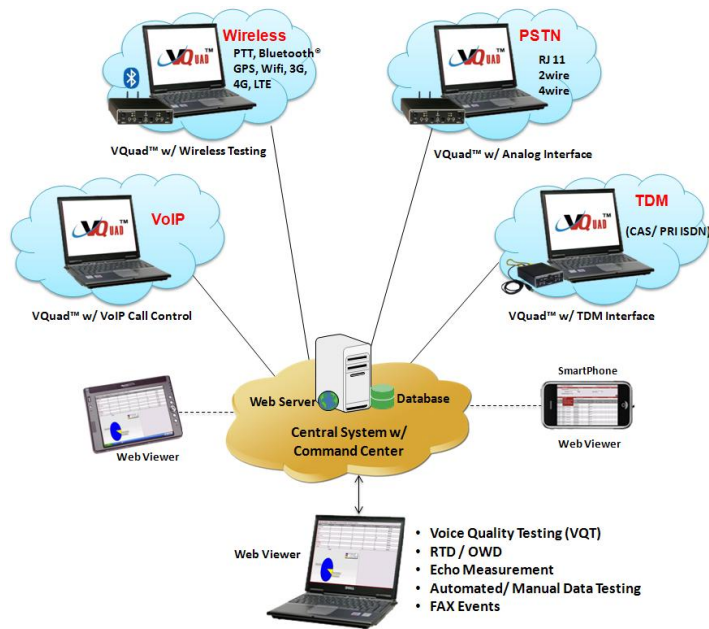


Complete Voice and Data Quality Testing Solutions



Single-Box Solution for
Wireless, Mobile Radio, PSTN,
VoIP, T1/E1 Devices

Automated and Centrally
Controlled Testing

PESQ LQ/LQO/WB, PAMS,
PSQM, Voiceband, Echo, SNR

Transmit / Detect DTMF/ MF
Digits, Tones, and Voice

Data Testing on Wired &
Wireless Devices

One-Way and Round Trip Delay
Measurements

Customized Result & Events
Reporting

Indoor Tracking System (ITS)
Location Stamping without
GPS Signals

GPS Mapping (most countries
supported)

Manual / Automatic Operation
with Result Logging

FAX Tx/Rx for 2-Wire (FXO) &
4-Wire Analog Networks

Command Line Interface (CLI)

Portable Solution Interfacing with:

- Any Communication Device (Mobile phones, Military/Mobile radio, Bluetooth®, WiMax, WiFi, Broadband 3G/4G, LTE, Smartphones -iPhone, Android, Blackberry).
- 2-Wire POTS (connect to PSTN, ATA, Media Gateway).
- SIP Call Agent (act as a SoftPhone and configure Proxy and Registrar).
- VoIP Ethernet (connect directly to any SoftPhone or any digital/VoIP hardware phone).
- T1/E1 (CAS and PRI ISDN protocols supported), 'SS7 Coming soon'.

Providing Analysis and Functionality such as:

- Supports multiple devices with single VQad™ software/hardware node.
- Testing includes Voice Quality, Data, and Video Analysis, Call Failure Rates, Dropped Calls, Echo, and Noise measurements.
- Data testing is available for Wireless devices as well as PC internet connection (supports Wifi and Broadband).
- Echo analysis over TDM, VoIP, 2-Wire, and Wireless using Echo Measurement Utility (EMU).
- Enhanced scripting with additional commands available for Bluetooth® enabled Mobile phones including RSSI, Battery Level, and Network identity.
- VQad™ with Dual UTA hardware and/or T1/E1 can operate on any PC including Rack/Tower, Laptop, Netbook, Tablet.
- Supported on Windows® XP, and Windows® 7 (32 & 64 bit).
- GPS connectivity for timing and location.
- Drive testing with real-time GPS maps.
- Voice Quality Testing (VQT) using PESQ LQ/LQO/WB.
- Wideband audio (supports both 8k and 16k samples/sec); all VoIP codec supported including mu-law, a-law, linear PCM, 16 bit raw Bluetooth®.
- Round Trip Delay (RTD) and One Way Delay (OWD) measurements.
- Fax emulation supporting up to 4 independent and simultaneous sessions with speeds up to 33600 baud (V.34).
- New VQad™ Probe, self contained unit includes VQad™, Dual UTA and PC. Control via Ethernet Remote Desktop (with support for mouse/keyboard).
- Complete automation and remote operation including traffic generation and call control scripting.
- Remote monitoring with result query and real-time statistics using web based WebViewer™.
- Client-Server support to access functionalities remotely (requires additional license).

