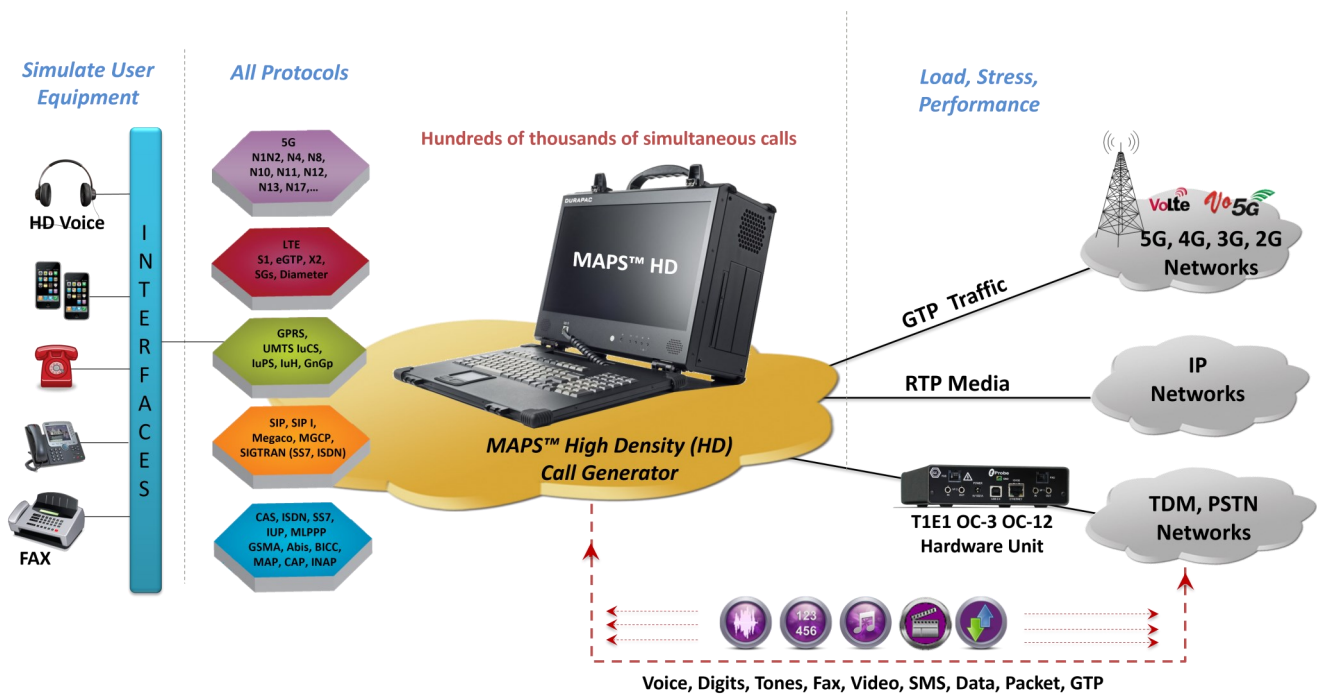


Message Automation & Protocol Simulation (MAPS™)

Multi-Interface, Multi-Protocol Emulator - 5G, 4G, 3G, 2G, IP, and TDM



Overview

GL's **Message Automation & Protocol Simulation (MAPS™)** is a protocol emulation and conformance test tool that supports a variety of protocols such as MGCP, SIP, MEGACO, SS7, ISDN, GSM, CAS, MC-MLPPP, MAP, LTE, UMTS, SS7 SIGTRAN, ISDN SIGTRAN, SIP I, Diameter, MAP IP, 5G N1N2, N4, and others. The product also supports RTP, TDM, TRAU GSM, and Mobile traffic emulation over various network.

The application includes various test plans and test cases to support the testing of real-time entities. Along with automation capability, the application gives users the unlimited ability to edit messages and control call scenarios (message sequences). "Call Scenarios" are generated through scripts.

MAPS™ 5G core network emulator can emulate multiple UEs and elements such as UE+gNB, AMF, SMF, UPF, AUSF, UDM, EIR, NEF, and SMSF on the 5G core network. For more details, refer to [5G New Radio \(NR\) and 5G Core \(5GC\) Network Test Solution](#) webpage.

MAPS™ works on both IP and TDM interfaces. The signaling protocols are SS7, ISDN, MLPPP, CAS, MAP, CAP, GSM, BICC SIP, SIP-I, MEGACO, MGCP, SIGTRAN, Diameter and INAP.

MAPS™ supports 3G and 4G mobile protocol emulation such as LTE (S1, eGTP) interfaces, LTE Diameter [S6a, S6d, S13, Cx/Dx, Gx, Rx, SLg, SLh], INAP IP (ANSI, ITU), CAP IP (ANSI, ITU), GSM A over IP, MAP IP, BICC IP, GPRS, and UMTS (IuCS, IuPS, IuH) over IP. MAPS™ architecture supports both Binary and Text Based Protocol emulation. MAPS™ also supports Location Services (LCS) emulation for positioning mobile devices. Emulate SLg, SLh interfaces (GMLC, MME, HSS), Lg, Lh interfaces (GMLC, MSC, SGSN, HLR), SLs interface (MME, E-SMLC) and Lb interface (MME, SMLC) and interfaces implementing positioning functionality in a cellular network.

