THE TERMS OF REFERENCE TO APPOINT A SERVICE PROVIDER FOR THE SUPPLY, INSTALLATION, AND COMMISSIONING OF THE QUALITY OF SERVICE (QoS) BENCHMARKING EQUIPMENT TO TEST THE NETWORK'S PERFORMANCE AND MONITOR QUALITY OF SERVICE OF THE MOBILE NETWORK OPERATORS' VOICE, DATA, VIDEO, MESSAGING SERVICES WITH SUPPORT AND MAINTENANCE FOR A PERIOD OF THREE (3) YEARS.

1. Purpose

The Authority intends to source through an open bid from eligible bidders to appoint a service provider to supply, install, and commission a Quality of Service (QoS) benchmarking equipment to test the performance and monitor quality of service of mobile network operators 'voice, data, video and messaging services with support and maintenance for a period of three years

2. Background

2.1. ICASA is mandated to ensure the provision of good QoS by licensed telecommunication network operators and service providers.

2.2. QoS is described as the ability of a mobile network to provide a service at an assured service level. QoS is very critical in mobile communication network technologies including second generation (2G/GSM), third generation (3G/WCDMA), fourth generation (4G/LTE), fifth generation (5G), and Wi-Fi.

2.3. ICASA intends to source through an open bid from qualified bidders, a QoS Benchmarking Equipment that is comprised of:

2.3.1. Drive-test equipment;

2.3.2. Walk-Test/Portable equipment (Backpacks);

2.3.3. Multi-vendor Post-processing tool; and

2.3.4. Scanner.

2.4. The proposed QoS Benchmarking Equipment will be used to monitor the performance of mobile services in South Africa in terms of service availability, accessibility (call setup), retainability (dropped calls), network coverage (signal levels), data throughput, latency and general quality of service.

3. Scope of the work

The scope of work entails the following deliverables:

3.1. **QoS Monitoring/Benchmarking Equipment**

3.1.1. ICASA seeks to acquire a QoS Benchmarking Equipment to monitor the quality of service for voice, data, video, and messaging services.

3.1.2. The equipment shall be comprised of the following components/equipment:

a. Drive-test Benchmarking equipment with twenty (20) User Equipment (UEs), that can be setup to conduct measurements in 2G/3G/4G/5G/ Wi-Fi mode in an outdoor environment. ***Note: The vehicle will be provided by ICASA and must be setup with 20 UEs, one scanner and one inverter.*** The Drive-test and Walk Test UEs must be of the same model.

b. Walk-Test/Portable equipment (Backpacks), with twenty (20) UEs that can be setup to conduct QoS measurements in 2G/3G/4G/5G/Wi-Fi mode in an indoor and outdoor environment. Two (2) backpacks with capability to setup ten (10) UEs per backpack, and two (2) ruggedized Tablets/ Controllers to setup the 20 EUs. The Drive-test and Walk Test UEs must be of the same model.

c. Scanner that can support 5G, LTE (FDD and TDD), LTE-A, UMTS/WCDMA, GSM, Wi-Fi technologies with scanning capability of 10 MHz - 6 GHz frequencies, including up to layer 3 decoding for all the supported technologies.

d. Multi-vendor Post-processing Tool, that supports 2G/3G/4G/5G and Wi-Fi reporting and analysis. The tool should be compatible with logfile type formats; SQZ, NMF, TRP. The tool shall support three (3) perpetual user licences with support and maintenance for three (3) years from the

contractual date. The Post-processing Tool shall be able to provide the analysis reports in a format specified by ICASA, root cause analysis of QoS issues and identification of problem location.

3.1.3. Detailed specifications of all equipment and software (Multi-vendor post processing tool) are provided in Appendix A.

3.1.4. The equipment shall record QoS events including blocked calls, dropped calls, signal levels, poor quality signals, low throughput thresholds, and other significant events related to QoS KPIs.

3.1.5. The Drive Test equipment must be locally and remotely configurable.

3.1.6. The equipment shall be mobile, easily deployed, and transferable in different modes of transport (such as cars, public buses, etc.), or can be installed at a designated location to be specified by ICASA.

