ESWATINI COMMUNICATIONS COMMISSION

Measuring and Monitoring Quality of Service

Leveraging AI Capabilities

Outline

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- Regulatory Environment
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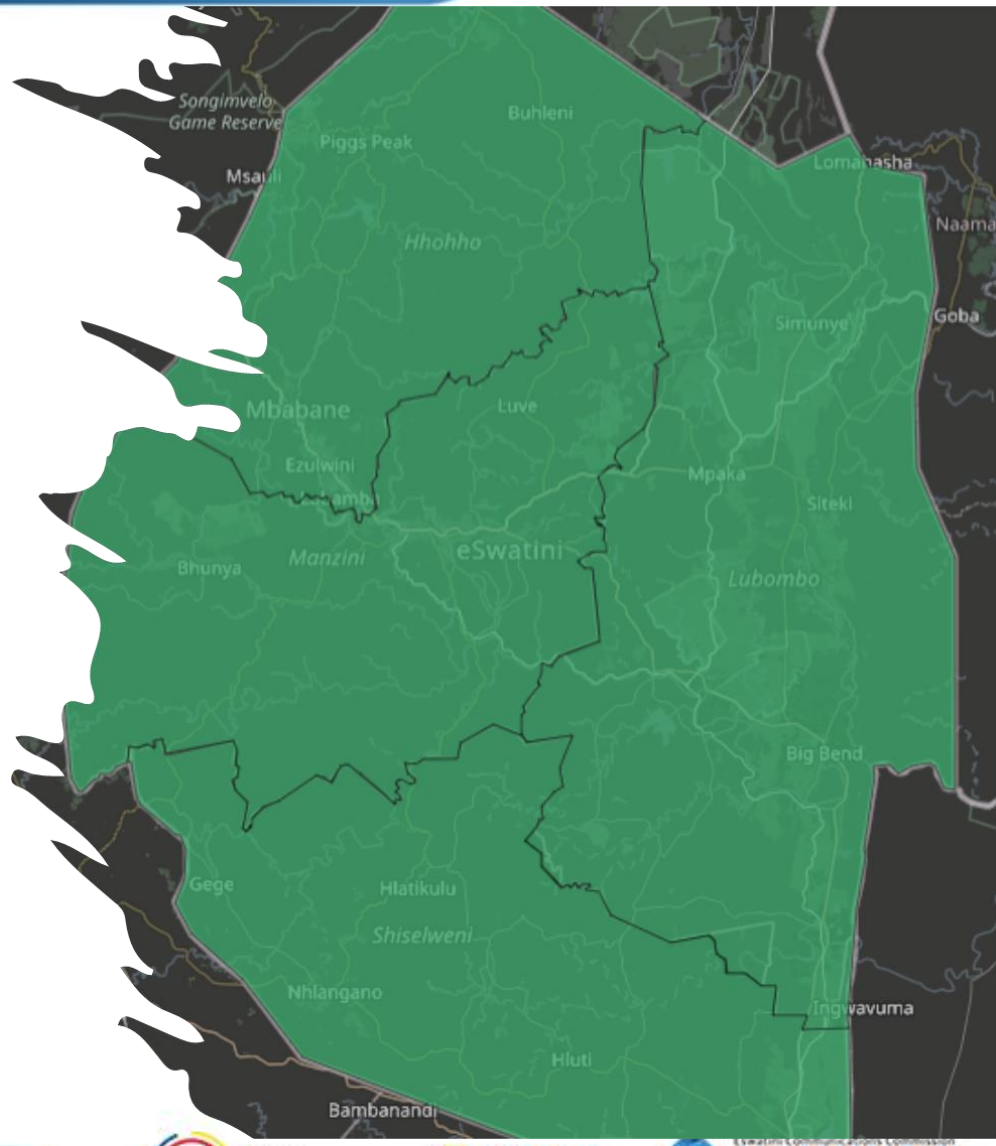
Background

ESWATINI COMMUNICATIONS COMMISSION

The Eswatini Communications Commission (ESCCOM) is the regulatory authority for the Information and Communication Technology (ICT) sector in Eswatini.

The Commission was established in 2013 by the Eswatini Communications Act, No. 10 of 2013 (the Act), to licence and regulate telecommunications, radio communications, broadcasting and postal services in Eswatini. Its scope extends to regulating the use and allocation of the radio frequency spectrum, administer cybersecurity and incidental matters to it, ensuring data protection and regulating electronic transactions.

The Commission therefore plays a critical role in the management and development of the ICT sector.



Introduction

The use of mobile communication services has become an essential part of the citizens' daily lives. According to the GSMA 2023 report, mobile communication is the primary and in some cases the only way that most people (about 73%), access the internet in low- and middle-income countries (LMICs).

Future developments show that mobile communication (internet) will connect more people than ever before to critical services, such as healthcare, education, e-commerce and financial services, as well as provide income-generating opportunities.

As data usage and dependence on connectivity continue to grow rapidly all over the world, it is critical that networks deliver reliable performance to meet the users' needs.

