

ABSTRAK

Ruang operasi merupakan area kritis rumah sakit yang membutuhkan pengawasan tata udara secara stabil karena berkaitan dengan kenyamanan tenaga medis, keselamatan pasien, dan kesiapan tindakan. Pada kondisi awal di Rumah Sakit Panti Rapih, terdapat lima masalah utama, yaitu data parameter tata udara masih tersebar, pemantauan delapan ruang operasi belum terpusat, kondisi abnormal belum diklasifikasikan secara otomatis, histori alarm belum terdokumentasi berbasis kejadian, serta evaluasi stabilitas ruang dan informasi tindak lanjut belum berbasis data. Penelitian ini bertujuan merancang dan membangun sistem *supervisory* tata udara ruang operasi berbasis *edge computing* untuk respons dini gangguan dan evaluasi stabilitas ruang. Metode penelitian menggunakan pendekatan rancang bangun dengan tahapan desain sistem, instalasi perangkat, pengujian *sampling* atau pengumpulan data, *troubleshooting*, dan evaluasi hasil akhir. Sistem menggunakan USR-M300 sebagai kontrol lokal OK-04 dan USR-EG628 sebagai perangkat *edge supervisory* untuk delapan ruang operasi. Data diperoleh dari sensor OK-04, Hisense/RS485, sensor *pre-cooling* berbasis blok, dan *dry contact* Daikin KRP4A51, kemudian ditampilkan melalui Node-RED dan HMI Weintek. Histori alarm disimpan menggunakan SQLite, notifikasi *fault* dikirim melalui Telegram, dan stabilitas ruang dievaluasi menggunakan *Room Operation Stability Index* (ROSI). Hasil pengembangan menunjukkan bahwa sistem mampu menampilkan data *real-time*, membedakan status Normal, *Warning*, dan *Fault*, mencatat histori alarm, mengirim notifikasi, membatasi akses dengan *login*, serta menghasilkan ROSI. Sistem ini dapat digunakan sebagai alat bantu *supervisory*, dengan saran pengujian jangka panjang dan peningkatan keamanan akses.

Kata kunci: ruang operasi, sistem *supervisory*, tata udara, *edge computing*, Node-RED, SQLite, ROSI, keamanan akses.

ABSTRACT

Operating rooms are critical hospital areas that require stable air-conditioning supervision because they are related to medical staff comfort, patient safety, and surgical readiness. In the initial condition at Panti Rapih Hospital, five main problems were identified: air-conditioning parameter data were still distributed across several sources, monitoring of eight operating rooms was not centralized, abnormal conditions were not automatically classified, alarm history was not documented based on events, and room stability evaluation and follow-up information were not data based. This project aimed to design and build an edge-computing-based supervisory system for operating room air-conditioning to support early fault response and room stability evaluation. The research used a system design and development method consisting of system design, device installation, sampling test or data collection, troubleshooting, and final evaluation. The system used the USR-M300 as the local controller for OK-04 and the USR-EG628 as the edge supervisory device for eight operating rooms. Data were obtained from OK-04 sensors, Hisense/RS485, block-based pre-cooling sensors, and the Daikin KRP4A51 dry contact, then displayed through Node-RED and Weintek HMI. Alarm history was stored using SQLite, fault notifications were sent through Telegram, and room stability was evaluated using the *Room Operation Stability Index* (ROSI). The development results show that the system can display real-time data, classify Normal, Warning, and Fault statuses, record alarm history, send notifications, restrict access using login authentication, and generate ROSI. This system can be used as a supervisory tool, with long-term testing and access-security improvement recommended.

Keywords: operating room, supervisory system, air-conditioning, edge computing, Node-RED, SQLite, ROSI, access security.