Independent Communications Authority of South Africa
Pinmill Farm, 164 Katherine Street, Sandton
Private Bag X10002, Sandton, 2146

Abridged report on the monitoring of the voice quality of service of the cellular mobile operators serving Gauteng Province – conducted by ICASA in 2017/2018 Quarter 3

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 Gauteng Province during the period 4 December 2017 to 15 December 2017. The report is based on the extended report on the monitoring titled "Quality of Service Report: Gauteng Province 2017/18 Quarter 3".

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

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 cellular mobile network.

Only voice services are topical for this report. However, the Authority is in the process of establishing a capability to also monitor the quality of data services.

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 the 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.

3. Why is ICASA conducting QoS measurements?

The Authority does 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 two key performance indicators (KPIs) measured are fundamentally the accessibility of the network for calls and the ability of the network to retain the call, i.e. not drop it. The generic name for the ability to set up a call is *accessibility*. For the ability to not drop calls the generic name is *retainability*. In technical terms one measures the accessibility by a parameter called Call Setup Success Ratio (CSSR) and the retainability by a parameter called Drop Call Ratio (DCR).

More specifically, the Call Setup Success Ratio (CSSR) is the fraction of the attempts to make calls that result in a connection to the dialled number, whilst the Dropped-Call Ratio (DCR) is the fraction of the calls which, due to the network, were cut off before the speaking parties had finished their conversation. Satisfactory performance applies when at least 98% of calls are set up on the first attempt in dialling and if not more than 3% of calls are dropped.

4. Monitoring that was done in Gauteng Province

The Authority conducted QoS measurements in Gauteng Province on the networks of the cellular mobile operators Cell C, MTN, Telkom and Vodacom. The measurements were carried out between 4 December 2017 and 15 December 2017 and covered a total distance of over 2500 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 Sandton, Mamelodi, Vanderijlpark, Springs and Krugersdorp. Gauteng Province has been visited before in 2013/14 financial year with different areas sampled.

Focusing 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 summary and key findings 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 Retainability (Drop Call Ratio) results, all operators met the DCR target, thus meeting the retainability target. There was no statistically significant difference in the results recorded between MTN, Telkom and Vodacom. Cell C's results show a statistically significant difference in relation to both Vodacom and MTN.

In terms of overall Accessibility (Call Setup Success Ratio), all operators were above the 98% target, thus meeting the accessibility target. There was a statistically significant difference between MTN and Cell C results as well as between MTN and Telkom.

A draft of the QoS monitoring report was shared with all the operators for comments and a network improvement plan. The summarised remedial actions are listed as follows:

5.1. Vodacom

Vodacom noted that though they met the target in all tested areas, it is still part of its culture to continuously improve customer experience. They provided the following plans to improve performance in Mamelodi area, where they performed poorly compared to other operators:

- There is a plan to upgrade capacity in the area by end of quarter 4, 2018. Furthermore, they will roll-out a new site by March 2019.

5.2. MTN

MTN reviewed the Authority's draft report and provided the following remedial action notwithstanding high achieved results:

- Sandton route – Network optimisation was conducted after receiving the Authority's results. Further additional sites will be deployed during 2018 to provide superior quality and coverage improvements. Intermittent sites availability issues along the route have been resolved.
- Vanderbijlpark route – MTN plans to integrate a new site into their network to improve capacity and coverage during the course of 2018. They also indicated that they had transmission issues in the area, which yielded lower samples than the minimum required for a drive test.

5.3. Cell C

Cell C highlighted the lack of its own network coverage in some of the areas tested. In these areas Cell C relies on national roaming arrangements with Vodacom's network. They provided root cause analysis for Springs (the only area where they didn't meet the Retainability target) as follows:

- Cell C deployed new equipment towards the end of November 2017 in Springs, this deployment caused poor performance and affected the drop call rate in the area. However, the issue has been resolved.

5.4. Telkom

Telkom is pleased with the results for all tested areas. According to Telkom, poor performance in Sandton area (the only area where they didn't meet the Retainability target) is mainly due to low coverage on its network and is caused by the following:

- Telkom doesn't have access to sub 1GHz frequency spectrum that is ideal for enhanced coverage, unlike all other operators.
- Only 50% of Telkom's sites in Sandton area are on air. Telkom has additional sites planned which are yet to be built to improve the mobile coverage.

6. 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, there is a noticeable improvement of voice service in the province. This might be attributed by the operators' infrastructure investment in recent years.

On the positive side, the operators have taken note of the results obtained by the Authority. The operators have undertaken to further investigate and have planned future network infrastructure investment to improve their respective networks in the areas of concern.