



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 Free State Province – conducted
by ICASA in 2017/2018 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 Free State Province during the period 28 August 2017 to 11 October 2017. The report is based on the extended report on the monitoring titled "Quality of Service Report: Free State Province 2017/18 Quarter 2".

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 Free State Province. Section 5 gives the key results for the four operators (ECNS 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 Free State Province

The Authority conducted QoS measurements in Free State Province on the networks of the cellular mobile operators Cell C, MTN, Telkom and Vodacom. The measurements were carried out between 28 August 2017 and 11 October 2017 and covered a total distance of over 2300 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 Botshabelo, Bethlehem, Ladybrand, Kroonstad and Sasolburg.

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 a 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, Cell C and Telkom did not meet the DCR target of less than 3%. MTN and Vodacom met the DCR target, thus meeting the retainability target. There was no statistically significant difference in the results between MTN, Telkom and Vodacom. Cell C's results show a statistically significant difference in relation to other operators' results.

In terms of overall accessibility (Call Setup Success Ratio), MTN was above the 98% target, Cell C, Vodacom and Telkom were below the target of 98%. Thus MTN is the only operator that met the accessibility target. There was a statistically significant difference between MTN's and other operators' results. There was no statistically significant difference between Vodacom's and Cell C's results and between that of Vodacom and Telkom. Cell C's and Telkom's results were statistically significantly different.

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 acknowledged the existence of issues in the low performing areas and shared the following remedial actions:
- Ladybrand route – Issues in the Ladybrand area are associated with poor coverage. On the other hand, spectrum utilisation is a challenge since this area borders Lesotho. New sites have been planned to resolve coverage related areas. 2G to 3G (U900) refarming is also planned in the area to extend 3G coverage and improve performance however the operator expects GSM quality to degrade after this exercise. New sites and refarming projected on air date is June 2018.
- Botshabelo route – An interim solution which was to adjust cell range parameters in the cells serving the area was implemented in November 2017. A permanent solution is to add a new site with projected on-air date of September 2018.
- Kroonstad route – There were issues with database settings of the cells serving the area and the settings were adjusted. Addition of a new site and of U900 refarming have projected on-air dates of September 2018 and June 2018 respectively.
- Bethlehem route – Failures occurred due to poor 3G coverage in the area. Challenges exist due to terrain and poor propagation properties of the 2100 MHz spectrum. 900 MHz spectrum refarming is planned for June 2017.
- Failures were found to be due to poor 3G coverage, new sites have been planned in these areas but 2100 MHz 3G will not be able to provide contiguous coverage due to the amount of capital expenditure involved due limited coverage footprint in this spectrum.
- The operator also highlighted that the test areas could be better served by the release of 800 MHz spectrum.
- In the interim U900 refarming will be done, but it should be noted that this exercise will compromise, in turn, 2G quality.

5.2. MTN

MTN submitted that it has reviewed the Authority's draft report and noted that out of five areas measured it only failed the CSSR target in Ladybrand and Sasolburg. The remedial actions to improve quality of service include:

- Botshabelo route – Down-tilting has been conducted in five sites to provide quality and coverage improvements. Two additional sites will be deployed in 2018.
- Bethlehem route – MTN recognises that some calls could not be set up due to poor coverage and has scheduled optimisation on three sites.
- Sasolburg route – Lack of coverage in the area was identified and two additional sites will be integrated during the course of 2018. Three sectors were optimised to improve capacity and coverage.
- Ladybrand route – MTN acknowledges that it experienced network issues resulting in one site being down during the Authority's drive-test. Thus the unavailability of the base station had an adverse effect on the overall network performance in the area. MTN has identified four sites that require optimisation and has scheduled tilt changes to improve quality and coverage in the area.
- Kroonstad route – One site was down during the drive-test. Two new sites will be integrated in the network during the course of 2018 and three sites will be optimised.

