Smart Watering with IoT

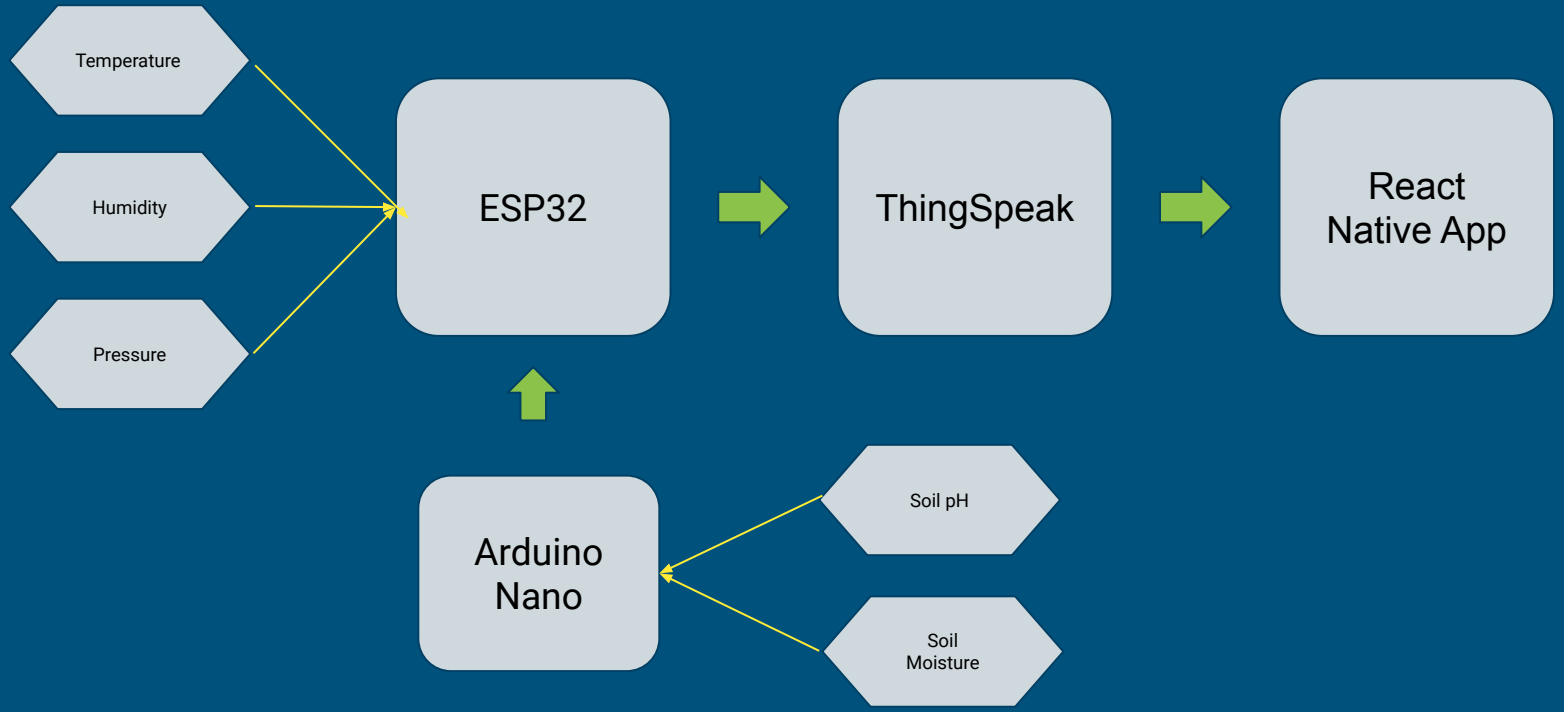
Kaede Kawata, Nyah Madison, Karin Luna, Inés Saavedra, Jordan Remar

Motivation

> Water scarcity, drought, and climate change will inhibit future ability to grow enough food to meet the demand required for an increasing population.

➔ We are creating an IoT-driven system that uses environmental data to predict the optimal time to water crops so farmers can meet the increasing food demand without wasting water.

