Weather Station User Manual

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REPRESENTATIVE

Brandon Jackson

Brian Atiyeh

Trevor Malarkey

Joynal Abedin

Leng Lee

Alumgur Uddin

Justin Roy

Naim Cekaj

Version History

Date	Version	Author	Comments
4/12/2018	v1.0	Brian Atiyeh	Document skeleton
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12/10/2018	v2.0	Joynal Abedin, Leng Lee, Alumgur Uddin, Justin Roy, Naim Cekaj	2018 Fall Final Version

Table of Contents

Installation

Any instruction written with the following font style must be entered into a terminal instance.

```
# This is a comment that has additional information this is a command
        in a terminal
```

Raspberry Pi Weather Station Setup

The following instructions must all be completed on the Raspberry Pi you will be using as the weather station.

GPS Sensor

The GPS sensor that the Weather Station application supports is the U-Blox 7 GPS USB Dongle

1. Ensure the GPS sensor and Raspberry Pi is near a window or outside.
2. Install the necessary GPS libraries for data retrieval.
   a. `sudo apt-get install gpsd gpsd-clients python-gps`
3. Connect the device to the gpsd library socket
   a. `sudo gpsd /dev/ttyACM0 -F /var/run/gpsd.sock`
4. Open the gpsd.sock file
   a. `sudo nano /etc/default/gpsd`
5. Add the following lines to the bottom of the gpsd.sock file
   a.
   ```
   # Other options you want to pass to gpsd
   START_DAEMON="true"
   GPSD_OPTIONS="/dev/ttyACM0"
   ```
      i.
      ```
      DEVICE=
      ""
      USBAUT
      O="true"
      ```
      ii. `GPSD_SOCKET="/var/run/gpsd.sock"`
6. Reboot the Raspberry Pi.
   a. `sudo reboot`

7. Test that it is working
    a. # Wait a minute or two for it to find a satellite # If it is not working, try running step #2 again cpgs -s

Sense Hat

*Optional - use either this or the individual sensors listed below
This application supports the Raspberry Pi Sense Hat which includes temperature, pressure, and humidity sensors along with various other additions.

1. Plug in the Sense Hat on top of the Raspberry Pi using all 40 GPIO Pins
2. Install the Sense Hat library
    a. sudo apt-get update
    b. sudo apt-get install sense-hat
3. Reboot Raspberry Pi
    a. sudo reboot

Individual Sensors

*Optional - use either this or the Sense Hat listed above
This application supports the AM2302 Temperature and Humidity Sensor and the Adafruit BMP280 Pressure Sensor.

For connecting the AM2302 Temperature and Humidity Sensor:

1. Make sure that the sensor is open and not being covered by anything.
2. Connect the + wire to the 2 pin on the Pi which is for 5V of power.
3. Connect the - wire to the 6 pin on the Pi which is for Ground.

4. Connect the data wire to the 8 pin on the Pi which is for the GPIO 14.

For connecting the Adafruit BMP280 Pressure Sensor:

1. Make sure that the sensor is open and not being covered by anything.
2. Connect the female to female wires to the Vin, Gnd, Sck, and Sdi pins on the pressure sensor.

3. Connect the Vin wire to the 1 pin on the Pi which is for 3V of power.
4. Connect the Gnd wire to the 9 pin on the Pi which is for Ground.
5. Connect the Sck wire to the 5 pin on the Pi which is for the I2C clock.
6. Connect the Sdi wire to the 3 pin on the Pi which is for the I2C data.
7. Once all wires have been connected go to the Raspberry Pi configuration and enable I2C.
8. To make sure that the sensor has properly been connected you can run the command sudo i2cdetect -y 1

Weather Station Client

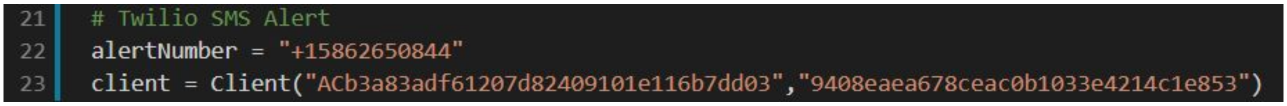
Station Set Up:

1. Navigate to the admin page if you have an account with administrator permissions (instructions for this on page #). If you do not have an administrator account, please contact the owner of the web application.
2. Click the “Download Client” button.
3. Extract all contents to a folder location of your choosing.
4. Follow the install instructions within the extracted files.

Twilio SMS Alert Set Up:

1. Obtain Twilio SID and authentication token from the following website
    a. https://www.twilio.com/try-twilio
    b. Follow the instructions to obtain your Twilio SID and authentication token
2. Once you obtained your SID and authentication token from Twilio insert those values and the number connected into ../alert.py at line 22 and 23.
    a. client = Client(<SID>, <AUTH_TOKEN>)

       Note: Save the SID and AUTH_TOKEN to be inserted later into a seperate file for handling alerts on the frontend.



```
21  # Twilio SMS Alert
22  alertNumber = "+15862650844"
23  client = Client("ACb3a83adf61207d82409101e116b7dd03","9408eaea678ceac0b1033e4214c1e853")
```

Fig-1

Development Setup (Locally)

Web Server Setup

This project requires the following dependencies before continuing the install:

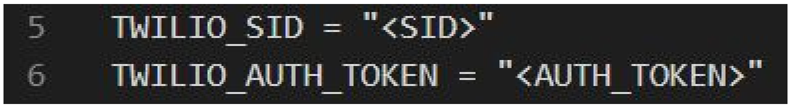
1. Node v9.5.0
2. Yarn v1.3.2
3. MySQL

Database Setup:

1. Create a MySQL user with the name "weatherstation" and password "ws1234".
    a. # Log into your MySQL shell. If you have a password on your root account # also add -p onto the end of the following command.
        i. mysql -u root
        ii. # Once logged in, create the user
        iii. mysql > CREATE USER 'weatherstation'@'localhost' IDENTIFIED BY 'ws1234'; # Grant all privileges to the new user you have created
        iv. mysql > GRANT ALL PRIVILEGES ON * . * TO 'weatherstation'@'localhost'; mysql > FLUSH PRIVILEGES;
2. Create a database with the name weatherstation while logged into your MySQL shell.
    a. mysql > CREATE DATABASE weatherstation;

After you have installed the above dependencies:

1. Using your terminal, cd into where you want to store your project directory.
2. Install nodemon globally
    i. npm i nodemon -g
3. Clone the git repository
    i. git clone https://github.com/batiyeh/weather-station-site
4. Navigate inside the weather-station/website directory
    i. cd weather-station-site/website
5. Open .env file and update TWILIO_SID and TWILIO_AUTH_TOKEN with your tokens from twilio
    i. code .env



```
TWILIO_SID = "<SID>"
TWILIO_AUTH_TOKEN = "<AUTH_TOKEN>"
```

6. Navigate back to the weather-station directory:
    i. cd ..
7. Install all required dependencies for both the server and the website
    i. npm install; cd website; npm install; cd ../
8. Create all necessary database tables
    i. npm run migrate
9. If you are running the server in production
    i. cd website/; npm run build; cd ../
    ii. npm run prod
10. If you are running the development server
    i. npm run dev

Weather Station Client

Generating a New Weather Station Build:

1. Open up a terminal and navigate into the client folder of the source code
2. Create a new python env.
    a. python3 -m venv env
3. Download the sensor libraries
    a. Temperature/Humidity: https://github.com/adafruit/Adafruit_Python_DHT
    b. Pressure: https://github.com/batiyeh/Adafruit_Python_BMP
    c. Sense Hat: https://github.com/RPi-Distro/python-sense-hat
4. Install all 3 sensor libraries into the created env folder. Do the command shown below in each downloaded sensor library folder.
    a. # Example of which directory to be in cd Adafruit_Python_DHT
       /path/to/env/version/of/python3 setup.py install
5. Activate the env and Install the requirements
    a. *../env/bin/activate*
    b. *pip3 install -r pi-requirements.txt*
    c. # verify RTIMULib 7.2.1 installed successfully
       pip3 freeze
    d. # if RTIMULib did not install download from
       https://github.com/RPi-Distro/RTIMULib

