Measurement campaigns, monitoring systems and sampling methodologies to monitor the quality of service in mobile networks – Regulators experience

Workshop:
ITU Workshop on "Telecommunication Service Quality"
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Presenter:
Uganda Communications Commission

Date:
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PRESENTATION OUTLINE

INTRODUCTION

Uganda's ICT sector has continued to grow over the last few years, despite the global economic slowdown, this state of affairs can be attributed to the increasing demand for both mobile voice and mobile internet services (Gillwald, A. et al, 2019).

Uganda's Telecom sector for both wired/fixed and wireless service stands at over 40 licensed operators in the market, delivering communication service using various technologies that include Cellular, MPLS,DWDM/Optical fibre, VSAT/Satellite, among others.

STATE OF ICT IN UGANDA

There are four (4) Mobile Network Operators (MNOs) using Cellular technology, these include MTN Uganda, Airtel Uganda, Uganda Telecom Corporation Limited (UTCL) and LycaMobile/Tangerine.

In the months April to June 2022, fixed and mobile subscriptions grew by more than 690,000 new subscriptions, slightly outperforming the 1Q22 quarter on quarter growth. This brings the total number of telephone subscriptions to 31.3 million at the end of June 2022.
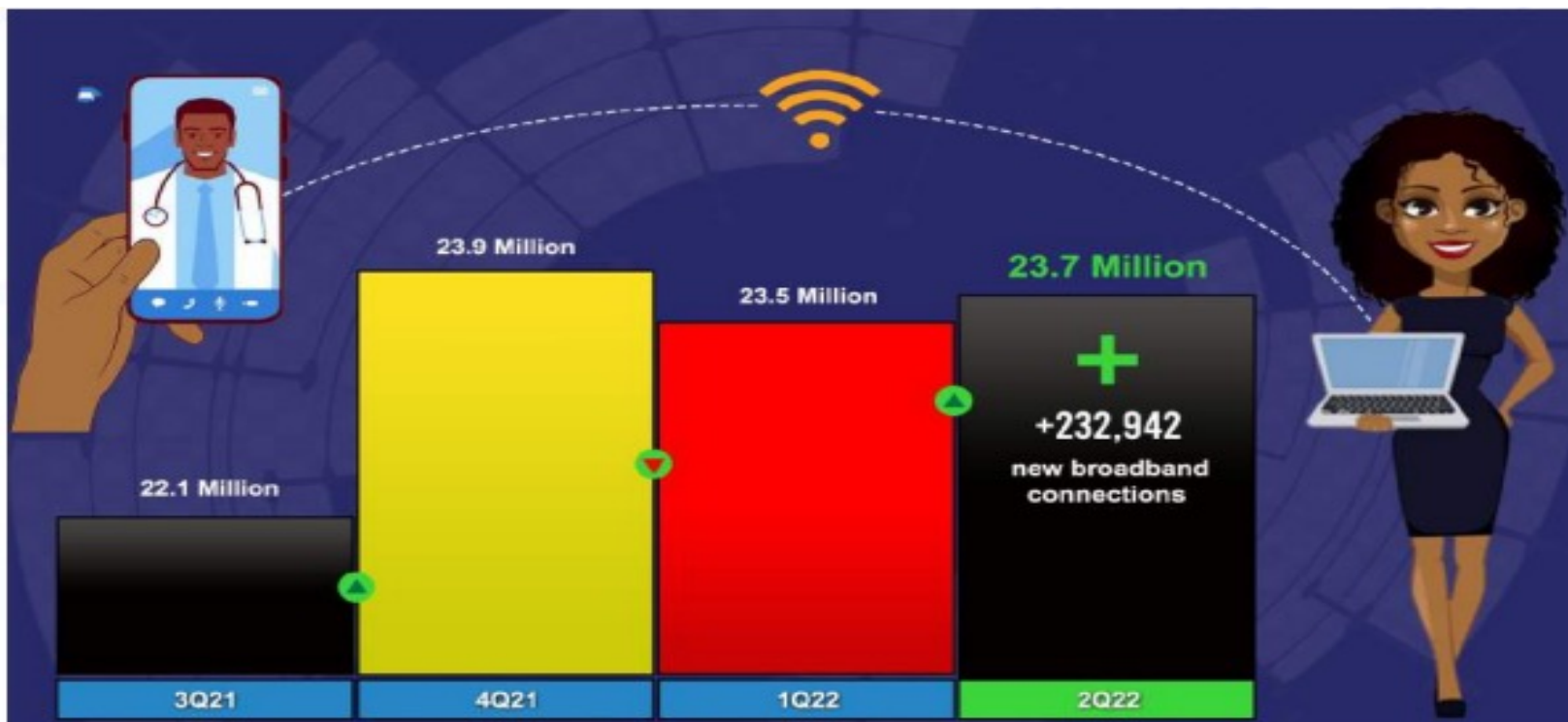
STATE OF ICT IN UGANDA_CONT'D

