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**Abridged report on the monitoring of voice quality of service of
the mobile operators serving Gauteng Province – conducted by
ICASA in financial year 2023/2024 Quarter 1**

1. Introduction

This report is produced for the benefit of consumers that may not have the time to read the full report and would like to (a) have a better understanding of the monitoring of quality of service (QoS) of cellular land mobile network operators and, (b) to understand the results of the Authority’s monitoring exercise in the Gauteng Province during the period between 19 June and 15 July 2023. The report is based on the monitoring report titled “2023/24 Quarter 1: Voice Quality of Service Report – Gauteng Province”. Only voice services are topical for this report.

Section 2 describes what the quality of a network is about and how measurements are conducted. Section 3 details why ICASA conducts QoS monitoring, while Section 4 focuses on the measurements that were conducted in the Gauteng Province. Section 5 gives the key results for the four operators (ECNS/ECS licensees) Cell C, MTN, Telkom and Vodacom. Section 6 gives the conclusion based on the measurements conducted.

2. What is network quality of service and how are measurements done?

Quality of Service (QoS) measurement refers to the exercise of measuring the performance of services that are delivered over mobile networks. It provides an

indication of what a customer experiences when using his/her cellphone on the mobile network.

A drive-test method is used to measure the QoS. Drive-testing is a method of measuring the coverage, capacity, and performance levels of a mobile network. Vehicles used are equipped with mobile radio equipment similar to a cellphone. The equipment can automatically make cellphone calls while driving. It makes calls in much the same way as a user would, but in a controlled and predetermined way. Measurements include a broad range of parameters of mobile cellular services.

Drive-tests are usually done on public roads. However, in villages, where public roads often do not exist, the vehicles may stop for a set of measurements and then advance to another point.

During a monitoring campaign for a particular province (which may take several weeks) the measurements are confined to a specific geographic region or regions. Specific regions are used for testing because it is not possible to survey an area as large as a province within the time and resources available. Fundamentally the measurements therefore represent a sampling of the network's performance.

When conducting measurements, calls would be initiated and maintained for a length of time. While doing so, it would be determined how easily a call is set up – whether the call is set up when first dialling, or whether there needs to be multiple attempts. Calls are of a standard length of time and during this period the system would also record whether a call is dropped. For voice calls, call set-up success ratio and call drop ratio are key elements in establishing quality of service (more on these aspects in section 3).

The whole process of making the calls is well controlled and parameters are automatically registered. Together with the measured values of the network parameters, the geographic position of every measurement is registered by means of a built-in GPS device. All information is recorded in files, called logfiles, for post-measurement processing.

Technical standards apply for the measurements and there is also a subscriber service charter that guides the Authority on the expected KPI targets.

3. Why is ICASA conducting QoS measurements?

The Authority conducts these quality-of-service measurements to ensure that the operators (service providers) maintain a reasonable level of quality of service delivered to their customers. The Authority, through the appointed service provider - Metro Global Telecom Services (Pty)Ltd., conducted QoS measurements in the financial year 2023/2024.

The key performance indicators (KPIs) measured are Accessibility, Retainability, Response Time and Speech Quality. In definition: *accessibility* refers to the ability to set up a call; *retainability* refers to ability of the network to retain the call, i.e., not drop it and *response time* measured through Call Setup Time, refers to the time interval from the instant a user initiates a network connection request until a complete message indicating call disposition is received by the calling terminal. *Speech Quality* on call basis is an indicator representing the end-to-end speech transmission quality of the mobile telephony service. This parameter computes the speech quality on the basis of completed calls. Measurement make use of the POLQA Algorithm which compares the reference signal received from the transmitting side against an equivalent sample on the receiving side.

To be more specific:

- Accessibility is measured through Call Setup Success Ratio (CSSR);
- Retainability is measured through Drop Call Ratio (DCR); and
- Response time is measured through Call Setup Time.
- Speech Quality is measured using the Mean Opinion Score (MOS)

The targets of the above, are stipulated in the End-User and Subscriber Service Charter Fourth Amendment Regulations 2023.

4. Monitoring that was done in the Gauteng Province

The Authority conducted QoS measurements in the Gauteng Province on the networks of the cellular mobile operators; Cell C, MTN, Telkom and Vodacom. The measurements were carried out in the period between 19 June and 15 July 2023, covered a total distance of over 4056 km.

The measurements were conducted in areas and in circumstances where the mobile service is likely to be frequently and widely accessed. These areas include major towns, townships, farm areas, other rural areas, major road arteries, areas of major economic activity nodes and areas that generated previous complaints. The sampled areas include Alberton, Centurion, Johannesburg/Midrand, Mamelodi and Roodepoort.

Focus on the above regions was aimed at collecting sampled data that well represent the experience of the general public in an important and representative part of the province.

5. Key results

This section provides a summary and key finding of all measurements. The results give a snapshot of the mobile network performance and customer experience at these locations during the measurement period.

The results indicate that the quality of service and operators' network performance vary significantly on a per-location basis.

In terms of overall Call Setup Success Ratio; all operators achieved the CSSR target of greater or equal to 98%. Thus, meeting the Accessibility target.

