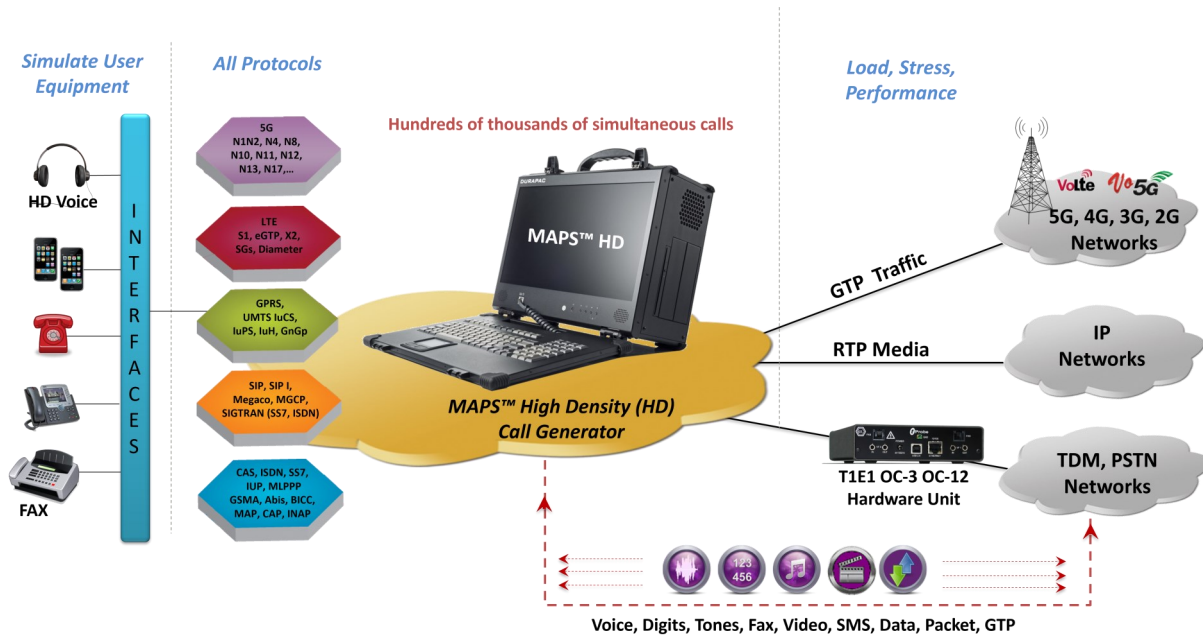


# Traffic Emulation Software for Wireless, IP, and TDM Networks



## Overview

As traffic intensity increases, network elements (including switches and transmission) can impart various impairments such as errors, excessive delay, congestion, blocking, loss, and degraded quality. Emulating traffic can be valuable to characterize the impairment as a function of traffic intensity and traffic types (e.g. Voice, Fax, Data, and Video).

[Message Automation and Protocol Simulation \(MAPS™\)](#) is a multi-protocol, multi-technology platform performs signaling and traffic generation for a vast array of communication protocols covering IP, Analog, TDM, and Wireless networks. MAPS™ can be used to test signaling over legacy networks (which use conventional signaling such as CAS, SS7, ISDN, PPP,...), newer generation IP networks (such as SIP, MGCP, MEGACO, SIGTRAN, Diameter), and also the Wireless networks including GSM, GPRS, UMTS, and LTE.

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

GL's MAPS™ products supporting various Traffic across IP, TDM, Wireless networks:

- Mobile Traffic Emulation ([ETH101](#), [ETH102](#), [ETH103](#))
- over LTE (S1, eGTP), UMTS (GnGp, luPS), GPRS Gb interfaces
- RTP Traffic Emulation for IMS/IP Networks ([PKS102](#), [PKS106](#), [PKS108](#), [PKS200](#), [PKS211](#))
- over SIP, SIP-I, MGCP, MEGACO, Diameter over IP interfaces
- RTP Traffic Emulation for Wireless Networks ([PKS102](#), [PKS108](#), [PKS200](#))
- over UMTS luCS & luH, GSM A over IP interfaces
- TDM Traffic Emulation ([XX610](#), [XX620](#), [XXFT0](#))
- over ISDN, SS7, CAS, GSM A interfaces
- TRAU GSM Traffic ([XX646](#))
- over GSM A-bis interfaces

With the [MAPS™ Client-Server](#) application, which supports a Command Line Interface (CLI) such as Python and Java scripting tools, it provides the capability for remote operation, automation, and multi-site connectivity. Users can perform all functions remotely, including initiating test bed setups, loading scripts and profiles, applying user events such as sending digits/files/tones, detecting digits/files/tones, dialing, originating calls, terminating calls, and starting and stopping traffic, among other actions.

For more details, refer to [Traffic Emulation webpage](#).



