Weather STATION PROJECT

Project ClosURE

FINAL REPORT

Version 1.0

07/19/2022

Sponsor: George Seto

Mentor: Valerie McQueen

VERSION HISTORY

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Version #** | **Implemented**  **By** | **Revision**  **Date** | **Approved**  **By** | **Approval**  **Date** | **Reason** |
| 1.0 | *Wired Technocrats* | *07/18/2022* | *Valerie McQueen* | *07/18/2022* | *This single version encompasses all the features propounded by the sponsor.* |
|  |  |  |  |  |  |
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**UP Template Version:** 11/30/06

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# General Project Information

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| --- | --- |
|  | **Description** |
| **Project Name** | Weather Station Project |
| **Project Description** | The weather station project is a product use for detecting the real-time analog values of the weather by cerating a trend reports onto the thingspeak. Furthermore, comes with a features of detecting the level of harmful gases present in the surrounding. |
| **Project Lead** | Shreyash Vijay Ankam |
| **Project Sponsor** | George Seto |
| **General Comments** | The component used for measuring the analog values are BME680, RJ-11, Davis Anemometer, ESP32, LoRa and Arduino Mega 2560 for the overall compilation of libraries of various sensors. |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Baseline** | **Actual** | **Variance** | **% Variance** |
| **Start Date** | 10/14/2021 | 10/14/2021 | 0 | 0% |
| **Finish Date** | 07/26/2022 | 07/17/2022 | 9 | -4% |
| **Hours** | N.A. | N.A. | N.A. | N.A. |
| **Days** | 204 days | 195 days | -9 days | -4% |
| **Budget** | $500.00s | $446.32s | $-53.68 | -1% |

# 

# Executive Summary

The main objective of the mobilized solar powered weather station project is to detect several toxins components present in the surrounding. Also to detect the amount of detrimental effects if has onto the flora and fauna nearby. The module has made with a compatibility of providing a user with an real-time gas levels alongwith a weather information at particular locations.

Furthermore, providing a user with an trend reports of all the analog values detected by various sensors. The trend reports provide a vivid collection of data from the past and assist in creating a data useful for predicting the future weather condition of that particular locations. The trend reports are compartmentalize in a manner to display an each analog values such humidity, gas level, rainfall in mm, temperature, wind speed , wind direction, approximately altitude and pressure.

Having been driven by a solar panel, the continuous flow of power to the system makes the project a reliable option to opt for the end-consumer. Furthermore, to provide the backup the overall MPPT plays a significant role which makes this project having a longer life.This makes this project a all-in-one features.

*Encompassing of large variety of the features of detecting the anlaog values and providing the real-time detail on the cloud has made the project all-purpose. The updated status of the project is that Instead of Lora we used ESP8266 (WiFi module) with Arduino Mega to directly send data from RJ15 and Davis anemometer to Thinspeak through WiFi. This was is done to eliminate the complexity of data transfer. This module is then powered by a 6Solar power management board, we get a constant 5v supply with help of the 3.3V rechargeable battery which is recharged using a solar panel.*

*The second setup is BME680 is connected to ESP32 which directly sends real-time data to things speak. We have made this setup separate so it is easy to carry and more mobile and can be used to detect air quality in different locations this can easily be powered using a power bank. The project was successful in extracting data from all the sensors and displayed the result in different graphical and numerical forms in the Thingspeak private channel. The project is successfully completed and handed over to Ritchie Gordan.*

# Lessons Learned

**Issue 1**: Had to decide whether to go with Raspberry Pi or Arduino Mega.

* Solution: We choose Arduino Mega since it has more GPIO pins compared to Raspberry Pi. Moreover, Raspberry Pi is literally a bit too much for the project we just need a controller that gets data and transfers it to Thingspeak and Arduino IDE is simple to work with as well.
* Lesson learned: Arduino has more GPIO pins than raspberry pi and Raspberry Pi is overpowering this project.

**Issue 2:** Issue with overall power calculation of solar panel and finalizing the sensors, especially with a rain gauge.

* Solution: We took the guidance of Prof. Mohammad Mousa with the overall power calculation of our project and decided to go with a 3W 12V solar panel and use a Solar power management board with a 3.3 V rechargeable battery to power up Arduino mega with a constant supply of 5v.

