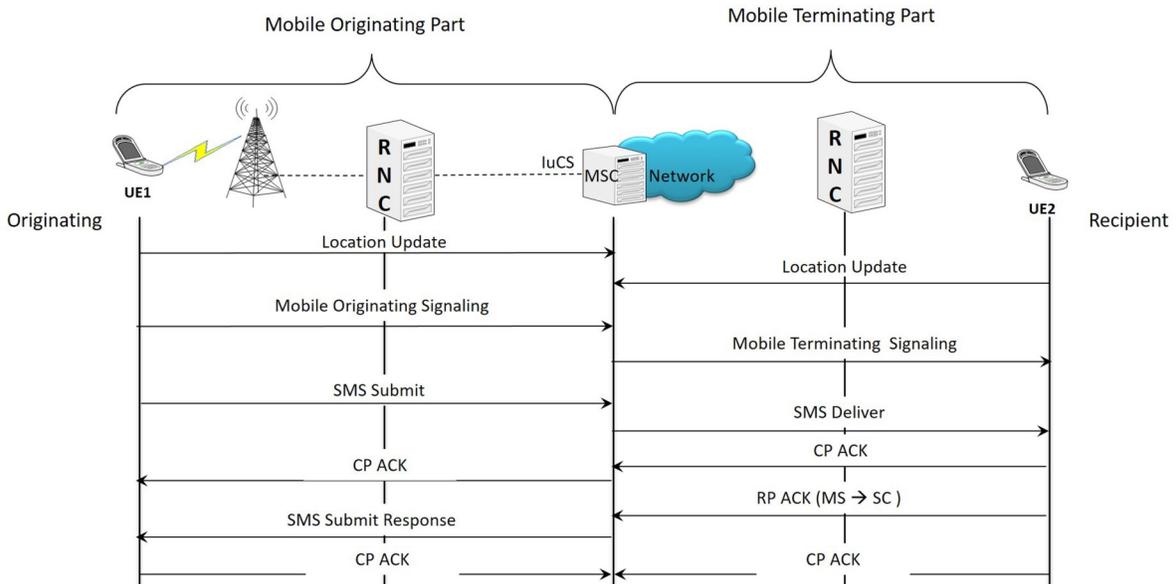


Mobile-to-Mobile SMS Call procedure

The Mobile-to-Mobile SMS Call Procedure is similar to Mobile to Mobile Voice Call Procedure, the SMS is initiated at the User Equipment. On receiving the Location Update the UE initiates the SMS by sending the location update message to network following which the Call Control Mobile Originating (MO) call is initiated.

MAPS™ luCS supports mobile-to-mobile SMS procedure, sent or received from mobile phone-to-mobile phone.

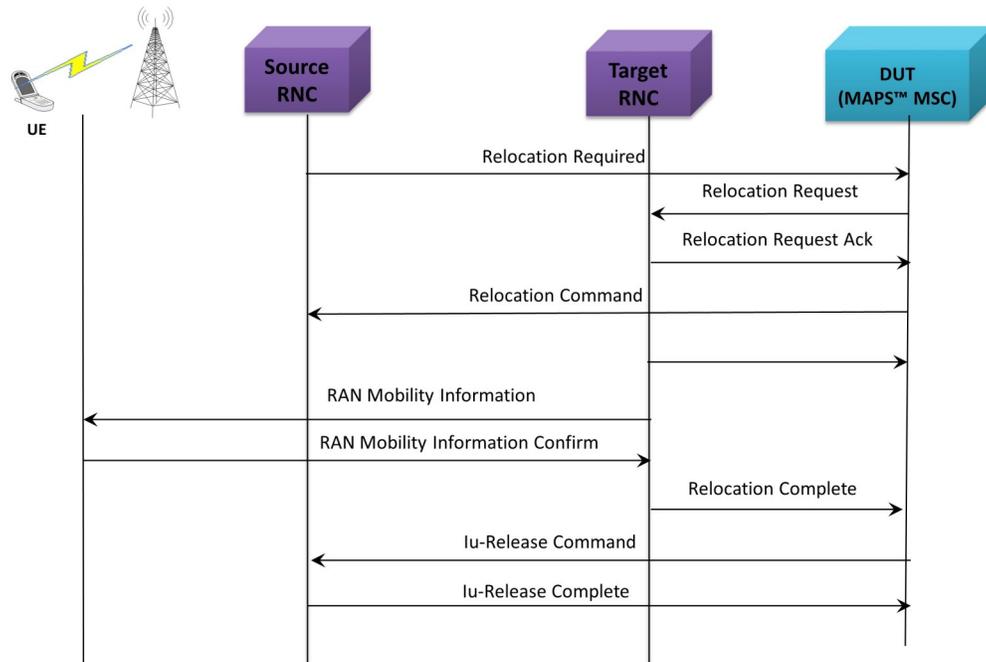
MAPS™ luCS supports both Short message Mobile Originated (SMS-MO) and Short message Mobile Terminated (SMS-MT) procedures.



