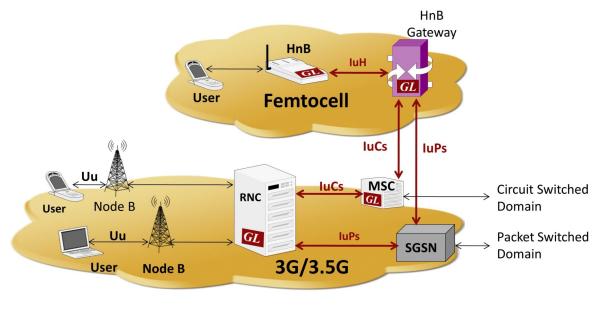
# MAPS<sup>™</sup> UMTS for IuCS, IuH Interfaces

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



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



MAPS<sup>™</sup> 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 <u>Voice Codecs</u> webpage for more comprehensive information.

For more information, please visit <u>MAPS<sup>™</sup> UMTS-IuCS and IuH Interface Emulation</u> webpage.



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#### IuCS and IuH 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<sup>™</sup> IuCS is also available in <u>High Density version</u> (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<sup>™</sup> IuCS IP supports traffic over Iu 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<sup>™</sup> 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<sup>™</sup> IuH 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.

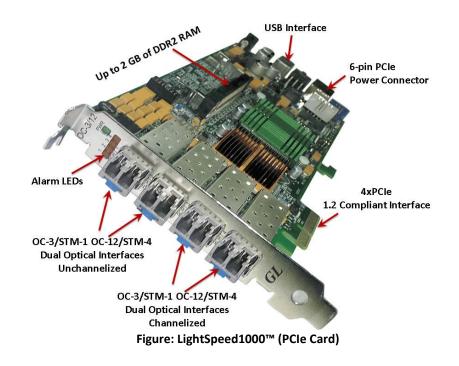
For comprehensive details on the application, please visit <u>MAPS™ UMTS-IuCS and IuH Interface Emulation</u> webpage.

#### **IuCS 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<sup>™</sup> 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<sup>™</sup> luCS ATM generates AAL2 traffic including Tone, Digits and File playback types.

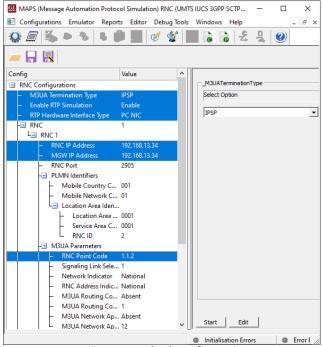
For comprehensive details on the application, please visit <u>LightSpeed1000™</u> webpage.



## **Testbed Configuration**

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

Testbed includes various parameter settings which configures the MAPS<sup>™</sup> 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.

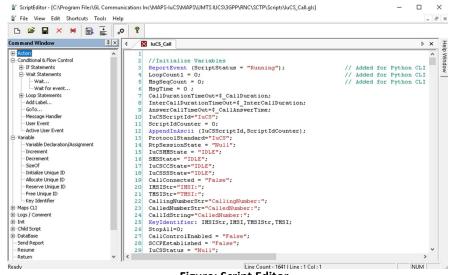
S Message Editor - CMServiceAccept File View Direction Tools Help			
8 X			
Initiating/Message     Initiating/Message     Initiating/Message     Initiating/Message     Initiating/     Directl fundler     Protocolf E-Container     Protocolf E-Ind     Protocolf E-Ind     NAS-Pugue Info     Larget     Initiating     Protocolf E-Ind     Protocolf E-Ind		CM SERVICE ACCEPT = 33 INSI DETACH INDICATION = 1 LICATION UPDATING ACCEPT = 2 LICATION UPDATING REJECT = 4 LICATION UPDATING REJECT = 4 AUTHENTICATION REJECT = 18 AUTHENTICATION REJECT = 18 AUTHENTICATION REJECT = 28 IDENTITY REJECT = 24 IDENTITY REJECT = 24 IDENTITY REJECT = 24 IDENTITY REJECT = 24 IDENTITY REJECT = 34 CM SERVICE ARGENT = 35 CM SERVICE ARGENT = 55 MM INFORMATION = 50	
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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.