3.1.7. The equipment shall be able to store measurement data i.e., logfiles locally for processing and reporting. The frequency of upload of captured data shall be configurable. The equipment shall provide for manual upload as a redundancy mechanism to the auto-upload.

3.1.8. The equipment shall be able to monitor the following voice call scenarios:

a. Mobile to Fixed (M2F) subscriber;

b. Mobile to Mobile (M2M) subscriber;

c. Fixed to Mobile subscriber.

3.1.9. The test measurement scenarios of the equipment shall simulate typical end-user behaviour.

3.1.10. The equipment shall be able to:

a. To support QoS benchmarking for Voice, Data, Video, and Messaging services offered in the different frequency bands as specified in the National Radio Frequency Plan (NRFP)1 using technologies, including, but not limited to GSM, EGSM, GPRS, EDGE, WCDMA (UMTS), HSUPA, HSPA+, HSDPA, LTE-TDD, LTE-FDD, LTE-A, Wi-Fi, VoLTE and 5G for each mobile service provider.

3.1.11. The equipment shall support QoS tests for Voice, Messaging, Video and Data services in accordance with the "ICASA quality of service parameters" as

[1] https://www.icasa.org.za/uploads/files/NRFP-Web_29032022.html

specified in SANS-1725-1 (Voice Standard), SANS-1725-2 (Data Standard), and the End-User and Subscriber Service Charter regulations as well as the respective international standards including, but not limited to, ITU-T E.804, ITU-T P.863, ITU-T P.862.1, ITU-T P.861, and ETSI 102 250-2.

3.1.12. The equipment shall allow flexibility for users to customize key performance indicators (KPIs), test cases, and report templates.

3.1.13. The equipment shall log and decode all protocol layer messages (Layer 1, Layer 2, and Layer 3) for all technologies supported.

3.2. **Installation and Commissioning**

3.2.1. The Drive-test equipment must be installed in a vehicle that will be provided by ICASA and the installation shall comprise of twenty (20) UEs, one scanner and one inverter. Vehicle installation will include but not be limited to the following: Cabling, Power Inverters, charging units, Antennas, GPS, and cabinets/racks/chassis with shock mountings to ensure a complete working equipment. The equipment should include battery backup that is capable of running the equipment for at least 2 hrs while the vehicle engine is not running.

3.2.2. The Walk-test equipment must comprise of 20 UEs in two (2) Backpacks with ten (10) UEs per backpack, and two (2) ruggedised Tablets/Controllers, one tablet/controller per backpack including supporting accessories.

3.2.3. Post-processing tool must be installed on applicable devices e.g. Laptop, Desktop or server. The supplier shall load or provide three (3) perpetual user licences.

3.2.4. The supplier shall provide software upgrade and installation of software patches at no additional costs to ICASA for all the components of the solution, i.e. Drive test, Walk test, scanner and Post processing tool.

3.2.5. The installation and commissioning will take place at ICASA's Head Office (Centurion) or at premises that are agreed on by ICASA and the successful Service provider.

3.3. **Product Support**

3.3.1. The bidder must have a local presence through own office in South Africa with technical support staff capable of providing technical support and maintenance of the proposed solution.

3.3.2. The supplier shall have an online portal for logging faults and complaints and may supplement this portal with other reporting/interaction platforms, e.g. email or telephone.

3.3.3. All support for software/hardware required for the proper functioning of the equipment shall be valid for three (3) years after equipment acceptance.

3.3.4. The supplier shall provide licenses, remote/local upgrades of software, and installation of software patches for three (3) years from the date of installation of the equipment at no cost to ICASA for the proper functioning of the equipment.

3.3.5. The supplier must state the manufacturer's Original Equipment Manufacturer (OEM) end of support, and end-of-life for the proposed QoS Equipment, which shall not be less than 3 years from the date of installation. This must be supported by the product roadmap of the proposed equipment.

