

ABSTRAK

Perancangan Sistem Integrasi Data Monitoring Frekuensi Radio Berbasis RTL-SDR Menggunakan HTTP REST API dengan Arsitektur Edge-Cloud Berbasis Website untuk Dashboard Monitoring

(2026:XV + 118 halaman + 35 gambar + 24 tabel + 9 lampiran)

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JURUSAN TEKNIK ELEKTRO

PROGRAM STUDI SARJANA TERAPAN TEKNIK TELEKOMUNIKASI

POLITEKNIK NEGERI SRIWIJAYA

Peningkatan penggunaan teknologi komunikasi nirkabel berdampak pada semakin padatnya pemanfaatan spektrum frekuensi radio, sehingga diperlukan sistem monitoring yang mampu mengelola data secara terintegrasi. Pengambilan data dilaksanakan dengan melakukan pengamatan terhadap 11 kanal frekuensi pada 20 titik yang terbagi dalam empat arah, yaitu utara, selatan, timur, dan barat, dengan masing-masing arah terdiri atas 5 titik. Penelitian ini bertujuan mengembangkan sistem integrasi data dan *dashboard* monitoring frekuensi radio menggunakan RTL-SDR dan *Raspberry Pi* dengan pendekatan *Hybrid Edge-Cloud*. Sistem mengintegrasikan data lokasi, sesi pengamatan, parameter spektrum, rekaman, hasil klasifikasi frekuensi, dan *Machine Learning* ke dalam platform berbasis web. Kontribusi penelitian mencakup integrasi GQRX dengan pengelolaan hasil *Machine Learning*, pengelolaan data dalam berbagai format, serta sinkronisasi *database* lokal dan *cloud*. Pengembangan sistem meliputi perancangan perangkat keras dan perangkat lunak, penggunaan SQLite dan Supabase PostgreSQL sebagai penyimpanan data, pengembangan *dashboard* Flask, implementasi HTTP REST API, serta pengujian fungsional sistem. Hasil implementasi menunjukkan bahwa sistem berhasil mengintegrasikan proses monitoring, pengelolaan data, komunikasi GQRX, pengolahan hasil *Machine Learning*, dan sinkronisasi data dari *database* lokal ke *cloud*. Pengujian fungsional menghasilkan 8 dari 8 skenario berhasil dan valid dengan tingkat keberhasilan 100%. Sistem juga mampu mengelola data monitoring pada seluruh titik dan kanal, menangani berbagai format data, menampilkan hasil analisis melalui *dashboard*, serta melakukan sinkronisasi data secara terstruktur.

Kata kunci: RTL-SDR, *Raspberry Pi*, monitoring frekuensi radio, HTTP REST API, *Hybrid Edge-Cloud*, GQRX.

ABSTRACT

Design of a Radio Frequency Monitoring Data Integration System Based on RTL-SDR Using HTTP REST API with a Website-Based Edge–Cloud Architecture for a Monitoring Dashboard

(2026: XV + 118 pages + 35 figures + 24 tables + 9 appendices)

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The increasing use of wireless communication technology has resulted in denser utilization of the radio frequency spectrum, requiring a monitoring system capable of managing data in an integrated manner. Data collection was conducted by observing 11 frequency channels at 20 monitoring points distributed across four directions: north, south, east, and west, with five points assigned to each direction. This study aims to develop an integrated data management system and radio frequency monitoring dashboard using RTL-SDR and Raspberry Pi based on a Hybrid Edge–Cloud approach. The system integrates location data, monitoring sessions, spectrum parameters, recordings, frequency classification results, and Machine Learning results into a web-based platform. The contributions of this study include GQRX integration with Machine Learning result processing, management of various data formats, and synchronization between local and cloud databases. System development involved hardware and software design, SQLite and Supabase PostgreSQL for data storage, Flask-based dashboard development, HTTP REST API implementation, and functional testing. The implementation results demonstrate that the system successfully integrates monitoring processes, data management, GQRX communication, Machine Learning result processing, and local-to-cloud data synchronization. Functional testing achieved 8 out of 8 successful and valid scenarios, resulting in a 100% success rate. The system is capable of managing monitoring data from all designated points and channels, handling various data formats, displaying analysis results through the dashboard, and synchronizing data in a structured manner. The developed system can support radio frequency spectrum monitoring activities in a structured, integrated, and sustainable manner.

Keywords: *Software Defined Radio, REST API, Raspberry Pi, Radio Frequency Monitoring, Hybrid Edge–Cloud, Data Integration.*