



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

**Abridged report on the monitoring of the quality of service of the
cellular mobile operators serving KwaZulu-Natal Province –
conducted by ICASA in 2016/2017 Quarter 4**

1. Introduction

This report is produced for the benefit of consumers who may not be technical-minded and who 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 KwaZulu-Natal Province during the period between 07 February 2017 and 09 March 2017. The report is based on the extended report on the monitoring titled "Quality of Service Report: KwaZulu-Natal Province".

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 KwaZulu-Natal 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 telephone calls which, due to technical reasons, were cut off before the speaking parties had finished their conversation (with one of the parties hanging up). This fraction is usually measured as a percentage of all calls where cut-off occurred.

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 KwaZulu-Natal Province

The Authority conducted QoS measurements in KwaZulu-Natal Province on the networks of the cellular mobile operators Cell C, MTN, Telkom and Vodacom. The measurements were carried out between 7 February 2017 and 9 March 2017 which covered a total distance of over 2000 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 Chartsworth, uMhlanga, Phoenix, Myeki and Mfekayi. Phoenix and uMhlanga were monitored in the past financial year 2013/14 and the areas were included in the current plans to assess the level of network quality of service improvements as promised by the mobile operators.

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, only Telkom did not meet the DCR target of less than 3%, while Vodacom, Cell C and MTN met the DCR target, thus meeting the Retainability target. However, there was no significant difference between the Vodacom and Cell C DCR results, while there was significant difference between Telkom and other operators. There were also significant differences between MTN and other operators.

In terms of overall accessibility (Call Setup Success Ratio), only MTN was above the 98 % target, and all other operators (Vodacom, Cell C and Telkom) were below the target of 98%.

Phoenix and uMhlanga were monitored during 2013/2014. For the operators Cell C, MTN and Vodacom there was noticeable improvement in the Retainability compared to 2013/2014. There was also improvement in Accessibility in the networks of Cell C and MTN.

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

5.1. Vodacom

Vodacom submitted that it has investigated GSM interference and conducted radio optimisation to improve the areas. Vodacom and ICASA will further engage to find the best possible solution to improve network accessibility in the affected areas. Vodacom performed poorly in terms of CSSR in Chartsworth, Phoenix and Umhlanga. The poor performance was due to Circuit Switch Fall Back (CSFB) slow response time. CSFB is a technology whereby voice and SMS services are delivered to LTE devices through the use of GSM or another circuit-switched network. Circuit Switched Fall Back is needed because LTE is a packet-based all-IP network that cannot support circuit-switched calls. Vodacom is in the process of resolving the issue.

5.2. MTN

MTN did not comment on the report. MTN was a best performer in all the areas tested in KwaZulu-Natal province.

5.3. Cell C

Cell C highlighted the lack of continuous coverage in some of the areas tested. It relies on roaming on Vodacom's network. This adversely affected its overall results, since the ICASA's test methodology relies on roaming occurring seamlessly. The actual customer experience is expected to be better than the measured results. In summary, the poor performance is due to the following:

- The dropped calls and call setup failures are due to low signal levels and insufficient transmission capacity, respectively.
- Furthermore, the low signal levels away from the town was due to the mountainous terrain of the area tested.

- Cell C relies on its national roaming arrangement with Vodacom in the areas specified in the Authority's report. Roaming provides coverage where its own network does not.
- Despite roaming arrangements, there are projects planned for the future to have new base-stations sites and 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 are as follows:

- Upgrading of the existing sites around Myeki to UMTS 2100MHz.
- Improving the existing network infrastructure around Myeki.
- Optimisation and capacity initiatives to improve network quality and coverage.

5.4. Telkom Mobile

Telkom did not comment on the report. Telkom performed poorly in all measured areas with the highest drop call ratio. Further engagement is required with Telkom on remedial action to be taken.

6. Conclusion

The monitoring method provides an indicative 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. Users, although they may be frustrated by sometimes not being able to make a call, or to have a call dropped, will still be able to get a fairly reasonable service from any of the operators.

On the positive side, operators have taken note of the results obtained by the Authority. They have undertaken to further investigate and improve their

networks in the area of concern. Two areas (Phoenix and uMhlanga) which were monitored during 2013/2014 measurements show the improvement of the networks of mobile operators.