In terms of overall Drop Call Ratio; Cell C is the only operator that failed to achieve the DCR target of less or equal to 3%, thus failed to meet the Authority's Retainability target.

In terms of overall response time (Call Setup Time); all operators met the target of less than 9 seconds as prescribed in the End-User and Subscriber Service Charter Fourth Amendment Regulations 2023. All operators met the Speech Quality Target of equal to or greater than 3.

6. Comparison of the current results to previous results

Johannesburg was previously monitored in the financial year 2013/2014. Midrand was previously monitored in the financial year 2021/22, and Centurion in 2013/2014. The aim of conducting the recent QoS measurements in these areas was to assess the level of improvement that the operators promised in the

previous financial years. Table 1 results show that there is a consistent good performance from all operators in Centurion.

Only Retainability measurements were conducted in Centurion in 2013/2014 and measurements were conducted on three operators (Cell C, MTN, and Vodacom). All operators show good performance in terms of Retainability, with MTN showing a significant improvement.

In 2013/2014, Accessibility measurements were conducted on three operators (Cell C, MTN, and Vodacom) in Johannesburg CBD. In the financial year 2021/22, measurements were conducted in Midrand. The Johannesburg /Midrand shows improvement in terms of Accessibility for all operators; operators maintained the target of greater or equal to 98%. In terms of Retainability, Vodacom, and MTN maintained good performance.

In Mamelodi, Vodacom and Telkom maintained good performance in terms of Accessibility; Vodacom and Telkom met the target of greater or equal to 98%. In terms of Retainability, Vodacom, MTN, and Telkom maintained good performance.

It must be noted that the target for Accessibility was 95% in 2013/2014, this is before the revision of *End-User and Subscriber Service Charter Regulations of 2016 as well as that of End-User and Subscriber Service Charter Fourth Amendment Regulations 2023* which became effective in March 2023. Table 4 below summarises the previous and current results. Telkom was not yet included in the measurements during the financial year 2013/14.

Table 1 Comparison of previous results

Area	Financial Year	Accessibility (%)				Retainability (%)			
		Cell C	MTN	Telkom	Vodacom	Cell C	MTN	Telkom	Vodacom
Centurion	23/24	99,41	99,01	99,43	99,61	2,81	2,10	0,35	0,35
	13/14	-	-	-	-	1,58	4,84	-	0,40
Johannesburg /Midrand	23/24	98,60	98,10	99,40	99,49	3,05	2,45	3,00	2,26
Midrand	20/21	99,50	99,67	99,66	99,66	2,08	1,65	2,10	0,84
Johannesburg CBD	13/14	93,42	96,41	-	98,74	-	-	-	-
Mamelodi	23/24	96,16	97,96	99,02	99,68	5,00	1,94	2,48	1,33
	17/18	98,76	99,74	99,02	98,66	0,29	0,27	0,27	1,11

The results shown in Table 2 are summarised below:

CSSR: The results indicate that all operators are maintaining a good consistent performance in terms of CSSR in Gauteng, thus achieving the Accessibility target in the province.

DCR: The results show that all operators, except Cell C, maintained the DCR target in all measurements conducted in Gauteng. Thus, meeting the Authority’s Retainability target of less or equal to 3%.

Table 1: Comparison of previous aggregated results

	Financial Year	Retainability (%)				Speech Quality (MOS)			
		Cell C	MTN	Telkom	Vodacom	Cell C	MTN	Telkom	Vodacom
Gauteng	2023/24	3.3	1.6	2.6	1.9	98.3	98.6	99.1	99.4
	2021/22	3.15	1.27	1.41	1.23	99.17	99.84	99.94	99.75

7. Mobile Network Operators’ feedback on the report

A detailed report was shared with the Mobile Network Operators for them to share their plans and remedial actions to address issues of poor performance.

7.1 Vodacom

Vodacom provided feedback and network improvement despite meeting the overall targets in all tested areas. The plans were provided as follows:

- Centurion: Vodacom highlighted the area, a new development, that experienced poor coverage. There is a new site, planned to be implemented in financial year 2024.2025, to improve the coverage in the drive test area. Furthermore, frequency optimisation which was conducted in quarter 3 of 2023 and the L700 upgrades will be conducted in quarter 1 of 2024.
- Midrand: The area experienced load-shedding stage 6 when measurements were conducted. Backup on the serving site has since been increased. Cluster optimisation has been completed and the L700 rollout including sectorisation will be implemented in quarter 1 of 2024. A new site was implemented in October 2023.
- Mamelodi: A few serving sites were out of service during the benchmarking period causing interference and congestion which affected data

performance KPIs, particularly downlink throughput. The remedial action includes a planned new site to be implemented in the financial year 2024/2025, permanent backup power, and the L700 upgrades which will be conducted in quarter 1 of 2024.

