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Company Profile

GL Communications has over the years worked with major telcom 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 30 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 -

- WIRELESS (5G, 4G LTE, 3G, 2G)
- IP/VoIP, Ethernet (Electrical and Optical)
- T1, E1, T3, E3, PSTN
- OC-3/STM-1, OC-12/STM-4

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 WIRELESS, SONET/SDH, T1/E1, and T3/E3 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.

Centralized Network Monitoring & Test Solutions
End-to-End Voice, Video, & Data QoS

Complete Voice, Video, and Data QoS Test Solution

For more details, please visit - https://www.gl.com/completevqtsolutions.html

Centralized Network Monitoring & Test Solutions
End-to-End Voice, Video, & Data QoS

- Various VQuad™ platforms are available for intrusive testing - allows to interfacing to any device types - Wireless, VoIP, PSTN, and TDM, to establish calls over the real-network, send and receive voice/video/data traffic and evaluate performance of devices and networks.
  - VQuad™ Dual UTA HD system - is a compactly design hardware for portability to simultaneously connect any 2 telephony devices end-to-end; requires PC or laptop.
  - a self-contained portable VQuad™ Probe HD - is a compactly design hardware for in-field or walk-around testing; supports one Dual UTA HD unit with NUC to simultaneously connect any 2 telephony devices end-to-end.
  - a self-contained VQuad™ mTOP™ system - support for up-to 6 Dual UTA HD units and an embedded SBC using Two-stacked 1U mTOP™ units to simultaneously connect up to 12 telephony devices; suitable for in-lab and drive testing.
- Voice Quality Test (VQT) software - Can be used with VQuad™ or as stand-alone application for fully automated testing of NB, WB, and SWB speech per PESQ LQ/LQO/WB and POLQA standards.
- GL NetTest Data Quality Testing - Can be used with VQuad™ or as stand-alone application on Android, iOS and PC devices to perform data test over wired and wireless networks.
- Video Quality Testing (VAC™) application - Can be used with VQuad™ or as stand-alone application on any Android, WinPC, and Linux PC to perform fully automated Video Conference testing and get Audio and Video MOS QoS results along with several analytical metrics.
- Drive Test - Drive test for quality of Voice call, Video call, and Data on the go; with results and call control info plotted on Google Maps, easily monitor the signal strength from a central location
- 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.
- 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, 2-Wire, and Mobile networks

Features

Supported Device Types:
- Any Wireless phone independent of Network. Connects via Bluetooth® headset or wired headset with full Call Control and QoS during established calls. Supports legacy networks as well as VoLTE, 5G, and next generation networks.
- Mobile Radios including Military, Government, Mass Transmit, and Commercial. Include both audio along with automated radio keying (Push to Talk).
- 2-Wire FXO (simulates analog phone). Connects to PSTN, ATA Media Gateway ... replaces analog phone in any analog network.
- 4-Wire analog (Tx/Rx) replaces headset on any system. Also supports replacing phone handset at the curly cord (RJ22).
- SIP Call Agent (act as a SoftPhone while configuring Proxy and Registrar). Includes both SIP Call Control as well as RTP audio traffic.

Supported Analysis and Functionalities:
- Automated Call Control with Pass/Fail statistics for Place Call and Dropped Call. Supports 2-wire Analog, Mobile Phone Bluetooth/wired headset, PTT and VoIP SIP.
- Voice Quality Analysis using GL POLQA (ITU-P.863) supports NB, WB and SWB audio. Fully automated testing with MOS along with Speech Level, Noise Level, and Speech Activity.
- Audio Analysis includes both Power and Frequency. Confirm if proper audio bandwidth was sustained during the call. Also includes Path Confirmation, Double-Talk analysis, and Audio dropout analysis.
- Delay Measurement supports both One-Way and Round-Trip during the established call.
- Data Testing using GL NetTest supports Android, iOS and PC devices. Includes TCP, UDP, HTTP, FTP, DNS, VoIP and network specific tests. Fully automated (also includes manual operation) and remote controllable.
- Video Conference Testing between two Video Agents (Android, Windows PC, and Linux PC supported) generates Video and Audio MOS (along with additional metrics). User-configurable Reference Video.
- Drive Testing - GPS and ITS location tracking with results overlay
- Complete Automated testing using VQuad™ scripting supports Call Control, Voice Analysis, Data Testing, and Video Testing.
- Remote operation via CLI and API. In addition, each VQuad™ node can control remote VQuad™ node allowing a single VQuad™ script to control both sides of the call. Additional Remote operation provided directly from the GL WebViewer™.
Wireless Network Test Solutions (4G, 3G, 2G, Wi-Fi, Bluetooth®)