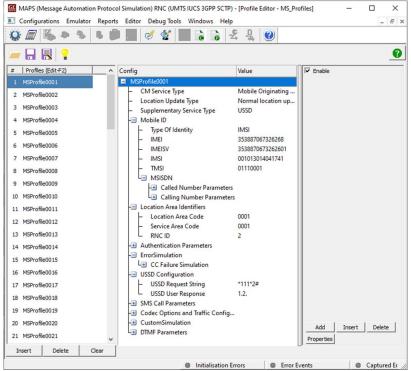
**Figure: Script Editor** 

#### **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<sup>™</sup> luCS IP Call emulation

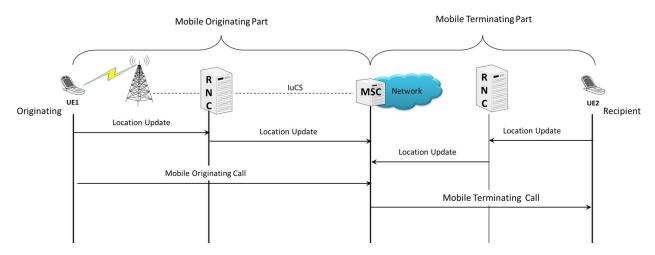
#### Mobile-to-Mobile Voice Call Procedure

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.

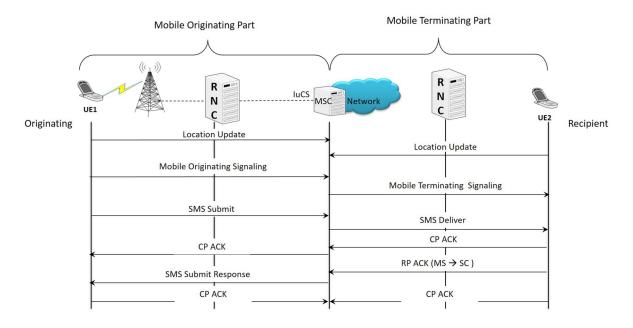


#### Mobile-to-Mobile SMS Call procedure

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<sup>™</sup> luCS supports mobile-to-mobile SMS procedure, sent or received from mobile phone-to-mobile phone.

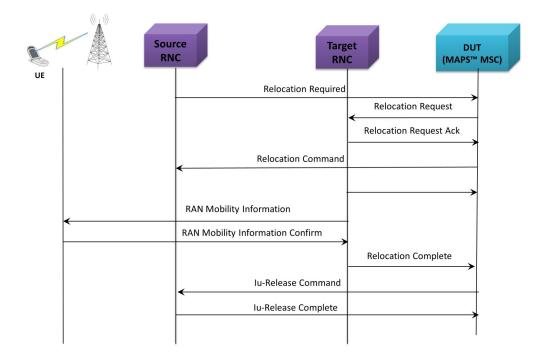
MAPS™ IuCS supports both Short message Mobile Originated (SMS-MO) and Short message Mobile Terminated (SMS-MT) procedures.



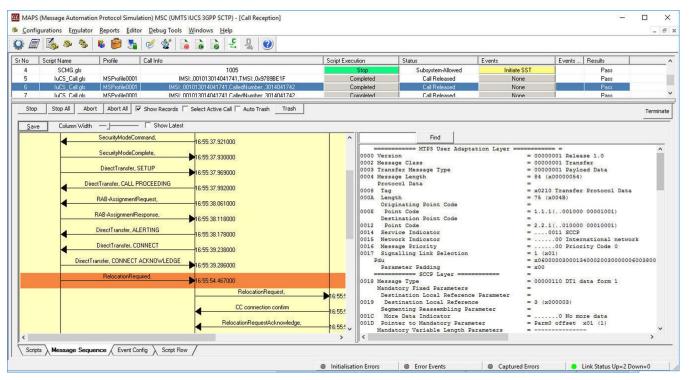
### MAPS<sup>™</sup> luCS IP Call emulation (Contd.)

