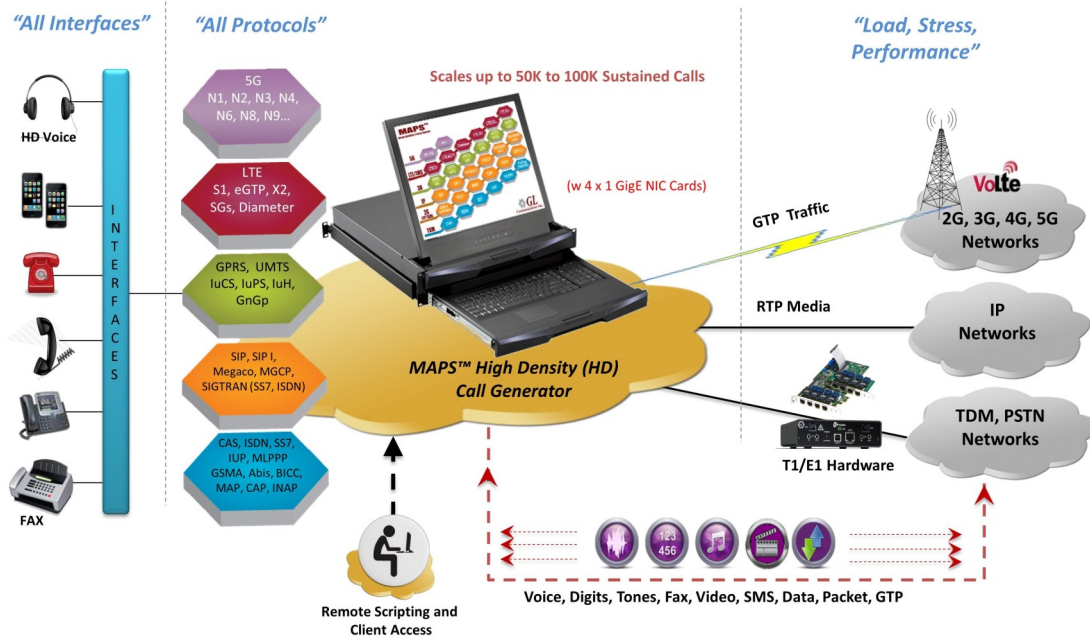# Traffic Simulation Software for Wireless, IP, and TDM Networks

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. Simulating traffic can be valuable to characterize the impairment as a function of traffic intensity and traffic types (e.g. Voice, Fax, Data, & 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 simulate 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 Simulation (ETH101, ETH102, ETH103)
- over LTE (S1, eGTP), UMTS (GnGp, IuPS), GPRS Gb interfaces
- RTP Traffic Simulation for IMS/IP Networks (PKS102, PKS106, PKS108, PKS200, PKS211)
- over SIP, SIP-I, MGCP, MEGACO, Diameter over IP interfaces
- RTP Traffic Simulation for Wireless Networks (PKS102, PKS108, PKS200)
- over UMTS IuCS & IuH, GSM A 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

With MAPS™ Client-Server application, MAPS™ supports a Command Line Interface (CLI) such as the TCL, Python, VBScript, Java, and .Net scripting tools, to provide the capability of remote operation, automation, and multi-site connectivity. 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.

For more details, visit Traffic Simulation webpage.

Features

	Traffic Type	License
GTP Mobile Traffic Simulation 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 N3(GTP),N6 (IP)	GTP Mobile Traffic Core – Stateful HTTP traffic simulation Simultaneous simulation of multiple GTP sessions per user	ETH101
	Packet Load (HD GTP Mobile Traffic Core)- Stateful high density packet traffic generation TCP/HTTP, UDP, and PCAP Replay	XXXXX
	Mobile Traffic Core – Gateway	ETH102
	Mobile Traffic Simulation - GPRS Gb	ETH103
RTP Traffic Simulation over SIP, SIP I, MGCP, MEGACO, UMTS, GSM, Diameter, and LTE networks	Create, manage RTP sessions and generate and receive RTP traffic over the sessions with complete automation capability Simulation of RTP Traffic such as Voice, Digits, Tones, IVR and Impairments Automate the 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.	PKS102
	Simulation of RTP Video Traffic (H.263 & H.264), Fax (Pass-thro & T.38)	PKS106
	RTP Voice Quality Measurements – MOS, R-Factor scores	PKS108
	Simulation of RTP FAX Traffic - G.711 Pass-thro and T.38	PKS200, and PKS211
SMS Traffic Simulation 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)).	
TDM Traffic Simulation over ISDN, SS7, GSM, CAS interfaces	Simulation of TDM Traffic such as digits, voice file, single tone, dual tones, IVR, Dynamic VF	XX610, XX620
	Simulation of TDM Fax Traffic	XXFT0
	TRAU GSM Traffic over GSM Abis interface Create, monitor, and terminate TRAU GSM traffic sessions	XX646