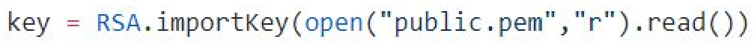
    e. *cd RTIMULib/Linux/python*
    f. */path/to/env/version/of/python setup.py install*
    g. repeat step ‘b’

6. Edit BIOS Settings
    a. Terminal: sudo raspi-config
    b. interfacing options (default 5)
    c. SPI (Enter) (default 4)
    d. "Would you like SPI interface enabled?" (YES)

7. Generate a new Private + Public Key
    a. open a new terminal on the Master Pi
    b. #enter command to clone
       git clone https://github.com/Joy57/WSU-RaspberryPi-WeatherStation-Final
    c. # enter command to create directory to store keys
       mkdir MasterStation
    d. # enter command to generate keys
       python /path/to/script/keyGeneration.py

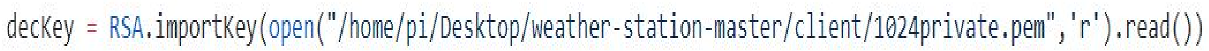
8. Getting Scripts needed for Master
    a. open a new terminal on Master Pi
    b. #enter command to clone
       git clone https://github.com/Joy57/WSU-RaspberryPi-WeatherStation-Final
    c. #copy files from folder client_src to /home/pi/Desktop/MasterStation
       1024private.pem, 1024public.pem, alert.py, alertFlags.txt, keyGeneration.py, post.py, pycryptoDecrypt.py, weatherapi.py, verifyKey.py, getOldest.py

9. Changing Encrypting Key
    a. generate new keys by following step 7
    b. open textstorage.py from MasterStation folder
    c. change encryption key to new key here:



```
key = RSA.importKey(open("public.pem","r").read())
```

10. Changing Decryption Key
    a. generate new keys by following step 7
    b. open pycryptoDecrypt.py from MasterStation folder
    c. change decryption key to new key here:



```
decKey = RSA.importKey(open("/home/pi/Desktop/weather-station-master/client/1024private.pem",'r').read())
```

11. Run the build
    a. *for development purposes copy client_src from the downloaded repository into your desktop*
    b. *pyinstaller weatherstation.spec -F*

12. The compiled weatherstation file can be found in the /path/to/dist folder

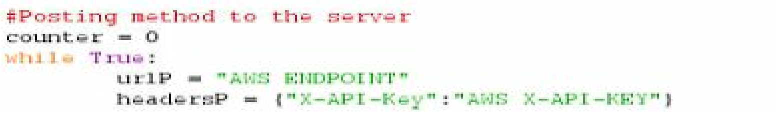
13. To make post request to the server

    a. Must complete AWS Version User Manual and retrieve the SensorData and Verify-API's Endpoints and X-API-KEY

    b. Open a new Terminal on Master Pi

    c. #enter command to navigate to MasterStation folder
    cd /home/pi/Desktop/MasterStation

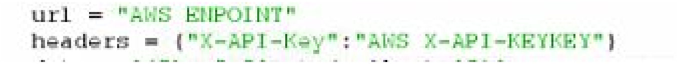
    d. Input your AWS ENDPOINT and X-API-KEY at post.py



```
#Posting method to the server
counter = 0
while True:
        urlP = "AWS ENDPOINT"
        headersP = {"X-API-Key":"AWS X-API-KEY"}
```

Fig-2

    e. Input your AWS ENDPOINT and X-API-KEY at verifyKey



```
url = "AWS ENPOINT"
headers = {"X-API-Key":"AWS X-API-KEYKEY"}
```

Fig-3

    f. #To post run command
    Python post.py

14. Download Dragino_Weather_Station folder /dist/ folder and move the folders to the desktop.

15. Autostart on boot for LoRa communication

    a. Navigate to file path: /home/pi/.config/lxsession/LXDE-pi/autostart

    b. Add one of the following depending on role of the device:

@/home/pi/Desktop/dragino_lora_app_receiver/dragino_lora_app

OR

@/home/pi/Desktop/dragino_lora_app_sender/dragino_lora_app

Registration

User Account

Registering for a user account is relatively simple. Enter your desired username, an email address you have access to, and the desired password for your account, see

Figure-4 below for an example.

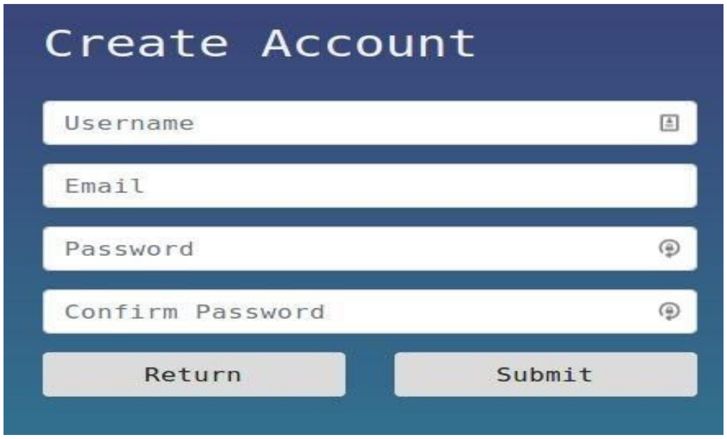


Fig-4

Your password must be at least 8 characters long and have one letter and one number in it. Once you have successfully registered your account you will have to wait for an admin to approve your account to login with it.

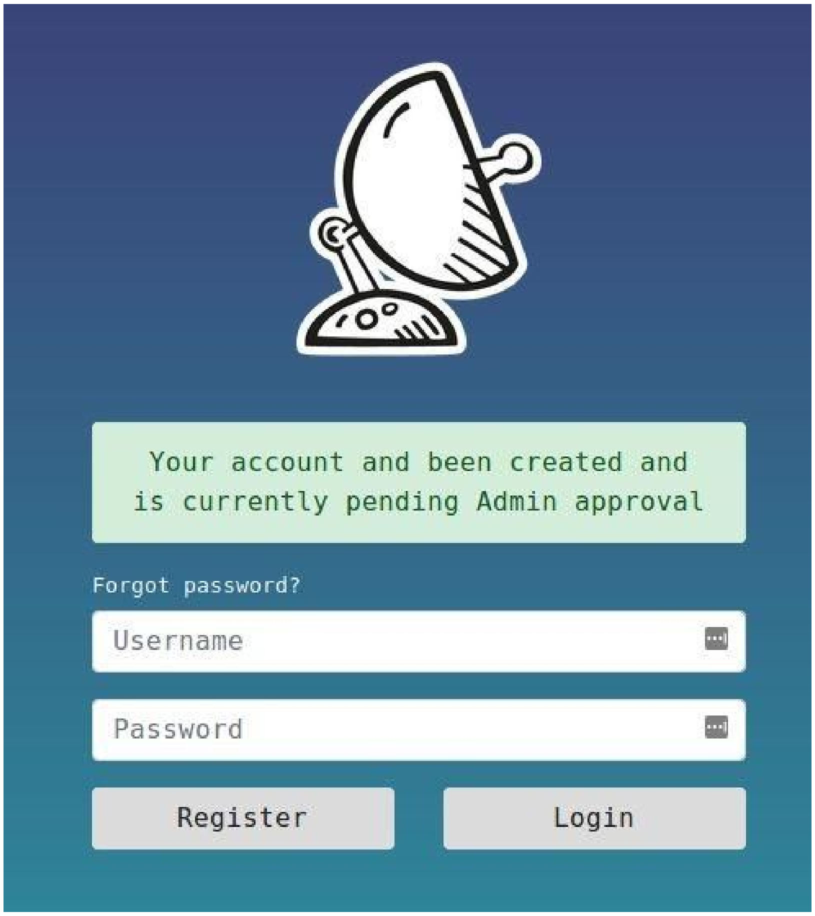

Your account and been created and is currently pending Admin approval

Fig-5

Fig-6

Login

Administration Login

If you are the owner of the website and are looking to login for the first time you can access your administration account using the following credentials:

Username: superuser
Password:
superuser123

Be sure to change the password on the profile page once you have logged into to securely protect your account.