MAPS™ IuCS IP Call emulation (Contd.)

Handover (Relocation) Call Procedure

Relocation is a procedure used during mobility scenarios when Control of the Serving Radio Network Subsystem (SRNS) is changed to another Radio Network Subsystem (RNS). This procedure is only performed for a UE in CONNECTED state. The Serving SRNS Relocation procedure is used to move the connection between the RAN and the CN for the source SRNC to the RAN for the target RNC, from a "standing still position". In the procedure, the Iu links are relocated.



The following screenshot depicts end-to-end procedure emulation, you may observe the Relocate Required request messages sent from RNC1 to MSC and from MSC to RNC2.

The screenshot shows the MAPS interface with a table of script execution results and a detailed message sequence view.

Sr No	Script Name	Profile	Call Info	Script Execution	Status	Events	Results
4	SCMG.gls		1005	Stop	Subsystem-Allowed	Initiate SST	Pass
5	IuCS_Call.gls	MSPProfile0001	IMSI: 001013014041741.TMSI: 0x9789BE1F	Completed	Call Released	None	Pass
6	IuCS_Call.gls	MSPProfile0001	IMSI: 001013014041741.CalledNumber: 3014041742	Completed	Call Released	None	Pass
7	IuCS_Call.rls	MSPProfile0001	IMSI: 001013014041741.CallerNumber: 3014041742	Completed	Call Released	None	Pass

The message sequence view shows the following messages:

- SecurityModeCommand (16:55:37.921000)
- SecurityModeComplete (16:55:37.930000)
- DirectTransfer_SETUP (16:55:37.969000)
- DirectTransfer_CALL_PROCEEDING (16:55:37.992000)
- RAB_AssignmentRequest (16:55:38.061000)
- RAB_AssignmentResponse (16:55:38.118000)
- DirectTransfer_ALERTING (16:55:38.178000)
- DirectTransfer_CONNECT (16:55:39.238000)
- DirectTransfer_CONNECT_ACKNOWLEDGE (16:55:39.286000)
- RelocationRequired (16:55:54.467000)
- RelocationRequest (16:55:54.467000)
- CC connection confirm (16:55:54.467000)
- RelocationRequestAcknowledge (16:55:54.467000)

The protocol details view shows the MTP3 User Adaptation Layer parameters:

```

===== MTP3 User Adaptation Layer =====
0000 Version = 00000001 Release 1.0
0002 Message Class = 00000001 Transfer
0003 Transfer Message Type = 00000001 Payload Data
0004 Message Length = 84 (x00000054)
Protocol Data =
0008 Tag = x0210 Transfer Protocol Data
000A Length = 75 (x004B)
Originating Point Code =
000E Point Code = 1.1.1(.001000 00001001)
Destination Point Code =
0012 Point Code = 2.2.1(.010000 00010001)
0014 Service Indicator = .....0011 SCCP
0015 Network Indicator = .....00 International network
0016 Message Priority = .....00 Priority Code 0
0017 Signalling Link Selection = 1 (x01)
Pdu = x0600000300013400020030000006003800
Parameter Padding = x00
===== SCCP Layer =====
0018 Message Type = 00000110 DTI data form 1
Mandatory Fixed Parameters =
Destination Local Reference Parameter =
0019 Destination Local Reference = 3 (x000003)
Segmenting Reassembling Parameter =
001C More Data Indicator = .....0 No more data
001D Pointer to Mandatory Parameter = Parm0 offset x01 (1)
Mandatory Variable Length Parameters =
    
```


MAPS™ IuCS ATM Call Terminate Procedure

The MTC is initiated by Network by sending Paging message towards UE. Here, the UE is the call receiver. UE will send the Paging Response message. The rest of the call flow is same as in MOC procedure.

