IoT Sensor Project (Smart Plant Sensors)

sddec21-08

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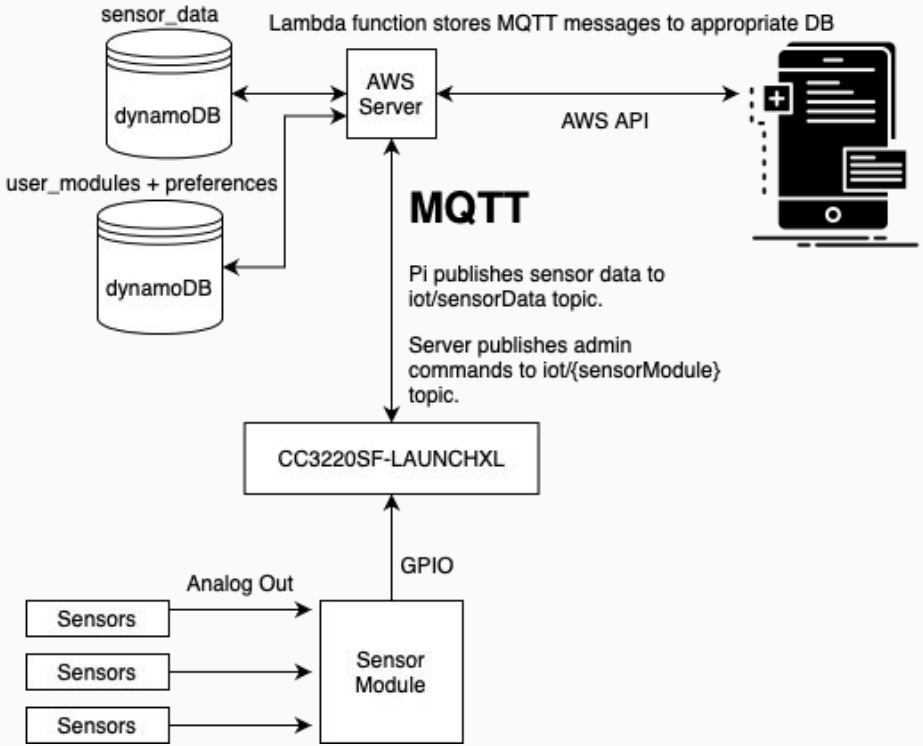
Project Recap

Project Recap

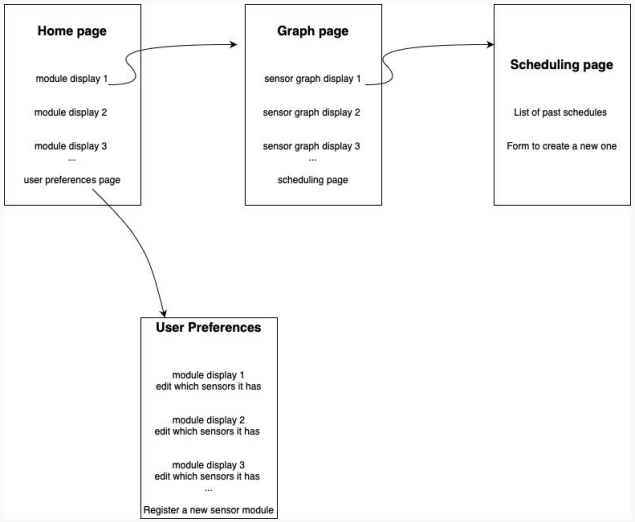
- Smart garden ecosystem with hardware and software components
- Daughter board that interfaces with sensors and talks to TI launchpad
- Web-based interface that allows users to monitor the status of their plants remotely
- Focus on modular design with arbitrary sensors and a flexible user preferences setup



