The South African Experience with QoS Drive Testing

ITU Workshop on Telecommunications Service Quality

Rio de Janeiro, Brazil, 27 - 29 November 2017

Praneel Ruplal, Pr. Eng.

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Introduction

- Quick facts about South Africa:
  - Land surface area : 1 219 602 km^2
  - Total population : 55,91 million
  - Provinces : 9 provinces
  - Telecommunications : 4 mobile network operator, with more than 10 MVNOs
  - Regulator : Independent Communications Authority of South Africa (ICASA)

Mandate of ICASA

- ICASA is responsible for regulating the electronic communications, broadcasting and postal industries in the public interest and ensure affordable services of a high quality for all South Africans.

- Quality of Service
  - Engineering and Technology is responsible for technical measurements
  - Compliance & Consumer Affairs (CCA) responsible for compliance and customer complaints

Empowering Legislation

- ICASA's quality of service mandates is derived from the following Legislations:
  - The Independent Communications Authority of South Africa Act 13 of 2000, as amended (the ICASA Act)
    - *ICASA Act enables ICASA to **regulate** broadcasting, electronic communications and postal services sectors in the **public** interest.*
  - The Electronic Communications Act, 2005 (Act No. 36 of 2005), as amended (the ECA)
    - *Promote the **universal** provision of electronic communications networks and electronic communications services and **connectivity for all.***
    - *Promote the interest of **consumers** with regard to **price**, **quality** and variety of electronic communications services.*
    - *Ensure information security and **network reliability.***

Regulations and Standards

- Regulations:
  - End-User and Service Subscriber Service Charter of 2016.
    - *Prescribe **minimum standards** for electronic communications services to an **end-user**.*
    - *Ensure that the **quality of service offered** to an end-user is in accordance with **the prescribed service parameters**; and*
    - ***Protect** the rights of end-users in the electronic communications sector by: (i) providing an end-user with sufficient information to enable **informed decisions**; (ii) ensuring the efficient and effective **resolution of complaints**; and (iii) facilitating **redress** to an end-user where appropriate.*
- Standards
  - SANS 1725-1: GSM Voice standard
    - *specifies **requirements**, **definitions** and **measurement methods** for a range of **user perceivable** Quality of Service parameters specific to GSM networks.*
    - *It does not apply to the establishment of **target values** for QoS*

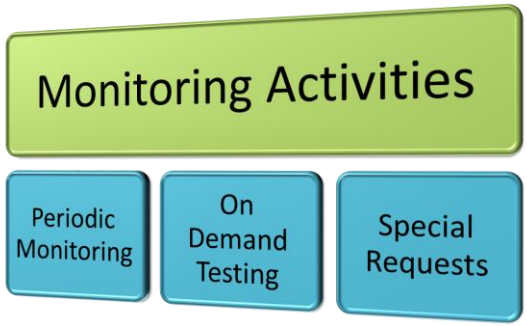
Functions of the QoS Measurement Team

- Providing necessary tools and facilities, such as mapping facilities, for supporting internal planning in ICASA and consumers, especially for promoting broadband use.
- Conducting Quality of Service monitoring of mobile networks to improve services to consumers.
- Investigating cross-border signal spillage and radio interference problems, and working with the regulators of neighbouring countries to rectify these.
- Supporting Compliance and Consumer Affairs by conducting QoS measurements – for the quality of end-to-end voice and data services

Monitoring Activities

- ## Periodic Monitoring

- Measurement of end-to-end quality for voice and data services by measuring KPIs such as:
  - Call Set-up success rate
  - Drop Call rate
  - Data Speeds



- ## On Demand Testing
  - Consumer Coverage Complaints: testing that follows consumer complaints when basic voice calls are not possible at certain locations.
  - Cross Border Issues: Testing and coordinating when there is spillage between the two countries.
- ## Special Requests
  - Major Events within the country (such as major sporting events, elections, etc.)
  - Request from other government agencies

Monitoring Tools

- TEMS Pocket (4 Mobile phones and one Tablet)
  - Indoor tool

- TEMS Symphony (8 Voice, 4 Data channels)
  - Benchmarking tool

QoS Monitoring Process

Route Selection

- Provinces are selected based on annual plan
  - Five areas are selected within each province based on population and historical complaints.
  - Route selected allow us to collect enough sample for each area
  - Areas are selected with no input from the MNOs.
- ESRI GIS mapping tool is used to assist with route selection and areas covered in the previous campaigns

Monitoring

- Benchmark all MNOs at the same time.
- All target areas are repeated to validate the results.
- Monitoring is conducted using **SANS 1725-1** standard.
- Two devices for each operator used (Short call or long call for voice or 4G preferred and 3G preferred for data measurements)
- Short call average of **400** samples per area and long calls average of **140** samples per area.

Reporting

- Draft report including the repeated measurements is shared with MNOs for comments and remedial action.
- Review the report based on MNOs comments and remedial action. Remedial actions are summarised in the final report for publication.
- Submit report for internally for approval and publish the report on the Authority website.

