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# Voice, Video, and Data Quality Testing Solutions

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# Topics

- Hardware Platforms – VQuad™ and vMobile™
- Voice Analysis Tool (VAT™)
- Voice Quality Testing (VQT) - POLQA and PESQ
- AutoVQT™
- Testing Environments – Mobile Phones, Analog, Radios, VoIP SIP
- Available Metrics
- WebViewer™ - Web Based Client for Voice and Data Quality Testing
- Data Testing
- Video Testing

# Hardware Platforms

# Dual UTA HD Hardware Unit



Back Panel



Front Panel

# VQuad™ Probe HD



Back Panel



Front Panel

# VQuad™ mTOP™ Specifications

Front and Back Panel of VQuad™ mTOP™ 1



Front and Back Panel of VQuad™ mTOP™ 2



GPS connection on mTOP™ 1 daisy chains the GPS to multiple mTOP™ systems



# Current GL Mobile Test Hardware Platforms



vMobile™



vMobile™ Interfaces



Back Panel

Front Panel

VQuad™ Probe HD



Back Panel

Front Panel

Dual UTA HD



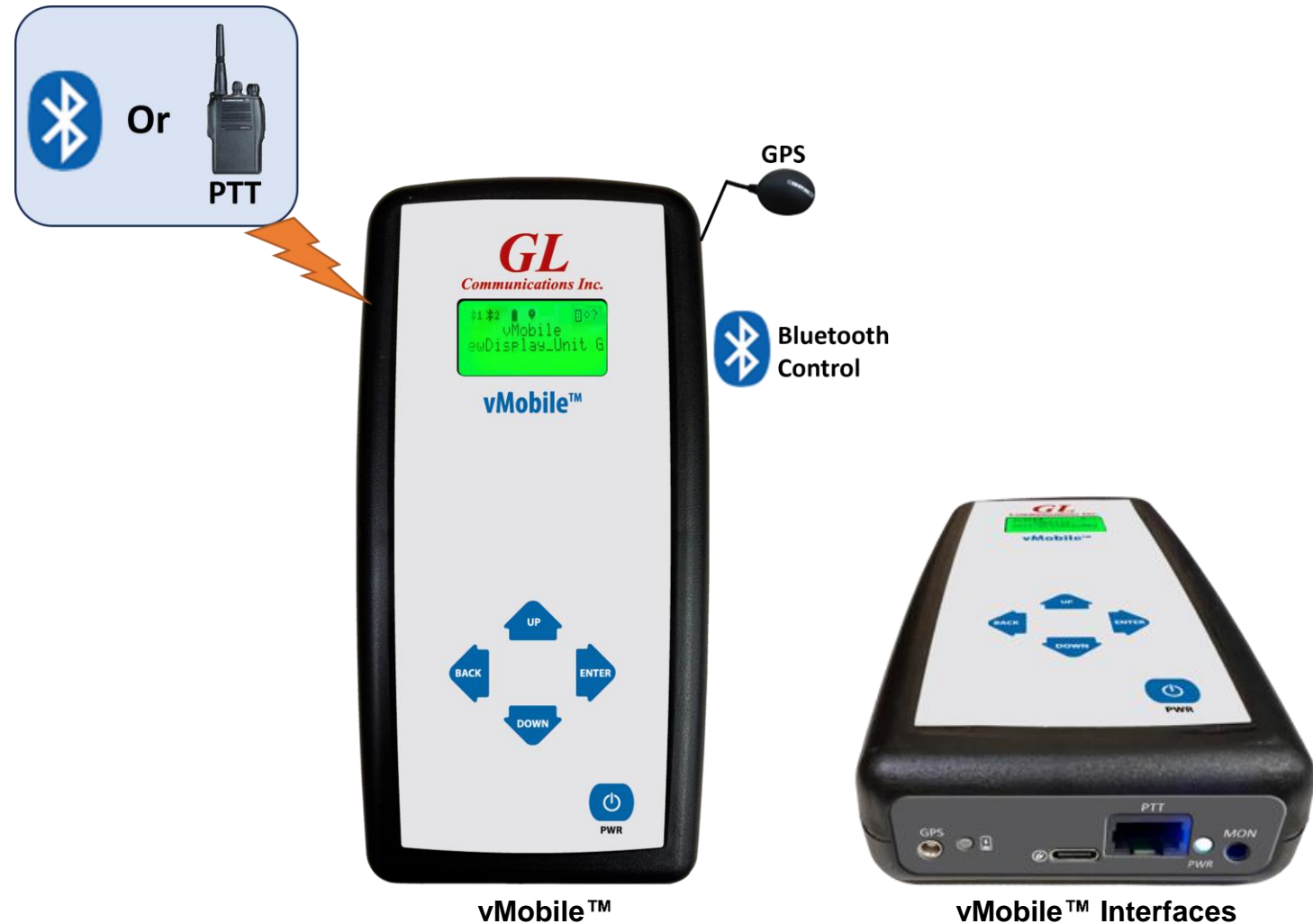
Front Panel

Back Panel

VQuad™ mTOP™

# vMobile™ Hardware Unit

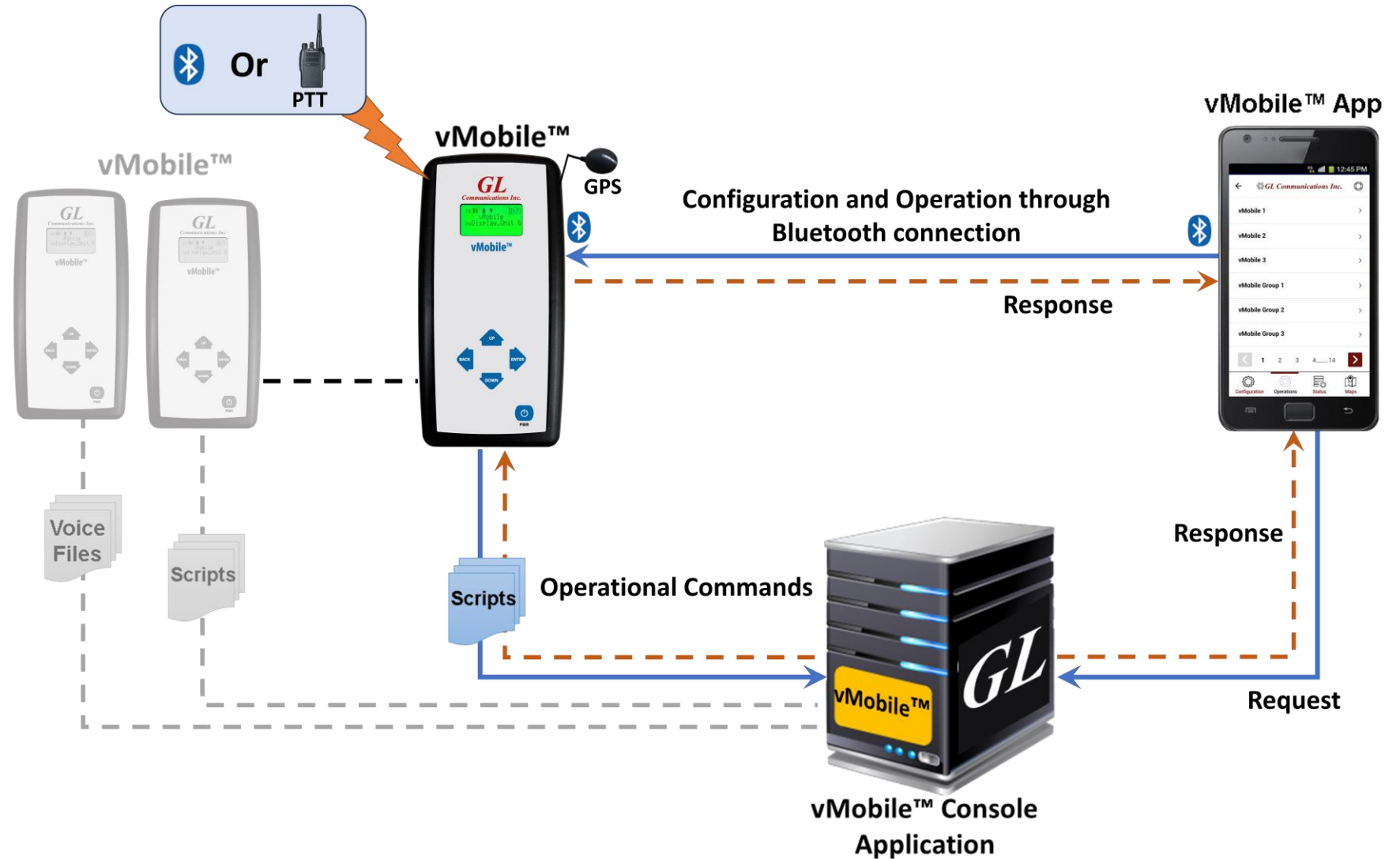
- Fully Automated
- Mobile Phone and Mobile Radio Testing
- Both Bluetooth and Analog modes
- Drive and Walk Testing
- Voice Quality Testing
- Delay Testing
- Solution supports GL WebViewer™
- Works with GL VQuad™, Voice Analysis Tool (VAT™) and Voice Quality Testing (VQT) solutions
- GPS/WiFi Clock sync, High Precision Clock Oscillator with 40 ms daily precision





# vMobile™ Configuration and Operation using Console and Console App

- The vMobile™ Console can run from any web-browser or using the Console App from any Android/IOS device
- Used to Monitor, Configure, and Operate the individual vMobile™ units
- vMobile™ Console can be used to create and edit vMobile™ scripts as well as upgrade the vMobile™ software when available
- Multiple vMobile™ units can be controlled from a single Console or Console App
- Remotely Upgrade vMobile™ software and audio files
- vMobile™ Error logs can be accessed from the Console or Console App



# vMobile™ Control and Operation

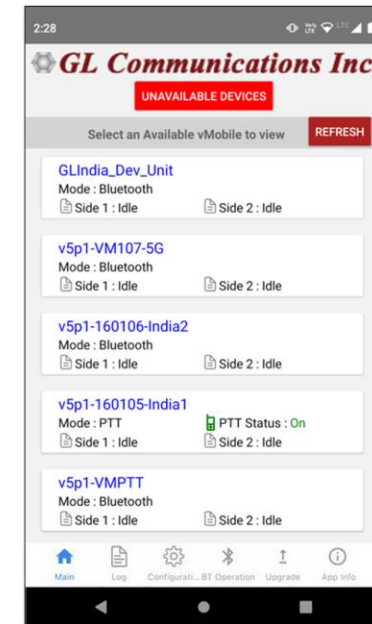
## vMobile™ Console

## vMobile™ Console APP

GL Communications Inc.

vMobile Status

vMobile Name	Wi-Fi Network	Side 1	Side 1 Script	Side 2	Side 2 Script	GPS Latitude - Longitude
GLIndia_Dev_Unit	DSPTeam	160073Dev1 ( MotoPhone1 )	answercallside1.vms	160073Dev2 ( motoPhone2 )	wbxxside2.vms	12.911302 , 77.89264
v5p1-VM107-5G	glimesh	US107Test1 ( VELVET )	central3000bxxwbside1.vms	US107Test2 ( RobGalaxy )	answercallside2.vms	39.143362 , -77.215513
v5p1-160106-India2	DSPTeam	US109Test1 ( Q6 )	waiteventreceivetests1.vms	US109Test2 ( Q6 )	answercall.vms	12.926155 , 77.601742
v5p1-160105-India1	DSPTeam	IN105Test1 <b>PTT On</b>	side1r.vms	NA	NA	12.926363 , 77.601412
v5p1-VMPTT	glimesh	USPTTTest1 ( Not Yet Connected )		USPTTTest2 ( Not Yet Connected )		39.1434 , -77.215535
Zhiyong22	Zhiyong_test	BTTest113 ( RobG8 )	central3000bxxwbside1.vms	BTTest213 ( Zhi5g )	answercallside2.vms	39.143375 , -77.215552
RobvMobile3	glimesh	LTest1 ( RobGalaxy )		LTest2 ( ZDBTTest1 )		39.14334 , -77.215473
v5p1-VM101-rob	glimesh	US160101Test1 ( VELVET )	answercallrunscriptside1.vms	US160101Test2 ( RobGalaxy )	runscriptoptionside2.vms	39.1434 , -77.215525
Sonny50m	GURUMNARA	LTest1 ( SonnysiPhone )	side1r.vms	LTest2 ( GalaxyJ7Prime )	side2m.vms	39.104778 , -77.227892



Configuration and Operation through Internet connection



Configuration and Operation through Bluetooth connection



# vMobile™ Status

GL Communications Inc.

vMobile Status

vMobile Name	Wi-Fi Network	Side 1	Side 1 Script	Side 2	Side 2 Script	GPS Latitude - Longitude
GLIndia_Dev_Unit	DSPTeam	160073Dev1 ( MotoPhone1 )	answerallside1.vms	160073Dev2 ( motoPhone2 )	wbtxrxside2.vms	12.911302 , 77.89264
v5p1-VM107-5G	glmesh	US107Test1 ( VELVET )	central3000brrxwside1.vms	US107Test2 ( RobGalaxy )	answerallside2.vms	39.143362 , -77.215513
v5p1-160106-India2	DSPTeam	US109Test1 ( Q6 )	waiteventreceptestside1.vms	US109Test2 ( Q6 )	answerall.vms	12.926155 , 77.601742
v5p1-160105-India1	DSPTeam	IN105Test1 <span style="color: green;">PTT On</span>	side1r.vms	NA	NA	12.926363 , 77.601412
v5p1-VMPTT	glmesh	USPTTTest1 ( Not Yet Connected )		USPTTTest2 ( Not Yet Connected )		39.1434 , -77.215535
Zhiyong22	Zhiyong_test	BTTest113 ( RobG8 )	central3000brrxwside1.vms	BTTest213 ( Zhi5g )	answerallside2.vms	39.143375 , -77.215552
RobvMobile3	glmesh	LTest1 ( RobGalaxy )		LTest2 ( ZDBTTest1 )		39.14334 , -77.215473
v5p1-VM101-rob	glmesh	US160101Test1 ( VELVET )	answerallrunscriptside1.vms	US160101Test2 ( RobGalaxy )	runscriptoptionside2.vms	39.1434 , -77.215525
Sonny50m	GURUMNARA	LTest1 ( SonnyiPhone )	side1r.vms	LTest2 ( GalaxyJ7Prime )	side2m.vms	39.104778 , -77.227892

Console Status

2:28

GL Communications Inc.

**UNAVAILABLE DEVICES**

Select an Available vMobile to view REFRESH

**GLIndia\_Dev\_Unit**

Mode : Bluetooth

Side 1 : Idle      Side 2 : Idle

**v5p1-VM107-5G**

Mode : Bluetooth

Side 1 : Idle      Side 2 : Idle

**v5p1-160106-India2**

Mode : Bluetooth

Side 1 : Idle      Side 2 : Idle

**v5p1-160105-India1**

Mode : PTT PTT Status : On

Side 1 : Idle      Side 2 : Idle

**v5p1-VMPTT**

Mode : Bluetooth

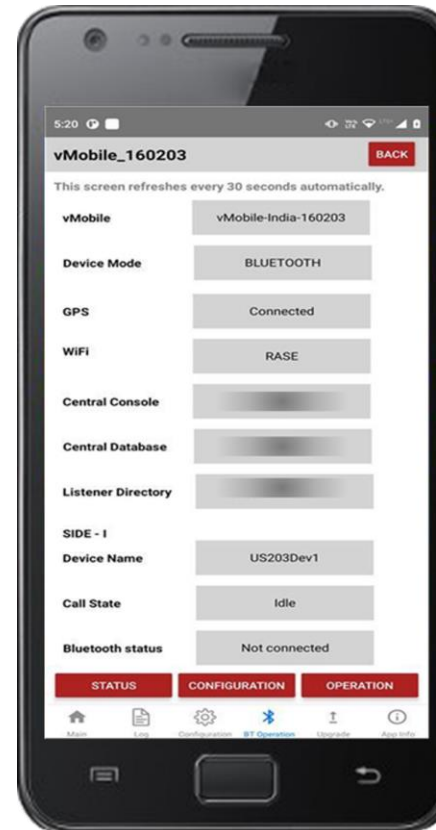
Side 1 : Idle      Side 2 : Idle

Main   Log   Configurati... BT Operation   Upgrade   App Info

Console App Status

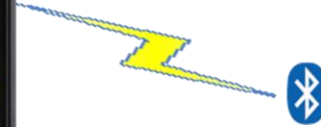
# vMobile™ Configuration, Status and Operation via Bluetooth

- Console App can be used to configure, get the status and operate vMobile™ via Bluetooth easily
- This feature helps the user to operate, configure, or view status during slow internet/no internet areas



Console App on Smartphone (Android/iOS)

Configuration, Status and Operation



vMobile™

# VQuad™ GUI with Script Editor

The screenshot displays the VQuad GUI with Script Editor interface, which is divided into several functional areas:

- Configure Panel (Left):** Contains a tree view of devices including RealLineFX01, RealLineFX02, RealBT1 (MotoPhone1), RealBT2 (MotoPhone2), UA1, and PT T side1/2. A 'Setup Devices' button is located at the top.
- Terminal (Top Middle):** Shows the AT command interface for 'RealBT1'. The terminal output includes:
 

```
set bt sco nowbs
Reset
WRAP THOR AI (5.0.2 build 992)
Copyright (c) 2003-2013 Bluegiga Technologies Inc.
READY.
```
- Script Editor (Right):** Displays a script file named 'C:\Program Files (x86)\GL Communications Inc\VQuad\Profiles\Demo\_scripts\Demo\BT\_Bidirectional\_FileTxRx\_POLQA.scp'. The script contains various AT commands and control logic, such as:
 

```
13 Set Global1: Device ID=?+1;
14 Continuous Run Marker
15 //Load / Run Answer call script
16 Stop Script: Device ID=Global1;
17 Load Script: Device ID=?+1,Path=C:\Program Files\GL Communications Inc\VQuad\Profiles\Univers
18 //****Note: If user has Windows 7 64 bit system then he needs to provide the following path to load Vq
19 //Start the script on far end device to answer the call
20 Run Script: Device ID=Global1;
21 //If call drops prematurely, goto Break Point
22 Set Event Watch: Event=Call Dropped; Break=True;
23 Pause Timer: Interval=3;
24 //Identifying which device in Dual UTA
25 Create Call ID: Call ID=NBPDQATESTIndia;
26 Send Call ID: Device ID=?, Direction=Outbound;
27 Send Call ID: Device ID=Global1; Direction=Inbound;
28 //Place call to other side
29 //**** Note, modify the Place Call number as desired
30 Place Call: TEL=5551212,Device ID=?;
31 Wait Event: Event=Connect Indication,Interval=30;
32 //Checking for a connection
33 If: Connect Indication Received;
34   Pause Timer: Interval=4;
35 //Modify iterations to change number of bidirectional transfers.
36 Clear Event Watch: Event=Call Connected;
37 Do: Iterations=2;
38 //Fem1: transmit far-side to local
39 Tx/Rx File Sync: RxFile1=C:\VQT_Degraded\0fem1PolqANB.pcm,DeviceId2=Global1,FileOp
40 Tx/Rx File Sync: DeviceId2=Global1,TxFile2=C:\VQT_Reference\VQuad_Auto\POLQANB\fe
41 Pause Timer: Interval=15;
42 //male1: transmit local to far-end
43 Tx/Rx File Sync: DeviceId2=Global1,RxFile2=C:\VQT_Degraded\0male1PolqANB.pcm,FileOp
44 Tx/Rx File Sync: TxFile1=C:\VQT_Reference\VQuad_Auto\POLQANB\male1POLQA.pcm,De
45 Pause Timer: Interval=15;
46 Loop
47 //This pause interval is for pasue between bidirectional transfers, modify as necessary
48 Pause Timer: Interval=5;
49 Else
50 //Call failed, send error
51 //You can search the WebViewer database to determine number of failed calls based on this error
52 Clear Event Watch: Event=Call Dropped;
53 Send Comment: Text=Error: PlaceCall Failed;
54 End If
55 //This breakpoint is invoked if at anytime the connection between the far-side and near-side is lost
56 Break Point
57 If: Call Dropped;
58 //Call Dropped, send Error
59 //You can search the WebViewer database to determine number of dropped calls based on this e
60 Send Comment: Text=Error: Call Dropped;
61 End If
62 Clear Event Watch: Event=Call Dropped;
63 Disconnect Call:Device ID=Global1;
64 Pause Timer: Interval=2;
65 Disconnect Call:Device ID=?;
66 Stop Script: Device ID=Global1;
67 Pause Timer: Interval=5;
68 //This pause interval is for inter-call, modify as necessary
69 Pause Timer: Interval=10;
70
71
```
- Script Components (Middle Left):** A list of components including Call Control, Dual UTA Device Operations, Voice Tx/Rx & Delay, Traffic Generation/Detection, FXD Device, Mobile/Bluetooth Device, Analysis, Data Testing, Misc / Reports, Conditional, External Operations, Remote VQuad Operations, and Central Database Connection.
- Script Editor (Middle Right):** A list of script items with line numbers, corresponding to the script code on the right.
- Events (Bottom):** A table showing system events:
 

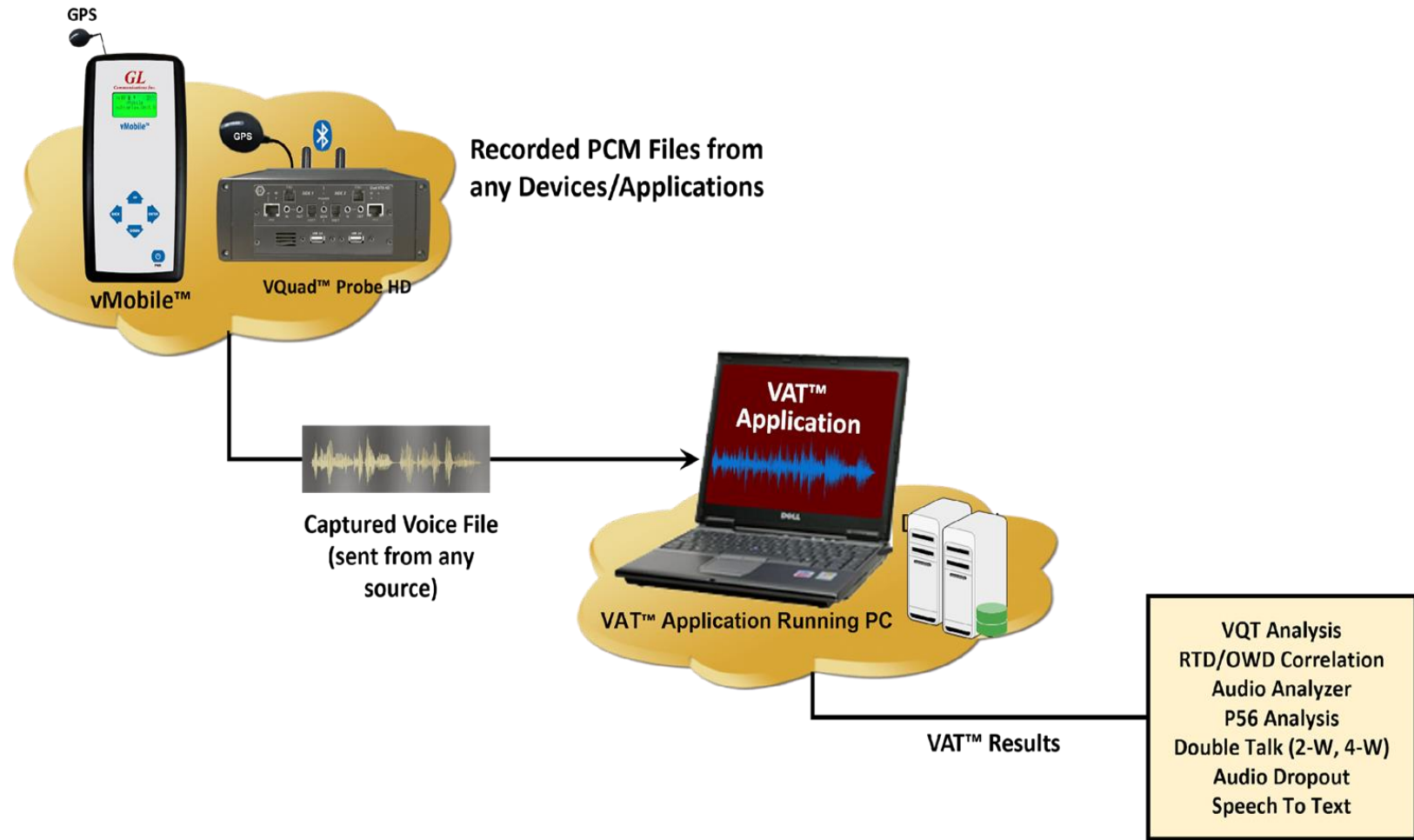
Timestamp	Device Name	Events
09/15/2023 12:34:42 PM	RealLineFX02	Stop All Traffic
09/15/2023 12:34:42 PM	RealLineFX02	TxRxSync Done
09/15/2023 12:34:42 PM	RealLineFX02	StopTxRxSync - Local; Device1=2
09/15/2023 12:34:47 PM		CentralDB:Request: ID=16 Command=C:\Prog
09/15/2023 12:35:22 PM		VAC Socket Error: Connection timed out.
09/15/2023 12:35:22 PM		VAC Server Disconnected
- Call Log (Bottom Left):** A table showing call status:
 

Call	Auto	Vol(Rx)	Script
1.	Idle	Stopped	Stopped
2.	Idle	Stopped	Stopped
3.	Idle	Stopped	Stopped
4.	Idle	Stopped	Stopped
5.	Idle	Stopped	None
6.	Idle	Stopped	None
7.	Connected	Stopped	Stopped
8.	Connected	Stopped	None
9.	Idle	N/A	Stopped
10.	Idle	N/A	Stopped
11.	Idle	N/A	Stopped
12.	Idle	N/A	Stopped

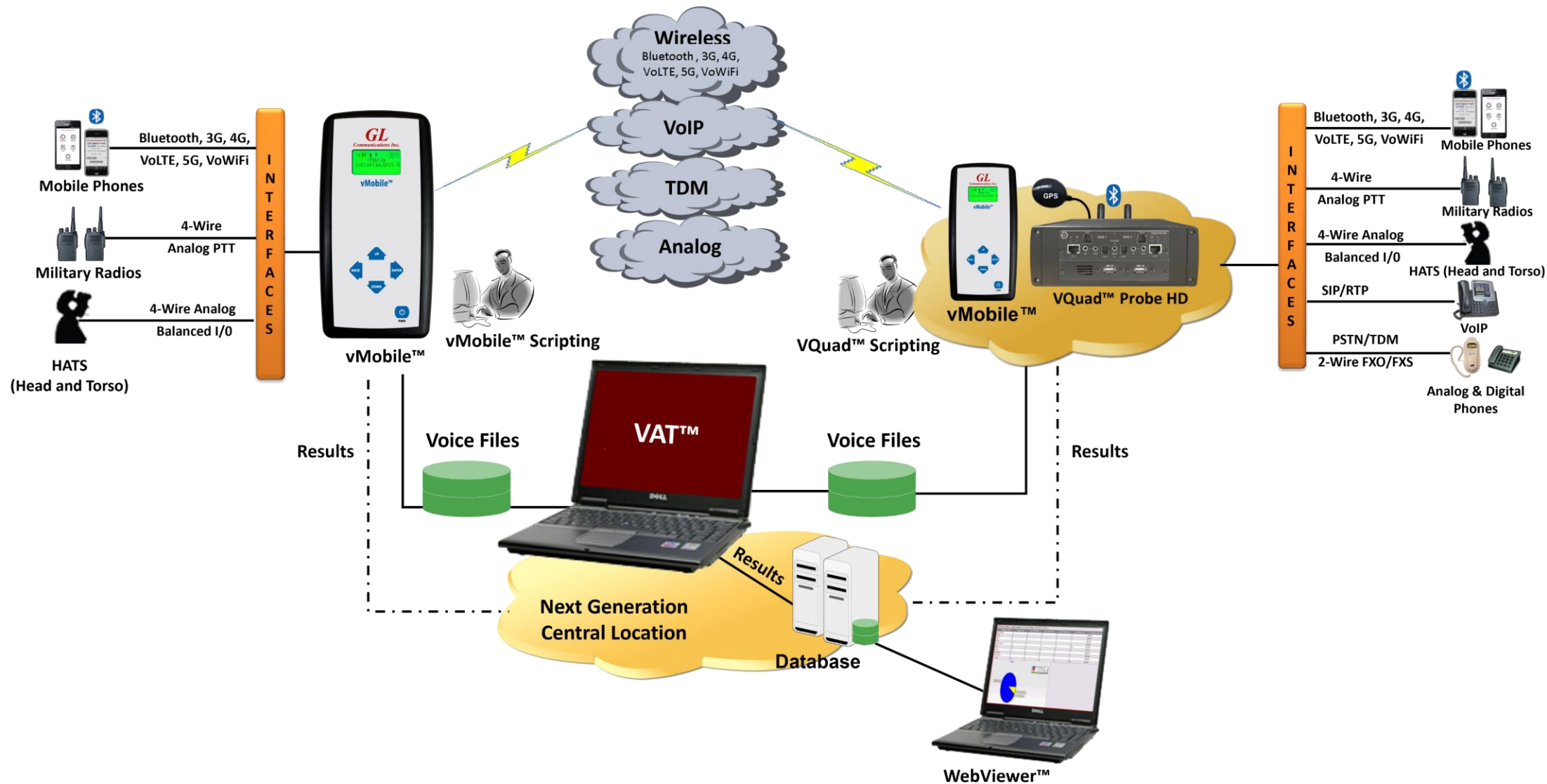
# Voice Analysis Tool (VAT™)

# Voice Analysis Tool (VAT™)

- GL VAT™ supports analyzing any Raw PCM voice file including NB, WB, and SWB. Audio files can be generated from any application including GL VQuad™ and vMobile™
- Fully automated operation with log file containing results and stored in the GL Central Database which can be accessed easily using the GL WebViewer™
- VAT™ CLI (Command Line Interface) supports remote operation
- Audio analysis includes, Round Trip and One Way Delay, Dropout Audio analysis, Double-Talk, Power Level and Frequency Analysis, Speech Activity, Active Speech Level and Noise Level, and DC Offset
- Supports VQT analysis when coupled with the GL VQT software
- Supports multiple analytical tests per individual voice file



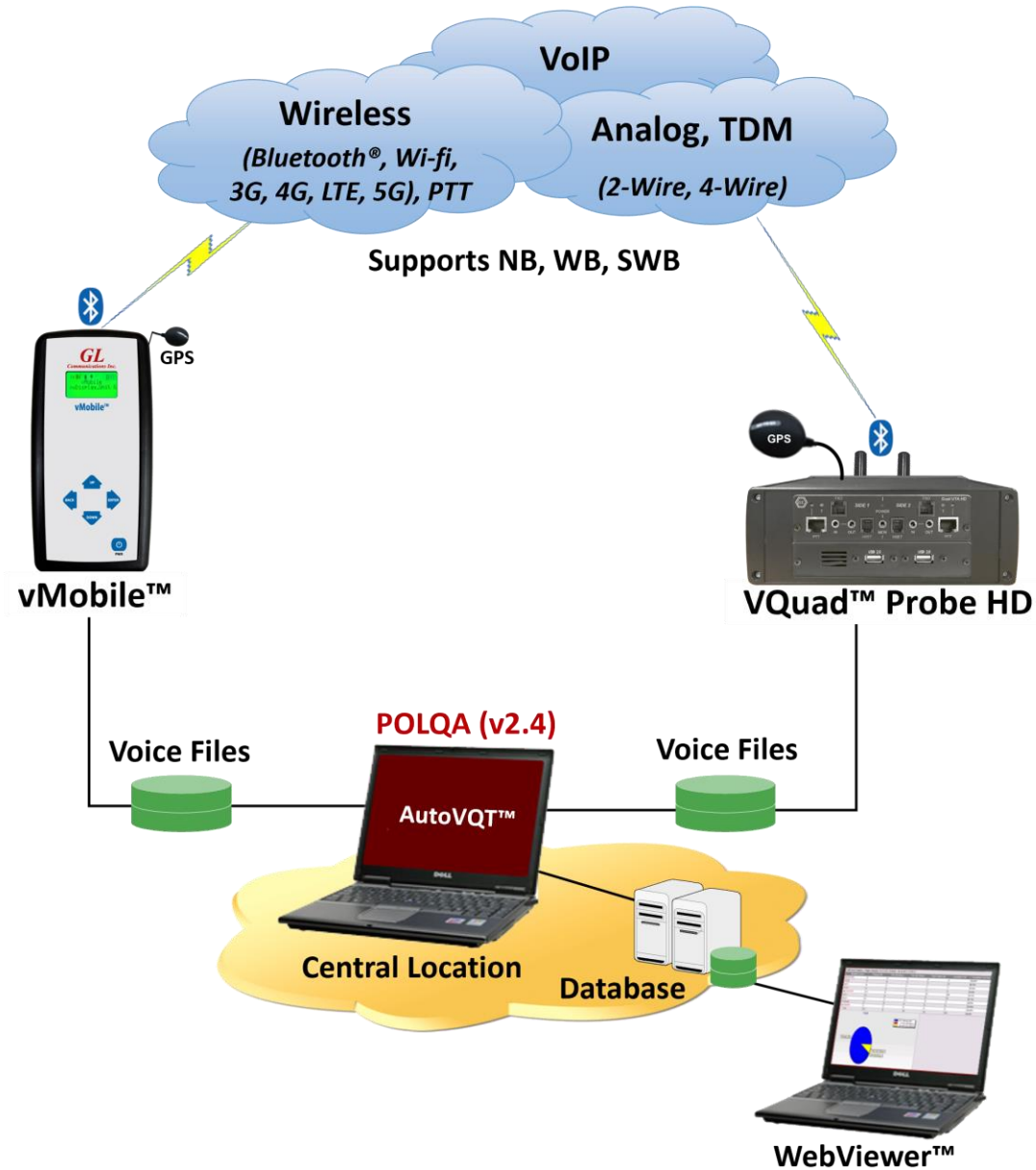
# VAT™ Operations





# Voice Quality Testing (VQT)

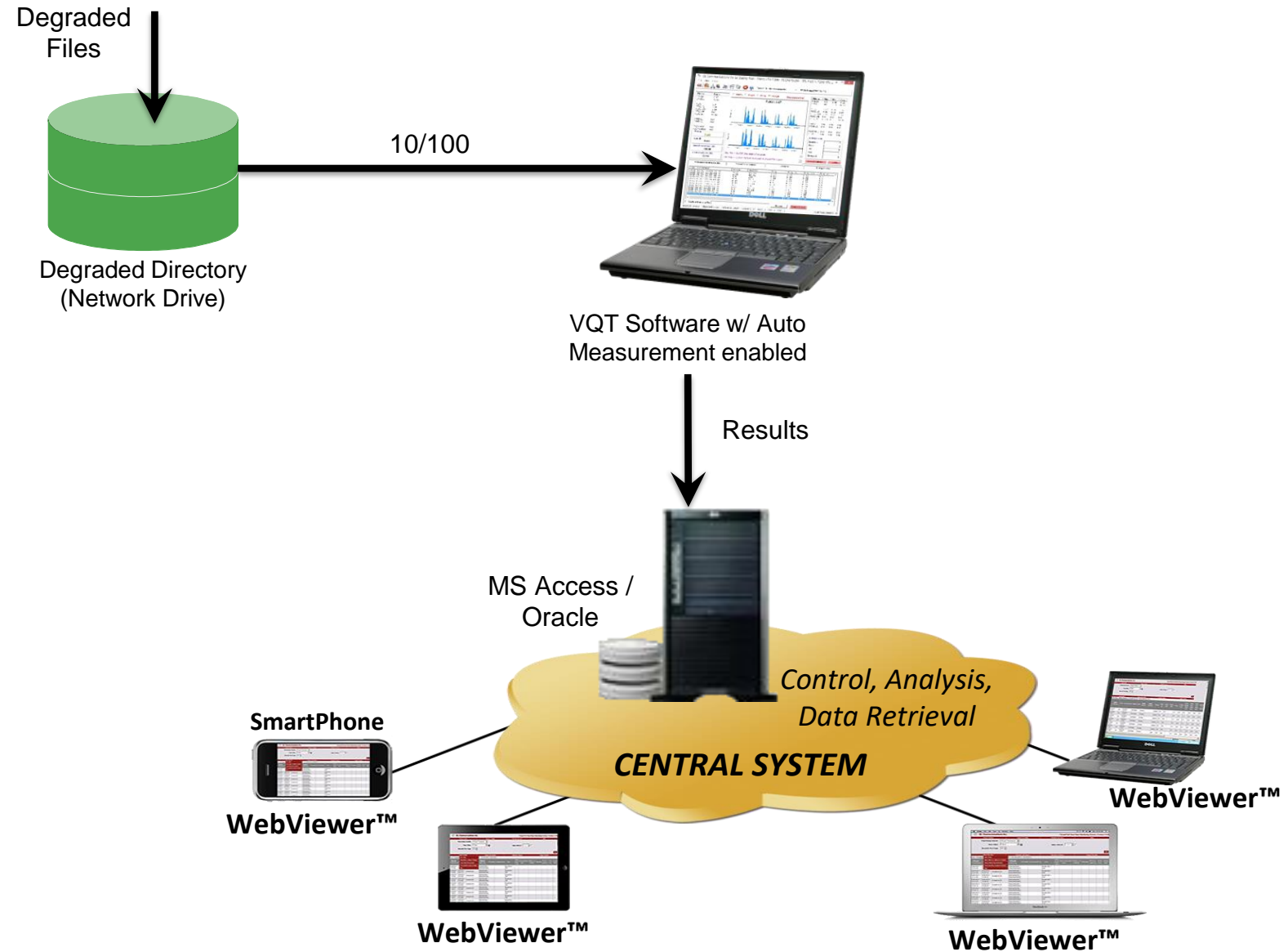
# Centralized Voice Quality Testing



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

# Auto Measurement

- Automatically analyze the degraded files using GL VQT Software
- Detailed results including Jitter (min / max / avg), Clipping (front/back/all), Latency, and Noise / Signal Measurements (activity / peak)
- VQT uses the File Monitor to perform automated measurements on remote locations VQT Solutions



# Voice Quality Test Software

GL Communications Inc Voice Quality Test - PAMS (ITU P.800), PSQM/PSQM+ (ITU P.861), PESQ (ITU P.862), POLQ...