MAPSTM - Simulation of all network elements and functionalities
PacketScanTM - Non-intrusively monitor a wireless network infrastructure

Wireless Network - In your Lab

For more details, please visit Communications Networking 5G, 4G, 3G, 2G Lab

For more details, please visit - Wireless Voice, Video, and Data QoS Testing (E2E)
Summary of Products

- **Complete Wireless Lab Suite** for simulation, monitoring, troubleshooting the 5G, 4G, 3G, and 2G mobile networks

- **5G Network**: 5G Network emulator can simulate multiple UEs and elements such as UE+gNB, AMF, SMF, UPF, AUSF, UDM, UDR, NSSF, NRF and interfaces N1, N2, N3, N4, N5, N8, N9, N10, N11, N12, N13, N14, N21 and N22 which forms the 5G core network.

- **LTE and VoLTE Network**: Simulate entire network infrastructure using MAPS™ LTE Simulator & analyze using GL’s PacketScan™: supported interfaces - S1-u, S1-MME, X2, S3, S4, S5/S8, S10, S11, S13, S16, Location Services (LCS) over SLs, Circuit Switched Fall Back (CSFB) and SMS procedures over SGs.

- **IMS Network**: Simulate entire network infrastructure using MAPS™ IMS and Diameter Simulator & analyze using GL’s PacketScan™; supported interfaces - S6a, S6d, S3, Sh, SLg, SLh, Cx/Dx, Rx, Gx, Gy/Ro, Rf, Gm, SGi, Mw, Mi, and Mj interfaces.

- **UMTS Network**: Simulate entire network infrastructure using MAPS™ UMTS Simulator & analyze using GL’s PacketScan™; supported interfaces - IuCS and IuH (over IP and ATM), IuPS (over IP), and LoCation Services (LCS) over IuPc Interfaces.

- **GSM Network**: Simulate entire network infrastructure using MAPS™ GSM Abis or A Simulator & analyze using GL’s PacketScan™; supported interfaces - A, Abis, Mobis, Gs, Ls, Lb, Lp, & Up interfaces.

- **GPRS Network**: Simulate Gb, Gn/Gp interface using MAPS™ Gn Gp Simulator, and analyze all these interfaces with PacketScan™.

- **TRAU Protocols**: Test using TRAU Analysis, Playback and Simulator.

- **End-to-End Voice, Data, and Video QoS and Drive Testing**: VQuad™ platforms include support for call control of variety of wireless devices independent of underlying network – from 2G to 4G LTE and beyond, for evaluating Voice, Video, and Data quality testing.

- **PacketScan™** (available in Basic, HD Versions): Captures live high-density Wireless and VoIP traffic, visual analysis, call QOS monitoring with E-model based MOS & R-factor scores; Supports All-IP based Protocols - SIP, UMTS, LTE, Diameter, IMS, SIGTRAN, MGCP, MEGACO, BICC, MAP, CAP, GSM, GPRS, and more.

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

Features

- Includes broadest range of test and simulation tools for wireless devices and network.

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

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

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

- Verify complete functionality of an element or an entity within the wireless network infrastructure.

- Authenticate and confirm security procedures.

- In-lab and Field Testing Solutions

  - Automated Mobile Phones Testing using Wired Headset Method or using Bluetooth®.