#### 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.



#### Document Number: PKS160-LTS220-21.2.23-01

### MAPS<sup>™</sup> IuCS ATM Call Control Procedure

MAPS<sup>™</sup> IuCS ATM is configured as RNC (User End), which initiates the LUC procedure by sending LOCATION UPDATING REQUEST message informing the network about its new location. At the network end, MSC completes the LUC procedure by replying with the LOCATION UPDATING ACCEPT message; the LU procedure is released.

The Call Control MO script also handles Mobile Originating call procedure following the Location Update procedure, which is initiated by sending CM SERVICE REQUEST message to the network (MSC).

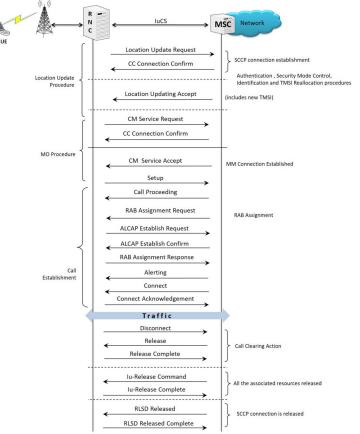


Figure: Mobile Originating Call Procedure over ATM and Call Control MO Procedures at RNC Node over IuCS ATM

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lo Script Name		Call Info	Script Execution		Events	Events Profile		Total Iterations	Completed Iteratio	ns
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CalControl_			Start	-	None		Unknown		0	
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				00.051000		Pdu Pdu	A COM			01000009020205034
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ŀ			17.05	00.051000		Source Local	Refere	sce Parameter		
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		blish Request			00					1 Route on :
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	Esta	ablish Confirm	17.05	00.251000		Optional Vari Calling Part	able Le	sigth Paramete	ers = -	
1			17.00	00.251000	003				= 0	ptional parameter 4
	KAB-Ass	gnmentResponse,	17:05	00.252000	00				= 0	
	DirectTra	nsfer, ALERTING			000	Address Inc 12 Point Code				l åddress o
			17:09	00.302000	00	12 SSN Indice	tors			0. Address de
-	DirectTra	ansfer, CONNECT	17:05	00.316000	00					.0000 No global 1 Route on S
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## MAPS<sup>™</sup> luCS 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.

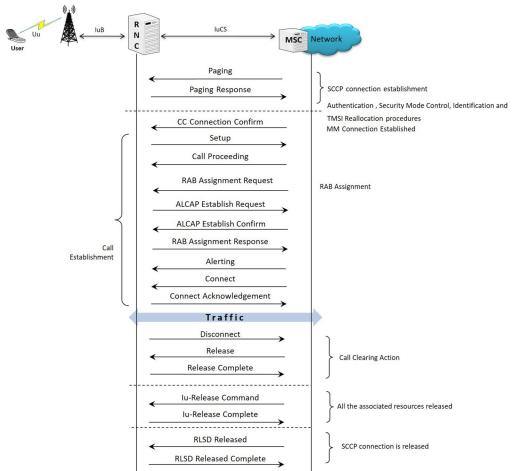


Figure: Mobile Terminating Call Procedure over ATM and Call Terminate Procedures at RNC Node over IuCS ATM