Project Visualization

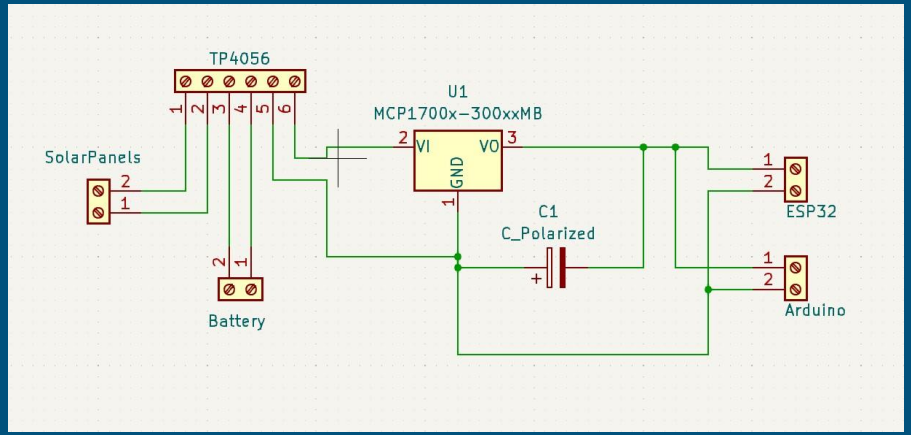


Completed work

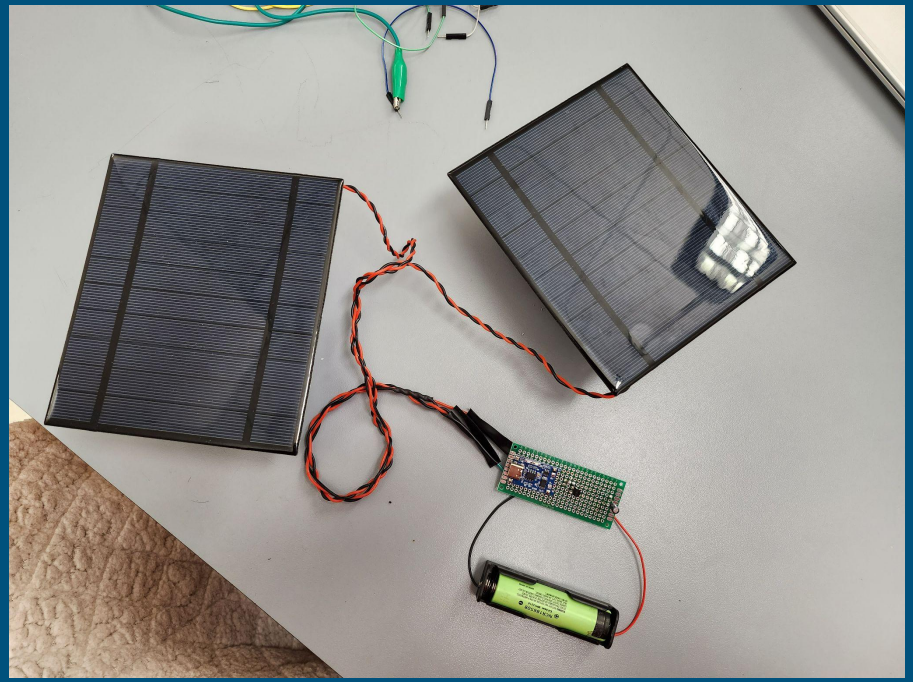
- ★ Pursue sustainability goals by powering our system using solar panels
- ★ Data pipeline from sensors to React Native working
- ★ User login and registration in React Native
- ★ Sensors capturing data correctly
- ★ Visualizing captured data in the app
- ★ Optimal watering alert system set up

Power System

- Powered using solar panels and a Li-ion battery
- Circuit tested to power ESP32 and Arduino Nano
- Tested on breadboard to show it is properly working



