



QUALITY OF SERVICE FINDINGS FOR MOBILE VOICE TELEPHONE AND DATA SERVICES IN UGANDA

1. BACKGROUND

The Uganda Communications Commission (UCC) is committed to ensuring that you, the consumer, receive reliable and quality communications services. As part of our mandate under the Uganda Communications Act 2013, we work to protect your interests while supporting operators to improve the quality of communication services.

Between August and September 2024, UCC carried out assessments of mobile voice and data services in different towns across Uganda. This exercise involved visiting and taking network measurements in key locations such as commercial business areas, health centers, district headquarters, schools, and residential areas to understand how consumers experience these services in real-life situations.

Our tests were conducted during peak hours—when most people are using their phones—to capture how well networks perform during busy times.

The services of the following operators were assessed: Uganda Telecommunications Corporation Limited (UTCL) operating as Utel, MTN Uganda Limited, Airtel Uganda Limited, and Tangerine Limited operating as Lycamobile.

This publication provides a snapshot of the Quality of Service (QoS) consumers experienced in thirty (30) sampled towns during this measurement period.

The results reflect the performance in those specific areas at the time the measurements were taken and may not fully represent the experience in other locations or the general network performance overall.

2. INTERPRETATION

The Commission targets for Voice QoS are informed by the QoS regulations of 2019, as indicated below.

SN	KPIs	Definition	Target
1.	Blocked Call Rate (BCR)	Maximum proportion of call attempts on the network blocked	≤2%
2.	Dropped Call Rate (DCR)	Maximum proportion of calls on the network dropped	≤2%
3.	Call Setup Success Rate (CSSR)	Proportion of call attempts with an indication of call connection (alerting, busy tone or announcement) <u>within 12 seconds</u> from the instant the user initiates a request	≥95%

3. SUMMARY OF THE FINDINGS

a. Voice Performance

A good quality call is characterized by a quick and successful setup, stable connection and clear audio with no premature disconnection or quality issues.

A high-quality call, from setup to completion, can be assessed using key metrics such as Call Setup Success Rate (CSSR), Blocked Call Rate (BCR), and Dropped Call Rate (DCR).

i. Call Setup Success Rate (CSSR): This reflects how reliably someone can make a call when they dial a number. It measures the network's accessibility and ability to establish a call successfully without issues such as failed attempts or "call failed" messages. A high CSSR (95 - 100%) means users experience seamless access to the network whenever they need to make a call, contributing to a positive and dependable quality of experience.

ii. Blocked Call Rate (BCR): This reflects how often calls fail to connect, reflecting the network's accessibility. A low BCR (2% - 0%) ensures that calls are rarely blocked, indicating sufficient network capacity and availability. Poor BCR can result from several factors, including network congestion, limited signal strength, or infrastructure gaps in certain areas, such as insufficient tower coverage or interference.

iii. Dropped Call Rate (DCR): This represents the frequency of calls that disconnect unexpectedly after being successfully established, reflecting the network's retainability of ongoing calls. A low DCR indicates a stable and consistent communication experience, where calls are maintained without interruptions. Poor DCR can result from issues such as weak signal strength, signal interference from other radio transmitters, and handover failures between network cells during mobility.

b. Data Performance

A good quality data session allows smooth web browsing, email use, social media messaging, video calls, and streaming, without interruptions and some of the key metrics that nurture a good data service experience include throughput, latency and packet loss.

i. Data Throughput/ Speed means the amount of (number of data packets) that gets transferred from one point on the network to another in a given amount of time. It is measured in bits per second (bps) in two directions.

- Download from web server to user device, and
- Upload from user device to web server.

As a primary indicator of data service quality, download speed affects the performance of data-intensive applications, such as streaming, browsing, and file downloads, viewing statuses. Higher download speeds correlate with a better user experience, making this metric essential for benchmarking data performance.

ii. Latency (Response Time): Latency measures the time it takes for data to travel from the user's device to the server and back, impacting real-time applications such as video calls and online gaming. Low latency is critical for responsive data services, making it a valuable metric for evaluating the quality of data connections, especially for real-time applications such as gaming and video calls.

iii. Packet Loss (Lost Data): Packet loss is a crucial metric for evaluating network reliability, as it reflects the percentage of data packets that fail to reach their destination. Lower packet loss values ensure smoother communication and a better quality of experience for real-time services such as voice calls, video streaming, and gaming.

Table 1 and 2 below provide a summary of the voice and data performance for each operator against specific service Key Performance Indicators (KPIs).

