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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 etc.)

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

- Wireless 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 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

VoIP Network Analysis & Simulation Products
VoIP Network Analysis & Simulation Products

Summary of Products

- **PacketScan™** – Captures live VoIP traffic, visual analysis, call QOS with E-model based MOS & R-factor scores
- **PacketProbe™** - Embedded CPE based VoIP Monitoring Probe
- **PacketScanWeb™** - Centralized report collection from PacketScan™ probes & remote monitoring using web-based clients
- **GLInsight™** - Decode and analyze fax and modem calls over IP
- **IPNetSim™** - Simulates real-time conditions in IP network such as impairments (latency, packet loss, jitter) on a per call basis or throughout entire network
- **PacketExpert™** - 4, 12, and 24 Port Ethernet, VLAN, MPLS, Q-in-Q, IP, UDP Tester
- **PacketCheck™** - Ethernet performance analysis for 10Mbps, 100Mbps and 1Gbps
- **PacketShark™** - Handheld GbE Capture, Filter and Aggregation Tap
- **RTPToolBox™** - Simulate RTP session and test RTP packets
- **PacketGen™** - High-density VoIP call generation with traffic for load testing, stress testing
- **PacketH323™** - H.323 Call Simulator
- **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
- **MAPS™ for VoIP** - Scripted protocol simulation and conformance test tool for
  - UMTS IuCs and IuH
  - UMTS IuPs, Gn, Gp
  - LTE S1, eGTP, Diameter
  - SIP, SIP-I, MGCP, MEGACO
  - SIGTRAN, ISDN SIGTRAN
  - GSM over IP, MAP over IP

Features

- Generate/analyze thousands of calls simultaneously
- Tap packet networks, capture Ethernet packets at wire speed
- Traffic types include voice files, digits, tones, T.38 fax, & modem
- Supports all industry standard codecs - G.711, G.729, G.726, AMR, EVRC, GSM, and more
- Visual analysis, real-time listening, recording, statistics
- R-Factor based MOS using E-Model
- Intrusive and non-intrusive test/monitoring solutions
- Automated test setup for monitoring IP networks
- Unlimited ability to edit IP communication protocol messages and control call scenarios
- Storage and analysis of calls over packet network
- Network-wide Voice, Video, and Data Quality (QoS) Monitoring System
- Centralized Network Monitoring System
- Impairments generator – 10 Mbps, 1Gbps, 10 Gbps, 40 Gbps
- Test individual links, switches, Gateways, IADs, IP phones, Soft phones, LAN, WAN, Core/MPLS networks
- Test voice, fax, data, or multimedia transmission over IP
- Includes broadest range of test and simulation for echo testing
PSTN/TDM Network Analysis & Simulation Products
PSTN/TDM Network Analysis & Simulation Products

Summary of Products

- **T1/E1 carrier and T3/E3 carrier Test Solutions** - Portable, Handheld, and PC-based platforms available
- **OC-12/STM-4, OC-3/STM-1 Test Solutions** - Portable, and PC-based platforms available
- **Digital Central Office Simulator System (DCOSS)** - For high density digital & analog call simulation – uses T1/E1 boards for SS7 and ISDN simulation, Analog Phone Simulator (APS), and BRI Phone Simulator (BPS)
- **SS7 and ISDN Network Test Solutions** - using DCOSS, T1E1, MAPS™
- **NetSurveyorWeb™** facilitates display of real-time the call detail records (CDR), traffic, signaling and message trace captured over TDM lines using a simple web browser
- **VQuad™ Probe™, VQuad™ with DUAL UTA** - End-to-End Voice, Data, Video quality metrics for FXO, and TDM devices (soft phones, IP phones) with complete automation and centrally controlled system
- **GLInsight™** - Decode and analyze fax and modem calls over PSTN, and TDM networks
- **MAPS™ for PSTN/TDM** - Scripted protocol simulation and conformance test tool for
  - SS7, ISDN protocols over TDM and IP (SIGTRAN)
  - ISDN protocols over TDM and IP (ISDN SIGTRAN)
  - SS7 MAP protocol over TDM, and IP
  - MLPPP protocol
  - CAS protocol
  - GSM protocols over TDM and IP