Normal Login

Once you have registered for an account you can visit the login page to sign in. Enter your username and password and if your account has been approved you will gain full access to the website.

If you entered your login credentials incorrectly or are not yet approved you will receive a message telling you the problem.

Forgotten Password

If you have forgotten the password associated with your account you can request a password reset from the forgotten password page, see Figure-6 below.

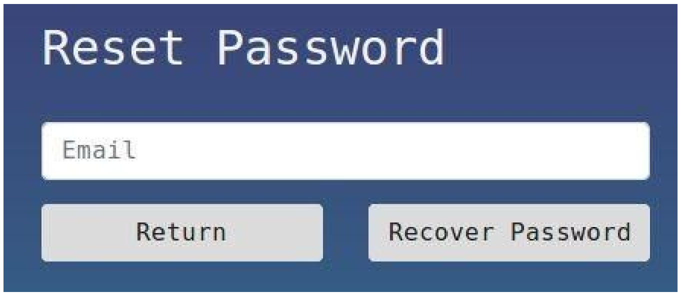


Fig-6

Enter the email address you used to register your account. If the email you entered is the correct email you will receive an email containing a link to reset your password. Once you have followed the link simply enter the new password for your account and you should be able to login with it.

Navigation Bar

The Navigation Bar is displayed at the top of the webpage and allows you to navigate around the website (Fig-7). Clicking the text in the Navigation Bar will take you to the corresponding page. Clicking your username on the right side of the Navigation Bar will display a dropdown menu with additional options for user profile, logout, and admin (if you have administrative privileges)

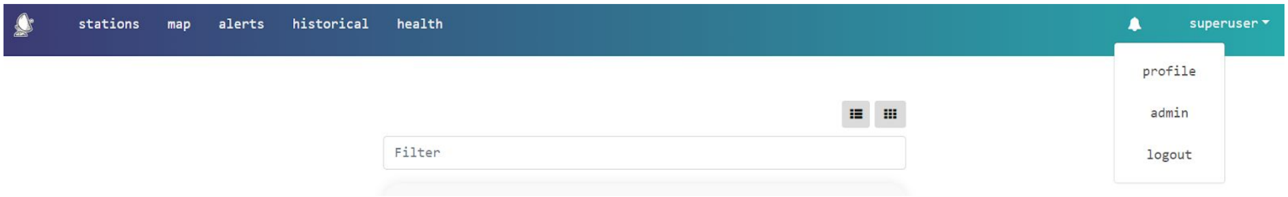


Fig-7

Administration Page

The Administration Page is restricted only to users that have admin or superuser privileges. The page consist of three separate components, Edit Stations, Pending Users, and Edit Permissions, that can be navigated by tabs as shown in Fig-8.

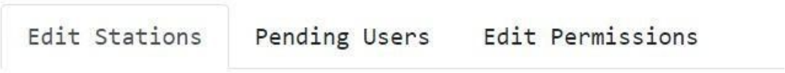
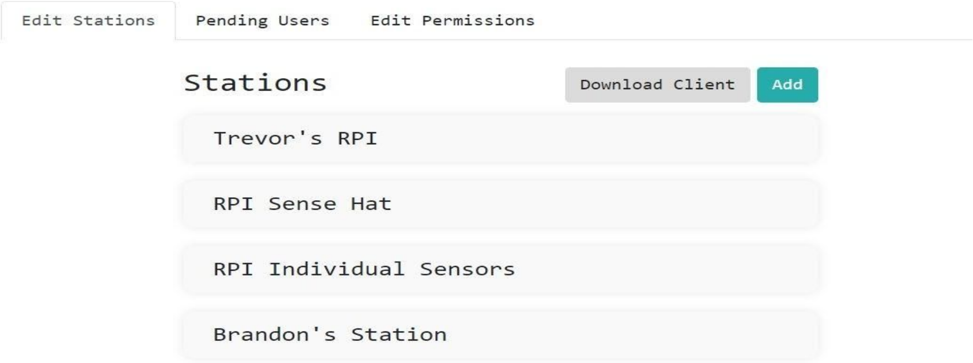


Fig-8

Edit Stations

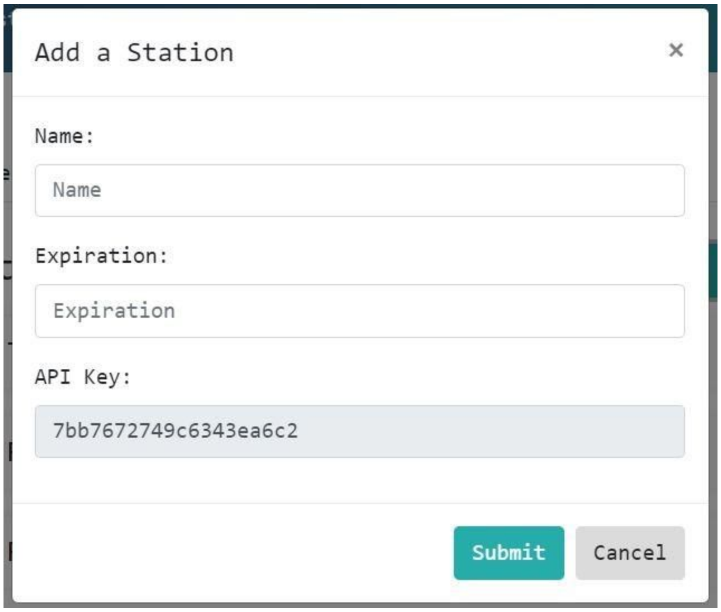
This is the default tab that loads when arriving on the Administration Page. This tab displays a list of all the stations that have been created and is where users can add new stations by clicking the add button show in Fig-9. This tab also includes the download for the client code to run the weather station, found in the Download Client button right next to the add station button.



Trevor's RPI
RPI Sense Hat
RPI Individual Sensors
Brandon's Station

Fig-9

Upon clicking the add station button a modal will appear with a name input box, an optional expiration date for the station, and the API key to connect the station with the client code(Fig-10).



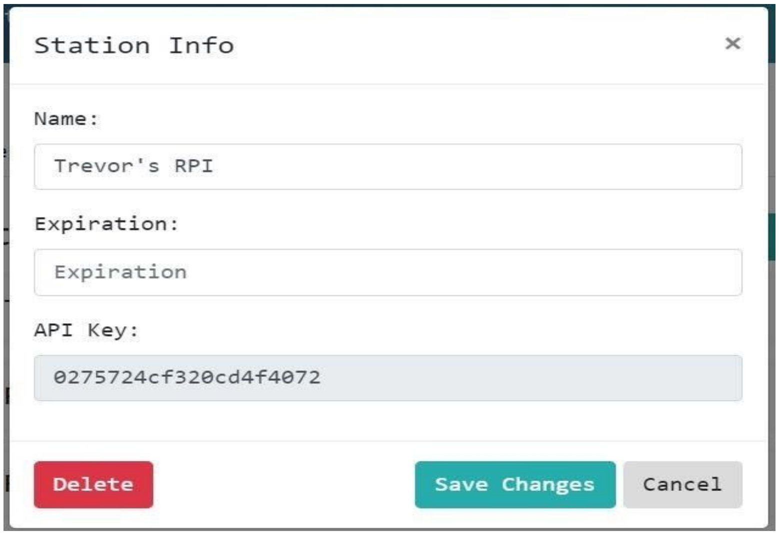
Name: Name

Expiration: Expiration

API Key: 7bb7672749c6343ea6c2

Fig-10

Users may also click on a station in the list and the stations card will load with information that can be edited such station name and the expiration date to be saved by clicking save changes. The information card also displays the API key which cannot be edited and if users wish to remove the entire station from the site they can click delete. This is shown in Fig-11.