MTN highlighted that it had the highest call setup success rate of all operators, which was 2% higher than any other operator and 0.01% below the best dropped call rate. Since the time the Authority conducted the drive-tests, MTN has initiated optimisation of several sites to address coverage and quality aspects. A total of six additional sites will be built and integrated into MTN's network during the course of 2018.

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

- Cell C has project plans for the future to have site roll-out, capacity and transmission routes improved and optimised in the low performing areas.
- Cell C is further testing seamless handover with its roaming partner Vodacom.
- Optimisation and capacity initiatives are taking place in the regions to complement the existing coverage.
- New sites are planned to be built in poor performing areas.

5.4. Telkom

Telkom gave the following response to the Authority's draft report:

- ICASA's drive tests give a snapshot of network performance on the specific day and time and is not a true representation of the overall network performance. Nevertheless, Telkom views the test results as very significant and use them as additional input to further improve the quality of the mobile network.
- Telkom, as the fourth entrant in the mobile market, depends on a national roaming agreement with roaming partner MTN, to cater for areas with limited or no Telkom coverage. Having a roaming agreement is particularly important to Telkom as they don't have access to the 900 MHz frequency band, which is a crucial requirement for the cost-effective deployment of national coverage, specifically in rural areas. Nevertheless, Telkom continues to extend its network coverage including in rural areas, to the extent possible.
- Telkom acknowledges that poor network coverage contributed to not meeting all performance objectives in some of the areas tested. However, Telkom is in a process of planning and building additional sites that are aimed at mitigating

the poor coverage in the areas in question, the operator acknowledges that it is facing site acquisition challenges, which hamper these efforts.

- Regarding the Call Setup Success Ratio (CSSR) results in the test area, Telkom made the following comments:
 - (i) Telkom is pleased that the Call Setup Success Rate (CSSR) was above the Authority's target threshold in the Botshabelo area.
 - (ii) Telkom noted that it did not meet the CSSR target in Bethlehem, Kroonstad and Sasolburg by a small margin.
 - (iii) Most of the failed CSSR in Ladybrand occurred on the roaming partner's network. Telkom currently does not have additional sites planned for the Ladybrand area and will continue to depend on the roaming partner.
 - (iv) Telkom is planning additional sites in the Kroonstad area and 80% of these are currently in the Site Acquisition and Integration phase. These additional sites will further improve coverage and quality in this area.
 - (v) The CSSR failures experienced on the Telkom network were mainly caused by poor coverage and network optimisation related issues, which are being addressed. From the network optimisation perspective, Telkom is engaging with the national roaming partner in an endeavour to improve the network.
- Regarding the Drop Call Ratio (DCR) results in the tested areas, Telkom made the following specific comments:
 - (i) Telkom is pleased that in terms of the Drop Call Ratio (DCR), out of all the areas tested, the operator met the mandated threshold of 3% in the Botshabelo, Kroonstad and Sasolburg areas. Telkom has already planned additional sites in the Kroonstad area, out of which 80% are in the Site Acquisition and Integration phase. These additional sites will further improve coverage and quality of services in this area, even though the network performance was already meeting the stipulated performance standards.

- (ii) Telkom will continue to rely on the roaming partner for network coverage in areas such as Ladybrand as there are currently no sites planned. The operator will continue to engage MTN with a view of improving the customer's network experience.
- (iii) It is noted through the log files that UMTS was used mostly during the drive tests. However, most of the dropped calls emanated on GSM, which could be a result of the refarming of the GSM spectrum. The refarming of the 1800 MHz spectrum was done to improve national data connectivity. The impact of refarming the 1800 MHz spectrum on GSM is being monitored to mitigate the impact on GSM quality of service.
- (iv) Telkom reiterates that the current service level agreement with the roaming partner does not discriminate between Telkom and MTN customers in terms of the quality of service provisioning and applies on a national basis. Therefore, the operator expects customers to enjoy a similar QoS as experienced by MTN customers.

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 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.