  - Automated Data and Video Quality Testing.

  - Automated Voice Quality Analysis using POLQA and/or PESQ.

  - One Way Delay and Round-Trip Delay Measurements.

  - Frequency and Power Measurements for Network Confirmation.

  - GPS and ITS location tracking with results overlay.

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

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GL Communications Inc.
Ethernet/IP Network Test Solutions
(1 Gbps, 10 Gbps)

For more details, please visit - https://www.gl.com/voipanalysis_simulation.html
Ethernet/IP Network Test Solutions
(1 Gbps, 10 Gbps)

Summary of Products

- **Multi-functional Ethernet/IP Tester - PacketExpert™ (available in 1G, 10G, and Multi-Port Versions)** -
  - 4-port, 12-port, and 24-port
  - 1 Gbps, 10 Gbps Electrical/Optical Ethernet
  - VLAN, MPLS, Q-in-Q, IP, TCP, UDP Tester
  - 40/100 Gbps Coming Soon !!
  - BERT, Loopback, RFC2544, Y.1564 SLA Verification
  - Wire speed Packet Capture and Playback,
  - Multi-stream Traffic Generation and Analysis; RFC6349 (ExpertTCP™)
  - PacketBroker, IP WAN Link Emulator

- **All-IP Monitoring Probe - PacketScan™ (available in 1G, 10G Versions)** - Captures live high-density VoIP traffic, visual analysis, Call QoS with E-model based MOS & R-factor scores; All - IP and Wireless over IP Protocols supported

- **MAPS™ IP (available in 1G, 10G, and 40G Versions)** - High-density IP call generation with traffic for performance testing and troubleshooting; The application gives users the unlimited ability to edit messages and control scenarios (message sequences). All - IP and Wireless over IP Protocols supported

- **IPNetSim™ and IPLinkSim™ (available in 1G, 10G Versions)** - Emulates single stream or multi-streams IP network of up to 10 Gbps full duplex. In IPNetSim™, the incoming traffic can be identified into separate user defined streams (up to 16 streams for 1 Gbps pipe and up to 4 streams for 10 Gbps pipe). Test the performance of WAN network by emulating the WAN conditions (Bandwidth throttling, Congestion emulation, Latency, Packet Loss, Packet effects, Packet Corruption etc.).

- **End-to-End Voice, Data, and Video QoS Testing** - VQuad™ platforms supports end-to-end Voice, Data, Video quality metrics for VoIP devices (soft phones, IP phones) with complete automation and centrally controlled system

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

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

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

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

- **NetSurveyorWeb™ Lite** - Distributed Network Surveillance System at Probe Level

- **GLInsight™**, **FaxScan™**, **Fax Simulator** - Decode and analyze T.38 and G.711 pass-through fax calls over IP

Features

- Generate/analyze thousands of calls simultaneously over IP networks.
- Impairments generator - 1Gbps, 10 Gbps
- High Volume Mobile Data Traffic Generation over LTE, UMTS, and GPRS Networks (4 Gbps or 40 Gbps)
- 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
- 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 and Distributed Network Monitoring System
- Network-wide Voice, Video, and Data Quality (QoS) Monitoring System
- Includes broadest range of test and simulation for echo testing
SONET / SDH Network Test Solutions

For more details, please visit - SONET SDH Testing
SONET / SDH Network Test Solutions

Summary of Products

- **Channelized SONET/SDH for T1 E1** - Analyze/Simulate thousands of channels for processing ISDN, SS7, CAS and other channelized protocols. In an OC-3/STM-1, all 84 T1s or all 63 E1s can be identified and processed in transmit and receive modes. In an OC-12/STM4, all 336 T1s or all 252 E1s can be identified and processed in transmit and receive modes.

- **Channelized T3 E3 for T1 E1** - Analyze/Simulate thousands of channels for processing ISDN, SS7, CAS and other channelized protocols. In a T3/E3, all 28 T1s or all 32 E1s can be identified and processed in transmit and receive modes.