Drive Test Routes Selection Criteria

- The route is designed with no input from operators and fulfil the following criteria:
  - Route must cover rural, urban, and farming areas, freeways and major roads within the focus area.
  - Route must include all types of area of interest within the city boundary to the maximum extent possible, i.e. residential area, industrial area, airport, shopping malls, stadiums etc.
  - The Route is always designed such that the resulting sample size per area will be representative of the population density in that area.
    - Minimum sample size of 120 samples is recommended for 95% confidence interval.
  - Areas which were previously monitored and areas with high number consumer complaints.

KPI Targets

Parameter	2009 – March 2016 Target	April 2016 to Current Target	Reporting Period
Average drop call ratio	3%	3%	6 months
Average Call Setup Success Ratio	95%	98%	6 months
Average Service Availability	95%	95%	6 months

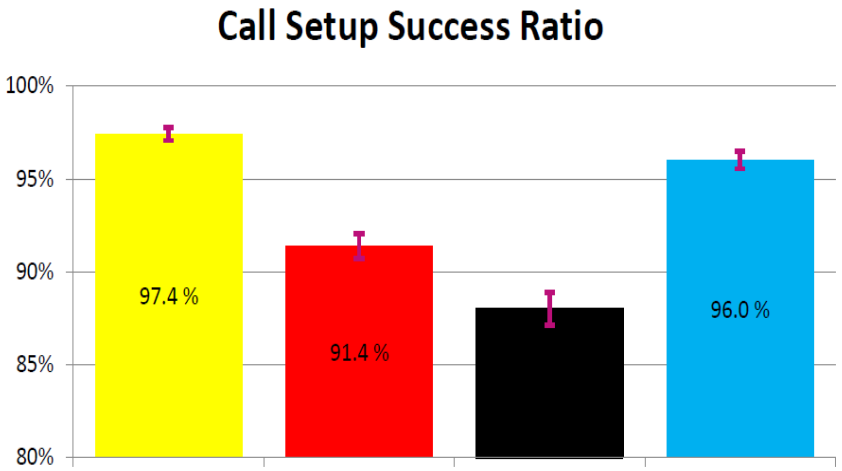
- Each licensee submit a compliance report every 6 months
- ICASA conducts snap shot drive test by selecting number of provinces in each quarter of the year.

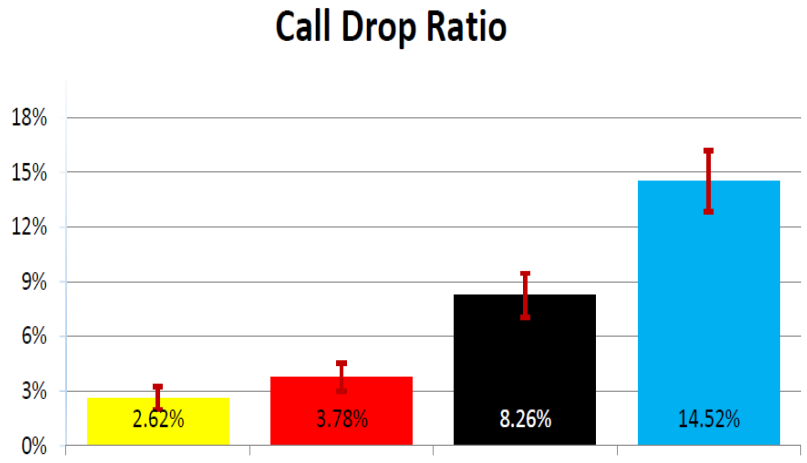
Dropped Call Ratio (DCR) is defined as the proportion of incoming and outgoing calls, which, once correctly established and therefore having been assigned a traffic channel, is dropped or interrupted prior to the deliberate completion by the user.

Call Setup Success Ratio (CSSR) is defined as the percentage of calls that are successfully set up as a percentage of the total number of call attempts

