

## ABSTRACT

Indonesia, with the geographical condition of a vast archipelagic country, has its own challenges if you want to keep up with the development of telecommunications technology that is currently being researched, namely the Internet of Things. This is due to difficulties in infrastructure for installing sensors in hard-to-reach places and the large number of Internet of Things devices that still use terrestrial communications technology. One of the IoT communication technologies, namely LoRa, with characteristics that use low power and long communication range (average use is 15-30 Km in terrestrial use) and uses unlicensed frequencies (ISM band) to be a suitable technology for communication. M2M for long distance.

In this final project, the researcher designs a prototype sensor node based on LoRa for Direct-to-satellite communication for IoT satellites orbiting LEO (400Km). This sensor node is designed in the form of a minimum micro controller system equipped with LoRa modules, dummy sensors, and a power supply subsystem consisting of solar panel modules and batteries with the aim of placing sensor nodes in hard-to-reach places in Indonesia.

The result of this research is the creation of a prototype sensor node that has the ability to transmit with LoRa technology that works according to its function to transmit data from the sensor at a frequency of 923 MHz, the sensor node itself can work according to its function, either when the solar panel powered the sensor node while charging the battery at the same time, when the battery powered the sensor node by itself ,and when the solar panel itself (the battery is fully charged), then the average RF output power generated by this sensor node prototype is 18.20 dBm, and the last is the power consumption from the measurement results of this sensor node prototype. for 24 hours is 4838.4 mWh, which means it has been covered by battery power charged by solar panels of 5838 mWh for charging for three hours.

**Key words:** Sensor Node, communication *Direct-to-satellite*, LoRa, IoT Sattelite