GL's **End-to-End Communications Network Lab (EE-CNL)** provides reliable integrated solutions to vendors and service providers for emulation, monitoring, troubleshooting the network using [MAPS™ 5G 4G 3G 2G Wireless Lab Suite](#).

For more details, refer to [Message Automation & Protocol Simulation](#) (MAPS™) webpage.



818 West Diamond Avenue - Third Floor, Gaithersburg, MD 20878, U.S.A
(Web) www.gl.com - (V) +1-301-670-4784 (F) +1-301-670-9187 - (E-Mail) info@gl.com

Supported Protocols	
5G Protocols	N1N2, N4, N8, N10, N11, N12, N13, N17, N21, N29, N51
4G Protocols	LTE S1, LTE eGTP [S3, S4, S5, S8, S10, S11 and S16], LTE Diameter [S6a, S6d, S13, Cx/Dx, Gx, Rx, SLg, SLh], LTE X2-AP, LTE SGs, and LTE SLs.
3G Protocols	UMTS IuCS, IuH (over IP), UMTS IuPS (over IP), UMTS Gn Gp (over IP), UMTS IuPC
IP Protocols	SIP, MEGACO, MGCP, SIP I (SIP ISUP), ED137 (Air Traffic Management) SS7 SIGTRAN (SS7 over IP), ISDN SIGTRAN (ISDN over IP), INAP IP (ANSI, ITU) GSM AoIP (GSM A over IP), GSM Lb, MAP IP (MAP over IP), GPRS Gb over IP, CAP IP (ANSI, ITU)
TDM, 2G Protocols	ISDN & LAPD, SS7, GSM A, GSM Abis CAS, MC-MLPPP, MAP, CAP, INAP, IUP

Features

- **Signaling and Traffic Emulation over 5G**
 - End-to-End 5G Network Emulation
 - Feature and Functional Testing
 - Performance Testing
 - Inter-Operability Testing
 - Migration Testing
 - Advanced Voice Feature Testing - IVR, Voice Recognition, Speech-to-Text
- **Flexible MAPS™ architecture**
 - Makes testing across any domain easy and feasible.
 - An end-to-end testing of call control and QoS from TDM-to-TDM, TDM-IP–TDM, or an All-IP network.
 - To test legacy networks (such as CAS, SS7 and ISDN), IP networks (such as SIP, MGCP, MEGACO, SIGTRAN), and the emerging technologies including UMTS, LTE better known as 3G, 4G
- **Single Framework – Single Platform**
 - Testing across all domains easy
 - Significantly reduces user efforts to emulate multiple protocols / interfaces
 - PC based test solution, no bulky hardware
- **Customize Test Scenarios using Scripts**
 - Build valid or invalid test cases
 - Emulate a complete protocol state machine
 - Offers ‘syntax-ready commands’ to easily build scripts
 - Protocol Conformance Testing
- **Customize Protocol Messages**
 - Modify any messages, message parameters, and/or information elements
 - Add, modify or remove any optional parameter depending on specific feature of interest
 - Perform packet level fault insertion by impairing any bit / byte of a message
- **Ready-to-use scripts**
 - Includes ready-to-run scripts for emulating important call scenarios / procedures
 - Syntax-ready commands in script reduces dependency on technically skilled resources
 - Reusability, easy maintainability and reduced ‘time-to-market’

Features (Contd.)

- **Multi-Interface and Multi-Protocol Emulation**
 - Test any node in a network using respective protocols communicating with that node
 - Emulate multiple interfaces carrying signals or data across the network
 - IMS and Multimedia Services Network Lab - refer to [IP Multimedia Services \(IMS\) Emulator](#) webpage
 - Setup a virtual real-time network emulating all the network elements using 'MAPS™ 5G 4G 3G 2G Wireless Lab Suite'
- **Multiple Link and Transport Layer Emulation**
 - Supports multiple transports for IP network (TCP, UDP and SCTP)
 - Supports both IPV4 and IPV6
 - Emulate multiple SS7 (MTP) links, LAPD Links
- **Performance, Load, Stress Testing**
 - Test to measure the capability of an entity for various traffic conditions, and protocol specific behavior
 - Load generation defines Total Call Generation, Maximum Active Calls, and Calls per second
 - Call rate configuration for fixed, pre-determined patterns, and for random statistical patterns
- **Test Automation**
 - Define multiple auto-handlers to an incoming message
 - Automate the execution of the multiple calls sequentially or randomly
 - Handle the incoming messages
- **Scheduler**
 - Manual / bulk call generation at scheduled time
 - Load pre-saved configuration files to automatically run the scheduled test
 - Schedule the call generation to be processed only once/immediate execution/daily/on completion of previous execution
- **Command Line Interface (CLI) for Remote Call Control**
 - Capability of accepting commands from scripting tools such as the Python and Java
 - Control and operate MAPS™ remotely, also gather statistics, logs and reports
 - Availability of MAPS™ Application Programming Interface (APIs) to integrate with any of the other applications. For more details, refer to [MAPS™ APIs for Complete Automation](#) webpage
- **Traffic Emulation**
 - Traffic generators and analyzers to perform end-to-end testing of various traffic types over Wireless, IP and TDM networks
 - Establish a voice session, monitor power level, signaling bits, or perform loopback testing real-time voice traffic
 - Transmit and receive voice files, DTMF and MF digits, Tones, FAX (Pass-through T.38), IVR, and Video (H.263 & H.264)
 - Supports almost all industry standard voice codec types - refer to [Voice Codecs](#) webpage
- **Remote MAPS™**
 - Multi-node and multi-interface emulation from a single GUI
 - Suitable for testing any core network, access network, and inter-operability functions
 - Single Licensing Server controlling server and client licenses (no. of users)
 - Simultaneous traffic generation/reception at 100% on all servers
 - Admin privileges to control Testbed and access to configuration files for each remote client user. For more details, refer to [Multi-node Multi-interface Simulation](#) webpage