1. Voice Subscription

On a Year-on-Year comparison, the growth translates into 2.4 million new telephone subscriptions between June 2021 and June 2022. This is an 8% Year-on-Year growth in subscriptions.

STATE OF ICT IN UGANDA_CONT'D

2. Broadband/Data Subscription

In terms of penetration, the 23.7 million broadband subscriptions translate into a broadband penetration of 55 internet connections for every 100 Ugandans.

In the months April to June 2022, the sector recorded a total of 232,000 new broadband subscriptions. This brought the total number of broadband connections to 23.7 million broadband subscriptions.

3. Legal Framework

Section 5(i) & (k) of the Uganda Communications Act, 2013 mandates the Commission;

- to set national standards and ensure compliance with national and international standards and obligations laid down by international communication agreements and treaties to which Uganda is a party;

- to promote and safeguard the interests of consumers and operators as regards the quality of communications services and equipment, with reference to;

  a) *The Uganda Communications Commission (Quality of Service) Regulation, 2019,*

  b) *License Obligations on QoS*

ADHERENCE TO ITU-T RECOMMENDATION E.806

Uganda QoS/QoE monitoring approach adopts the E.806 recommended best practices as below;

Section	ITU_T Recommendation E.806	Uganda QoS/QoE Practice
6.1	Measurement Environment	
	1. Indoor tests	Carried out on Request
	2. Outdoor tests	Routine exercise carried out across the year
6.2	Measurement Methodologies	
	1. Walk Testing	Carried out on Request
	2. Drive testing	Routine campaigns carried out across the year
	3. Unattended Probes	Carried out on Request
	4. Crowdsourced Data Collection	NETQ-UG App
	a) active measurements	Adopted
	b) Passive Measurements	Not yet explored
6.3	Guidelines for Measuring QOS parameters for MNOs	
	1. Radio Coverage	Adopted to consider MNO generated maps as basis for drive test campaigns, Impose MNO predictions onto GIS systems
	2. Voice Call Measurements	Adopted on Automatic RAT selection, M2M and M2F, 2Min calls
	3. Broadband Data Measurements	Adopted- Web browsing/HTTP, FTP, video streaming
7	Characteristics and Requirements for Monitoring Equipment System	Our QOS monitoring equipment meets all the requirements in this section
		It meets all the requirements 1 to 20 in the section
8	General Recommendations for Post processing	Adopted recommendations 1 to 4 of this section in ITU-T E.806

APPROACH TO QUALITY OF SERVICE (QOS)

WHAT IS QoS?

Quality of Service (QoS) is defined as the "*totality of characteristics of a telecommunications service that bear on its ability to satisfy stated and implied needs of the user of the service*" **(ITU-T Rec. E.800).**

Accordingly, ***improving the quality of communication services was identified*** as a Commission strategic objective.

WHY MONITOR QoS?

Verify **Operators' Compliance** by benchmarking their performance against set standards by the Commission.

Ensure **Transparency** by making known the minimum QoS level of service, which the service provider is required to provide, and the user has a right to expect.

Unlike prices, which consumers can easily compare across service providers, the consumers rely on publicized QoS performance information to **make informed decisions/choices.**

Check claims made by operators.

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ROLE PLAYED BY UCC ON QoS

1. Develop regulations on performance targets

2. Obtaining information on the level of QoS

3. Publishing information on QoS performance for different services (e.g., voice and data)

Identifying QoS parameters per service and setting appropriate targets

Based on a standardized methodology for measurement, the level of QoS is monitored against defined QoS parameters.

The publication is purposed to empower the consumer with options to choose from. The operator is tasked to share remedial plans to improve the areas with poor QOS.

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WHO DOES THE COMMISSION MONITOR?