- **Unchannelized LightSpeed1000™** - comes with all the necessary software for overall capturing, monitoring, emulation, and protocol analysis over SONET-SDH links. Supports wire-speed recording and playback of Unchannelized ATM, PoS, and RAW Traffic over OC-12/STM-4, and OC-3/STM-1 lines.

- **Ethernet Testing for Fiber Optic Networks** – GL offers PacketExpert™ (available in 1G, 10G, Multi-port Versions) to perform independent layer-wise (VLAN, MPLS, IP, UDP) testing at wire speed for both Optical and Electrical interfaces.

  - 1 Gbps, 10 Gbps, 40G/100G coming soon
  - 4, 12, and 24 Port (HD Only)
  - VLAN, MPLS, Q-in-Q, IP, UDP Tester
  - Electrical Ethernet and Optical Ports

- **Ethernet Testing for HD Only**

- **IP WAN Emulators** - IPLinkSim™ and IPNetSim™ includes 10G Optical (SFP) ports for wire speed testing of WAN networks.

- **ATM Protocol Analyser** - Capture and analyze the ATM cells across the U-plane for both NNI and UNI interface carrying AAL0, AAL2 and AAL5 traffic.

- **PoS Protocol Analyzer** - Capture and analyze the packets over SONET-SDH using Point-to-Point Protocol (PPP) link layer protocol, which encapsulates other network layer protocols like IP for transmission on synchronous and asynchronous communications lines.

- **UMTS Protocol Analyzer** - helps in fault diagnosis and troubleshooting UMTS network.

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

Features

- Wire-speed processing of ATM, PoS or RAW data for Tx and Rx - supports BERT, capture and playback of packets, delay emulation, and protocol analysis.

- Software selectable OC-3 / OC-12, or STM-1 / STM-4 for Unchannelized and Channelized traffic.

- Channelized ports allow direct access to anything and everything on SONET / SDH
  - Framing and Payload, including structured traffic (T1, E1, STS-1, DS3 etc) or unstructured traffic (ATM, PoS, etc)
  - Supports multiplexing multiple T1 or E1 channels to a single channelized OC-3/STM-1 OC-12/STM-4 line and vice versa
  - Supports any combination of DS0/64/56/16/8 kbps fractional T1/E1, and N x T1/E1 interface definitions (a total of 252 E1s or 336 T1s – on each OC-12/STM-4 line)

- Hardware based filtering options: sixteen 128-bit independent filters with bit masks, for both ports with AND/OR include/exclude conditions

- Hardware based precise time stamping of cells / packets with 10 nsec resolution, 1 ppm accuracy

- Comprehensive analysis / emulation of voice, data, fax, protocol, and voice quality testing

- API Toolkit to develop user specific applications

- Precisely emulates packet delays that occur over SONET/SDH carrying ATM or PoS traffic, delay is adjustable from 1 ms to maximum of 500 msec

- Test the impact of delay and congestion under various real world conditions

- Assess impact of delay on SLA (Service Level Agreements)

- Simulate satellite delay and bng FiberLoops

- Test WAN application performance under deteriorated but repeatable conditions
TDM Network Test Solutions
T1 E1, T3 E3, Datacom

Quad / Octal T1 E1 PCIe Board
Dual T1 E1 Express (PCle) Board
Handheld T1 E1 Tester LinkTest Dual E1
Rackmount Quad T1 E1 Solution

tProbe™ - Portable USB Pod
T1 E1 VF FXO FXS Serial Datacom
tScan16™
16-Port T1 E1 Analyzer
Dual T3 E3 T1 E1 USB Pod
Rackmount T1 E1 FXO FXS mTOP™ Solution
Rackmount T3 E3 T1 E1 mTOP™ Solution

For more details, please visit - https://www.gl.com/hardwarePlatforms.html

Echo, Delay, and Noise Possibilities

AEC built in to mobile phone
- Mobile Phone
- Speaker Phone
- Handsfree in car

AEC built in to mobile phone

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

VoIP Phone
- Speaker Phone
- Soft Phone

EC Test Equipment

For more details, please visit - https://www.gl.com/echocan.html
TDM Network Test Solutions
T1 E1, T3 E3, Datacom

