Terms of Reference (TOR) for Procurement of Mobile Quality of Services Monitoring (Tools & Software) System



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Bhutan InfoComm and Media Authority
Royal Government of Bhutan



October 2026

1. Background

The Bhutan InfoComm and Media Authority (BICMA) is the regulatory body responsible for regulating and monitoring the quality of telecommunications and ICT services in Bhutan. The Authority is mandated to ensure that telecommunications service providers comply with the prescribed Quality of Service (QoS) requirements and deliver reliable and satisfactory telecom services to the consumers. Currently, two licensed telecom operators are providing mobile telecommunications services in Bhutan, and the Authority undertakes regular Quality of Services (QoS) monitoring to assess the performance and quality of services provided by both the operators.

The Authority is currently undertaking QoS monitoring of 4G mobile services (especially voice and data services) at different locations of the country. The monitoring activities are carried out to assess key service performance indicators and to verify compliance with the quality of service standards and requirements prescribed by the Authority. The result of such monitoring also helps to identify the telecom operators service quality issues, coverage gaps, network performance limitations and areas of improvement. An important regulatory function is therefore to monitor that consumers receive telecommunications services that meet the required standards.

With the launch of 5G technology in Bhutan in December 2021, the mobile telecommunications landscape has witnessed a major transformation with the roll out of newer technologies and higher capacity services. However, the Authority currently lacks dedicated 5G QoS monitoring equipment, tools and software to independently assess and evaluate the performance of 5G networks. As 5G services continue to develop and expand, the Authority is increasingly required to enhance its technical ability to monitor and assess the quality of 5G services effectively, accurately and consistently. Moreover, the Authority is also in need of additional 4G QoS monitoring equipment.

In this regard, in order to further enhance the mobile QoS monitoring capability of the authority, the Authority intends to procure a Mobile Quality of Services Monitoring (Tools & Software) System.

2. Objectives of the 5G & 4G QoS Monitoring Tools

The 4G and 5G QoS monitoring tools are intended to support the Authority in effectively monitoring and assessing the quality and performance of mobile telecommunications services provided by the telecom operators. These tools will enable the Authority to measure the QoS parameters for voice and data services, identify network performance issues, and verify compliance with the prescribed QoS standard of the Authority. The following are the objectives of 5G and 4G monitoring tools;



a. To monitor the quality and performance of 4G and 5G mobile services provided by the telecom operators in different locations across Bhutan.

b. To measure important QoS parameters for voice and data services and determine whether the services provided by the telecom operators meet the standards and requirements set by the Authority.

c. To identify network performance and service quality issues and provide reliable monitoring results to support the Authority in taking appropriate regulatory actions and ensuring better quality of service for consumers.

3. Scope of the Work

The scope of the work for the procurement of the QoS Monitoring System are as follows:

a. Supply the QoS Monitoring System as per the required Technical Specifications and the quantities mentioned under the Technical Specifications Requirements.

b. Provide all the hands-on-training and engineering services like operational training and Site Acceptance Test (SAT) on site physically by the manufacturer's expert based on the requirement as deemed by the Purchaser.

c. Deploy experts/technicians from manufacturers with required and authentic certification to provide all the required materials and to complete the hands-on-training and engineering services. It should be the sole responsibility of the winning bidder to assess and reassess all the requirements.

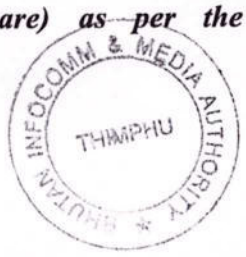
d. Provide documentation manual and technical training for operation, maintenance and troubleshooting.

e. Provide warranty service or assurance of license period and AMC for a period of a minimum of 5 years. The bidder shall be responsible for all the cost related to the warranty service and an assurance of license period and AMC for a period period for hardware and software.