57% of the world's population are now using mobile internet. GSMA 2023

54% of the world's population own a smartphone GSMA 2023

Introduction

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Mobile cellular technology in Eswatini is the primary mode of connection in the country, accounting for almost **98%** of telecommunications subscriptions. In the 2021/22 Financial Year, mobile cellular subscriptions increased by 19.2% from 1 279 599 to 1 524 629, with mobile cellular penetration consequently rising from 112% to **131%.** Mobile broadband connectivity also improved, by 25% from 1 105 987 to 1 379 525. Accordingly, mobile broadband penetration advanced from 96% to **119%** in the period. The number of mobile smartphones in use increased by 22% in the year 2022 with smartphone penetration consequently advancing to **73%.**

Such advancements require that mobile services are always available to customers at the right and acceptable quality.

98% mobile subscriptions
ICT Report,2022

113% Cellular penetration

73% Smartphone penetration

119% broadband penetration

ESWATINI DATA PROTECTION AUTHORITY
CIRT
Eswatini Communications Commission UNIVERSAL ACCESS SERVICE FUND

QoS Measurement and Monitoring

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Quality of Service (QoS) as defined by the International Communication Union (ITU) is 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.

From a telecommunications point of view, QoS is always end-to-end including the end-user, its equipment, access network (fixed or mobile), IP transport network, core network, and through the Internet.

Quality of Service (QoS) directly impacts customer satisfaction, loyalty, and the overall success of telecommunication companies.

It is important that we continuously monitor and measure QoS so that the service providers may regularly identify areas of improvement, optimize their network performance, and ensure that the service meets or exceeds customer expectations.

Measuring and Monitoring QoS

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The Commission has in place Key Performance Indicators (KPIs) that Mobile operators should comply with to guarantee that customers experience services of good and sustainable quality. These are measured through active and passive monitoring, test calls, and real-time analytics. This provides transparency on the level of service quality in the telecommunications industry.

QoS Measurements (KPIs)

- Call quality
- Service availability
- Service accessibility
- Service retainability
- Service response time
- Network Performance (latency, Packet loss, throughput)
- Customer satisfaction

QoS Monitoring

- Stationary / Walk /Drive tests
- Network Management System (NMS)
- Customer Satisfaction Surveys

Why QoS Monitoring

- Proactive fault management that enables service providers to deliver reliable and high-quality telecommunications services leading to high customer satisfaction levels.
- Identifies network usage trends and opportunities for growth and improvement in the ICT industry.
- Insights into reports and performance enable regulators to make informed decisions about the different aspects of the network concerning evolving and emerging technologies.
- Compliance and Regulatory requirements – service providers operate in a regulated environment and must comply with the specific QoS standards.
- Qualitative data from surveys provide insights into the overall user experience and identify areas for improvement.

Regulatory Environment

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2013

- The Electronic Communications Act no. 09 of 2013
- Swaziland Communications Commission Act no. 10 of 2013

2016

Quality of Service Regulations, 2016

2019

Deployment of RPM system with the regulator

2022

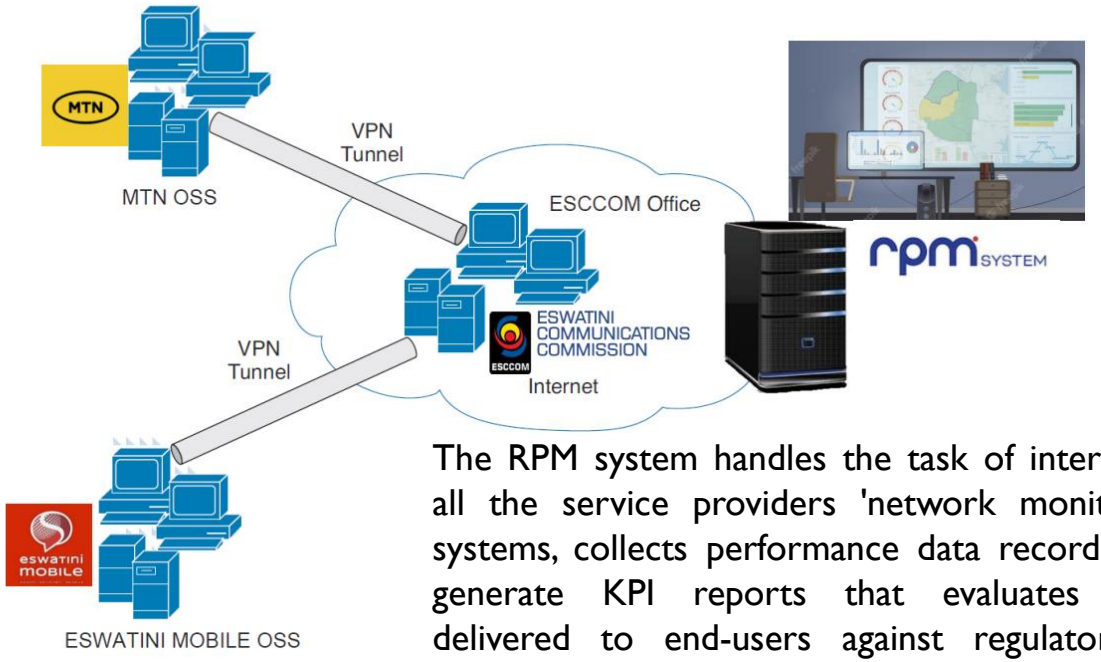
Quality of Service Guidelines, 2022

The Quality-of-Service Regulations which aims to:

- create conditions for customer satisfaction by making known the quality of service which the service provider is required to provide and the user has a right to expect;
- measure the quality of service provided by the service providers from time to time and to compare them with the norms so as to assess the level of performance; and
- protect the interest of consumers of electronic communications services.