File View ACU ITS Help

GL Speech Quality Measurements PESQ Normal(P862.1): ON

Metrics	Scores
POLQAV3	2.97
EMODEL	57.54
PESQ	N/A
PESQ LQ	N/A
PESQ LQO	N/A
PESQ WB	N/A
PESQ IE	N/A
PAMS LE	N/A
PAMS LQ	N/A
PSQM MOS	N/A

PAMS PSQM PESQ **POLQAV3 Connected**

**P.863 : 2.97**

Deg. File = C:\QQT\_Degraded\6\1em1Polqa\_20240207143416\_N12\*55'48"

Ref. File = C:\QQT\_Reference\Quad\_Auto\POLQANB\1em1POLQA.pcm

Metrics	Max	Min	Av
POLQAV3	4.5	1.04	2.97
EMODEL	100	10.38	57.54
PESQ	N/A	N/A	N/A
PESQ LQ	N/A	N/A	N/A
PESQ LQO	N/A	N/A	N/A
PESQ WB	N/A	N/A	N/A
PESQ IE	N/A	N/A	N/A
PAMS LE	N/A	N/A	N/A
PAMS LQ	N/A	N/A	N/A
PSQM M...	N/A	N/A	N/A

Rating: **Fair**

User ID: **Female\_NB**

Speech Level Gain (dB): **-2.86**

Noise Level Gain (dB): **12.54**

Rating Count

Excellent	300
Good	1178
Fair	2946
Poor	5
Disregard	0

**Reset Statistics** --> File

**Measurement Results** Manual Measurement Analysis Rating Criteria

VQT Timestamp	POLQAV3	EMode1	PESQ	PESQ LQ	PESQ LQO	PESQ WB	PAMS L
2024/02/07 2:30:00 PM	4.5	100	N/A	N/A	N/A	N/A	N/A
2024/02/07 2:30:19 PM	3.54	68.72	N/A	N/A	N/A	N/A	N/A
2024/02/07 2:30:38 PM	4.44	94.67	N/A	N/A	N/A	N/A	N/A
2024/02/07 2:30:58 PM	2.96	57.3	N/A	N/A	N/A	N/A	N/A
2024/02/07 2:31:16 PM	4.5	100	N/A	N/A	N/A	N/A	N/A
2024/02/07 2:31:35 PM	3.44	66.77	N/A	N/A	N/A	N/A	N/A
2024/02/07 2:32:55 PM	4.44	94.77	N/A	N/A	N/A	N/A	N/A
2024/02/07 2:33:14 PM	2.91	56.27	N/A	N/A	N/A	N/A	N/A
2024/02/07 2:33:32 PM	4.5	100	N/A	N/A	N/A	N/A	N/A
2024/02/07 2:33:52 PM	3.49	67.81	N/A	N/A	N/A	N/A	N/A
2024/02/07 2:34:11 PM	4.48	98.26	N/A	N/A	N/A	N/A	N/A
2024/02/07 2:34:30 PM	2.97	57.54	N/A	N/A	N/A	N/A	N/A

Capture Events to File

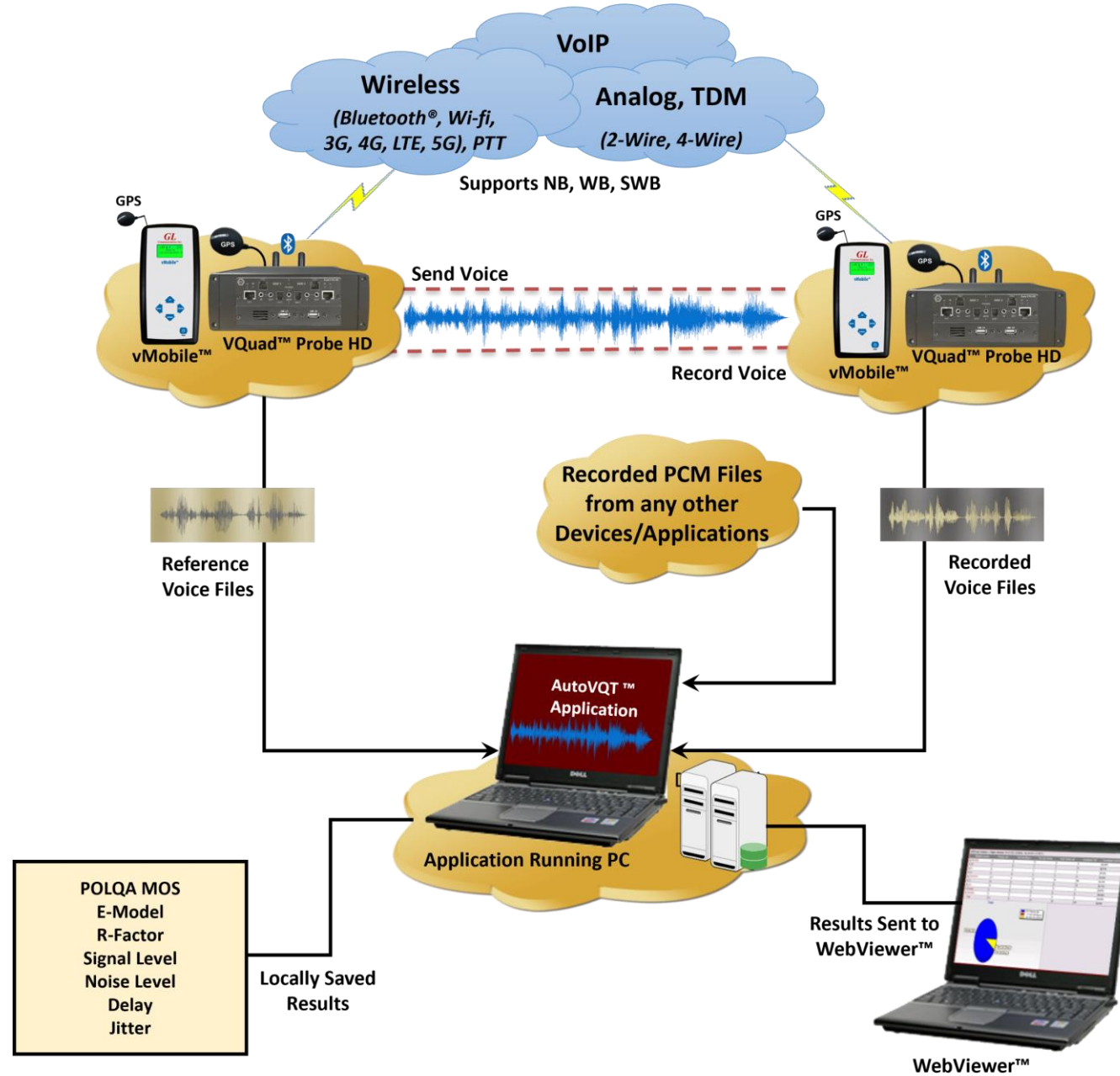
graphical: on degraded: raw reference: raw Excellent: 300 Good: 1178 Fair: 2946 Poor: 5 Total Measurements: 4430

# VQT Highlights

- Supports ITU Standards (POLQA, PESQ LQ/ LQO / WB)
- Supports NB, WB and SWB codecs
- Auto-Measurement Capabilities
- Detailed Results / Statistics
- Criteria Rating System
- Remote Access Capabilities
- Delay Measurement
- Jitter (Min, Max, Average per Utterance)
- Clipping (front, back, all)
- Noise/Signal Levels (Activity, Peak, etc.)

**AutoVQT™**

# AutoVQT™ Operations



# AutoVQT™ Analysis Time

- The following table summarizes the average time taken to analyze PCM files when they are provided at the same time using Windows® 11 Pro 64-bit operating system, equipped with a 12th generation Intel® Core™ i9-12900K processor at 3.20 GHz and on 32 GB of RAM

PCM Type	Approximate Time Required to Process 1000 PCM Files Simultaneously (Min : Sec)	Approximate Time Required to Process 1 PCM File (Sec)
Narrowband (NB)	02:01	0.12
Wideband (WB)	02:13	0.13
Super wideband (SWB)	02:26	0.14

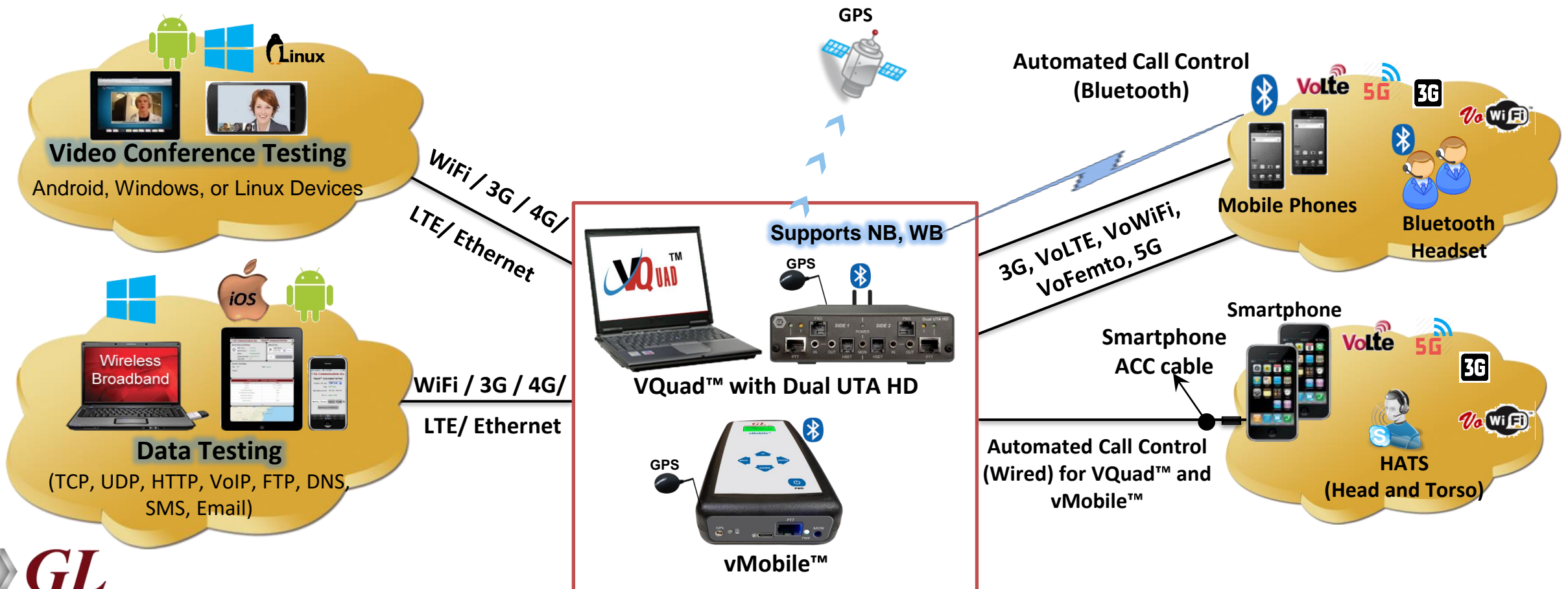
- On average, when the application is required to analyze multiple PCM files with different sampling rates (300 NB, 300 WB, and 400 SWB files), the total time taken to analyze all the 1000 PCM files at the same time is approximately **02 minutes and 31 seconds**



# Testing Environments

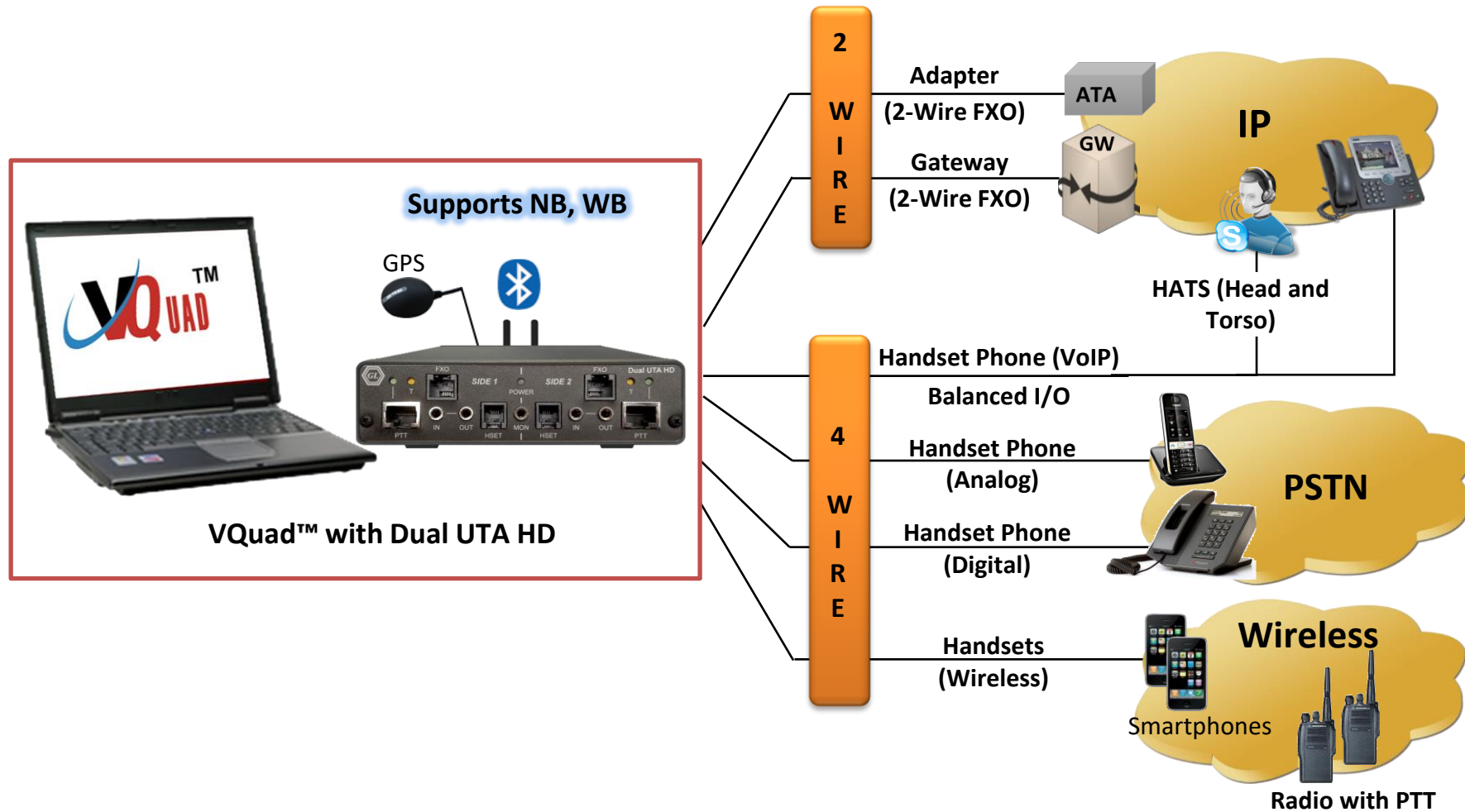
# Wireless Phone Network

- **Connectivity** - Bluetooth® NB & WB, PTT, GPS, Wired Headset Smartphone ACC, 4-wire Balanced I/O Interfaces on Dual UTA HD and vMobile™
- **Devices** – Military/Mobile Radios, 5G/4G/3G/WiFi Smartphones (all Mobile phones), Bluetooth® Headsets/Car Kits, Mobile devices with Smartphone ACC



# Analog Network (2-wire FXO and 4-wire)

- **Connectivity** – 2-Wire FXO, 4-Wire Balanced I/O, HSET Interfaces on Dual UTA HD
- **Devices** – Analog Phones, Next Generation Gateways, PBX, ATAs over PSTN network



# Mobile Radios (PTT)

- The vMobile™ and Dual UTA HD provides a contact-closure control to support the push-to-talk (PTT) function of a mobile radio
- Software (VQuad™/vMobile™) Script:
  - Enable PTT
  - Pause for User-Defined Period
  - Send Audio (VQT Reference) File
  - Pause for User-Defined Period
  - Disable PTT