Visit <http://www.gl.com/completevqtsolutions.html> for more details.



GL Communications Inc.

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Automated Testing of Mobile Radio and Wireless Devices (Wi-Fi, Bluetooth®, 3G, 4G-WiMax, LTE) using Dual UTA

Wireless networks can impair voice quality by various means including poor mobile phone quality, voice compression and decompression algorithms, delay, loss or gain in speech levels, noise, acoustic and landline echo, and other distortions. GL provides a compact and portable solution for Wireless devices and Mobile Radio testing.

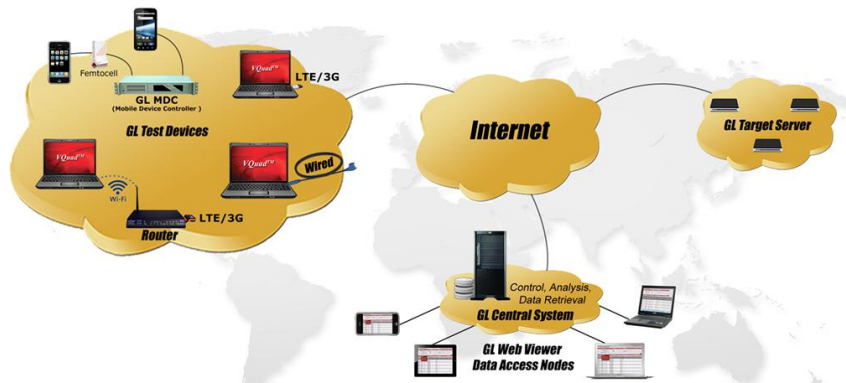
- Testing mobile end-to-end voice , data, and video quality.
- Mobile Phone call control – supports Bluetooth®, and 2.5mm Audio Headset Jack interfaces, 3.5mm terminations for Smartphones (iPhone, Android, Blackberry).
- Control Mobile Radios with Push-to-Talk functionality; Supports radio keying and send/record audio.
- Automatic One-Way Delay (OWD) & Round Trip Delay (RTD) measurements with results sent to GL VQT database.
- Synchronized software for sending/recording voice files.



Automated Data Testing

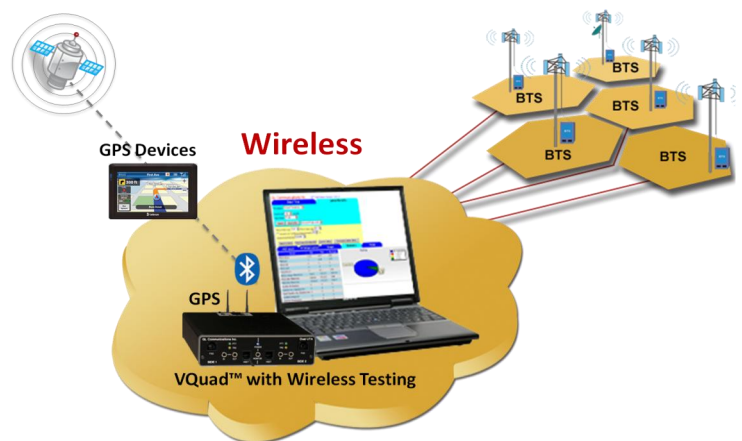
VQquad™ is enhanced to support Data Testing including TCP, UDP, VoIP, Route, HTTP, FTP, DNS, and SMS. The Data Tests are configured via the VQquad™ scripting and supports Wireless devices as well as PC Ethernet connections (wired, WiFi, Broadband 3G/4G, LTE).

- Both IOS (iPhone/iPad) and Android supported with downloadable GL app.
- Mobile device communicates with Mobile Device Controller from anywhere in the world.
- Network independent, supports 3G, 4G, WiMax, and LTE.
- PC based supports WiFi, wired, and Broadband card (3G, 4G, LTE).
- Fully automated and remote testing with all results accessible via WebViewer™.
- Multiple interfaces connected to same VQquad™ providing simultaneous testing.