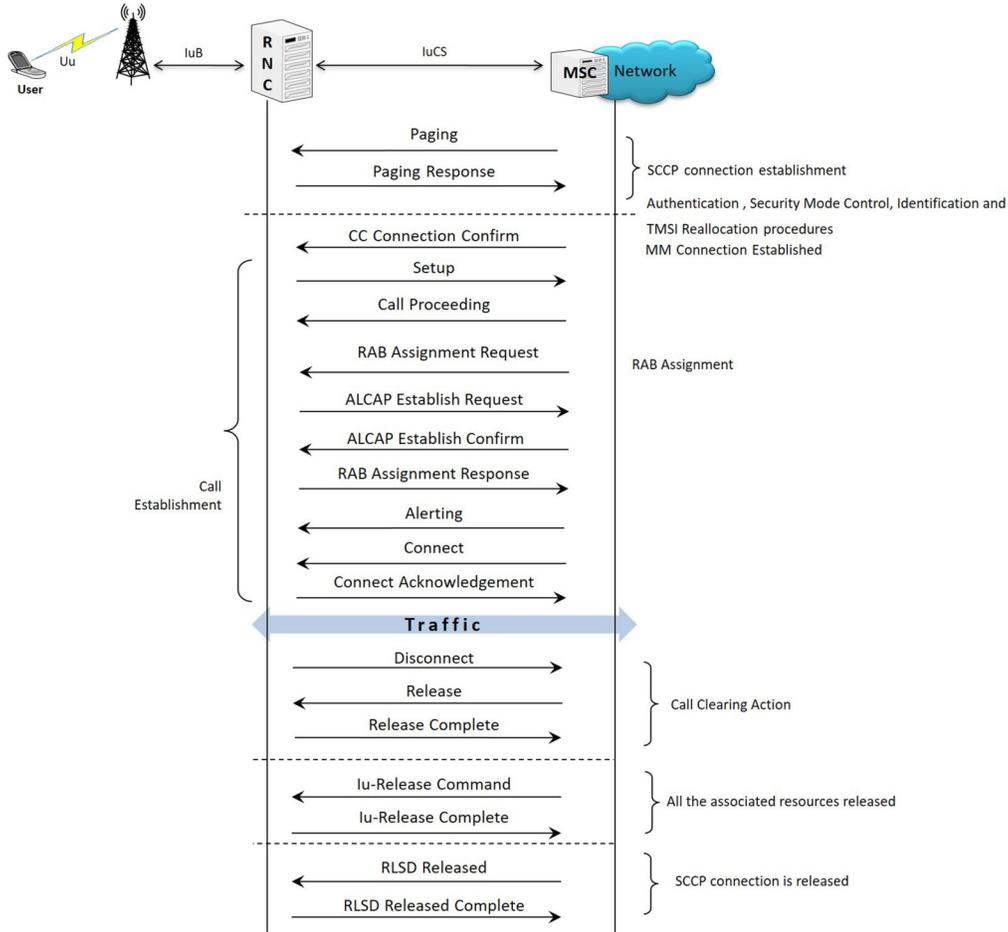
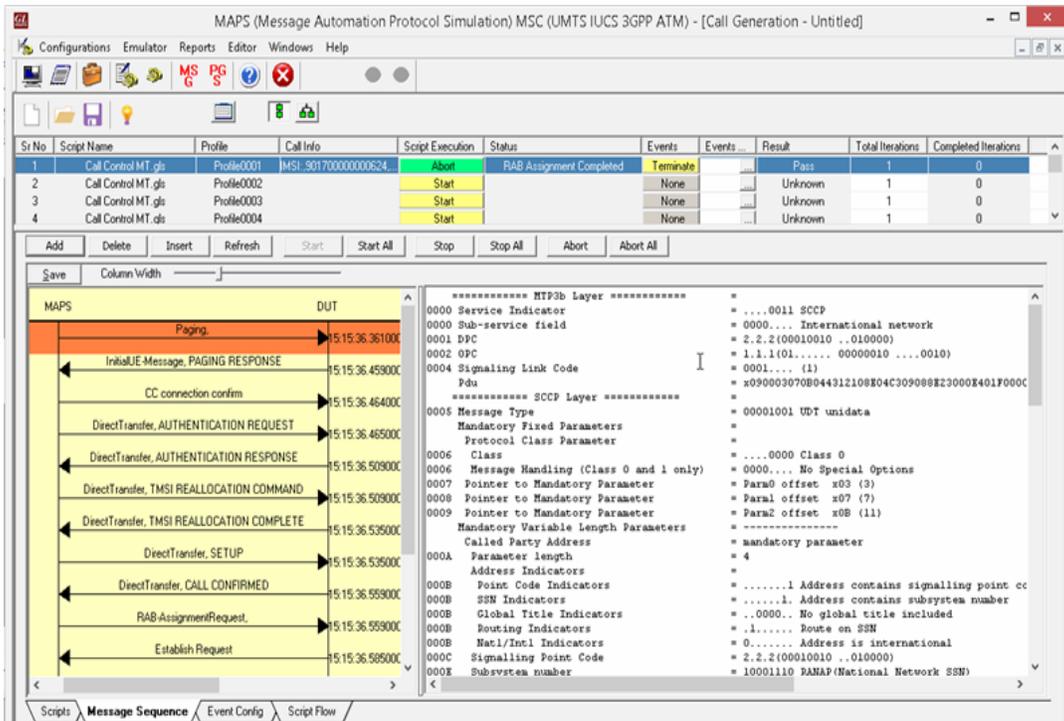