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Analog and TDM Traffic Simulation

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.
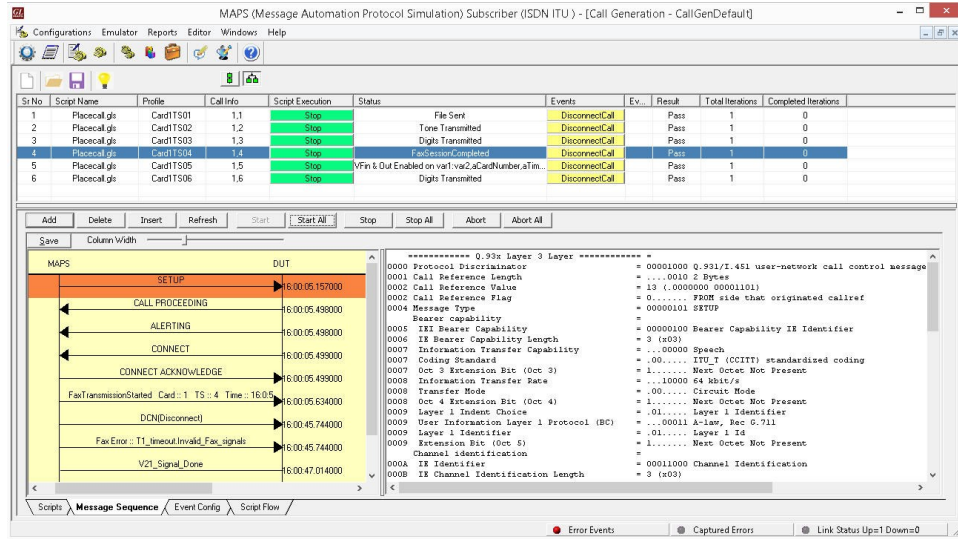
TDM traffic simulation using MAPS™ ISDN, MAPS™ SS7, MAPS™ GSM A, and MAPS™ FXO FXS

Figure: Traffic simulation 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 simulation in Circuit Switch (CS) network.

This feature is supported in MAPS™ GSM A over IP, MAPS™ MAP, and MAPS™ UMTS IuCS & IuH applications.
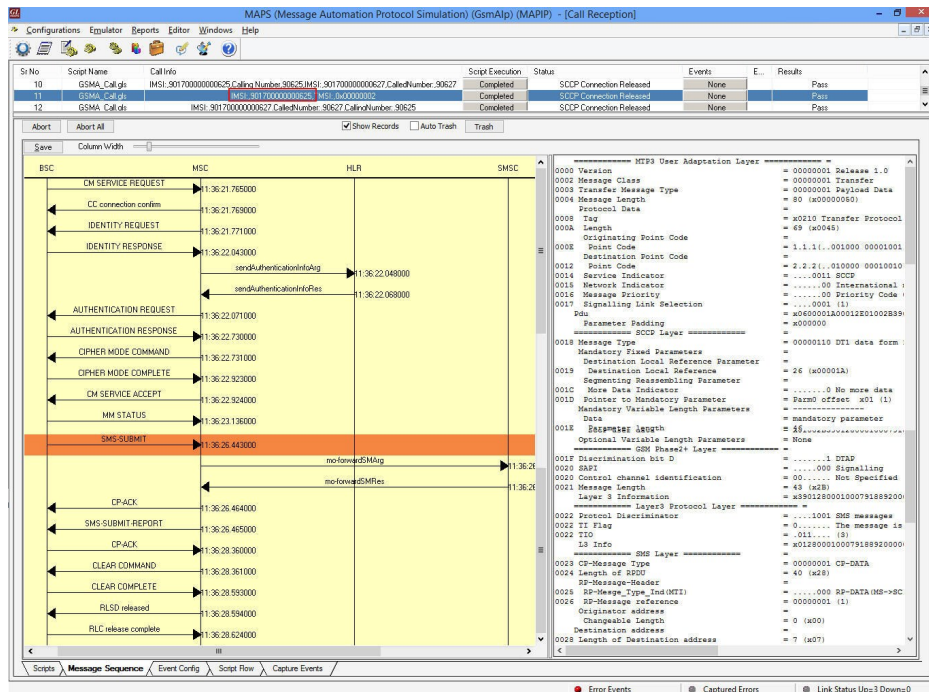
Figure: SMS test solution