GPS and ITS Location Stamping

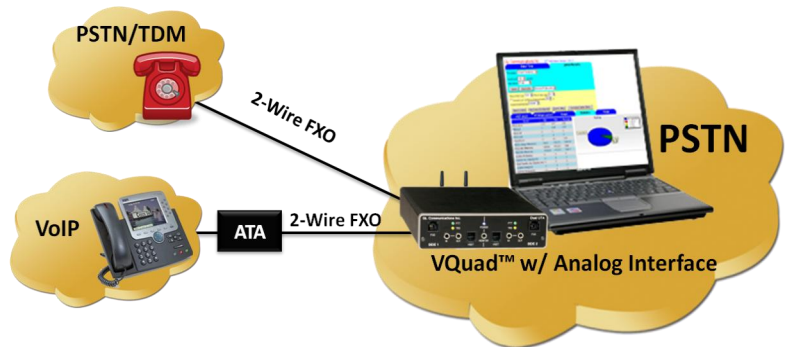
- The GPS mapping provides real-time GPS information during the VQquad™ test as well as saved to the VQT database.
- GPS Location includes stamping each VQT result with Latitude, Longitude, and GPS Time Stamp.
- GL VQT Automatic Mode allows automatic execution of the VQT algorithms (PESQ LQ/LQO/WB, PAMS, PSQM+).
- The Indoor Tracking System (ITS) in VQquad™ is developed to support VQT in remote and unreachable GPS signal locations..
- The ITS information (location, timestamp) is saved to the VQT database per VQquad™ Measurement.



Automated Testing of 2-Wire Analog interface (PSTN, ATA, Media Gateway) using Dual UTA

GL's VQuad™ with Dual UTA provides the solution for testing Analog 2-wire interfaces (PSTN, ATA, Media Gateway). The Dual UTA Analog interface supports two-stage dialing, IVR testing, Voice Quality Testing, Delay Measurements, and Echo Measurements. This solution can be configured to automatically send/record a multitude of voice files and perform VQT immediately after the voice recording is complete.

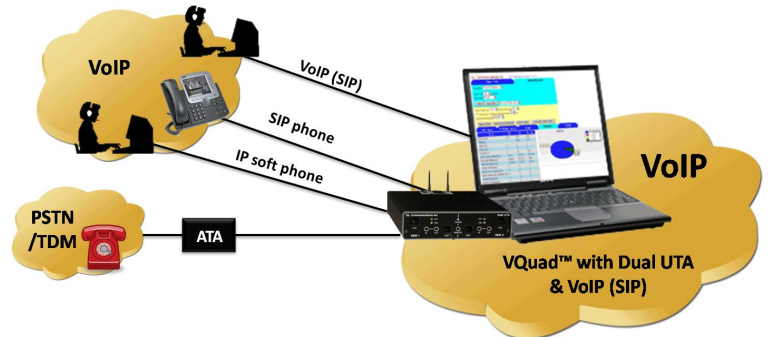
- Fax Testing using the Dual UTA 2-wire FXO or 4-wire analog interfaces. Supports up to 4 simultaneous T.30 faxes.
- Two Analog ports per Dual UTA (RJ-11 interface).
- Manual or Automatic operation of traffic generation and full call control.
- Supports all standard and customized call progress tones.
- Remote Access for starting/stopping the tests along with retrieving results.
- GL VQT Automatic Mode supports automatic execution of the VQT algorithms (PESQ LQ/LQO/WB).
- EC Testing and Measurements, Round Trip Delay, and One Way Delay Measurements.
- Each analog port may be controlled independently for traffic and call control.



Automated Testing of VoIP (SIP) Interface, Digital VoIP Phones, VoIP Softphones using Dual UTA

GL's VQuad™ with VoIP option, along with VQT, provides the ability to perform manual or automated tests on the VoIP network. The VQuad™ provides direct connection to the VoIP network with up to eight instances connected simultaneously. VQuad™ with Dual UTA provides the ability to test ATA's and Softphones while connected to the VoIP Network.

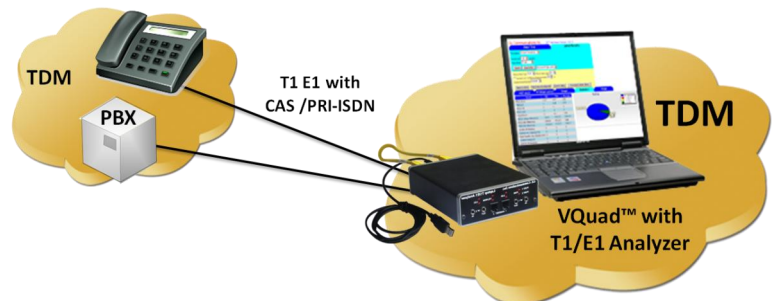
- Manual or Automatic call control (SIP protocol) with user-defined parameters for authentication and proxy.
- Automatic send/receive voice files over already established calls.
- Time/Digit/Tone triggering of send/receive voice files.
- Allows automatic execution of the VQT algorithms (PESQ LQ/LQO/WB).
- EC Testing and Measurements, Data Testing from PC or Device, Round Trip Delay ,and One Way Delay Measurements.