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

## Features

	Traffic Type	License
<a href="#">GTP Mobile Traffic Emulation</a> Generate and verify user mobile data (Email, Web-HTTP, and FTP), gateway traffic, and packet traffic over (GTPv1 and GTPv2) GPRS Gb, UMTS (GnGp, IuPS), and LTE(S1, eGTP) network interfaces, 5G N1N2 ,N4	GTP Mobile Traffic Core – Stateful HTTP traffic emulation	ETH101
	Simultaneous emulation of multiple GTP sessions per user	
	PacketLoad™ (HD GTP Mobile Traffic Core)- Stateful high density packet traffic generation TCP/HTTP, UDP, and PCAP Replay	XXXXX
	Mobile Traffic Core – Gateway	ETH102
<a href="#">RTP Traffic Emulation</a> over SIP, SIP I, MGCP, MEGACO, UMTS, GSM, Diameter, and LTE networks	Mobile Traffic Emulation - GPRS Gb	ETH103
	Create, manage RTP sessions and generate and receive RTP traffic over the sessions with complete automation capability	PKS102
	Emulation of <a href="#">RTP Traffic</a> such as Voice, Digits, Tones, IVR and Impairments	
	Automate the Interactive Voice Response (IVR) testing process (call establishment and traffic generation / detection) process through scripts	
All Voice Codecs 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, and G722, G722.1.		
	Emulation of <a href="#">RTP Video Traffic</a> (H.263 & H.264), Fax (Pass-thro & T.38)	PKS106
	<a href="#">RTP Voice Quality Measurements</a> – MOS, R-Factor scores	PKS108
	Emulation of <a href="#">RTP FAX Traffic</a> - G.711 Pass-thro and T.38	PKS200, and PKS211
<a href="#">SMS Traffic Emulation</a> over the GSM, UMTS, and MAP interfaces	Ability to push / pull Short Messages over the network as if sent by thousands of mobile phones (Short Message Mobile Originated (SMS-MO)). MAPS™ can also transmit a Short Message to a mobile phone (Short Message Mobile Terminated (SMS-MT)).	
<a href="#">TDM Traffic Emulation</a> over ISDN, SS7, GSM, CAS interfaces	Emulation of <a href="#">TDM Traffic</a> such as digits, voice file, single tone, dual tones, IVR, Dynamic VF	XX610, XX620
	Emulation of <a href="#">TDM Fax Traffic</a>	XXFT0
	<a href="#">TRAU GSM Traffic</a> over GSM Abis interface	XX646
	Create, monitor, and terminate TRAU GSM traffic sessions	

## Analog and TDM Traffic Emulation

With the purchase of additional license ([XX610](#), [XX620](#)), MAPS™ supports transmission, detection and capture of various traffic such as, digits, voice files, single tones, dual tones, Dynamic VF, FAX, and IVR over established calls on TDM and Analog networks. The volume of calls can vary from few hundreds to thousands of calls depending on the T1 E1 or Analog platform of choice. TDM traffic emulation using MAPS™ ISDN, MAPS™ SS7, MAPS™ GSM A, and MAPS™ FXO FXS.

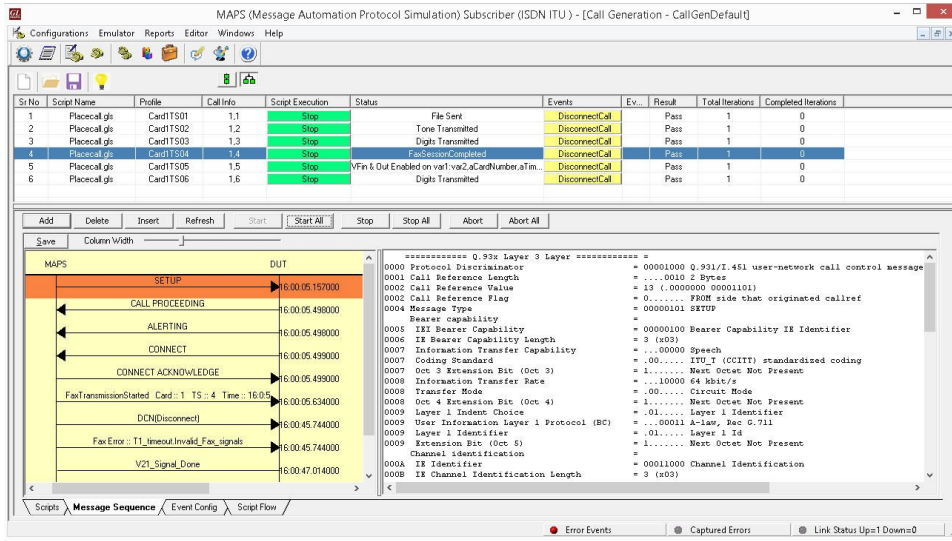


Figure: Traffic Emulation Events

## Short Message Service (SMS) Test Solutions

MAPS™ also supports sending and receiving SMS (Short Message Service) using signaling channel simultaneously with other voice and data services over a GSM, UMTS, or MAP interfaces. MAPS™ has the ability to push / pull Short Messages over the network as if sent by thousands of mobile phones (Short Message Mobile Originated (SMS-MO)). MAPS™ can also transmit a Short Message to a mobile phone (Short Message Mobile Terminated (SMS-MT)). The short message service testing is available on the GSM, UMTS, and MAP interfaces. GL's [2G, & 3G Wireless Lab](#) setup supports end-to-end SMS calls emulation in Circuit Switch (CS) network.

This feature is supported in MAPS™ GSM A over IP, MAPS™ MAP, and MAPS™ UMTS luCS and luH applications.