Additional GUI Features

- Ladder diagram of the messages with detailed decode of each message
- Call statistics summarizing the entire testing with a tabular and graphical view
- Tx, Rx, and Retransmit message statistics for the respective protocol
- Scripted call generation and automated call reception
- Automated stress/load testing capabilities through Load Generation and Bulk Call generation features
- Control the test flow by defining events. User-defined, Auto-generated, Track specific events and error logs to identify syntax errors, transport errors, decode errors, and more
- A single Remote Client GUI to remotely control/monitor all the network interfaces and elements emulated by MAPS™ Servers; one or more MAPS™ applications can be installed in a single Sever
- Unlimited number of remote client user can be defined at the server
- User Defined Statistics for RTP traffic parameters
- Generate Reports and Statistics for Call Status, Link Status, Message Statistics and RTP Voice Quality Metrics (LMOS, CMOS)
- GUI Options to enable or disable colour coding feature in Profile Editor and call sorting feature in Call Reception

The screenshot displays the MAPS (Message Automation Protocol Simulation) CWP (SIP IETF Telephone) - [Call Generation] interface. The main window shows a table of call execution results with columns for Sr No, Script Name, Profile, Call Info, Script Execution, Status, Events, Result, Total Iterations, and Completed Iterations. Below the table is a ladder diagram showing message sequences between MAPS and DUT, including INVITE, 100 Trying, 180 Ringing, and CallSetUpTime. A detailed SIP message decode is visible on the right. An inset window titled 'Load Generation - LoadGendefault' shows configuration options for call generation, including 'Total Calls To Generate', 'Max Active Calls', 'Multi Distributions', and 'Scripts'.

Sr No	Script Name	Profile	Call Info	Script Execution	Status	Events	Result	Total Iterations	Completed Iterations
1	SipCallControl.gls	CwP0001	0002@192.168.1.37	Stop	Send_Silence_Started	TerminateCall	Pass	10	0
2	SipCallControl.gls	CwP0002	0002@192.168.1.37	Stop	Send_Silence_Started	TerminateCall	Pass	10	0
3	SipCallControl.gls	CwP0003	0002@192.168.1.37	Stop	Send_Silence_Started	TerminateCall	Pass	10	0
4	SipCallControl.gls	CwP0004	0002@192.168.1.38	Stop	Send_Silence_Started	TerminateCall	Pass	10	0
5	SipCallControl.gls	CwP0005	0002@192.168.1.38	Stop	Send_Silence_Started	TerminateCall	Pass	10	0
6	SipCallControl.gls	CwP0006	0002@192.168.1.38	Stop	Send_Silence_Started	TerminateCall	Pass	10	0
7	SipCallControl.gls	CwP0001	0002@192.168.1.37	Stop	Send_Silence_Started	TerminateCall	Pass	10	0
8	SipCallControl.gls	CwP0002	0002@192.168.1.37	Stop	Send_Silence_Started	TerminateCall	Pass	10	0
9	SipCallControl.gls	CwP0003	0002@192.168.1.37	Stop	Send_Silence_Started	TerminateCall	Pass	10	0
10	SipCallControl.gls	CwP0010	0002@192.168.1.37	Stop	Send_Silence_Started	TerminateCall	Pass	10	0

The 'Load Generation - LoadGendefault' window shows the following configuration options:

- Total Calls To Generate: *
- Max Active Calls: 2000
- Unique Distributions Per Script:
- Multi Distributions:
- Distributions:
 - Uniform: MinCR=40, MaxCR=80, Duration=10
 - Fixed: Call Rate=250, Duration=10
 - Normal: MinCR=40, MaxCR=80, Duration=10
- Scripts:
 - SipCallControl
 - Registration
- Profile: Exclusive Profiles
 - Profile0003
 - Profile0005
- Stop Time:
 - Days: 0, Hours: 0, Minutes: 0
 - Start Time: 00:00:00.000
 - End Time: 00:00:00.000