We had issues with RJ11which used a 7V input supply, we changed it to RJ15 with an input voltage of 5v which can be directly powered by Arduino mega pins.

* Lesson learned: Power Calculation depends on the two aspects of this project such as power consumption from all the sensors with the Arduino board and the Rechargeable battery which has to be charged by the Solar Panel. Thus, a 3.3 V rechargeable battery will charge up the Arduino board and 3W 12V will charge up the rechargeable battery with help of the Solar power management board.

**Issue 3**: There were interfacing issues with Davis Anemometer.

* Solution: We were reaching on the connection of Davis anemometer to Arduino board since it was used for both Windspeed and direction it used both digital and analog pins we built a step up with approximately 4k pullup resistors which measure the wind speed as high as 5V and Low as 0 which avoids false float triggers while it calculates the speed.
* Lesson Learned: As said the Davis anemometer needs to be connected to pin 2 which has to be connected to a pull resistor of 4k which pulls the pin 2 to 5v switch is open, If we don’t use a pullup resistor it will cause the circuit voltage to float and gives false trigger on the inputs.

**Issue 4**: Configuration issues with libraries and boards in Arduino IDE. The coding part of the data transfer from the board to Thingspeak was a bit complex.

* Solution: We had to figure out different libraries to use so that we can use the inbuilt function which can be used instead of creating a new function to avoid the complexity of the code. Boards such as ESP32 and Arduino Mega had been installed. The coding part of the sensor was done but the WiFi and the transmission part were the figured using WiFi.h library and sent data as strings to the Thingspeak with API of it which was successful.
* Lesson Learned: The was a different set of libraries that had to be used for different sensors used and for the module to connect to WiFi. We have used two different board to run the code one is Arduino Mega and ESP32 which has to be given correctly with the proper port. The Code had to be modified according to the pins and their functions.

**Issue 5**: The LoRa module of the transmitter wasn’t working as we expected and made the whole process complex to transfer the data and receive.

* Solution: We used ESP8266 WiFi module with Arduino Mega so it can directly send data to Thingspeak instead of using the whole LoRa node and Gateway made the whole process simple.
* Lesson Learned: The LoRa module transmitter wasn’t sending the data as we wanted to so this changed the whole project setup instead of sending data from the node to the gateway and then to Thingspeak we decided to send data directly to the Thingspeak from both Arduino and ESP32 by adding ESP8266 with Arduino mega which gives it WiFi access and ESP32 itself is a WiFi module.

**Issues 6**: Removing the LoRa changed the whole setup of the project and the project looked more stationery with all the huge sensors in and big box it was hard to carry or mobile.

* Solution: The main objective was to make the project more mobile as possible using solar panels so, we took ESP32 and attached it with BME680 which made it like a remote which can be carried within a palm and can measure Air Quality, Temperature, Humidity and Pressure of different location powered up using power bank. The Arduino Mega with RG15 and Davis anemometer can still use a Solar panel to power it up can be mobile or stationary and the data will be stored in the Private channel of the Thingspeak at the same time.
* Lesson Learned: The project’s major concern was to make it mobile to measure the air quality in a different location so by making BME 680 and ESP32 separate and handy modules will achieve that so it can be carried around like a mobile device and can sense the gases.

# Administrative Closure

* Team have not borrowed any equipment from the college so team had nothing to return to the college.
* As sponsor is on vacation, he advised team and gave authority to handover project to college lab faculty Ritchie Gordan.
* After Final Technical Review and approval from mentor Valerie McQueen, project was handed over to Ritchie Gordan on August 04, 2022.