Results Presentation

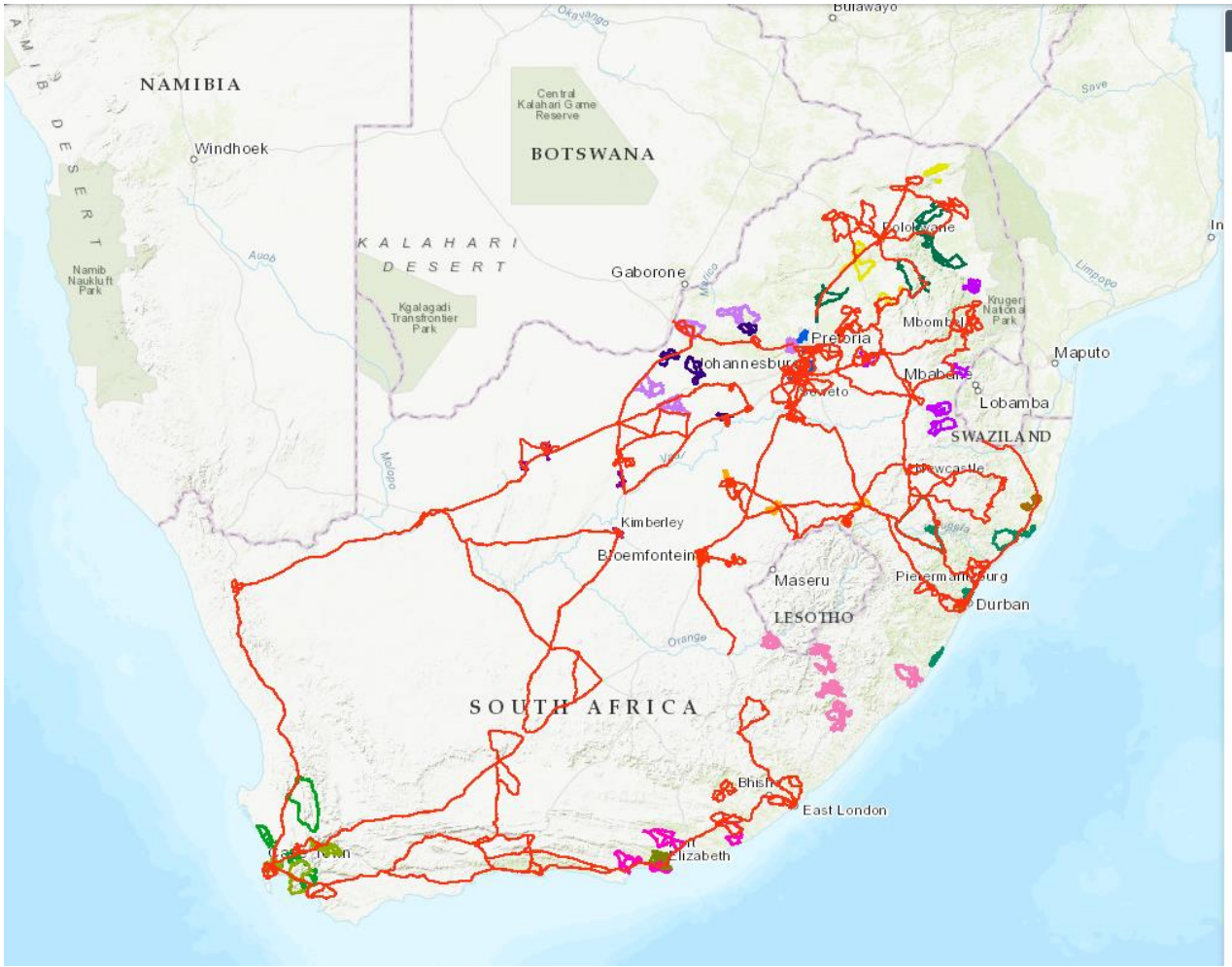
Route Name	Operator	CSSR (%)	DCR (%)
Bizana	Operator 1	97.82%	3.48%
	Operator 2	93.16%	4.86%
	Operator 3	89.08%	5.69%
	Operator 4	94.72%	15.68%
Mthatha	Operator 1	97.68%	2.02%
	Operator 2	93.46%	3.17%
	Operator 3	75.43%	19.18%
	Operator 4	97.41%	14.83%
Tsolo	Operator 1	99.18%	1.56%
	Operator 2	96.45%	2.85%
	Operator 3	88.41%	7.43%
	Operator 4	97.29%	14.07%
Mount Fletcher	Operator 1	94.61%	2.82%
	Operator 2	83.68%	4.45%
	Operator 3	88.39%	5.54%
	Operator 4	93.89%	17.19%
Sterkspruit	Operator 1	99.45%	3.27%
	Operator 2	97.20%	3.46%
	Operator 3	96.57%	4.27%
	Operator 4	96.77%	10.37%
Average for the above 5 areas	Operator 1	97.42%	2.62%
	Operator 2	91.39%	3.78%
	Operator 3	88.01%	8.26%
	Operator 4	96.02%	14.52%





https://www.icasa.org.za/LegislationRegulations/RadioFrequencySpectrum/QualityofService/tabid/546/Default.aspx

GIS Mapping of the Covered Areas



Legend

QOS_Webmap_App

OMNITELE_NATIONAL_QOS_2013_2014

QOS ROUTES 2013 - 2014

GP_Q1_2013_14

EC_Q2_2013_14

KZN_Q3_2013_14

WC_Q4_2013_14

QOS ROUTES 2014 - 2015

LP_Q1_2014_15

NW_Q2_2014_15

NC_Q3_2014_15

FS_Q4_2014_15

QOS ROUTES 2015 - 2016

MP_Q1_2015_16

EC_Q2_2015_16

WC_Q3_2015_16

QOS ROUTES 2016 - 2017

NW_Q2_2016_17

Challenges

- Results were sometimes contested by mobile network operators.
  - Testing methodology
  - Reports published without sharing with network operators.
  - Device capabilities.
- Lack of HR capacity (Outsourcing)
- Funding
- Pace of technology

Questions

THANK YOU