

ABSTRACT

Indonesia has a port with a container terminal with the 23rd most dense traffic in the world. To increase efficiency and reduce dwelling time, currently ports in the world are starting to transform towards smart ports. Ports in Indonesia are also starting to transform towards Smart Ports, one of which is the Tanjung Priok port. The implementation of Smart Port to improve the quality of Tanjung Priok port services is stated in "Decree of the Head of the Tanjung Priok Main Port Authority Office No: HK.206.2/11/OP.TPK-2021 Concerning the Strategic Plan of the Tanjung Priok Main Port Authority Office for 2020 -2024." 5G private networks can support smart port operations by providing fast, secure, and customizable connectivity.

The research was conducted at the Tanjung Priok port because it is a benchmark for smart ports in Indonesia. This research carries out a feasibility analysis from the technical, economic, and regulatory aspects of 5G private networks in 2 scenarios, namely (i) The 5G Private Network is self-organized by the "Port" and (ii) The 5G Private Network network is organized by Cellular Operators and rented by the port. Technical analysis is obtained from coverage analysis and capacity analysis, then a simulation is performed using the Atoll network simulator. Economic Analysis is obtained using CAPEX OPEX analysis, business feasibility analysis (NPV, IRR, PBP, and PI), and sensitivity analysis. Regulation analysis is obtained from the study of existing regulations related to deployment, resources, and standardization.

Based on this research, the total gNodeB based on coverage and capacity analysis is 17 gNodeB. The simulation results show that the value of Synchronization Signal-Reference Signal Received Power (SS RSRP) is -88.09 dBm and is considered "excellent", while the Synchronization Signal-Signal Interference Noise Ratio (SS SINR) mean value is 11.5 dB and is considered "good". The CAPEX and OPEX values for the first scenario are Rp7,398,699,150 and Rp4,330,949,567. The CAPEX and OPEX values for the second scenario are Rp4,995,026,910 and Rp3,690,451,856. Economic analysis shows that the first scenario is said to be unfeasible with the NPV, IRR, PBP, and PI values each being -Rp1,497,574,359, -5%, 6 years, and 0.8. Meanwhile, the second scenario is said to be feasible with the NPV, IRR, PBP, and PI values each being Rp1,380,518,779, 21%, 4 years, and 1.3.

Keywords: 5G private network, Atoll network simulator, smart port, network planning, economic planning.