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ANNEXURE A

1. Purpose of ANNEXURE A

The purpose of Annexure A is to highlight the technical and functional requirements and specifications of the Mobile Network Quality of Service (QOS) Module that the Independent Communications Authority of South Africa (hereinafter referred to as "the Authority") is seeking to acquire as per the outlined terms and conditions.

2. Background

2.1 Quality of Service (QoS) can be described as a network's ability to provide a service at a guaranteed service level. QoS is critical for mobile communication network technologies including second generation (2G/GSM), third generation (3G/WCDMA), fourth generation (4G/LTE) systems and any subsequent generation systems (including 5G).

2.2 The Authority has a legislative mandate to protect the rights of consumers by promoting the delivery of quality services to consumers and other stakeholders. The Authority previously promulgated a regulatory framework for monitoring of Quality of Service levels offered by operators. The regulatory framework and accompanying service level standards are prescribed in terms of the End-user Subscriber Service Charter Regulations, 2016 as amended (the Regulations). However, due to lack of technical monitoring capabilities there are several limitations in the implementation an enforcement of the regulations.

2.3 Regulation 10 of the Regulations imposes an obligation on each licensee to monitor its network on a twenty-four (24) hour seven (7) days a week basis.

Regulation 9(14) of the Regulations states that a licensee must submit a report to the Authority regarding its compliance with the parameters listed in sub-regulation 12, twice annually. However, as of today, the Authority has no satisfactory means or methods of verifying these compliance reports. Further, the Authority has no means to independently assess compliance by licensees with prescribed parameters. In terms of best practice, effective monitoring and enforcement of compliance with the prescribed standards requires that a regulator possess the capability to collect data continuously and adheres to the latest methodologies / mechanisms to obtain and assess QoS measurements.

2.4 Drive-test methods provide a snapshot of an operator's network performance on selected routes and at a particular time of day. A centralised system provides measurements from the entire network, all the different locations at different times are monitored, so the representability is assured [ETSI EG 202 057-3 V1.1.1]. A combination of both the drive-test method and a centralised system will provide the Authority with the ability to monitor network performance within the country, and thus adequately protect end-users whilst verifying the accuracy of data reported by licensees (particularly mobile operators) to assess and confirm regulatory compliance.

2.5 In order to be reliable, the monitoring of network performance must provide constant measurements from across the entire network, in different locations on a twenty-four (24) hour basis. This therefore requires a system to continuously collect this data. The system and its associated mechanism will make it possible to monitor network performance and track traffic, verify compliance of reported data and devices in the market to the benefit of consumers.

2.6 The project's objective is to monitor and verify network performance, track Traffic ~~& Tariffs~~ and ensure network performance authenticity by enabling the Regulator to monitor the Quality of Service associated with each Mobile Network Operator in South Africa, and to have better enforcement for issues related to traffic (Voice, SMS, Data).

2.7 The Authority invites eligible service providers to submit an open bid for a Network Performance Monitoring and a Tracking System to collect data and

give reports on the Mobile Network Operators (MNOs) in the country.

3. Functional Specifications

The QoS measurement and monitoring module will be used to measure the performance of telecommunications networks, identify mobile network performance issues in each specific network and analyse their root causes, and to report key performance indicators on mobile networks.

The module should support any data from Mobile Networks with the ability to manage information from multi-vendor and multi-technology networks, which will enable the calculation and publishing of pre-defined sets of Key Performance Indicators (KPIs), based on the raw data collected from different operator network elements. It should feature configurable alerts with real-time statistics to identify any network failure or outage leading to interrupted or abnormal user experience.

Quantifying quality of service depends on various network performance parameters including amongst others; dropped call, call set success ratio, message transmission success ratio, response time, call set-up time, delay…etc. that will be automatically monitored by the platform. These parameters are prescribed in terms of regulation 9 of the Regulations (and in particular sub-regulation 12, read with sub-regulations 1, 2 and 5).

Bidders must submit proof (e.g. datasheets, product manuals, catalogues, etc.) to confirm/verify that the proposed system conforms to the Architecture Requirements, Technical Parameters, Special Reporting Requirements listed below:

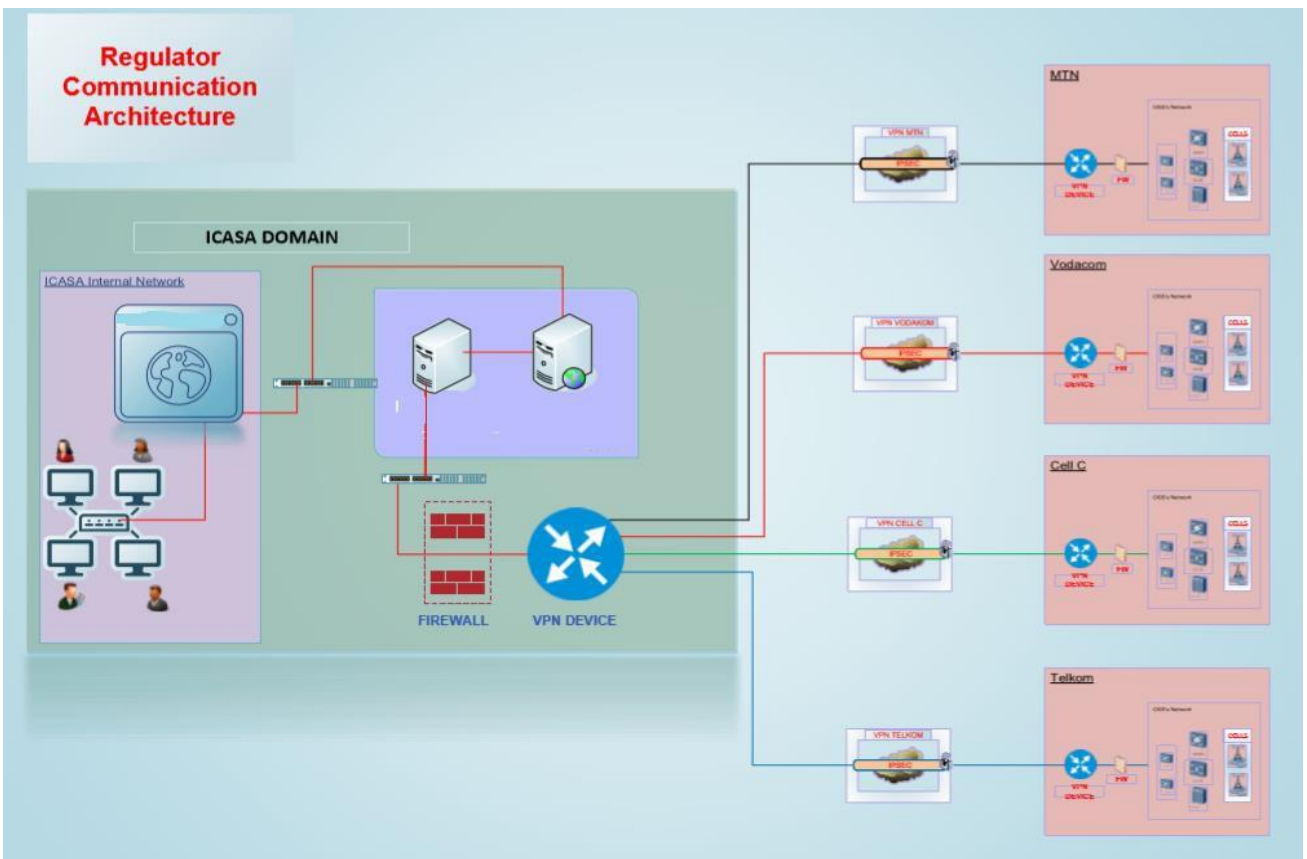
3.1. Hardware, Documents and Training

The scope of work includes the following deliverables:

Table 1 Project Deliverables

ITEM NUMBER	BRIEF DESCRIPTION
	Quality of Service (QOS) Monitoring System (Voice, SMS & Data KPIs)
3.1.1.	Service provider/Vendor's side QOS Monitoring System (with all supporting hardware, software, licenses and databases). Break down as follows: 3. QOS Monitoring System Application Software 4. QOS Monitoring System requisite Hardware 5. Secure File Transfer Protocol (SFTP) requirements (for a minimum of 4 Operators) 6. Software licenses 7. Database prerequisite 8. Various Pricing options (inclusive of the hardware or excluding it) ICASA's side 1. QOS Monitoring System Application Software 2. QOS Monitoring System requisite Hardware **Note:** *a) The supplier shall provide QOS Monitoring System hardware requirements and specifications to ICASA.* *b) The supplier shall integrate and setup the proposed solution.* *c) ICASA will provide virtual dedicated links (e.g. SFTP sufficient link between Operators/points of collections and ICASA Head Office)*
	Documentation
3.1.2.	Electronic copy of the Quality of Service and Network Performance Monitoring System operating manuals
3.1.3.	Electronic copy of the Quality of Service and Network Performance Monitoring System design documents

	Support
3.1.4.	Provide support for the duration of five years of the project. Support to kick-off immediately after implementation (on Acceptance). Service Level Agreement (SLA) to be implemented between the parties within one month of delivery and acceptance of the system.
	Training
3.1.5.	Provide full training to staff members of ICASA. A minimum of twenty-five (25) employees of ICASA must be trained at no additional cost to ICASA. Provide additional refresher training during the maintenance and support period upon the release of enhancements to the system or whenever needed.



3.2. Network Architecture and configuration

Figure 1: Set-up and connection of the FTP/SFTP servers to centralised server

3.2.1. The proposed Network Performance Monitoring system shall:

- Collect/extract raw files/data from each mobile operator
- Process/transform collected files/data
- Load the processed data into a database

- Visualise the reporting data

3.2.2. The system needs to be configured with performance-management alarms in response to service degradation. The system should be able to:

- Perform integrity and reliability checks of OMC-R/source raw data on trial.
- Customise reporting: Configure automatic email alerts for network events (align with service-affecting incidents).
- Allow access control configurations (administrator profile and general users' profile (priority and non-priority) to ensure maximum security.