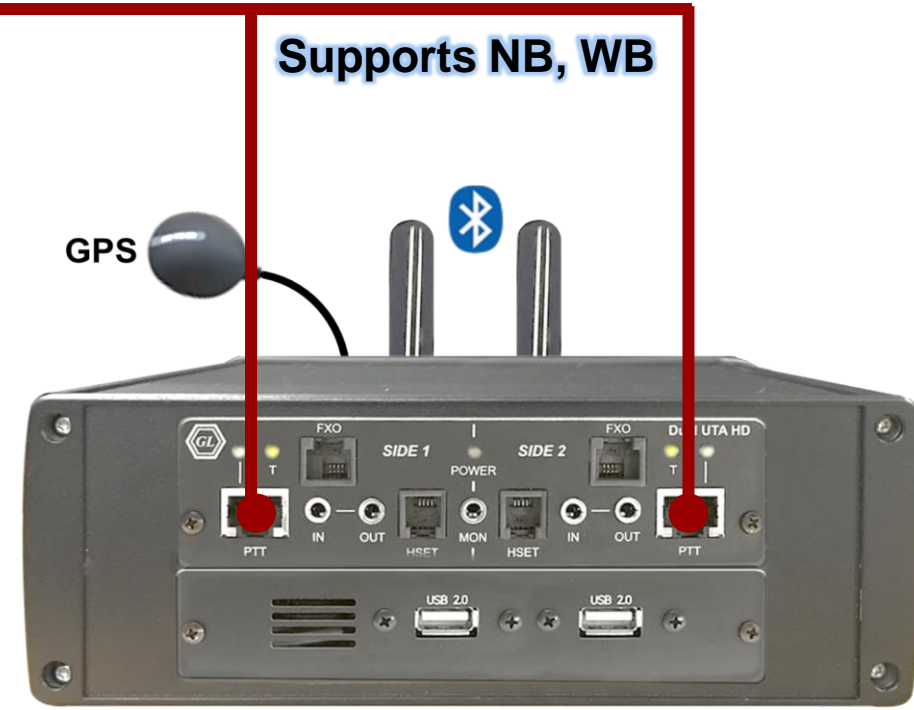


PTT Control Plus  
Audio IN/OUT



Mobile Radios

PTT Control Plus  
Audio IN/OUT

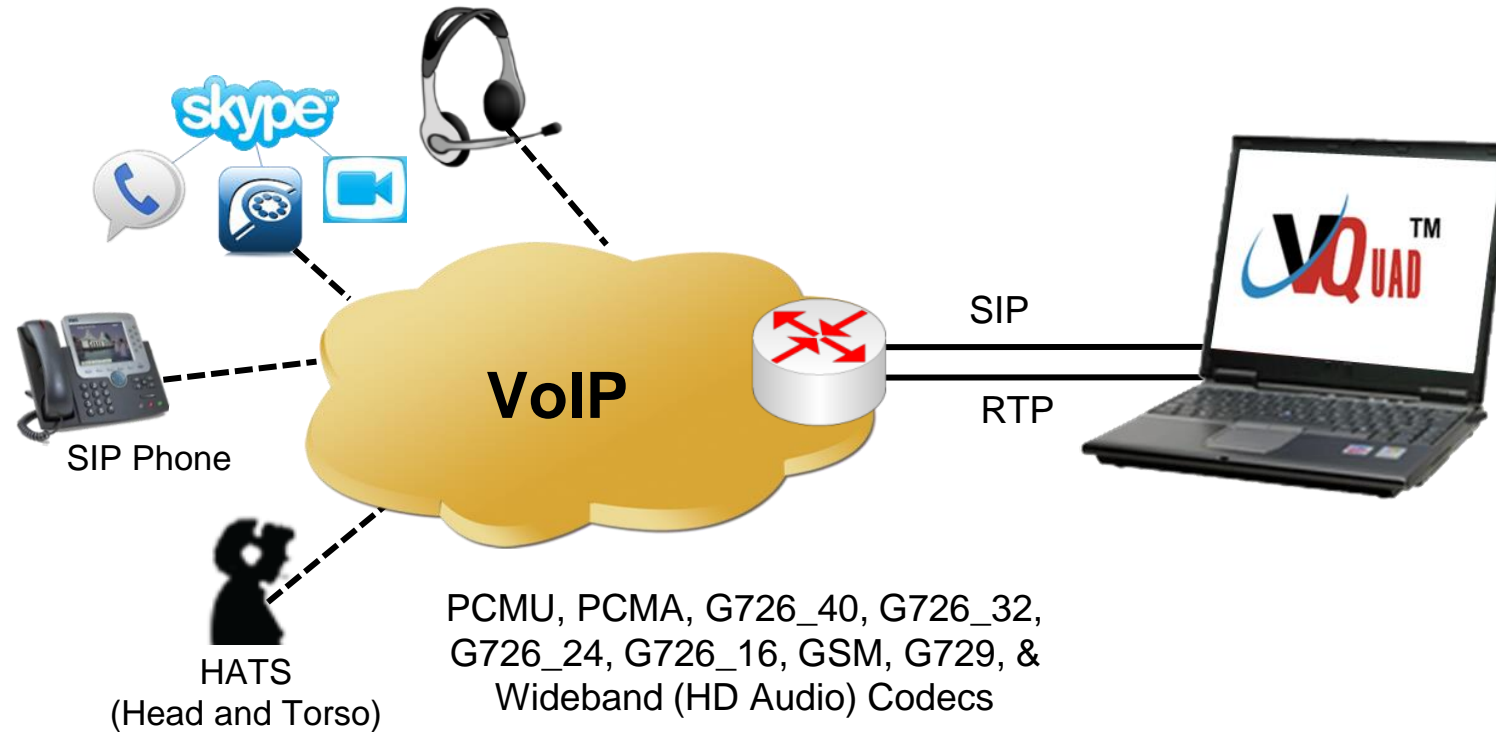


Supports NB, WB

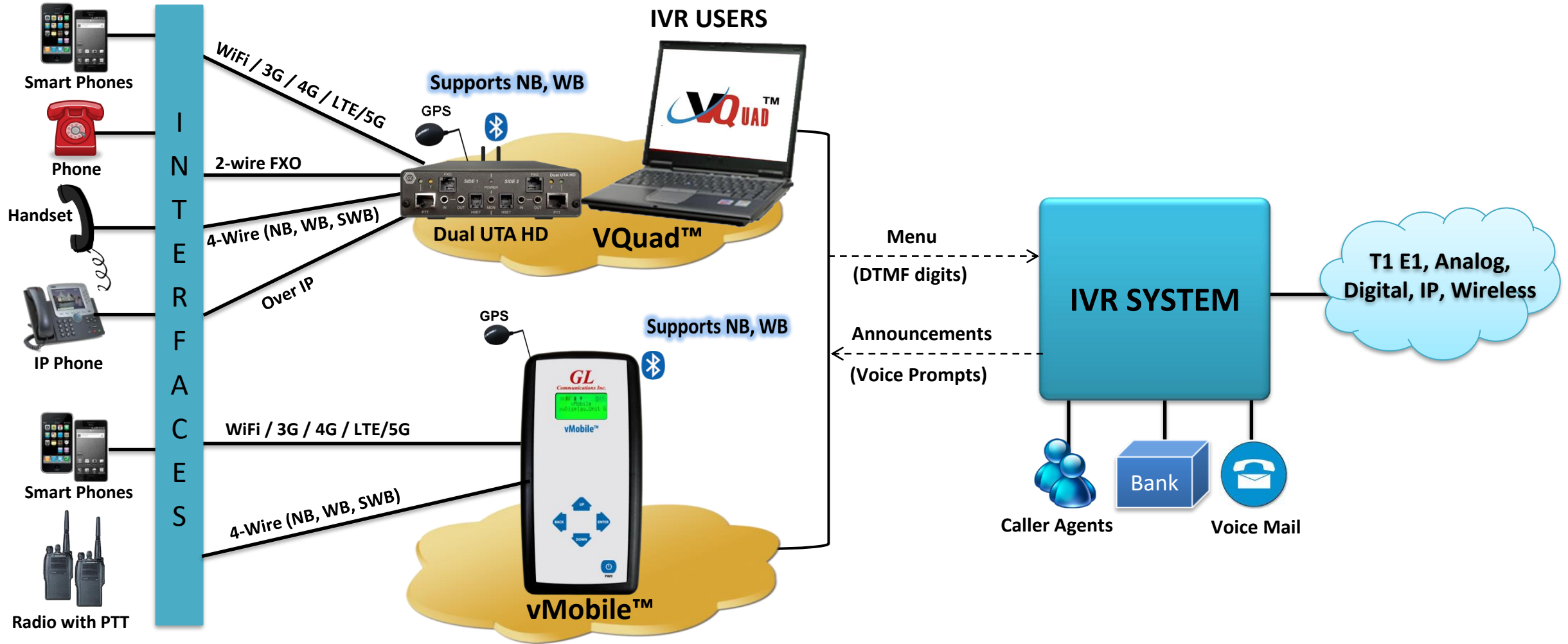
VQuad™ Probe HD

# VoIP (SIP) Interface, Digital VoIP Phones, VoIP Softphones

- **Connectivity** – Internal SIP cores within VQuad™ (SIP Signaling - Does not require Dual UTA HD), 4-wire Balanced I/O, HSET Interfaces on Dual UTA HD
- **Devices** – VoIP Phones, Soft Phone, HATS



# Interactive Voice Response (IVR) Systems

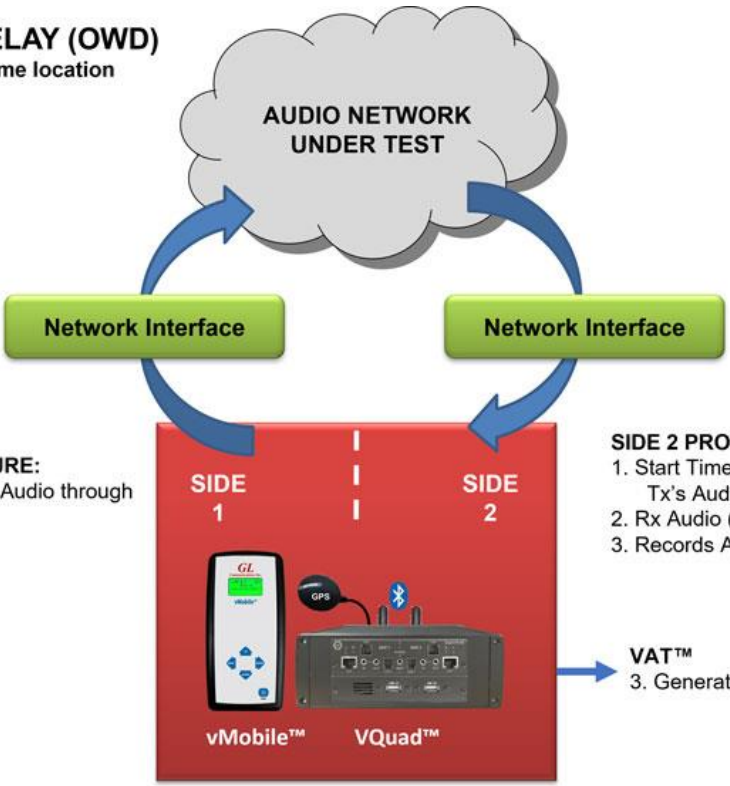


# Available Metrics

# Delay Measurements

## OWD - End points at same Location

**ONE-WAY DELAY (OWD)**  
- End Points at same location



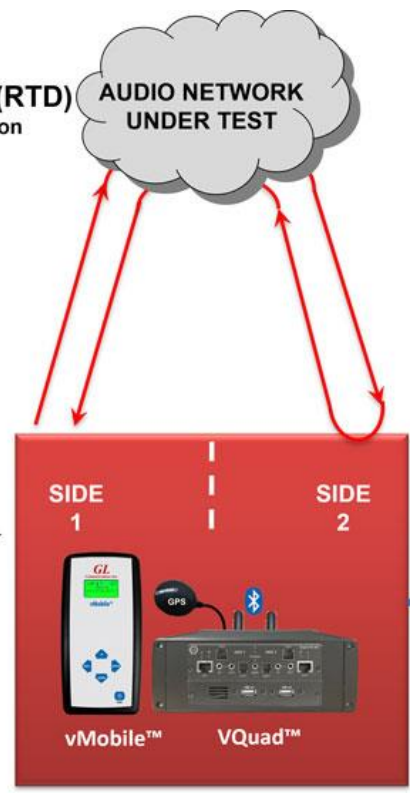
**SIDE 1 PROCEDURE:**  
1. Tx Audio: Send Audio through network

**SIDE 2 PROCEDURE:**  
1. Start Timer: At exact time of Side 1 Tx's Audio  
2. Rx Audio (detect) and Stop Timer  
3. Records Audio into PCM file

**VAT™**  
3. Generates Report for OWD Delay

## RTD - End points at same Location

**Round Trip DELAY (RTD)**  
- End Points at same location



**SIDE 1 PROCEDURE:**  
1. Tx Audio: Send Audio through network  
2. Rx Audio (detect) and Stop Timer  
3. Records Audio into PCM file

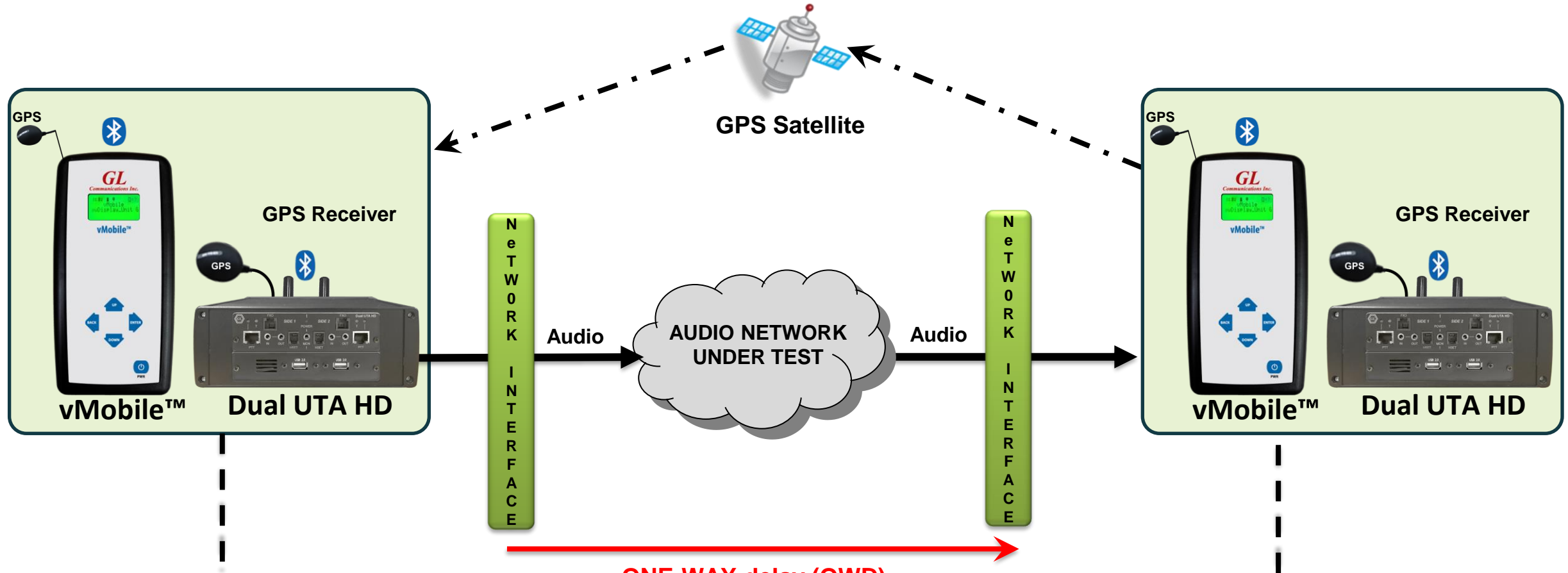
**SIDE 2 PROCEDURE:**  
1. Mirror the Side2 port at exact time of Side1, so that Audio will be reflected to Side1

**VAT™**  
4. Generate Reports for RTD Delay



# One Way Delay (OWD)

End points at two separate locations

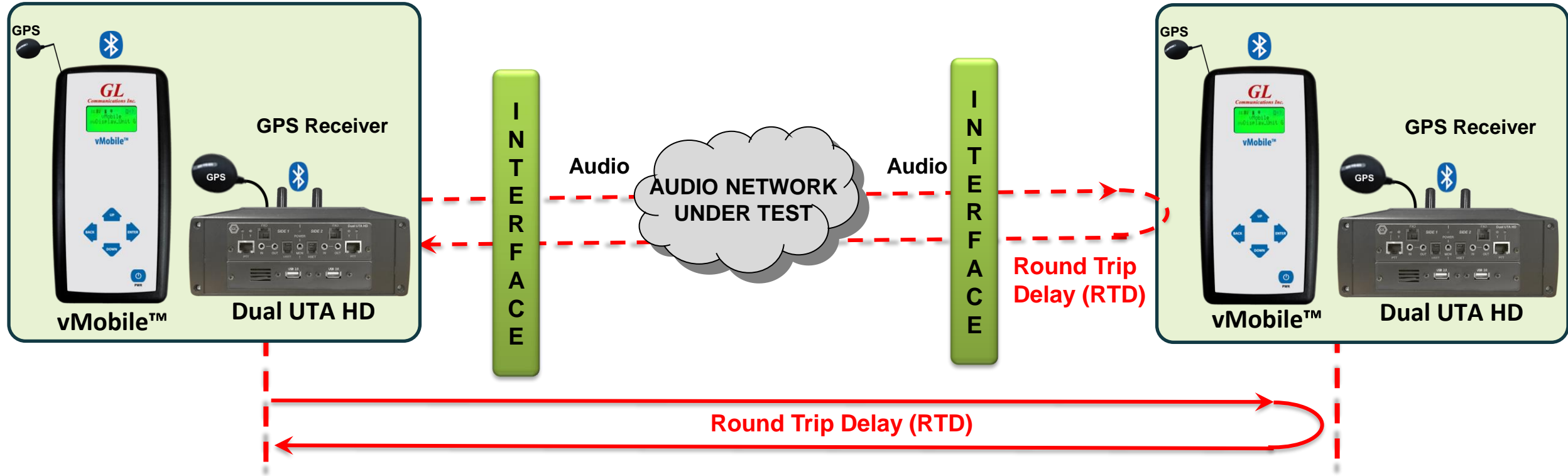


1. Tx AUDIO  
At pre-determined time (12:00:00.000)  
Send pulse through network

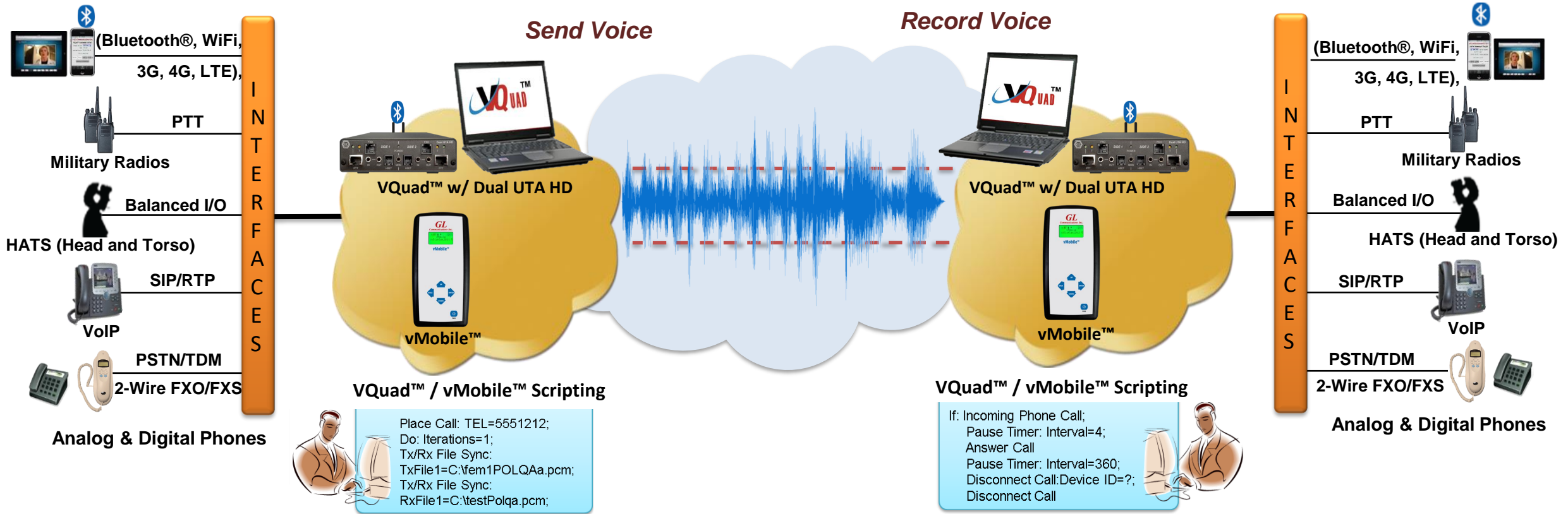
1. Start Timer  
At pre-determined time (12:00:00.000)
2. Rx (detect) pulse and Stop Timer  
Report delay (12:00:00.000 delay)