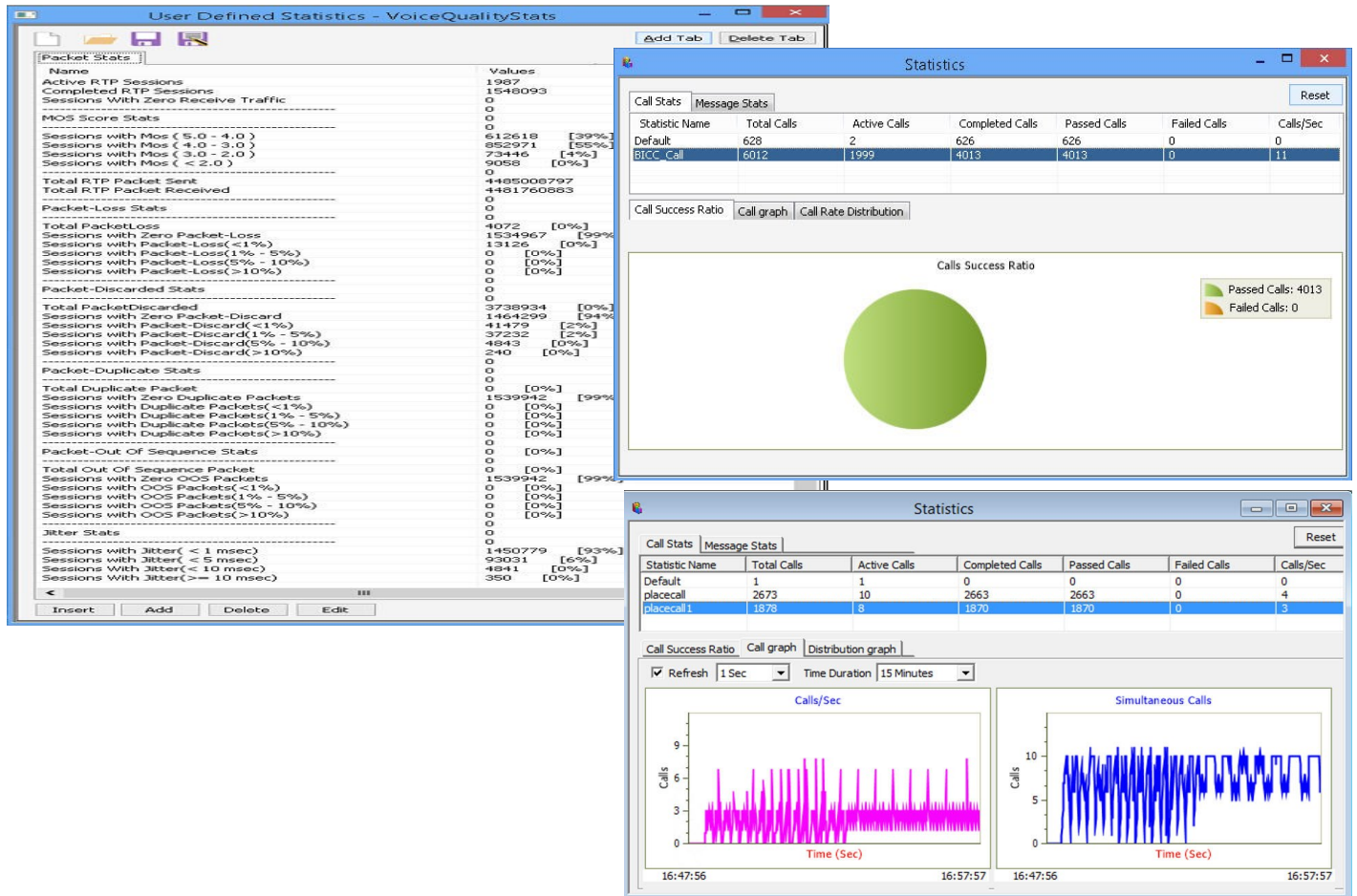
Command Line Interface for Remote Access

(Requires additional licensing)

MAPS™ can be configured as server-side application, to enable remote controlling of the application through multiple command-line based clients. Multiple MAPS™ CLI servers can also be controlled remotely from single client application. Supported clients include Python and Java.

User can remotely perform all functions such as start test bed setup, load scripts and profiles, apply user events such as send digits/file/tones, detect digits/file/tones, dial, originate call, terminate call, start and stop traffic and so on.

User can also generate and receive calls through commands. The client applications are distributed along with MAPS™ Server application.



Summary of Supported Traffic Types

- **RTP Traffic Simulation** (PKS102, PKS108, PKS200, PKS106)
over UMTS IuCS and IuH, IuPS, SIP, SIP-I, MGCP, MEGACO, GSM A, and GSM Abis over IP interfaces
- **TDM Traffic Simulation** (XX610, XX620, XXFT0)
over ISDN, SS7, CAS, GSM A interfaces
- **TRAU GSM Traffic** (XX646)
over GSM A-bis interfaces
- **Mobile Traffic Simulation** (ETH100, ETH101, ETH102, ETH103)
over LTE S1, eGTP and UMTS GnGp, IuPS, IuH, GPRS Gb interfaces