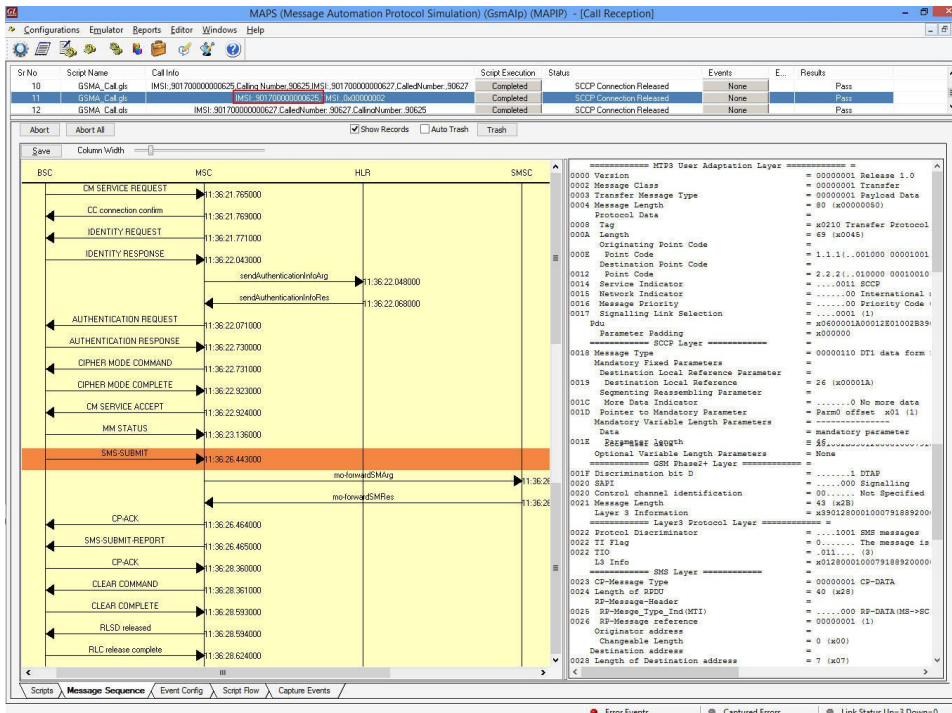


Figure: SMS test solution

## FAX Simulation over T1 or E1 (XXFT0)

Fax Simulator ([XXFT0](#)) is capable of transmitting and receiving bulk fax over many T1 E1 timeslots or through two-wire FXO and FXS lines. The software can emulate many "virtual fax machines" - transmitter as well as receiver. All variations of T.30 fax protocol are supported such as page size, resolution, min and max data rate, and codec type – including high speed fax such as V.34. This application works with MAPS™ TDM products simulating complete real-time single and bulk (100's) fax calls.

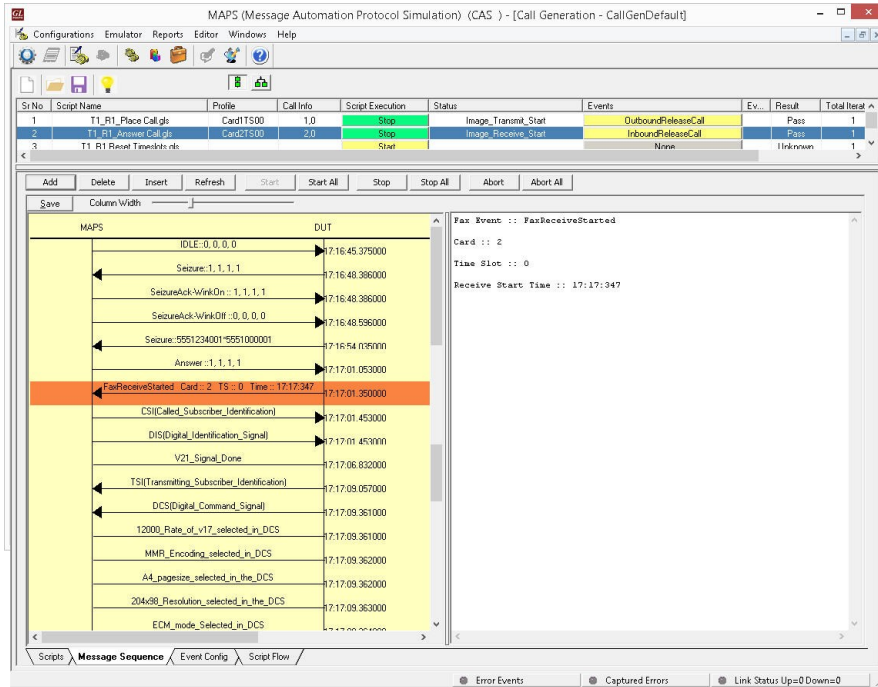


Figure: Fax simulation

## GSM TRAU Traffic Emulation

For GSM, TRAU (Transcoder Rate Adapter Unit) traffic emulation (xx646) is included with options to create, monitor, and terminate TRAU GSM traffic sessions supporting transmit/receive DTMF digits, files, and tones over established GSM calls. TRAU traffic emulation is applicable for MAPS™ GSM Abis application only.