Power System



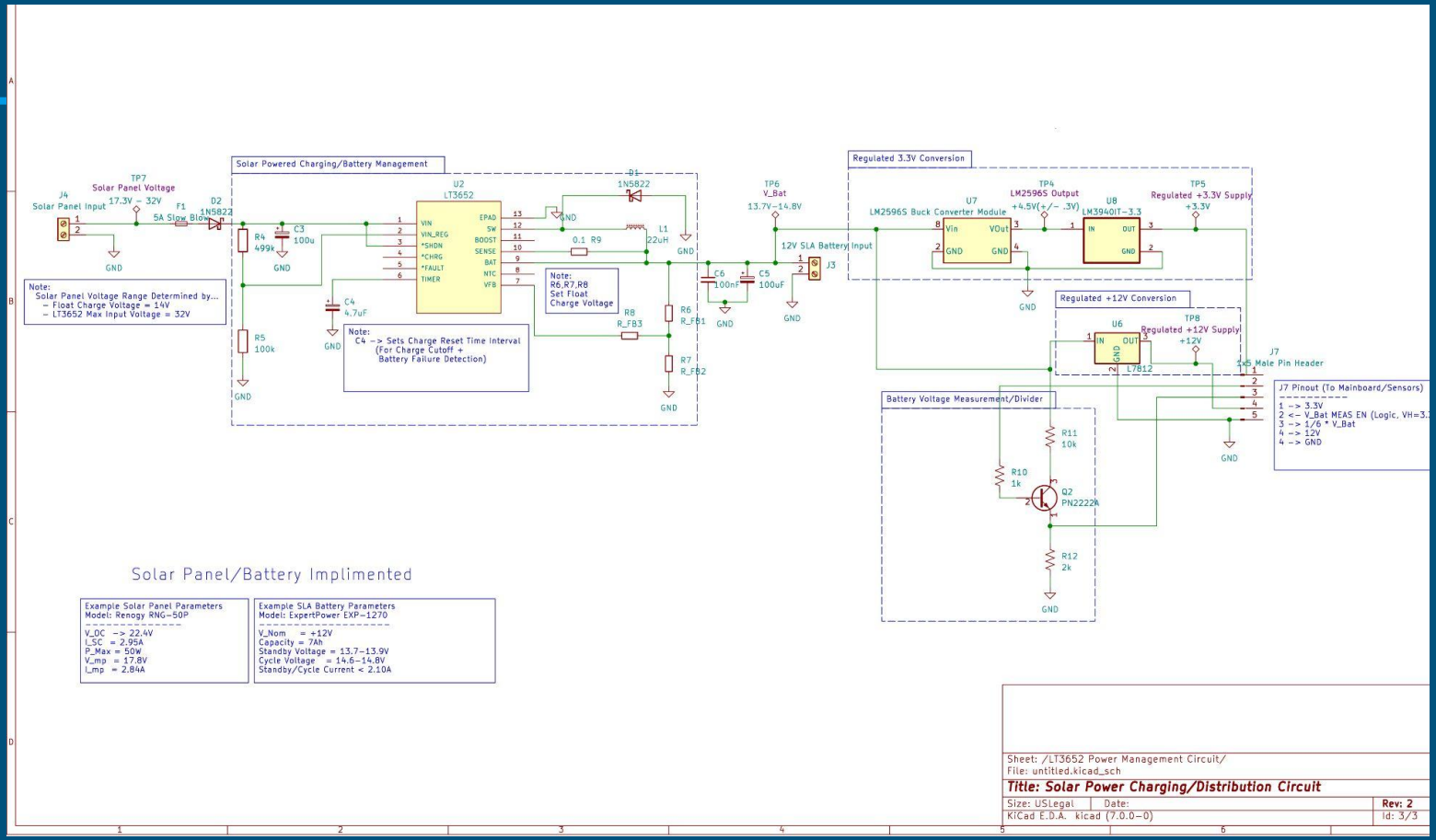
- Soldered onto PCB, tested to show that it is working properly
- Needs to be tested with all the sensors connected to devices
- Need to design weatherproof container

Power Distribution - Rev. 2

Goals

- Wish to implement Sealed Lead Acid Batteries
  - Typically operate at +12V or higher and don’t require balance charging
  - More cost efficient than Li-ion batteries on a cost/capacity basis
  - Less risk of thermal runaways/fires
- Maximize Efficiency
  - Minimize linear regulation to reduce power losses
  - Generate both 3.3V and 12V Supply Rails
- PCB Manufacturability