Features

- Analyze/Simulate thousands of channels
- All traffic types (Voice, Digits, Tones, Fax, Modem)
- All protocols (V5.x, HDLC, SS7, ATM, MLPPP, PRI/BRI ISDN, CAS, GSM A, GSM Abis, GPRS, TRAU, UMTS, Frame Relay, CDMA 2000, and more)
- All interfaces (Analog, T1, E1, T3, E3, OC-3/12-STM-1/4)
- Unlimited ability to edit TDM communication protocol messages and control call scenarios
- 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
Wireless (2G, 3G, 4G) Network Analysis & Simulation Products
Wireless (2G, 3G, 4G) Network Analysis & Simulation Products

Summary of Products

• Testing GSM Network - A, and Abis Interfaces over TDM and IP – GSM Analyzer, and Scripted GSM Protocol Simulation using MAPS™ GSM

• Monitoring GPRS Network Gb and Gn Interfaces using GPRS Analyzer

• Testing TRAU Protocols using TRAU Analysis, Playback and Simulator

• Monitoring CDMA2000 Network Interfaces pertaining to packet transmission namely A1, A3/A7, A9, and A11 using CDMA 2000 Analyzer

• Testing UMTS Network - Iub, Iur, IuCS, IuH, and IuPS Interfaces with UMTS Analyzer, and Scripted UMTS IuCS, IuH, IuPS Simulation using MAPS™ UMTS

• Testing LTE Network – S1-u, S1-MME, X2, S3, S4, S5/S8, S10, S11, S13, S16 interfaces using LTE Analyzer, and Scripted LTE S1, eGTP-c Simulation using MAPS™ LTE

• Testing Diameter Core – Simplify testing of the Diameter core signaling network interfaces such as Cx/Dx, and Rx interfaces using MAPS™ Diameter

• VQuad™ Probe™, VQuad™ with DUAL UTA - End-to-End Voice, Data, Video quality metrics for wireless devices (smart phones, mobile radios, Wi-Fi, WiMax, and Bluetooth) with complete automation and centrally controlled system

Features

• Simulate up to 500 Smartphones (UEs) powering up and down

• All traffic types (Voice, Digits, Tones, Fax, Modem)

• Authenticate and confirm security procedures

• 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, and SMS.

• GPS and ITS location tracking with results overlay

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

• Includes broadest range of test and simulation for echo testing
Network-wide Voice, Video, & Data Quality Testing Products
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, PacketScan™ for VoIP, 2-Wire Voice/Data Capture for PSTN

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

- **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

- **Network VQT Monitoring** - solution consists of Distributed VQuad™ Nodes, VQuad Command Center, array of analysis applications, central location database, and remote client web-browsers to provide a complete solution for Voice Quality Testing and Analysis

- **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)
  - 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 –
  - Data Testing TCP, UDP, VoIP, Route, HTTP, FTP, SMS, and DNS statistics
  - 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
Echo, noise, and delay possibilities

- Acoustic Echo 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

Echo, noise, and delay possibilities

Line and Acoustic Echo
Test / Measurement
Testing Echo Cancellers | Echo Simulation and Analysis Products

Summary of Products

- **G.168 EC Compliance Testing** of ATAs and Gateways – PSTN, TDM, and All IP Networks
- **Test Acoustic Echo Cancellation** as per G.167 and P.340 Standards – PSTN, TDM, Wireless, and All IP Networks
- **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
- **Test Voice Enhancement Device** per G.160 and G.169
- **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)
Contacts

GL Communications Inc.
818 West Diamond Avenue - Third Floor
Gaithersburg, MD 20878
Contact: Shelley Sharma at Ext. 114
Phone: (301) 670-4784
Fax: (301) 670-9187
Email: info@gl.com

Branch Offices

GL USA West Coast Office
Contact: Shelley Sharma (temporary)
Phone: (301) 670-4784
Email: info@gl.com

GL Shanghai, China Office
21D, Hua Min Empire Plaza,
726 West Yan An Road,
Shanghai, 200050
China
Contact: Ding JianXiong
Phone: 86-21-6237-0268, 86-21-6270-3066
Fax: 86-21-6237-0268 Ext:103
Email: glchina@gl.com

GL Bangalore, India Office
GL Communications India Pvt. Ltd.
#1,“Uma Admirality”, Ground Floor,
Bannerghatta Road,
Bangalore - 560029
India
Contact: Sanjeev Kulkarni
Phone: 91-80-40488400 Ext. 404
Fax: 91-80-40488401
Email: glindia@gl.com