Summary of Products

- Simulation and Analysis
  - All interfaces (Analog FXO and FXS, T1, E1, Serial Interface, T3, E3)
  - All traffic types (Voice, Digits, Tones, Fax, Modem)
  - Wide range of functionalities and testing capabilities for testing T1 and E1 links
  - Hardware can be USB based portable, Handheld, Laptop-based, or Rackmount platforms
  - Any capacity from Dual-port, to High Density 16 T1/E1 ports can be supported
  - All protocols (FXO, FXS, CAS, SS7, ATM, MLPPP, ISDN, GSM, BICC, IUP, MAP, CAP, INAP, GSM, TRAU, GPRS, UMTS, HDLC, MLPPP, Frame Relay and more)

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

- MAPS™ TDM - High-density call generation with traffic for performance testing and troubleshooting;
  - Unlimited ability to edit messages and control scenarios (message sequences)
  - Bulk call generation and protocol specific traffic simulation over TDM network

- VQuad™ with TDM option provides the ability to perform automated tests simulating up to 12 simultaneous CAS, PRI ISDN, or No Call Control (NOCC) calls on either T1 or E1 trunks.

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

- Repeaters - Multi-port, T1 E1 J1 Switch


- Includes broadest range of test and simulation for echo testing for PSTN, TDM, IP, and Wireless networks; Typical Scenarios -
  - Stimulus / Simulation all Analog, Digital, and RTP Ethernet) Applications; Simulate acoustic echo into modules such as a Sound Card, a Mobile Phone, a Regular Phone, an IP Phone, or a Speaker Phone
  - Testing your developmental EC software without any hardware
  - 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
  - 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.
  - Test Voice Enhancement Device (VED) per G.160 and G.169
  - Echo Path Delay Simulation software - Simulate a real network with echo paths at one or both ends; simulates delay, loss, double-talk, noise, and other impairments over T1/E1/IP network
  - Echo Path Delay 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, 2-Wire, and Mobile networks
  - Centralized Network-wide monitoring of speech levels, noise, hybrid echo, acoustic echo and voice quality (QoS)
PSTN Network Test Solutions

MAPS™ APS-24, 48, 96, or 192 Port

- Bulk call generator in minutes
- FXO and FXS Capabilities
- Plug and play
- Assessment of Voice Quality, Fax Quality
- Tones and Digits Detection
- Scalable from hundreds to thousands of calls
- Remoting, Automation, Scripting, Reporting

For more details, please visit - https://www.gl.com/hardware_platforms.html
PSTN Network Test Solutions

Summary of Products

- **tProbe™ FXO FXS** - The FXO and FXS ports on tProbe™ unit allows to simulate all of the FXO and FXS functionalities using tProbe™ Client Server or using MAPS™ FXO FXS application. The FXO port on the tProbe™ also permits non-intrusive capture and analysis of voice-band signals from a two-wire telephone line.

- **MAPS™ APS** - High capacity Analog 2-wire Bulk Call Generator used to test a Central Office (CO), PBX, ATAs, Gateway or other telecommunications equipment, which provide local loop interfaces. Supports automated bulk analog call simulation for up to 384 independent FXO ports per MAPS™ CAS Server (includes 2 Octal T1 cards)

- **GLInsight™, FaxScan™, Fax Simulator** - Simulate, decode and analyze T.30 fax calls over PSTN networks

- **CAS Protocol Analyzer** - helps in fault diagnosis and troubleshooting signalling in PSTN network.

- **VQuad™ HD, VQuad™ with DUAL UTA HD** - Two Analog FXO ports per Dual UTA provides complete automated analog testing with QoS measurements.