4. Instruction on the Bid

4.1 Category of Supply

1. The Bid should consider supplying of the following:
    a. ***QoS Monitoring System (Tools and Software) as per the technical specification/requirement***



b. Providing technical in-person training to the officials of the Authority

2. The supply of the above mentioned shall be considered as the one lot. A winning bidder needs to clearly provide the technical and financial details as specified in the bid.

3. The work should not change the existing proposed modality for the procurement unless agreed between the parties.

4. A bidder can be awarded upon fulfilling the technical and financial requirements.

4.2 Language of the Bid

The Bid prepared by the Bidder, and all correspondence and documents relating to the Bid exchanged by the Bidder and the Purchaser, shall be written in English.

4.3 Document Comprising the Bid

The Bid prepared and submitted by the Bidder shall comprise the following components:

a. Bid Form, Technical Data Sheets and Financial Quote and any other documents mentioned in the eGP, should be completed.

b. Power of Attorney indicating that the person(s) signing the Bid have the authority to sign the Bid and thus that the Bid is binding upon the Bidder during the full period of its validity.

4.4 Bid Price

a. Bidders shall quote for the entire Scope of Supply including Hardware, Software, Support maintenance and physical in-person training in Bhutan with a break up of prices of individual particulars/quantities specified in the technical requirements.

b. The total Bid Price shall also cover all the Supplier's obligations mentioned in or reasonably to be inferred from the Bidding Documents in respect of Supply, transportation to site, all in accordance with the requirement of Bidding Documents. The Bidder shall complete the appropriate Price Schedules stating the Unit Price for each item and total Price.

c. The quoted price should be inclusive of transport, insurance and all associated costs, taxes, fees, markups, etc.

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d. Prices quoted by the Bidder shall not be subject to any price adjustment during the performance of the Contract. A Bid submitted with an adjustable price quotation will be treated as non-responsive and rejected.

4.5 Bid Submission

The minimum days for Bids submission will be as specified in the eGP.

4.6 Pre-Bid Meeting

Pre-bid meetings shall not be conducted if required from bidders as per the procurement norms. However, clarifications of the doubts may be facilitated via the eGP system until the last 7 working days before the bid closing date.

4.7 Bid Currencies

The price quoted shall be in Ngultrum.

5. Minimum Mandatory Eligibility Requirements

The bidders shall fulfill the following mandatory requirements to be eligible for further technical evaluation. The bidders not fulfilling these mandatory requirements will not be evaluated.

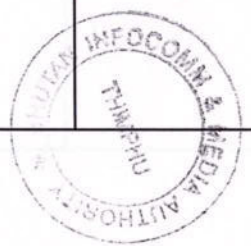
Sl No	Mandatory Requirement	
1	Valid Trade license	Required
2	Valid Tax Clearance Certificate	Required
3	Manufacturer Authorization	Required (The manufacturer authorisation is required in order to ensure the genuinity and originality of the goods supplied. The Bidders have to obtain the signed and sealed manufacturer authorisation). It is not the dealership certificate but the evidence to provide the goods originality from the manufacturer.)
4	Technical Resources and Materials	(i) The Bidder shall provide the signed authorization letter from the manufacturer

		mentioning that the manufacturer will provide the expert to carry out in-person physical training to the Purchaser's officials and that the expert is qualified and responsible for the above task. (ii) Submit the CV of the Manufacturer's expert along with evident certificates. (ii) The Bidder shall provide the detailed documents required by the procuring agency including the brochures/specific datasheet of the equipment which they are bidding for.