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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 & 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.
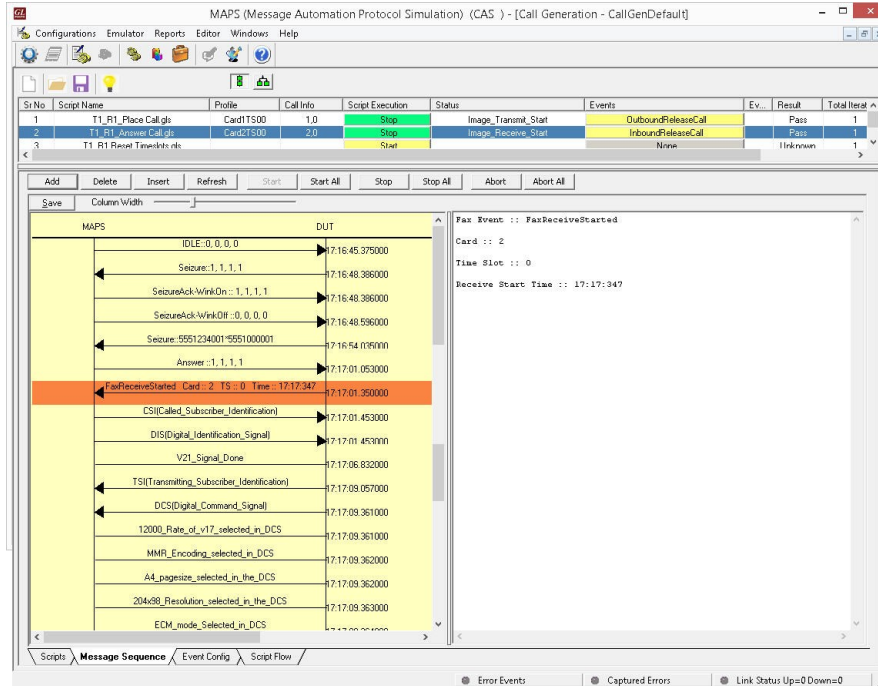
Figure: Fax simulation

GSM TRAU Traffic Simulation

For GSM, TRAU (Transcoder Rate Adapter Unit) traffic simulation (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 simulation is applicable for MAPS™ GSM Abis application only.
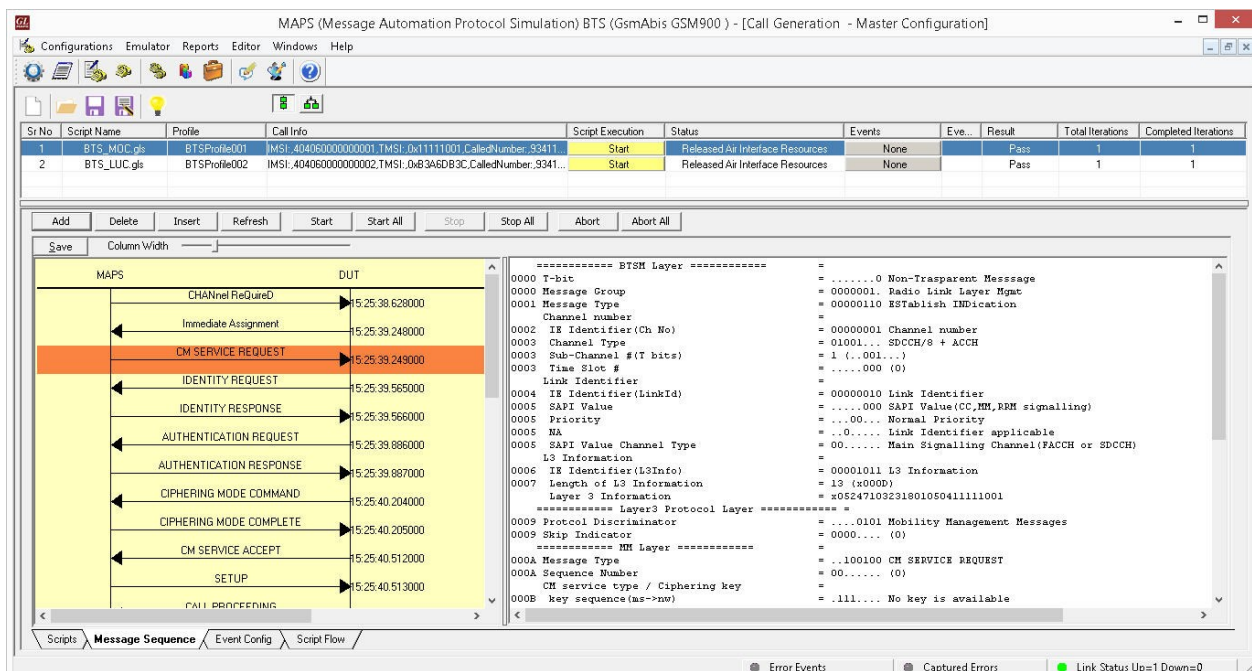

