

Smart Energy & Environment Monitor

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1. Project Background & Description

Modern homes increasingly require better insight into energy consumption and environmental conditions. High energy bills, overheating rooms, and appliance misuse are common problems.

This project proposes an IoT-based monitoring solution that tracks **(1) room temperature**, **(2) humidity**, and **(3) simulated appliance power usage**, then transmits the data through a network layer to a simple analysis dashboard.

The system will collect sensor data at regular intervals, perform lightweight processing on the Raspberry Pi (e.g., threshold detection for overheating or unusual energy spikes), and publish values to an MQTT broker. A separate subscriber application will store, display, and graph this data, offering a clear UI for users.

2. Tools, Technologies and Equipment

Hardware / Sensors

- Raspberry Pi (or simulated environment if needed)
- SenseHAT or simulated temperature/humidity data (allowed per "It's OK to simulate sensors" on page 14)

assignment

- Optional: smart plug data simulator (JSON generator)

Networking / Protocols

- **MQTT** for lightweight messaging (recommended in higher-grade examples on page 11)

assignment

- JSON-formatted payloads
- Localhost or cloud-based broker (Mosquitto)

Programming Languages

- Python for device logic and data processing
- Optional JavaScript (Node.js) for dashboard or API service

Cloud / Software Tools

- Mosquitto MQTT broker

- Flask or Node.js for a simple web dashboard
- GitHub repository for version control
- VS Code / PyCharm IDE
- SQLite or CSV for storing historical readings

3. Project Repository

A GitHub repository will be created to contain:

- Proposal document
- Sensor/edge-device code
- MQTT subscriber + dashboard code
- Architecture diagrams, readme, and final submission items