

ABSTRACT

This study discusses the implementation of a private 5G network using Free5GC as the core network and UERANSIM as the simulator for the Radio Access Network (RAN) and User Equipment (UE) in a virtual environment. Network performance was evaluated by measuring Quality of Service (QoS) parameters—throughput, delay, and packet loss—based on the TIPHON ETSI standards. Testing was conducted under two main scenarios: a local scenario with varying numbers of UEs (5 and 10 UEs), and a public scenario with 1 UE, using a bandwidth of 100 Mbps over a 60-second duration. Traffic generation was performed using iPerf3 and analyzed with Wireshark. In the local scenario, the system demonstrated excellent performance, with peak UDP throughput reaching 86 Mbps on 10 UEs, minimum TCP delay recorded at 1.01 ms on 5 UEs, and packet loss consistently at 0%. In the public scenario, UDP achieved a maximum throughput of 100 Mbps, while TCP reached only 28 Mbps; however, both protocols maintained 0% packet loss. These results confirm that the network system was successfully built with stable and reliable performance, demonstrating the effectiveness of open-source software for simulating private 5G networks.

Keywords: 5G Private Network, Free5GC, UERANSIM, QoS, Virtualization