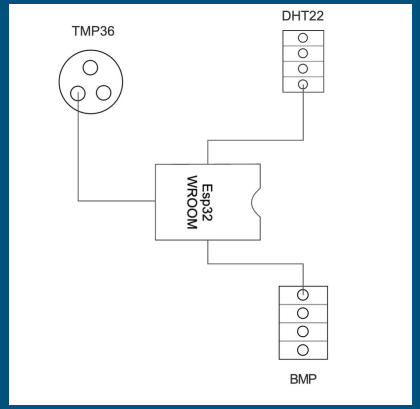
Rev. 2 - Schematic

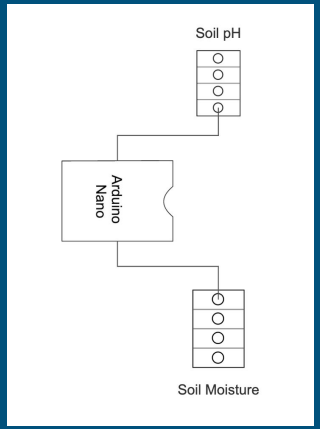


Controls

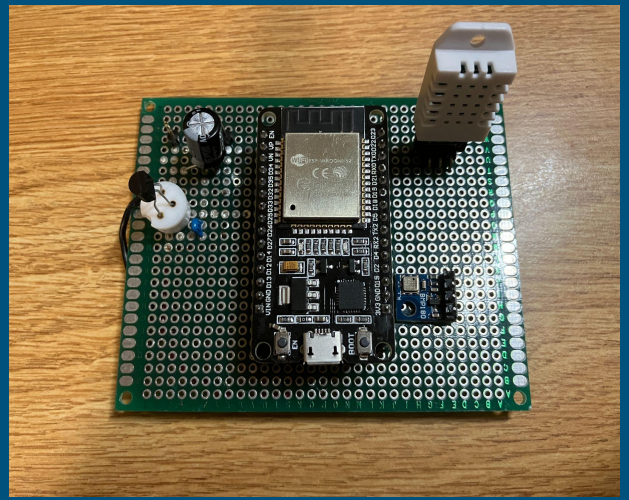
Sensors includes:

- Thermometer (TMP36)
- Humidity Sensor (DHT22)
- Pressure Sensor (BMP)
- Soil Moisture Sensor
- Soil pH Sensor