Automated Testing of TDM T1/E1 Interface (CAS/PRI ISDN) using USB T1/E1 Analyzer

Voice quality is essential for all Networks as well as Gateways and Switches. Providing the mechanism for VQT over T1/E1 trunks is essential. The VQuad™ with TDM option includes a truly portable solution. VQuad™ can generate and receive up to 8 simultaneous CAS or PRI ISDN or No Call Control (NOCC) calls on T1 or E1 trunks, 'SS7 coming soon'. Once the call is up, sending/recording voice is provided via the VQuad™ traffic configuration yielding in VQT MOS results.

- T1/E1 Network Support.
- Supports Call Control for PRI ISDN and CAS Protocols, 'SS7 coming soon'.
- Supports No Call Control (NOCC), where the T1/E1 call is connected without any call control required.
- Sending/recording voice files for VQT analysis and EC testing.
- Send/detect digits/tones.
- Allows automatic execution of the VQT algorithms (PESQ LQ/LQO/WB).

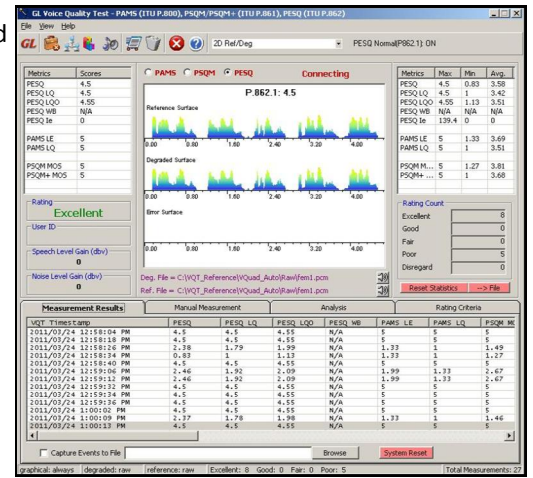


Associated Applications with VQuad™ (VQT, VBA, EMU)

GL's **Voice Quality Testing (VQT)** software compares the two voice files ('reference' and 'degraded') and provides an ITU-standard score (PESQ LQ/LQO/WB, PAMS and PSQM). The VQT software allows users to perform **manual and automated voice quality assessments**.

- Several additional analytic metrics for determining the reasoning for the resultant score.
- VQuad™ supports an integrated solution for all interfaces for low- density networks as well as expanded high density networks.
- Degraded voice files automatically transferred from VQuad™ nodes to VQT analysis via File Monitor Utility.
- Multiple VQT Auto-Measurement sessions may be configured, each session with a unique set of requirements and a unique reference voice file.
- Results are displayed both in tabular as well as graphical formats.
- Displays analytical results such as jitter, clipping, noise level, and delay (end to end as well as per speech utterance).
- Allows voice files to be saved based on the rating criteria (i.e., if VQT is fair or poor, save the degraded voice file) to the hard drive.

For complete details, refer to <http://www.gl.com/voicequalitytesting.html>.



The screenshot shows the VQT Auto-Measurement configuration window. It contains a table with columns: File, Reference File, Type, Option, Inventory, User ID, and Counts. The table lists several measurement sessions with their respective file paths and configurations.

File	Reference File	Type	Option	Inventory	User ID	Counts
degraded1	C:\VQT_Reference\Samples_AFT\A-law\1\male1a.pcm	A-Law,8,8000,LSMS(Brate)	Auto Del		fem1	56
degraded2	C:\VQT_Reference\Samples_AFT\A-law\1\male2a.pcm	A-Law,8,8000,LSMS(Brate)	Auto Del		fem2	56
degraded3	C:\VQT_Reference\Samples_AFT\A-law\1\male3a.pcm	A-Law,8,8000,LSMS(Brate)	Auto Del		fem3	56
degraded4	C:\VQT_Reference\Samples_AFT\A-law\1\male1a.pcm	A-Law,8,8000,LSMS(Brate)	Auto Del		male1	56
degraded5	C:\VQT_Reference\Samples_AFT\A-law\1\male2a.pcm	A-Law,8,8000,LSMS(Brate)	Auto Del		male2	56
degraded6	C:\VQT_Reference\Samples_AFT\A-law\1\male3a.pcm	A-Law,8,8000,LSMS(Brate)	Auto Del		male3	54

Voice Band Analysis (VBA)

The Near Real-time Voice-band Analyzer (VBA) is an analysis tool for monitoring voice band traffic over VoIP, TDM, 2-Wire and wireless network. All results from VBA are automatically sent to WebViewer™ central database (Oracle or MSAccess). The results that can be queried over web interface include Active Speech Level, Activity Factor, RMS Factor, DC Level, Noise Level, Echo Return Loss, Echo Delay, and Echo Dispersion statistics along with the additional analytical Call information.

