MAPS™ UMTS for IuCS, IuH Interfaces
(UMTS IuCS Emulation over IP and ATM; and IuH Emulation over IP)

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 simulation (up to 20,000) with related information access directly from Database, or CSV files
- Simultaneous call simulation 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).

For detailed information on the MAPS™ IuCS and IuH applications please visit https://www.gl.com/maps-umts-iucs-iuh-emulator.html webpage.

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IuCS and IuH over IP

GL's MAPS™ UMTS IuCs 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™ IuCS 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™ IuCS IP supports traffic over Iu UP protocol layer with additional licensing. Also, supports RTP traffic simulation (requires additional licensing) including various types such as send and receive tone, digits, and voice files.

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


IuCS over ATM

GL's LightSpeed1000™ hardware platform (PCle Card) with quad optical ports supports simulation of UMTS IuCs over ATM layer on OC-3/STM-1 interface using MAPS™ IuCS ATM application. The LightSpeed1000™ comes with software for overall monitoring, protocol simulation 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™ IuCS 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™ IuCS ATM generates AAL2 traffic including Tone, Digits and File playback types.

For comprehensive details on the application, please visit [https://www.gl.com/OC3-OC12-analysis-emulation-card.html](https://www.gl.com/OC3-OC12-analysis-emulation-card.html) webpage.
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.

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.
Pre-processing Tools...

**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](image)

**Profile Editor** - The profile editor allows users 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](image)
**MAPSTM IuCS IP Call Simulation**

### 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 Originating Part](image1)

**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.

MAPSTM IuCS supports mobile-to-mobile SMS procedure, sent or received from mobile phone-to-mobile phone. MAPSTM IuCS supports both Short message Mobile Originated (SMS-MO) and Short message Mobile Terminated (SMS-MT) procedures.
The following screenshot depicts end-to-end procedure simulation, you may observe the Relocate Required request messages sent from RNC1 to MSC and from MSC to RNC2.
MAPSTM IuCS ATM Call Control Procedure

MAPSTM 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
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™ 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.

The following figure depicts the Packet Switched (PS) domain GPRS Attach procedure flow.
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™- IUH and DUT.

![Supplementary Service Call Procedure Diagram]

Figure: Supplementary Service Call Procedure

The following screenshot depicts end-to-end procedure simulation, for example you may observe the Supplementary Service Call Procedure.

![Supplementary Service Call Generation at HNB Screenshot]

Figure: Supplementary Service Call Generation at HNB

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Supported Protocols and Specifications

### Iu-CS Interface
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<th>Standard / Specification Used</th>
</tr>
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<tbody>
<tr>
<td>SCCP</td>
<td>Q.713, CCITT (ITU-T) Blue Book</td>
</tr>
<tr>
<td>MTP3</td>
<td>Q.703, ITU-T Blue Book</td>
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<tr>
<td>RANAP</td>
<td>3GPP TS 25.413 V9.1.0</td>
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<tr>
<td>MM / CC</td>
<td>3GPP TS 24.008 V5.16.0 (2006-06)</td>
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<tr>
<td>RR</td>
<td>3GPP TS 04.18 V8.13.0</td>
</tr>
<tr>
<td>SMS</td>
<td>3GPP TS 03.40 V7.5.0 &amp; 3GPP TS 04.11 V7.1.0 GSM 03.38 version 7.2.0 Release 1998</td>
</tr>
<tr>
<td>Iu UP (User Plane)</td>
<td>3GPP TS 25.415</td>
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### Iu-H Interface
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<tr>
<th>Supported Protocols</th>
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<td>RUA</td>
<td>3GPP TS 25468 V9.1.0</td>
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<tr>
<td>RANAP</td>
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### Iu-CS ATM Interface
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<tr>
<td>SCCP</td>
<td>ITU-T Q.2110</td>
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<tr>
<td>MTP3b</td>
<td>ITU-T Recommendation Q.2210</td>
</tr>
<tr>
<td>AAL Type 2 (ALCAP)</td>
<td>ITU-T Recommendation Q.2630.1</td>
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Bulk UE Simulation 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 IuCS and IuH 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.

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

Buyer’s Guide

PKS160 - MAPS™ UMTS – Iu-CS Interface Emulation
PKS160 - MAPS™ UMTS – IuH Interface Emulation
PKS102 - RTP Traffic Option
PKS109 - UMTS IuCS and IuH HD
PKS103 - RTP IuUP Soft Core
MAPS™ UMTS IuCS ATM with Lightspeed1000™
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

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.