

THE DESIGN AND SIMULATION OF 5G NETWORK FOR SUPPORTS THE SMART GOVERNANCE SYSTEMS IN THE CITY OF MADIUN

ABSTRACT

In the current era of globalization and digital advancement, fast, accurate, and precise information services are highly needed. Today's society is closely connected to information, where space and time are no longer obstacles to obtaining all necessary information. This situation naturally impacts the development of technology and the behavior of society as one of the main pillars in conducting daily activities. Thus, the presence of 5G networks today is also proof of innovation in the world of information and digitalization. The advent of 5G technology is believed to drive the emergence of more smart cities based on smart governance in Indonesia, including in Madiun City. This is due to the 5G network infrastructure having very fast current network specifications, which are also increasingly intelligent, thereby supporting Artificial Intelligence (AI) systems, which are the primary focus of smart governance.

A city can be considered a smart city based on smart governance if it has integrated information and communication technology to a certain level in the management and operational processes of the city in daily life. Madiun City itself has many flagship programs related to smart governance. One of them is the Pahlawan Street Center, which is part of the main goal of achieving smart governance. It incorporates various aspects of technological innovation, smart branding, and smart economy. The realization of smart governance in Madiun City is also marked by various innovations related to public service systems in the government, which are entirely electronic-based, along with the M-Tech profit to support the smart city program in terms of IoT (Internet of Things). This research will conduct an analysis of smart governance design in Madiun City. Furthermore, a literature review will be conducted to support the design simulation of 5G using Atoll software. An analysis and optimization will also be carried out on the simulation results using the signal level, SS-SINR, and Throughput parameters. As a result of this research, the design and simulation outcomes showed that 29

gNodeB 4G sites and 18 gNodeB 5G sites were planned. The coverage planning design results indicate that, based on the calculations, 19 sites are needed for 4G and 23 sites for 5G. The simulation analysis of the design parameters showed that the average results fall within the 'very good' to 'normal' categories. Furthermore, the design and simulations did not require optimization as they have already achieved ideal results or results that meet the Radio KPI (Key Performance Indicator) standards, including parameters such as SS-RSRP (Synchronization Signal-Referenced Signal Received Power), SS-SINR (Signal to Noise and Interference Ratio), and Throughput.

The results of the software simulation will also be analyzed and optimized using parameters such as signal level, SS-SINR, and Throughput. This study is expected to improve and support the development of infrastructure, especially in the government system and the city center of Madiun, to provide more advanced and better public services. Additionally, it aims to enhance the quality of public services, making them more efficient, thanks to the network slicing capabilities in the 5G network that will be developed in this research.

Keywords: 5G, Smart governance, Artificial Intelligence, Network Simulation, Government.