

Braxton Walk & Ben Ford

Professor Nere

CS 380

19 December, 2025

Final Project Report

Project Description:

Our final project focused on designing an end-to-end plant monitoring system that collects environmental data, stores it in the cloud, and visualizes trends over time. The system monitors soil moisture, light levels, temperature, and humidity (with temperature and humidity provided by a single sensor). Data flows from our embedded hardware to a cloud backend (AWS) and is ultimately displayed through a python flask web dashboard.

Arduino (Data Collection):

1. Collects sensor data using an Arduino Uno.
2. Packages readings into a JSON-formatted string.
3. Sends the data over the serial port.
4. Waits for a fixed interval (e.g., 45 seconds) before repeating the process.

ESP32 (Networking & Cloud Communication):

1. Connects to WiFi (typically via a hotspot).
2. Establishes a connection to AWS services.
3. Listens on the serial port for incoming Arduino data.
4. Publishes received JSON data to an AWS topic.
5. Continuously listens for new sensor readings.

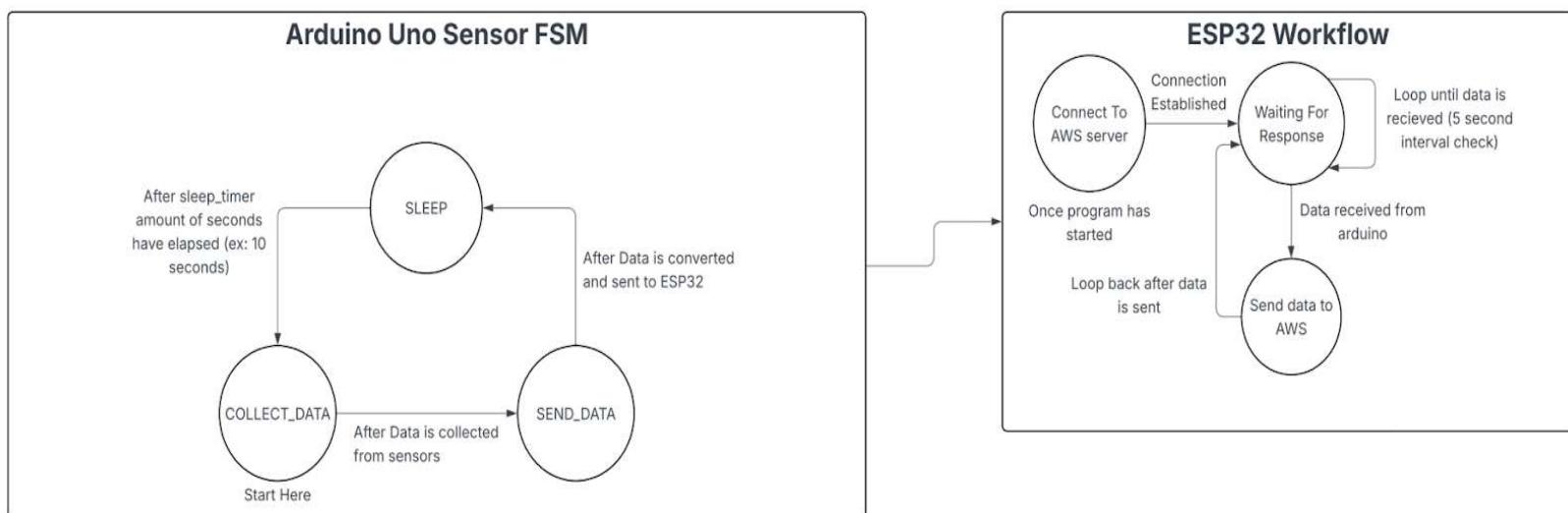
Python Backend:

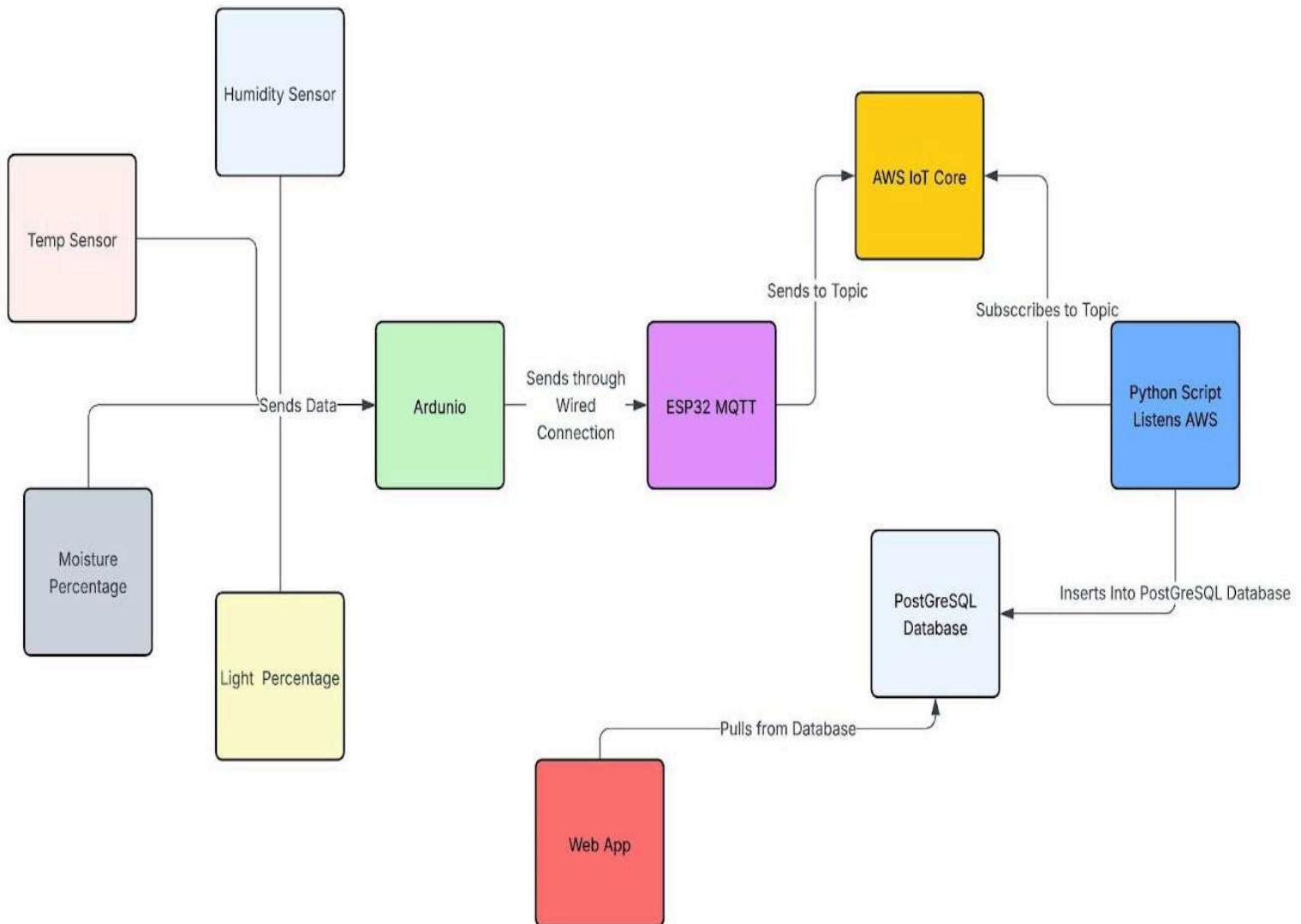
1. Connects to a local PostgreSQL database.
2. Subscribes to the AWS topic for incoming data.
3. Extracts sensor values from published messages.
4. Inserts processed data into the database for long-term storage.