Confi	gurations Emulator Reports Editor Windows I	Help		- 1
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1				
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1	Call Control MT.gls Profile0001 MSI:,9017	0000000624,	bot RAB Assignment Completed Terminate Pass 1	0
2	Call Control MT.gls Profile0002		itart None Unknown 1	0
3	Call Control MT.gls Profile0003		itat None Unknown 1	0
4	Call Control MT.gls Profile0004		itart None Unknown 1	0
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Save	Column Width			
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	InitialUE-Message, PAGING RESPONSE	_	02 OPC T = 1.1.1(01 00000010	0010)
- H	Invidoc Hessage, PAdina Heshanac	15:15:36.459000	04 Signaling Link Code	
	CC connection confirm		Pdu = x090003070B044312108E04C30	088#23000#401#000C
- F		15:15:36.464000	05 Message Type = 00001001 UDT unidata	
L	DirectTransfer, AUTHENTICATION REQUEST	15:15:36.465000	Mandatory Fixed Parameters =	
- F		10.10.36.463000	Protocol Class Parameter =	
	DirectTransfer, AUTHENTICATION RESPONSE	15:15:36:509000	06 Class =0000 Class 0 06 Message Handling (Class 0 and 1 only) = 0000 No Special Option	
	DirectTransfer, TMSI REALLOCATION COMMAND		07 Pointer to Mandatory Parameter = ParmO offset x03 (3)	·
- H	Directifansier, TMST REALLOCATION COMMAND	15:15:36.509000	08 Pointer to Mandatory Parameter = Parml offset x07 (7)	
	DirectTransfer, TMSI REALLOCATION COMPLETE		09 Pointer to Mandatory Parameter = Parm2 offset x0B (11)	
- M		15:15:36.535000	Mandatory Variable Length Parameters = Called Party Address = mandatory parameter	
	DirectTransfer, SETUP	15:15:36.535000	OA Parameter length = 4	
Г		15:15:36.535000	Address Indicators =	
	DirectTransfer, CALL CONFIRMED	15 15 36 559000	OB Point Code Indicators =1 Address contains	
			OB SSN Indicators =1. Address contains OB Global Title Indicators =0000 No global title i	
	RAB-AssignmentRequest,	15:15:36.559000	OB Routing Indicators = .1 Route on SSN	PC A GLOBAL
	Establish Request		OB Natl/Intl Indicators = 0 Address is intern	ational
			0C Signalling Point Code = 2.2.2(00010010010000)	

Scripts A Message Sequence Event Config Script Flow

### MAPS<sup>™</sup> IuH IP CS and PS Domain Procedures

MAPS<sup>™</sup> 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.

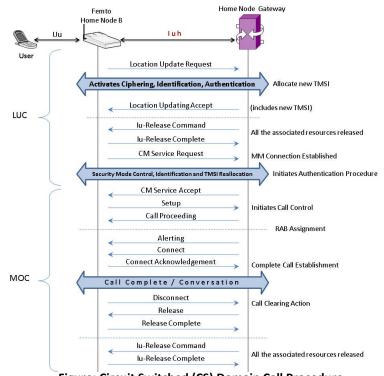


Figure: Circuit Switched (CS) Domain Call Procedure

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

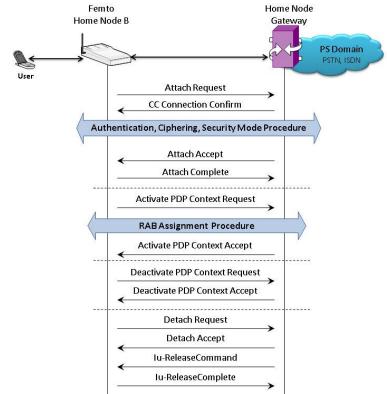


Figure: Packet Switched (PS) Domain Call Procedure



### **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<sup>™</sup> 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<sup>™</sup>- IuH and DUT.