Table 1: Voice performance across the 30 towns, with each operator's compliance on voice KPIs targets of CSSR (>=95%), BCR (<=2%) and DCR (<=2%)

Town	Airtel CSSR	Airtel BCR	Airtel DCR	MTN CSSR	MTN BCR	MTN DCR	UTel CSSR	UTel BCR	UTel DCR	Lycamobile CSSR	Lycamobile BCR	Lycamobile DCR
Kampala	98.6%	0.3%	0.3%	99.0%	0.1%	0.0%	98.4%	0.0%	1.8%	90.9%	0.0%	0.9%
Wakiso	99.1%	0.5%	0.3%	98.8%	0.3%	0.5%	98.4%	0.3%	1.3%	75.1%	0.2%	0.4%
Mukono	97.9%	1.4%	0.2%	99.3%	0.7%	0.0%	99.8%	0.2%	2.1%	91.8%	1.8%	0.2%
Mityana	99.3%	0.0%	0.7%	98.9%	0.2%	0.2%	96.1%	1.0%	2.9%	88.0%	1.5%	0.7%
Luwero	98.7%	0.9%	0.3%	98.6%	0.9%	0.1%	92.7%	2.6%	4.8%	58.3%	5.4%	0.4%
Masaka	99.3%	0.0%	0.3%	98.5%	1.1%	0.0%	99.7%	0.6%	2.1%	66.5%	1.4%	0.7%
Gulu	96.2%	3.0%	0.0%	99.3%	0.1%	0.3%	98.1%	0.5%	1.3%	53.5%	0.8%	0.5%
Kitgum	98.4%	1.2%	0.0%	98.5%	0.8%	0.2%	97.8%	1.8%	0.5%	Limited Coverage	Limited Coverage	Limited Coverage
Arua	98.8%	1.1%	0.0%	99.0%	0.6%	0.1%	98.0%	1.6%	1.5%	43.0%	3.0%	0.9%
Lira	99.2%	0.7%	0.0%	98.8%	0.5%	0.1%	98.7%	1.0%	1.7%	45.0%	3.6%	1.2%
Kotido	96.9%	1.7%	1.1%	97.4%	1.8%	0.5%	97.9%	0.8%	0.8%	Limited Coverage	Limited Coverage	Limited Coverage
Yumbe	99.1%	0.5%	0.0%	99.9%	0.0%	0.1%	95.6%	4.2%	0.7%	Limited Coverage	Limited Coverage	Limited Coverage
Masindi	97.4%	2.6%	0.0%	99.8%	0.2%	0.0%	99.5%	0.0%	0.0%	98.3%	0.0%	0.2%
Hoima	98.2%	1.8%	1.7%	99.8%	0.0%	0.3%	98.4%	0.5%	0.7%	99.2%	0.0%	0.3%
Fort Portal	98.7%	1.3%	0.1%	98.7%	1.0%	0.3%	98.9%	0.5%	2.2%	83.0%	0.0%	0.0%
Mubende	99.0%	1.0%	0.4%	100.0%	0.0%	0.0%	98.0%	1.2%	1.4%	75.9%	0.0%	0.3%
Kasese	98.8%	1.0%	0.0%	99.4%	0.2%	0.1%	98.4%	1.2%	2.2%	96.1%	0.3%	0.1%
Kyenjojo	99.0%	0.7%	0.1%	99.6%	0.2%	0.1%	98.9%	0.8%	2.0%	97.0%	0.6%	0.3%
Mbarara	97.5%	2.3%	0.3%	99.9%	0.1%	0.0%	98.6%	0.5%	1.8%	89.0%	0.9%	0.1%
Isingiro	99.4%	0.6%	0.3%	99.9%	0.1%	0.1%	94.8%	5.2%	9.1%	88.7%	1.4%	2.9%
Kabale	99.5%	0.4%	0.0%	99.4%	0.5%	0.2%	99.1%	0.4%	3.2%	79.1%	0.4%	0.1%
Ntungamo	99.2%	0.8%	0.2%	99.5%	0.1%	0.1%	97.1%	2.6%	4.8%	69.5%	0.3%	0.9%
Rukungiri	99.4%	0.6%	0.5%	99.4%	0.3%	0.1%	97.4%	2.1%	11.3%	93.7%	0.3%	2.7%
Kisoro	99.9%	0.1%	0.1%	97.4%	1.9%	0.0%	85.9%	11.7%	22.7%	67.2%	5.0%	0.3%
Mbale	99.3%	0.1%	0.3%	99.7%	0.2%	0.2%	98.4%	0.0%	1.2%	93.9%	0.0%	0.1%
Tororo	98.2%	1.0%	0.0%	99.3%	0.4%	0.0%	98.6%	0.2%	0.6%	96.9%	0.1%	0.2%
Jinja	99.9%	0.1%	0.0%	99.4%	0.3%	0.1%	99.3%	0.1%	0.7%	83.8%	0.0%	0.0%
Soroti	99.9%	0.1%	0.0%	99.9%	0.1%	0.0%	97.0%	2.0%	0.3%	59.8%	1.4%	0.1%