Figure: GSM TRAU traffic simulation

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. Currently, RTP Video simulation is supported only in MAPS™ SIP.
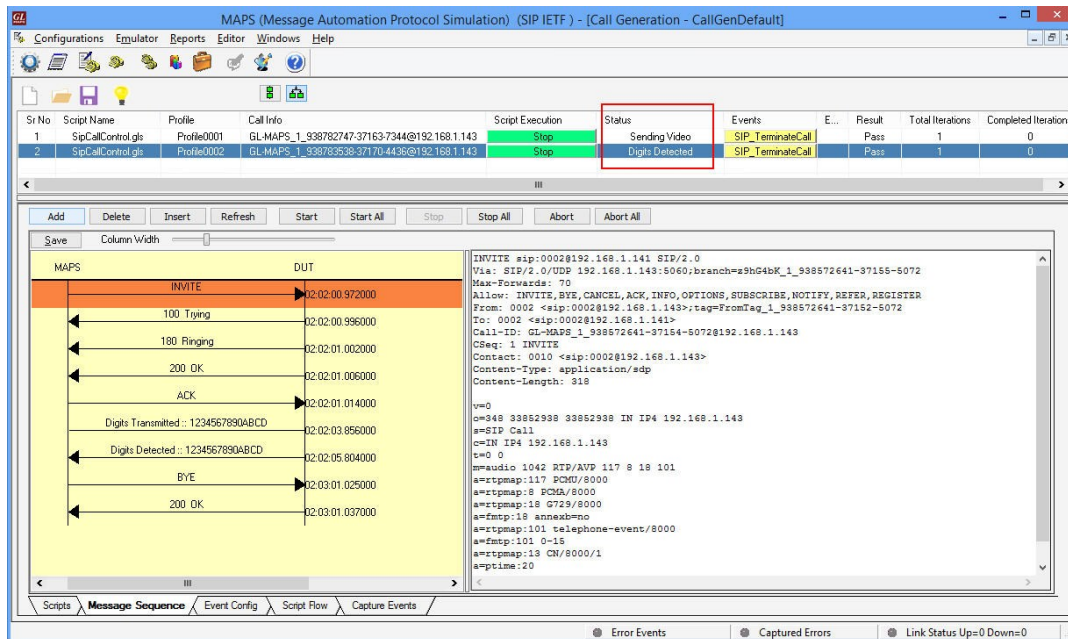
Figure: RTP Traffic simulation

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.
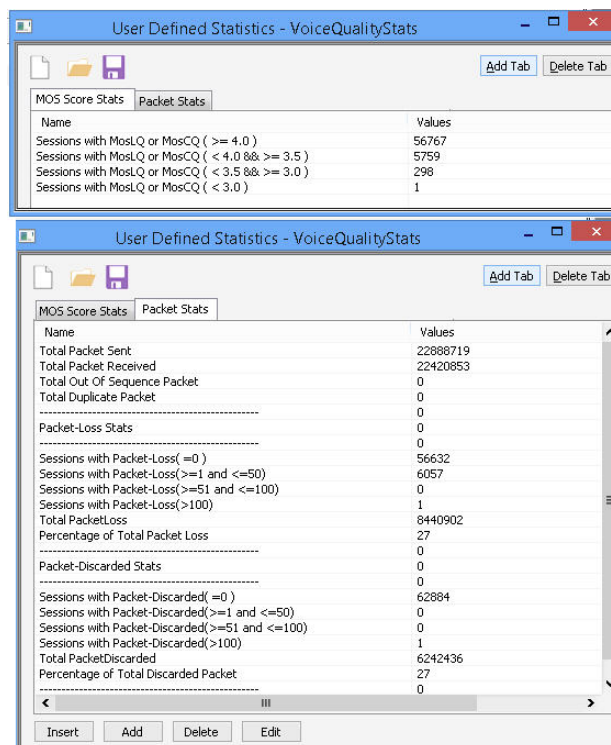