Station Info

Name:

Trevor's RPI

Expiration:

Expiration

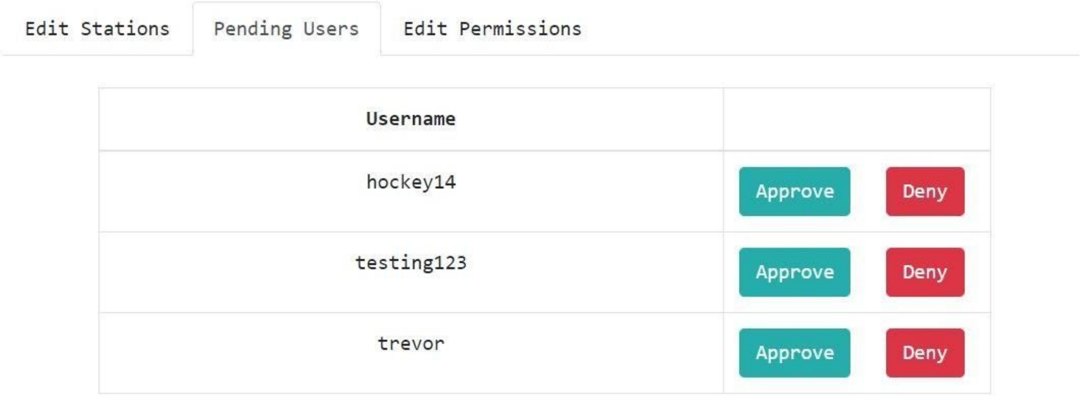
API Key:

0275724cf320cd4f4072

Fig-11

Pending Users

This tab displays all of the users in a table that have registered for an account on the site. The table shows what the requested users username is and then the option to approve or deny the requested account. Once an option has been chosen that user will be notified by email whether there account request has been approved or denied. Both superusers and admins have the privileges to approve new accounts. An example of a superuser on this tab is shown in Fig-12.

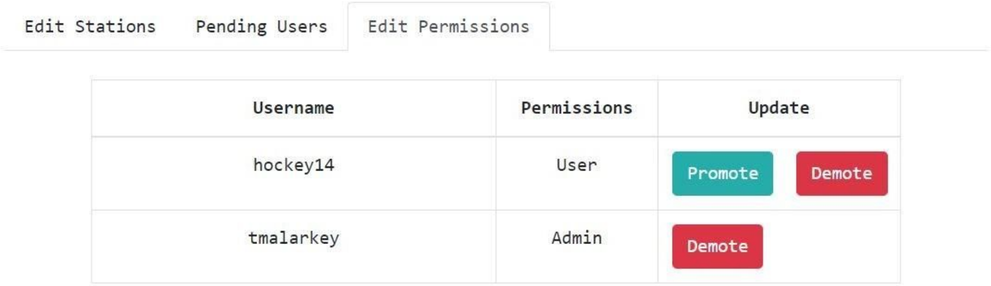


Username		
hockey14	Approve	Deny
testing123	Approve	Deny
trevor	Approve	Deny

Fig-12

Edit Permissions

This tab displays all of the users in a table with their username, permission type, and the options for updating the permission type of the user. If a superuser is on the page it will load all of the admins and regular users into the table. If an admin is on the page then the site will only load all of the regular users into the table, this is due to the fact that admins have the ability to promote regular users to admin privileges but cannot demote other admins. An example of a superuser on this tab is shown in Fig-13.



Username	Permissions	Update
hockey14	User	Promote Demote
tmalarkey	Admin	Demote

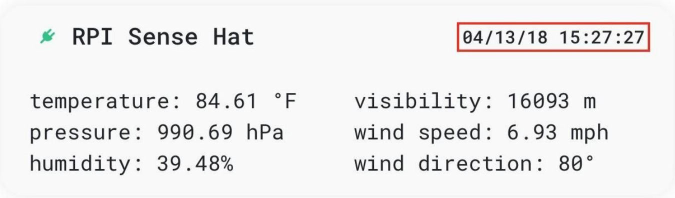
Fig-13

Stations Page

This page displays the latest weather from all connected or disconnected stations. It can be accessed by clicking on the “stations” link in the navigation bar or directly after logging into the website.

Station Card

This card will display all of the weather data retrieved from that station. The date in Fig-14 displayed below refers to the time the weather was last retrieved.



RPI Sense Hat 04/13/18 15:27:27

temperature: 84.61 °F
pressure: 990.69 hPa
humidity: 39.48%
visibility: 16093 m
wind speed: 6.93 mph
wind direction: 80°

Fig-14

The connection status indicator is also displayed to the left of the station name. The station will be displayed with a green plug icon if it is connected. If the station is disconnected, it will be displayed as a red circle. Examples shown in Fig-15 and

Fig-16

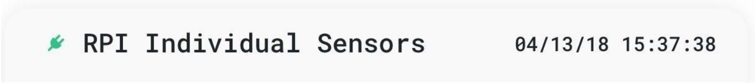

RPI Individual Sensors 04/13/18 15:37:38

Fig-15

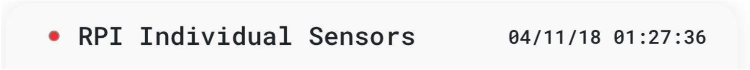

● RPI Individual Sensors 04/11/18 01:27:36

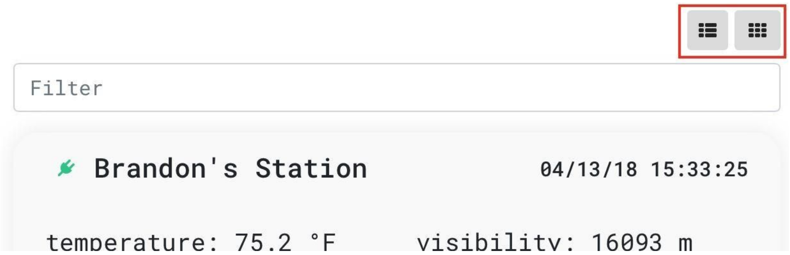
Fig-16

Filter By Station Name

Start typing in the input box at the top of the list of stations to filter by station name. If the combination of characters typed into the filter input box matches any of the characters in a station's name, it will be displayed in the list. Otherwise, it will not be displayed. If the filter input box is empty, all stations will be displayed.

Display Mode

Clicking on the button on the left in Fig-17 will display all stations in a list view. Clicking on the button on the right in the image below will display all stations in a two column grid view.



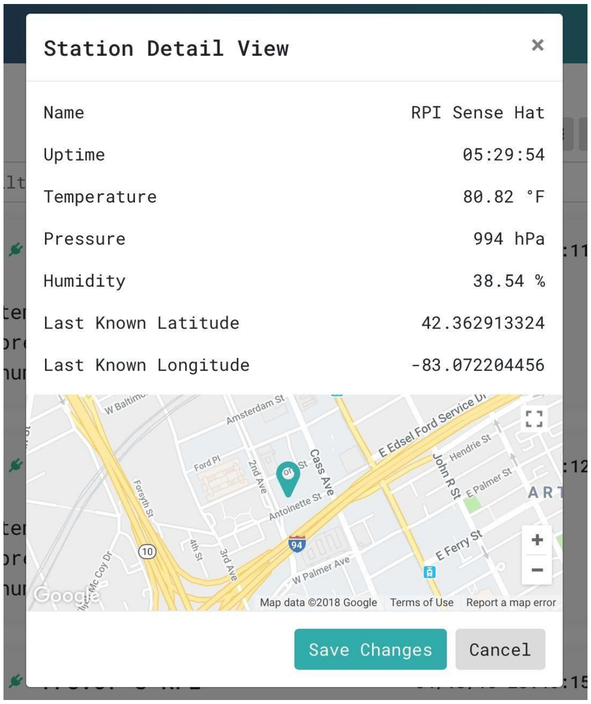
Brandon's Station 04/13/18 15:33:25

temperature: 75.2 °F visibility: 16093 m

Fig-17

Station Detail View

Clicking on a station card will bring up the station detail view. This window displays additional information about the station as shown below in Fig-18. It includes the uptime (time since the station was last connected), temperature, pressure, humidity, latitude, longitude, and a map to display the station location. If there is no GPS data, the map will not be displayed and the coordinates will be displayed as "Unavailable."

