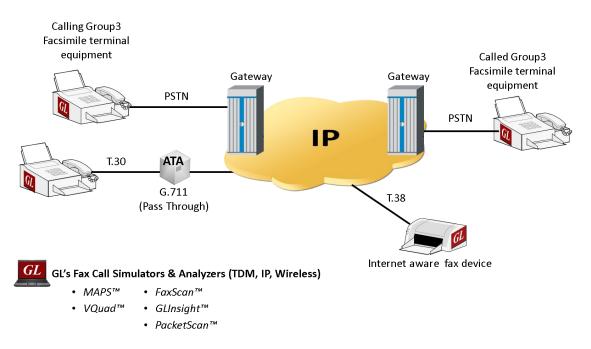
Fax Simulation over IP



Overview

GL offers a variety of test tools to perform **FAX over IP (FoIP)** simulation and monitoring. Fax simulator supports both **RTP G.711 Pass Through Fax Simulation (PKS200)** and **T.38 Fax Simulation over UDPTL (PKS211)**. Almost all MAPS[™] IP based simulation products supports FAX simulation using any of these two methods. Typical applications of our Fax Simulators include load testing of fax servers, qualification testing of T.38 Gateways, testing of ATAs (Analog Terminal Adapters), testing of internet-aware fax machines, and many more. With respect to channel capacity RTP pass-through and T.38 fax simulation over UDPTL supports up to 120 concurrent Fax channels.

GL's **RTP Fax Simulator** simulates multiple Pass-Through fax calls. Fax Pass-Through mode is a method of transmission of modulated fax data over an IP transport. The support for simulation of Fax over IP in Pass-Through mode (using G.711 PCMU and PCMA) has been recently introduced in all IP based MAPS[™] simulation products supporting RTP traffic simulation over an established call.

With RTP Fax Simulator you can transmit pre-recorded Tiff image to the DUT (Real-time Fax machine), receive Pass-Through fax from the DUT, and record complete fax call messages as log file along with a Tiff image. Typical applications of our RTP Fax Emulation software are load testing of fax servers, qualification testing of T.38 Gateways, testing of ATAs (Analog Terminal Adapters), testing of internet-aware fax machines, and many more.

As Fax is not ideally suited to travel via a normal phone call, the T38 protocol was developed compliant with **ITU-T T.38 (03/2002).** A much robust approach is offered using **T.38 Fax Relay protocol**, with redundancy, re-transmission, and efficiency. Implementation of this protocol uses UDPTL to transport T.38 frames.

All GL's call generators such as <u>MAPS</u>[™], and <u>VQuad</u>[™] supports pass-through RTP fax calls for G.711 PCMU and G.711 PCMA codec. Recently added is the ability to perform Fax Simulation using T.38 Fax Relay protocol over UDPTL.

For more information, please visit Fax Simulation over IP webpage.

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Main Features

Fax Standards	V.34, V.21, V.27, V.29, V.8 and V.17
Data Rate	2400 bps to 33600 bps
ECM/nonECM	supported
Channel Capacity	For T.30 - 2 to 120 ports supported
Page sizes	A4, A3, B4, letter, legal
Page Resolutions	204x98, 204x196, 204x391, 408x391, 200x200, 300x300, 400x400
Error Correction Strategies	T.38 - FEC or Redundancy
Rate Management	T.38 - Rate Management 1 (local tcf) or Rate Management 2 (transferred tcf)
Compression	Modified Huffman (MH), Modified READ (MR), or Modified-Modified READ (MMR) Encoding
Fax Call Quality Statistics	Provides fax call quality parameters like Received Page Count, Received Page Error Count, Re- ceived Byte Count, Received Line Count, Received Bad Line Count, Received Bad Pkt Count,