3.3.6. The supplier shall guarantee that they have support from the (OEM) regarding the availability of spares and repair facilities.

3.4. **Product Manuals and Technical description**

3.4.1. The supplier must provide manuals on the proposed equipment that guide on how to operate the equipment, conduct troubleshooting, and basic service maintenance of the equipment must be provided in soft and hard copy at the time of delivery of the equipment and shall be in English.

3.4.2. The bidder must provide technical description (schematics and equipment architecture) of the proposed equipment must be included in the response to this bid response.

3.5. **Acceptance and Approvals**

3.5.1. The supplier shall provide a checklist of items listed in 3.1.2 which will be signed by both parties upon delivery of the equipment components.

3.5.2. A full functional test, including a drive test and reports generation shall be conducted on the equipment after installation to confirm that it meets the requirements specified by ICASA.

3.6. **Training**

3.6.1. Within the context of this procurement, the supplier shall provide full training to fifteen (15) officials of ICASA.

3.6.2. The training shall cover the functionality and maintenance of the equipment with practical hands-on sessions.

3.6.3. The training shall be done on the actual equipment being supplied under this bid.

3.6.4. The supplier shall provide skills transfer plan which includes hands-on training of ICASA staff members with timeframes, learning outcomes, and the objectives.

3.6.4.1. A skills transfer plan shall cover the following skills areas and hands-on training on:

(a) Configuration of QoS Equipment, and Test cases for Voice and Data measurements.

(b) Support and maintenance procedures.

3.6.5. A skills transfer plan must be accompanied by reference letters indicating similar training conducted in the past 5 years.

3.7. **Expected Components of the Equipment**

3.7.1. The supplier is expected to provide ICASA with a QoS Benchmarking Equipment that consists of:

3.7.1.1. Drive-test Benchmarking Equipment;

3.7.1.2. Walk-test/Portable equipment;

3.7.1.3. Multi-vendor Post-processing tool;

3.7.1.4. Scanner;

3.7.2. The equipment should be able to measure the following mobile service KPI's: service availability, accessibility, retainability, service/network coverage and quality of service.

3.8. **Project Delivery Plan**

3.8.1. The bidder shall provide a project delivery plan which includes:

3.8.1.1. Gantt Chart which includes, Milestones such as Delivery schedule of equipment, integration plan, acceptance test plan with work breakdown structure. The delivery timelines of the equipment and software must be clearly indicated in the project delivery plan.

3.8.1.2. Roles and Responsibilities Matrix/Diagram.

3.8.1.3. Project risks management with a mitigation plan, and Quality control measures.

3.8.2. The Project Leader/or designated project manager shall perform the ongoing reporting and management of the Service Level Agreement (SLA) in accordance with the contract.

4. Proposed advertising period and recommended media

4.1. The bid will be advertised for a minimum of 21 calendar days in the e-tender portal and ICASA's website on an 80/20 procurement principle.

5. Sourcing method

5.1. The goods/service will be procured through a open bid in terms of ICASA's Supply Chain Management policy.

6. Briefing Session

6.1. A non-compulsory virtual briefing session will be conducted.

7. Qualification criteria

7.1. Bidders will be evaluated on Mandatory requirements, Functionality, price and special goals, based on the qualification criteria.

7.2. **Mandatory Requirements**

Table 1. Mandatory Requirements

Mandatory Requirements	**Compliant (*with supporting documents*)**	**Non-Complaint**
The bidder must have a local presence with offices located in South Africa, e.g. Lease Agreement or Municipal Rates and Taxes.		
The bidder shall provide written proof that they are a registered and authorized OEM supplier or distributor of the proposed equipment in South Africa, e.g. agreement, or letter, or certificate		

7.3. **Functionality Criteria**

7.3.1. Prequalification criteria cut-off point is 70 points out 100 points.

7.3.2. Only bidders who obtain the minimum cut-off score of 70 points will be evaluated further in accordance with the 80/20 procurement principles as prescribed by National Treasury Regulations.