Town	Airtel CSSR	Airtel BCR	Airtel DCR	MTN CSSR	MTN BCR	MTN DCR	UTel CSSR	UTel BCR	UTel DCR	Lycamobile CSSR	Lycamobile BCR	Lycamobile DCR
Kamuli	96.0%	3.9%	0.1%	99.8%	0.0%	0.0%	99.0%	0.0%	0.4%	Limited Coverage	Limited Coverage	Limited Coverage
Mayuge	99.2%	0.8%	0.0%	99.7%	0.3%	0.4%	97.6%	1.4%	12.6%	75.3%	1.5%	0.0%

Table 2: Data performance across the 30 towns for each operator, focusing on Data KPIs

Town	Airtel HTTP DL Throughput	Airtel Latency	Airtel Packet Loss	MTN HTTP DL Throughput	MTN Latency	MTN Packet Loss	Lycamobile HTTP DL Throughput	Lycamobile Latency	Lycamobile Packet Loss
Kampala	12.5 Mbps	72.2 ms	3.2%	11.0 Mbps	83.2 ms	2.5%	4.5 Mbps	48.9 ms	3.3%
Wakiso	10.6 Mbps	73.5 ms	1.5%	12.4 Mbps	43.8 ms	1.4%	4.7 Mbps	59.7 ms	12.3%
Mukono	9.5 Mbps	76.0 ms	1.8%	9.8 Mbps	79.7 ms	6.7%	4.5 Mbps	54.9 ms	8.6%
Mityana	9.9 Mbps	62.1 ms	23.5%	16.3 Mbps	51.3 ms	49.1%	4.1 Mbps	58.7 ms	36.8%
Lira	16.9 Mbps	61.6 ms	11.4%	19.6 Mbps	53.7 ms	1.6%	3.7 Mbps	70.1 ms	11.4%
Arua	17.8 Mbps	77.9 ms	31.6%	20.0 Mbps	61.1 ms	8.1%	5.8 Mbps	137.0 ms	75.1%
Rukungiri	11.2 Mbps	70.3 ms	33.9%	16.6Mbps	53.6 ms	4.7%	0Mbps	224.3 ms	98.5%
Soroti	26.7 Mbps	54.6 ms	1.1%	14.6Mbps	58.6 ms	0.9%	6.5 Mbps	108.9 ms	3.4%
Tororo	23.6 Mbps	66.9 ms	1.75%	16.3 Mbps	92 ms	3%	6.1 Mbps	77.1 ms	1.4%
Jinja	26 Mbps	56.8 ms	1.3%	20.2 Mbps	52.7 ms	1.6%	4.3 Mbps	66.2 ms	0.7%
Gulu	21.7 Mbps	76.2 ms	8.4%	14.1 Mbps	52 ms	6.8%	5.4 Mbps	61.7 ms	18.9%
Mbale	24.3 Mbps	66.9 ms	1.7%	15.8 Mbps	92.0 ms	3.0%	6.1 Mbps	77.1 ms	1.4%
Kasese	16.4 Mbps	60.6 ms	2.3%	19.3 Mbps	51.8 ms	1.8%	7.3 Mbps	67.91 ms	3%
Fort Portal	14.7 Mbps	67.9 ms	20.3%	16.6 Mbps	49.48 ms	3%	3.8 Mbps	55.6 ms	4.2%
Hoima	15.8 Mbps	58.6 ms	8.9%	15.7 Mbps	85.9 ms	1.6%	7.6 Mbps	84.5 ms	8%
Mbarara	13.6 Mbps	68.6 ms	17.2%	13.3 Mbps	92.7 ms	5.9%	5.2 Mbps	63.6 ms	2%
Masaka	11 Mbps	76.2 ms	8.4%	18.4 Mbps	52 ms	6.8%	5.4 Mbps	61.7 ms	18.9%
Ntungamo	9.9 Mbps	57.9 ms	8.4%	14.0 Mbps	60.4 ms	0.8	5.3 Mbps	84 ms	13.6%
Kabale	9.3 Mbps	66.8 ms	20.4%	16.5 Mbps	51.8 ms	1.5%	4.6 Mbps	56.3 ms	0.3%
Kisoro	11.9 Mbps	102.6 ms	12.7%	15.0 Mbps	58.7 ms	7.8%	Limited Coverage	Limited Coverage	Limited Coverage
Masindi	19.3 Mbps	47.1 ms	1.2%	14.5 Mbps	86.7 ms	13.2%	6.2 Mbps	61 ms	0.7%
Luwero	9.5 Mbps	57 ms	23.9%	18.0 Mbps	54.8 ms	21.6%	5.3 Mbps	91.2 ms	45.4%
Kotido	8.9 Mbps	96.7 ms	20.1%	22 Mbps	79.1 ms	15.8%	Limited Coverage	Limited Coverage	Limited Coverage
Kitgum	16.6 Mbps	84.22 ms	26.4%	15.6 Mbps	122.2 ms	14.8%	Limited Coverage	Limited Coverage	Limited Coverage
Yumbe	24.8 Mbps	93.6 ms	23.2%	19.2 Mbps	76.3 ms	13%	Limited Coverage	Limited Coverage	Limited Coverage
Kamuli	9.9 Mbps	64.4 ms	41.2%	24.1 Mbps	59.5 ms	15.0%	Limited Coverage	Limited Coverage	Limited Coverage
Mayuge	20. Mbps	70.1 ms	2.2%	20.5 Mbps	66.0 ms	9.5%	4.9 Mbps	74.6 ms	10.5%