- **VQuad™ 24-port HD FXO solution** is an all-in-one 2U rack supporting both Wide Band (WB) and Narrow Band (NB) Audio (HD and SD Audio)

- **vHandi™** - VQuad™ can also work with handheld analog tester – vHandi™ to automate voice quality testing on analog lines.

Features

- Test a Central Office (CO), PBX, ATAs, Gateway or other telecommunications equipment which provide local loop interfaces

- Call monitoring, call recording and analysis or quality and performance

- Traffic Classifier provides non-intrusive, real-time monitoring and classification in real-time for 16 different traffic types including silence, voice, a variety of data modulations, fax modulations, DTMF digits, and call progress signals traffic.

- Support up to 384 FXO port simulation per 4U MAPS™ APS

- Supports 24 independent HD FXO ports per 2U VQuad™ system. Solution is scalable for unlimited number of FXO ports.

- Flexibility to control FXO and FXS functionality via scripts

- Functionalities
  - Basic Telephony functions - On-hook, Off-hook, Detect ringing signal, Dial, Hook flash
  - Digit related functions - Send and Detect digits
  - File transfer functions - Send and Receive file
  - Tone related functions - Detect busy tone, call waiting tone, dial tone, reorder tone, ring-back tone, special dial tone, Send and Detect test tone, tones
  - Fax related Functions - Send and Receive fax
  - FSK related functions - Detect Caller ID, Detect VMWI
  - VQT (Optional) - MOS, E-Model, PESQ, POLQA Scores
  - P.56 analysis of any captured audio file (Active Speech Level, Noise Level, Speech Activity Factor, DC Offset, and Total RMS Power.)
  - Delay, Power, Frequency Measurements

- Supported FXO call scenarios
  - Caller ID
  - Two-way Calling, Three-way Conference Calling, Three-way Calling with Calling Party Number ID
  - VMWI – Voice Mail with MWI (message waiting indicator) & SDT (stutter dial tone)
  - Call Waiting – Deted tone, Call ID, Flash to accept call
  - Call Forwarding
  - FXO Metrics (Line Current, Line Voltage and Ring Voltage, Audio C-Message)

- Supported FXS call scenarios
  - User-programmable call progress tone generation for different countries/regions:
  - Dial tone, Ringback tone, Busy tone, Reorder tone
  - Howler tone (extended off-hook signal)
  - Ring generation with programmable ring cadence
Custom Test Solutions for Communications Networks
Military | Maritime | Government

For more details, please visit - https://www.gl.com/completevqtsolutions.html

Custom Test Solutions for Communications Networks
Military | Maritime | Government

Summary of Products

- Customized test solutions for Communications Networks in Military/Maritime/Government
  - Precise Delay measurements tools
  - Precise Delay simulation tools
  - Echo measurements and mitigation tools
  - TDM, Optical, Ethernet / IP
- Precise Packet Triggering, Capture, and Analysis over Ethernet, IP, & UDP/TCP
  - Filter and record only packets of interest
  - Packet filtering can be based on all layer headers
  - Generates a trigger (1 µsec pulse) for each packet that satisfies filter criteria
- Military Radio Communication - Simulation and Analysis of Speech per ITU-T PESQ and POLQA
- STI field test services for evaluating public safety networks (at Railways, Airports, Malls)
- Automated Test Solution for Land Mobile Radios (LMR) and Mobile Phones (connects via Bluetooth or Wired)
  - In-lab, Drive-test or field-test – platforms customized for every need
  - Drive-test - GPS and ITS location tracking with results overlay
  - Unattended, 24/7 testing to ensure reliability of 911 services
  - End-to-end device testing independent of underlying network
  - Perform Voice Quality, Delay, Echo and Signal Quality Measurements
  - Perform Video Conference Testing
  - Perform Data Testing – a variety of tests supported, HTTP, Email, SMS, TCP, UDP, including Phone Info, Sim Info and Device Info
  - All systems are connected to the central system for remote monitoring, remote operation, storing and display of results/ events.
- Audio Analysis over Ethernet, IP, Optical, TDM, and PSTN
  - Bulk Audio Call generator to stress test network
  - Transmit and receive audio signals at the network elements and gateway interfaces
  - Emulate Balanced Audio and PTT Contact Closure Interface
  - Perform Voice Quality Assessment per PESQ and POLQA
- Video Analysis
  - Bulk Video Call generator to stress test network
  - Perform Video Quality Assessment - Audio MOS, Video MOS, Audio/Video MOS
  - Simulation of Video calls from any endpoint device - Android Phones, Windows/Linux PCs
  - Video Codecs supported are JPEG, H.261, H.263, H.263+, H.264, MPEG, MPEG-2, MPEG-4, VC1
- Centralized Network Surveillance
  - Probes to monitor live signaling and traffic behavior at different points in the networks
  - Probes for IP, Wireless, SONET/SDH and Traditional TDM / Analog, based ATM Networks
  - All protocols over Wireless, IP and TDM network supported – 5G, LTE, UMTS, GSM, SIP, ED137, CAS, ISDN, SS7, ...
For more details, please visit - https://www.gl.com/delay-tests-voip-air-traffic-management.html