Figure: Voice quality measurements

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.
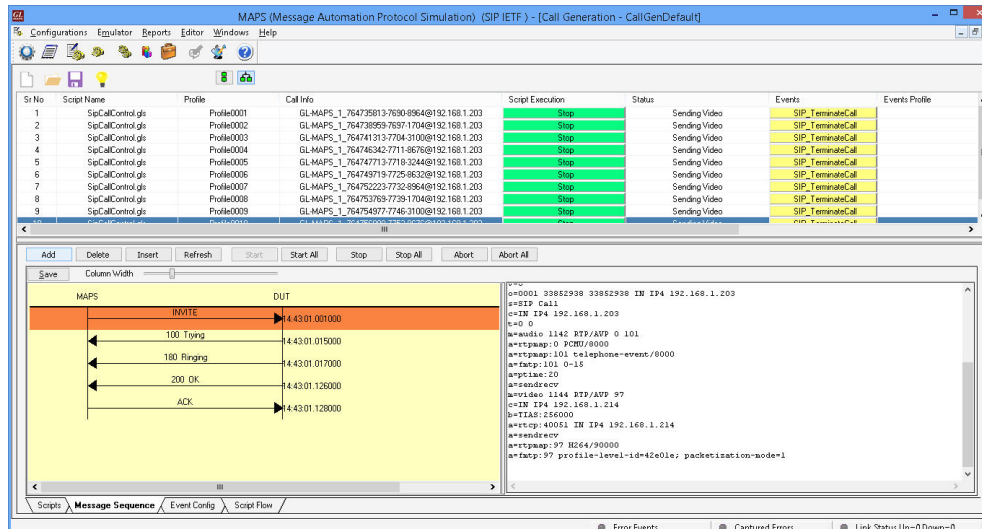

Figure: Voice quality measurements

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.
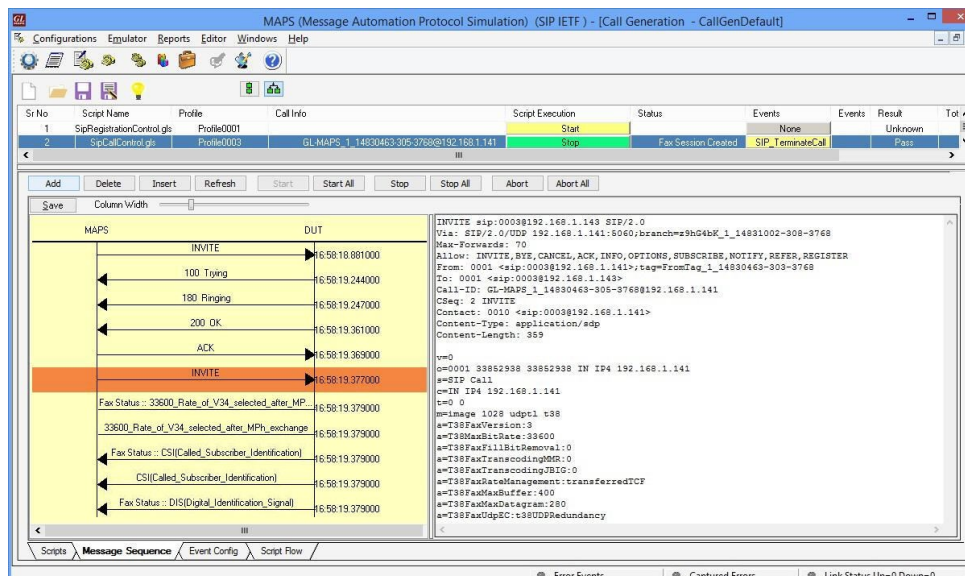