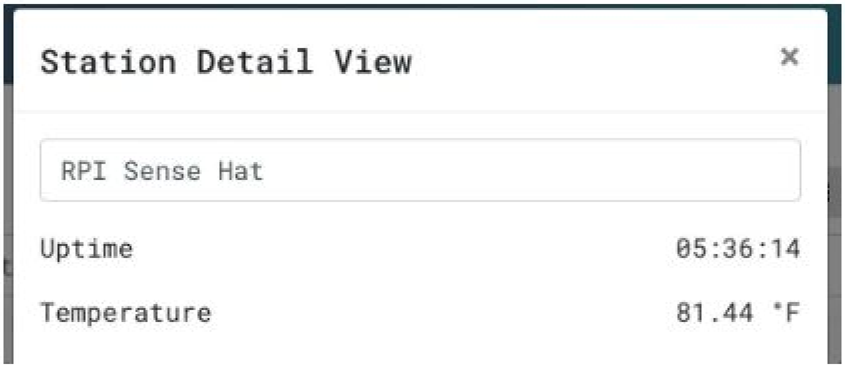


Station Detail View

Name	RPI Sense Hat
Uptime	05:29:54
Temperature	80.82 °F
Pressure	994 hPa
Humidity	38.54 %
Last Known Latitude	42.362913324
Last Known Longitude	-83.072204456

Fig-18

If you are a user with admin privileges, the name displayed at the top of the station detail view will be shown in a text input box (Fig-19). This name can be changed by entering in a new name and clicking "Save Changes."



Station Detail View

RPI Sense Hat

Uptime	05:36:14
Temperature	81.44 °F

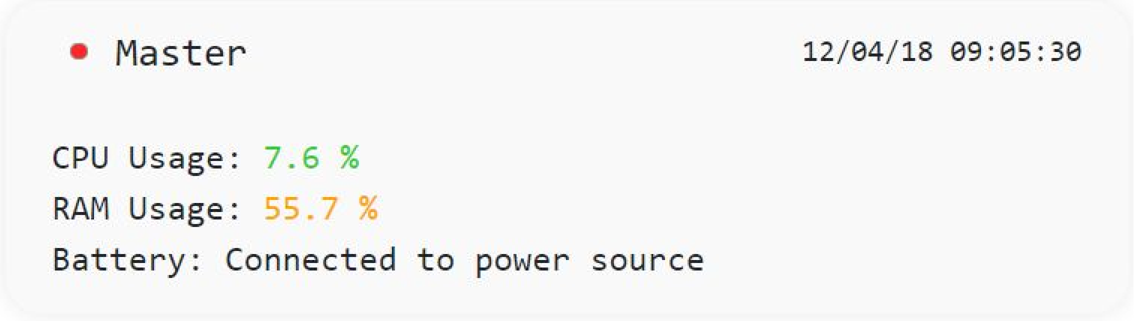
Fig-19

Health Page

This page displays the latest health data from all connected or disconnected stations. It can be accessed by clicking on the “health” link in the navigation bar.

Station Health Card

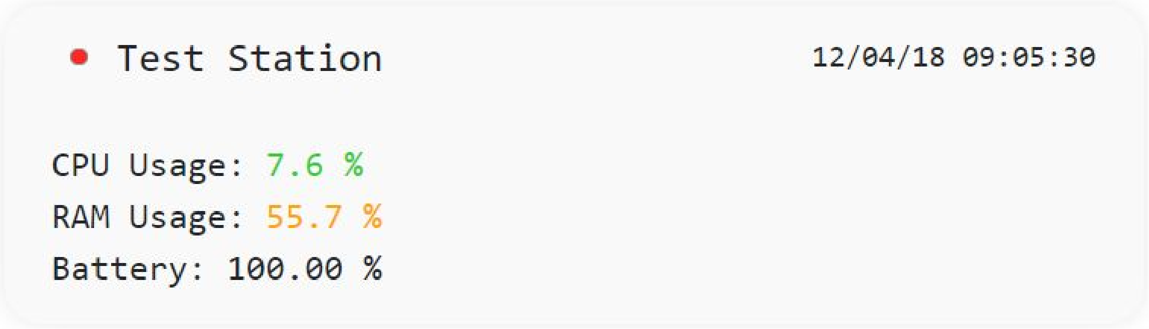
This card will display health data retrieved from that station. Health data includes CPU usage, RAM usage and battery percentage based on how long the station has been running. The date and connection status indicator of both connected and disconnected have the same representation from figures Fig-14, Fig-15, Fig-16 respectively. If the station is declared to be the “Master” station, then we are under the assumption that this station is connected to a power source other than a battery pack. In this case, the battery percentage will state that the station is “Connected to a power source”. Examples shown in Fig-20 and Fig-21



● Master 12/04/18 09:05:30

CPU Usage: 7.6 %
RAM Usage: 55.7 %
Battery: Connected to power source

Fig-20



● Test Station 12/04/18 09:05:30

CPU Usage: 7.6 %
RAM Usage: 55.7 %
Battery: 100.00 %

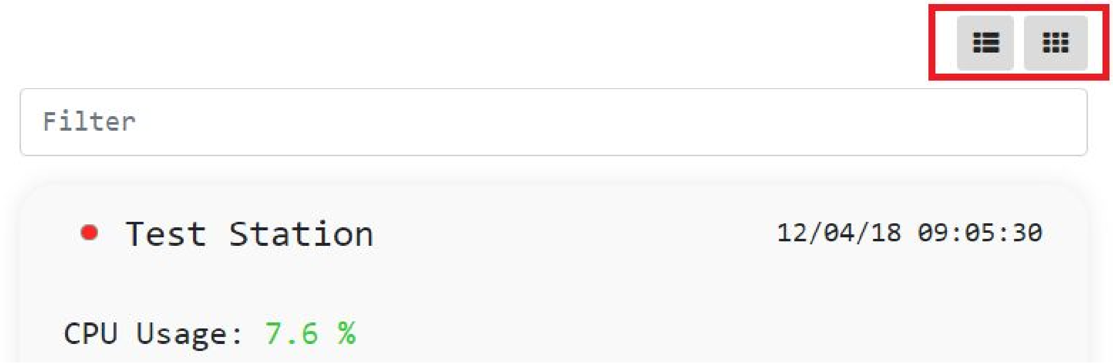
Fig-21

Filter By Station Name

Start typing in the input box at the top of the list of stations to filter by station name. If the combination of characters typed into the filter input box matches any of the characters in a station’s name, it will be displayed in the list. Otherwise, it will not be displayed. If the filter input box is empty, all stations will be displayed.

Display Mode

Clicking on the button on the left in Fig-22 will display all stations in a list view. Clicking on the button on the right in the image below will display all stations in a two-column grid view.