Protocols Supported & Standards

MAPS™ for Protocol Emulation in 5G Network

- **5G N1N2:**
GL's MAPS™ Emulator is an advanced protocol emulator for 5G emulation over N1N2 reference point between the gNB (gNodeB) and the AMF (Core Access and Mobility and Management Function) in order to support UE and non-UE related services. For more details, refer to [5G N1N2 Interface Emulation](#) webpage.
- **5G N4:**
GL's MAPS™ 5G-N4 Interface Emulator is an advanced protocol emulator for 5G emulation over N4 interface that can emulate PFCP messages and signaling specification as defined by 3GPP standards. The PFCP is found on the N4 reference point between SMF (Session Management Function) and UPF (User Plane Function). For more details, refer to, [5G N4 Interface Emulation](#) webpage.
- **5G N8:**
MAPS™ 5G-N8 can emulate and test Unified Data Management (UDM) and Access and Mobility Management Function (AMF) elements via the Nudm and Namf service-based N8 interface. For more details, refer to [5G N8 Interface Emulation](#) webpage.
- **5G N10:**
MAPS™ 5G N10 can emulate and test Unified Data Management (UDM) and Session Management Function (SMF) elements via the Nudm service-based N10 interface. For more details, refer to [5G N10 Interface Emulation](#) webpage.
- **5G N11:**
MAPS™ 5G-N11 can emulate and test Access and Mobility Management Function (AMF) and Session Management Function (SMF) elements via the Nudm service-based N11 interface. For more details, refer to [5G N11 Interface Emulation](#) webpage.
- **5G N12:**
MAPS™ 5G-N12 interface can emulate and test Authentication Server Function (AUSF) and Access and Mobility Management Function (AMF) elements via the Nausf service-based N12 interface. For more details, refer to [5G N12 Interface Emulation](#) webpage.
- **5G N13:**
MAPS™ 5G-N13 can emulate and test Authentication Server Function (AUSF) and User Data Management (UDM) elements via the Nausf service-based N13 interface. For more details, refer to [5G N13 Interface Emulation](#) webpage.

Protocols Supported & Standards

MAPS™ for Protocol Emulation in 5G Network (Contd.)

- **5G N17:**
MAPS™ 5G-N17 can emulate and test Equipment Identity Register (EIR) and Access and Mobility Management Function (AMF) elements via the service-based N17 interface. For more details, refer to [5G N17 Interface Emulation](#) webpage.
- **5G N20:**
MAPS™ 5G-N20 can emulate and test Access and Mobility Management Function (AMF) and Short Message Service Function (SMSF) entities in 5G Core Network (5GC) elements via the service-based N20 interface. For more details, refer to [5G N20 Interface Emulation](#) webpage.
- **5G N21:**
MAPS™ 5G-N21 can emulate and test Unified Data Management (UDM) and Short Message Service Function (SMSF) entities in 5G Core Network (5GC) elements via the service-based N21 interface. For more details, refer to [5G N21 Interface Emulation](#) webpage.
- **5G N29:**
MAPS™ 5G-N29 can emulate and test Network Exposure Function (NEF) and Session Management Function (SMF) entities in 5G Core Network (5GC) elements via the service-based N29 interface. For more details, refer to [5G N29 Interface Emulation](#) webpage.
- **5G N51:**
MAPS™ 5G-N29 can emulate and test Network Exposure Function (NEF) and Session Management Function (SMF) entities in 5G Core Network (5GC) elements via the service-based N29 interface. For more details, refer to [5G N51 Interface Emulation](#) webpage.

Protocols Supported & Standards

MAPS™ for Protocol Emulation in TDM, 2G

- **ISUP (Integrated Services Digital Network User Part)**

MAPS™ SS7 can emulate Service Switching Point (SSP), where ISUP signaling is defined by the ITU-T and ANSI standards. MAPS™ SS7 functionality covers the ITU and ANSI variant of SS7 implementing MTP2, MTP3, and ISUP protocols. MAPS™ SS7 also supports scripting through CLI such as the Python and Java, using MAPS™ client-server functionality with additional license. For more details, refer to [MAPS™ SS7 Protocol Emulator](#) webpage.

- **ISDN (Integrated Services Digital Network)**

MAPS™ ISDN is designed to emulate complete ISDN & LAPD over TDM (T1/E1) connection (Switch to Subscriber), where ISDN signaling is defined by the ITU-T standards. MAPS™ ISDN also supports TDM traffic emulation. MAPS™ ISDN also supports ISDN and LAPD Conformance Test Suite. For more details, refer to [MAPS™ ISDN Protocol Emulator](#) webpage.

- **GSM A Interface**

MAPS™ GSM A can emulate BSC and MSC entities over A Interface by generating and receiving BSSMAP and DTAP messages. The signaling conforms ITU-T and 3GPP standards. MAPS™ GSM A also supports TDM traffic emulation. For more details, refer to [MAPS™ GSM A Interface Emulator](#) webpage.

- **GSM Abis Interface**

MAPS™ GSM Abis can emulate BTS and BSC entities over Abis Interface by generating and receiving BTSMP messages. The signaling conforms 3GPP standards. MAPS™ GSM Abis also supports TDM traffic emulation. For more details, refer to [MAPS™ GSM Abis Interface Emulator](#) webpage.

- **MAP (Mobile Application Part)**

MAPS™ MAP Emulator can emulate various MAP signaling interfaces (C, D, E, F, H, and & Packet-switched interfaces such as Gc, Gr, Gf, Gd) in GSM/UMTS networks as defined by 3GPP standards. For more details, refer to [MAPS™ MAP Emulator](#) webpage.

- **CAS (Channel Associated Signaling)**

MAPS™ CAS Emulator can emulate any CAS based protocol (CAS signaling types include Loopstart, Groundstart, Feature Group D (FGD), Winkstart, MFC-R2) in telephone networks. For more details, refer to [MAPS™ CAS Protocol Emulator](#) webpage.