UCC carries out independent inhouse QoS benchmarking audits for the following mobile network operators:

- Airtel Uganda Limited (Airtel)
- MTN Uganda Limited (MTN)
- Tangerine Limited T/A Lycamobile
- Uganda Telecommunications Company Limited (UTCL)

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WHEN DOES THE COMMISSION MONITOR QoS?

<u>Year Period</u>

Quality of Service monitoring is carried out twice in a Financial year, i.e August to September and December.

<u>Time of Day</u>

The measurements are carried out during the two peak periods in a day, namely:

- Morning: 8:00am to 12:00pm
- Evening: 5:00pm to 9:00pm

WHEN DO WE MONITOR?_CONT'D

All MNOs Traffic Trend per Quarter

TRAFFIC IN ERLANGS

- 17,200,000,000
- 17,000,000,000
- 16,800,000,000
- 16,600,000,000
- 16,400,000,000
- 16,200,000,000
- 16,000,000,000
- 15,800,000,000
- 15,600,000,000
- 15,400,000,000
- 15,200,000,000

16,955,879,371
16,757,592,130
16,755,872,080
16,480,164,792
16,377,551,772
15,849,307,521

Jun-21 Jul-21 Aug-21 Sep-21 Oct-21 Nov-21 Dec-21 Jan-22 Feb-22 Mar-22 Apr-22 May-22 Jun-22 Jul-22 Aug-22 Sep-22

The Selection of period of the year to measure QOS audits is based on the aggregated Operators' traffic trends. Telecom team takes September and December as the peak periods of the year.

HOW DO WE MONITOR (METHODOLOGY)

The Benchmark-oriented **drive test sampling** methodology for measuring the Quality of Service of the mobile telephony networks is used. This includes auto generated on-net test calls (M2M, M2F).

The post processing of the collected drive test logfiles has been automated to generate statistical representation of the performance of the towns monitored. Clean up is then done to eliminate non-network related failures.

The performance reports, per town, are generated using a defined template in the post processing tool.

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KEY PERFORMANCE INDICATORS (KPIs)

The data collected includes:

a) Dropped calls,
b) Blocked calls,
c) Successful calls,
d) Call setup time,
e) Download and Upload Throughput,
f) Latency (Round Trip Time)
g) Packet Loss

KPIs

1) Call Setup Success Rate (≥95%),

2) Blocked call rate (≤2%) and

3) Dropped call rate (≤2%).

In the case of data, measurements are conducted but with no specific targets yet.

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EQUIPMENT AND TOOLS

The team uses the **Infovista Tems** quality of service monitoring systems which include;

- Tems Paragon,
- Tems Sense *(picture representation)*,
- Tems Investigation
- Pocket.

QoS MONITORING FINDINGS

Preparation of an actionable TMT paper with proposals on;

1) Communication of findings to the operators – Remedial plans

1) Publication of findings (Name and Shame)

Adobe Acrobat
Document

APPROACH TO QUALITY OF EXPERIENCE (QoE)

QUALITY OF EXPERIENCE (QoE)

QoE is defined as "*the degree of delight or annoyance of the user of an application or service*" (ITU-T Rec. P.10/G.100) – it is a measure of the overall level of satisfaction of a user of a service from the user's perspective.

End users also **quantify** the quality that they personally experience during their use of a telecommunication service **– This is referred to as Quality of Experience (QoE)**

WHY MONITOR QoE?

The Commission developed a crowdsourcing QoE monitoring Tool commonly known as NetQ-UG. **NetQ-UG APP** (*available on Google Play Store and App Store*) and Web Portal (https://netq.ug/speed-test/index.php).

The tool allows consumers to independently monitor:
1. Quality of internet services
2. Usage of internet bundles
3. Share feedback on the voice experience

Acquire information to facilitate planning and direct engagement with their service provider over their quality of experience.