Town	Airtel HTTP DL Throughput	Airtel Latency	Airtel Packet Loss	MTN HTTP DL Throughput	MTN Latency	MTN Packet Loss	Lycamobile HTTP DL Throughput	Lycamobile Latency	Lycamobile Packet Loss
Mubende	17.5 Mbps	57.2 ms	14.2%	16.6 Mbps	51.3 ms	1.1%	3.8 Mbps	86.6 ms	8.7%
Kyenjojo	12.5 Mbps	56.1 ms	3.2%	12.3 Mbps	63.8 ms	2.6%	7.9 Mbps	63.6 ms	5.5%
Isingiro	11.5 Mbps	78.6 ms	30%	14.7 Mbps	92.5 ms	11.7%	6.1 Mbps	137.7 ms	19.1%

4. TREND ANALYSIS

Table 3 and 4 provide a year-on-year analysis of key Quality of Service (QoS) parameters for both voice and data services across all operators from 2022 to 2024. Each parameter was selected based on its importance to user experience and its direct impact on network quality perception.

Table 3: Trends for voice service KPIs—CSSR and DCR—across all operators.

Metric	2022	2023	2024	Trend
MTN CSSR Compliance	99%	98%	99%	Improving
MTN DCR Compliance	0.8%	0.4%	0.1%	Improving
Airtel CSSR Compliance	97%	98%	99%	Improving
Airtel DCR Compliance	0.8%	0.8%	0.2%	Improving
UTel CSSR Compliance	98%	98%	98%	Consistent
UTel DCR Compliance	2.0%	2.5%	3.3%	Declining
Lycamobile CSSR Compliance	65%	88%	69%	Declining
Lycamobile DCR Compliance	0.1%	0.2%	0.5%	Consistent

Table 4: Trends for data service KPIs

Parameters	Average HTTP Download Speeds (Mbps)			Avg. Latency (ms)			Avg. Packet loss (%)	
	2022	2023	2024	2022	2023	2024	2023	2024
Operator								
Airtel	9.0	17.7	15.5	98	96	69	5.6	13.6
MTN	9.2	10.2	16.3	62	55	69	1.4	7.8
Lycamobile	4.8	5.7	5.3	67	90	84	22.7	13.6

5. CONCLUSION

The quality of service (QoS) experienced by mobile network users can vary significantly across locations and over time due to inherent challenges in wireless technology. Factors such as network coverage, interference, network capacity, and environmental conditions—including traffic demand, natural terrain, infrastructure type, and user devices—can impact service performance.

From the findings, it is evident that network coverage, particularly the presence of black spots (geographical areas with weak or no signal), remains a critical issue affecting quality of service. Black spots are primarily caused by:

- Physical obstructions, such as buildings, trees, and geographical terrain, including valleys and hillsides.
- Areas that are out of the coverage footprint and, as such, require investment in network infrastructure.
- The placement of towers or masts and the resulting distance from users, which impacts signal strength.
- Dense concrete and metallic building materials hinder signal penetration and affect indoor coverage.

To address these challenges, operators have been mandated to roll out their networks to cover 90% of Uganda's geographical area within five years of being licensed. Furthermore, in 2023, the Commission allocated additional spectrum to operators, specifically to enhance network performance and improve service quality for users.

While the limitations and challenges of wireless technology are well understood, the Commission is committed to bridging the existing gaps and ensuring consistent improvements in consumer experience. This includes working collaboratively with operators to address coverage issues, empower consumers with the ability to choose service providers and ensure access to modern, reliable, and high-quality communication services.

These efforts align with Uganda's vision of achieving an ICT-driven, knowledgeable, and productive society.

For QoS-related complaints, please contact your network service provider. If the complaint remains unresolved, you can reach the Commission through our tollfree line 0800 222 777 for assistance.

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