Python Flask ,HTML / JavaScript Frontend:

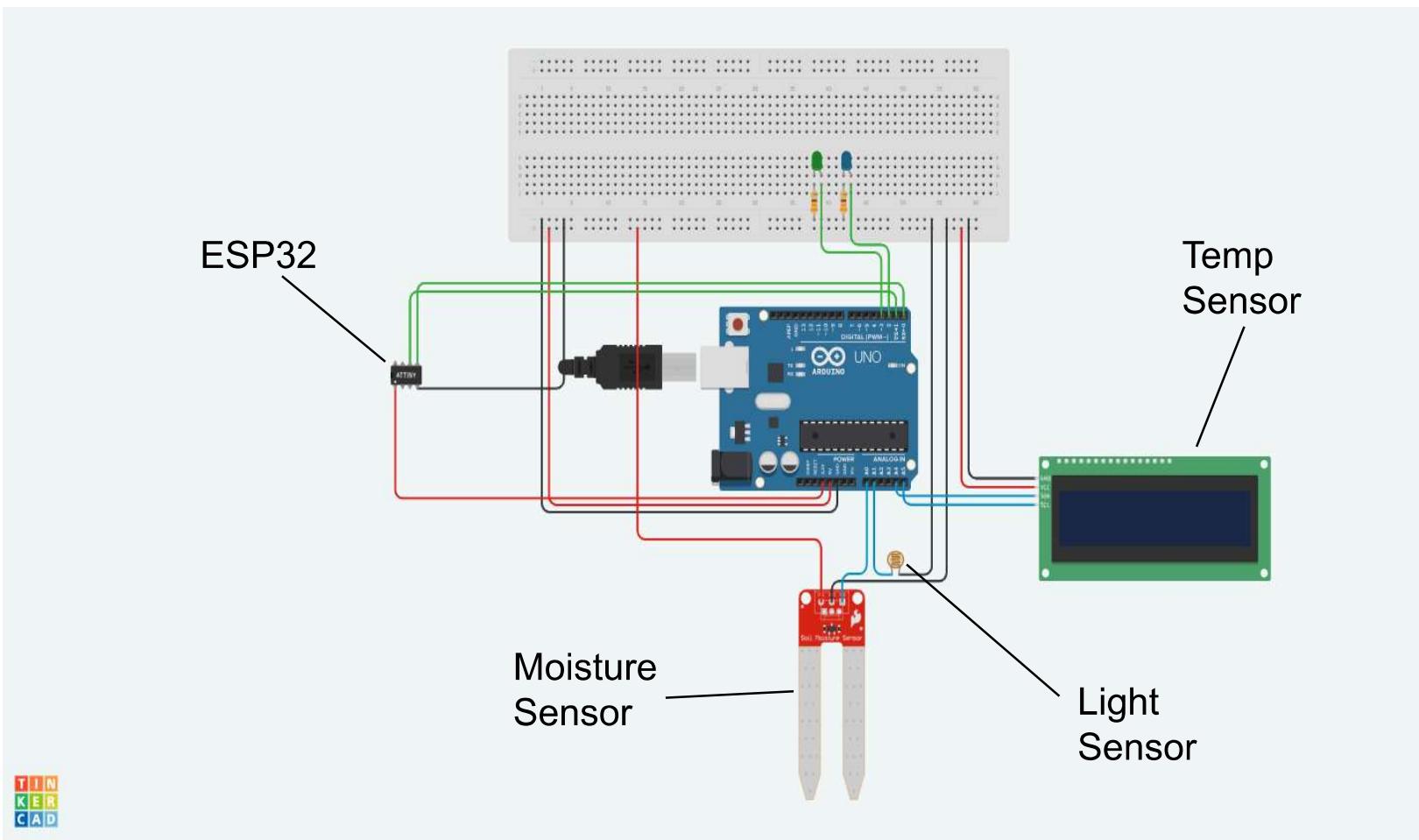
1. Retrieves stored data from the database.
2. Displays time-series graphs for temperature, humidity, soil moisture, and light.
3. Dynamically updates visualizations as new data is added.

FSM Diagram / Flow Chart:





Circuit Diagram:



Link with comments on specific parts used can be found here: (hopefully it works)

<https://www.tinkercad.com/things/aVvP0AndJdF-cs380-final-project-diagram>

Bugs / Limitations:

- Connection issues to wifi, esp could not connect to the school wifi so we used hotspot
 - Local database limits availability for others to implement this project
 - Everything is powered by wires, thus your laptop must be close to the plant to gather readings