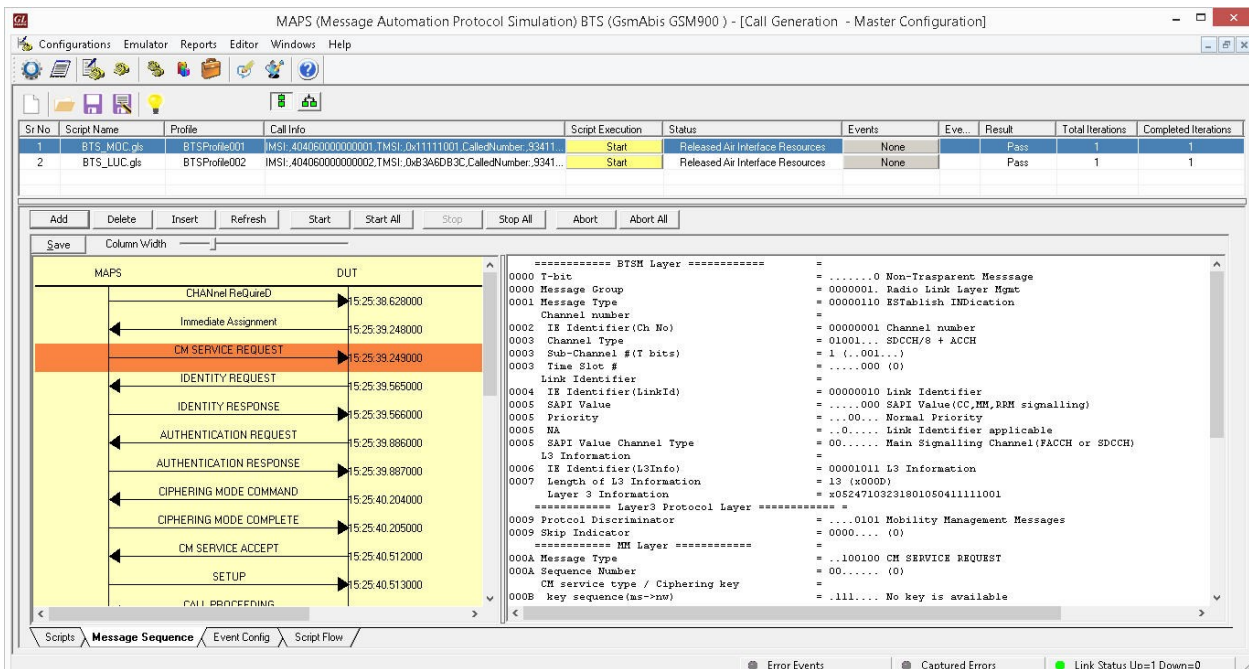


Figure: GSM TRAU Traffic Emulation

## RTP Traffic Simulation (PKS102)

MAPS™ supports transmission and detection of various RTP traffic such as, digits, voice file, single tone, dual tones, FAX, Dynamic VF, IVR, Voice, and Video sessions over established calls. With the purchase of [RTP Core](#) license (PKS102), MAPS™ RTP traffic commands are available. These features are applicable for MAPS™ UMTS IuCS & IuH, MAPS™ GSM A over IP, MAPS™ GSM Abis over IP, MAPS™ SIP, MAPS™ SIP I, MAPS™ MEGACO, MAPS™ MGCP applications only.

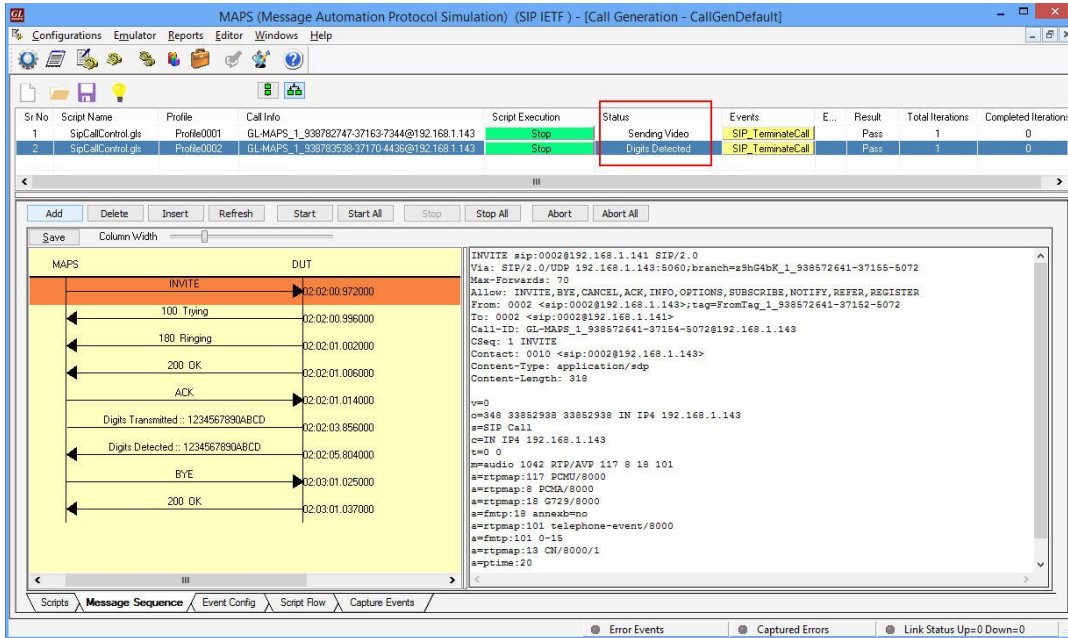


Figure: RTP Traffic simulation

## RTP Voice Quality Measurements (PKS108)

Using MAPS™ application, RTP based [Voice Quality \(MOS and R-Factor\) measurement](#) can be calculated and updated periodically for the received streams. Call quality metrics includes Listening MOS, Conversational MOS, PacketLoss, Discarded Packets, Out of Sequence Packets, Duplicate Packets, Delay and Jitter.