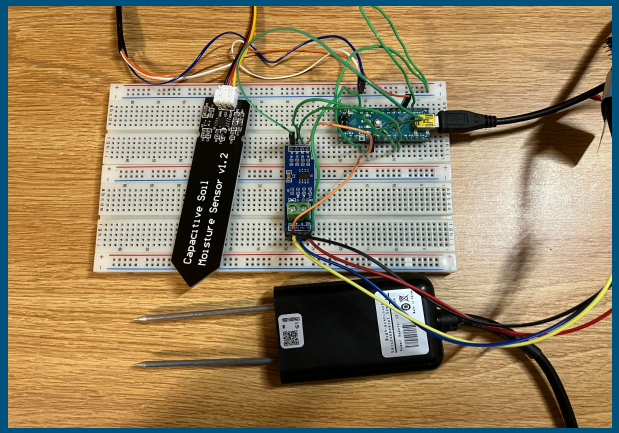




Controls



ESP 32

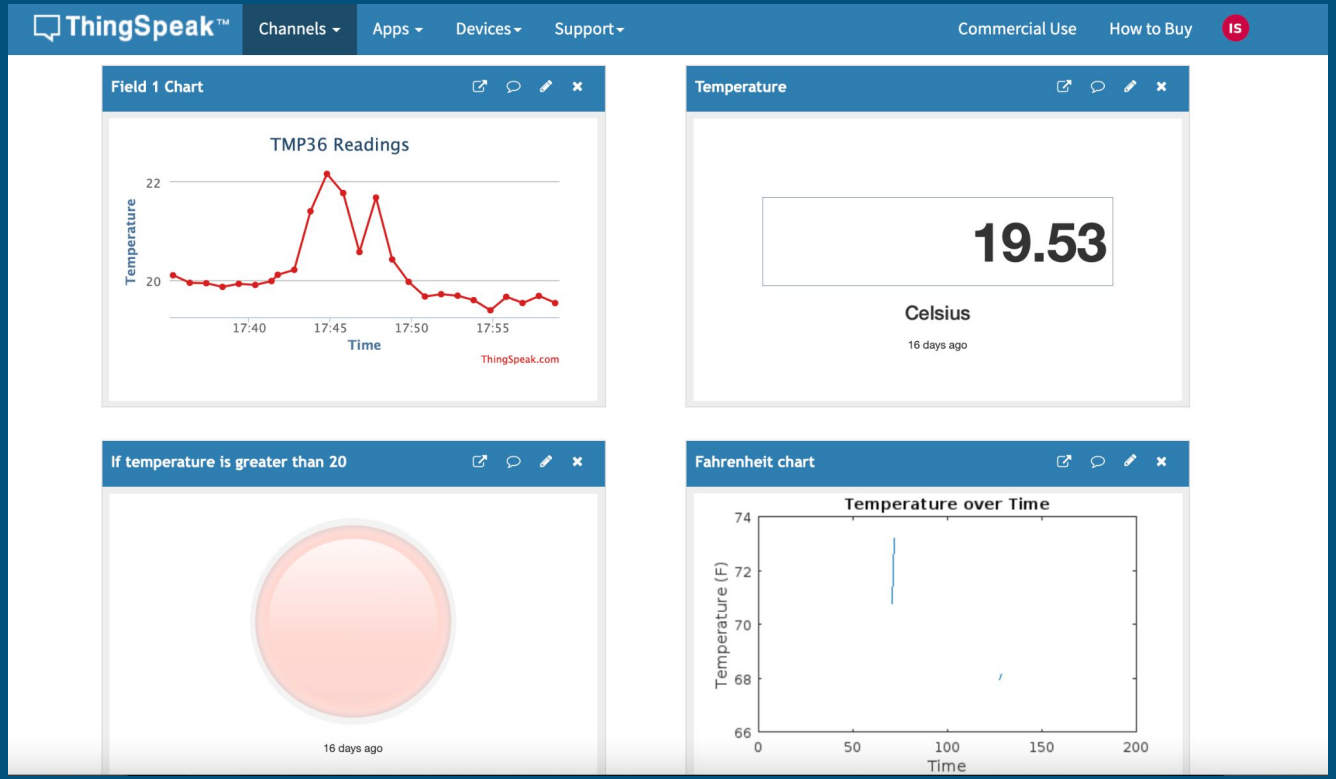


Arduino Nano

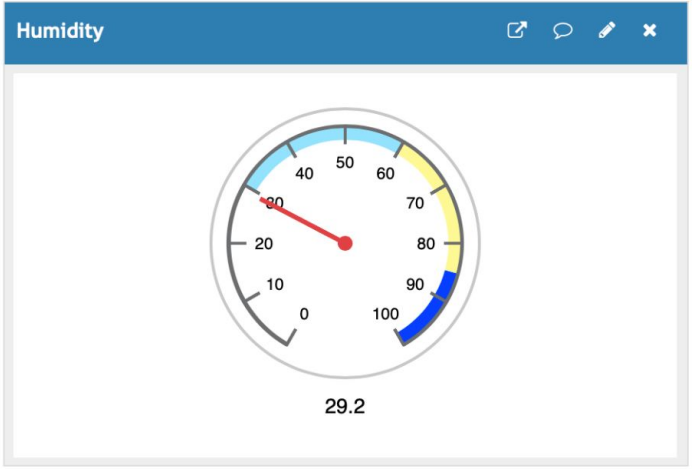
ThingSpeak

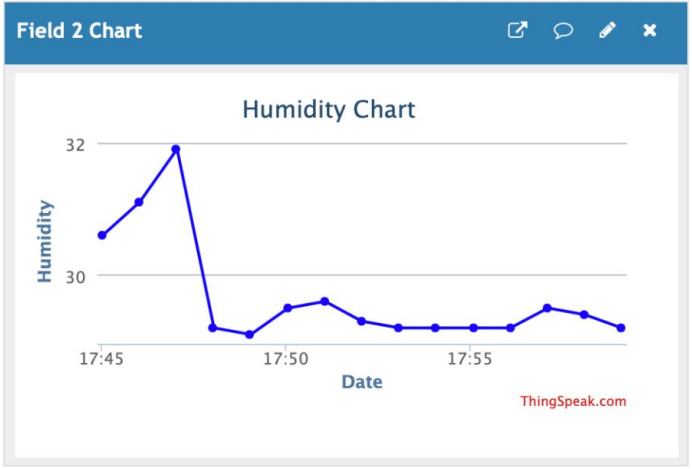
- Open-source IoT platform
- API and web-based interface for managing and accessing data

