

ABSTRACT

The manual attendance system at SMA Muhammadiyah 4 Surabaya, which is limited to in-class recording by teachers at the start of lessons, has proven to be ineffective. This method causes significant information delays regarding student arrivals at the beginning of the day, thereby hindering supervision and prompt disciplinary action. Furthermore, the manual process is prone to human error in recording and does not provide centralized, transparent data. To address these issues, this research develops an automated, IoT-based attendance system designed to be efficient and secure. This research began with a needs analysis and literature review to determine the relevant technologies: IoT, RFID, and AES. The next stage was designing the system architecture, including the ESP32 hardware and the software (database, website), followed by the development of a functional prototype. The system, which uses ESP32, RFID, and AES encryption with an IV, was then validated through three types of testing: functional testing, performance measurement (speed and accuracy), and a seven-day implementation trial directly at the school to ensure its reliability and stability. A key feature of this system is the delivery of real-time attendance notifications to parents via WhatsApp. Test results show the system is highly reliable, with an average response time of 2.12 seconds and an accuracy rate of 91.29%. Security testing also proved that the AES encryption implementation with an IV successfully generated a unique ciphertext for each transaction, thus securing the data from pattern analysis. During the trial at the school, the system successfully processed 100% of the data without failure. Therefore, this research not only successfully addresses the problems of manual attendance but also provides a primary contribution by implementing a secure IoT attendance system through the application of a strong encryption standard.

.Keywords: *Student Attendance, RFID, IoT, ESP32, AES Encryption, Parental Monitoring, Website.*