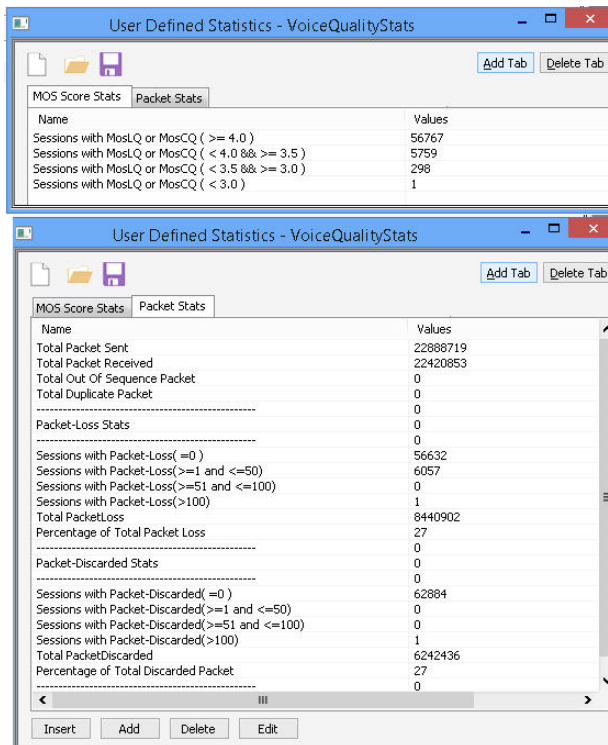


Figure: Voice quality measurements

## RTP Video Traffic Generation (PKS106)

With additional [RTP Video Traffic Generation \(PKS106\)](#) licenses up to 500 simultaneous video streams can be simulated using H.264 codecs. Transmit and receive pre-recorded video traces with video codecs like H.264, H.263 etc. H.263 provides video capture and video conference monitoring capability, while H.264 is an industry standard codec for video compression.

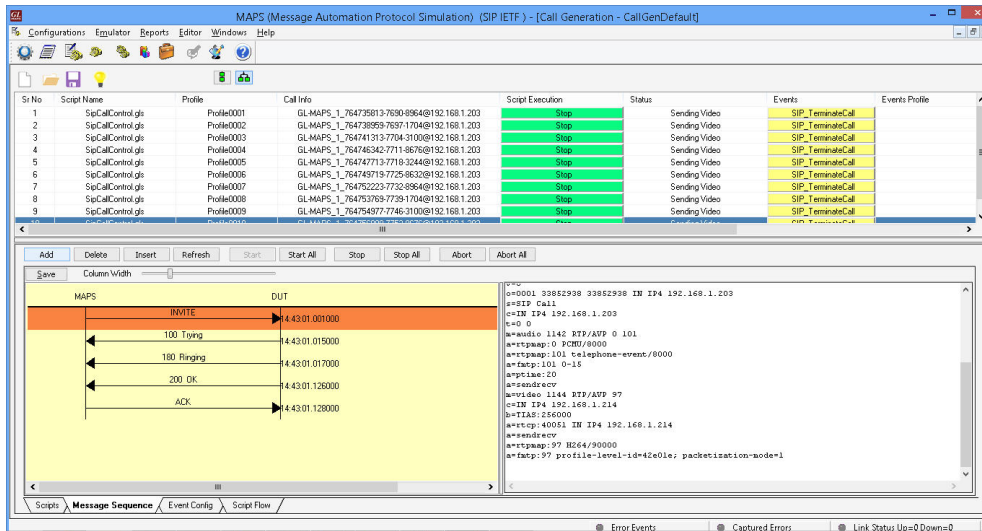


Figure: Voice quality measurements

## FAX Simulation over IP (PKS200, PKS211)

GL's test tools supports FAX over IP (FoIP) simulation and monitoring with additional licensing [RTP G.711 Pass Through Fax Simulation \(PKS200\)](#) and [T.38 Fax Simulation over UDPTL \(PKS211\)](#).

GL's RTP Fax Simulator simulates multiple fax calls over IP in T.30 pass through mode (using G.711 PCMU and PCMA). It can transmit pre-recorded Tiff image to DUT (Real-time Fax machine), receive Pass-Through fax from DUT, and record complete fax call messages as log file along with a Tiff image.

Fax over UDPTL transport using T38 protocol (compliant with ITU-T T.38 (03/2002)) operates at the maximum of 33.6 kbps speed. Almost all MAPS™ IP products support fax simulation –MAPS™ SIP, MAPS™ SIP-I, MAPS™ MEGACO, MAPS™ BICC, MAPS™ GSM, and MAPS™ UMTS.

Typical applications of our Fax Emulation software are load testing of fax servers, qualification testing of T.38 Gateways, testing of ATAs (Analog Terminal Adapters), testing of fax machines, and many more.

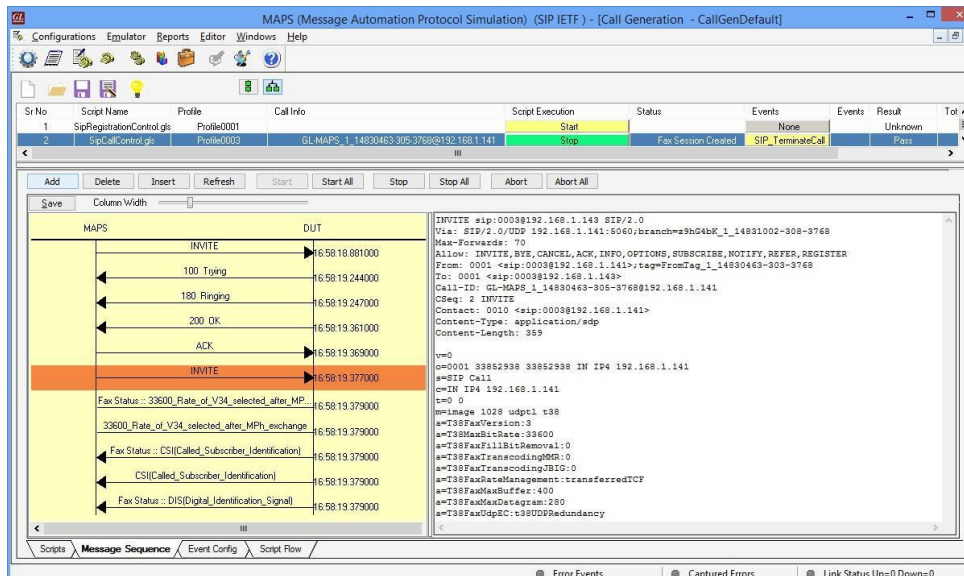


Figure: Voice quality measurements

## Mobile Traffic Simulation

### Mobile Traffic Core - GTP (ETH101)

The module supports stateful user-plane packet transmission and reception services between any two nodes (GTP-U protocol entity) in UMTS (SGSN, GGSN, RNC), LTE (SGW, PDNGW) networks. It allows simultaneous simulation of multiple sessions per user. Currently, supports HTTP traffic simulation with the base requirements such as port number, server IP address, and pre-canned HTTP traffic file. This module can also support generation and verification of data traffic such as Email, FTP, HTTP, and more. This module is supported in MAPS™ GnGp, MAPS™ LTE S1, MAPS™ LTE eGTP-c, MAPS™ IuPS, MAPS™ IuH and MAPS™ 5G N1N2 and N4.