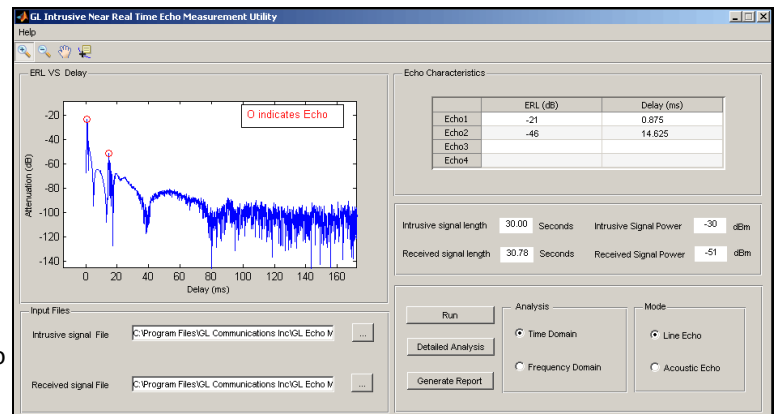
For complete details, refer to <http://www.gl.com/voicebandanalyzer.html> webpage.

Echo Measurement Utility (EMU) Software

The Echo Measurement Utility is used for Echo, delay, and voice quality analysis of voice calls in VoIP, TDM, 2Wire, and Mobile networks.

- Ability to automate the entire test process using VQuad™ scripting; including sending the results to the central database for access via GL's WebViewer™.
- EMU uses EMU Client software to automatically detect the incoming degraded voice files and send the measurements to database after analysis.
- Supports both line and acoustic echo measurements.

For complete details, refer to <http://www.gl.com/echo-measurement-utility.html> webpage.



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Associated Applications with VQuad™ (NetTest and FAX)

NetTest from PC and Mobile Devices

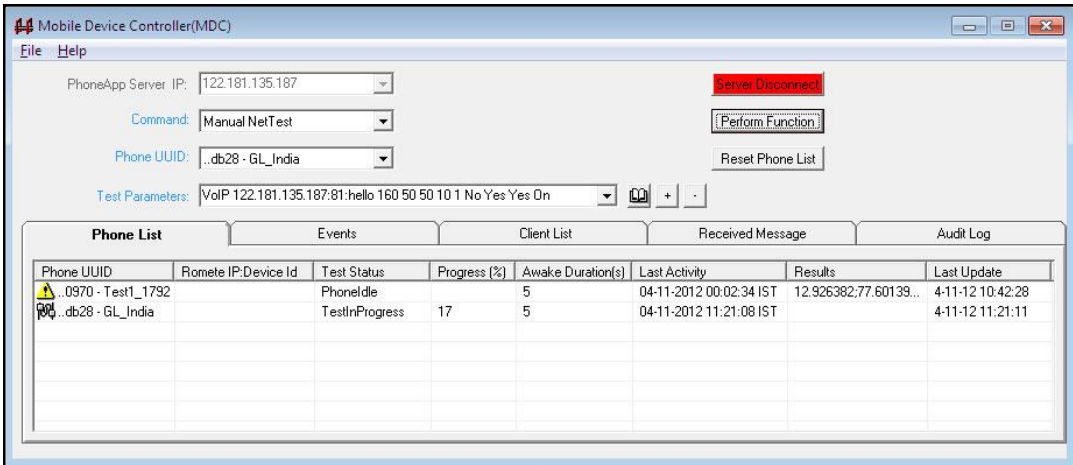
GL's VQuad™ solution is enhanced to support Data Testing using the NetTest application from PC and from mobile devices (using Mobile Device Controller).

VQuad™ can send commands (via the VQuad™ scripting) to the MDC and automate the NetTest to be performed on any connected Mobile Device. The Mobile Device will run the specified NetTests irrespective of whether the phone is on a voice call or not. MDC can manually set up the NetTest on the mobile devices using Test Type Editor.

- Automated Data Testing (NetTest) includes TCP, UDP capacity, VoIP, Route, HTTP, FTP, DNS, and SMS.
- Statistics and complete results are available through the WebViewer™ for both Mobile Device NetTests and PC based NetTests.

Note that the NetTest requires a GL Data Server at each target location, and the Mobile Device requires a GL deployed app (Apple or Android based) for operation.

For complete details, refer to <http://www.gl.com/automated-data-testing.html> webpage.