Field 1 - Temperature

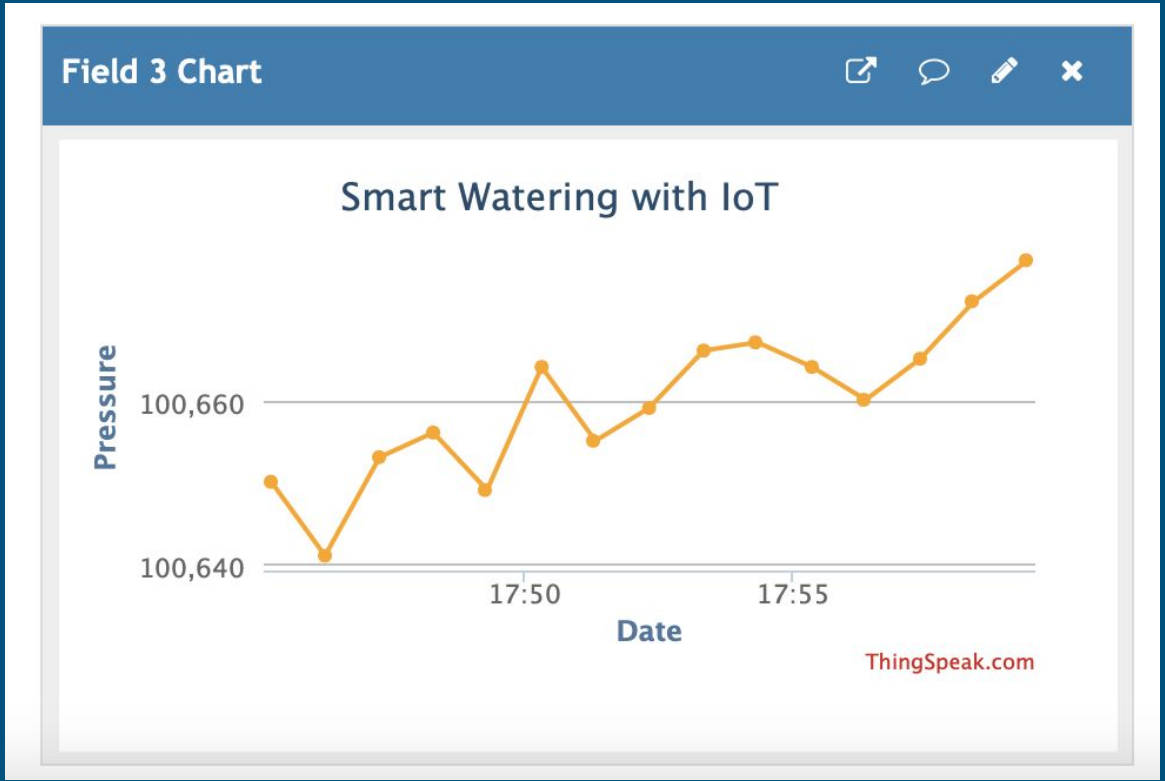


Field 2 - Humidity



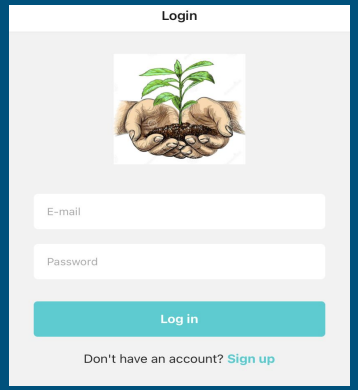


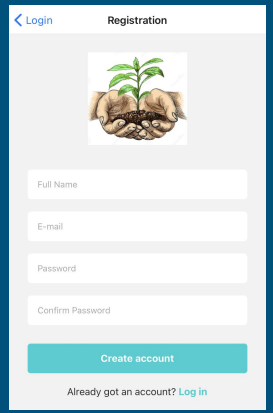
Field 3 - Pressure

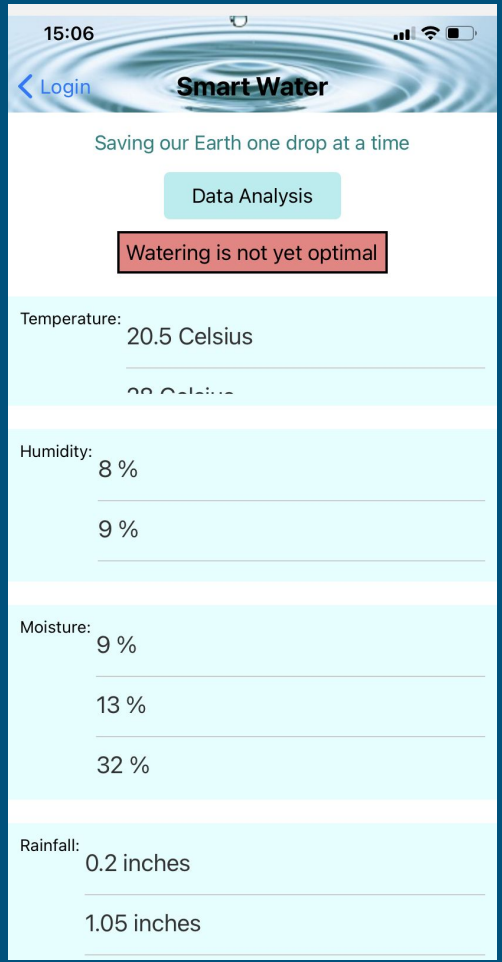


React App

- Firebase Authentication
- Account access from any device
- Alert system for optimal watering
- Dashboard for current system information
- Inclusive and easy to use