Table 2. Bid Evaluation criteria and weights

A. Functionality: Prequalification criteria	**Weight**	**Grading**
1. Proposed Project Delivery Plan The bidder provided a project delivery plan as per paragraph 3.8.1 which includes indication of: (1) The achievement of delivery and commissioning of the equipment within a period of 6 months from contract date. (2) The achievement of delivery and commissioning of the equipment can be achieved within a period of 7 - 12 months from the contract date. (3) The achievement of delivery and commissioning of the equipment can be achieved in more than 13 months from the contract date.	**10**	• 5 = Project delivery plan complies with requirement (1) • 3 = Project delivery plan complies with requirement (2) • 1 = Project delivery plan complies with requirement (3), or no submission.

2. Conformance to technical features of the tender (Appendix A, Table 3: Drive Test Equipment)	**15**	The bidder complies as follows: • 5 = Complies to all 10 features. • 3 = Complies with features from 1-9. • 1 = Complies with less than 9 features or no submission.
3. Conformance to technical features of the tender (Appendix A, Table 4: Walk Test Equipment)	**15**	• 5 = Complies to all 9 features. • 3 = Complies with features from 1-8. • 1 = Complies with less than 8 features or no submission.
4. Conformance to technical features of the tender (Appendix A, Table 5: Multi-vendor Post Processing tool)	**15**	• 5 = Complies to all 8 features. • 1 = Complies with less than 8 features or no submission.
5. Conformance to technical features of the tender (Appendix A, Table 6: Scanner),	**10**	• 5 = Complies to all 10 features. • 1 = Complies with less than 10 features or no submission.

6. Proof of three-year support and maintenance (written letter by OEM) from the Original Equipment Manufacturer (OEM) for the following requirements. 1. Ticket logging platforms (online system and other reporting platforms e.g. email or telephone) 2. Troubleshooting, 3. Licenses management, 4. Software upgrades,	**15**	• 5 = Proof of Support includes all listed requirements. • 1 = Doesn't comply with all the requirements or no submission.
7. Provide reference letters with company letterheads and contact details from companies where the proposed or similar QoS Benchmarking Equipment was deployed or provided in the past 5 years.	**10**	• 5 = Provided more than four (>4) reference letters. • 4 = Provided four (4) reference letters • 3 = Provided three (3) reference letters • 2 = Provided two (2) reference letters 1 = Provided one (1) or no submission of reference letters
8. Provide reference letters with company letterheads with contact details from companies where similar	**10**	• 5 = Provided more than four (>4) reference letters.

training was conducted as referenced in 3.6 for more than two personnel.		• 4 = Provided four (4) reference letters • 3 = Provided three (3) reference letters • 2 = Provided two (2) reference letters • 1 = Provided one (1) or no submission of reference letters
TOTAL FOR FUNCTIONAL PRE-QUALIFICATION CRITERIA.	**100**	
B. Price	**80**	
C. Specific Goals	**20**	
TOTAL	**100**	

APPENDIX A: DETAILED TECHNICAL SPECIFICATIONS

A.1. Drive Test Equipment

The equipment with Drive-test benchmarking equipment with twenty (20) User Equipment (UEs) that can be setup to conduct measurements in 2G/3G/4G/5G/ Wi-Fi mode in an outdoor environment. ***Note: A vehicle will be provided by ICASA and will be setup with 20 UEs, one scanner and one inverter.***

Table 3: Drive Test Equipment

Features	**Description**	**Compliant** (***with supporting documents/details***)	**Non-Complaint**
1. Number of Devices	20 User Equipment (UEs)		
2. Technologies	2G, 3G, 4G, 5G, and Wi-Fi		
3. Hardware	a. Cabinet/Chassis/Rack/Probes with a Control Unit or UEs are mounted in Cabinet/Chassis/Rack/Probes. b. Scalable and Modular. c. Easily transferable to different vehicles.		
4. Tracking	GPS positioning and trail mapping		
5. Input Voltage	10 – 19 V DC i.e., Equipment must be able to be powered using standard vehicle battery.		
6. Operation Mode	The equipment must have an option to be locally and remotely configurable to load (scripts, logfiles), start or stop scripts.		
7. Dashboard	Real-time local or web-based monitoring of measurements including actual route trail and measurement events.		