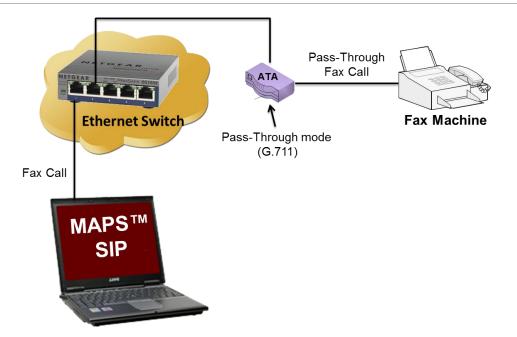
Fax Emulation Applications

- Load Testing sending or receiving up to hundreds of faxes simultaneously.
- V.34 Testing there are many fax modulations and V.34 is the fastest, permitting many pages to be transmitted quickly.
- High Speed / Low Speed fax protocol consists of low speed handshaking and high speed image transmission
- Multiple Pages single or multiple page fax transmission is supported
- With or without ECM Error Correction Mode permits the retransmission of erred pages.
- a-law and µ-law- In TDM networks, USA uses µlaw and the rest of the world use A-law both coding standards are supported
- Over PSTN, IP Fax transmission over PSTN FXO / FXS lines, or over VoIP (packet) networks
- Transmit / Record Tiff image and log Facsimile messages to a log file

Generation of Fax Call using MAPS[™] (T.30)

MAPS™ SIP can initiate a typical SIP call to the ATA which is configured in Pass through fax mode. Now, the ATA will initiate the call to the connected real time fax machine. Once the call is established **MAPS™** can transmit pre-recorded tiff image in pass-through mode to the fax machine at the other end. Similarly, fax generated from real fax machine can be recorded in the tiff format, and the fax call flow can be analysed in-detail for further troubleshooting.





MAPS[™] allows the user to initiate fax calls by sending call control messages using proper scripts and profiles. The profile allows necessary parameters of call control messages to be changed during runtime. The below figure depicts the fax call being generated using MAPS[™] SIP.

<u>14</u>		MAPS (Message Automation P	rotocol Simulatio	on) (SIP IETF) - [Call Gener	ation - CallGe	nDefault]			- 0 🔜
	tor <u>R</u> eports <u>E</u> ditor <u>W</u> indows								- 8
Q 🖉 🍇 🧇 🗌	🌭 🖌 📁 🦪 🐇 🥹								
🗅 🧀 🔒 💡	8 4]							
Sr No Script Name	Profile	Call Info	Script Execution	Status	Events	Events Profile	Result	Total Iterations	Completed Iterations
1 SipCalCo	ntrol.gls Profile0002	GL-MAPS_1_522389923-10627-11200@192.168.1.196	Start	Call Terminated	None		Pass	1	1
Add Delete	Insert Refresh St	art Start All Stop Stop All Abor	t Abort All						
Save Column W	īdth								
MAPS		DUT			•				^
MALO	INVITE				-				
F6:5247.697000									
	100 Trying	16:52:47.705000							
┥	180 Ringing	16:52:47.706000							
200 OK 16.52.47.707000									
	ACK								
		16:52:47.710000							
	Fax Status :: Send Fax Started	16:52:47.712000							
	Fax Status :: NEG_V34_33600	16:52:56.513000							
	Fax Status :: V21_Signal_Done	16:52:56.734000			_				
E	x Status :: CSI(Called_Subscriber_Iden	Niestian			-				
		16:52:57.253000			v <				> ~
Scripts Message S	()	Baw /							

Figure: Fax Call Generation using MAPS™

The below figure display RTP fax call being transmitted successfully using MAPS[™] SIP.

