

# Analisis Konsumsi Energi dan Packet Delivery Ratio Dengan Scheduling Model Pada Low Power Wide Area Network Untuk Aplikasi Internet of Things = Analysis of Energy Consumption and Packet Delivery Ratio with Scheduling Model on Low Power Wide Area Networks for Internet of Things Applications

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## Abstrak

Kemudahan manusia dalam mengakses informasi kapan dan dimana saja adalah tujuan diciptakannya Internet of Things (IoT). Banyak teknologi yang dapat menyokong implementasi IoT berjalan mulus, salah satunya Low Power Wide Area Network (LPWAN). Bertujuan mengirim informasi dalam jarak jauh dan konsumsi energi rendah, LPWAN didukung oleh teknologi physical layer sebagai platform modulasi radio untuk Internet of Things contohnya seperti LoRa. Berbagai data yang diterima oleh sensor node, maka diperlukan sebuah protokol penjadwalan sebelum melakukan transmisi ke base station atau sink node. Dalam riset ini, model penjadwalan yang akan digunakan adalah First Come First Served pada Cluster Head (CH-FCFS) dengan desain topologi jaringan star of stars. Model diimplementasikan ke dalam dua jaringan dengan 25 sensor nodes dan 1 cluster head; 50 sensor nodes dan 2 cluster head. Pengujian sistem model ini menggunakan simulator CupCarbon U-One 4.2. Hasil analisa jaringan pertama dan kedua memiliki keberhasilan pengiriman data sebesar 100% hingga ke sink node. Konsumsi energi 5 tahun untuk sensor node, cluster head S100, dan cluster head S200 adalah 22.732,2 Joule, 1.121.280 Joule, dan 1.121.280 Joule. Konsumsi energi 10 tahun untuk sensor node, cluster head S100, dan cluster head S200 adalah 45.464,4 Joule, 2.242.560 Joule, dan 2.242.560 Joule. Pengaruh dari penggunaan model scheduling dan penyesuaian penggunaan sensor berbasis baterai dijelaskan lebih rinci sesuai komunikasi model konsumsi energi pada simulasi.

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The ease with which humans access information anytime and anywhere is the purpose of the creation of the Internet of Things (IoT). Many technologies can support the implementation of IoT running smoothly, one of which is the Low Power Wide Area Network (LPWAN). Aiming at sending information over long distances and low energy consumption, LPWAN is supported by physical layer technology as a radio modulation platform for the Internet of Things for example like LoRa. Various data received by the sensor node, it requires a scheduling protocol before transmitting to the base station or sink node. In this research, the scheduling model that will be used is First Come First Served on Cluster Head (CH-FCFS) with a star of stars network topology design. The model is implemented in two networks with 25 sensor nodes and 1 cluster head; 50 sensor nodes and 2 cluster heads. The system testing of this model uses the CupCarbon U-One 4.2 simulator. The results of the first and second network analysis have the success of sending data by 100% to the sink node. The 5 year energy consumption for sensor nodes, S100 cluster head, and S200 cluster head are 22,732.2 Joules, 1,121,280 Joules, and 1,121,280 Joules. The 10 year energy consumption for sensor nodes, S100 cluster head, and S200 cluster head is 45,464.4 Joules, 2,242,560 Joules, and 2,242,560 Joules. The impact of the use of a scheduling model and adjustments to the use of battery based sensors are explained in more detail according to the communication model of energy consumption in

simulations.<i/>