# Round Trip Delay Functionality

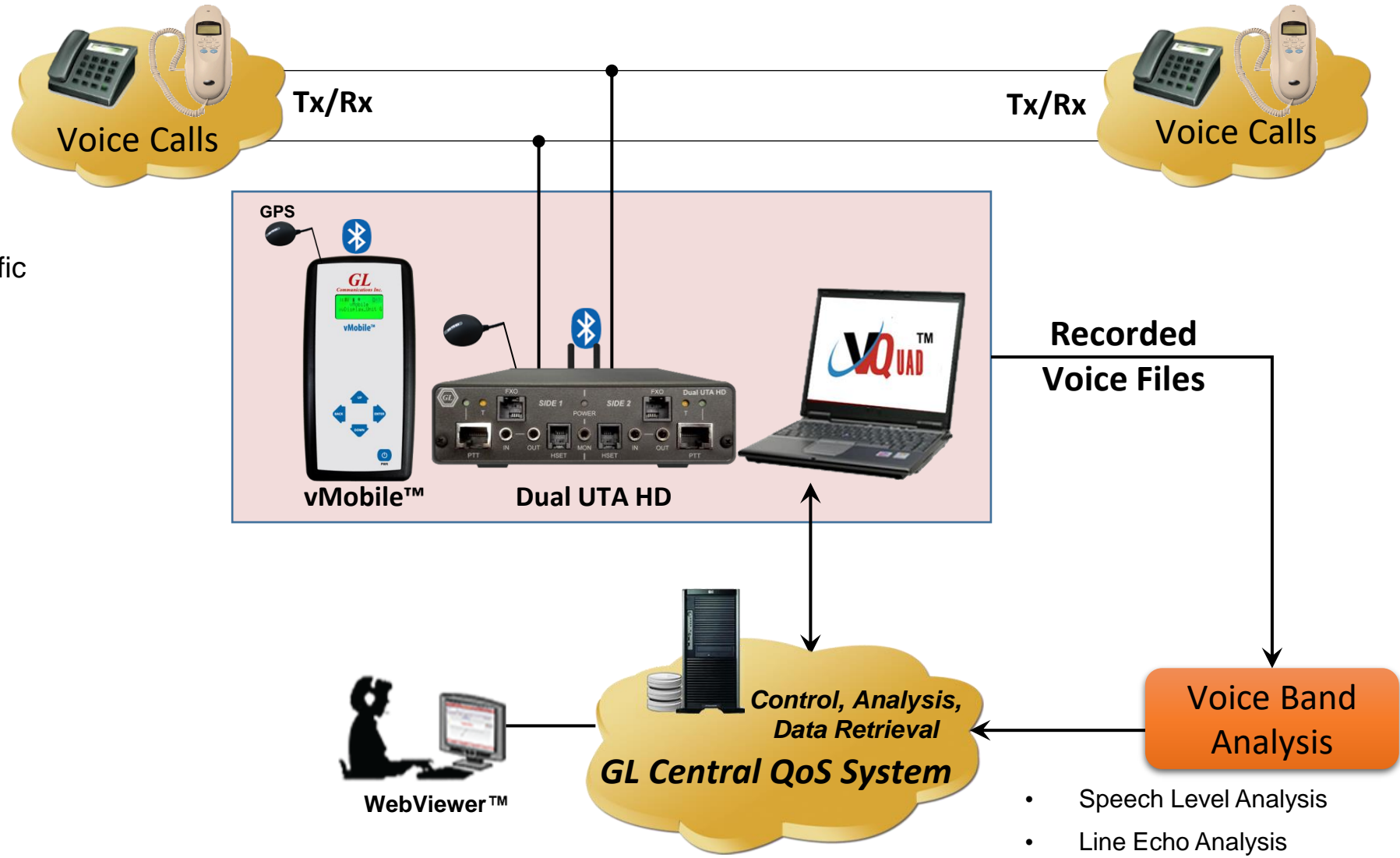
RTD on two systems (geographically separated)



# Automated Voice Quality Testing



# Voice Band Analysis

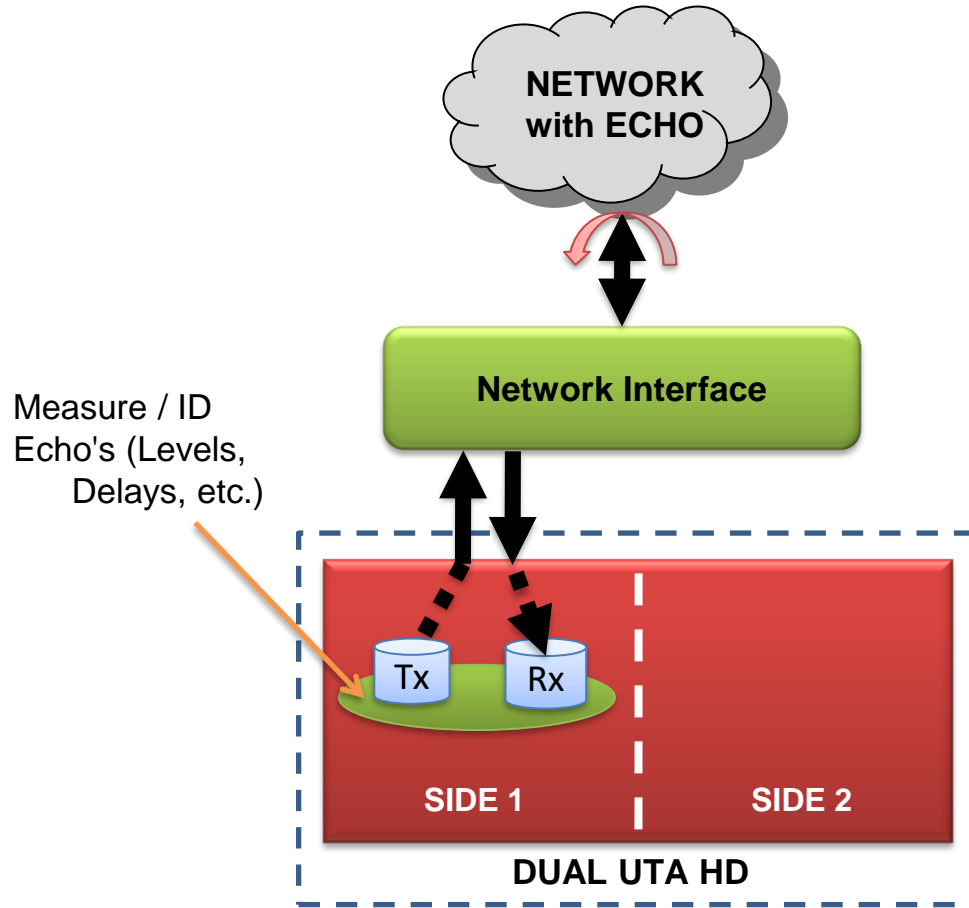


- Monitor voice band traffic
- Active Speech Level
- Noise Level
- Power & Frequency
- Audio Dropout analysis
- RMS Factor
- DC Level

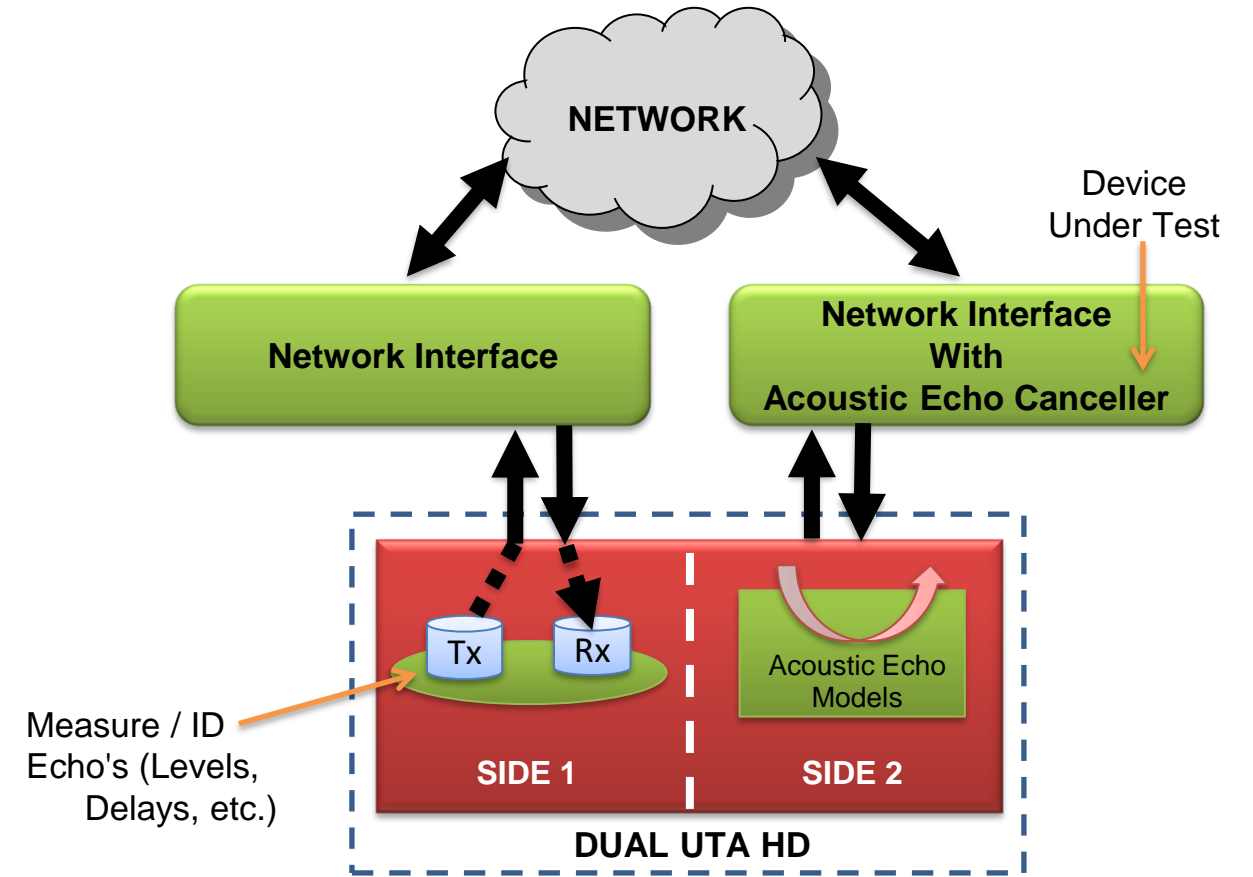
- Speech Level Analysis
- Line Echo Analysis
- Traffic Classification
- FaxScan™ Analysis
- Tone Decoder

# Echo Measurements

## Echo Identification

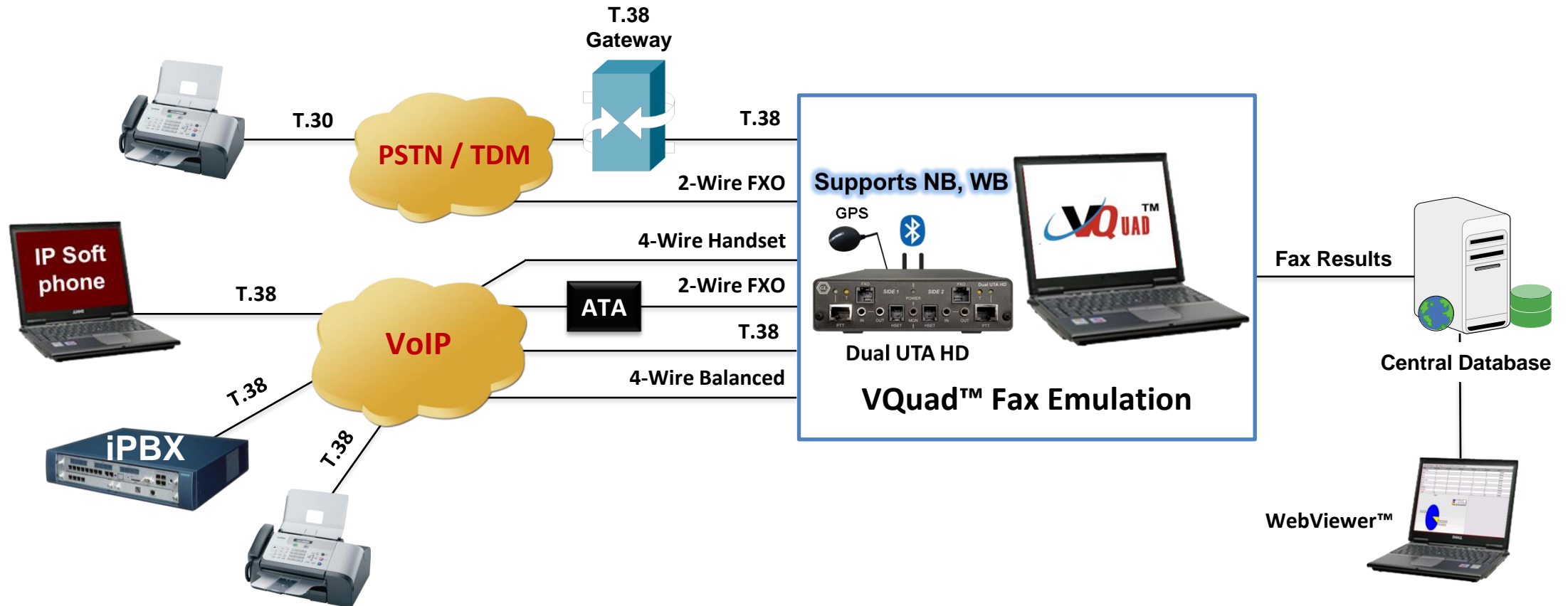


## Acoustic Echo Canceller Testing

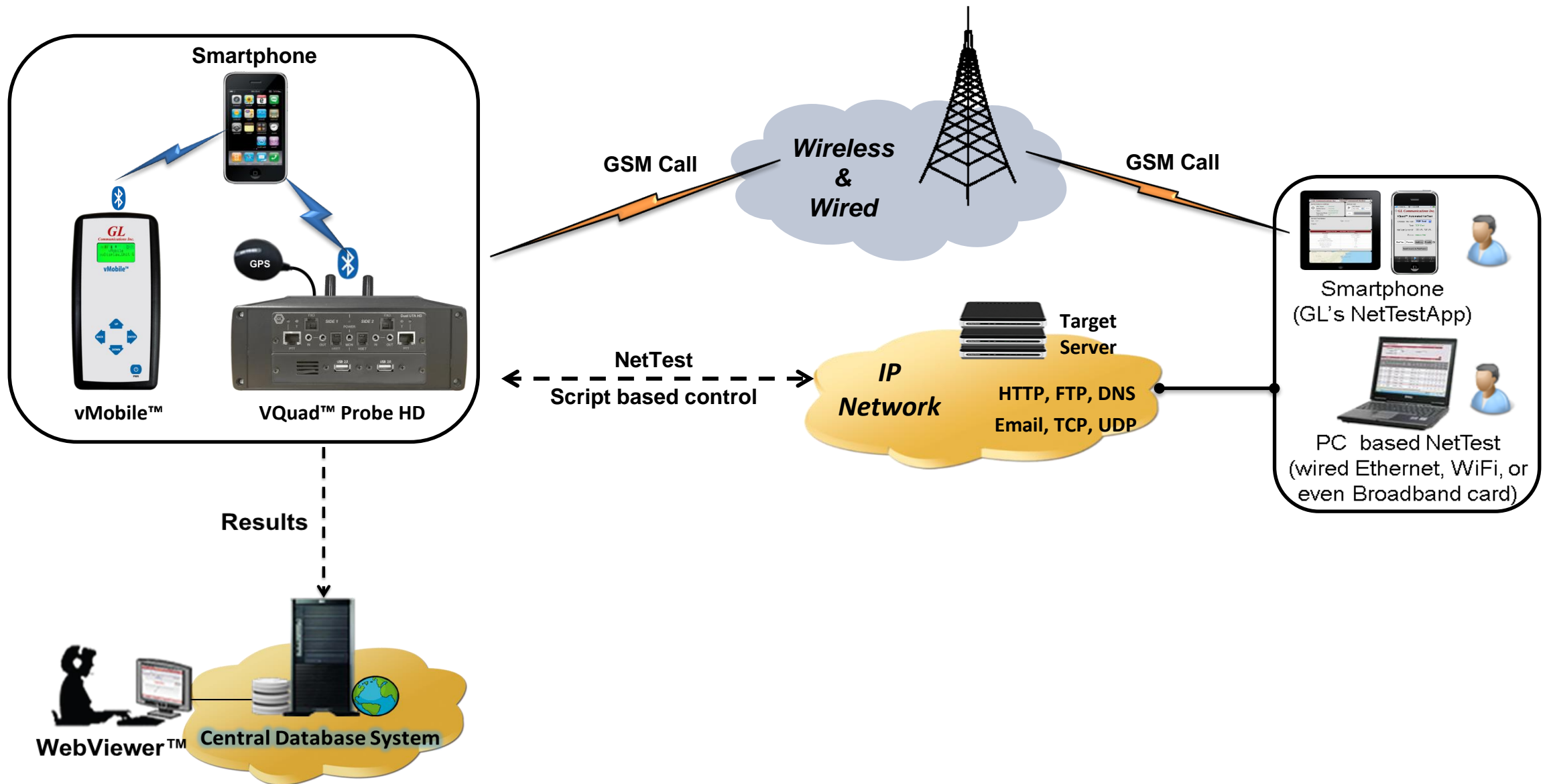


# Automated FAX Testing

- Sending and receiving 4 independent and simultaneous T.30 faxes (selectable up to V.34)
- Configurable Tx Rx fax rate from 2400 bps up to 33600 bps (V.34 fully supported)
- Fax Testing using the Dual UTA HD 2-wire FXO or 4-wire analog interfaces
- 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 Demodulator/Decoder