6. Technical Specifications and Requirements

Sl. No	Particulars (Item)	Sub-Items	Technical Specifications and Standards *(Shall fulfill all specifications and standards or equivalent to)*	Detailed Technical Specifications	Quantity
1	Mobile QoS measuring tools and softwares	Backpack based QoS monitoring Drive Test solution	Should be a backpack based QoS monitoring drive test solution. Should support standalone system operation. Should support a minimum of 6 UE simultaneously with at least one RF scanner. Smart, high-quality and lightweight backpack structure to fit the UEs and Scanner The UE should have the latest Qualcomm/Exynos/MediaTek or equivalent chipset-based devices. Backpack's backup battery should support a minimum of 4 hours of continuous operation without external power source. Should comply with EMC standard compliant tests, Should have and support GPS receivers.	Minimum 6 UEs simultaneously plus an RF scanner, with full concurrent test case execution in a single measurement session. Must support standalone system operation. The internal backup battery must provide a minimum of 4 hours of continuous operational power without requiring an external source. The UEs should be equipped with the latest android and a modern flagship-class mobile processing platform, such as the Qualcomm Snapdragon 8 Gen 2 or equivalent, preferably of Samsung make . All testphones should be free Over-The-Air RF reception and no obstacles blocking the signal transmission and reception. Test UEs must be controllable through physical cable connections in addition to wireless control capabilities.	1 set with licenses as mentioned in the detailed technical specifications



				Must include support for an additional +12V DC vehicle power source and AC chargers. Automated cooling and temperature controls for the backpack The UE should be a Smartphone with Samsung Galaxy S23 above/other brands equivalent to it. **Processor**: Modern multi-core processor capable of continuous 4G/5G measurement, data logging, GPS logging, and test application operations without performance degradation. **RAM**: Minimum 12GB RAM (preferably higher). **Storage**: Minimum (256 GB or higher) to store logs, maps, and measurement datasets. **Power**: Sufficient battery capacity for extended field measurements. **Network & SIM**: SIM and eSIM capabilities supporting all types of currently deployed networks.	
		Mobile QoS monitoring software in Drive	Should support all IMT services (GSM, UMTS, LTE, NR), QoS and QoE provided to end users.	**Technology Support**: Full support for IMT services across GSM, UMTS, LTE/LTE-A	**1 for each UE**

		Test Solution	The system shall support, at a minimum, the following test cases, as well as other relevant test cases as may be required: 1. Voice Service a. Call setup Time b. Call drop rate c. MoS d. Handover rate 2. Data Service a. Upload throughput b. Download throughput c. Latency 3. Coverage a. Signal Strength b. Signal Quality Should follow or comply the international standards below: 1. ITU-T P.863 (POLQA) 2. ITU-T P.1204.1 compliant video streaming quality of experience Should support active testing applications FTH/HTTP and browser testing with UEs. Should have live map support, realtime Map of the readings and support open source	Carrier Aggregation, and 5G NR (SA and NSA), as well as VoLTE. **Operational Frequency Bands**: Complete support for Bhutan Mobile Network Operators (MNO) deployed bands: 700 MHz, 850 MHz, 900 MHz, LTE 1800 MHz, 2100MHz, 2300 MHz TDD, and 3.1–3.6 GHz 5G NR bands. **Real-time Visualization & Maps**: Real-time display of measurement parameters on maps, supporting open-source map integration (e.g., OpenStreetMap, Google Map) and GPS tracking. **Voice Quality Testing**: • **Test Cases & KPIs**: Call Setup Time (s), Call Drop Rate (%), Call Success/Failure Rate (%), Handover Rate (%), and Speech Quality MOS. • **Standards Compliance**: ITU-T P.863 (POLQA) algorithm for voice quality assessment. ITU-T P.1204.1 compliant video	**phone with licenses**

			maps along with GPS support. Should support to provide record log files and monitor RF parameters. Should possess measurement tools with scripts, map, and playback support. Measure the quality of service with a fully-fledged handheld measurement tool with scripts, map, and playback support. Should support real-time display of measurement results, log file recording, indoor and outdoor map, application protocols such as voice call, FTP, HTTP, HTML browsing, SMS, WiFi, Scripting support, playback measurement etc.	streaming quality of experience. **Data Quality & IP Testing**: • **Core KPIs**: Download Throughput (Mbps), Upload Throughput (Mbps), Latency (ms), Signal Strength, Signal Quality, and Coverage. • **Protocols & Utilities**: • HTTP (DL/UL), FTP (DL/UL), iPerf3 (TCP/UDP), Traceroute, DNS lookup, and Speed Testing, SMS, **Radio Parameter Logging**: • **5G NR Parameters**: Real-time logging of SS-RSRP, SS-RSRQ, SS-SINR, RSSI, NR-ARFCN, PCI, Beam/SSB information, Path Loss, Timing Offset, and Serving/Neighbor cell information. • **4G LTE Parameters**: Real-time logging of RSRP, RSRQ, RSSI, SINR, EARFCN, PCI, Cell ID, and Serving/Neighbor cell information.	

