

ABSTRAK

AMELIA DEWI PUSPITA. Implementasi dan Analisis Keamanan Data Sistem *Smart Lighting* Menggunakan Algoritma PRESENT: Studi Kasus Gudang PT. Solusindo Bintang Pratama. Dibimbing oleh HENDRA KURNIAWAN dan NOVRIZAL FATTAH FAHMITRA.

Perkembangan pesat teknologi *smart lighting* berbasis *Internet of Things* (IoT) tidak selalu diikuti dengan penerapan mekanisme keamanan data yang memadai, sehingga menimbulkan risiko akumulatif yang dikenal sebagai *security debt bomb*. Sistem pencahayaan cerdas tidak hanya berfungsi untuk efisiensi energi, tetapi juga menghasilkan data aktivitas fisik gudang yang berpotensi mengungkap pola penggunaan ruang dan periode tanpa pengawasan apabila tidak dilindungi dengan baik. Penelitian ini bertujuan untuk merancang dan mengimplementasikan sistem *smart lighting* berbasis IoT yang mampu mengatur nyala lampu secara otomatis berdasarkan deteksi gerakan manusia sekaligus menjamin kerahasiaan dan integritas data melalui penerapan algoritma kriptografi ringan PRESENT. Sistem dibangun menggunakan mikrokontroler ESP32 dan sensor PIR, di mana data hasil deteksi sensor dienkripsi langsung di sisi perangkat sebelum dikirimkan melalui jaringan Wi-Fi menuju server lokal. Hasil pengujian menunjukkan bahwa sistem mampu mendeteksi aktivitas manusia dengan tingkat akurasi sebesar 96% dan waktu respons rata-rata 1,2 detik, serta penerapan algoritma PRESENT mampu melindungi data sensor dari serangan *eavesdropping* dan *Man-in-the-Middle* tanpa mengganggu kinerja sistem. Dengan demikian, sistem yang dikembangkan tidak hanya meningkatkan efisiensi energi, tetapi juga memperkuat keamanan data sebagai langkah mitigasi preventif pada lingkungan gudang berbasis IoT.

Kata kunci: enkripsi PRESENT, ESP32, *Internet of Things*, keamanan data, *smart lighting*.

ABSTRACT

AMELIA DEWI PUSPITA. Implementation and Analysis of Smart Lighting System Data Security Using the PRESENT Algorithm: A Case Study of PT. Solusindo Bintang Pratama Warehouse. Supervised by HENDRA KURNIAWAN and NOVRIZAL FATTAH FAHMITRA.

The rapid development of Internet of Things (IoT)-based smart lighting technology is not always accompanied by the implementation of adequate data security mechanisms, giving rise to an accumulative risk known as the security debt bomb. Smart lighting systems not only serve to improve energy efficiency, but also generate data on warehouse physical activity that could potentially reveal patterns of space usage and periods of unsupervised activity if not properly protected. This study aims to design and implement an IoT-based smart lighting system that can automatically control lights based on human motion detection while ensuring data confidentiality and integrity through the application of the PRESENT lightweight cryptographic algorithm. The system is built using an ESP32 microcontroller and a PIR sensor, where the sensor detection data is encrypted directly on the device side before being sent via a Wi-Fi network to a local server. Test results show that the system is capable of detecting human activity with an accuracy rate of 96% and an average response time of 1.2 seconds. The application of the PRESENT algorithm is able to protect sensor data from eavesdropping and Man-in-the-Middle attacks without disrupting system performance. Thus, the developed system not only improves energy efficiency but also strengthens data security as a preventive mitigation measure in IoT-based warehouse environments.

Keywords: PRESENT encryption, ESP32, Internet of Things, data security, smart lighting.