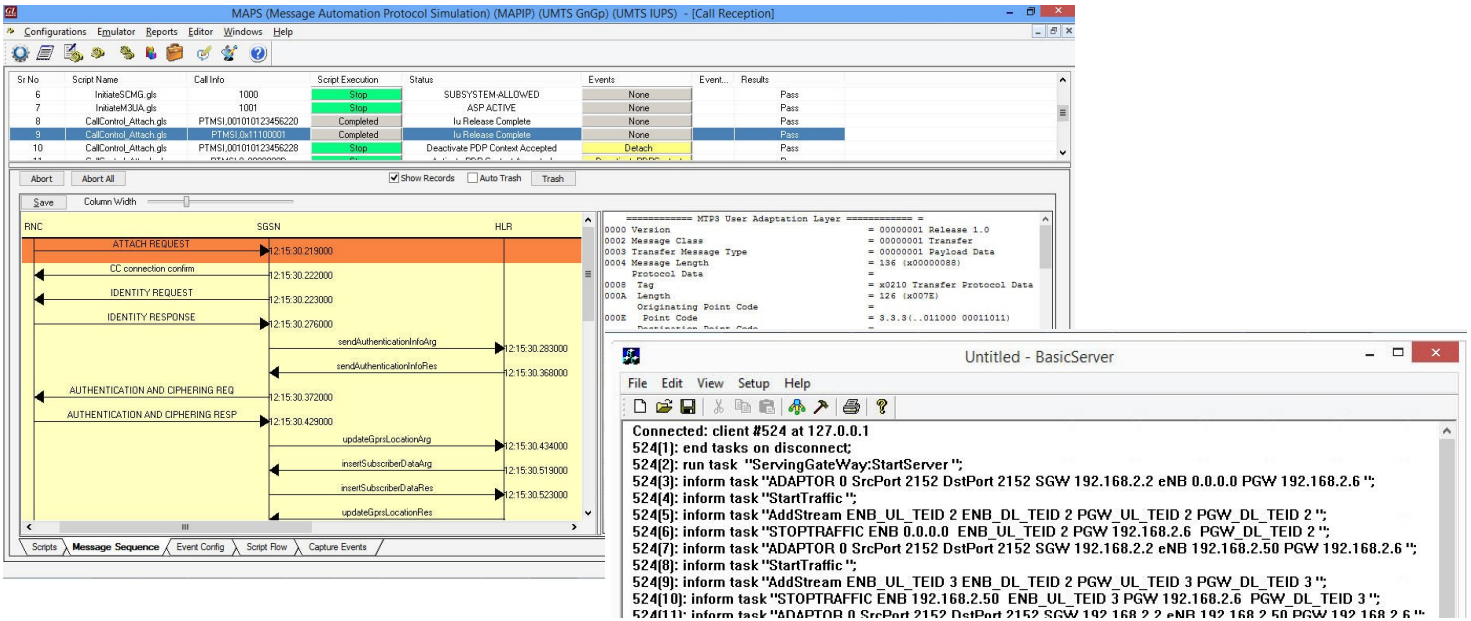


Figure: Mobile Traffic Server Log

### Mobile Traffic Core - Gateway (ETH102)

The module allows simulation of Gateway and transfer user plane data from RNC to GGSN. It handles GTP tunnels on both direction of SGSN. It can also act as GGSN for user-plane traffic by encapsulating IP traffic over GTP. This module supported in MAPS™ GnGp, MAPS™ LTE S1, MAPS™ LTE eGTP-c and MAPS™ IuH.

???: any IP based protocol used to carry packet radio service

HTTP: Hypertext Transfer Protocol

GTP: GPRS Tunnelling Protocol

TCP: Transmission Control Protocol

UDP: User Datagram Protocol

IP: Internet Protocol

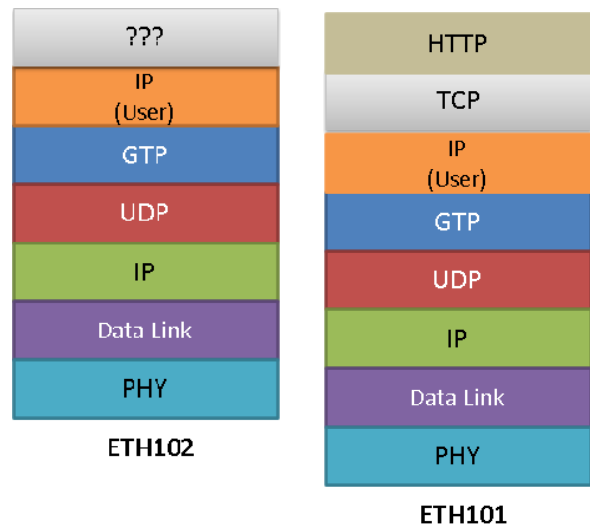


Figure: Packet Traffic Simulation (ETH100)

## Mobile Traffic Simulation - GPRS Gb (ETH103)

The module allows simulation of Mobile traffic over Gb interface between BSC and SGSN. Currently, this module transmits the pre-canned HTTP file (\*.txt) between BSC and SGSN nodes. It multiplexes both signaling and traffic over Gb interface. This module is supported in [MAPS™ GPRS Gb](#).

