IIoT Sensor Network Simulation - README

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Lab 04 – Conceptual Design of an IIoT Sensor Network

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# Overview

# This project models a basic Industrial Internet of Things (IIoT) network whereby three communication protocols—MQTT, CoAP, and OPC UA—generated real-time temperature and humidity data is transferred. Running and visualizing their performance helped one to grasp how these protocols operate in an edge-computing configuration.

# Technologies Used

* Applied: Python 3.10
* MQTT (via paho-mqtt) - CoAP (via aiocoap with Windows fallback on UDP)
* OPC UA (asynchronousua)
* Pandas and Matplotlib for graphic display
* Mosquitto MQTT Coordinator

# Project Structure

The folder structure is clean and organized as follows:  
  
iiot\_simulation/  
├── mqtt\_sensor\_simulation.py  
├── coap\_sensor\_simulation.py  
├── opcua\_sensor\_simulation.py  
├── coap\_server.py  
├── data\_visualization.py  
├── visualizations/  
│ └── mqtt\_visualization.png  
├── comparison\_report.pdf  
├── README.docx (this file)  
└── venv/ (virtual environment folder – not included in GitHub)

# How to Run It

1. Verify your Python 3.10 and pip installations.
2. Open PowerShell or your terminal and run:
3. Python -m venv venv;cd iiot\_simulation;venv\Scriptsactivate pip install paho-mqtt matplotlib pandas aiocoap asyncua
4. Run the Mosquitto broker out of a different terminal with:

# Simulating Each Protocol

* MQTT: Run Python mqtt\_sensor\_simulation.py.
* Run the server then client if supported using CoAP.
* Fall back on UDP client on Windows else.
* Run `python opcua\_sensor\_simulation.py` and maybe link with UaExpert.

# Visualizing Data

Run Python data visualisation.py in one terminal and keep mqtt\_sensor\_simulation.py running in another to view MQTT data. Real time updating of the live chart is possible.

# Final Thoughts

This simulation clarified for me the advantages and compromises of every protocol in an IIoT environment. MQTT was quick and simple to use; CoAP was lighter but had compatibility problems; OPC UA provided broad capabilities fit for industrial systems.