



SMART MANUFACTURING EXECUTION SYSTEM: REVOLUTIONIZING
INDUSTRY WITH IOT AND AI
(MODULE: IOT AND TELEGRAM ALERT)

UNDERGRADUATE THESIS
Submitted as one of the requirements to obtain
Sarjana Komputer

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ABSTRACT

Industrial environments need reliable and fast data monitoring to maintain operational efficiency and safety. This project takes on the task of constructing a secure *Industrial Internet of Things (IIoT)* pipeline to create an end-to-end data collecting and visualization system. My work is centered on the system's basic integration and data processing elements. The approach entailed establishing *Node-RED* to communicate directly with a Programmable Logic Controller (*PLC*) and collect vital process data. This data was then published to a *MQTT* broker, and the communication channel was encrypted with *TLS* certificates created by Step-CA to assure data integrity and secrecy. As a result, I created a service to listen to *MQTT* topics, parse the incoming data, and store it in a *TimescaleDB* database for efficient time-series analysis.

For data presentation, I built a *Flask*-based web application with two primary functions: it embeds a *Grafana* dashboard that queries *TimescaleDB* for historical data visualization, and it also uses a WebSocket connection to display live data directly from the *MQTT* stream, providing an immediate, real-time view of the industrial process. The final product is a safe and fully functional monitoring tool that later can send the user both live and historical data. This shows that industrial automation hardware can be successfully combined with modern open-source *IoT* technology.

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