Abridged report on the monitoring of voice quality of service of the mobile operators serving Limpopo Province – conducted by ICASA in financial year 2023/2024 Quarter 2

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 Limpopo Province during the period between 18 and 31 July 2023. The report is based on the monitoring report titled "2023/24 Quarter 2: Voice Quality of Service Report – Limpopo 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 Limpopo 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 Limpopo Province

The Authority conducted QoS measurements in the Limpopo Province on the networks of the cellular mobile operators; Cell C, MTN, Telkom and Vodacom. The measurements were carried out in the period between 18 and 31 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 Mamphokgo, Marble Hall, Mphahlele, Riba Cross and Sehlakwane.

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 failed to achieve the CSSR target of greater or equal to 98%. Thus, failed meeting the Accessibility target.

In terms of overall Drop Call Ratio; all operators 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

All the areas that were monitored are a combination of new areas as well as areas where the Authority received complaints. These areas were monitored for the first time.

7. Mobile Network Operators' feedback on the report

A detailed report and logfiles were 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 plans that are in place for areas that performed poorly. The plans were provided as follows:

- Mamphokgo: The area experienced poor coverage and poor signal quality. Available sites also experienced congestion due to reduced capacity which further contributed to poor performance in the area. A new site is planned, with the target date of Q4 of the 2024 financial year, to improve the coverage. Furthermore, there will be LTE upgrades and site hardening done in the area.
- Mphahlele and Marble Hall: The area experienced high unavailability due to ongoing load shedding as well as some of the sites not having adequate backup power. A new site is planned in the area, with the target date of Q4 of the 2024 financial year, to improve the coverage. Radio Frequency (RF) optimisation
- Riba Cross: The area experienced poor performance due to coverage gaps. A new site is planned in the area, with the target date of Q4 of the 2024 financial year. L700/L900/L2100 LTE upgrades will be done in Q3 and Q4 of the 2024 financial year.
- Sehlakwane: Failures in the voice service were due to poor coverage in some parts of the area. A drive test will be done to confirm the failures. Furthermore, a new site is planned in the area, with the target date of Q4 of the 2024 financial year. LTE upgrades will be done in Q3 of the 2024 financial year.

Furthermore, Vodacom indicated that a few sites were out of service during the drive due to ongoing power outages which resulted in poor coverage. Vandalism is an additional issue that exacerbates site unavailability.

7.2 MTN

MTN provided feedback and network improvement plans that are in place for areas that performed poorly. MTN indicated that power outages /load shedding was a major contributor to lower QoS experienced on their network. MTN plans were provided as follows:

Faults in the transmission network due to power failures/load shedding also had a negative impact on the CSSR in the province. MTN will conduct a thorough investigation of the transmission network in Limpopo to resolve some of the problems that contribute to blocked calls. Furthermore, MTN revealed that dropped calls were mainly due to site availability during load shedding times, in areas where MTN does not have alternative power solutions during power outages. A network planning team to plan a new coverage site for the 2025 network rollout.

7.3   CELL C

Cell C in its response indicated that it notes the findings of the Authority and will continue to engage 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:

Most of the failures were poor availability due to Eskom loadshedding and vandalism, especially in Sehlakwane. There are discussions with national roaming/managed network service provider regarding the site densification that is needed.

7.4   MTN

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 load shedding, load reduction, and vandalism negatively affected network availability. The following remedial actions were provided:

- Mamphokgo: Most failures were due to poor in the outskirts and roads joining villages. Additional sites need to be built in Ga-Masha and Moomane to improve user experience. There is limited coverage in the tested area due to the nature of the terrain. Nine (9) sites are planned to improve network performance in the area; three (3) sites are in the

acquisition phase, four (4) sites are in the build phase, and two (2) sites are in the lease agreement phase.

- 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.
- Marble Hall: Failures were caused by poor coverage and availability problems.
- Mphahlele: There are three (3) planned sites in the area.
- Sehlakwane: Most of the failures occurred on the roaming partner's network on the outskirts. Telkom will engage with the roaming partner to improve/resolve these issues to improve customer experience in the area.
- Riba Cross and Mphahlele: New sites are required to resolve the call setup failures and to improve poor network coverage. Riba Cross has terrain elevation issues, leading to poor network coverage. There are four sites planned in Riba Cross, three (3) sites in the site acquisition phase and one site in the lease agreement phase.

There are fourteen (14) sites planned in both Sehlakwane and Marble Hall. Nine (9) sites are in the acquisition phase, three (3) sites are in the lease agreement phase, and two are in site quality acceptance phase.

Telkom indicated that they will continue to engage with their roaming partners to resolve network issues to improve customer experience in the affected areas.

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 Limpopo Province, the results showed that in terms of overall Call Setup Success Ratio; all operators failed to meet the target of greater or equal to 98%. Thus, failed meeting the Accessibility target.

In terms of the Accessibility results for each specific route; MTN and Cell C failed to meet the CSSR target in all tested areas. Telkom and Vodacom only met the CSSR target in Mphahlele and Riba Cross.

In terms of overall Drop Call Ratio; All four operators failed to meet the overall DCR target of less or equal to 3%. Thus, failed to meet the Retainability target.

In terms of the Retainability results for each specific route; MTN, Telkom and Vodacom failed to meet the less of equal to 3% target in all areas. Cell C only met the target in Riba Cross.

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.