) ate/Time	Captured Events	Call Trace Id	Script Name	Script Id
15-1-15 15:27:08 544000	UDP Port = 5060		SIP-Protocol.als	CGProtScriptId 14 187697168-4524-643
15-1-15 15:27:08.544000	INVITE Sent		SIP-Protocol.gls	CGProtScriptId 14 187697168-4524-643
)15-1-15 15:27:08.556000	PROGRESS Received	GL-MAPS 1 187697169-4528-8320@192.168.1.203	SipCallControl.gls	CGProtScriptId 14 187697168-4524-643
15-1-15 15:27:08.556000	PROGRESS Received		SIP-Protocol.gls	CGProtScriptId 14 187697168-4524-643
15-1-15 15:27:08.556000	PROGRESS Received	GL-MAPS 1 187697169-4528-8320@192.168.1.203	SipCallControl.gls	CGProtScriptId 14 187697168-4524-643
15-1-15 15:27:08.673000	ACK Sent		SIP-Protocol.gls	CGProtScriptId 14 187697168-4524-643
15-1-15 15:27:08.673000	Call Connected	GL-MAPS_1_187697169-4528-8320@192.168.1.203	SipCallControl.gls	CGProtScriptId 14 187697168-4524-643
15-1-15 15:27:08.678000	Sending RTP Fax	GL-MAPS_1_187697169-4528-8320@192.168.1.203	SipCallControl.gls	CGProtScriptId_14_187697168-4524-643
15-1-15 15:27:32.397000	RTP Fax Sent	GL-MAPS_1_187697169-4528-8320@192.168.1.203	SipCallControl.gls	CGProtScriptId_14_187697168-4524-643
)15-1-15 15:27:39.386000	BYE Sent		SIP-Protocol.gls	CGProtScriptId_14_187697168-4524-643
015-1-15 15:27:39.394000	200 Ok to BYE Recevied		SIP-Protocol.gls	CGProtScriptId_14_187697168-4524-643
)15-1-15 15:27:39.394000	Call Terminated	GL-MAPS_1_187697169-4528-8320@192.168.1.203	SipCallControl.gls	CGProtScriptId_14_187697168-4524-643
)15-1-15 15:27:39.394000	Inter Call Duration = 1000	GL-MAPS_1_187697169-4528-8320@192.168.1.203	SipCallControl.gls	CGProtScriptId_14_187697168-4524-643

Figure: Successfully RTP Fax Events

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Fax Call Scenario

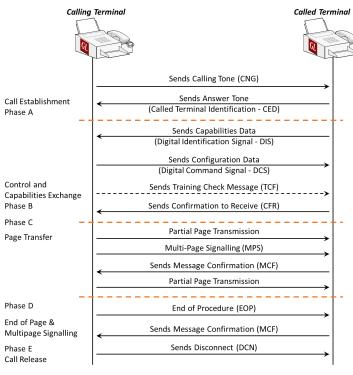


Figure: Fax Call Scenario

RTP Fax File

GL provides several .tif fax files for transmission/reception. Files were designed by the CCITT (Consulting Committee for International Telephone and Telegraph) many years ago.

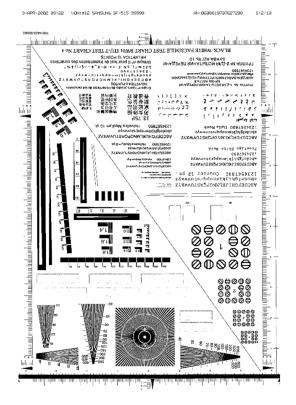


Figure: RTP Fax File

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Fax Simulation using MAPS[™] (T.38)

The fax call originating in PSTN network from Group3 Facsimile equipment, switches from analogue mode to digital mode between the gateways, and then again falls back to analogue mode in PSTN network at the receiving end. The T.38 Fax relay protocol is used to carry the fax control signals and image data between the gateways over the IP network.

GL's MAPS[™] SIP is a useful tool for simulation of T.38 fax call. It uses SIP signaling to establish the session, and it sticks to standards like ITU-T T.30, ITU-T T.38, ITU-T T.4, ITU-T V.8, ITU-T T.6 during fax call. One could configure MAPS[™] to perform different types of action like transmit file, digits, tones or Talk in audio mode before switching over to T.38 mode.

MAPS[™] SIP generates Re-Invite to switch from audio mode to image (FAX) mode.

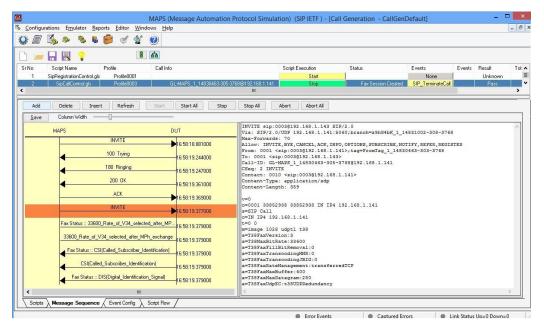


Figure: Fax Call Generation using MAPS™

While the call in progress, as depicted in the below screen, the MAPS[™] also provides events related to the progress of the call.