Filter

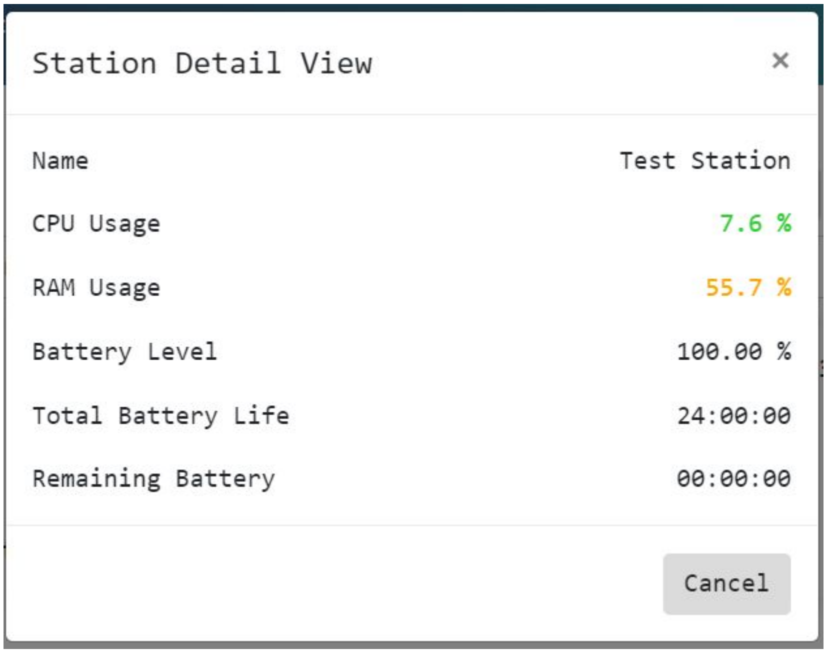
● Test Station 12/04/18 09:05:30

CPU Usage: 7.6 %

Fig-22

Station Health Detail View

Clicking on a station card will bring up the station detail view. This window displays additional information about the station as shown below in Fig-23. It includes the uptime (time since the station was last connected), CPU usage, RAM usage, battery percentage, total expected battery life, and estimated remaining battery life. In the case of the station being the “Master” station then battery percentage, total expected battery life, and estimated remaining battery life values display a null output.



Station Detail View

Name	Test Station
CPU Usage	7.6 %
RAM Usage	55.7 %
Battery Level	100.00 %
Total Battery Life	24:00:00
Remaining Battery	00:00:00

Fig-23

Map Page

Map Display

This page displays the last known location of all stations which have latitude and longitude coordinates. When you first arrive at the page, the map will automatically center itself so that each map marker is within the bounds of the map. Each station is displayed as a teal map marker shown in Fig-24. Each map marker also has a label displayed above it which shows the station's name.

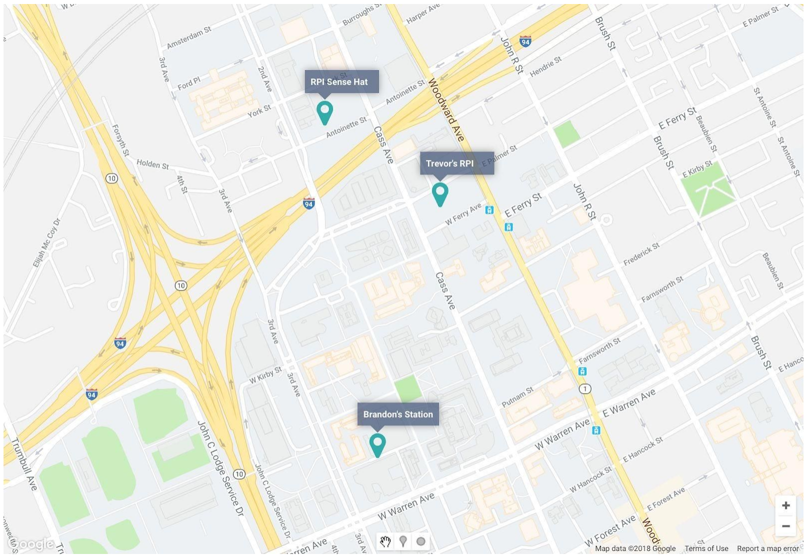
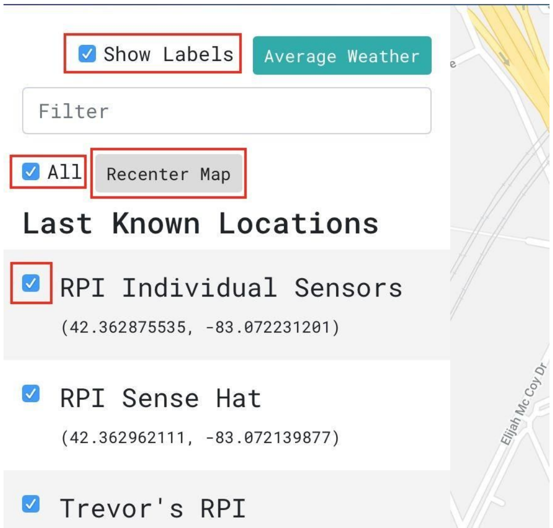


Fig-24

Hovering your mouse cursor over a marker will display the latest temperature, pressure, and humidity of that particular station.

Sidebar

The sidebar to the left of the map display (Fig-25) allows you to turn on/off markers, turn on/off map labels, recenter the map, filter by station name, and enable weather averaging mode. Clicking the checkbox next to an individual station will turn that marker on/off on the map display. Clicking the checkbox next to the “All” text will either check or uncheck all stations in the list. Clicking the “Recenter Map” button will center the map on all currently displayed stations. This feature can be particularly useful after turning on/off various stations. Finally, clicking the checkbox next to “Show Labels” will turn off the labels with the station names above each marker.



☑ Show Labels

Average Weather

Filter

☑ All

Recenter Map

Last Known Locations

☑ RPI Individual Sensors

(42.362875535, -83.072231201)

☑ RPI Sense Hat

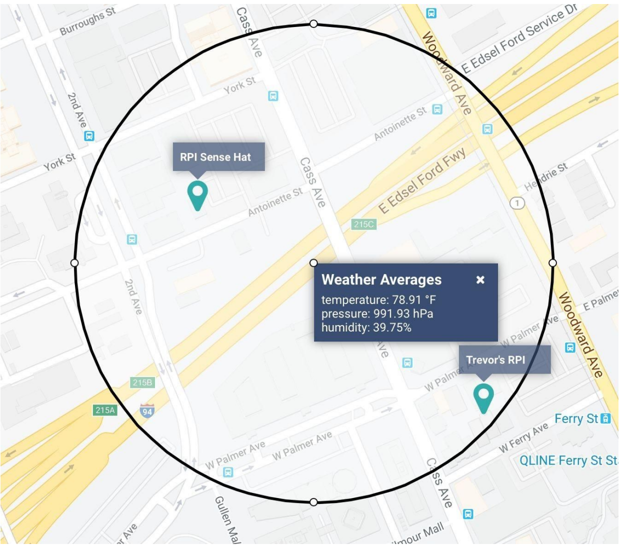
(42.362962111, -83.072139877)

☑ Trevor's RPI

Fig-25

Average Weather

Clicking the “Average Weather” button displayed in Fig-26 will toggle on the drawing mode for the Map Display. While this mode is turned on, you can click and drag on the map to begin drawing a circle. Once you let go, the circle is drawn on the map and any station markers within the circle will have their temperature, humidity, and pressure values averaged together. Clicking the button again will turn off the drawing mode. Clicking the “X” in the top right hand corner of the averaged weather values will remove the circle from the map.