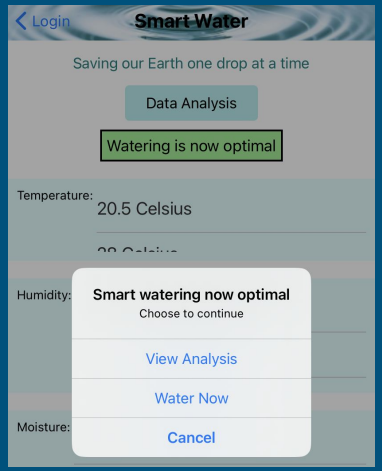


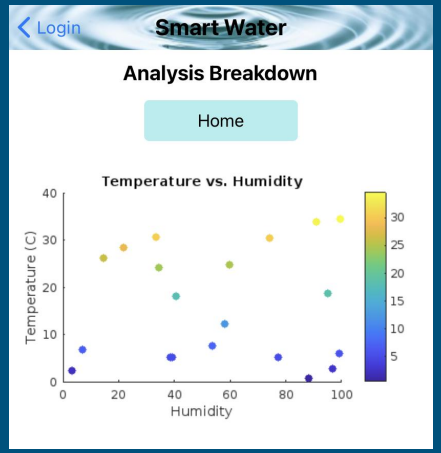


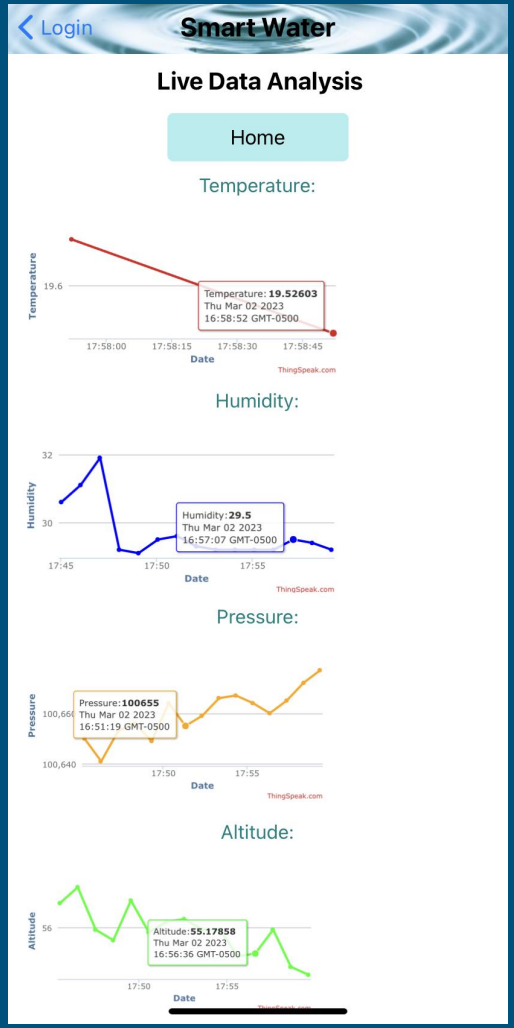


Data Analysis

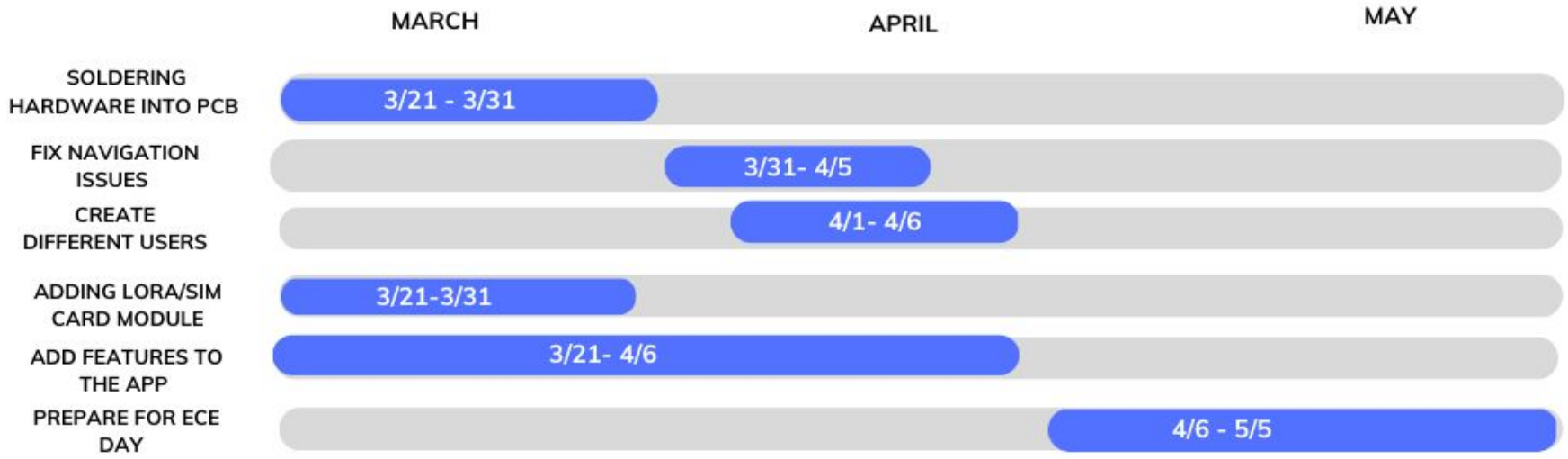
- Directly pipelined from ThingSpeak
- User actions options and system justification
- Interactive graphs of different measurements
- Live readings and analysis of current sensors







GANTT CHART


MARCH
APRIL
MAY
SOLDERING HARDWARE INTO PCB
3/21 - 3/31
FIX NAVIGATION ISSUES
3/31- 4/5
CREATE DIFFERENT USERS
4/1- 4/6
ADDING LORA/SIM CARD MODULE
3/21-3/31
ADD FEATURES TO THE APP
3/21- 4/6
PREPARE FOR ECE DAY
4/6 - 5/5