Current Setup

The Commission uses systems in place (RPM) that collect raw data for performance management files which are analysed to report on the real-time performance of the mobile operators.
The Commission then engages with the mobile operators to resolve, prevent, and further improve on the identified issues for a good quality of service to all consumers.



The RPM system handles the task of interfacing all the service providers 'network monitoring systems, collects performance data records and generate KPI reports that evaluates QoS delivered to end-users against regulatory-set targets

- Proactive monitoring is done through NMS using the RPM system
- Testing and reactive monitoring is done through Drive tests and walk-in tests
- Customer surveys and feedback channels are used to ensure customer satisfaction.

Outage Reporting

Outage Type	Reparation Period	Inform the Commission	Submit the Outage Report to the Commission
Critical Outages	≤ 1 hour	Immediately	Immediately after the problem is resolved
Major Outages	≤ 4 hours	Immediately	≤ 2days
Minor Outages	≤ 1 day	Immediately	≤ 7 days
Outages affecting Emergency Services riding on the network	≤ 30 minutes	Immediately	Immediately after the problem is resolved

Observations and Experience

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- Lack of real-time visibility everywhere – BTS, probes available
- Large amounts of data – NMS, Reports
- Stand-alone monitoring tools
- ERP/Unified system to identify problems across different areas – core, access, customer network
- Ever-changing networks
- Seamless integration
- Monitoring more on technical KPIs than customer experience
- Customer satisfaction

- With so much data, it can be easy to have insights - *embed machine learning to autonomously learn patterns*
- Direct access to PM files yields better results than relying on data provided by operators
- Capacity building and knowledge transfer empower regulators to make informed decisions without over-dependency on operator reports

Emerging Network Technologies and QoS

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Emerging technologies are constantly changing the way we live, work, and socialize. As telecommunications networks expand in scale and complexity with new technologies like 5G, edge computing and IoT, it becomes more difficult for operators to consistently deliver the levels of quality of service that customers have come to expect.
Without advanced monitoring capabilities, it is hard for operators to holistically optimize network resources, proactively detect and resolve issues, and ensure a seamless customer experience on these vast next-generation infrastructures.

Artificial Intelligence (AI) can be used to enhance QoS monitoring

Benefits:

- AI algorithms can analyse vast amounts of data at incredible speeds, detecting and predicting patterns that may indicate network congestion, security risks, or capacity constraints before they impact services or users.
- Continuously optimize networks based on insights derived from historical telemetry.
- Automate routine tasks to free up resources and speed up response times.
- Proactive operations minimize outages and mean-time-to-repair through prediction.
- Proactive capacity planning through AI forecasts infrastructure growth requirements months in advance, avoiding last-minute upgrades or bottlenecks.

Leveraging AI

Artificial intelligence can be used to gain competitive advantage, improve processes, and **achieve specific goals or outcomes**. Various AI techniques can be used to improve decision-making or problem-solving.

> "All QoS techniques are particularly well suited for the adoption of AI and can benefit from the automation of processes, because they can easily be processed and analysed in all layers of the network from its control system. The adoption of AI can enhance QoS and avoid over-provisioning of services…" BEREC,2023

According to Ericsson's report on AI business potential, the main benefits that professionals see with AI is improving customer experience and optimizing current network operations.

> "For operations, you need more real time data, 24/7, and be more proactive than reactive. And as data becomes more and more prevalent, the challenge will be on how can we drive the whole organization to be data-driven." **Nabeel Alheider, Advanced Analytics GM, STC, Middle-East**
>
> ERICSSON Report (AI business potential),2023

Use cases

- Data analysis and Insights
- Predictive analytics
- Automated Performance monitoring
- Quality measurement and benchmarking
- Network optimization
- Compliance monitoring

Conclusion and Future Trends

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- Quality of service measurement and monitoring is an end-to-end process that requires continuous monitoring to identify and address network issues promptly, leading to improved service quality.
- This requires a comprehensive approach that combines traditional methods with AI-based solutions.
- While traditional methods provide a solid foundation, AI-driven monitoring can enhance accuracy, efficiency, and proactive problem detection.
- AI assures service quality by continuously benchmarking performance against learned models customized for each network's uniqueness.
- The future of QoS monitoring lies in autonomous systems that largely run on their own using artificial intelligence.
- These will form closed feedback loops to fix problems with minimal human intervention, also crucial to ensure new advanced network technologies like 6G, private networks, and others work well with innovative applications in the future.