

ABSTRAK

RANCANG BANGUN SISTEM KEAMANAN DAN MONITORING KENDARAAN BERBASIS IOT MENGGUNAKAN ESP32 DENGAN NOTIFIKASI *REAL-TIME*

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PROGRAM STUDI DIII ELEKTRONIKA

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Keamanan kompartemen kendaraan distribusi memerlukan sistem pengawasan yang mampu memberikan informasi secara cepat dan akurat untuk mencegah terjadinya pembukaan kompartemen tanpa izin selama perjalanan. Pada penelitian ini dirancang dan dibangun sistem monitoring kompartemen kendaraan berbasis Internet of Things (IoT) menggunakan ESP32 dan modul SIM7000E yang dilengkapi fitur komunikasi seluler dan GNSS. Sistem memanfaatkan sensor konektor jack sebagai pendeteksi kondisi kompartemen, kemudian mengirimkan informasi status kompartemen dan lokasi kendaraan secara real-time melalui aplikasi Telegram dengan bantuan Cloudflare Worker sebagai perantara komunikasi ke Telegram Bot API. Pengujian dilakukan terhadap sensor konektor jack, konektivitas SIM7000E, akurasi data GNSS, fungsi sistem secara keseluruhan, latensi notifikasi, serta fitur monitoring status dan lokasi berdasarkan permintaan pengguna. Hasil pengujian menunjukkan bahwa sistem mampu mendeteksi kondisi kompartemen dan mengirimkan notifikasi dengan tingkat keberhasilan 100%, memperoleh data lokasi dengan rata-rata selisih koordinat sebesar 13,03 meter terhadap koordinat referensi Google Maps, serta menghasilkan rata-rata latensi pengiriman notifikasi sebesar 3,41 detik dan 1,53 detik pada kondisi jaringan normal. Berdasarkan hasil tersebut, sistem yang dirancang telah mampu melakukan monitoring kondisi kompartemen dan lokasi kendaraan secara real-time sehingga dapat digunakan sebagai solusi untuk meningkatkan keamanan dan pengawasan kendaraan distribusi.

Kata Kunci: Internet of Things, ESP32, SIM7000E, GNSS, Telegram, Monitoring Kompartemen Kendaraan.

ABSTRACT

DESIGN AND DEVELOPMENT OF AN INTERNET OF THINGS(IoT)-BASED VEHICLE SECURITY AND MONITORING SYSTEM USING ESP 32 WITH REAL TIME NOTIFICATIONS

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Vehicle compartment security requires a monitoring system capable of providing fast and accurate information to prevent unauthorized compartment opening during transportation activities. This research presents the design and implementation of an Internet of Things (IoT)-based vehicle compartment monitoring system using ESP32 and the SIM7000E module equipped with cellular communication and GNSS capabilities. The system utilizes a jack connector sensor to detect compartment conditions and sends real-time compartment status and vehicle location information through the Telegram application using a Cloudflare Worker as an intermediary to the Telegram Bot API. Testing was conducted on the jack connector sensor, SIM7000E connectivity, GNSS location accuracy, overall system functionality, notification latency, and on-demand status and location monitoring features. The results showed that the system successfully detected compartment conditions and delivered notifications with a 100% success rate, obtained location data with an average coordinate error of 13.03 meters compared to Google Maps reference coordinates, and achieved an average notification latency of 3.41 seconds and 1.53 seconds under normal network conditions. Based on these results, the proposed system is capable of providing real-time monitoring of vehicle compartment conditions and locations and can be utilized as a solution to improve the security and supervision of distribution vehicles.

Keywords: *Internet of Things, ESP32, SIM7000E, GNSS, Telegram, Vehicle Compartment Monitoring.*