Figure: Voice quality measurements

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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 N3 and N6.
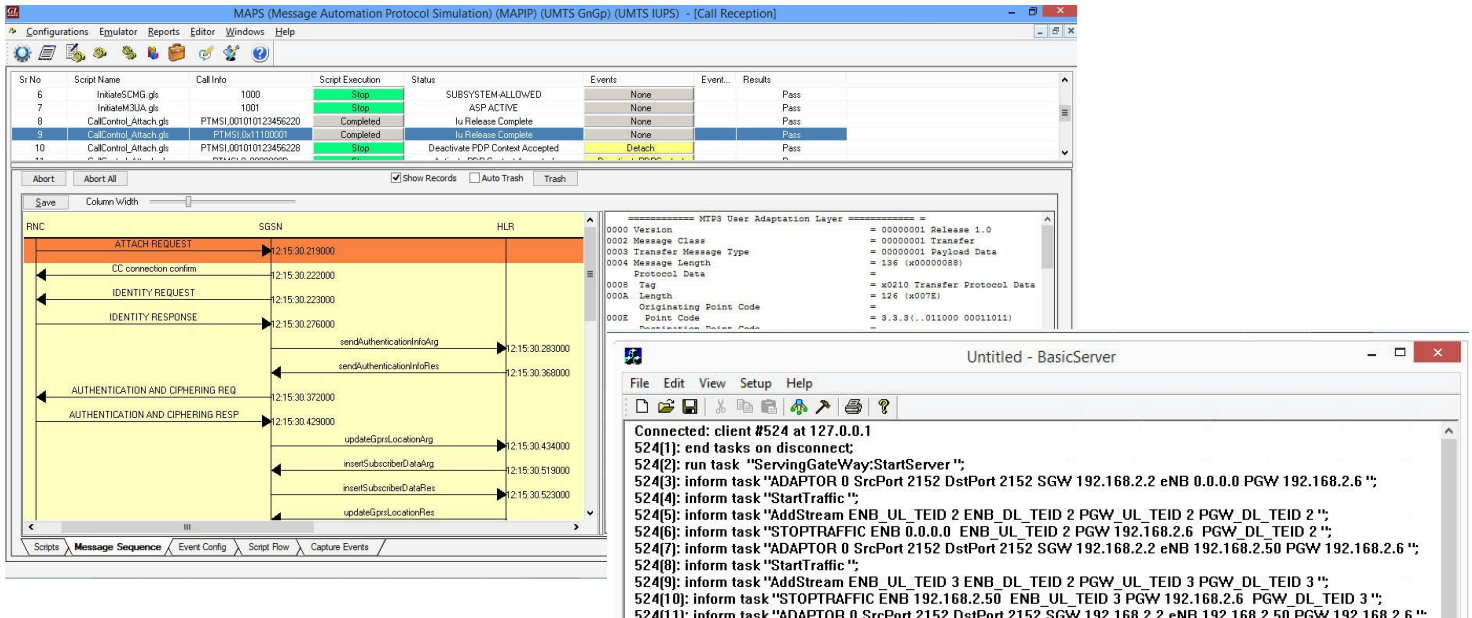
Figure: Mobile Traffic Server Log

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

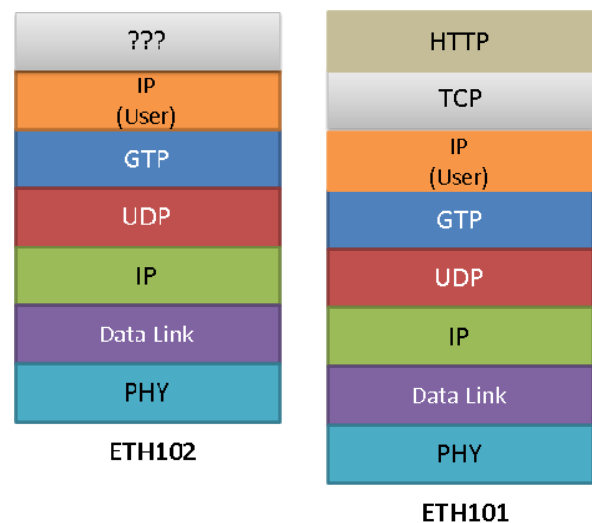UDP: User Datagram Protocol

IP: Internet Protocol

Figure: Packet Traffic Simulation (ETH100)