On Connect

Grabs most recent DB value to display to user

Subscribes to iot/sensorData to refresh as new data comes in



Overall System Diagram

Goals for the Semester

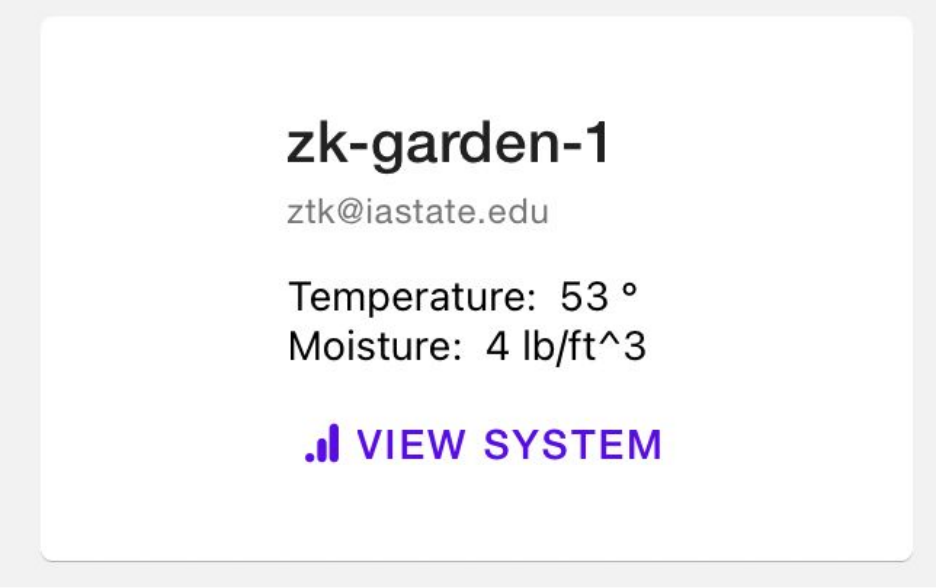
- Graph view for sensors
  - See how the temperature has been changing over time, watch moisture levels, etc.
- User preferences + alerts
  - Set up thresholds for sensor values and let user know when values are out of bounds
  - Visual indication on the board (simple LED to start)
- Daughter board and integration with gateway

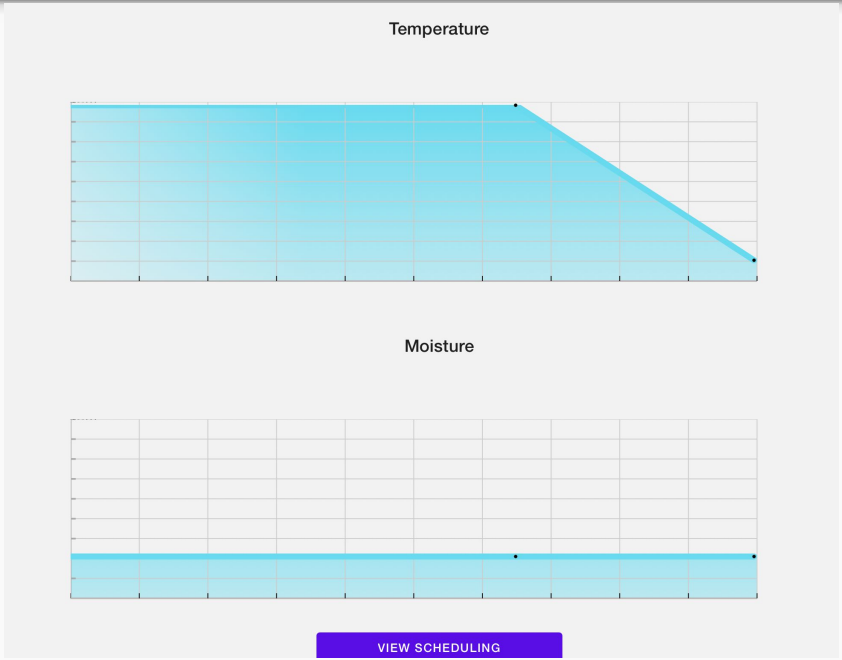
Progress

Progress Since 9/23

- Finished up graph view
- User preference system is complete
- Alert system is in place, along with user schedules
- PCB is finished and ordered
- Testing sensors with the Launchpad
- Have components for the daughterboard