Figure: Mobile Terminating Call Procedure over ATM and Call Terminate Procedures at RNC Node over IuCS ATM



MAPS™ IuH IP CS and PS Domain Procedures

MAPS™ UMTS IuH supports LUC followed by MOC and MTC procedure initiated from the network procedures in Circuit Switched (CS) domain between HnB-GW and (HnB) terminals. Also, supports all the procedures of IuH interface in PS domain. The following depicts the Circuit Switched (CS) domain LU and MO call procedure flow.

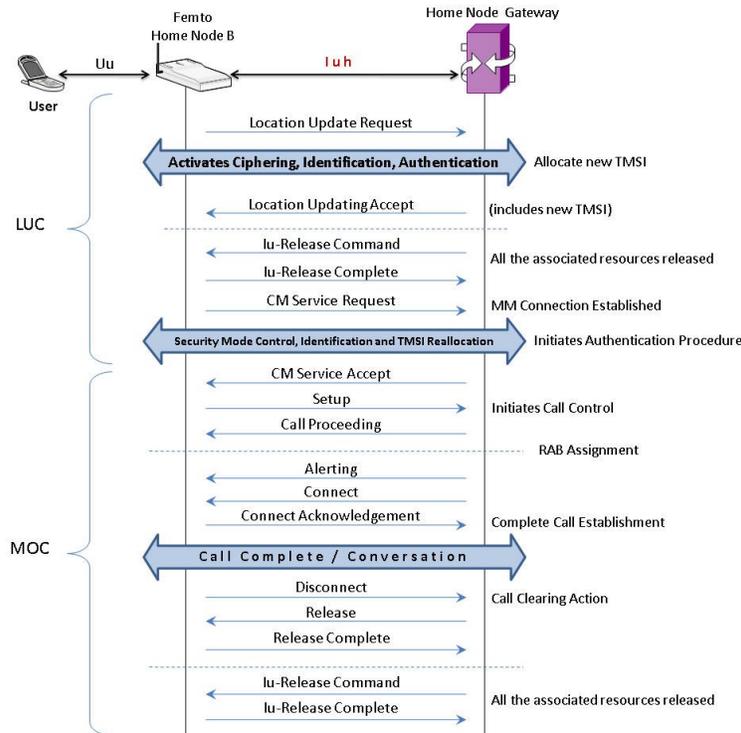


Figure: Circuit Switched (CS) Domain Call Procedure

The following figure depicts the Packet Switched (PS) domain GPRS Attach procedure flow.

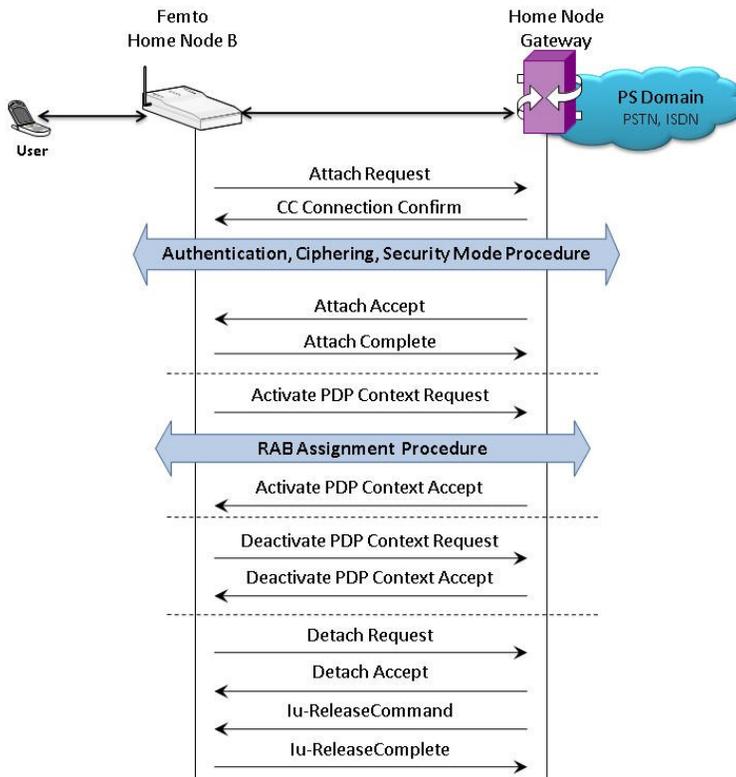


Figure: Packet Switched (PS) Domain Call Procedure

MAPS™ IUH Supplementary Service Type Procedure

Supplementary Service (USSD) is a communication protocol used by UMTS cellular telephones to communicate with the computers of mobile network operator. This service can be used for WAP browsing, prepaid callback service, mobile-money services, location-based content services, menu-based information services, and as part of configuring the phone on the network. The USSD services can be simulated in MAPS™ using CSV file configuration

Once the location update is successful, Supplementary Services procedure is initiated from the UE towards the network.