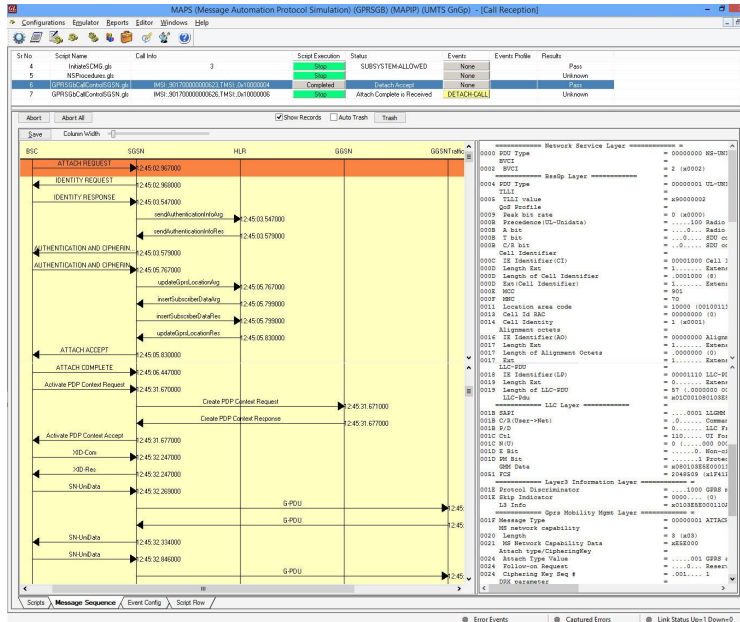


Figure: GPRS Gb Mobile Traffic Simulation (ETH103)

## PacketLoad™ - HD Mobile Traffic GTP

GL's [PacketLoad™](#) appliance can generate up to 100,000 user endpoints along with a high volume of mobile GPRS Tunneling Protocol (GTP-C) (control plane), GTP-U (user plane) and packet traffic for up to 40 Gbps to load test or stress test core 5G, 4G, and 3G networks. MAPS™ platform is the basis for all signaling protocols and traffic generation - which includes voice, tones, digits, fax, data, and video. It covers legacy PSTN, next generation VoIP, wireless equipment, interfaces, and networks. Interfaces can be Analog, TDM, IP/Ethernet or Wireless.

The appliance works with [MAPS™ 5G](#) (N1 N2, N4) [MAPS™ LTE](#) (S1, eGTP), [MAPS™ UMTS Gn Gp](#), [MAPS™ IuPS](#) applications. The MAPS™ Server system controls the PacketLoad™ appliance through CLI. At the generating end, MAPS™ emulates UEs with different mobile traffic parameters. At the receiving end, MAPS™ with PacketLoad™ verifies the received data and provides various statistics including the total packets transmitted and received, latency, delay, bandwidth, total TCP connections created, successful connections, packet loss, and more.