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TOOL FEATURES

Speed Test- Upload speed, Download speed, Network Delay and Packet Loss

RAT

Data Usage

Map

Feedback

TOOL FEATURES_CONT'D

DATA USAGE

- Define the date (From & To),
- Total data Usage,
- App usage breakdown

TOOL FEATURES_CONT'D

COVERAGE MAPS
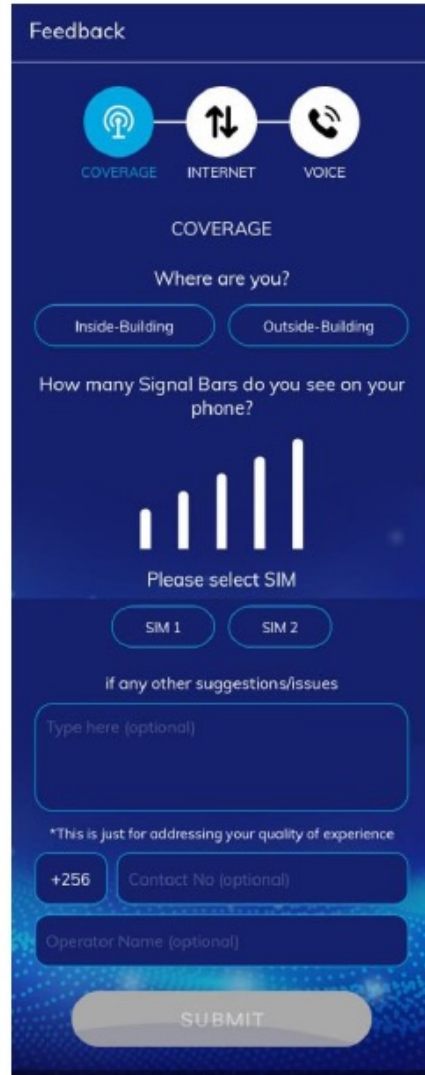
User will be able to view speed experience related plots on a map
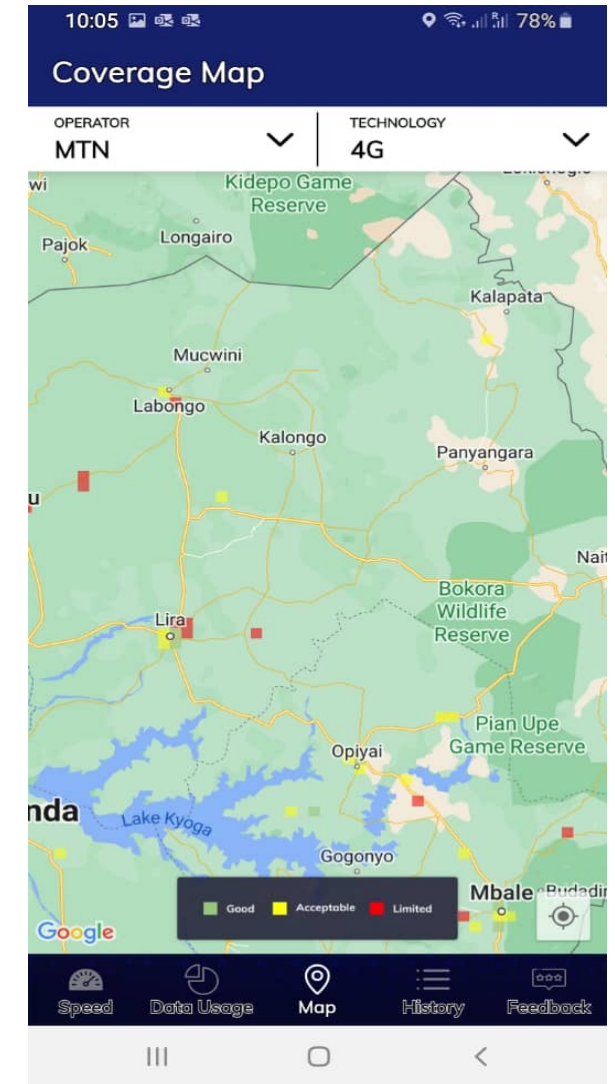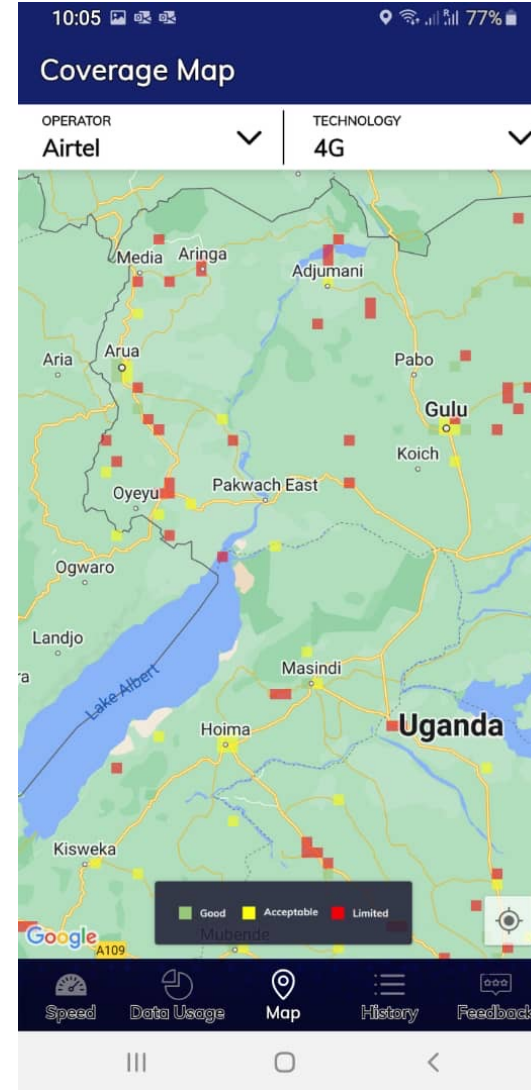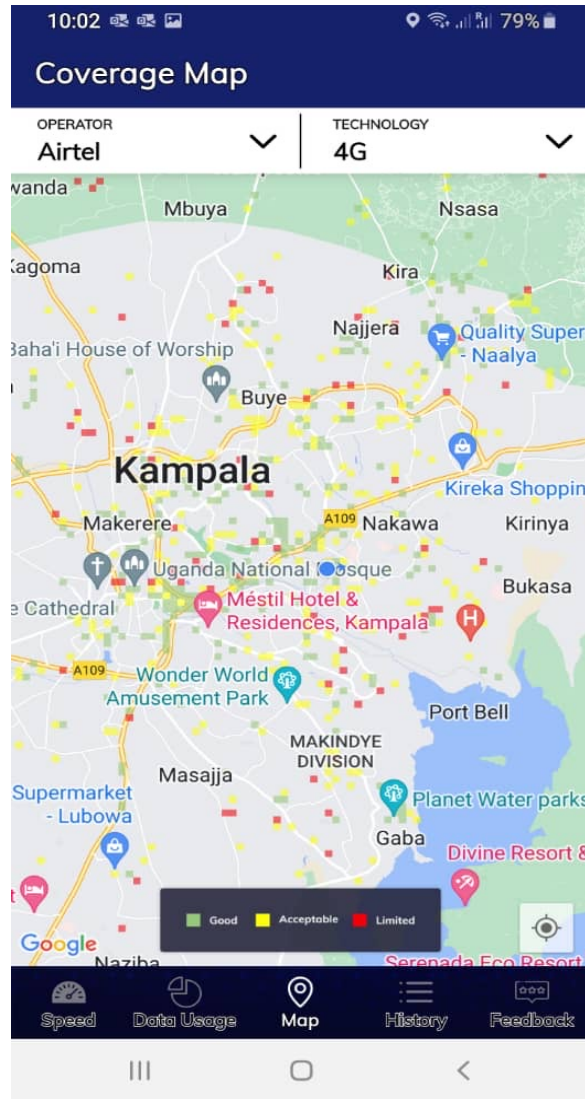
FEEDBACK

In this screen, user will be able to submit feedback or any issues related to Coverage, Internet & Voice

CHALLENGES

Whereas Uganda is experiencing a positive trajectory towards the achievement of the desired Quality of service to the 31 million subscribers, there are some snugs that need to be addressed to improve the service delivered. These include;

1. Limited coverage especially in rural areas

2. Lack of advanced technology deployments like 5G that can maximise the use of allocated spectrum to deliver better internet speeds to the users.

3. Unaffordable end user devices by majority of the subscribers. Majority of the users cannot afford   LTE capable phones.

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CONCLUSION

The National regulator (UCC) has matched up to the task of ensuring the Service providers deliver the much-desired Quality of service to the growing consumer base by;

1. Network service coverage for MNOs is targeted at 90% for a minimum Signal strength of -95dbm.

2. Regular QOS monitoring and enforcement of areas of non-compliance

3. Spectrum management practices to ensure efficient use of the scarce resource for the demanding technologies.

4. Regulating the use of standard end user devices on the market driven through Type approval process, CEIR and public sensitisation.

5. Providing an enabling environment to the market players in terms of tax subsides and enforcement of anti-competition laws

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THANK YOU