# End-to-End SMS Testing



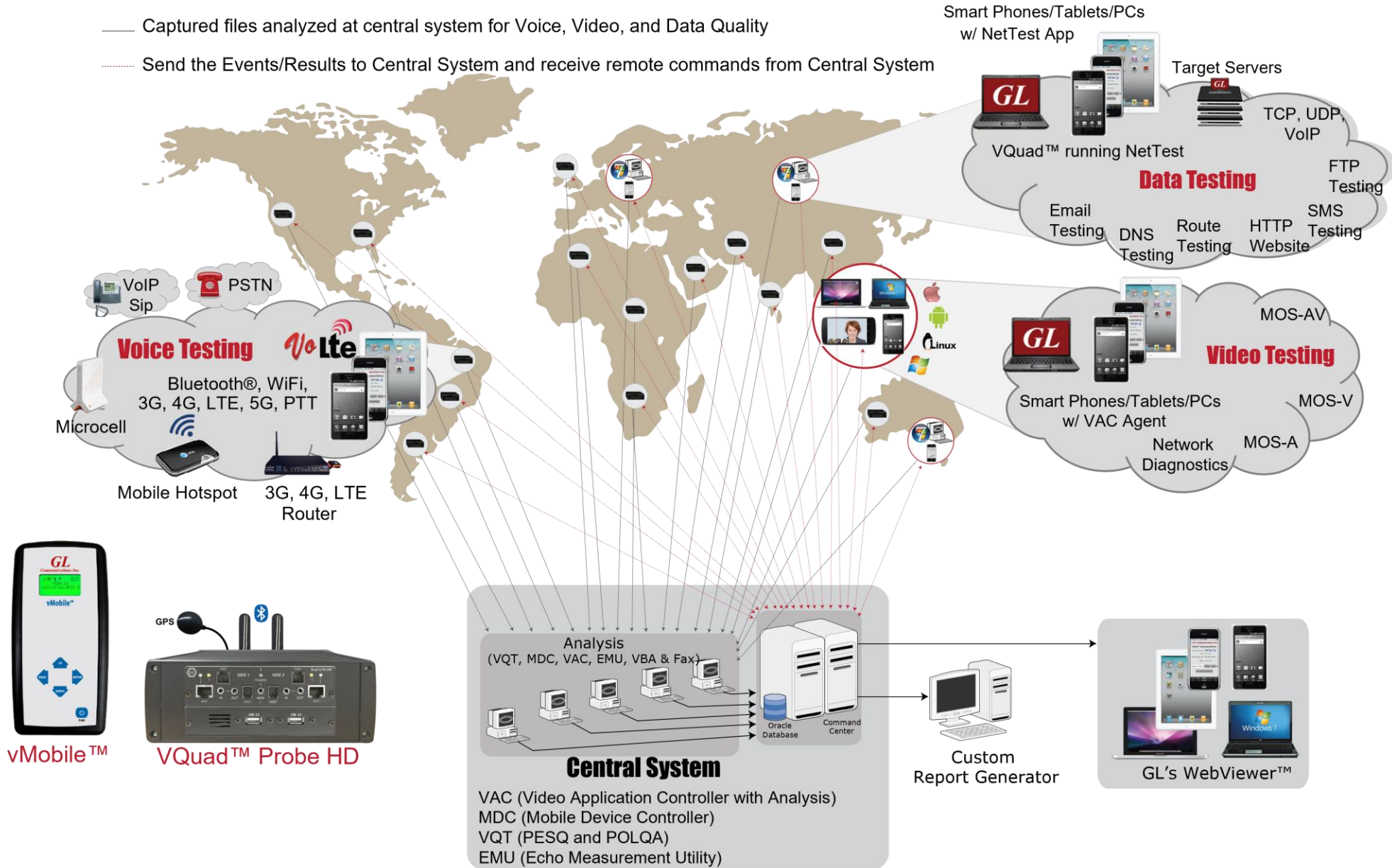
**WebViewer™**  
**(Web Based Client for Voice and Data Quality Testing)**



# GL WebViewer™

— Captured files analyzed at central system for Voice, Video, and Data Quality

..... Send the Events/Results to Central System and receive remote commands from Central System



# GL WebViewer™ Records

- Accessible remotely via any browser-based clients
- Database (MySQL or Oracle) stores the real-time and historic data

**GL Webviewer** Version 6.1.11 Refresh admin / Help

Note : For the best experience, press Ctrl + F5 after installation / new version updates to refresh the screen.

Results **Call Events** Status & Statistics Reports Load Filters: Select Filter **OFF** Live Updates: 5 sec **OFF**

VQT-POLQA Results between 08/16/2023 05:21:17 and 02/16/2024 05:21:17 (Last 6 Months)

Date & Time **Standard** 10 Minutes 1 Hour 12 Hours 24 Hours Today Yesterday 7 Days 1 Month 6 Months

Timestamp Type VQuad / vMobile Timestamp

Event ID Filter Contains  ?

Apply

Actions Records Per Page: 200 ?

Timestamp	Call Timestamp	Call ID	Device ID	GPS	Latitude	Longitude	Degraded Filename	Rating	POLQA v3 MOS	POLQA MOS	EModel (R-factor)	Speech Level Gain (dB)	Noise Level Gain (dB)	Active Speech Level - Ref (dBm)	Active Speech Level - Deg (dBm)	Mean Noise Level - Ref (dBm)	Mean Noise Level - Deg (dBm)	SNR - Ref (dB)	SNR - Deg (dB)	Active Speech Ratio - Ref (%)
02/16/2024 05:18:38	02/16/2024 05:15:41	GLRobFaxVQTTestRobFX02	RobFX02	N39°08'37" W077°12'57"	39.14	-77.22	fem1POLQ#	Excellent		4.11	82.32	-14.83	-13.7	-24.28	-39.11	-62.79	-76.48	38.51	37.37	57
02/16/2024 05:18:25	02/16/2024 05:15:41	GLRobFaxVQTTestRobFX01	RobFX01	N39°08'37" W077°12'57"	39.14	-77.22	fem1POLQ#	Excellent		4.29	88.13	-12.58	-12.67	-24.28	-36.86	-62.79	-75.46	38.51	38.6	57
02/16/2024 05:18:10	02/16/2024 05:15:41	GLRobFaxVQTTestRobFX02	RobFX02	N39°08'37" W077°12'57"	39.14	-77.22	fem1POLQ#	Excellent		4.18	84.4	-14.85	-13.42	-24.28	-39.13	-62.79	-76.21	38.51	37.08	57
02/16/2024 05:17:57	02/16/2024 05:15:41	GLRobFaxVQTTestRobFX01	RobFX01	N39°08'37" W077°12'57"	39.14	-77.22	fem1POLQ#	Excellent		4.21	85.43	-12.58	-12.67	-24.28	-36.86	-62.79	-75.46	38.51	38.6	57
02/16/2024 05:14:45	02/16/2024 05:11:53	GLRobFaxVQTTestRobFX02	RobFX02	N39°08'37" W077°12'56"	39.14	-77.22	fem1POLQ#	Excellent		4.33	89.77	-14.84	-13.55	-24.28	-39.12	-62.79	-76.34	38.51	37.22	57
02/16/2024 05:14:32	02/16/2024 05:11:53	GLRobFaxVQTTestRobFX01	RobFX01	N39°08'36" W077°12'56"	39.14	-77.22	fem1POLQ#	Excellent		4.42	93.98	-12.59	-12.3	-24.28	-36.87	-62.79	-75.08	38.51	38.21	57
02/16/2024 05:14:16	02/16/2024 05:11:53	GLRobFaxVQTTestRobFX02	RobFX02	N39°08'36" W077°12'56"	39.14	-77.22	fem1POLQ#	Excellent		4.16	83.88	-14.85	-13.39	-24.28	-39.13	-62.79	-76.17	38.51	37.04	57
02/16/2024 05:14:04	02/16/2024 05:11:53	GLRobFaxVQTTestRobFX01	RobFX01	N39°08'37" W077°12'56"	39.14	-77.22	fem1POLQ#	Excellent		4.24	86.28	-12.58	-12.42	-24.28	-36.86	-62.79	-75.21	38.51	38.35	57
02/16/2024 05:10:57	02/16/2024 05:08:06	GLRobFaxVQTTestRobFX02	RobFX02	N39°08'37" W077°12'57"	39.14	-77.22	fem1POLQ#	Excellent		4.33	89.68	-14.83	-14.01	-24.28	-39.11	-62.79	-76.8	38.51	37.69	57
02/16/2024 05:10:44	02/16/2024 05:08:06	GLRobFaxVQTTestRobFX01	RobFX01	N39°08'37" W077°12'57"	39.14	-77.22	fem1POLQ#	Excellent		4.23	86.07	-12.59	-12.79	-24.28	-36.87	-62.79	-75.58	38.51	38.71	57
02/16/2024 05:10:28	02/16/2024 05:08:06	GLRobFaxVQTTestRobFX02	RobFX02	N39°08'37" W077°12'57"	39.14	-77.22	fem1POLQ#	Good		3.76	73.49	-14.82	-13.99	-24.28	-39.1	-62.79	-76.78	38.51	37.68	57
02/16/2024 05:10:16	02/16/2024 05:08:06	GLRobFaxVQTTestRobFX01	RobFX01	N39°08'37" W077°12'57"	39.14	-77.22	fem1POLQ#	Excellent		4.29	87.96	-12.61	-12.93	-24.28	-36.89	-62.79	-75.73	38.51	38.84	57
02/16/2024 05:07:10	02/16/2024 05:04:09	GLRobFaxVQTTestRobFX02	RobFX02	N39°08'37" W077°12'57"	39.14	-77.22	fem1POLQ#	Excellent		4.31	89.02	-14.84	-13.44	-24.28	-39.12	-62.79	-76.24	38.51	37.12	57

# Network Status and Remote Access

- Displays status of all the VQuad™ probes (along with script running status), vMobile™, MDC, VQT, and File Monitor application status
- The VQuad™ and vMobile™ connected to the WebViewer™ can be accessed or controlled remotely through the web interface
- Various options are available to operate and control the systems remotely such as Load desired scripts along with script parameters, Start/Stop the scripts, and make configuration changes to the VQuad™ systems

VQuad
vMobile
MDC (NetTest)
VQT
File Monitor

✔ - Node Connected
✔ - Node Connected and Running Scripts
✘ - Node Disconnected
⊘ - Node Out of service

	PC Name	Version	VQuad Name	Latitude	Longitude	Devices Count	IP Address	Central IP Addresses	Location	Dual UTA	Last Active	Use BT Name	Grab Mac	Actions
^	✔ GLIN-23	V10.8 Release	Raga	12.93	77.6	7	AUTO GET LOCAL IP	PRIMARY IP	Fixed	Firmware version: 6/23/21 v72 Serial number: 157412 HV2	6/26/2023 7:43:46 AM	OFF	OFF	🔗 ✖
∨	✔ ROBTOWER	V10.7.7	RBICHOFFTESTPC	39.14	-77.22	6	USE THIS AS LOCAL IP	PRIMARY IP	Fixed	Firmware version: 6/23/21 v72 Serial number: 157214 HV2	6/26/2023 7:43:46 AM	OFF	OFF	🔗 ✖

**VQuad Device Script Running Status**

Device Type	Device Name	Script Name	Call Status	Call Type	Global Device & Start Variables	Start/Stop Script	Script Status	Actions
DuFxo	RobFXO1	TestSchedule1	CONNECTED		Variables	⊘ Stop	✔	🔗
DuFxo	RobFXO2	VQuad Fax Emulation_FXOAnswerCall	CONNECTED		Variables	⊘ Stop	✔	🔗
NetTest	PCNetTest	VQuad Fax Emulation_FXOAnswerCall	IDLE		Variables	▶ Start	✘	🔗
NetTest	MDNetTest-Acer	UserEventTest_Control	IDLE		Variables	▶ Start	✘	🔗
NetTest	VQNetTest-5	PCNetTest	IDLE		Variables	▶ Start	✘	🔗
NetTest	MDNetTest-GS	VACTest1	IDLE		Variables	▶ Start	✘	🔗

Bluetooth/FXO

^	✘ GLIN-07	V10.7.4	GLIN-07			2	AUTO GET LOCAL IP	PRIMARY IP	Fixed	Firmware version: 11/28/16 v20 Serial number: 156648 HV1	4/4/2023 3:45:12 PM	OFF	OFF	🔗 ✖
---	-----------	---------	---------	--	--	---	-------------------	------------	-------	--	---------------------	-----	-----	-----

# Filters

CLOSE

## Modify filters

**Select Filter**  X

**Select dates Range**

03/13/2023 01:00:00

03/15/2023 01:00:00

Clear

**Select Map Region**

Select
↓

**Call Direction (Inbound / Outbound)**

Both
↓

**Results List**

VQuad Call ID
↓

**Operators**

Starts with
▼

**Criteria**

Input
↓

Save Criteria

**Saved criteria**

*Note: Click on any row in the below table to Edit*

Audio/Delay	OWD (ms)	In range of	0	400	AND	<span style="color: red; font-size: 0.8em;">✕</span>
VQT POLQA	Active Speech Ratio - Deg (%)	Greater than or equals	50	--	AND	<span style="color: red; font-size: 0.8em;">✕</span>
VQT POLQA	Active Speech Ratio - Ref (%)	Equals	57	--	AND	<span style="color: red; font-size: 0.8em;">✕</span>
VQT POLQA	POLQA MOS	Greater than or equals	4	--	AND	<span style="color: red; font-size: 0.8em;">✕</span>
VQT POLQA	Active Speech Level - Ref (dBm)	Equals	-24.28	--	AND	<span style="color: red; font-size: 0.8em;">✕</span>
VQT POLQA	POLQA OWD (ms)	Greater than or equals	600	--	AND	<span style="color: red; font-size: 0.8em;">✕</span>
VQT POLQA	Jitter Ave (ms)	Less than or equals	2	--	AND	<span style="color: red; font-size: 0.8em;">✕</span>
	VQuad DeviceID	Contains	FX01		OR	<span style="color: red; font-size: 0.8em;">✕</span>
	VQuad Call ID	Contains	FXOPOLQATest		OR	<span style="color: red; font-size: 0.8em;">✕</span>

Save Filter

Delete Filter

Updated successfully

# Report Generation

- The user can save the search results to a local PC in \*.xls / \*.csv / \*.pdf formats. Custom reports are generated using DataImport for Events and Statistics, which can be saved to text or Excel output files via WebViewer™
- Google Maps plotting of various test results (VQT, VBA, VAC, EMU, NetTest, FAX, Call Control)
- Console View - customizing the threshold values for the test result parameters to populate the consolidated Average, Min, Max results in tabular format and plot corresponding graphics statistics

The screenshot displays the GL Webviewer interface (Version 6.1.11) with the 'Reports' menu open. The menu options are: Call Process Graphics, Analysis Graphics, Custom Reports (highlighted), Google Maps, ITS Viewer, and Console View. The main interface shows a search filter for 'RobVQuadTest' and a table of results.

VQuad Call ID	Completed Calls	Connected Calls	Call Dropped	Incoming Calls	Fax Done	Fax Success	VQT POLQA	Call Failed	Speech Level Gain	Call Attempts
GLRobFaxVQTTTest	100%	100%	0	2441	2437	99.88%	4.23	0	-13.69	2440

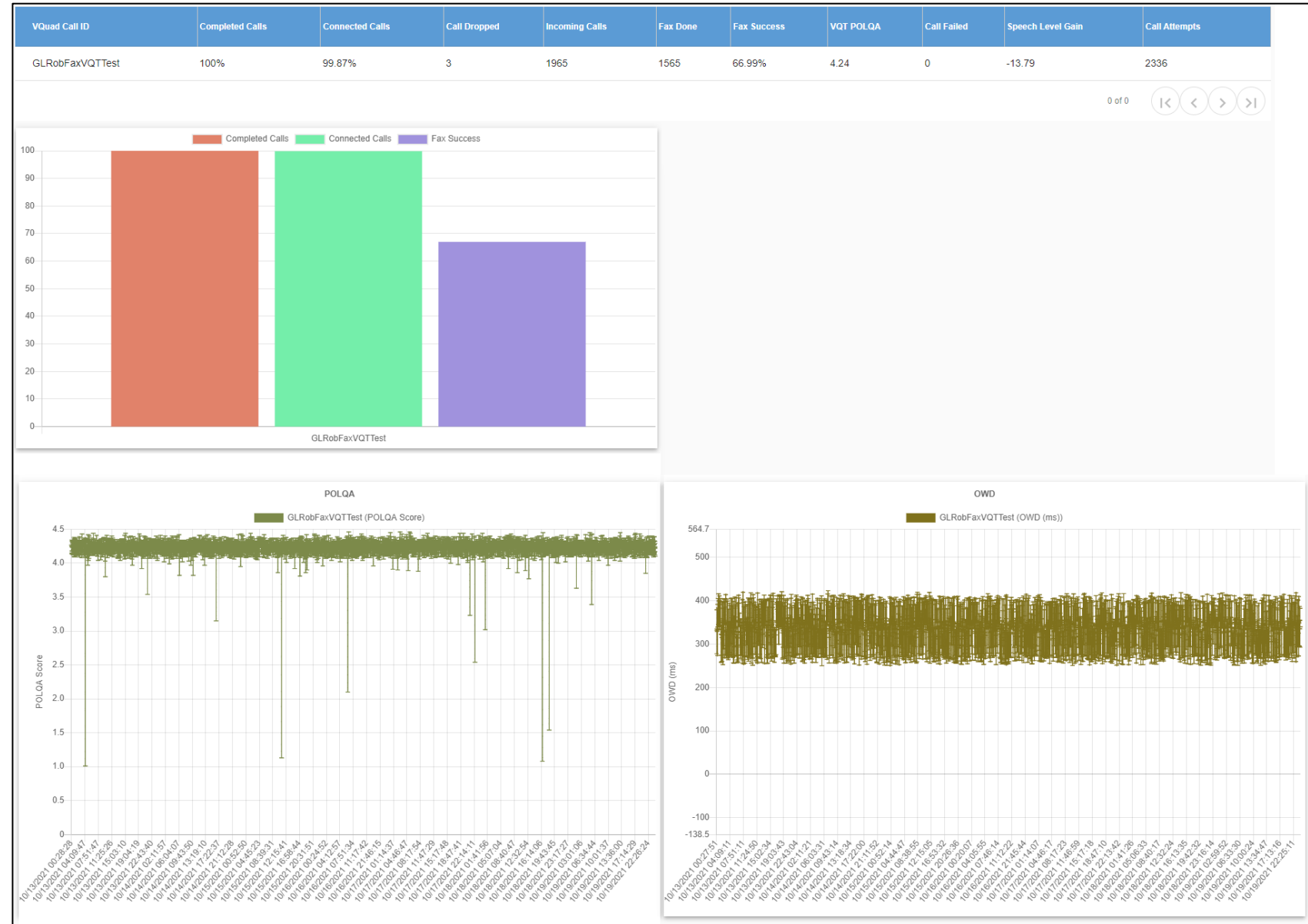
# Call Events and Scheduling the Reports