# Information Distribution & Archive

|  |  |  |
| --- | --- | --- |
| No. | Document Name | One Drive Archive Link |
| 1. | Project Management Plan | [Wired\_Technocrats Project\_Management\_Plan.docx](https://ssfcollege-my.sharepoint.com/:w:/g/personal/aappiah_flemingcollege_ca/EaF7vpGE14lCsDDrAfWb5VQBVO2uW825K3UhutT1U7SUQw?e=ysgtjZ) |
| 2. | Gantt Chart | [WiredTechnocrafts\_GanttChart.mpp](https://ssfcollege-my.sharepoint.com/:u:/g/personal/aappiah_flemingcollege_ca/EVzJiBRGXSFOt8ykXgqiQtIBgHYIQ6PEN5uJ2Y664z6RgA?e=jaxVTe) |
| 3. | Requirement Breakdown Structure | [Wired\_Technocrats REQUIREMENT BREAKDOWN STRUCTURE.docx](https://ssfcollege-my.sharepoint.com/:w:/g/personal/aappiah_flemingcollege_ca/Edt6B3X1bZ1OsHkMTfjRD0ABCznKwdFafsl99fc5slpDBg?e=cmk8Yl) |
| 4. | Issue Log Report | [Wired\_Technocrats ISSUE LOG Report.docx](https://ssfcollege-my.sharepoint.com/:w:/g/personal/aappiah_flemingcollege_ca/EbxXJ9eOeWVJgKMLmK3wy-gB4Tyvs7cZYK8TDECByWyy6w?e=jMdVH3) |
| 5. | Product Backlog Report | [Wired\_Technocrats Product backlog.docx](https://ssfcollege-my.sharepoint.com/:w:/g/personal/aappiah_flemingcollege_ca/EY9ln3FmNjFDkFEX3iHjnwUB2H43H7rzyhfpvk4IVy27Vg?e=11lOm2) |
| 6. | Project Charter | [Wired\_Technocrats Project Charter.docx](https://ssfcollege-my.sharepoint.com/:w:/g/personal/aappiah_flemingcollege_ca/Eeq9Z31QhQ5InmGUcqJmUq0BnI01fW9Vftd1XKRlIRKamA?e=PLixCe) |
| 7. | Cost Estimation | [Wired\_Technocrats Cost Estimation.docx](https://ssfcollege-my.sharepoint.com/:w:/g/personal/aappiah_flemingcollege_ca/EfVacow89JJNk5e3QT8DU7ABlQw755fZMj7DJmRDCOdr6g?e=aDBTtq) |
| 8. | Team Retrospective (start.stop activity) | [Wired\_Technocrats Team Retrospective Stop.Start.Continue Activity.xlsx](https://ssfcollege-my.sharepoint.com/:x:/g/personal/aappiah_flemingcollege_ca/EUdnSR9YZWdLk-VoH4YM96sBxSLeWSwrqpRnygJ6UaLXng?e=0OkPvZ) |
| 8. | User Tutorial / Manual | [UserGuidance .mp4](https://ssfcollege-my.sharepoint.com/:v:/g/personal/aappiah_flemingcollege_ca/EZqwVORWEaFOmHmXNfKojisBANqMXHmoFDHYsZtdwWIgaQ?e=IDMEkP) |
| 9. | Project Closure Report | [Project Cloure Report](https://ssfcollege-my.sharepoint.com/:f:/g/personal/aappiah_flemingcollege_ca/EngR9EhrPvRKuuOp4ZhHn9sBR5FKSDv5x6CI_QfAAB6QKQ?e=nyZ2yk) |
| 10. | Poject Code | [Code](https://ssfcollege-my.sharepoint.com/:f:/g/personal/aappiah_flemingcollege_ca/Epk4VnfwC9dMqoLGNp1D3koBso1Ro47v_lA1mg4UH5GeAQ?e=6LIilz) |

The undersigned acknowledge they have reviewed the Project Close-Out Form and in the capacity of Project Sponsor, Project Mentor and Applied Project Team, agree with the approach it presents.

