

ABSTRACT

The advancement of mobile device technology in recent decades has been accompanied by a significant increase in digital content consumption, particularly video. This growth is largely driven by two key trends: the widespread ownership of multiple devices by individual users and increasingly intensive patterns of data usage. To meet these growing demands while maintaining acceptable quality of service, it is essential to enhance network capacity. However, conventional solutions such as expanding server infrastructure or deploying additional physical resources often entail high costs and energy inefficiencies, limiting their practicality and scalability.

One of the more efficient alternative solutions is the use of edge caching, which is a temporary content storage mechanism placed closer to the end user, between the data center and the user device. This approach has the potential to reduce network traffic load and eliminate repeated requests to the central server, thereby reducing access latency and enhancing response times. These efficiencies have been shown to provide performance improvements in time-sensitive services, such as video streaming, online gaming, and other real-time applications. Furthermore, these efficiencies have a direct impact on improving quality of experience (QoE) and network operational efficiency.

The test results show that the implementation of caching in two main scenarios—web multimedia and Video on Demand—successfully improves system performance significantly. In the web multimedia scenario, caching is able to reduce RTT by 74.60% and increase throughput by 255.84%. Meanwhile, in the Video on Demand scenario, the RTT reduction was recorded at 91.74%, with the highest throughput increase of 218.94%. These findings confirm that caching plays a crucial role in keeping the system responsive and efficient, even under the pressure of high traffic and content demand.

Kata kunci : 5G, Edge Caching, OpenRAN, Round Trip Time, Throughput