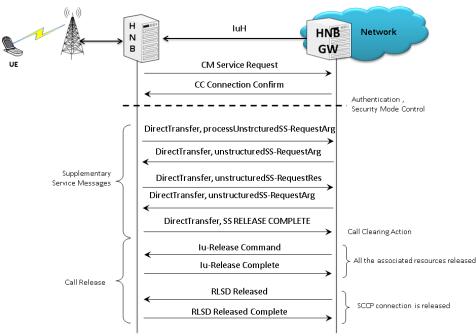


Figure: Supplementary Service Call Procedure

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

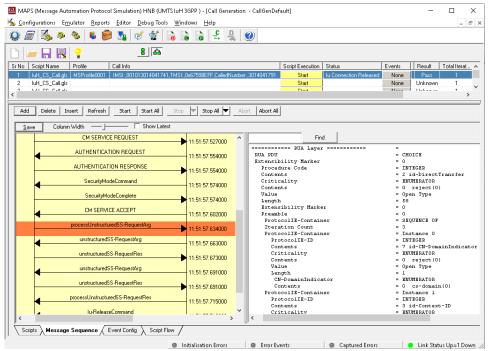


Figure: Supplementary Service Call Generation at HNB

## **Supported Protocols and Specifications**

Supported Protocols	Standard / Specification Used
	lu-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
lu UP (User Plane)	3GPP TS 25.415
	lu-H Interface
RUA	3GPP TS 25468 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

luCS IP	
Control Plane	User
CC   MM   RR   SMS   SS	Plane
RANAP	IuUP
SCCP	RTP
M3UA	UDP
SCTP	ODF
IP	IP
MAC	MAC
UMTS luCS over IP	

#### Figure: Protocol Stack for IuCS Interface

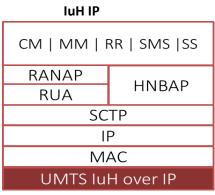


Figure: Protocol Stack for Iu-H Interface

Supported Protocols	Standard / Specification Used
lu	I-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
lu UP (User Plane)	3GPP TS 25.415

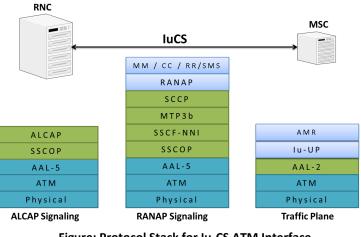


Figure: Protocol Stack for Iu-CS ATM Interface

### **Bulk UE emulation with CSV based Profiles**

MAPS<sup>™</sup> 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<sup>™</sup> UMTS IuCS and IuH test tools to include CSV subscriber profiles. CSV database system used within MAPS<sup>™</sup> is a simple Excel<sup>®</sup> 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.

-	- 🔒 🖳 📍	8 66								
No	Script Name	Profile Call Info		Script Execution	Status	Events	Even	Result	Total Iterations	Completed Iterations
1	luCS_Call.gls	IMSI: 1013014041761.T	MSI: 0x11110021.CalledNumber: 30140517	61 Stop	Send_File-Started	Hold		Pass	1	0
2	luCS_Call.gls	IMSI:,1013014041762,T	MSI:;0x11110022;CalledNumber:;30140517	62 Stop	Send_File-Started	Hold		Pass	1	0
3	luCS_Call.gls	IMSI:,1013014041763,T	MSI: ,0x11110023,CalledNumber: ,30140517	63 Stop	Send_File-Started	Hold		Pass	1	0
1	luCS_Call.gls	IMSI:,1013014041764,T	MSI:,0x11110024,CalledNumber:,30140517	64 Stop	Send_File-Started	Hold		Pass	1	0
5	luCS_Call.gls	IMSI:,1013014041765,T	MSI:,0x11110025,CalledNumber:,30140517	65 Stop	Send_File-Started	Hold		Pass	1	0
5	luCS_Call.gls	IMSI:,1013014041766,T	MSI:,0x11110026,CalledNumber:,30140517	66 Stop	Send_File-Started	Hold		Pass	1	0
7	luCS_Call.gls	IMSI:,1013014041767,T	MSI: 0x11110027.CalledNumber: 30140517	67 Stop	Send_File-Started	Hold		Pass	1	0
3	luCS_Call.gls	IMSI:,1013014041768,T	MSI:,0x11110028,CalledNumber:,30140517	68 Stop	Send_File-Started	Hold		Pass	1	0
3	luCS_Call.gls	IMSI:,1013014041769,71	MSI:,0x11110029,CalledNumber:,30140517	69 Stop	Send_File-Started	Hold		Pass	1	0
0	luCS_Call.gls	IMSI: 1013014041770.T	MSI:.0x11110030.CalledNumber:.30140517	70 Stop	Send File-Started	Hold		Pass	1	0
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3	1.01E+12	0×1111001	3.01E+09	3.01E+09	FALSE	1	8.67802E+14	0x0001	0x0001	0x10		1 0x6	0x0123456	OP	0x010203	0x0102030	0x8000	0x000000C	1	Mil
4	1.01E+12	0×1111001	3.01E+09	3.01E+09	FALSE	1	8.67802E+14	0x0001	0x0001	0x10		1 0x6	0x0123456	OP	0x010203	0x0102030	0x8000	0x000000C	1	Mil
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6	1.01E+12	0×1111001	3.01E+09	3.01E+09	FALSE	1	8.67802E+14	0x0001	0x0001	0x10		1 0x6	0x0123456	OP	0x0102030	0x0102030	0x8000	0x000000C	1	Mil
7	1.01E+12	0×1111001	3.01E+09	3.01E+09	FALSE	1	8.67802E+14	0x0001	0x0001	0x10		1 0x6	0x0123456	OP	0x010203	0x0102030	0x8000	0x0000000	1	Mil
8	1.01E+12	0×1111001	3.01E+09	3.01E+09	FALSE	1	8.67802E+14	0x0001	0x0001	0×10		1 0x6	0x012345€	OP	0x010203	0x0102030	0x8000	0x000000C	1	Mil
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Figure: Bulk Call Generation with CSV based Subscriber Profiles and Sample MS\_Profiles\_IMSI.csv File