**WebView**  
**VQuad WebViewer - Real Time Monitoring System**

Custom Reports - Dynamic Report  
 Report Name : RobGroup1 (RobVQuadTest, RobDelayTest, RobNetTest, RobPOLQAResults)

Start Datetime : 2021-10-13 00:27:02  
 End Datetime : 2021-10-20 00:30:02

User : Administrator

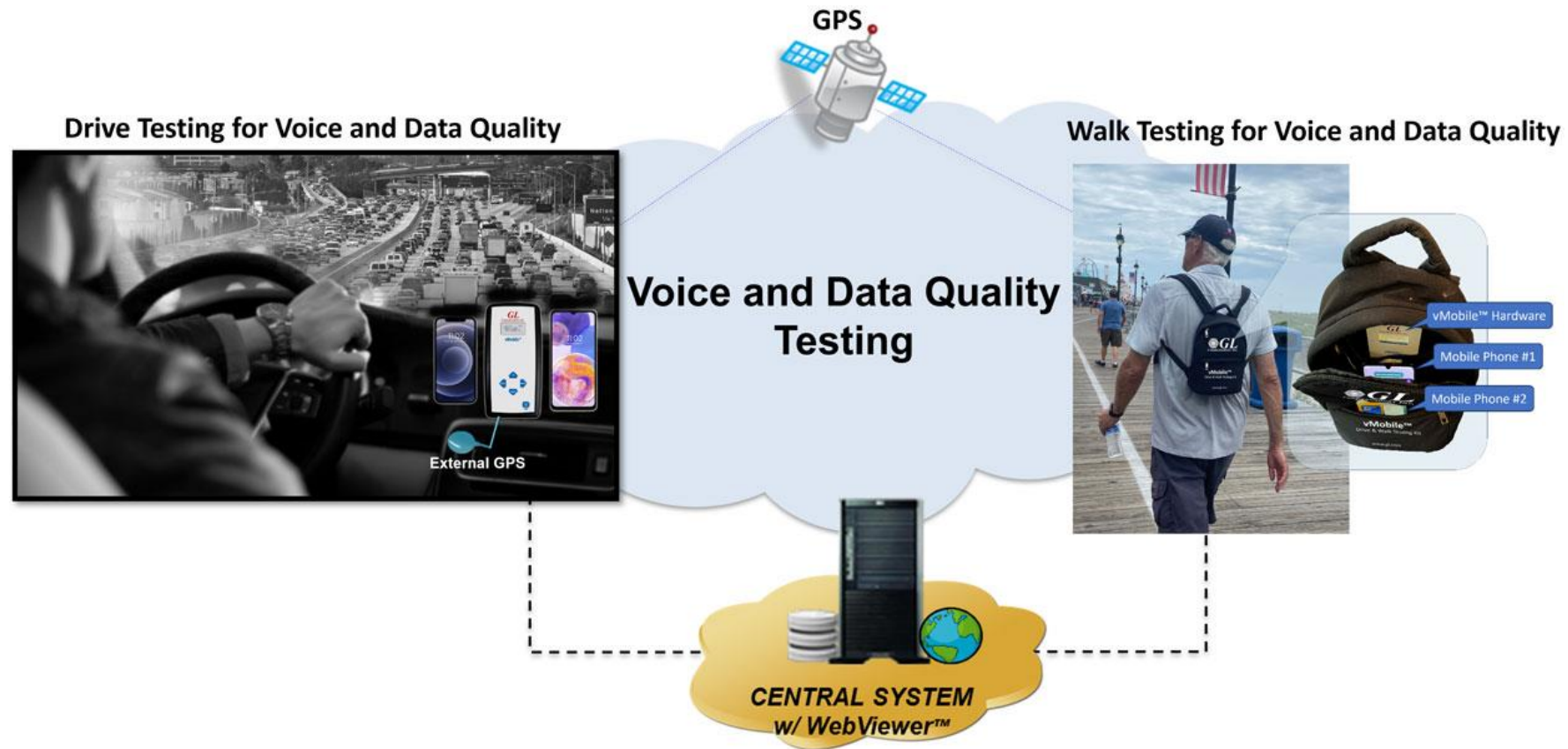
**Custom Reports**

**Filters**

Timestamp Search : VQuad Timestamp Load Filter : Off

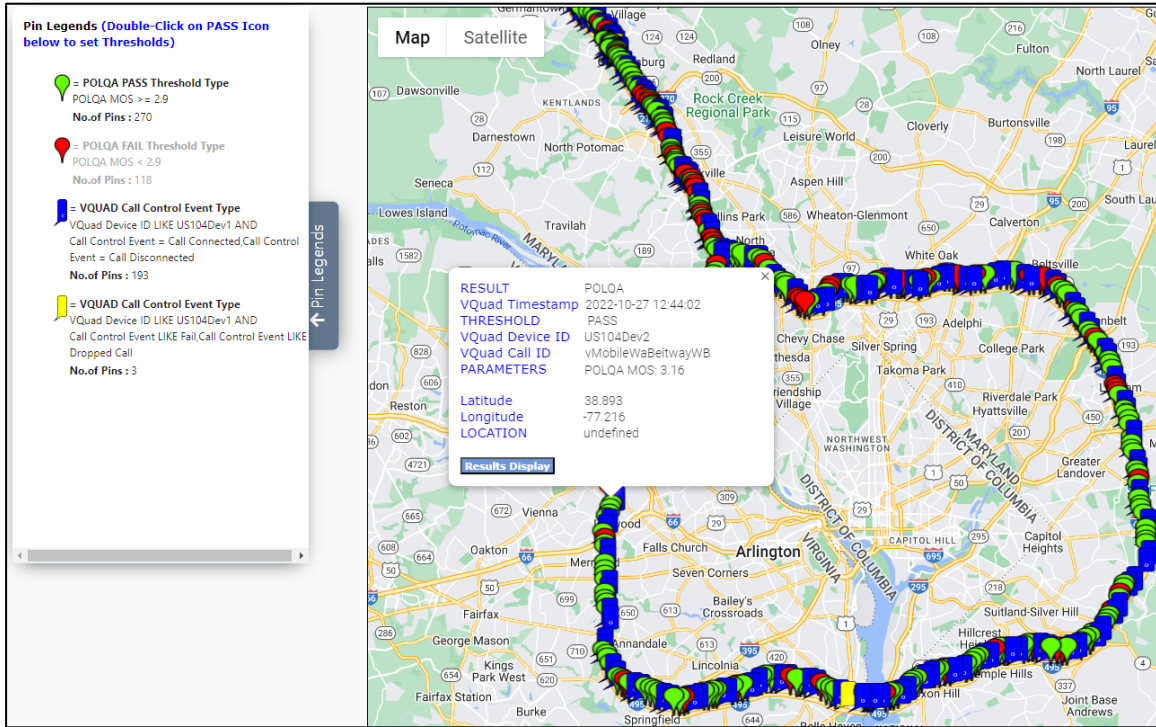
Event ID / Device ID Filter : GLROBFAXVQTEST

# Drive and Walk Testing for Wireless Networks

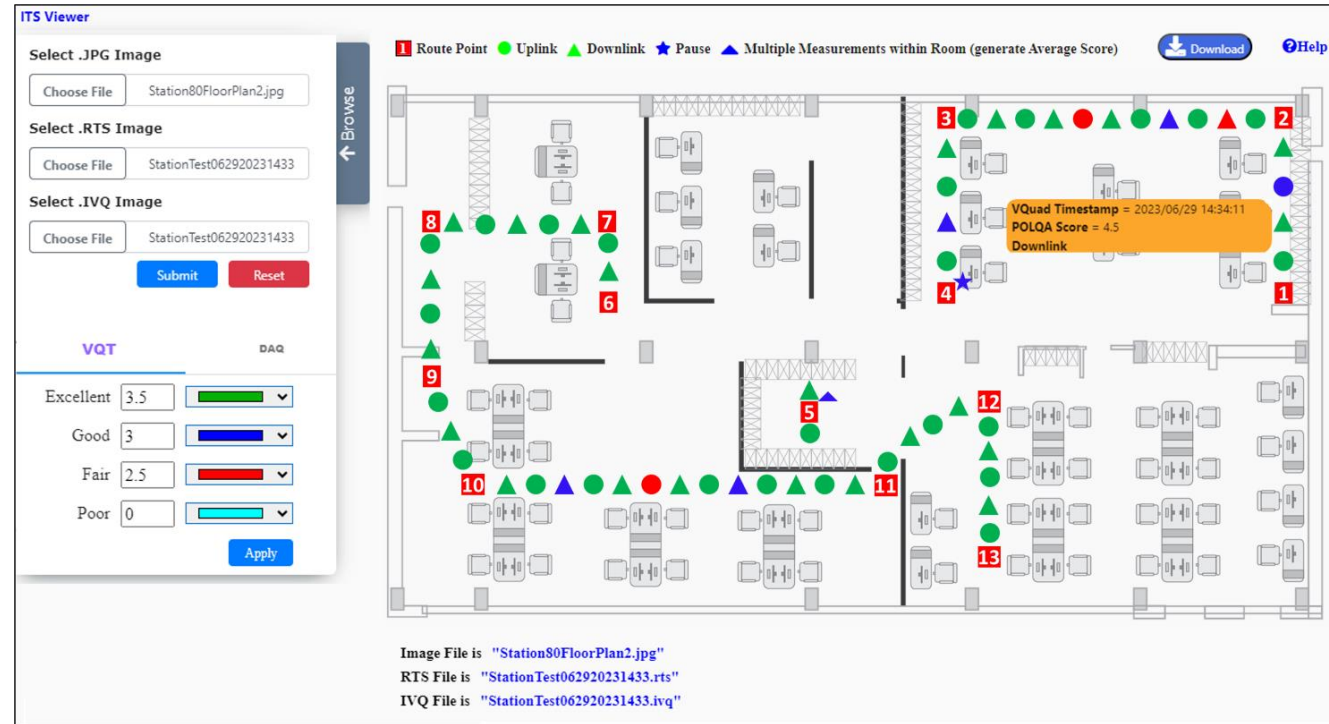


- Drive test with any Wireless device with real-time GPS mapping
- GPS connectivity for recording timing and location of tests performed
- The GPS mapping records and adds the real-time GPS information to all test results and vMobile™ call control
- GPS Location includes stamping each result with Latitude, Longitude, and GPS Time Stamp
- GPS information is automatically sent to central database and accessed via Google Maps feature in WebViewer™

# Real-time GPS and ITS Plotting



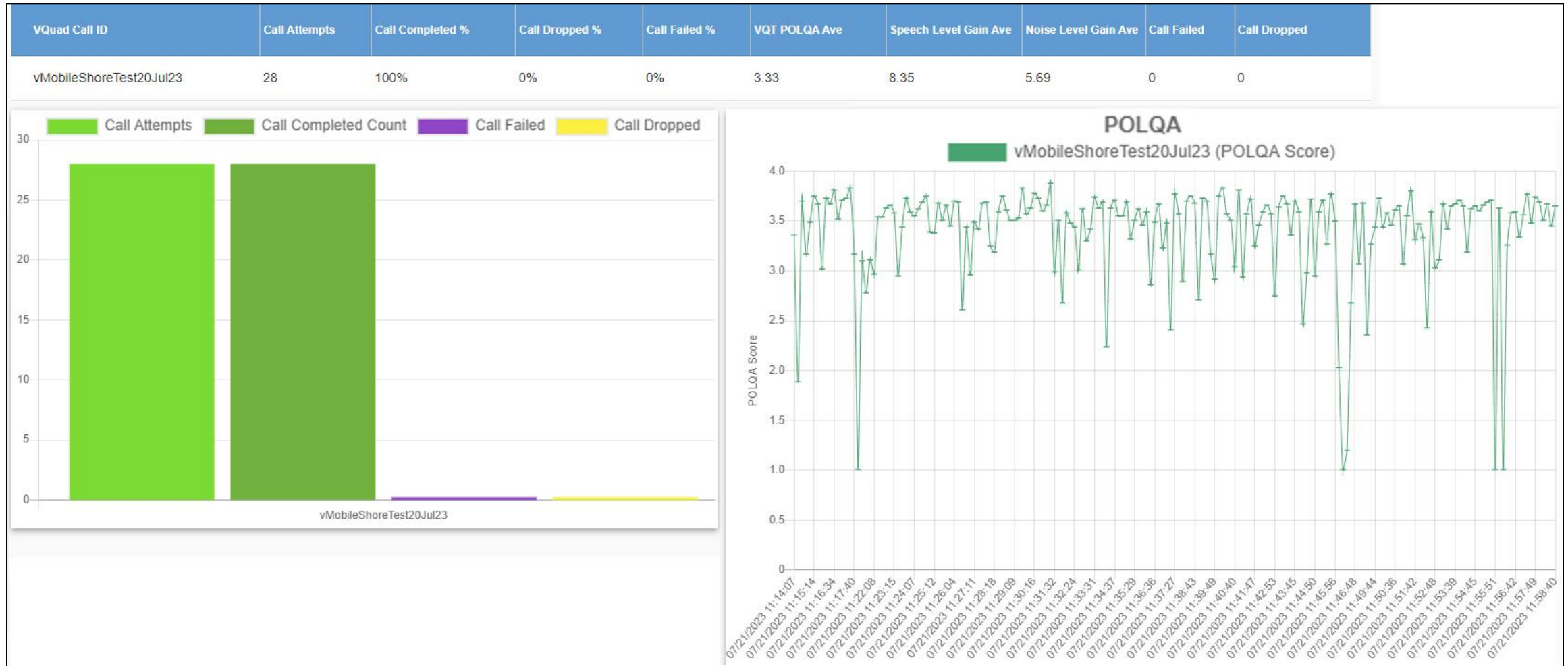
Real-time GPS Plotting



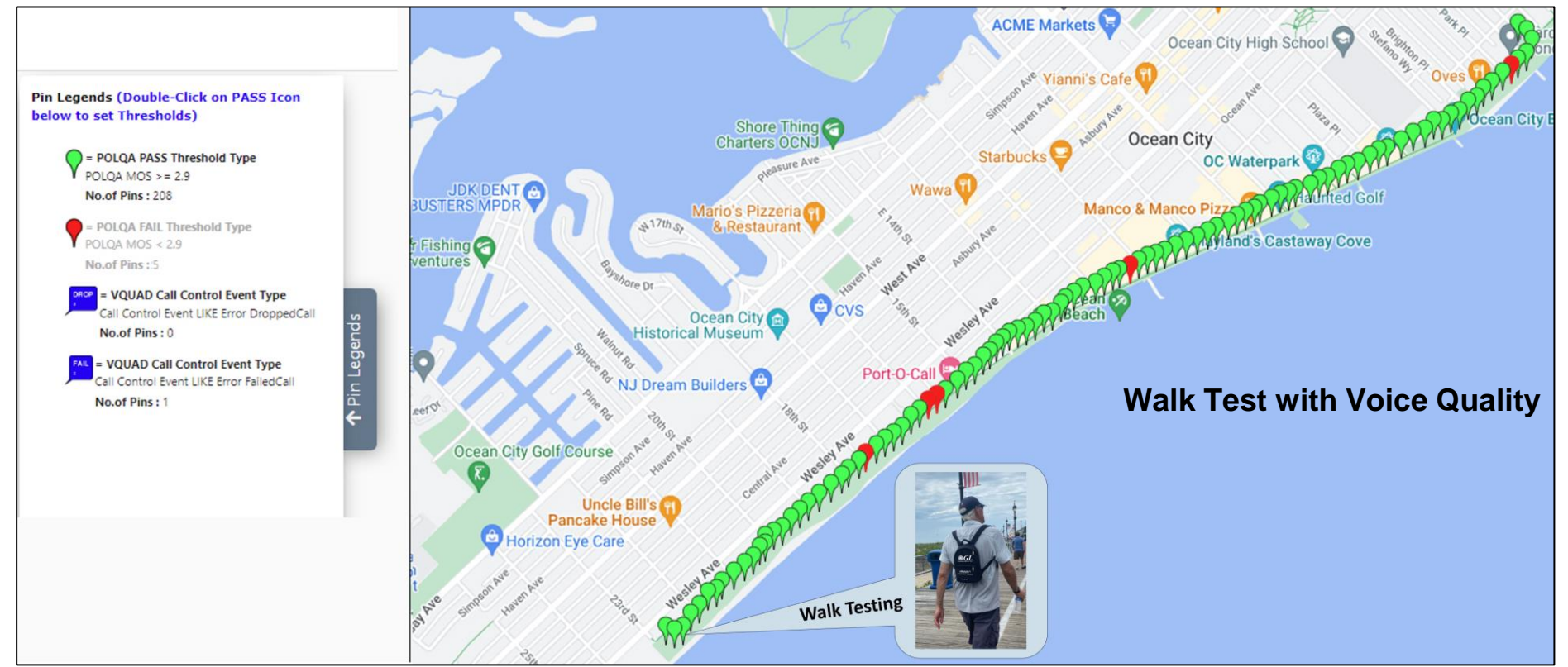
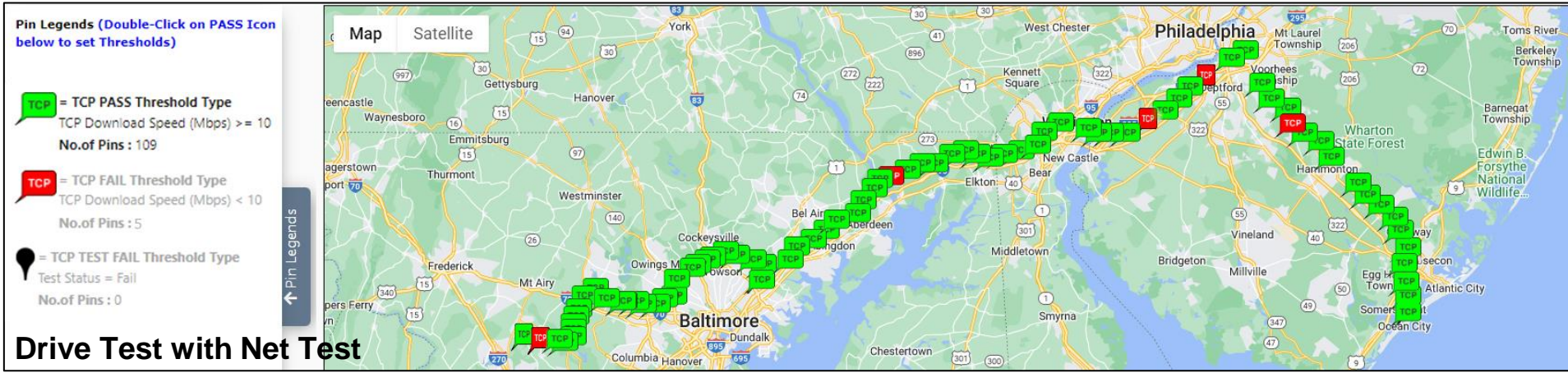
Real-time ITS Plotting