Date/Time	Captured Events	Call Trace Id	Script Name	Script Id
2015-9-29 17:58:19.820000	Fax - Status: DCS(Digital_Command_Signal)			
2015-9-29 17:58:19.820000	Fax - Status: CFR(Confirmation To Receive)			
2015-9-29 17:58:19.821000	Fax - Status: CFR(Confirmation To Receive)			
2015-9-29 17:58:19.822000	Fax - Status: PPS EOP(Partial Page Signal End Of Procedure)			
2015-9-29 17:58:19.823000	Fax - Status: DCN(Disconnect)			
2015-9-29 17:58:19.823000	Fax - Status: Fax Session Successful			
2015-9-29 18:01:54.855000	BYE Sent			
2015-9-29 18:01:54.870000	200 Ok to BYE Recevied			
2015-9-29 18:01:54.870000	Call Terminated			
2015-9-29 18:01:54.870000	Inter Call Duration = 1000			
2015-9-29 18:02:54.776000	INVITE Sent			
2015-9-29 18:02:54.786000	PROGRESS Received			
2015-9-29 18:02:54.786000	PROGRESS Received			
2015-9-29 18:02:54.788000	PROGRESS Received			
2015-9-29 18:02:54.788000	PROGRESS Received			
2015-9-29 18:02:54.908000	ACK Sent			
	Call Connected			
2015-9-29 18:02:54.927000	ACK Sent			
2015-9-29 18:03:19.875000	Fax - Status: Sending Fax			
2015-9-29 18:03:19.876000	Fax - Status: DIS(Digital_Identification_Signal)			
2015-9-29 18:03:19.877000	Fax - Status: DIS(Digital_Identification_Signal)			
2015-9-29 18:03:19.877000	Fax - Status: DIS(Digital_Identification_Signal)			
2015-9-29 18:03:19.878000	Fax - Status: DIS(Digital_Identification_Signal)			
2015-9-29 18:03:19.879000	Fax - Status: DCS(Digital_Command_Signal)			
2015-9-29 18:03:19.879000	Fax - Status: DCS(Digital_Command_Signal)			
2015-9-29 18:03:19.880000	Fax - Status: DCS(Digital_Command_Signal)			
2015-9-29 18:03:19.881000	Fax - Status: CFR(Confirmation_To_Receive)			
2015-9-29 18:03:19.881000	Fax - Status: CFR(Confirmation_To_Receive)			
2015-9-29 18:03:19.882000	Fax - Status: PPS_EOP(Partial_Page_Signal_End_Of_Procedure)			
2015-9-29 18:03:19.883000	Fax - Status: DCN(Disconnect)			
2015-9-29 18:03:19.883000	Fax - Status: Fax Session Successful			
2013 3 23 10.03.13.003000				

Figure: Successfully Fax Events

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Fax Call Scenario

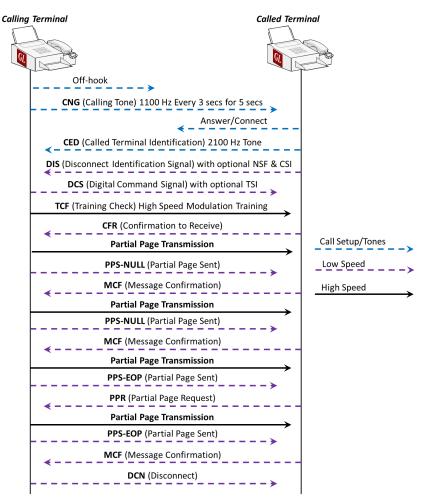


Figure: Fax Call Scenario

T.38 Fax Call Quality Statistics

After completion of the call, as depicted in the below screenshot, MAPS[™] provides call quality statistics.

GL			MAPS (Messag	e Automation Protocol Simu	lation) (SIP IET) - [Call Generation -	CallGenDefault]		- 🗆 🗙
🍕 <u>C</u> onfigu	rations E <u>m</u> ula	itor <u>R</u> eports <u>E</u> ditor	<u>W</u> indows <u>H</u> elp						_ 8 ×
Q 🖉	🍝 🧶 '	S 🖡 🎒 🍼 -	🔮 🕐						
🗋 🗀		2	8 क						
Sr No	Script Name		Profile	Call Info		Script Execution	Status	Events	Events Profile
1	s	ipCalControl.gls	Profile0001	GL-MAPS_1_867920-4840-250	14@192.168.1.203	Stop	Fax Session Successful	SIP_TerminateCall	
٢				ш					>
Add	Delete	Insert Refresh	Start Start	t All Stop Stop All	Abort Abo	t All			
Save	Column W	idth]						
	Fa	ax Status :: PPS_MPS(Parti	al_Page_Signal_MultiPage	_Signal) 16:13:37.369000	▲ T1	ansmitted Page Count	= 2, Transmitted Byte Count	= 24960, Transmitted L:	ine Count = 4308 ^
		Fax Status ::	V21_Signal_Done	-					
		East Status v MCD	(Message_Confirmation)	16:13:37.369000					
				16:13:37.369000					
		Fax Status :: In	nage_Transmit_Start	16:13:37.369000					
		Fax Status :: Ir	mage_Transmit_End	16:13:37.369000					
	Fao	x Status :: PPS_EOP(Partia	I_Page_Signal_End_Of_Pr	ocedure)					
		Enu Status	V21_Signal_Done	16:13:37.370000					
				16:13:37.370000					
		Fax Status :: MCF	(Message_Confirmation)	16:13:37.370000					
		Fax Status ::	DCN(Disconnect)	16:13:37.370000					
		Fax Status ::	V21_Signal_Done	16:13:37.370000					
		Fax Statu	us :: Successful		=				
				16:13:37.370000					
	Fax Statu	is :: Transmitted Page Cour	nt = 2, 1 ransmitted Byte Lo	int = 24960,					
K		ш			` <				>
Scripts	Alessage S	equence / Event Config	g \ Script Flow /						
						Erro	r Events 🛛 🚇 Captured	Errors 🛛 🚇 Link St	atus Up=0 Down=0

Figure: T.38 Fax Call Quality Statistics

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Supported Data Rate and Protocol

The Fax Emulator supported transmission Group 3 protocols include:

Data Rates (Kbps)	ITU Standard V.27 V.29	V.17	V.34 V.34bis
2.4	Х		х
4.8	Х		х
7.2	Х	х	х
9.6	Х	Х	х
12		Х	Х
14.4		Х	х
16.8			х
19.2			х
21.6			х
24			х
26.4			х
28.8			х
31.2†			х
33.6†			х

Supported File Formats

- G.711 A-law encoded 8-bit samples.
- G.711 µ-law encoded 8-bit samples
- 16-bit linear samples that utilize only the low 13 bits. The upper 3 bits are sign extended.
- 16-bit linear samples utilizing all 16-bits
- Fax Image Output
 - Class-F TIFF format as specified in RFC 2301
- Pcap, ngpcap file format for T.38



Buyer's Guide

Item No	Product Description
<u>PKS211</u>	T.38 Fax Simulation over UDPTL
<u>PKS200</u>	RTP Pass Through Fax Emulation, requires one of the licenses below, (w/dongle)
PKS202	Fax Port Licences (2 Fax Ports, RO)
PKS203	Fax Port Licences (8 Fax Ports, RO)
PKS204	Fax Port Licences (30 Fax Ports, RO)
PKS205	60 Fax Ports, RO
PKS206	120 Fax Ports, RO

Item No	Related Software/Hardware
<u>VBA032</u>	Near Real-time Voice-band Analyzer
<u>FXT001</u>	GL Insight™ - Single Fax Analysis - TDM
<u>FXT002</u>	GL Insight™ - Single Fax Analysis - IP
<u>PKV100</u>	PacketScan™
<u>UTE001</u>	Portable USB based Dual T1 or E1 Laptop Analyzer
<u>VQT022</u>	VQuad™ 2 Ports Fax Emulation (2-wire, & 4-wire)
<u>VQT022a</u>	VQuad™ 8 Ports Fax Emulation (2-wire, & 4-wire)
<u>VQT035</u>	2-Wire Voice/Data Capture
<u>VQT241</u>	Dual Universal Telephony Adapter (UTA)

For more information, please visit <u>Fax Simulation over IP</u> webpage.



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