The following figure illustrates the **Supplementary Service** call flow between MAPS™- LuH and DUT.

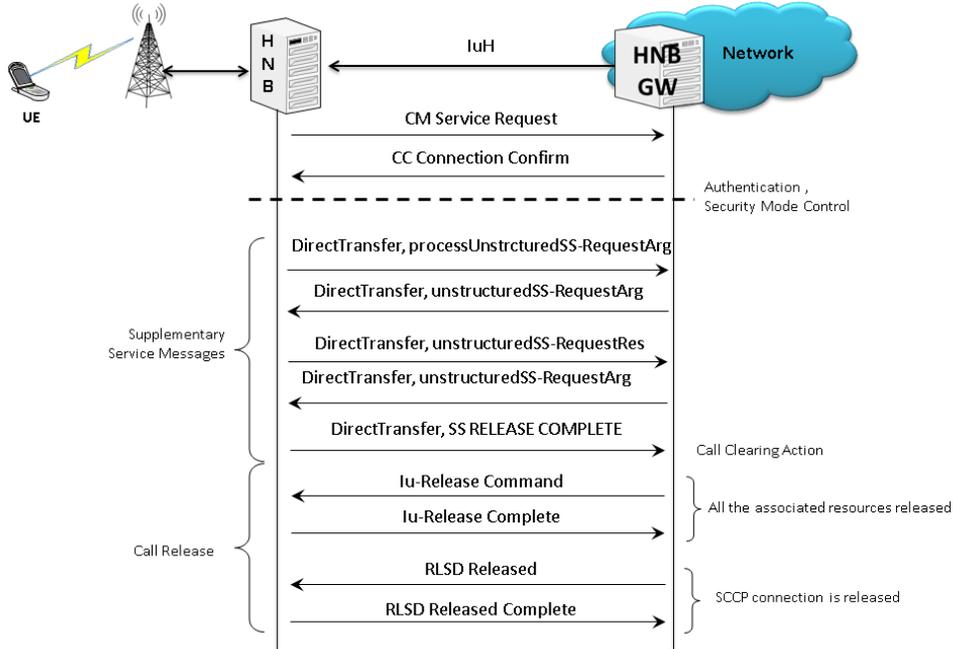


Figure: Supplementary Service Call Procedure

The following screenshot depicts end-to-end procedure emulation, for Example you may observe the Supplementary Service Call Procedure