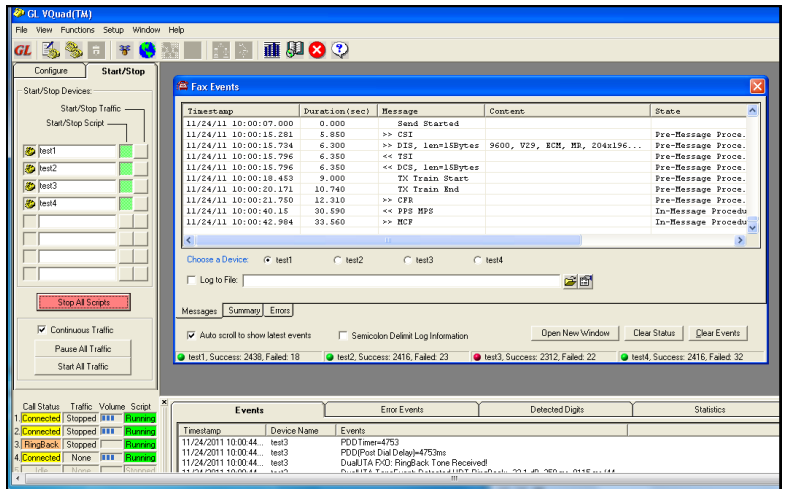


VQuad™ FAX Emulation

VQuad™ with Dual UTA supports sending and receiving up to 4 independent and simultaneous T.30 faxes. The user can configure the Tx and Rx fax rate from 2400 baud to 33600 baud with V.34 fully supported. Interfaces supported for fax generation include 2-wire FXO and 4-wire analog. Support for additional interfaces such as T1/E1 and VoIP (T.38) are coming soon.

- Capability of 4 independent and simultaneous T.30 faxes (selectable up to V.34).
- Supports fax rate ranging from 2400baud up to 33600baud (V.34 fully supported).
- Supports Fax Tx Rx for 2-wire analog (FXO) and 4-wire analog networks.
- VQuad™ Fax events includes messages, summary, and errors log.
- Ability to auto save fax (both East and West directions) to PCM file for enhanced analysis using GL Insight™ and GL Fax Extractor.
- VQuad™ scripting supports fax send or receive sessions configurations.
- Support for additional interfaces such as T1/E1 and VoIP (T.38) are coming soon.

For complete details, refer to <http://www.gl.com/fax-emulation-using-vquad.html> webpage.

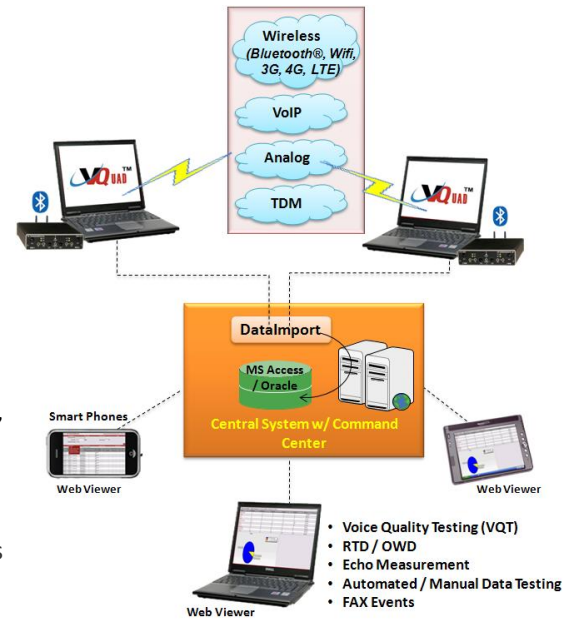


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Network Voice and Data Quality Testing System

GL's **Network VQT System** provides a complete solution that consists of Distributed VQuad™ Nodes, VQT Software, VQT WebViewer™, Command Center, and the other assisting tools.

- **Distributed VQuad™ Nodes** - These nodes control individual or multiple wireless, landline, VoIP or T1/E1 telephony terminals.
- **Voice Quality Testing Software (VQT)** – provide PESQ, Echo, Delay, Fax, and various Data testing results. Fully automated and remotely accessible, all results are automatically transferred to the Central Database for access via the GL WebViewer™. Included with the PESQ results are Jitter, Clipping, Signal and Noise Levels.
- **Remote Client WebViewer™** - remotely access all results associated with the VQuad™ test including Call Control (Call Failure and Call Dropped), Voice Quality, Round Trip Delay, One Way Delay, Echo Measurement, Fax Events, Data Testing from PC or Mobile Device. Provide user-defined reports as well as statistics.
- **VQuad™ Command Center** - remotely controls multiple Distributed VQuad™ Nodes (Network nodes or Distributed Degraded Voice Collecting Sites), performs voice quality analysis, and RTD measurements.