- **MC-MLPPP (Multi-Class Multi-Link Point-to-Point)**

MAPS™ MLPPP is an advanced tool for MLPPP emulation over TDM (T1 E1) that can emulate peer end-points (Router or a Switch). The MLPPP signaling specification conforms to IETF standards. For more details, refer to [MAPS™ MC-MLPPP Conformance Tester](#) webpage.

- **CAP (CAMEL Application Part)**

MAPS™ CAMEL (Customized Applications for Mobile networks Enhanced Logic) Application Part (CAP) Protocol emulator can emulate functional entities such as Service Control Function (gsmSCF) and Service Switching Function (gsmSSF). For more details, refer to [MAPS™ CAP Protocol Emulator](#) webpage.

Protocols Supported & Standards

MAPS™ for Protocol Emulation in TDM, 2G (Contd.)

- **INAP (Intelligent Network Application Part)**

MAPS™ INAP Protocol Emulator is an advanced protocol emulator for INAP (Intelligent Network Application Part) that can emulate INAP messages and signaling as per ITU, ANSI specifications. INAP information flow is defined between functional entities such as SCF and SSF distributed across SS7 network. For more details, refer to [MAPS™ INAP Emulator](#) webpage.

- **IUP (BT SS7 Interconnect User Part Protocol)**

MAPS™ IUP is an advanced protocol emulator used to emulate UK specific SS7 IUP in British Telecom (BT) networks. It is designed to emulate interconnect route between Incoming and Outgoing Networks as defined by the PNO-ISC/INFO/004(IUP) and TGS/SPEC/006 specifications. For more details, refer to [MAPS™ IUP Protocol Emulator](#) webpage.

MAPS™ for Protocol Emulation in IP Network

- **SIP (Session Initiation Protocol)**

MAPS™ SIP supports emulating SIP proxy servers, Redirect servers, Registrars, Registrants, and User Agents such as SIP phones. MAPS™ SIP also supports bulk audio and video call generation capabilities. The MAPS™ SIP Conformance Suite performs protocol conformance testing as per ETSI standard. For more details, refer to [MAPS™ SIP Protocol Emulator](#) webpage.

- **MEGACO (Media Gateway Control)**

MAPS™ MEGACO emulator can emulate MGC and Media Gateways with various types of calls. It can also control scenario involved in Media conversion. The MAPS™ MEGACO Conformance Suite performs protocol conformance testing as per ETSI TS 102 374-2 standards. MAPS™ MEGACO also supports RTP traffic emulation. For more details, refer to [MAPS™ MEGACO Protocol Emulator](#) webpage.

- **MGCP (Media Gateway Controller Protocol)**

MAPS™ MGCP can emulate MGC and Media Gateways with various types of calls. It can also control scenario involved in Media conversion. The MAPS™ MGCP Conformance Suite is designed to perform protocol conformance testing as per RFC 3435. MAPS™ MGCP also supports RTP traffic emulation. For more details, refer to [MAPS™ MGCP Protocol Emulator](#) webpage.

- **ED137 (Air Traffic Management)**

MAPS™ ED-137 emulate many endpoints and generates bulk calls (load testing) on the network as per EUROCAE (European Organization for Civil Aviation Equipment) standards. Emulation test tools include MAPS™ ED-137 VoIP ATM Telephone, MAPS™ ED137 VoIP ATM Radio, and MAPS™ ED-137 Air Traffic Recorder. For more details, refer to [Testing ED-137 and ED-138 Interoperability Standards for VoIP Air Traffic Control](#) webpage.

- **SIP I (SIP ISUP)**

MAPS™ SIP I can emulate Signaling Gateway, Softswitch entities as UAC, UAS in the network, where SIP ISUP signaling is specified by the ITU and IETF standards. MAPS™ SIP I also supports RTP traffic emulation. For more details, refer to [MAPS™ SIP I Protocol Emulator](#) webpage.

Protocols Supported & Standards

- **SS7 SIGTRAN (SS7 over IP)**

MAPS™ SS7 SIGTRAN can emulate Signaling Gateway and Softswitch, where ISUP signaling over IP specification is defined by ITU-T Q.761-764 and Q.784 standards. MAPS™ SS7 SIGTRAN functionality covers the ITU and ANSI variants of SS7 implementing M3UA and ISUP protocols. For more details, refer to [MAPS™ SIGTRAN \(SS7 over IP\) Protocol Emulator](#) webpage.

- **MAP IP (Mobile Application Part over IP)**

MAPS™ MAP IP emulate various MAP signaling interfaces transported using SIGTRAN in UMTS/GSM network as defined by 3GPP standards. MAPS™ MAP IP functionality covers the ITU and ANSI variants of SS7 implementing M3UA, M2PA, and MTP3 protocols. It also supports LCS procedures over Lg, Lh interface. For more details, refer to [MAPS™ MAP Emulator](#) webpage.

- **ISDN-SIGTRAN (ISDN over IP)**

MAPS™ ISDN SIGTRAN emulate complete ISDN connection between SG (Signaling Gateway) to MGC (Media Gateway Controller), where ISDN signaling are as defined by the ITU-T Q.921 / Q.931 standards. For more details, refer to [MAPS™ ISDN SIGTRAN Protocol Emulator](#) webpage.

