Water Weather Stations
Vision and Scope

Harrison Saliba and Daniel Shtunyuk

February 5, 2021

Version: 1.0

Ver.	Date	Who	Change	Who
1.0	10-20-2020	D.S. & H.S.	Initial document	

1 Business Requirements

1.1 Background

The Weather Water Stations project is an ongoing project with the SEA Discovery Center located in Paulsbo, WA. The projects goal is to educate youth campers on cyber-security, computer science, and electrical engineering. Students take a camp at the SEA Discovery Center and are able to take home a Water Weather Station in a small form factor to take readings of multiple water conditions.

1.2 Business Opportunity

The project offers an educational tool for youth campers that will attend the camp at the SEA Discovery Center. This will give youth an opportunity to learn more about how a system involving hardware, networking, and security to capture sensor data to create meaningful information about the current water conditions. This information is valuable, as it can be used to analyze changes in water conditions in many areas across the region.

1.3 Business Objectives and Success Criteria

The final deliverable is a system where campers can build their weather station, bring it home, make a secure connection to it, and upload that data to a online database. Campers will use the knowledge they learned at camp about secure connections to connect to the device. Then using the water weather and GPS location create useful data that can be used to track weather changes over the greater Pacific North West area.

1.4 Customer and Market Needs

By creating a system that campers take home that physically represents the ideas they learned at camp they will retain the knowledge they learned for a longer period of time and hopefully gain more interest in pursuing a STEM field. The system can accomplish this by having a repeatable task that campers can do to create data both meaningful to them and possible research on water temperatures.

1.5 Business Risks

There are risks that can impact a campers further interest in the project, if they do experience a form of failure either in the water weather station itself or through the Android and Web app. A camper could have a water weather station drown underwater if it isn't sealed against water properly. This shouldn't be a common risk, as the team will try to create a housing that is sealed properly against water. In the case that it does get submerged, there isn't much to be done other than replace the station and have the project team learn about the incident to build a better sealed housing. Another more critical failure point would be the server that stores all the data from the many water weather stations that will be submitting data through the android app. If the data on the server is lost or becomes corrupt, then all

the data that has been captured will not be accessible to the campers and the SEA Discovery Center. This is a very bad situation. The best way to mitigate this kind of issue is to make backups of the data and store them somewhere else than the main server. This way, if the main server ever goes down, the data is stored on another server to increase redundency of the data.

2 Vision of the Solution

2.1 Vision Statement

We will create a system for students to practice their cyber-security knowledge and create useful data for The SEA Discovery Center. The Water Weather Stations is a system of hardware and software that allows for the secure collection of water weather data by students from the SEA Discovery Center. Unlike an online or local hardware connection our product is a combination of both that gives students the ability to make physical secure connections and globally useful data.

2.2 Major Features

The project will consist of three major code bases: the water weather station hardware code, the Android application used to create a Bluetooth connection to the weather station, and the web interface for displaying collected data in a relevant way. Along side the web interface there will be a database that can store and organize the collected data.

2.3 Assumptions and Dependencies

The product depends on having a camper that will setup the water weather station and have access to an area of water where they can safely deploy the water weather station and leave it in the water indefinitely. The area of water where the water weather station is to be deployed will have basic access to the internet, either through an Internet Wi-Fi connection or a cellular data network, to upload the data retrieved from the water weather station. This project also requires the camper has an Android device, since the application is currently only built for Android OS. In order to collect data, the camper is expected to periodically check-in the water weather station and retrieve data from the station to send it to the web server.

3 Scope and Limitations

3.1 Scope of Initial Release

This is a continuation of the on-going project with work from a previous team. For the station, We will finish implementing the current sensors and add a new additional sensor to the station. The station firmware will be updated to have the new sensor implemented, to read the sensor, log the data, and to send it to the Android app. The Android app will need

to read and send the data logs, with the new sensor along with the other sensors, to the database with an encrypted connection. For the web app, we will continue to finish up and complete the web app to get it up and running live, with a simple, visual representation of the data logs from the many water weather stations. For the Android app, we will implement the communication between the android app and the database which will be storing all the station data logs and making sure the data is transmitted reliably and securely using an encrypted connection.

3.2 Scope of Subsequent Releases

As development progresses, we would like to add a visual guide on the Android app for the campers when they first receive the station and install the Android app. The guide will guide the user on how to assemble the station together and how to connect and retrieve data from the station. For the web app, we want to add filters and sorting options for the visual representation of the station data. For the station, we would like to improve the power usage of the station, through more battery capacity, more efficient and optimized code, and testing different times between sleep and wake of the station.

3.3 Limitations and Exclusions

We have a couple limiting factors, mainly the funding for the stations. As these stations will be used at the SEA Discovery Center's Cyber-Security Summer Camp, the material costs for creating the devices will be funded by sponsors of the camp. We are currently limited to $50 per station with the current housing and internal hardware components. We will not be able to modify the housing design of the current station, since that will change the layout and circuitry of the station and there is not enough available time to fulfill such a redesign of the hardware.

4 Business Context

4.1 Stakeholder Profiles

4.1.1 SEA Discovery Center

The SEA Discovery Center will benefit by being able to engage students after they have left their campus. This will allow for greater retention and aid in their goal of youth education on cyber-security.