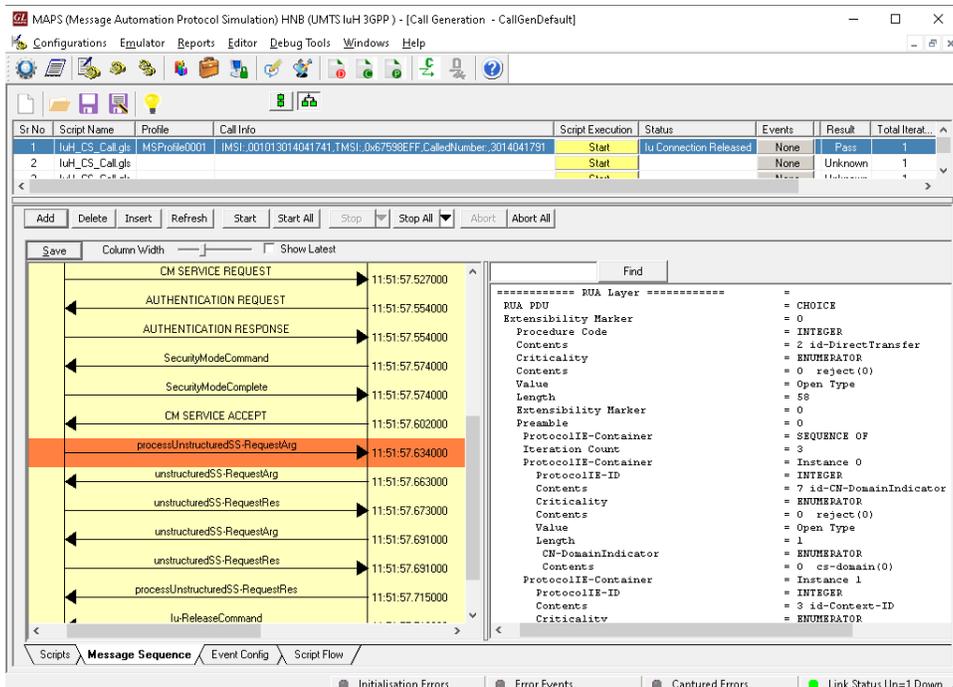


Figure: Supplementary Service Call Generation at HNB

Supported Protocols and Specifications

Supported Protocols	Standard / Specification Used
Iu-CS Interface	
SCCP	Q.713, CCITT (ITU-T) Blue Book
MTP3	Q.703, ITU-T Blue Book
RANAP	3GPP TS 25.413 V9.1.0
MM / CC	3GPP TS 24.008 V5.16.0 (2006-06)
RR	3GPP TS 04.18 V8.13.0
SMS	3GPP TS 03.40 V7.5.0 & 3GPP TS 04.11 V7.1.0 GSM 03.38
Iu UP (User Plane)	3GPP TS 25.415
Iu-H Interface	
RUA	3GPP TS 25.468 V9.1.0
RANAP	3GPP TS 25.413 V9.1.0
MM / CC	3GPP TS 04.08 V7.17.0
RR	3GPP TS 04.18 V8.13.0
SMS	3GPP TS 03.40 V7.5.0 & 3GPP TS 04.11 V7.1.0 GSM 03.38

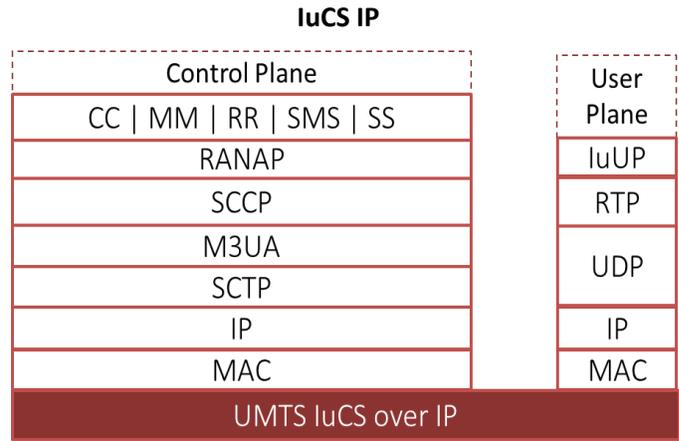


Figure: Protocol Stack for IuCS Interface

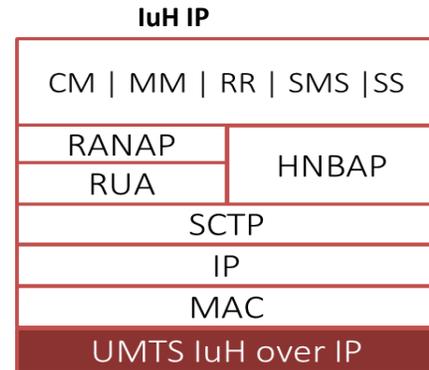


Figure: Protocol Stack for Iu-H Interface

Supported Protocols	Standard / Specification Used
Iu-CS ATM Interface	
SCCOP	ITU-T Q.2110
MTP3b	ITU-T Recommendation Q.2210
AAL Type 2 (ALCAP)	ITU-T Recommendation Q.2630.1
RANAP	3GPP TS 25.413 V9.1.0
MM / CC	3GPP TS 24.008 V5.16.0 (2006-06)
RR	3GPP TS 04.18 V8.13.0
SMS	3GPP TS 03.40 V7.5.0 & 3GPP TS 04.11 V7.1.0 GSM 03.38
Iu UP (User Plane)	3GPP TS 25.415