				Data Management & Replay: Timestamped and geo-referenced data logging. Data must remain exportable in non-proprietary formats including CSV, TSV, JSON, and XML. Must support instant session replay and measurement playback.	
		Post-processing software	GUI based custom reports and custom KPI definition. Should support QoS and QoE analysis, including the root cause analysis and quick drilldown to problem details. Should support automated data load and report execution with online maps. Log files format should be compatible with any third-party post-processing tools. Should support real-time statistics with the following view types: line, bar, and gauge graphs, and text views etc. Should support that files can be instantly filtered and merged based on geographical area, operator, time, measurement name, serving system, problem event, or any combination of these attributes	Dashboard for real-time monitoring including actual route and measurement events. Interactive web-based dashboards. **Architecture & Database**: Windows-based desktop software utilizing a local database engine for data management (non-cloud-based). **Network & Protocol Support**: Decodes Layer 3 and above signaling messages for GSM, UMTS, LTE/LTE-A CA, VoLTE, 5G NR, and VoNR. **Standards Compliance**: Aligned with	1 set with licenses as mentioned in the detailed technical specifications

			Graphical and customizable user interface Should support analysis at multiple layers of the network and benchmark analysis for multiple operators. Report generation in pdf, excel format. Should support automation at certain levels. Should be able to generate results based on multiple benchmarks of QoS and QoE. Should support import and export of data between open source map software such as QGIS Should support a local database to keep record of the measurements done. Should be able to analyze and display network performance score reports comparing different operator's measurement data for different mobile KPIs. Should support visualization and replay of the drive test. Should not be cloud based software. Should be a windows based software provided with a laptop/PC	ETSI TS 102 250 series, ETSI TR 103 559 benchmarking guidelines, and ITU-T QoS/QoE frameworks. **Benchmarking & Analysis Capabilities**: • Multi-layer network analysis and benchmarking across multiple mobile operators. • Multi-dimensional filtering by time, operator, technology, device, service, band, route, site, and geographic polygon area. • Operator-wise, technology-wise, band-wise, and route/site-wise comparative extraction. • Custom KPI benchmark definition with automated flagging for results failing KPI thresholds. **Visualization & Mapping**: Geo-referenced map visualization supporting routes, cells, and KPI distributions. Must support drive test route replay and bidirectional import/export with open-source GIS software (e.g., QGIS, KML/KMZ). **Report Generation**: Automated report generation in PDF and MS Excel formats.	

				Reports must include date/time, GPS coordinates, operator, technology, frequency band, serving cell details, and key performance parameters.	
		Hardware for the post-processing tool	High-performance Windows base or laptop suitable for post-processing, visualization, database operation and analysis of large 4G/5G drive-test measurement datasets. RAM, storage, processing,	Operating System with minimum Windows 11 Professional, 64-bit, or the latest Windows Modern 64-bit multi-core processor with performance equivalent to or better than a current-generation Intel Core i7 / AMD Ryzen 7 class processor, or equivalent. RAM with Minimum 32 GB DDR5 RAM, expandable to 64 GB or higher. Storage with Minimum 1 TB NVMe SSD for operating system and post-processing.	1
		License and AMC	License and AMC	Licensing & Maintenance Period: Minimum five (5) year license term with no additional charges for software updates, patches, and routine maintenance during the active license period. Upon expiry of the 5-year term, the Android measurement application and desktop post-processing software must	With all licenses