4.1.2 SEA Discovery Center Students

SEA Discovery Center students will be able to create meaningful data using what they learned at the cyber-security camp. This allows for a deeper understanding of why cyber-security is important and a meaningful impact on the students education.

4.1.3 The general public

The General public will be able to access the water weather data collected by students and be able to get copies of this information for free through the web application.

4.2 Project Priorities

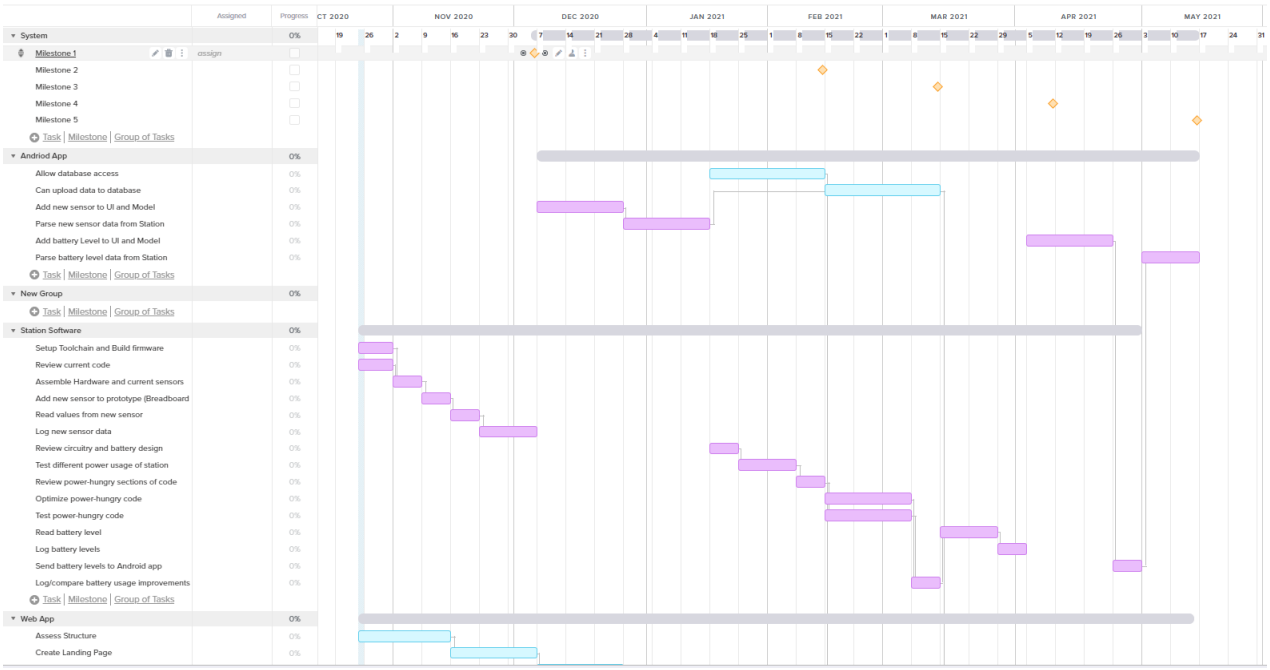
The most important features will be the hardware, hardware code and Android app. These three things must work together to allow students to operate them freely. Then the ability for the Andriod app to connect to the database and store the collected information remotely. Finally, the web-app that must make the stored data relevant, organized, and available to the public.

4.3 Operating Environment

Each layer will require its own operating environment. The water weather station will physically exist in the water and must be built appropriately. The hardware code, written in C and compiled to the specific machine code of the processor picked for the hardware, will run on the given processor in the weather station. The Android app will exist on an Android device capable of Bluetooth connections that will connect to the weather station securely. The database will be hosted on a sever connected to the internet and will allow for the secure addition of data and public access. The web app will also be hosted on a server connected to the internet and allow for public connections and display the data that exists in the database.

5 Schedule

5.1 Gantt Chart



5.2 Key Milestones

5.2.1 Milestone 1 (Dec 4, 2020)

Our web app will have a landing pages users go to when visiting our site.

5.2.2 Milestone 2 (Feb 12, 2021)

The Android app will be able to connect to the database.

5.2.3 Milestone 3 (Mar 12 2021)

The user should be able to view the data in the database and the app should be able to upload to the database.

5.2.4 Milestone 4 (Apr 23, 2021)

The User Interface should be optimized to seem fluid and be easy to read.

5.2.5 Milestone 5 (May 14, 2021)

The website should include a way to download copies of all the data points for further analysis.

5.3 Resource Assignments

The device should cost less than 50 dollars to lower costs. The web app and database can be hosted on the school network for an unknown amount. But it should be containerized for easy deployment in multiple settings. The web app should also have minimal traffic so not too many resources should be allocated.

5.4 Individual Responsibilities

Harrison is responsible for the creation of the database and web app.

Daniel is responsible for the additions to the hardware and Android app.

6 Deliverables

6.1 Software/Hardware

A piece of hardware with novel data measurements compared to the last iteration. A functional Android application for reading the new data points we added to the buoy. An optimized and user friendly Webb Application for viewing the processed data.

6.2 Documentation

Documentation on proper assembly of the device, proper use of new feature in the Android app, and proper documentation and instruction for the web-app.

6.3 Key Presentations

We will present our project at the end of 492 and 493.

6.4 Other Deliverables

We may offer in-person training on the assembly of the device given safe COVID protocols.