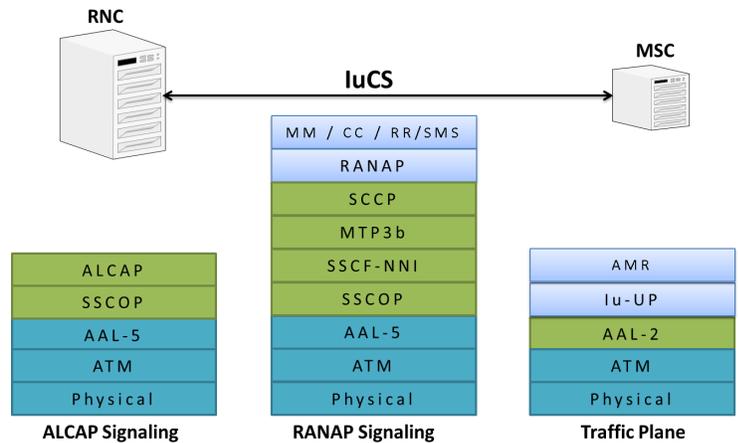


Figure: Protocol Stack for Iu-CS ATM Interface

Bulk UE emulation with CSV based Profiles

MAPS™ supports bulk call generation to stress and load test the network with number of subscriber profiles. Each profile can have unique parameters to simulate different real-time scenarios. However, creating and maintaining massive number of XML based subscriber profiles with unique mobile identifiers such as IMSI, TMSI, MSISDN and traffic parameters is not feasible. Therefore, recent enhancements were introduced to MAPS™ UMTS luCS and luH test tools to include CSV subscriber profiles. CSV database system used within MAPS™ is a simple Excel® file that can dynamically generate up to 20,000 number of subscribers with unique identifiers (IMSI, TMSI, MSISDN) and other key parameters in sequential order.

Sr No	Script Name	Profile	Call Info	Script Execution	Status	Events	Event...	Result	Total Iterations	Completed Iterations
1	luCS_Call.gls		IMSI: 1013014041761.TMSI: Dlx1110021.CalledNumber: 3014051761	Stop	Send_File-Started	Hold	Pass	1	0	
2	luCS_Call.gls		IMSI: 1013014041762.TMSI: Dlx1110022.CalledNumber: 3014051762	Stop	Send_File-Started	Hold	Pass	1	0	
3	luCS_Call.gls		IMSI: 1013014041763.TMSI: Dlx1110023.CalledNumber: 3014051763	Stop	Send_File-Started	Hold	Pass	1	0	
4	luCS_Call.gls		IMSI: 1013014041764.TMSI: Dlx1110024.CalledNumber: 3014051764	Stop	Send_File-Started	Hold	Pass	1	0	
5	luCS_Call.gls		IMSI: 1013014041765.TMSI: Dlx1110025.CalledNumber: 3014051765	Stop	Send_File-Started	Hold	Pass	1	0	
6	luCS_Call.gls		IMSI: 1013014041766.TMSI: Dlx1110026.CalledNumber: 3014051766	Stop	Send_File-Started	Hold	Pass	1	0	
7	luCS_Call.gls		IMSI: 1013014041767.TMSI: Dlx1110027.CalledNumber: 3014051767	Stop	Send_File-Started	Hold	Pass	1	0	
8	luCS_Call.gls		IMSI: 1013014041768.TMSI: Dlx1110028.CalledNumber: 3014051768	Stop	Send_File-Started	Hold	Pass	1	0	
9	luCS_Call.gls		IMSI: 1013014041769.TMSI: Dlx1110029.CalledNumber: 3014051769	Stop	Send_File-Started	Hold	Pass	1	0	
10	luCS_Call.gls		IMSI: 1013014041770.TMSI: Dlx1110030.CalledNumber: 3014051770	Stop	Send_File-Started	Hold	Pass	1	0	