#### Document Number: PKS160-LTS220-21.2.23-01

## **Buyer's Guide**

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	Product Description
PKS102       RTP Traffic Option         PKS109       UMTS luCS and luH HD         PKS103       RTP luUP Soft Core         LTS100       Lightspeed1000 <sup>™</sup> - Dual OC3/12 STM1/4 PCIe Card         LTS105       Lightspeed1000 <sup>™</sup> - Portable Dual OC3/12 STM1/4 USB Unit	<u>PKS160</u>	MAPS <sup>™</sup> UMTS-IuCS Interface Emulation
PKS109       UMTS luCS and luH HD         PKS103       RTP luUP Soft Core         LTS100       Lightspeed1000 <sup>™</sup> - Dual OC3/12 STM1/4 PCIe Card         LTS105       Lightspeed1000 <sup>™</sup> - Portable Dual OC3/12 STM1/4 USB Unit	<u>PKS160</u>	MAPS <sup>™</sup> UMTS-IuH Interface Emulation
PKS103       RTP IuUP Soft Core         LTS100       Lightspeed1000™ - Dual OC3/12 STM1/4 PCIe Card         LTS105       Lightspeed1000™ - Portable Dual OC3/12 STM1/4 USB Unit	<u>PKS102</u>	RTP Traffic Option
LTS100       Lightspeed1000™ - Dual OC3/12 STM1/4 PCIe Card         LTS105       Lightspeed1000™ - Portable Dual OC3/12 STM1/4 USB Unit	<u>PKS109</u>	UMTS luCS and luH HD
LTS105 Lightspeed1000 <sup>™</sup> - Portable Dual OC3/12 STM1/4 USB Unit	<u>PKS103</u>	RTP IuUP Soft Core
	<u>LTS100</u>	Lightspeed1000™ - Dual OC3/12 STM1/4 PCIe Card
LTS220 OC-3 / STM-1 MAPS <sup>™</sup> UMTS IuCS over ATM, requires LTS214	LTS105	Lightspeed1000 <sup>™</sup> - Portable Dual OC3/12 STM1/4 USB Unit
	LTS220	OC-3 / STM-1 MAPS™ UMTS luCS over ATM, requires LTS214

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

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



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