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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.
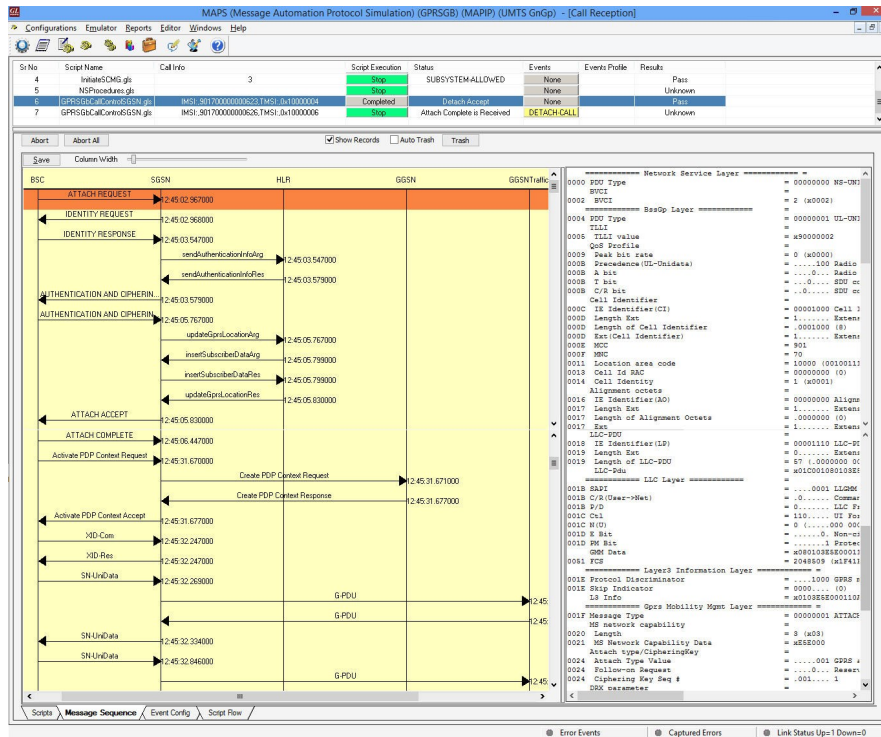

Figure: GPRS Gb Mobile Traffic Simulation (ETH103)

Packet Load - HD Mobile Traffic GTP

GL's MAPS™ platform with Packet Load appliance provides high density (up to 4 Gbps) stateful TCP/HTTP, UDP, and PCAP Replay traffic simulation solution in UMTS (SGSN, GGSN, RNC), and LTE (SGW, PDNGW) networks. Packet Load is a 1U network appliance that includes 4 x 1GigE ports supporting total capacity of up to 4 Gbits/sec stateful packet traffic generation.

To verify bearer allocation bandwidth at the end points, the packet traffic can be generated with GL's MAPS™ UMTS / LTE simulators along with Packet Load module that allow to encapsulate the generated packet data within GTP headers and transmit through the gateway points such as SGSN & GGSN, or SGW & PGW.