Graph view

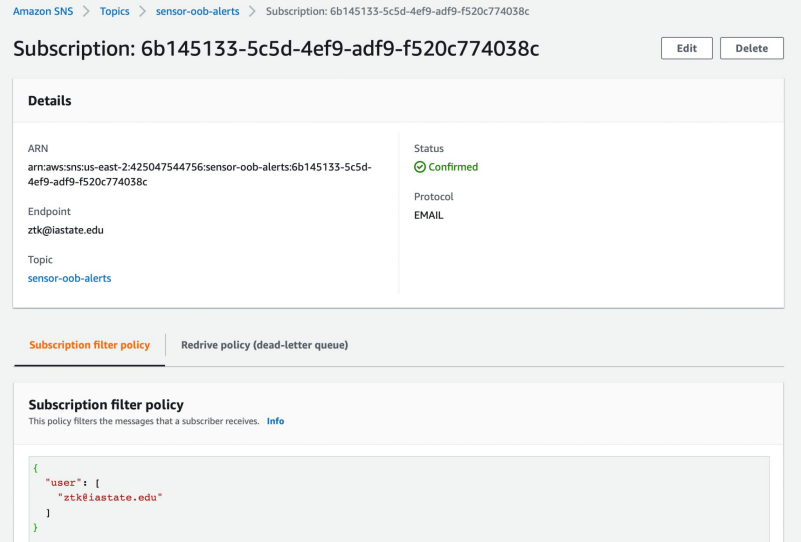

zk-garden-1
ztk@iastate.edu
Temperature: 53 °
Moisture: 4 lb/ft^3
VIEW SYSTEM

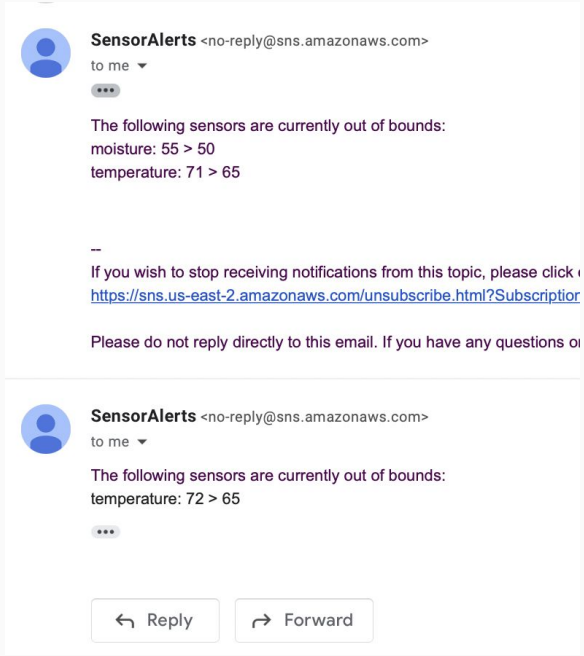

Temperature
Moisture
VIEW SCHEDULING

Notification System

- Built on top of AWS's Simple Notification Service (SNS)
  - Easy to integrate
  - Flexible publish/subscribe architecture that meets our needs
    - Supports SMS + email alerts
    - Supports message filters (which we use to filter out only specific users)
- AWS Lambda function triggers whenever data comes in
  - Checks if the user who the data belongs to has any thresholds set up
  - Checks if the data is in/out of bounds with respect to those thresholds
    - Emails the user if it's not
    - Sends the board "status=good" or "status=bad" message

User is subscribed to the appropriate SNS topic (with the proper Message Attribute filter) when they first register with the site (with the email they registered with).

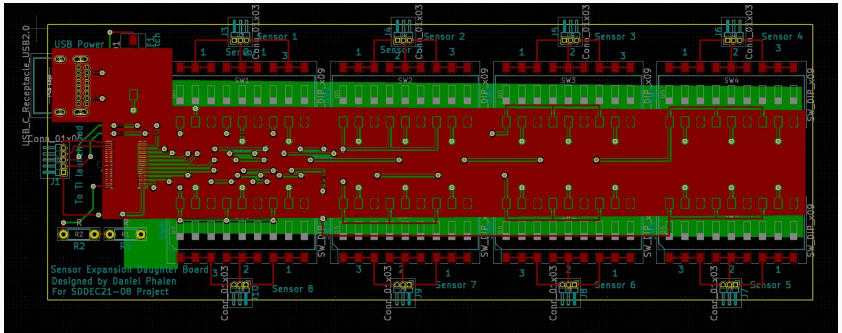




Challenges

Challenge: Flexibility on the firmware side

- Key part of project is flexibility. This means arbitrary sensors, arbitrary ports, etc.
- Software is easy to make flexible
- Hardware has flexibility built in
- How to make the main firmware control loop flexible enough that it knows what sensors are hooked up to it?

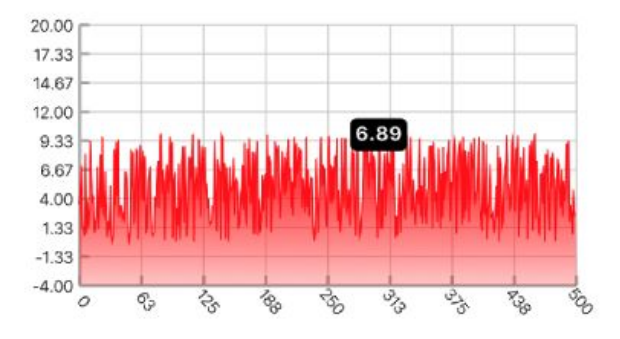


Solution

- To achieve firmware flexibility, utilize the internet connectivity of the TI Launchpad
- Empty MQTT request on boot
- AWS Lambda function sees the request, sends down a message containing a list of sensors `module_sensors`
- Control loop considers `module_sensors[0]` to be the sensor hooked up on the daughter board's Sensor 1 port, etc

Challenge: Working with software libraries

- Most graph libraries for React Native have poor documentation
- It took a few implementations of different libraries to get our graph functionality working
- There isn't a date picking library for React Native that supports web integration



Questions?

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