7.2 MTN

MTN provided feedback and indicated that most negative events (call setup failures and dropped calls) in Gauteng are due to site availability issues in the network. Vandalism and power outages (load shedding) remain the greatest challenge to MTN, which negatively impacts the quality of service in the network. MTN shared that they are embarking on a national project to improve network resilience with regard to site standby time during the unprecedented loadshedding, improving transmission capacity during rerouting where possible, and bolstering site resistance due to vandalism. The findings and plans were provided as follows:

- Centurion: MTN will immediately perform antenna optimization and increase power at identified sites to improve the coverage in the location of the dropped calls.
- Johannesburg/Midrand: MTN analysis revealed that several serving sites were temporarily down at the time of the drive test. The issues on the site have now been resolved and coverage restored in the area. MTN also experienced poor coverage in some areas because of site availability problems within the network. The problems on serving sites have been resolved and coverage has since been restored.
- Mamelodi: Five dropped calls experienced in Mamelodi were mainly due to temporary availability of the serving sites. MTN indicated that a network planning team will investigate the possibilities of building another site in the area to improve coverage. In areas where blocked calls we experience, azimuth change will be implemented to resolve the coverage issues.

7.3 Cell C

Cell C in its response indicated that it notes the findings of the Authority and will continue to provide improved services to its subscribers by engaging with its national roaming service provider to improve coverage in areas identified with

poor performance. The plans to address poor performance were provided as follows:

- Alberton: Cell C will investigate the possibility of uplink interference in one of the sites. Site Availability issues will be escalated to the national roaming partners or managed network service provider.
- Johannesburg/Midrand: The issues of poor coverage and site availability in the area have been escalated to the national roaming/managed network service provider.
- Mamelodi: Poor radio frequency (RF) coverage and quality were experienced in the area. Poor performance indicators are addressed via service tickets to roaming partner. Site availability has been escalated to the national roaming/managed network service provider.
- Roodepoort: Multiple drop calls experienced were due to a destination that was out of order. Errors of destination out of order to test number have been resolved.

7.4 Telkom

Telkom's response to the report indicated that it views the Authority's test results as very significant and uses them as additional input to further improve the quality of the mobile network. Furthermore, Telkom indicated that measurements were conducted during Eskom stage 6 load shedding which affected the availability of sites.

- Alberton: Most failures were caused by congestion and poor quality on the GSM network. Telkom was in the process of shutting down its GSM network across the country (Gauteng was finally switched-off on 2 September 2023), and it was to be expected that the few remaining GSM cells would congest, resulting in poor radio frequency (RF) quality. There is a total of twenty-two (22) sites planned in the area; seventeen (17) sites are in the acquisition phase, three (3) sites in the build phase, and two (2) in the lease agreement phase.
- Mamelodi: Nine (9) failures occurred on the roaming partner's network because two (2) Telkom sites in the area experienced availability issues during the drive test. There is a total of thirty-three (33) sites planned in the area; twenty (20) sites are in the acquisition phase, five (5) sites are in

the build phase, seven (7) are in the lease agreement phase, and one in site quality acceptance phase.

- Johannesburg/Midrand: Dropped calls in the area were caused by overshooting calls with poor RF conditions and this will be addressed through network optimization to reduce service impact during load shedding. Seventy-one (71) sites are planned to improve network performance in the area; forty-three (43) sites are in the acquisition phase, nine (9) sites are in the build phase, seventeen (17) sites are in lease agreement phase, one in site quality acceptance phase and one site in site replanning phase.
- Roodepoort: There is a total of thirty-three (33) sites planned in the area; twenty-four (24) sites are in the acquisition phase and nine (9) sites are in the build phase.
- Centurion: There is a total of twenty-seven (27) sites planned in the area; eighteen (18) sites are in the acquisition phase and three (3) sites in build phase, six (6) in lease agreement phase.

8. Conclusion

The monitoring method provides a snapshot of an operator's network performance, from the users' point of view, on the selected routes and the particular time of day. Although this is not necessarily a true representation of the mobile service providers overall network performance, enough understanding has been gained to assess that it could be difficult for a user to initiate a call in some of the tested areas. It also means that if the user succeeds in initiating a call and the call is established, then there is a likelihood that the call will be dropped before the user completes his/her conversation. Although users may be frustrated sometimes by not being able to make a call, or to have a call dropped, users will still be highly likely to get a reasonable service from any of the operators.

As we benchmarked the operators in Gauteng Province, the results showed that in terms of overall Call Setup Success Ratio; all operators achieved the target of greater or equal to 98%. Thus, meeting the Accessibility target.

In terms of the Accessibility results for each specific route; all four operators met the 98% CSSR target in Centurion, JHB/Midrand, and Roodepoort; Telkom failed

to meet the CSSR target in Alberton; Cell C and MTN failed to meet the target in Mamelodi.

In terms of overall Drop Call Ratio; Cell C is the only operator that failed to achieve the DCR target of less or equal to 3%, thus failed to meet the Authority's Retainability target.

In terms of the Retainability results for each specific route; MTN failed to meet the target in Mamelodi; Telkom failed to achieve the target in two tested areas (Alberton and Roodepoort), and Cell C failed to achieve the target in three tested areas (Centurion, Mamelodi and Roodepoort).

All operators met the Call Setup Time target of less than 9 seconds in all the tested areas as per the End-User and Subscribers Service Charter Fourth Amendment Regulations of 2023. All operators met the required speech quality target of a score of at least 3.