MAPS™ with Packet Load is used to verify the received data with the various statistics like Total packets transmitted and received, Latency, Delay, Bandwidth, No of TCP connection created, Successful connection, Packet loss, and so on.
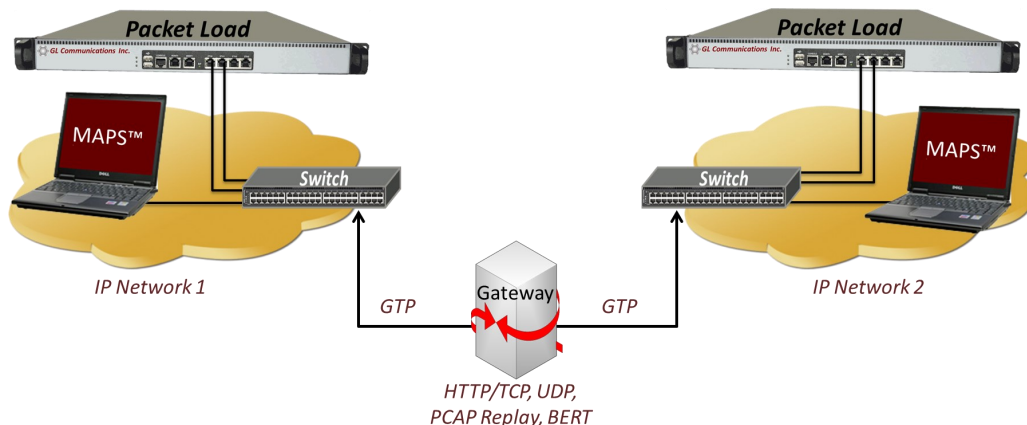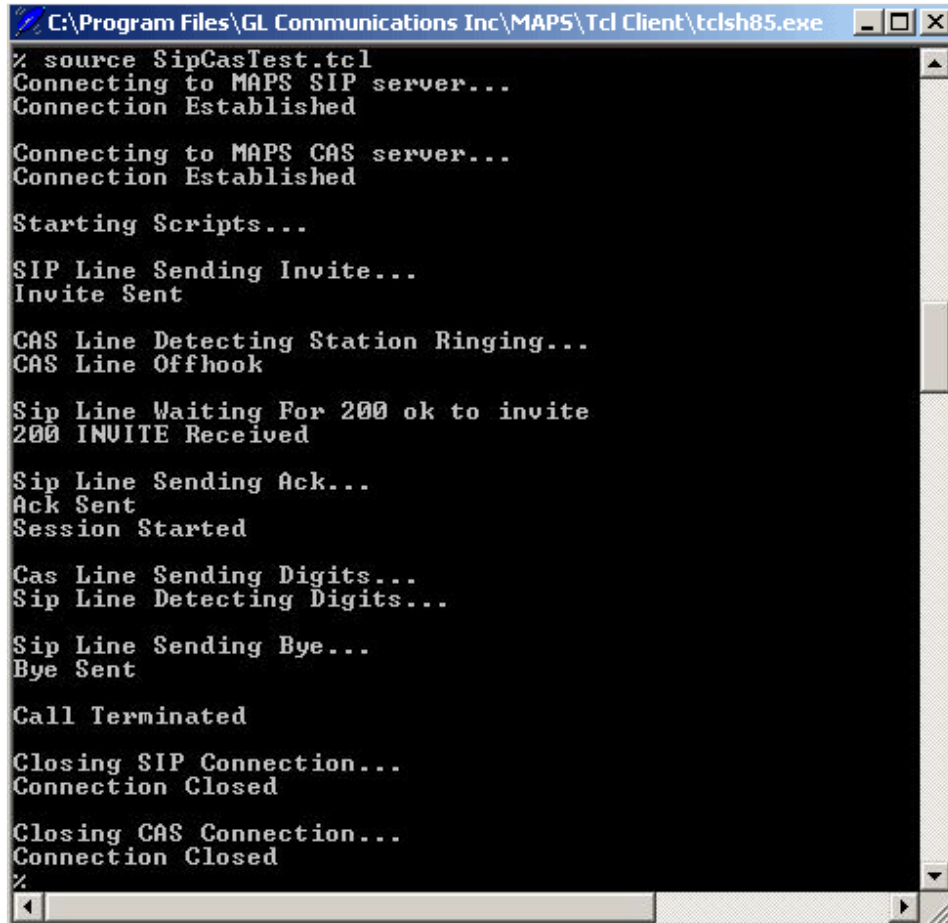

Figure: Packet Load connected to MAPS™ in the network

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Automated Traffic Simulation using CLI

In addition to the GUI, MAPS™ can also be operated through a Command Line Interface (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.

Figure: Traffic Simulation between IP to TDM

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Buyer's Guide

Item No	Product Description
ETH100	Packet Traffic Simulation - GTP
ETH101	Mobile Traffic Core-GTP
ETH102	Mobile Traffic Core-Gateway
ETH103	Mobile Traffic - Gb
PKS102	RTP Soft Core for RTP Traffic Generation
PKS103	RTP IuUP Softcore
PKS106	RTP Video Traffic Generation
PKS107	RTP EUROCAE ED137
PKS108	RTP Voice Quality Measurements
PKS200	RTP Pass Through Fax Emulation
PKS211	T.38 Fax Simulation
XX610	File based Record/Playback (includes xx600)
XX620	Transmit/Detect digits (Place Call/ Answer Call)
XXFT0	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
XX646	Multi-Channel TRAU Tx/Rx Emulation and Analysis
XX624	MAPS™ FXO FXS Emulator

Buyer's Guide

Item No	Related Software
XX692	MAPS™ GSM A
XX693	MAPS™ GSM Abis
XX648	MAPS™ ISDN
XX649	MAPS™ SS7
XX651	MAPS™ CAS
PKS120	MAPS™ SIP
PKS122, PKS123	MAPS™ MEGACO
PKS124	MAPS™ MGCP w/ Conformance Test Scripts
PKS126	MAPS™ SIP I
PKS166	MAPS™ GnGp
PKS138	MAPS™ GPRS SGSN & GGSN
PKS131	MAPS™ GPRS Gb over IP
PKS132	MAPS™ MAP over IP
PKS137	MAPS™ GSM A over IP
PKS160	MAPS™ UMTS IuCS & IuH
PKS164	MAPS™ UMTS IuPS
VBA038	FaxScan™ for T.30
PKV104	FaxScan™ for T.38
FXT001	120 Fax ports licenses
FXT002	GL Insight™ - Single Modem Analysis - IP

For more details, refer to Traffic Simulation webpage webpage.