8. Minimum Measurements Capability	a. Data: Ping, FTP/FTPS DL/UL, HTTP/HTTPS, Network Performance Test, Video streaming and OTT applications. b. Voice Circuit Switch and VoLTE: Call Setup Success Ratio, Call Drop Ratio, Call Setup Time. c. Signal Strength and Quality for 2G/3G/4G/5G/Wi-Fi d. Messaging: SMS Delivery Time		
9. Inverter	12V DC 500 Watts Inverter		
10. Battery Backup	Minimum of 2 hours battery backup at maximum configuration.		

A.2. Walk Test Equipment (Backpack)

Walk-Test/Portable equipment (Backpacks), with twenty (20) UEs that can be setup to conduct measurements in 2G/3G/4G/5G/Wi-Fi mode in an indoor environment. A total of 20 UEs are required for the Walk Test equipment. Two backpacks with capability to setup 10 UEs per backpack, and 2 Tablets/Controllers (1 Tablet/Controller per Backpack).

Table 4: Walk Test Equipment

Features	**Description**	**Compliant** (***with supporting documents/details***)	**Non-Complaint**
1. Number of Devices	20 UEs, 2 ruggedised tablets/ controllers		
2. Technologies	2G, 3G, 4G, 5G, and Wi-Fi		
3. Number of Backpacks	2		
4. UEs in Backpack operational mode	UEs must be carried in Backpacks for indoor and outdoor environments.		

5. Operation Mode	Local configurable to load, start or stop scripts.		
6. Dashboard	Real-time local monitoring of measurements including actual route trail and measurement events, using a local controller e.g., Tablet.		
7. Tracking	GPS positioning and trail mapping.		
8. Power supply	Backpacks with backup power supply e.g., power banks		
9. Scalable and Modular	Must be able to add more devices per backpack		

A.3. Multi-vendor Post Processing Tool

Table 5: Multi-vendor Post Processing Tool

Features/Description	**Compliant (*with supporting documents/details*)**	**Non-Complaint**
1. Multi-vendor and Multi technologies post processing tool i.e., it must be able to process logfiles from the following QoS benchmarking equipment which are; TEMS (Infovista), SwissQual, Nemo (Keysight) and other reputable QoS benchmarking equipment. The tool should be compatible with logfile type formats; SQZ, NMF, TRP. Supports the technologies 2G, 3G, 4G, 5G, and Wi-Fi.		
2. Three (3) perpetual licences.		
3. Drill-down ability to analyse root cause failure e.g., Call Failure		
4. Supports analysis of ETSI KPIs, e.g., Drop Call Ratio, Call Setup Success Ratio, Call Setup time, Data throughput and Latency.		
5. Multiformat Report support, e.g., Excel-based reports, Customization capabilities for reports and analysis workbooks.		
6. Support Data visualization on maps such as Open Street Maps, Google Maps etc.		

7. Fully automatic benchmarking reports generation		
8. Interactive dashboards.		

A.4. Scanner Receiver

Table 6. Scanner Receiver

Features/Description	**Compliant (*with supporting documents/ details*)**	**Non-Complaint**
1. **Band Range:** 10 MHz – 6 GHz		
2. **Supported Technologies**: 5G, LTE (FDD and TDD), UMTS/WCDMA, GSM, Wi-Fi		
3. Simultaneous Multi-Technology Measurement		
4. Automatic Channel Detection or Mobile Blindscan		
5. 4G/5G Dynamic Spectrum Sharing (DSS)		
6. Spectrum analysis and channel power measurements		
7. SIB and MIB Decoding		
8. LTE MIMO Measurements (2x2 and 4x2)		
9. **Layer 3 Measurements:** 5G, LTE (FDD and TDD), WCDMA, GSM		
10. Number of channels (LTE/UMTS) 24		