Weather Averages ×

temperature: 78.91 °F

pressure: 991.93 hPa

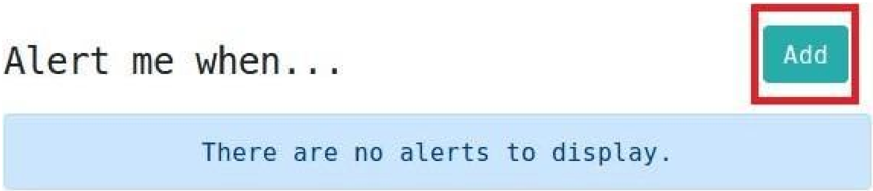
humidity: 39.75%

Fig-26

Alerts Page

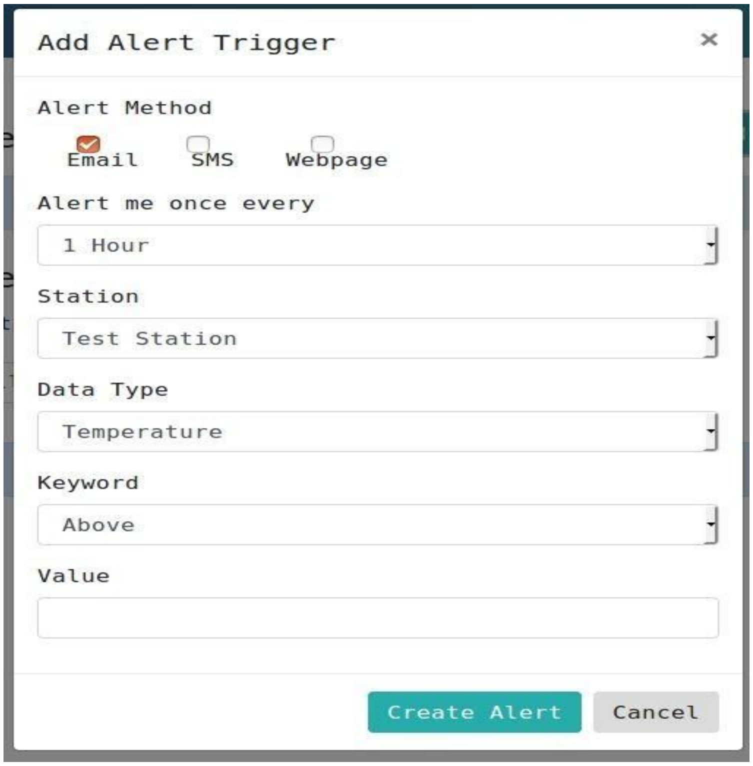
Creating an Alert

On the alerts page you have the options of setting up a system of weather alerts for each station you have connected. When getting started its important to make sure you have at least one station registered or you will not be able to create an alert. Clicking on the Add button will open up the menu shown below in Fig-27



Alert me when...

There are no alerts to display.



Add Alert Trigger

Alert Method

☑ Email ☐ SMS ☐ Webpage

Alert me once every: 1 Hour

Station: Test Station

Data Type: Temperature

Keyword: Above

Value:

Fig-27

Here you will be prompted for several pieces of information. You can customize your alert as you see fit with information such as:

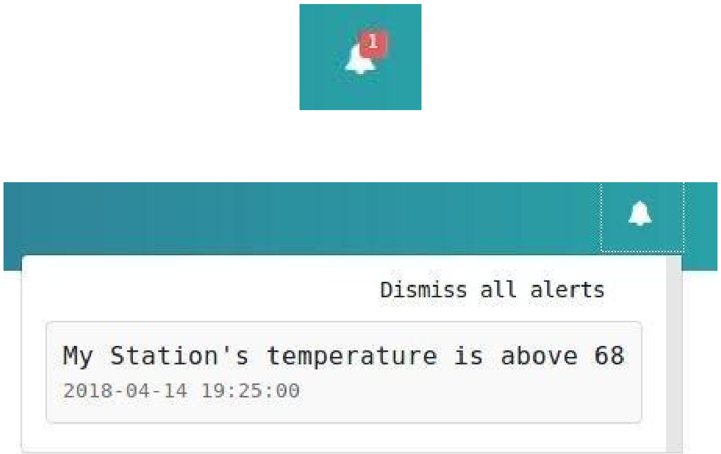
- Alert Method - How do you want to receive your alerts?
- Frequency - How often do you want these alerts to be allowed to be triggered?
- Station - Which station do you want to receive this alert for?

- Data Type - Which type of weather data do you want to be alerted for?
- Keyword - Do you want to know if the data is above, below or between a value?
- Value - What threshold do you want to set for triggering this alert?

Once you have successfully created your alert you can view the details of it on the alerts page. If you wish to change any of the settings on your alert simply click on it and you can edit it as you wish.

Webpage Alerts

If you have opted into webpage alerts and one as been triggered you will notice the bell icon in the navigation bar has updated to indicate the number of unread alerts you currently have. Clicking on this icon will open a dropdown where you can view all these triggered webpage alerts, shown below in Fig-28



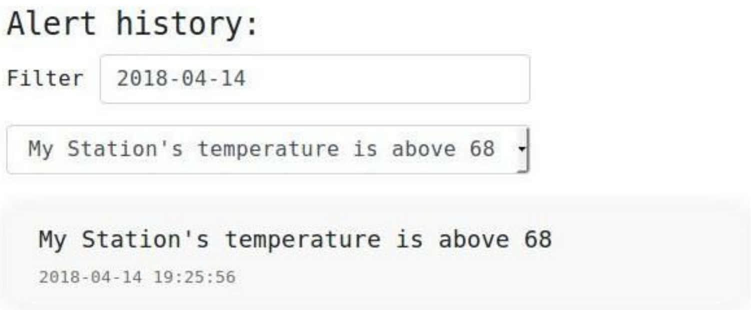
Dismiss all alerts

My Station's temperature is above 68
2018-04-14 19:25:00

Fig-28

Historic Alerts

At the bottom of the alerts page you have access to a complete history of every alert that has been triggered, see Fig-29 below.


Alert history:

Filter 2018-04-14

My Station's temperature is above 68

My Station's temperature is above 68

2018-04-14 19:25:56

Fig-29

You can filter this list of triggered alerts in two different ways. You can select from a drop down any of the current alerts you have created and will see the exact details of when these alerts were triggered on the selected day. Or alternatively you can filter the list of historic alerts by date using the calendar filter.

Clicking on any of the alerts will open up a modal that will display to you the details of the weather at the station when the alert was triggered. These alerts will remain in the history until the station that the alert is associated with is removed from the website.

Historical Page

Default Graph

This page displays the stored historical weather data collected from all of the stations on a line graph. The default graph when you first arrive at the page is the temperature data for the last twenty-four hours. The x-axis displays the time scale and the y-axis displays the data type. Each stations data is displayed on a dashed line with data points that when hovered over show the exact time and data reading that was taken, as shown in Fig-30.

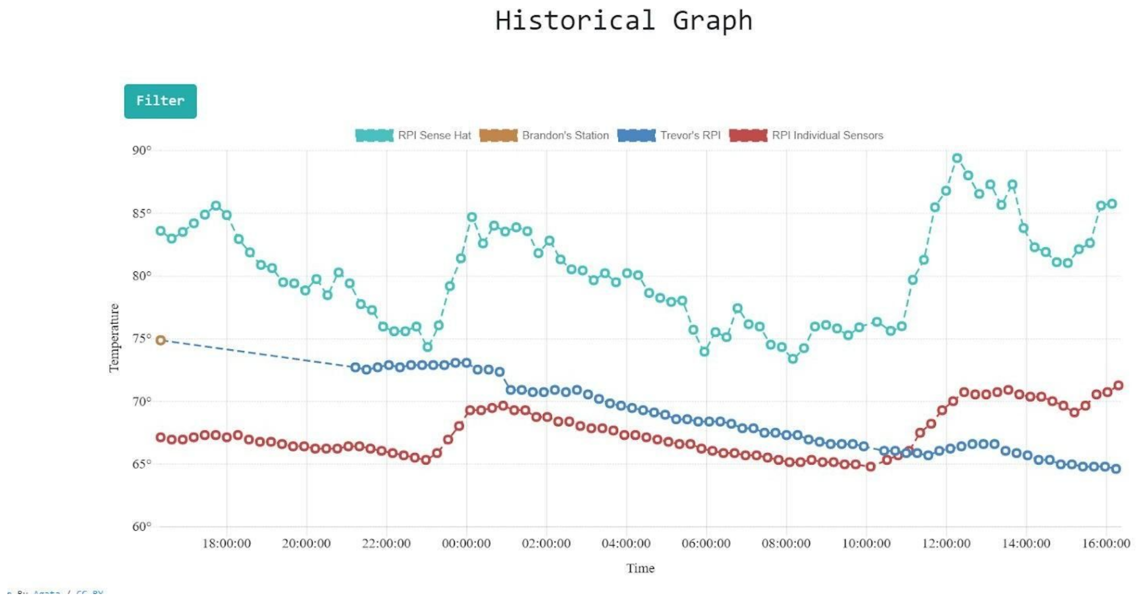
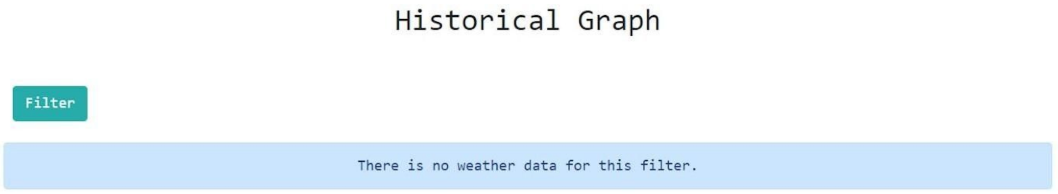


Fig-30

If there is no data for the last twenty-four hours or there is no data for the selected filter type then the page will show an alert as shown in Fig-31 that there is no data.

