Comparison Report: IIoT Sensor Network Simulation

Jassey-Jabarr Fisayo
ITAI 3377: A.I. at the Edge & IIoT
Professor: Patricia McManus
February 25, 2025

Setup

This project was executed using Google Colab to simplify the development environment and avoid local setup complexities. The simulation was performed locally within Colab, bypassing the need for a virtual environment or external tools like Mosquitto. Required libraries—pandas, numpy, and matplotlib—were installed directly in Colab using !pip install. The script, mqtt_sensor_simulation.py, was designed to simulate temperature and humidity data for an IIoT sensor network without using MQTT due to Colab's network limitations. Data was generated locally and visualized in real-time, with the final plot saved as mqtt_visualization.png.

Results

The simulation generated 50 data points over approximately 50 seconds. Temperature values ranged between 20°C and 25°C, while humidity values ranged between 30% and 50%, reflecting realistic environmental conditions for an IIoT sensor network. The data was plotted using Matplotlib, producing a line graph with two lines: a red line for temperature and a blue line for humidity. The y-axis was scaled from 15 to 55 to accommodate both metrics, and the x-axis displayed timestamps with rotated labels for clarity. The plot, saved as mqtt_visualization.png, included a title, grid, and legend for better readability.

Analysis

Direct simulation in Colab ensured reliable plotting, as it avoided network-related issues that plagued earlier attempts with MQTT. Attempts to use broker.hivemq.com via WebSocket failed due to Colab's restrictions on outbound connections, leading to the decision to skip MQTT and focus on local data generation. This approach guaranteed a working visualization but omitted the protocol experimentation intended for the lab. For a full IIoT implementation, MQTT or other protocols like CoAP and OPC UA would be better suited in a local environment with a broker like Mosquitto, allowing real-time data transfer and protocol comparison.

Thank you