**SPONSOR**

|  |  |  |  |
| --- | --- | --- | --- |
| Signature: |  | Date: |  |
| Print Name: | George Seto |  |  |
| Title: |  |  |  |

**MENTOR**

|  |  |  |  |
| --- | --- | --- | --- |
| Signature: |  | Date: |  |
| Print Name: | Valerie McQueen |  |  |

**PROJECT TEAM MEMBERS**

|  |  |  |  |
| --- | --- | --- | --- |
| 1 Signature: |  | Date: | Aug 03, 2022 |
| Print Name: | Shreyash Vijay Ankam |  |  |
| 2 Signature: |  | Date: | Aug 03, 2022 |
| Print Name: | Keyur Patel |  |  |
| 3 Signature: |  | Date: | Aug 03, 2022 |
| Print Name: | Robin Sharma |  |  |
| 4 Signature: |  | Date: | Aug 03, 2022 |
| Print Name: | Sarthak Sehrawat |  |  |
| 5 Signature: |  | Date: | Aug 03, 2022 |
| Print Name: | Sam Jeyaraj jaychandrabose |  |  |

# AppendiCES: References

The following table summarizes the documents referenced in this document.

|  |  |  |
| --- | --- | --- |
| **Document Name and Version** | **Description** | **Location** |
| Project Management Plan | This document describes the overall goal, scope, and detailed explanation of the project and implementation. | [Wired\_Technocrats Project\_Management\_Plan.docx](https://ssfcollege-my.sharepoint.com/:w:/g/personal/aappiah_flemingcollege_ca/EaF7vpGE14lCsDDrAfWb5VQBVO2uW825K3UhutT1U7SUQw?e=ysgtjZ) |
| MS Project Gantt Chart | This document elaborates on the overall breakdown of the workflow, as well as the graphical representation of the Gantt Chart. It includes the detailed task implementation, as well as the time and other resources needed to complete it. | [WiredTechnocrafts\_GanttChart.mpp](https://ssfcollege-my.sharepoint.com/:u:/g/personal/aappiah_flemingcollege_ca/EVzJiBRGXSFOt8ykXgqiQtIBgHYIQ6PEN5uJ2Y664z6RgA?e=jaxVTe) |
| Project Charter | The project charter explains the purpose of the project as well as the goals, objectives, success criteria, risks, and constraints that the team considered before starting the project. | [Wired\_Technocrats Project Charter.docx](https://ssfcollege-my.sharepoint.com/:w:/g/personal/aappiah_flemingcollege_ca/Eeq9Z31QhQ5InmGUcqJmUq0BnI01fW9Vftd1XKRlIRKamA?e=PLixCe) |
| Product Backlog Report | In this document, user requirements are broken down into user stories in order to track project progress and complete each user story as a milestone in a bid to fulfill all user requirements. | [Wired\_Technocrats Product backlog.docx](https://ssfcollege-my.sharepoint.com/:w:/g/personal/aappiah_flemingcollege_ca/EY9ln3FmNjFDkFEX3iHjnwUB2H43H7rzyhfpvk4IVy27Vg?e=11lOm2) |
| Issue Log | In this document, the team has logged all of the issues encountered and overcome during the project's execution phase. | [Wired\_Technocrats ISSUE LOG Report.docx](https://ssfcollege-my.sharepoint.com/:w:/g/personal/aappiah_flemingcollege_ca/EbxXJ9eOeWVJgKMLmK3wy-gB4Tyvs7cZYK8TDECByWyy6w?e=jMdVH3) |
| Cost Estimation | This file contains the cost estimates generated by the team while developing the procurement list. | [Wired\_Technocrats Cost Estimation.docx](https://ssfcollege-my.sharepoint.com/:w:/g/personal/aappiah_flemingcollege_ca/EfVacow89JJNk5e3QT8DU7ABlQw755fZMj7DJmRDCOdr6g?e=aDBTtq) |
| Instruction Manual | It is a tutorial video that provides a detailed tour of the features available to the user. | [UserGuidance .mp4](https://ssfcollege-my.sharepoint.com/:v:/g/personal/aappiah_flemingcollege_ca/EZqwVORWEaFOmHmXNfKojisBANqMXHmoFDHYsZtdwWIgaQ?e=IDMEkP) |

# References:

Project Closeout Template: <https://www2a.cdc.gov/cdcup/library/templates/CDC_UP_Project_Close_Out_Template.doc>

Procurement list:

<https://ssfcollege-my.sharepoint.com/:w:/g/personal/aappiah_flemingcollege_ca/EfVacow89JJNk5e3QT8DU7ABlQw755fZMj7DJmRDCOdr6g?e=aDBTtq>

ThingSpeak: