Test & Measurement Solutions
For Telecom Network
GL Communications Inc.

IP and Ethernet Simulation & Analysis
All Protocols over IP, TCP, UDP
Signaling, Traffic, Voice, Video, & Data QoS
10 GigE, MPLS, VLAN, SLA

Wireless Simulation & Analysis
LTE, VoLTE, UMTS, GSM, TRAU, GPRS
Wireless Drive Testing, GPS Mapping
Signaling, Traffic, Voice, Video, & Data QoS

TDM Simulation & Analysis
Signaling & Traffic
T1, E1, Analog, FXO, FXS

High Speed Telecom Lines
OC-3, OC-12, STM-1, STM-4, T3, E3
Channelized & Unchannelized

Voice, Fax, Data, & Video Quality
IP, TDM, PSTN, 3G 4G, 2G, Bluetooth
PESQ, POLQA

Network-wide Monitoring Solutions
Signaling & Traffic
VoIP, TDM, Wireless

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- IP and VoIP Testing, Installation and Maintenance

- Evaluation and testing of high speed telecom lines (OC-3, OC-12, STM-1, STM-4, T3, E3 etc.)

- T1, E1, T3, E3, Analog - Testing, Installation and Maintenance

- Wireless (2G, 3G, 4G) Testing, Installation and Maintenance

- Network-Wide Voice, Video, and Data Quality Test Solutions

- Echo Measurement, and Simulation, Echo Canceller Testing Solutions
Company Profile

GL Communications has over the years worked with major telecom equipment vendors (EVs) and system integrators to meet the testing requirements arising at various stages of telecommunications product development life-cycle.

With its proven expertise of over 25 years, GL has a comprehensive suite of telecom testing solutions to verify and ensure 'quality and reliability' of variety of telecom networks including Wireless, and high-speed fiber optic lines. A privately held company, founded in 1986, GL offers customers a team of seasoned experts with a broad understanding of the specific challenges they face and the technical creativity to meet complex requirements.

Unlike conventional test equipment, our test platforms provide unprecedented visualization, capture, storage, & features without sacrificing portability, convenience, or cost-effectiveness.

GL's test tools range from simple PC-based software test tool to all-encompassing hardware units with futuristic expansion capacities. GL's test solutions cover wide array of networks -4G (LTE), 3G, IP, Ethernet, T1, T3, E1, E3, OC-3/STM-1, OC-12/STM-4, and traditional PSTN networks.

The tools are widely used by the telecommunication industry for conformance testing, automated stress/load testing, performance testing, remote accessibility, centralized web-based control and analysis, fault testing and analysis, and customized testing.

GL Communications Inc. provides consulting services for telecommunication companies all around the world. We offer consulting services for T1/E1, T3/E3, SONET/SDH testing and analysis, and system design of wireless, satellite, fiber optic, and microwave networks. Please visit www.gl.com for any additional information regarding GL's consulting services.

A broad classification of the test and measurement solutions based on different networks is detailed in this brochure

Visit [http://www.gl.com](http://www.gl.com) for more details.
VoIP Network Analysis & Simulation Products

PacketExpert™ - 1Gbps, 10 Gbps Quad Port Ethernet and Optical Tester
Wirespeed BER, Record Playback, WAN Emulation, SLA Testing, PacketBroker

PacketExpert™ HD – 12 /24 Port Ethernet and Optical Tester

PacketScan™ HD
High Density Network Monitoring

MAPS™ HD
High Density Network Simulation

For more details, please visit - http://www.gl.com/voipanalysis_simulation.html
VoIP Network
Analysis & Simulation Products

Summary of Products

- **PacketScan™ (available in Basic, HD Versions)** - Captures live high-density VoIP traffic, visual analysis, Call QOS with E-model based MOS & R-factor scores; All - IP Protocol Analysis — SIP, SIGTRAN, MGCP, MEGACO, H.323, GSM, GPRS, UMTS, LTE, Diameter, and more.

- **PacketProbe™** - Embedded CPE based VoIP Monitoring Probe

- **MAPS™ VoIP (available in Basic, HD Versions)** - High-density VoIP call generation with traffic for performance testing and troubleshooting; The application gives users the unlimited ability to edit messages and control scenarios (message sequences).
  - UMTS IuCs and IuH
  - UMTS IuPs, Gx, Gq
  - LTE X2, S1, eGTP
  - Diameter S6a, S6d, S13, Cx/Dx, Gx, Rx, Sh
  - IMS (Mw, Mi, Mj)
  - SIP, SIP-I, MGCP, MEGACO, Skinny
  - SS7, and ISDN over IP (SIGTRAN)
  - GSM, BICC, MAP, INAP over IP
  - GPRS Gb

- **PacketExpert™ (available in 1G, 10G, and HD Versions)** -
  - 4, 12, and 24 Port (HD Only)
  - VLAN, MPLS, Q-in-Q, IP, UDP Tester
  - Electrical Ethernet and Optical Ports
  - Wire speed Packet Capture and Playback, PacketBroker
  - WAN IP Link Emulation
  - BERT, RFC2544, Y.1564 SLA Verification

- **IPNetSim™** - Simulates real-time conditions in IP network such as impairments (latency, packet loss, jitter) on a per call basis or throughout entire network

- **VQuad™ Probe, VQuad™ with DUAL UTA** - End-to-End Voice, Data, Video quality metrics for VoIP devices (soft phones, IP phones) with complete automation and centrally controlled system

- **PacketCheck™** - Ethernet performance analysis for 10Mbps, 100Mbps and 1Gbps

- **PacketShark™** - Handheld GigE Packet Capture, Filter and Aggregation Tap

- **RTPoolBox™** - Simulate RTP sessions independent of signaling and test RTP packets

- **PacketH323™** - H.323 Call Simulator

- **NetSurveyorWeb™** - Centralized report collection from PacketScan™ probes & remote monitoring using web-based clients

- **GLInsight™, FaxScan™** - Decode and analyze fax and modem calls over IP

Features

- Generate/analyze thousands of calls simultaneously over IP networks.
- Test individual links, switches, Gateways, IADs, IP phones, Soft phones, LAN, WAN, Core/MPLS networks
- Generate/analyze traffic over IP; Traffic types include voice files, digits, tones, T.38 fax, & modem
- Tap packet networks, capture Ethernet packets at wire speed, transmit the recorded traffic conditions to test the network
- Impairments generator - 1Gbps, 10 Gbps
- Ethernet, VLAN, Q-in-Q, MPLS, IPv4, IPv6, UDP testing at wire speed for applications such as BERT, RFC 2544, Y.1564 SLA, and Loopback testing
- Supports all industry standard codecs - G.711, G.729, G.726, AMR, EVRC, GSM, and more
- Visual analysis, real-time listening, recording, statistics
- Intrusive and non-intrusive test/monitoring solutions
- Automated test setup for monitoring IP networks
- Unlimited ability to edit IP protocol messages and control call scenarios
- Capture, storage and analysis of calls over packet network
- Centralized Network Monitoring System
- Network-wide Voice, Video, and Data Quality (QoS) Monitoring System
- Includes broadest range of test and simulation for echo testing
TDM / SONET / SDH / PSTN Network Analysis & Simulation Products

Dual T1 E1 Express (PCIe) T1/E1 Analyzer  
Quad / Octal T1 E1 PCIe Card  
Dual HD Universal-T1 E1 PCI Card  
OC3/OC12 PCIe Card LightSpeed1000™

tProbe - Portable USB based T1 E1 VF FXO FXS and Serial Data Analyzer  
Portable USB based Dual T1 E1 Analysis Unit  
tScan16™ - T1 E1 Analysis (16 Port Rx Only)  
Portable USB based Dual T3 E3 Analysis Unit

VQuad™ Probe

LinkTest™ SINGLE (LTS001)  
LinkTest™ SINGLE+ (LTS002)  
LinkTest™ DUAL (LTS003)

LinkSim™ (LTS101)  
LinkTest™ DualE1 (LTS010)  
vHandi (VQT290)

For more details, please visit - http://www.gl.com/hardware_platforms.html
Summary of Products

- **T1/E1 carrier and T3/E3 carrier Test Solutions** - Portable-USB Based, Handheld, and PC-based platforms available - Dual-port, Quad-port, High Density Octal-ports, High Density 16 T1/E1 Rx Ports

- **Serial Data Communications Analyzer** - Datacom Analyzer is an optional board available with GL's tProbe T1 E1 Analyzer USB Unit  non-intrusive monitoring of serial interfaces (X.21, V.24, V.35, RS-449, RS-485, EIA-530 and EIA-530A )

- **Optical Carrier Test Solutions – LightSpeed1000™** - Portable, and PC-based platforms available for wire-speed processing on quad optical ports. Supports wire-speed recording and playback of Unchannelized and Channelized ATM, PoS, and RAW Traffic over OC-12/STM-4, OC-3/STM-1 lines.

- **Optical Carrier Test Solutions – PacketExpert™ (available in 1G, 10G, and HD Versions) --**
  - 4, 12, and 24 Port
  - VLAN, MPLS, Q-in-Q, IP, UDP Tester
  - Wire speed Packet Capture and Playback
  - Electrical Ethernet and Optical Ports
  - WAN IP Link Emulation
  - BERT, RFC2544, Y.1564 SLA Verification

- **NetSurveyorWeb™** Centralized report collection from T1/E1/T3/E3/Optical probes & remote monitoring using web-based clients.

- **VQuad™ Probe, VQuad™ with DUAL UTA** - End-to-End Voice, Data, Video quality metrics for FXO, and TDM devices with complete automation and centrally controlled system

- **MAPSTM PSTN / TDM** - High-density TDM call generation with traffic for performance testing and troubleshooting; The application gives users the unlimited ability to edit TDM communication protocol messages and control call scenarios (message sequences).

- **GLInsight™, FaxScan™** - Decode and analyze fax and modem calls over PSTN, and TDM networks

- **Repeaters—Multi-port, T1E1J1 Switch**

Features

- All interfaces (Analog, T1, E1, Serial Interface, T3, E3, OC-3/STM-1, OC-12/STM-4 ) - Simulation and Analysis

- All traffic types (Voice, Digits, Tones, Fax, Modem) - Simulation and Analysis

- All protocols (SS7, ATM, MLPPP, ISDN, CAS, GSM, MAP, INAP, GPRS, TRAU, UMTS, Frame Relay, CDMA 2000, V5.x, HDLC, and more)

- Analyze/Simulate thousands of channels

- Unlimited ability to edit TDM communication protocol messages and control call scenarios

- Capture, storage and analysis of calls over PSTN and TDM network

- Network-wide Voice and Data Quality (QoS) Monitoring System

- Centralized Network Monitoring System

- Test signaling termination, detection , and analysis over PSTN switch, gateway, ISDN switch, TDM PBX, IP PBX networks

- Includes broadest range of test and simulation for echo testing
Test Wireless (2G, 3G, 4G) Infrastructure

For more details, please visit - www.gl.com/maps.html

For more details, please visit - http://www.gl.com/completevqtsolutions.html
Summary of Products

- **Testing IMS Network** - Mw, Mi, Mj interfaces - Analysis using GL’s **PacketScan™**, and Simulation using **MAPS™ IMS Simulator**

- **Testing LTE Network** - S1-u, S1-MME, X2, S3, S4, S5/S8, S6a, S10, S11, S13, S16 interfaces - Analysis using GL’s **PacketScan™**, and Simulation using GL’s **MAPS™ IMS Simulator**

- **Testing Diameter Core** - Simplify testing of the Diameter core signaling network interfaces such as S6a, S6d, S13, Cx/Dx, Gx, Rx, Sh interfaces - Analysis using GL’s **PacketScan™**, and Simulation using GL’s **MAPS™ Diameter Simulator**

- **Testing UMTS Network** - Iub, Iur, IuCS, IuH, and IuPS Interfaces - Analysis using GL’s **PacketScan™**, and Simulation using **MAPS™ UMTS Simulator**

- **Testing GSM Network** - A, Abis, Mobis, Gs, Ls, Lb, Lp, & Up interfaces; supported codec - AMR, HR, FR, EFR - Analysis using GL’s **GSM Analyzer or PacketScan™**, Simulation using **MAPS™** GSM Abis or **A Simulator**

- **Monitoring GPRS Network** - Simulate Gn Gp interface using **MAPS™ Gn Gp Simulator**, and monitor Gb, Gn, Gp, Gs interfaces - Analysis using GL’s **GPRS Analyzer or PacketScan™**.

- **Testing TRAU Protocols** using **TRAU Analysis, Playback and Simulator**

- **End-to-End Voice, Data, and Video QoS and Drive Testing** – VQuad™ Probe, VQuad™ with DUAL UTA - includes support for call control of variety of mobile device networks – from 2G to 4G LTE and beyond, including the capability of sending/recording voice, testing video conferencing, and testing a variety of data over the mobile devices, for evaluating Voice, Video, and Data Quality.

- **Monitoring CDMA2000 Network** - interfaces pertaining to packet transmission namely A1, A3/A7 - using GL’s **CDMA 2000 Analyzer**

- **PacketScan™ All IP Monitoring** — Capture and monitor live Voice, Video, and Fax traffic over IP with visual analysis, call QoS with E-model based MOS & R-factor scores; All-IP Protocols supported.

Features

- Network-wide Voice, Video, and Data Quality (QoS) Monitoring System

- **NetSurveyorWeb™** - Centralized report collection from **PacketScan™** probes & remote monitoring using web-based clients

- **MAPS™ for 2G, 3G, 4G, IMS** - Simulate up to 500 Smartphones (UEs) powering up and down

- All traffic types (Voice, Digits, Tones, Fax, Modem) - Simulation and Analysis

- Authenticate and confirm security procedures

- Long term activity recording with Web-based analysis and reporting

- Fixed or Field Testing Solutions

- Unlimited ability to edit wireless communication protocol messages and control call scenarios

- Perform end-to-end SMS testing and SMS testing between two entities within a Wireless infrastructure

- Automated Data testing for PC Internet connection (Broadband 3G/4G/LTE, WiFi, Wired) and Apple/Android Mobile Devices includes TCP, UDP, HTTP, VoIP, FTP, DNS, Email, and SMS.

- GPS and ITS location tracking with results overlay

- Includes broadest range of test and simulation for echo testing
Network-wide Voice, Video, & Data Quality Testing Products

- POLQA, PESQ, LQ/LQO/WB
- POLQA MOS, Jitter, Clipping, Levels
- Data Testing - Wired and Wireless Networks
- Call Events - Progress & Failures
- Fax Events - Encoding, Resolution, ECM, Modem
- Delay Measurements – RTD, OWD
- E-Model, SNR, Signal Level
- Echo Measurements - ERL, Delay
- QoS, Timeouts, Retransmissions
- Google Mapping

For more details, please visit - [http://www.gl.com/completevqtsolutions.html](http://www.gl.com/completevqtsolutions.html)

GL’s Automated Voice, Data Quality Testing

Network-wide Voice, Video, & Data Quality Testing Products

Summary of Products

- **Intrusive VQuad™** with Dual UTA system, or a self-contained **VQuad™ Probe** - a portable hardware that interfaces Wireless, VoIP, PSTN, and TDM networks to send and receive speech signals

- **Non-Intrusive Probes** - T1/E1 Analyzer for TDM and PSTN, PacketScan™ for IP

- **Voice Quality Test (VQT)** software - analyzes the transmissions using POLQA, PESQ LQ/LQO/WB, PSQM, and PAMS

- **Data Quality Testing** - perform data test over wired and wireless networks using **VQuad™ Probe** NetTest application

- **Voice Band Analyzer (VBA)** - analysis tool for monitoring the quality of voice band traffic over VoIP, TDM and Wireless networks

- **Echo Measurement Utility** - analysis tool for echo, and delay measurements of voice calls in VoIP, TDM, 2Wire, and Mobile networks

- **VQT WebViewer™** - facilitates a voice quality test result display using a simple web browser. Also supports user-defined statistics and events configuration for both tabular and graphical outputs.

Features

- Typical networks supported by GL’s **VQuad™** - Dual UTA -.
  - Wireless communication devices
    - (Mobile phones, Smart phones -Blackberry, iPhone, Android, Military/Mobile radio PTT, Bluetooth®, WiMax, WiFi, 3G, 4G, LTE, LTE –Advanced)
  - PC Internet connection (Broadband 3G/4G/LTE, WiFi, Wired)
  - 2-wire Analog Simulation (FXO port) for connecting to ATA, PSTN, Switch Router
  - Phone Handset for connecting to VoIP phones, Digital phones, Analog phones.

- Intrusive and Non-Intrusive Probes

- Solutions support low-density and high-density networks

- Type of tests or measurements that can be performed include -
  - Automated Data Testing - TCP, UDP, VoIP, Route, HTTP, FTP, SMS, Email, DNS, Phone / User Equipment/ SIM Information
  - Voice Quality testing as per ITU-P.862.1/2 PESQ
  - Active Speech and Noise Levels, Latency, Jitter, Clipping, and Power Measurements
  - E-Model and Mean Opinion Score (MOS) results
  - Echo Measurements
  - Round Trip Delay (RTD), One Way Delay (OWD), Post Dial Delay (PDD), Signal to Noise Ratio (SNR)
  - GPS and ITS location tracking with results overlay

- All results/measurements/events are automatically sent to central database via TCP/IP Results are accessible remotely via browser based clients

- Scripting for automated testing, and portability for mobile drive testing

- Remote control and access with centralized data retrieval, and analysis
Testing Echo Cancellers
Echo Simulation and Analysis Products

Echo, noise, and delay possibilities

- Acoustic Echo C canceller
- Noise Suppression
- Speech level control

Acoustic Echo
- Mobile Phone
- Speaker Phone
- Hands free in car

AEC built in to mobile phone (Sometimes)

- Short Echo Delay
- Good Echo Path Loss
- w/ built-in LEC

ATA

2-wire POTS Phone

VoIP Phone
- Speaker Phone
- Soft Phone

Acoustic Echo

Line and Acoustic Echo
Test / Measurement

For more details, please visit - http://www.gl.com/echocan.html
Testing Echo Cancellers
Echo Simulation and Analysis Products

Summary of Products

- Testing ECs in a PSTN, TDM, All-IP, and Wireless Environment
- **AutoECTest** - G.168 EC Compliance Testing of ATAs and Gateways
- **Auto AEC Test** - Test Acoustic Echo Cancellation as per G.167 and P.340 Standards
- Testing your developmental EC software without any hardware
- Test Voice Enhancement Device per G.160 and G.169
- **Echo Path Delay/Loss Simulation** - Software - simulates delay, loss, double-talk, noise, and other impairments over T1/E1 lines
- **Echo Path Delay / Loss Measurement** - Software - allows intrusive and non-intrusive measurement of Echo Return Loss (ERL) & Echo Path Delay (EPD)
- **Voice Band Analyzer (VBA)** - analysis tool for monitoring the quality of voice band traffic over VoIP, TDM, and Wireless networks
- **Echo Measurement Utility (EMU)** - analysis tool for echo, and delay measurements of voice calls in VoIP, TDM, 2Wire, and Mobile networks
- **VQuad™ Probe, VQuad™ with DUAL UTA** - Network-wide monitoring of speech levels, noise levels, hybrid echo, acoustic echo and voice quality (QoS)

Features

- Simulate a real network with echo paths at one or both ends
- Simulate delay, loss, double-talk, noise, and other impairments
- Accurate field characterization of echo paths, impulse responses, delay, and loss statistics
- Simulate acoustic echo into modules such as a Sound Card, a Mobile Phone, a Regular Phone, an IP Phone, or a Speaker Phone
- Generate dynamic (changing) acoustic echo
- Compliance testing w/ hybrid simulation, application of stimulus, capture of response, and graphical analysis of response.
- Test cases for all possible variations of echo path loss, delay, hybrid filters, etc
- Typical Scenarios -
  - Stimulus / Simulation all Digital (TDM Applications)
  - Stimulus / Simulation all Analog (Mobile Phone Applications)
  - Stimulus RTP (Ethernet) / Simulation Analog or Digital (VoIP IP Phone Applications)
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