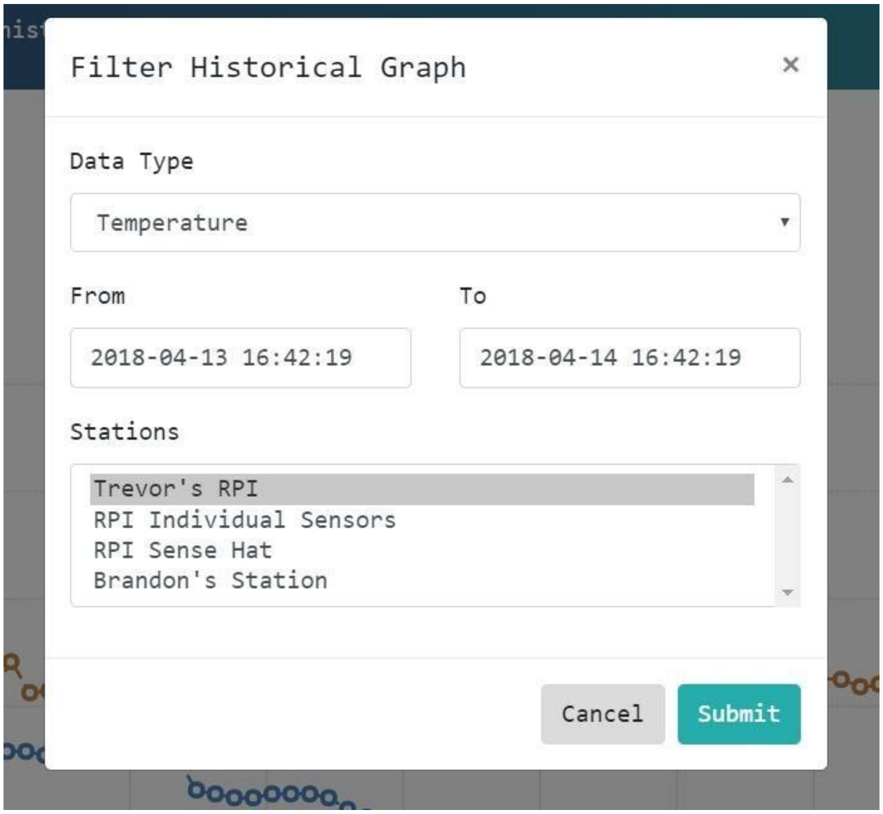


There is no weather data for this filter.

Fig-31

Filtering Options

Upon clicking the filter button on the page it brings up the filter modal that is shown in Fig-#. The possible data types to filter for are Temperature, Pressure, and Humidity this will change the data type in the data points. This will also change the y-scale of the graph, for Temperature it scales by degrees, Pressure is by hecto-pascals, and Humidity is by percent. Another option is to filter by time as shown in Fig-32, it is defaulted for the last twenty-four hours, users can select any date range except for setting the from date to be greater than the to date and setting the to date to be less than the from date. The last filtering option is to select which stations are to be drawn on the graph which is limited up to five stations.



Filter Historical Graph ×

Data Type

Temperature ▾

From

2018-04-13 16:42:19

To

2018-04-14 16:42:19

Stations

Trevor's RPI
RPI Individual Sensors
RPI Sense Hat
Brandon's Station

Fig-32

Filtering By Station

For filtering by stations there is two options to complete this desired effect. One is show in Fig-# above where the user can select which station or stations they would like to have displayed on the graph. The other option is when the graph is displayed in the graph legend the user may click on the station name and that stations line will no longer appear on the graph as shown in Fig-33.

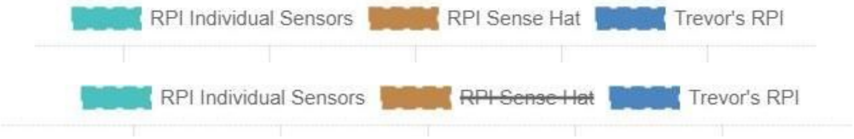
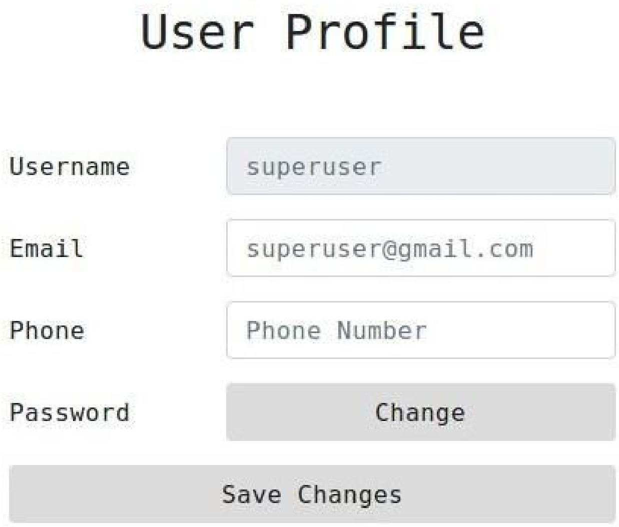


Fig-33

User Profile Page

On the user profile page you can view the information for your account such as username, email, and phone number, see Figure-34 below. Here you can change the email associated with your account, change or add a phone number to your account, and change your password. If you wish to opt into sms alerts you will need to have entered a phone number in on your profile.



User Profile

Username	superuser
Email	superuser@gmail.com
Phone	Phone Number

Fig-34

Cloning SD cards for fresh Raspberry Pi

From the Sender or Receiver Raspberry Pi.

Use a USB SD card adapter and an SD card with at least 8gb of storage for best results. For example: https://www.amazon.com/UGREEN-Reader-Portable-Adapter-Windows/dp/B0779V61XB/ref=sr_1_1_sspa?s=electronics&ie=UTF8&qid=1544284652&sr=1-1-spons&keywords=usb+sd+card+reader&psc=1

With the Raspberry Pi running and USB + SD Card inserted navigate to Menu->Accessories->SD Card Copier.

This program will open and you will choose the device you're copying from (only 1 device should be listed here), and what device the destination is; which in this case should have a name distinction that should be recognized as the SD card you have inserted.

The program will prompt you informing you that the SD card will have everything erased from the device and rewritten.

This process will take between 5-10 minutes depending on amount of running processes. When it is complete you should be able to remove the SD card and plug it into a fresh Raspberry Pi and the OS should exist as an exact copy with all the boot up processes running as they do on the other device. If you do not have SenseHAT/LoRa/Sensors attached to the device you may receive errors depending on what role it will be performing.

Verification of it working properly can be done using a single sender/receiver and checking the specific folders the device should be writing to or sending from.

Storm Prediction

To use the data model to make a prediction if a storm will be coming, first you need the necessary dependencies installed:

1. pandas 0.23.4
2. scikit-learn 0.20.1
3. graphviz 0.10.1
4. python >= 3.0

After all dependencies are installed you will need to open the folder Analysis from the repository you have cloned in the earlier steps. Verify that in Analysis folder, the following exists:

1. handler.py
2. pi_storm.py
3. sms_alert.py
4. sql.py
5. weather_data.csv

To use the model, do the following:

1. open a terminal
2. run command
   ```
   python3 sql.py
   ```
3. This will analyze the most recent data from the database and send an Alert based on the prediction.

The predictions are ranked based on a number system.

0 : thunderstorm
1 : sky is clear
2 : snow
3 : rain