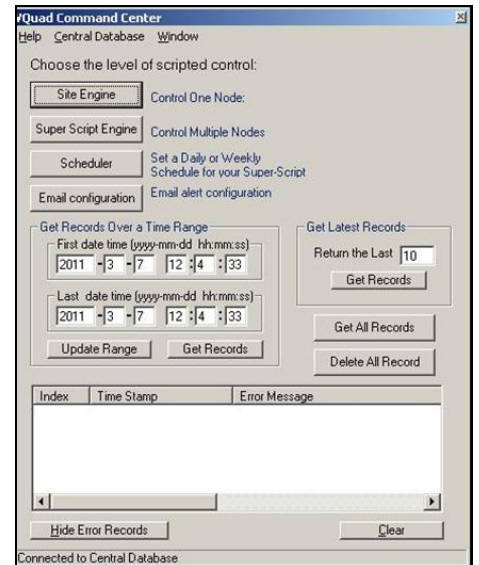


VQuad™ Command Center

VQuad™ Command Center controls all network node locations, with each node location comprising of VQuad™ devices (Mobile Bluetooth®/landline phones/VoIP Terminal/FXO/TDM).

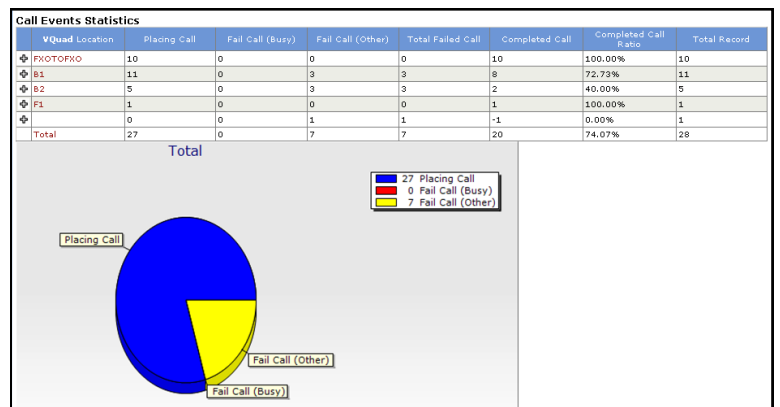
The Command Center controls all distributed sites, including actions such as -

- **Central Monitoring** - Controls and checks the status of all distributed network nodes in real-time. Each Network Node executes individual scripts and is remotely controlled via the RCC VQuad™ Command Center.
- **Automation** - Provides automation with flexible and easy to use scripting.
- **Scheduling** - Initiates voice collecting tasks periodically for each site at user-defined time.
- **E-mail Support** - is the ability to provide user-defined automated email associated with VQuad™ errors as well as VQT failed results. The email alerts are user-defined and supports multiple email addresses.



Remote Client WebViewer™

- Multi-user support, and user-friendly interfaces are remotely accessible via browser based clients (PC and IOS devices supported).
- Query and Access results, generate reports, display user-defined statistics in tabular and graphical views.
- Display real-time status of entire network with ability to remote access all nodes associated with the network.
- The VQT WebViewer™ queries the VQT central database and displays the results in both tabular and graphical formats. Results include Call Event, User Defined Events, Bluetooth® events, Data Test (Net Test results from PC and Mobile Devices) results, Fax Events, Echo Measurement, VQT, VBA, Delay Measurement and others.
- The WebViewer™ is a simple, easy to use Web browser which can operate on both PC and Mac systems (including iPhone and iPad).
- Voice and Data Testing, Echo Measurements and Analysis over TDM, VoIP, and Wireless networks.



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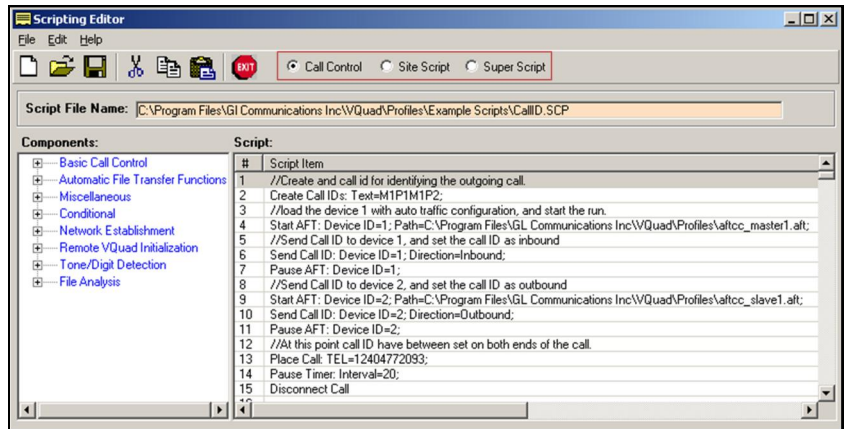
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VQuad™ Scripts

