Requirements document for Hub:

For section 2 of this project, a proof-of-concept wireless Hub will be created to facilitate the transfer of data to and from the valve and web application. This Hub will connect to the world wide web via ethernet shield. This ethernet shield allows our hardware devices to read and write to an SD card for data transfer, as well as access ethernet libraries. The Hub is in charge of transmitting soil moisture data from the valve to the web application for authorized viewing. The Hub, in turn, sends the control conditionals to the valve.

The following is a tentative list of user stories relating to the Hub section of the project. The plan of action for development is an incremental procedure, in which the first steps are for getting acquainted with the technology. As the schedule progresses, the onboarding tasks will become more complex, until it builds into an actual project deliverable.

These user story deliverables are all minimal viable products (MVPs), meaning they will contain just enough features for functionality, but will gather feedback for future product development. There are also a number of stretch goals included in this project, including a google scheduling calendar.

HUB DESIGN CONSTRAINTS:

The following are the design constraints for the Hub portion of the project. These constraints are all hardware and software that our client would like to use. This preference is because the previous technologies and hardware are already being used in the organization, and are needed in order to maintain compatibility.

- **32u4 RFM95 LORA Radio (915 MHz)**
- **Ethernet Shield**
- **Arduino IDE**
- **MQTT**

EPIC:

Wireless Hub: As a user, I would like information to get from the Web App to the Valve.

User Stories:

1:       As a user, I want to use 32u4 RFM95 LORA radio, 915Mhz, ethernet shield, and stackable headers for this project.

Acceptance criteria:

Get familiar with these technologies, and Arduino, and be able to send signals to blink an L.E.D light.

2:       As a user, I want the system to communicate **to/from** the HUB using LORA

Acceptance criteria:

Simple information such as a text file should safely arrive from an external system, to the HUB, using Long Range radio frequency.

3: As a user, I want the HUB to **send AND receive** simple data to the valve and the web application.

> Acceptance criteria:

>> Simple information such as a text file should safely arrive **to/from** the HUB and VALVE, and the HUB and WEB APP.

4: As a user, I want the HUB to send the VALVE a **start time** and a **duration**.

> Acceptance criteria:

>> When the HUB sends a start time and a duration for use, the valve should open on the start time, and close after the duration.

5: As a user, I want the HUB to send/receive the VALVE a **unique ID number**, indication which valve the HUB is speaking to.

> Acceptance criteria:

>> Scenario: The HUB will be connected to 2 valves, and will send different time instructions to both of them, and see if they each operate independently.

6: As a user, I want the HUB to be able to send the valve different **modes** on which to operate.

> Acceptance criteria:

>> Mode 1: Valve opens and closes valve on **soil moisture data** alone.

>> Mode 2: Valve opens and closes based on **the time of day**, in **Real Time,** where real time will be a value **within 5 seconds of actual real time.**

>>> - **Stretch goal:** Google Calendar Scheduling system.

>> Mode 3: Valve opens and closes based on **both time of day and moisture data.**

>> **Stretch Goal:**   Manual mode

7: As a user, I want the HUB to send the VALVE some basic state information, including **date and time**, and the **Volumetric Water Content (VWC) threshold.**

> Acceptance criteria:

>> Mode 1: HUB sends/receives the **date and time**, and **the VWC threshold**, which is the parameter for moisture content in the soil.

8: As a user, I want the VALVE to **turn OFF** when the hub goes down.

> Acceptance criteria:

>> When an unexpected failure happens, such as loss in network, and the WEB APP doesn't respond, I want the VALVE to automatically turn to the **OFF** state, as to not let water flow out all night.

The total time for these user stories is about 15 weeks long, meaning it fits perfect in Fall/Winter term.

Tentative development Schedule