MAPS™ for Protocol Emulation in 3G, 4G Network

- **LTE (Long Term Evolution) S1**

MAPS™ LTE S1 is designed to emulate network elements such as eNodeB (Evolved Node B), and MME (Mobility Management Entity) in S1 interface as per 3GPP 36.413 9.0.0 and 3GPP TS 24.301 V9.0.0 standards. The application gives the users the unlimited ability to edit S1-AP/NAS messages and control scenarios (message sequences). For more details, refer to [MAPS™ LTE for S1 Interface Emulator](#) webpage.

- **LTE (Long Term Evolution) S3, S4, S5, S8, S10, S11 & S16**

MAPS™ LTE eGTP-c (Evolved GPRS Tunneling Protocol for Control Plane) is designed to emulate MME (Mobility Management Entity), SGW (Serving Gateway) and PGW (PDN Gateway) in S11, S5/S8 interfaces as per 3GPP TS 29.274 standards. The application gives the users the unlimited ability to edit eGTP-c messages and control scenarios (message sequences). For more details, refer to [MAPS™ LTE eGTP Interface Emulator](#) webpage.

- **LTE X2-AP**

MAPS™ X2 Application Protocol (X2AP) is used to co-ordinate handovers and perform load management between eNodeB (Evolved Node B) network elements - Source eNB and Target eNB. The MAPS™ X2AP test tool is designed with specific test cases, as per LTE 3GPP mobile standards. For more details, refer to [MAPS™ LTE for X2 Interface Emulator](#) webpage.

- **LTE SLs**

MAPS™ supports simulation of Location Services Application Protocol (LCS-AP) messages applicable to LTE SLs interface between **E-SMLC** (Enhanced Serving Mobile Location Center) and **MME** (Mobile Management Entity) network elements as per 3GPP TS 29.171 V14.0.0 (2016-12) specifications. For more details, refer to [MAPS™ LTE SLs Emulator](#) webpage.

For detail information on the supported protocols and standards, refer to [Message Automation & Protocol Simulation \(MAPS™\)](#) webpage

MAPS™ for 3G, 4G Networks (contd.)

- **GSM Lb**

MAPS™ supports emulation of Base Station System Application Part LCS Extension (BSSAP-LE) message exchange between BSS (Base Station Center) and SMLC (Serving Mobile Location Center) entities as per 3GPP TS 49.031 specifications over GSM Lb interface in LCS network. For more details, refer to [MAPS™ Lb Interface Emulator](#) webpage.

- **UMTS IuPS (over IP)**

MAPS™ UMTS IuPS designed to emulate RNC (Radio Network Controller), and 3G SGSN (3G Serving GPRS Support Node) network elements in IuPS interface as per 3GPP and ITU-T standards. For more details, refer to [MAPS™ UMTS for IuPS Interface Emulator](#) webpage.

- **GPRS Gb over IP**

MAPS™ is designed to emulate GPRS Gb interface messages and signaling specification as defined by 3GPP standards between the BSS (Base Station Subsystem) and the SGSN (Serving GPRS Support Node) over IP transmission protocol. For more details, refer to [MAPS™ GPRS Gb Interface Emulator](#) webpage.

- **UMTS IuCS and IuH (over IP)**

MAPS™ UMTS IuCS emulate RNC (Radio Network Controller), and 3G MSC (3G Mobile Switching Center) by generating RANAP messages and signaling specification as defined by ITU-T and 3GPP standards. MAPS™ also supports RTP traffic emulation over these interfaces. MAPS™ UMTS IuH emulate Femto Home Node B (HNB), and a Femto Home Node Gateway (HNB-GW) as per 3GPP standards (TS 25468, TS 25.413, TS 04.08, TS 04.18, TS 03.40/03.38/04.11). MAPS™ IuH also supports RTP traffic emulation over UMTS IuH interface. With additional licensing Mobile and Gateway GTP traffic is supported. For more details, refer to [MAPS™ UMTS for IuCS, IuH Interfaces Emulator](#) webpage.

- **Diameter [S6a, S6d, S13, Cx/Dx, Gx, Rx, SLg, SLh]**

MAPS™ Diameter is an ideal solution for emulation of various interfaces and elements in the LTE core network such as the MME, SGSN, HSS, AF, PCRF, PCEF, PDN-GW, GMLC, and EIR nodes in S6a, S6d, S13, Cx/Dx, Gx, Rx, SLg, and SLh interfaces as per 3GPP standards (3GPP TS 29.272 V10.3.0, and 3GPP TS 29214-b10). For more details, refer to [MAPS™ Diameter Protocol Emulator](#) webpage.

- **INAP IP (ANSI, ITU)**

MAPS™ INAP IP (ANSI, ITU) Emulator is an advanced protocol emulator for INAP (Intelligent Network Application Part) that can emulate ANSI INAP messages and signaling as per ITU-T Q.121x & Q.122x specifications. INAP information flow is defined between functional entities such as Service Control Function (SCF) and Service Switching Function (SSF) distributed across SS7 network. For more details, refer to [MAPS™ INAP Emulator](#) webpage.