3.2.3. ICASA and the service provider will conduct a Provisional Acceptance Testing (PAT) of the system. PAT is conducted to determine if the requirements specified by the contract are fulfilled after each implementation milestone.

3.3. Operators, Vendors and Technology

The state of the South African mobile networks is given in Table 2, the dimensioning of the servers and configuration should be calculated according to the size of the network data to be collected to ICASA, while anticipating the possible future network expansion or addition of new Radio Access Technologies by the MNOs.

Table 2 South African mobile operators' sites, vendors and technologies

OP.#	OPERATOR NAME	VENDOR	TECHNOLOGY	SERVICE	ESTIMATED TOTAL BASE STATIONS COUNT
1	VODACOM	Huawei	GSM, UMTS, LTE	RAN KPI	18000
		Ericsson			
		ZTE			
		Nokia			
2	MTN	Huawei	GSM, UMTS, LTE	RAN KPI	9000
		Ericsson			
		ZTE			
		Nokia			
3	CELL C	ZTE	GSM, UMTS, LTE	RAN KPI	4700
		Huawei			

		Nokia			
4	TELKOM	Huawei	GSM, UMTS, LTE	RAN KPI	2400

Note: The system should be expandable, to accommodate more entrants (licensees) in future.

3.4. Product Support and Licensing

3.4.1. The supplier must have capacity to maintain, repair and replace all components of the system in a timely manner.

3.4.2. Local presence in South Africa is critical, as the Authority requires service with short lead times.

3.4.3. The supplier must have an online portal for logging failures and complaints and may supplement this portal with other reporting platforms.

3.4.4. The bidder must state the manufacturer's end of support for this solution, which shall not be less than 5 years from final acceptance of the system.

3.4.5. The bidder shall provide the licenses to be used, remote upgrades of software and any installation of software patches. Licenses must be valid for at least 5 years from installation of the system.

3.4.6. The bidders must state any third party or supplier they are involved with in supplying the solution.

3.4.7. The bidder shall provide the product roadmap for the proposed solution.

3.5. General Requirements

The mobile network Quality of Service (QOS) module shall meet the following general requirements:

3.5.1. **Modularity**, **flexibility** and ease of upgrade, as well as the ability to add extra interfaces.

3.5.2. Have fixed module(s)/schedulers capable of communicating and collecting raw data from the Operation and Maintenance Centre (OMC-R) or sourcing data from all Mobile Network Operators (MNOs) into a central server;

3.5.3. Have the capability to **record, analyse, calculate KPIs and create reports**;

3.5.4. **Failure detection capabilities** to determine impairment of the quality of service in facilities within the system;

3.5.5. Have an **enforcement and compliance module** that tracks the KPIs of the

Base Station System (Radio KPIs) network nodes against predefined ICASA's thresholds (target and limit values)

3.5.6. Have a **database** to store all records. The database should be easy to interface with other databases, including those of licensees;

3.5.7. Be able to work with various vendors (and be **compatible** with most vendor equipment currently used by the mobile operators);

3.5.8. Have a module that **verifies the integrity and reliability** of the OMC-R or source data before processing.

3.5.9. **GIS exports** from the monitoring system which must be compatible with third party mapping software such as **Google earth or Bing maps and Open street maps**.

3.5.10. Be capable and flexible enough for users to **create new KPIs** from network counters.

3.5.11. Be able to process multiple technologies: **2G, 3G, 4G (GSM, CDMA, WCDMA, LTE, etc.).**

3.5.12. Offer the capability to **correlate processed drive test data with OMC-R/source Data** on the same platform or separately.

3.6. Special Reporting requirements

3.6.1. The system should allow building of new reports and amendment of **the ready-made and regular reports** with ease.

3.6.2. Display customization

3.6.3. Dashboard Customization

3.6.4. Automated reporting

3.6.5. Support of multiple output reports, such as PDF and excel reports

3.7. Technical Parameters/ Key performance indicators (KPIs)

3.7.1. The System shall have the capability to monitor significant events related to QoS KPI (as prescribed in the ICASA's "End-User and Subscriber Service Charter regulations of 2016" and SABS's "SANS 1725") including but not limited to the following mandatory mobile voice and data communications basic parameters KPIs:

3.7.1.1. Traffic Channel (TCH) Blocking Rate: Blocking rate for Traffic channel (congestion).

3.7.1.2. Call Setup Time or Voice Service Access Delay: Measure of time it takes for the user equipment to set up a call.

3.7.1.3. Call Setup Success Rate (CSSR)

3.7.1.4. Call Drop Ratio (CDR) Data Service Availability

3.7.1.5. Data Service Access Time Data Service Access Rate

3.7.1.6. Data Service Drop Rate DL Average User Throughput

3.7.1.7. Radio Resource control (RRC) Blocking rate.

3.7.1.8. Radio Access Bearer (RAB) Blocking rate

3.7.1.9. Service Call drop rate

3.7.1.10. ERAB setup success rate

4. Period of assignment

All work is to be carried out in accordance with the timeline as agreed with the Authority. The Authority will not be responsible for any cost incurred due to an extension of the project resulting from delays by the Service Provider.