UNIVERSITY OF BRESCIA

PhD Program
in
TECHNOLOGY FOR HEALTH

Performance Analysis of 5G Infrastructure for Sustainable IoT Optimization

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XL Cycle

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Background

This research project is critical for advancing the understanding of 5G technology and its infrastructure, which significantly differs from 4G due to its service-based architecture. The service-based approach in 5G enables numerous capabilities such as: Network Slicing, Ultra-Reliable Low-Latency Communication (URLLC), Enhanced Mobile Broadband (eMBB), and Massive Machine-Type Communication (mMTC). Understanding these new capabilities is essential for optimizing network performance and addressing the challenges that come with 5G, such as increased complexity in network management and the need for robust security measures.

Objectives

This study aims to provide detailed insights into these aspects, contributing to the effective deployment and management of 5G networks. Detailed insights into key metrics such as data rates latency, jitter, packet loss, and error rates. Understanding the impact of network slicing URLLC, eMBB, mMTC on network performance. Insights into 5G-specific protocol behaviors, aiding in optimization and troubleshooting. Development of strategies for Optimizing 5G network deployment and management.

Methodologies

The methodology was structured to provide a comprehensive analysis of the 5G network's performance under various conditions, leveraging both hardware and software tools to generate and measure network traffic.

1. Deployment and Configuration. The configuration process ensured that all components were correctly integrated and operational, simulating a real-world 5G deployment.

2. Scenario Creation. Each scenario was meticulously planned to stress-test specific capabilities and identify potential performance bottlenecks.

3. Data Collection: During the execution of each scenario, Wireshark was used to capture network traffic data. While iPerf was used to generate network traffic. The combination of these tools enabled a comprehensive analysis of the network's behavior under various conditions.

Expected Results and Impact

The experimental setup aims to showcase the substantial potential of 5G infrastructure across various domains. The findings are expected to pave the way for future advancements in health technologies, such as remote surgeries and wearable devices, as well as in areas like precision agriculture, predictive maintenance in smart industries, smart grids, and beyond.