For more details, please visit - https://www.gl.com/test-solutions-for-voip-air-traffic-management.html
Test Solutions for Air Traffic Management

Summary of Products

- Customized test solutions for VoIP Air Traffic Management networks
  - Simulation Test Tools for ATM per ED-137
  - ATM Network Quality Monitoring Tools per ED-138
  - Critical Timing Measurement Tools for ATM
  - WAN link simulation
  - Interoperability Test Tools

- Simulation Test Tools for ATM per ED-137
  - ED-137 B and C compliant and VOTER Validated.
  - MAPS™-ED-137 tools generate Air-to-Ground (AG) calls and Ground-to-Ground (GG) calls as per EUROCAE ED-137 (1B and 1C)
  - MAPS™-ED-137 Recorder (4B and 4C) emulates call recording functionality at CWP, GRS, and Recorder interfaces.
  - Test the functions of Controller Working Position (CWP), Ground Radio Station (GRS), or Radio Media Gateway (RMG) entities
  - Simulate hundreds of CWP/Radios with unique IP addresses in a single instance
  - Supports hundreds of simultaneous calls and complete automation of bulk call generation with traffic
  - Fully integrated, complete test environment for Air Traffic Management
  - Linked Session Management to group and identify all calls belonging to particular Radio
  - Define DSCP (Differentiated Service Code Point) values for signaling and voice traffic
  - Depicts easy to understand call flow graphs of SIP message exchanges and message contents (SIP headers and SDP attributes)
  - Provides aggregated voice quality statistics such as MOS/R-Factor, packet loss, duplicate and out of sequence packets

- ATM Network Quality Monitoring Tools per ED-138
  - PacketScan™ captures and monitors live signaling and traffic over Air Traffic Management network
  - Waveform viewer, Call-flow graphs, and QoS monitoring - analyze calls for voice quality (MOS), packet loss, jitter, latency, etc.
  - Real-time and/or historical data analysis
  - Centralized monitoring of several probes deployed over the network with NetSurveyorWeb™
  - Individual call recording and retrieval system - Requires additional system configurations

- Precise Timing Measurement Tools for ATM
  - MAPS™ TM-ATM (Timing Measurements in Air Traffic Management) test suite to accurately simulate end points in ATM network and provide critical timing measurements for various types of delay occurrences in signaling and voice transmission through the network
  - Includes all necessary hardware and software to identify, capture, timestamp, and correlate events at Analog, TDM and IP interfaces.
  - Capable of generating triggers based on PTT activation
  - Capture, filter and record only packets of interest
  - Generates a trigger (1 Microsecond pulse) for each packet that satisfies filter criteria
  - Packet filtering can be based on all Layer 2 (Ethernet), Layer 3 (IP) Layer 4 (UDP/TCP) Headers
  - Enhanced TM ATM solution uses GPS time to perform precise timing measurement during deployment and field testing.
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