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				remain operational with all features available at the time of expiry. The suppliers and manufacturer should enter into the contract between the two to enable and provide the 5 years free license and AMC to the purchaser. The suppliers and manufacturer may include the 5 years license and AMC costs in the total bidding bid amount (inclusive).	
		SAT and training	Training, criteria for acceptance, installation and configuration. The SAT, installation, configuration and training to the BICMA officials should be conducted physically by the expert from the international manufacturer/company for 5 working days in the BICMA office.	Site Acceptance Testing (SAT) & Training: • The supplier must deliver complete installation, initial setup, and hands-on practical training for BICMA technical personnel. • Training scope must cover field measurements, test script creation, device locking control, post-processing, custom KPI configuration, and automated report generation. • Field testing and analysis must be conducted using the supplied equipment. • Comprehensive user manuals, technical reference guides, and	In-person

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				training documentation must be provided. • script creation, device locking control, post-processing, custom KPI configuration, and automated report generation. • Field testing and analysis must be conducted using the supplied equipment. • Comprehensive user manuals, technical reference guides, and training documentation must be provided.	



7. Financial Quote Table

The financial quote has to be provided in the following table format:

a.

Particulars	**Sub-Items**	**Specific equipment model/mode, And Name of the manufacturers/ country origin**	**Unit Price**	**Quantity**	**Total Price (Nu)**
Mobile QoS measuring tools and softwares	Backpack based QoS monitoring Drive Test solution				
	Mobile QoS monitoring software in Drive Test Solution				
	Post-processing software				
	Hardware for the post-processing tool				
	License and AMC				
	SAT and training				
Total Quoted Price					

8. Technical Support and Warranty

a. Quality assurance is expected from the supplier, such that any error or fault in hardware equipment and its subsystem, accessories, software requirement installation tools mentioned in technical specifications shall be acted upon, resolved, mitigated and/or replaced accordingly at no cost to the Purchaser.

b. **The warranty period or the licenses and AMC for the equipment shall be minimum 5 years after the Site Acceptance Test.**

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c. The winning bidder/supplier shall provide free support and provide after-sales services for a period of five (5) years from the time of acceptance of the hardware and software.

d. The winning bidder/supplier shall ensure that all products and installations are acute, complete, operable, uncompromised, and error-free.

e. The local suppliers shall enter into contact with the manufacturer to provide any warranty support for (5) years.

f. The supplier is required to provide after-sales service and assurance that all equipment and installation are accurate, complete, operable, uncompromised, and error-free during the warranty period. In addition, the supplier is required to provide remote and on-site support.

9. Deliverables

a. The winning bidder(s)/supplier(s) should deliver the equipment/system as per the required quantity and specification.

b. The site work (site acceptance test shall commence after inspection and acceptance of delivered equipment by the procuring agency as to quantity and specifications based on the agreed contract.

c. The supplier shall provide the necessary setup and configuration services of all deliverables, to include but not limited to hardware, software, network, and electrical. Documentation for operation (SAT on site), maintenance and troubleshooting.

d. The required in-person training by the expert from the manufacturer has to be provided.

10. Expected Outcomes

a. Supplied goods should be of high quality as in the technical specifications.

b. Quality of work like online training and SAT on site should be not less than the approved proposal and conditions.

11. Work Plan

The tender shall include a work-plan, which shall not exceed four and half months 4.5 months for the delivery of equipment from the date of award.

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12. Supplier's Roles and Responsibilities

a. The bidder/firm shall carry out the tasks and specific activities outlined in this TOR and eGP to deliver the specific expected output professionally and responsibly.

b. Prepare relevant documentation/manual of the delivered equipment and its subsystem and provide to the purchaser.

c. Submit a final report to the Purchaser within 7 days after delivery and conclusion of all work.

d. Saving the office properties from all negative actions and negligence.

e. Control on his/her assigned staff for this assignment.

13. Purchaser's Roles and Responsibilities

a. The Purchaser shall pay only to the winning bidder, the cost of equipment and any other fees outlined in the contract upon submission and acceptance of the bidder's performed work by the Purchaser.

b. Enable the bidder to execute his tasks as per the agreed work-plan.

