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**Abridged report on the monitoring of the quality of service of the
cellular mobile operators serving Limpopo Province – conducted
by ICASA in 2017/2018 Quarter 1**

1. Introduction

This report is produced for the benefit of consumers who 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 Limpopo Province during the period between 19 and 30 June 2017. The report is based on the extended report on the monitoring titled "Quality of Service Report: Limpopo Province 2017/18 Quarter 1".

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 Limpopo Province. Section 5 gives the key results for the four operators (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 in order 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 a call 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 Limpopo Province

The Authority conducted QoS measurements in Limpopo Province on the networks of the cellular mobile operators Cell C, MTN, Telkom and Vodacom. The measurements were carried out between 19 and 30 June 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 Thabazimbi, Lephalale, Ga-Seleka, Bakenberg and Aganang. Limpopo Province has been visited before in 2014/15 and 2016/17 financial years 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 results section of the full report provides the 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 end-users' 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 of less than 3%, thus meeting the retainability target. There is no statistically significant difference recorded between Cell C, MTN and Vodacom results. There is a statistically significant difference between Telkom and other operators (Vodacom, MTN and Cell C).

In terms of overall accessibility (Call Setup Success Ratio), all four operators (Cell C, MTN, Telkom and Vodacom) were below the 98% target. There was no statistical significant difference between MTN and Vodacom results. Telkom results show a statistically significant difference in relation to all other operators' results. Cell C results also show a statistically significant difference in relation to all other operators' results.

The results of this QoS monitoring report was shared with all the operators for comments and network improvement plan. The summarised remedial actions are listed below:

5.1. Vodacom

Vodacom submitted that it has reviewed the Authority report and shared the following remedial action to address poor coverage and quality of service in the areas:

- Ga-Seleka – Two new sites in Friendship and Bangalong went live in August 2017.
- A total of 24 planned sites for the 2018/19 financial year are distributed in the five areas which were covered during measurement. 14 out of 24 planned sites are within the Aganang area.
- One new site for each area of Lephalale, Thabazimbi and Ga-Seleka scheduled to be on air within the next 6 months.
- Network optimisation activities were conducted after the report was shared with Vodacom.

5.2. MTN

MTN reviewed the Authority's draft report and submitted the following remedial action to address poor coverage and service quality in the areas:

- Thabazimbi route - Two additional sites in Thabazimbi, which were in the process of being built at the time of the drive test, came on air on the 5 and the 18 July 2017 respectively.
- Lephalale route – One new site was activated on the 26 June 2017 post the Authority's drive test.
- Ga-Seleka route – Additional site activations are currently scheduled for quarter 4 of 2017.
- Bakenberg route – GSM interference was observed in the area. MTN conducted frequency optimisation to alleviate interference.
- Aganang route – MTN is currently conducting frequency optimisation in this area and an additional site is currently scheduled for quarter 4 of 2017.

Notwithstanding the additional sites already implemented and those commissioned in Ga-Seleka and Aganang routes, a total of eight additional sites have been planned and are expected to be live by year end in the areas where the Authority did the drive tests.

5.3. Cell C

Cell C highlighted the lack of its own continuous coverage in some of the areas tested. In some areas Cell C relies on national roaming arrangements with Vodacom's network. In summary, the poor performance was attributed by the following:

- The dropped calls and call setup failures due to low signal levels and insufficient transmission capacity, respectively.
- Lack of seamless roaming/handover between Cell C and Vodacom network. Cell C relies on its national roaming arrangement with Vodacom in some of the areas specified in the Authority's report. Roaming provides coverage where Cell C's own network does not have coverage.

Despite roaming arrangements, there are projects planned to have new base-station sites, to have capacity and transmission routes improved and optimised in the low-performing areas.

Cell C's plans and remedies in the low performance areas include:

- New sites that are planned to be rolled out in the next 3 years.
- Implementation of seamless roaming in the future.
- Optimisation and capacity initiatives to improve network quality and coverage.

5.4. Telkom Mobile

Telkom was pleased with the Authority's report and highlighted the following in its response:

- The problem of the lack of 900 MHz frequency band, which is a crucial requirement for the cost-effective deployment of national coverage specifically in rural areas.
- Within the Limpopo test area, about 93% of tests were made on MTN's network on which Telkom is roaming and 7% on Telkom's own network. However, Telkom met the DCR (Drop Call Ratio) target of less than 3% in all five test areas and CSSR (Call Setup Success Ratio) target of more than 98% in two of the three areas.

Although the ICASA drive-testing only gives a snapshot of network performance on the specific day and time and not a true representation of the overall network performance, Telkom takes the results as input to further improve the quality of its networks in these areas. Telkom's plans and remedies in the low-performance areas are as follows:

- In Ga-Seleka and Aganang, Telkom currently has no sites planned and will continue to depend on our roaming agreement to provide voice services in these areas.
- In the Thabazimbi area, Telkom already planned additional sites, which will increase overall network quality.
- Further engagement with the roaming partner regarding network improvements in the areas where Telkom subscribers roam on MTN's network.

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, enough understanding has been gained to assess that it could be difficult for a user to initiate a call when 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. However, the degree to which the operators' results are below the standard is not very large. Although

users may be frustrated sometimes by not being able to make a call, or to have a call dropped, users will still be able to get a reasonable service from any of the operators.

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