1	IMSI	TMSI	CallingNu	CalledNu	EnableAut	MTService	IMEI	PagingLA	PagingSA	RAC	PagingRN	RABID	KEY	operation	OP	OPc	AMF	SQN	CipherKey	Auth	
2	binary	hex	binary	binary	int	int	binary	hex	hex	hex	int	hex	hex	string	hex	hex	hex	hex	int	str	
3	1.01E+12	0x111100C	3.01E+09	3.01E+09	FALSE		1	8.67802E+14	0x0001	0x0001	0x10	1	0x6	0x012345E	OP	0x010203C	0x010203C	0x8000	0x000000C	1	Mil
4	1.01E+12	0x111100C	3.01E+09	3.01E+09	FALSE		1	8.67802E+14	0x0001	0x0001	0x10	1	0x6	0x012345E	OP	0x010203C	0x010203C	0x8000	0x000000C	1	Mil
5	1.01E+12	0x111100C	3.01E+09	3.01E+09	FALSE		1	8.67802E+14	0x0001	0x0001	0x10	1	0x6	0x012345E	OP	0x010203C	0x010203C	0x8000	0x000000C	1	Mil
6	1.01E+12	0x111100C	3.01E+09	3.01E+09	FALSE		1	8.67802E+14	0x0001	0x0001	0x10	1	0x6	0x012345E	OP	0x010203C	0x010203C	0x8000	0x000000C	1	Mil
7	1.01E+12	0x111100C	3.01E+09	3.01E+09	FALSE		1	8.67802E+14	0x0001	0x0001	0x10	1	0x6	0x012345E	OP	0x010203C	0x010203C	0x8000	0x000000C	1	Mil
8	1.01E+12	0x111100C	3.01E+09	3.01E+09	FALSE		1	8.67802E+14	0x0001	0x0001	0x10	1	0x6	0x012345E	OP	0x010203C	0x010203C	0x8000	0x000000C	1	Mil
9	1.01E+12	0x111100C	3.01E+09	3.01E+09	FALSE		1	8.67802E+14	0x0001	0x0001	0x10	1	0x6	0x012345E	OP	0x010203C	0x010203C	0x8000	0x000000C	1	Mil
10	1.01E+12	0x111100C	3.01E+09	3.01E+09	FALSE		1	8.67802E+14	0x0001	0x0001	0x10	1	0x6	0x012345E	OP	0x010203C	0x010203C	0x8000	0x000000C	1	Mil
11	1.01E+12	0x111100C	3.01E+09	3.01E+09	FALSE		1	8.67802E+14	0x0001	0x0001	0x10	1	0x6	0x012345E	OP	0x010203C	0x010203C	0x8000	0x000000C	1	Mil
12	1.01E+12	0x1111001	3.01E+09	3.01E+09	FALSE		1	8.67802E+14	0x0001	0x0001	0x10	1	0x6	0x012345E	OP	0x010203C	0x010203C	0x8000	0x000000C	1	Mil
13	1.01E+12	0x1111001	3.01E+09	3.01E+09	FALSE		1	8.67802E+14	0x0001	0x0001	0x10	1	0x6	0x012345E	OP	0x010203C	0x010203C	0x8000	0x000000C	1	Mil
14	1.01E+12	0x1111001	3.01E+09	3.01E+09	FALSE		1	8.67802E+14	0x0001	0x0001	0x10	1	0x6	0x012345E	OP	0x010203C	0x010203C	0x8000	0x000000C	1	Mil
15	1.01E+12	0x1111001	3.01E+09	3.01E+09	FALSE		1	8.67802E+14	0x0001	0x0001	0x10	1	0x6	0x012345E	OP	0x010203C	0x010203C	0x8000	0x000000C	1	Mil
16	1.01E+12	0x1111001	3.01E+09	3.01E+09	FALSE		1	8.67802E+14	0x0001	0x0001	0x10	1	0x6	0x012345E	OP	0x010203C	0x010203C	0x8000	0x000000C	1	Mil
17	1.01E+12	0x1111001	3.01E+09	3.01E+09	FALSE		1	8.67802E+14	0x0001	0x0001	0x10	1	0x6	0x012345E	OP	0x010203C	0x010203C	0x8000	0x000000C	1	Mil
18	1.01E+12	0x1111001	3.01E+09	3.01E+09	FALSE		1	8.67802E+14	0x0001	0x0001	0x10	1	0x6	0x012345E	OP	0x010203C	0x010203C	0x8000	0x000000C	1	Mil
19	1.01E+12	0x1111001	3.01E+09	3.01E+09	FALSE		1	8.67802E+14	0x0001	0x0001	0x10	1	0x6	0x012345E	OP	0x010203C	0x010203C	0x8000	0x000000C	1	Mil
20	1.01E+12	0x1111001	3.01E+09	3.01E+09	FALSE		1	8.67802E+14	0x0001	0x0001	0x10	1	0x6	0x012345E	OP	0x010203C	0x010203C	0x8000	0x000000C	1	Mil

Figure: Bulk Call Generation with CSV based Subscriber Profiles and Sample MS_Profiles_IMSI.csv File

Buyer's Guide

Item No	Product Description
PKS160	MAPS™ UMTS-IuCS Interface Emulation
PKS160	MAPS™ UMTS-IuH Interface Emulation
PKS102	RTP Traffic Option
PKS109	UMTS IuCS and IuH HD
PKS103	RTP IuUP Soft Core
LTS100	Lightspeed1000™ - Dual OC3/12 STM1/4 PCIe Card
LTS105	Lightspeed1000™ - Portable Dual OC3/12 STM1/4 USB Unit
LTS220	OC-3 / STM-1 MAPS™ UMTS IuCS over ATM, requires LTS214

Item No	Related Software
XX165	T1 or E1 UMTS Protocol Analyzer
LTS206	OC-3 / STM-1 UMTS Protocol Analysis
LTS306	OC-12 / STM-4 UMTS Protocol Analysis
PKS164	MAPS™ UMTS-Iu-PS Interface Emulation

For complete list of MAPS™ products, refer to <https://www.gl.com/signaling-and-traffic-simulator.html> webpage.



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