# Results in WebViewer™ - Custom Reports

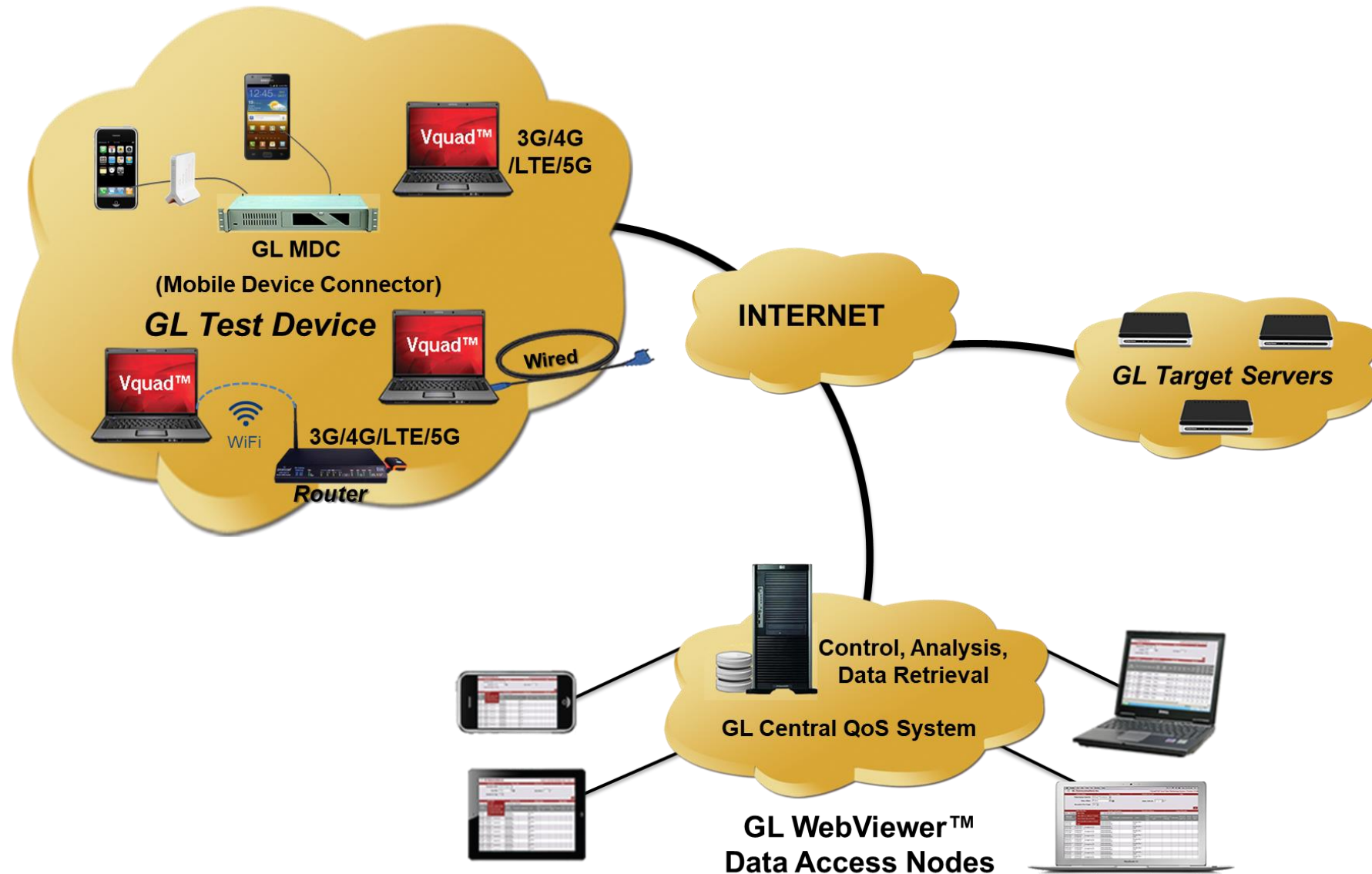


# Results in WebViewer™ - From Drive and Walk Test



# GL NetTest - Data Testing

# Automated Data Testing over Wired & Wireless (Bluetooth®, WiFi, 3G, LTE, 5G) Networks



# Mobile Device Controller (MDC) GUI

- GL's Mobile Device Controller application and the supporting downloadable apps on the Smartphones (iPhone, Android), can remotely perform the data tests when the phone is within a voice call or outside a voice call

The screenshot displays the Mobile Device Controller (MDC) GUI. The interface includes a menu bar (File, Help), a configuration section for PhoneApp Server IP (127.0.0.1), Command (Start AutoTest), Device Name (UID) (.U3NP - iphone3GS), and Test Parameters (TCP 122.181.135.187:81 8000 Both Off On). The Auto Test Parameters section includes Call ID (MDCAutoTest), Loop (Continuous), and Time Interval (5). A red 'Server Disconnected' button is visible. Below the configuration are buttons for 'Perform Function', 'Refresh Phone List', and 'Manage Devices'. The main area features a 'Phone List' tab with a table of device information.

PhoneID	Device Name (UID)	Phone Number	Device Model	Device G...	Remote IP: Devi...	Test Status	Pr...	A...	Last Activity
000003	..2925 - Nexus	NA	Nexus S	12.927,7...		PhoneIdleAutoTest		5	08/05/2014 12:00:12
000005	..8960 - iBall	NA	iBall Slide 3G Q...	12.927,7...		PhoneIdle		5	08/04/2014 18:48:08
000008	..DKPJ - GL's iPad	No Sim	iPad2 Wifi	12.926,7...	LocalHost	PhoneIdleAutoTest		5	08/05/2014 12:00:09
000004	..U3NP - iphone3GS	No Sim	iPhone3GS	12.926,7...		PhoneIdleAutoTest		5	08/05/2014 12:00:09
000007	..7047 - GT	NA	GT-I9060	0.0.0.0		PhoneSuspended		900	08/05/2014 11:45:59
000011	..HYU= - Nokia 630	NA	NOKIA RM-976...	0.0.0.0	LocalHost	PhoneIdle		5	08/05/2014 12:00:13
000002	..DTD0 - GLiphone4s	No Sim	iPhone4S	12.916,7...	122.181.135.18...	PhoneIdle		5	08/03/2014 22:13:18
000012	..0452 - motoe	NA	XT1022	12.926,7...	LocalHost	PhoneIdle		5	08/05/2014 12:00:10
000009	..3018 - HTC	NA	HTC Desire 60...	12.927,7...	LocalHost	PhoneIdle		5	08/04/2014 12:31:05
000006	..5103 - LG	NA	LG-P936	0.0.0.0		PhoneIdle		5	08/05/2014 11:49:24
000014	..e0dc - Nexus7Tab	NA	Nexus 7	0.0.0.0		PhoneIdle		5	08/04/2014 19:15:33

Central Database Settings:  Send Manual Results to Central Database Central Database IP: 122.181.135.187 Clear Local Event Log Resend Phone Info

Central DB Connected

# VQuad™ NetTest Events Log

- Mobile Device NetTest and PC based NetTest Statistics and complete results are relayed back to VQuad™, which can be access via WebViewer™

**Note:** 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

The screenshot displays the 'NetTest Events' window. At the top, there is a 'Show Device' dropdown menu set to 'All' and an 'Audit Log Enabled' checkbox. Below this are four tabs: 'Status', 'Results', 'Audit Log', and 'Manual MDNetTest'. The 'Results' tab is active, showing a table with the following data:

Timestamp	Phone ID	GPS	Test Type	Results
11/10/2011 2:27:01 PM	RobMDNetTest2	N39°08'40"W77°13'19"	TCP	Upload Window Probes Received=0
11/10/2011 2:27:01 PM	RobMDNetTest2	N39°08'40"W77°13'19"	TCP	Upload Zero Window Updates Sent=0
11/10/2011 2:27:01 PM	RobMDNetTest2	N39°08'40"W77°13'19"	TCP	Upload Bytes Lost=0
11/10/2011 2:27:01 PM	RobMDNetTest2	N39°08'40"W77°13'19"	TCP	Max Route Speed(Mbps)=4
11/10/2011 2:27:01 PM	RobMDNetTest2	N39°08'40"W77°13'19"	TCP	Round Trip Time(ms)=123
11/10/2011 2:27:16 PM	RobNetTest	N39°08'36"W077°12'57"	UDP	Download Capacity(Mbps)=92.3240
11/10/2011 2:27:16 PM	RobNetTest	N39°08'36"W077°12'57"	UDP	Download QOS(%)=96.8
11/10/2011 2:27:16 PM	RobNetTest	N39°08'36"W077°12'57"	UDP	Download Packet size(Bytes)=1400
11/10/2011 2:27:16 PM	RobNetTest	N39°08'36"W077°12'57"	UDP	Download kilopackets/sec=8.928

Below the table are controls for 'Clear Result', 'Capture Result', and 'Show latest'. At the bottom, there is a summary table:

Device Id	Phone Name	Test Type	Status	Test Progress	Get Log
RobTest1					Get Log
RobTest2					Get Log
RobNetTest	PCNetTest	UDP	Running		Get Log
RobMDNetTest	RobAndroid	VoIP	Running		Get Log
RobMDNetTest	ATTPhone4	UDP	Started		Get Log

MDNetTest Status: UDP Started

# Data Tests running on Android and Apple Devices using GLNetTest App

GL Communications Inc.

## VQuad™ Automated NetTest

[Set FTP Params](#) ⓘ

FTP IP:

Port:

User Name:

Password:

Put File Size:

Directory:

Mode:  ⓘ

GL Communications Inc.

## VQuad™ Automated NetTest

[Set Receive SMS Params](#) ⓘ

Number of Messages to read from each phone:  ▼

Timeout(of the Test):

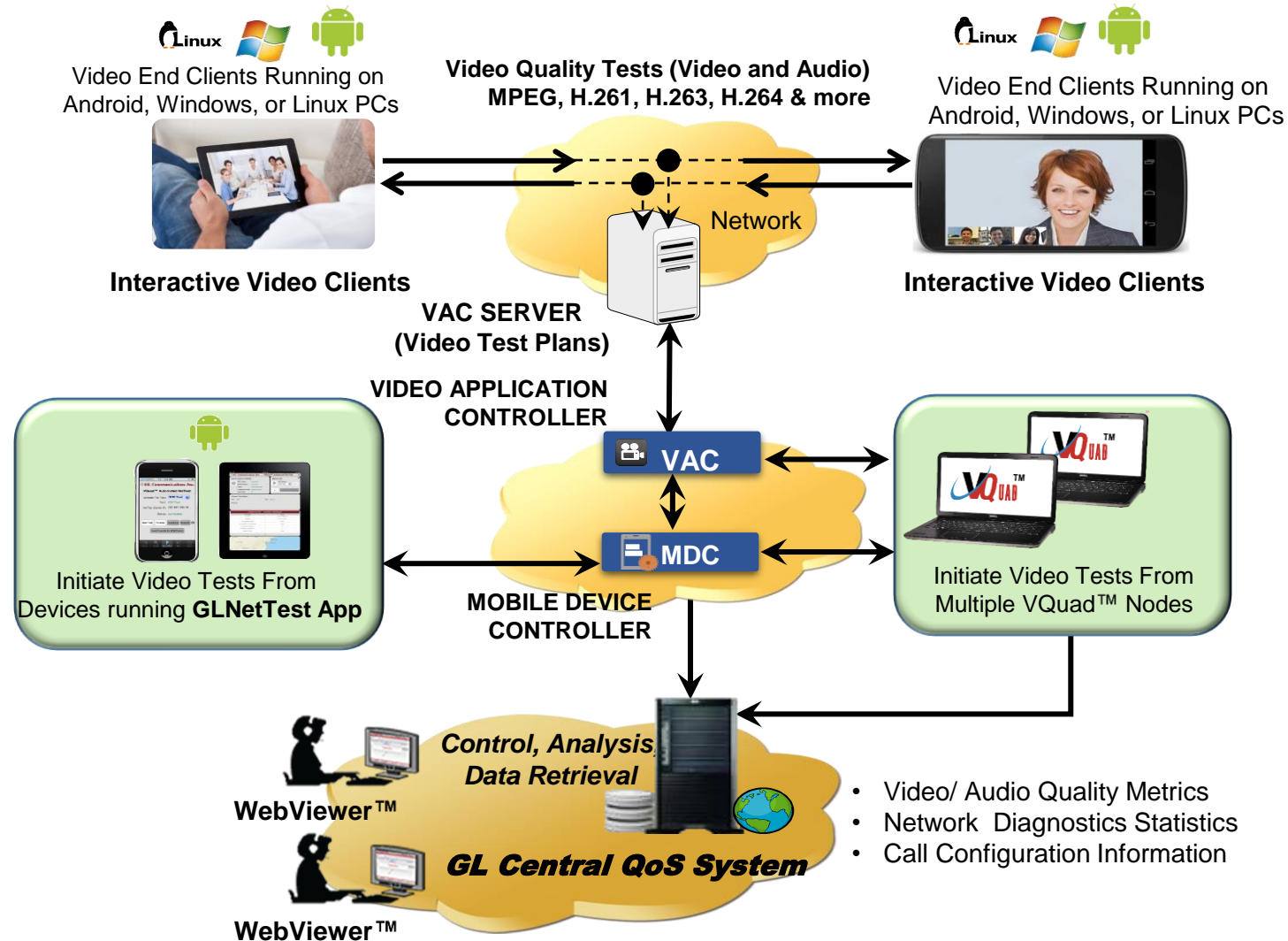
Message: [Format](#)

Phone Number: [Manage List](#)

# Video Testing



# Automated and Manual Video Quality Testing (Android, Windows® and Linux Interface)



# Video Test Results in WebViewer™

VIDEO QUALITY							AUDIO QUALITY					AUDIO-VIDEO QUALITY		IP NETWORK HEALTH							CALL CONFIG INFO					
Absolute MOS-V	Relative MOS-V	Video Frame Rate (Frames per Second)	Impaired I Frames (%)	Impaired B/P Frames (%)	Loss Rate within B/P Frames (%)	EPSNR	Relative MOS-A	Audio Bitrate (kbps)	Audio Bandwidth (kHz)	Signal Level (dBm0)	Noise Level (dBm0)	Relative MOS-AV	End System Delay (ms)	Network Packet Loss Rate (%)	Network Packet Discard Rate (%)	Mean Burst Loss Rate (%)	Mean Burst Length (Packets)	Mean Gap Loss Rate (%)	Mean Gap Length (Packets)	Jitter (PPDV) (ms)	Image Resolution (Pixels)	GoP Length	Audio Codec Type	Audio Sample Rate	Video Codec PLC Type	Audio Codec PLC Type
4.38	4.5	30	0	0	0	36.9	3.84	5	3.5	-23	-61	3.69	166	0	0	0	0	0	8886	0.75	1280 X 720	15	AMR-NB 5.9Kbps	8000	standard	AMR-NB 5.9Kbp
4.38	4.5	30	0	0	0	36.06	3.84	5	3.5	-23	-61	3.66	166	0	0	0	0	0	8893	0.5	1280 X 720	15	AMR-NB 5.9Kbps	8000	standard	AMR-NB 5.9Kbp
4.37	4.49	30	0	0	0	36.8	3.84	5	3.5	-23	-61	3.69	166	0	0	0	0	0	8847	0.81	1280 X 720	15	AMR-NB 5.9Kbps	8000	standard	AMR-NB 5.9Kbp
4.31	4.43	30	0	0	0	35.94	3.84	5	3.5	-23	-61	3.64	166	0	0	0	0	0	8840	0.75	1280 X 720	15	AMR-NB 5.9Kbps	8000	standard	AMR-NB 5.9Kbp
3.86	4.16	30	0	0	0	34.02	4.2	64	3.5	-23	-61	3.46	113	0	0	0	0	0	83088	0.06	704 X 480	15	G.711 μ-law PLC 64Kbps	8000	standard	G.711 μ-law PLC 64Kbps
3.86	4.16	30	0	0	0	34.02	4.2	64	3.5	-23	-61	3.46	113	0	0	0	0	0	82549	0.06	704 X 480	15	G.711 μ-law PLC 64Kbps	8000	standard	G.711 μ-law PLC 64Kbps
4.3	4.3	30	0	0	0	34.95	4.2	64	3.5	-23	-61	3.77	166	0	0	0	0	0	38439	0.62	1920 X 1080	15	G.711 μ-law PLC 64Kbps	8000	standard	G.711 μ-law PLC 64Kbps
4.27	4.27	30	0	0	0	35.05	4.2	64	3.5	-23	-61	3.81	166	0	0	0	0	0	38389	0.56	1920 X 1080	15	G.711 μ-law PLC 64Kbps	8000	standard	G.711 μ-law PLC 64Kbps
4.34	4.46	30	0	0	0	36.45	3.84	5	3.5	-23	-61	3.66	166	0	0	0	0	0	8783	0.56	1280 X 720	15	AMR-NB 5.9Kbps	8000	standard	AMR-NB 5.9Kbp
4.31	4.43	30	0	0	0	36.45	3.84	5	3.5	-23	-61	3.64	166	0	0	0	0	0	8735	0.56	1280 X 720	15	AMR-NB 5.9Kbps	8000	standard	AMR-NB 5.9Kbp
4.32	4.44	30	0	0	0	36.45	3.84	5	3.5	-23	-61	3.64	166	0	0	0	0	0	8792	0.5	1280 X 720	15	AMR-NB 5.9Kbps	8000	standard	AMR-NB 5.9Kbp
4.37	4.49	30	0	0	0	36.45	3.84	5	3.5	-23	-61	3.66	166	0	0	0	0	0	8849	0.63	1280 X 720	15	AMR-NB 5.9Kbps	8000	standard	AMR-NB 5.9Kbp
4.34	4.46	30	0	0	0	36.38	3.84	5	3.5	-23	-61	3.65	166	0	0	0	0	0	8902	0	1280 X 720	15	AMR-NB 5.9Kbps	8000	standard	AMR-NB 5.9Kbp
4.37	4.48	30	0	0	0	36.45	3.84	5	3.5	-23	-61	3.66	166	0	0	0	0	0	8941	0.31	1280 X 720	15	AMR-NB 5.9Kbps	8000	standard	AMR-NB 5.9Kbp
4.65	4.65	30	0	0	0	39.06	4.2	64	3.5	-23	-61	4.16	146	0	0	0	0	0	76238	0.25	1920 X 1080	15	G.711 μ-law PLC 64Kbps	8000	standard	G.711 μ-law PLC 64Kbps

# Thank you!

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