

ABSTRAK

Monitoring suhu dan kelembapan perlu dilakukan secara berkelanjutan untuk mengetahui kondisi lingkungan secara real-time serta mendukung penyimpanan histori data. Namun, pada beberapa fasilitas, proses monitoring belum mampu mendokumentasikan perubahan suhu dan kelembapan secara kontinu sehingga histori data yang tersimpan menjadi kurang lengkap dan sulit digunakan untuk evaluasi. Oleh karena itu, penelitian ini bertujuan untuk merancang dan membangun sistem telemetri suhu dan kelembapan multi-node berbasis Internet of Things (IoT) yang mampu melakukan monitoring secara real-time, terpusat, dan berkelanjutan.

Sistem yang dikembangkan menggunakan sensor DHT22 sebagai sensor suhu dan kelembapan, ESP32 sebagai pengendali utama sekaligus modul komunikasi, database MySQL sebagai media penyimpanan data, serta website monitoring sebagai media visualisasi data. Data hasil pengukuran dikirim melalui jaringan internet menuju server dan ditampilkan dalam bentuk tabel serta grafik secara real-time. Selain mendukung monitoring multi-node, sistem juga dilengkapi fitur histori data, analisis data loss, dan error komunikasi untuk mengevaluasi keandalan proses pengiriman data. Hasil penelitian menunjukkan bahwa sistem mampu melakukan monitoring suhu dan kelembapan secara real-time, menyimpan data ke database, serta menampilkan informasi monitoring dari beberapa node secara terpusat melalui website. Sistem juga mampu menyediakan informasi mengenai kualitas pengiriman data berdasarkan data yang diterima, data hilang, dan error komunikasi. Dengan demikian, sistem yang dikembangkan dapat digunakan sebagai solusi monitoring lingkungan yang lebih efektif serta mendukung proses pemantauan secara berkelanjutan.

Kata kunci: Internet of Things (IoT), telemetri, suhu dan kelembapan, multi-node, data loss, monitoring lingkungan.

ABSTRACT

Temperature and humidity monitoring needs to be carried out continuously to observe environmental conditions in real time and support historical data recording. However, in some facilities, monitoring systems are not able to continuously document environmental changes, resulting in incomplete historical data that may limit monitoring and evaluation activities. Therefore, this study aims to design and develop a multi-node temperature and humidity telemetry system based on the Internet of Things (IoT) for real-time, centralized, and continuous monitoring.

The developed system utilizes DHT22 sensors for temperature and humidity measurements, ESP32 microcontrollers as the main controller and communication module, a MySQL database for data storage, and a web-based monitoring platform for data visualization. Measurement data are transmitted through the internet to a server and displayed in real time in the form of tables and graphs. The system is also equipped with multi-node monitoring, historical data storage, data loss analysis, and communication error analysis to evaluate data transmission reliability. The results show that the system is capable of monitoring temperature and humidity in real time, storing data in a database, and presenting monitoring information from multiple nodes through a centralized website. In addition, the system provides information regarding transmission quality based on received data, lost data, and communication error values. Therefore, the developed system can be used as an effective environmental monitoring solution and supports continuous observation of environmental conditions.

Keywords: *Internet of Things (IoT), telemetry, temperature and humidity, multi-node, data loss, environmental monitoring.*