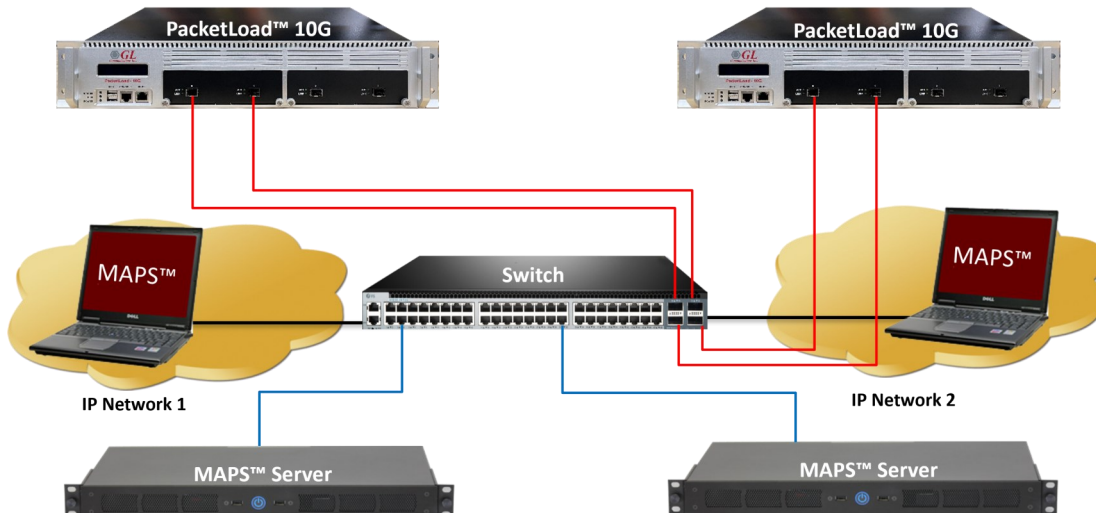


Figure: PacketLoad™ connected to MAPS™ in the network



## Automated Traffic Simulation using CLI

In addition to the GUI, MAPS™ can also be operated through a CLI. All the GUI based functionalities of the application can be controlled remotely. Traffic simulation on a local network as well as from a remote location is possible with the client interface.

```

Python 2.7.9 Shell
File Edit Shell Debug Options Windows Help
Python 2.7.9 (default, Dec 10 2014, 12:28:03) [MSC v.1500 64 bit (AMD64)] on win32
Type "copyright", "credits" or "license()" for more information.
>>> ===== RESTART =====
>>>
Isup Server Connection... True
Isup Testbed Starting... True
Isup Profile Loading... True
MTP3 Health Status Checking... True
MTP3 Link is UP... True
Set CardNumber: 0
Set Timeslot: 0
Isup Call Placing On CARD1TS1... True
Isup Call Connecting... True
Isup Call Status...ISUP CALL CONNECTED
Isup Hold Call... True
Isup Retrieve Call... True
Isup Suspend Call... True
Isup Resume Call... True
Isup Call Terminating... True
Isup MsgCount: 15
Isup LastMSGRCV: 11:46:36.323 <-      Release Complete
===== MTP3 Layer =====
=
0000 Service Indicator           = ...0101 ISDN User Part
0000 Priority Code               = ..00.... Priority Code 0
0000 Sub-service field          = 10..... National Network
0001 DPC                        = 1.1.1(00001001 ..001000)
0002 OPC                        = 2.2.2(10..... 00000100 ....0100)
0004 Signalling Link Code       = 0001.... (1)
      Higher Layer Data         = x02001000
===== ISUP Layer =====
=
0005 Circuit Identification Code = 00000010 ....0000 (2)
0007 Message Type               = 00010000 Release Complete
0008 Pointer to optional parameters = x00 (0)
      Mandatory Variable Length Parameters = None
      Optional Variable Length Parameters = None

**** Isup Call Flow ****
Time Stamp      Route      Message
11:46:21.988   ->      Initial Address
===== MTP3 Layer =====
=

```

Figure: Sample Python Client

## Buyer's Guide

Item No	Product Description
<a href="#">ETH100</a>	Packet Traffic Simulation - GTP
<a href="#">ETH101</a>	Mobile Traffic Core-GTP
<a href="#">ETH102</a>	Mobile Traffic Core-Gateway
<a href="#">ETH103</a>	Mobile Traffic - Gb
<a href="#">PKS102</a>	RTP Soft Core for RTP Traffic Generation
<a href="#">PKS103</a>	RTP IuUP Softcore
<a href="#">PKS106</a>	RTP Video Traffic Generation
<a href="#">PKS107</a>	RTP EUROCAE ED137
<a href="#">PKS108</a>	RTP Voice Quality Measurements
<a href="#">PKS200</a>	RTP Pass Through Fax Emulation
<a href="#">PKS140</a>	MAPS™ LTE S1 Emulator
<a href="#">PKS142</a>	MAPS™ LTE eGTP (S3, S4, S5, S8, S10, S11 & S16) Emulator
<a href="#">PKS164</a>	MAPS™ UMTS IuPS Emulator
<a href="#">PKS166</a>	MAPS™ UMTS - Gn Gp Interface Emulation
<a href="#">PKS500</a>	MAPS™ 5G N1N2 Interface Emulator
<a href="#">PKS501</a>	MAPS™ 5G N4 Interface Emulator
<a href="#">PKS211</a>	T.38 Fax Simulation
<a href="#">XX610</a>	File based Record/Playback (includes xx600)
<a href="#">XX620</a>	Transmit/Detect digits (Place Call/ Answer Call)
<a href="#">XXFT0</a>	WCS Fax Emulation Software
XXXFT2	2 Fax ports licenses
XXXFT3	8 Fax ports licenses
XXXFT4	30 Fax ports licenses
XXXFT5	60 Fax ports licenses
XXXFT6	120 Fax ports licenses
<a href="#">XX646</a>	Multi-Channel TRAU Tx/Rx Emulation and Analysis
<a href="#">XX624</a>	MAPS™ FXO FXS Emulator



**GL Communications Inc.**

818 West Diamond Avenue - Third Floor, Gaithersburg, MD 20878, U.S.A

(Web) [www.gl.com](http://www.gl.com) - (V) +1-301-670-4784 (F) +1-301-670-9187 - (E-Mail) [info@gl.com](mailto:info@gl.com)

## Buyer's Guide (Contd.)

Item No	Related Software
<a href="#">XX692</a>	MAPS™ GSM A
<a href="#">XX693</a>	MAPS™ GSM Abis
<a href="#">XX648</a>	MAPS™ ISDN
<a href="#">XX649</a>	MAPS™ SS7
<a href="#">XX651</a>	MAPS™ CAS
<a href="#">PKS120</a>	MAPS™ SIP
<a href="#">PKS122, PKS123</a>	MAPS™ MEGACO
<a href="#">PKS124</a>	MAPS™ MGCP w/ Conformance Test Scripts
<a href="#">PKS126</a>	MAPS™ SIP I
<a href="#">PKS138</a>	MAPS™ GPRS SGSN & GGSN
<a href="#">PKS131</a>	MAPS™ GPRS Gb over IP
<a href="#">PKS132</a>	MAPS™ MAP over IP
<a href="#">PKS137</a>	MAPS™ GSM A over IP
<a href="#">PKS160</a>	MAPS™ UMTS IuCS & IuH
<a href="#">PKS164</a>	MAPS™ UMTS IuPS
<a href="#">VBA038</a>	FaxScan™ for T.30
<a href="#">PKV104</a>	FaxScan™ for T.38
<a href="#">FXT001</a>	120 Fax ports licenses
<a href="#">FXT002</a>	GL Insight™ - Single Modem Analysis - IP

For more details, refer to [Traffic Simulation webpage](#) webpage.



**GL Communications Inc.**

818 West Diamond Avenue - Third Floor, Gaithersburg, MD 20878, U.S.A

(Web) [www.gl.com](http://www.gl.com) - (V) +1-301-670-4784 (F) +1-301-670-9187 - (E-Mail) [info@gl.com](mailto:info@gl.com)