14. Duration of Assignment

The duration of the assignment from the date of Award is tentatively four and half months (4.5 months) and it may be subdivided into the following:

a. 4 ~~3~~-months: Delivery of QoS Monitoring System
b. 15 days: Acceptance of delivered items, configuration of the procured system, documentation and online training.

15. Assignment Constraints

The bidder shall arrange the space for the configuration of the monitoring system and physical training for the Monitoring system of their own.

16. Mode of Payment

a. The mode of payment will be done in Ngultrum only

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17. Bid Security

The bidder shall provide/submit the bid security of Nu. 130,000.00 (One Hundred and Thirty Thousands Ngultrum only). Any defaulting bidders shall be served with a notice to deposit the stated amount in Bid Securing Declaration within 5 days which the bidder shall be debarred (across all Government Agencies) for a period of one year. The Authority will immediately go to the next bidder, once the notice is served to the defaulting bidder. Without the bid security, the bid will be considered unresponsive.

18. Tax Deducted at Source (TDS)

The TDS shall be deducted as per the Procurement Rules and Regulations of Bhutan during the payment.

19. Performance Security

The performance security of the 10% of the total bid amount shall be paid by the bidder to the Purchaser. The performance security shall be returned to the bidder after five years of the payment of bid amount by the Purchaser. Performance security may be submitted in the form of Bank Guarantee or Cash Warrant or Demand Draft or online submission through any banks prior to formal signing of the contract agreement.

20. Opening and Evaluation of Bids

The Tender Opening Committee will open the bids and the Tender Evaluation Committee shall evaluate the bids.

a. **Mandatory Eligibility Requirement:** Non compliance to the minimum mandatory eligibility requirements will be treated as non responsive and the bid shall not be considered for further evaluation.

b. **Clarification on Bid:** To assist in the examination, evaluation and comparison of bids, the Purchaser may at its discretion, ask the Bidder for clarification of its bid. The request for clarification and the response shall be in writing and no change in price or substance of the bid shall be sought, offered or permitted. The bids fulfilling the mandatory eligibility requirement shall be put for technical evaluation. The bidders who fulfilled technical requirements will be financially evaluated.

c. **Preliminary Examination:** The Purchaser will examine the bids to determine whether they are complete, whether any computational errors have been made, whether the documents have been properly signed, and whether the bids are generally in order. Arithmetical errors will be rectified on the following basis: If there is a discrepancy

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between the unit price and the total price that is obtained by multiplying the unit price and quantity, the unit price shall prevail and the total price shall be corrected. If the Bidder does not accept the correction of errors, its bid will be rejected. If there is a discrepancy between words and figures, the amount in words will prevail. Prior to the detailed evaluation, the Authority will determine the substantial responsiveness of each bid. For purposes of these clauses, a substantially responsive bid is one which conforms to all the terms and conditions of the bid without material deviations. A bid determined as not substantially responsive will be rejected by the Purchaser and may not subsequently be made responsive by the Bidder by correction of the non-conformity.

d. Evaluation Criteria:

(i) Technical Evaluation

The technical evaluation will be as per the required technical specifications and compliance to the Terms of Reference (ToR). The evaluation will check the fulfillment of the technical proposal of the Bidders as per the technical specification requirements. Not fulfilling the technical specifications requirement will be considered technically non-responsive. **The bid will be considered for the next evaluation which is financial evaluation only if the technical specifications are fulfilled.**

The Purchaser may also seek clarification from the Bidders regarding technical details in writing or through presentations by the Bidder if the Purchasers feels the need to determine its technical fulfillment.

(ii) Financial Evaluation

The bids fulfilling the technical evaluation having the lowest financial proposal and meeting the technical specification prescribed in Terms of Reference will be selected.

21. Award Letter and Contract Signing

a. If required, negotiations shall be conducted with the firms based on ranking.
b. Seven (7) working days standstill period shall observe from the date of issuance of the letter of intent to award to allow the bidders to lodge complaints if aggrieved by the decision of the tender committee.