- **CAP IP (CAMEL Application Part)**

MAPS™ Protocol Emulator includes CAP protocol emulation over TDM and IP based GSM, GPRS, UMTS networks. Allows configuring MTP3, M3UA, M2PA, SCCP, SCTP, and CAP protocol parameters. Supported CAMEL services includes Apply Charging for GSM call sessions, Apply Charging for GPRS data sessions, Toll Free service, Establish Temporary Connection, Connect To Resource, and others. For more details, refer to [MAPS™ CAP Protocol Emulator](#) webpage.

- **LTE SGs Fallback Interface**

MAPS™ SGs Emulator is designed to realize the CS fallback function for Voice and SMS delivery via the Circuit Switched (CS) core network using SGs interface between the Mobility Management Entity (MME) and Visitor Location Register (VLR), as defined in 3GPP TS 29.118 specifications (SGsAP). For more details, refer to [MAPS™ LTE SGs Emulator](#) webpage.

Buyer's Guide

Item No	Product Description
PKS111	MAPS™ Remote Controller
PKS117	MAPS™ ED137 Recorder (Includes PKS102)
PKS118	MAPS™ ED137 Radio (Includes PKS107, & PKS102)
PKS119	MAPS™ ED137 Telephone (Includes PKS102)
PKS120	MAPS™ SIP
PKS121	MAPS™ SIP Conformance Scripts
PKS122	MAPS™ MEGACO
PKS123	MAPS™ MEGACO Conformance Scripts
PKS124	MAPS™ MGCP and Conformance Scripts
PKS126	MAPS™ SIP I
PKS127	MAPS™ IMS Emulator
PKS129	MAPS™ SCTP Conformance Test Suite
PKS130	MAPS™ SS7 SIGTRAN (SS7 over IP)
PKS131	MAPS™ Gb Emulator over IP
PKS101	SIP Core
PKS102	RTP Soft Core for RTP Traffic Generation
PKS103	RTP IuUP Soft Core
PKS106	RTP Video Traffic Generation
PKS107	RTP EUROCAE ED137
PKS108	RTP Voice Quality Measurements
PKS200	RTP Pass Through Fax Emulation
PKS143	MAPS™ IuCP Interface Emulator



GL Communications Inc.

818 West Diamond Avenue - Third Floor, Gaithersburg, MD 20878, U.S.A
 (Web) www.gl.com - (V) +1-301-670-4784 (F) +1-301-670-9187 - (E-Mail) info@gl.com

Buyer's Guide (Contd.)

Item No	Product Description
PKS146	MAPS™ LTE SGs Interface Emulator
PKS147	MAPS™ GSM Lb Interface Emulator
PKS148	MAPS™ LTE SLs Interface Emulator
PKS151	MAPS™ CAP IP Protocol Emulator
PKS160	MAPS™ UMTS IuCS and IuH
PKS164	MAPS™ UMTS IuPS Protocol Emulator
PKS166	MAPS™ UMTS GnGp Interface Emulator
PKS132	MAPS™ MAP over IP
PKS135	MAPS™ ISDN SIGTRAN (ISDN over IP)
PKS136	MAPS™ INAP IP (ANSI, ITU)
PKS139	MAPS™ Diameter
PKS140	MAPS™ LTE-S1
PKS141	MAPS™ LTE X2-AP
PKS142	MAPS™ LTE-eGTP-c (S3, S4, S5, S8, S10, S11 and S16)
PKS500	MAPS™ 5G N1N2 Interface Emulator
PKS501	MAPS™ 5G N4 Interface Emulator
PKS502	MAPS™ 5G N17 Interface Emulator



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Buyer's Guide (Contd.)

Item No	Product Description
PKS503	MAPS™ 5G N8 Interface Emulator (Requires PKS502)
PKS504	MAPS™ 5G N10 Interface Emulator (Requires PKS502)
PKS505	MAPS™ 5G N11 Interface Emulator (Requires PKS502)
PKS506	MAPS™ 5G N12 Interface Emulator (Requires PKS502)
PKS507	MAPS™ 5G N13 Interface Emulator (Requires PKS502)
PKS508	MAPS™ 5G N20 Interface Emulator (Requires PKS502)
PKS509	MAPS™ 5G N21 Interface Emulator (Requires PKS502)
PKS510	MAPS™ 5G N22 Interface Emulator (Requires PKS502)
PKS511	MAPS™ 5G N29 Interface Emulator (Requires PKS502)
PKS511	MAPS™ 5G N51 Interface Emulator (Requires PKS502)
ETH101	Mobile Traffic Core - GTP
ETH102	Mobile Traffic Core - Gateway
ETH103	MobileTrafficCore - Gb
XX648	MAPS™ ISDN & LAPD Emulator
XX642	MAPS™ ISDN & LAPD Conformance Emulator
XX682	MAPS™ IUP Emulator
XX649	MAPS™ SS7
XX647	MAPS™ SS7 Conformance Scripts
XX651	MAPS™ CAS



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Buyer's Guide (Contd.)

Item No	Product Description
XX652	MAPS™ MC-MLPPP
XX656	MAPS™ INAP
XX692	MAPS™ GSM A
XX693	MAPS™ GSM Abis
XX624	MAPS™ FXO FXS Emulator
XX694	MAPS™ MAP (B, C, D, E, F, G, and H interfaces)
XX696	MAPS™ CAP (CAMEL Application Part)

For MAPS™ complete products, refer to [Message Automation & Protocol Simulation](#) (MAPS™) webpage.

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