The VQuad™ script editor allows the user to create and edit Call Control Scripts, Site Scripts, and Super Scripts. The Super Script controls (start/stop) multiple Site Scripts, while the Site Scripts run simultaneously or sequentially. Each site script corresponds to one VQuad™ node.

Call control scripts are used to control calling process and VQuad™ actions, locally and remotely. The call control script creates VQuad™ devices (Mobile phones, Analog phones, VoIP, TDM, and 2-wire), loads auto traffic configuration file on the devices, and starts traffic generation and detection on the devices.



```
C:\WINDOWS\system32\cmd.exe - vquadcli 192.168.1.18
C:\>vquadcli 192.168.1.18
Vquad Remote Access <client> v.1.2.0
Vquad IP Address: 192.168.1.18
Vquad 1: Connecting...
Daemon: Connecting...
Daemon: Connected.
type 'h' for help
xvquad
Daemon: Message sent.
Vquad 1: Connected.
Vquad 1: Connecting...
Vquad 1: Connected.
scc 1 start(0)
Vquad 1: Message sent.
scc 2 start(0)
Vquad 1: Message sent.
slog all(-1) enable(1)
Vquad 1: Message sent.
saft 1 continuous(0)
Vquad 1: Message sent.
saft 2 continuous(0)
Vquad 1: Message sent.
glog all(-1) c:\
Vquad 1: Message sent.
```

VQuad™ and VQT Command Line Interface

The VQuad™ and VQT Command Line Interface (CLI) is designed to remotely access various application functionalities and thus controlling VQuad™ and VQT nodes located at various destinations.

The supporting commands helps the VQuad™ users to run the application installed on remote PC, Load Call Control Script Configuration, Load VQuad™ Master Configuration, Load Auto Traffic Configuration, Start Stop Call Control Script, Start Stop Auto Traffic Run, Place Call, Answer Call, Disconnect Call, Set and Get Log Files, and other operations.

The supporting VQT commands includes - Start/Stop VQT, Get VQT Status, Auto Measurement, Manual Measurement, Capturing Events, Retrieve Log files and others.

VQuad™ Software Specifications	
Tone Generation	200-4000Hz
Tone Detection	0-4000Hz

Buyer's Guide

VQuad™ Network Options

- [VQT010](#) - VQuad™ Software (Stand Alone)
- [VQT241](#) - VQuad™ Dual UTA with Balanced, Analog FXO, PTT, and Phone Handset Interfaces
- [VQT242](#) - VQuad™ Dual UTA Bluetooth option for controlling any Bluetooth® device (Call Control and Audio)
- [VQT270](#) - VQuad™ Probe with Dual UTA
- [VQT013](#) - VQuad™ with SIP (VoIP) Call Control
- [VQT015](#) - VQuad™ with T1 E1 Call Control
- [VQT018](#) - VQuad™ Lite with Dual UTA FXO and Bluetooth® devices
- [VQT040](#) - VQuad™ WebViewer™

Buyer's Guide contd...

VQuad™ Miscellaneous

- [VQT204, VQT204u, VQT204e](#) - GPS for Dual UTA
- [VQT030](#) - Network Command Center (Multi-Node Command and Control Center for VQuad™ Systems)
- [VQT442](#) - Mobile Audio Interface for Smartphones
- [VQT443](#) - 3-wire headset interface Adaptor for Smartphones

VQT and Analysis

- [VQT002](#) - Voice Quality Testing (PESQ LQ/LQO/WB)
- [VQT004](#) - Voice Quality Testing (PESQ LQ/LQO/WB, PAMS, PSQM)
- [VBA032](#) - Near Real-time Voice-band Analyzer
- [EMU037](#) - Echo Measurement Utility (EMU) Software
- [VQT600](#) - VQuad™ NetTest Data Server Solution
- [VQT601](#) - Mobile Device Controller (MDC) Software
- [VQT022](#) - VQuad™ Fax Emulation (2 simultaneous ports)
- [VQT022a](#) - VQuad™ Fax Emulation (8 simultaneous ports)



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