

INTERNET OF THINGS

(FALL 2020)

Project Report



Temperature & Air Quality Monitor in Automobiles for Pet Lovers

Submitted By

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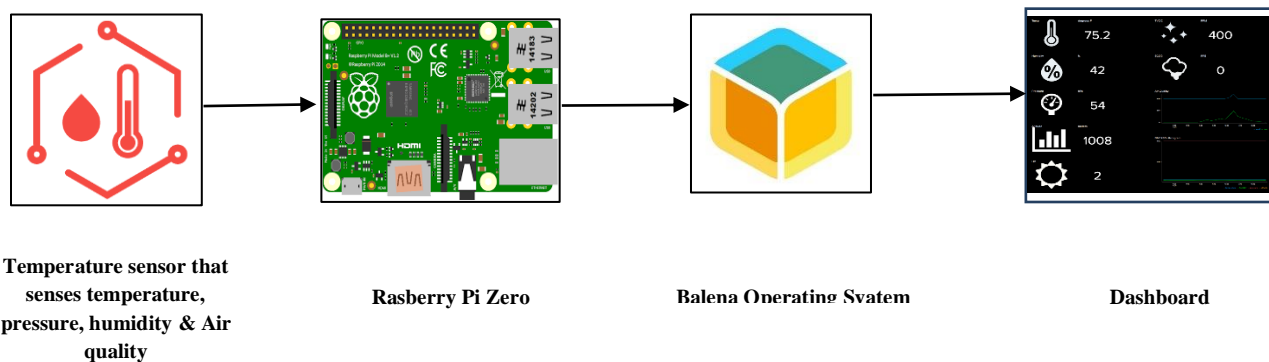
Sahitya Gadde (16274900)

Introduction:

In this modern world, there are many pet lovers who would like to carry their pets to the places wherever they go. It's the responsibility of the same person to ensure the safety of their pets. There are some public places where they can't take their pets. For example, if a person visits a shopping mall he can't carry his pet into the shopping mall. Hence, he/she have to park his car in the parking lot, leave his pet inside the car, slide down the window a little bit for air circulation and continue his shopping. For suppose he/she forgot to slide down the window and left for shopping then the pet gets suffocated due to lack of air circulation and raise in temperature. Even though he/she slides down the window and left for shopping there is a possibility that one of the many people inside the parking lot may smoke the cigarette. The smoke released may enter the car and damage the air quality which in turn may have effects on pets.

This is where our project finds the scope. We are developing a "Temperature and Air quality monitoring system for Pet lovers" in which we are monitoring the temperature levels, humidity, pressure and air quality of the air inside our automobile and present them in an attractive dashboard so that the pet owner can monitor the atmospheric conditions inside his automobile through all of his gadgets having internet connection.

High level architecture of the project:



Hardware Requirements:

- Raspberry Pi Zero
- 32 GB or larger Micro – SD Card
- Power Supply and cable
- BME680 Sensor
- Connecting cables

Software Requirements:

- Balena Cloud to create dashboards using sensor data
- Balena Etcher to flash our SD card
- Balena CLI for command line interface
- Balena Sense code for installing the services

Project Implementation:

Step-1:

- The first step of our implementation is to flash the operating system is to flash balena operating system into our Raspberry pi zero board.
- For this initially we have to create a balena cloud account.
- Once we signed up and login into our balena cloud account then we have to create an application as shown in below with our Wifi SSID and password and then we have to download Balena operating system image file.

Create application


Organization

la4kf's Organization

Application name

Temperature_Monitoring_System

Default device type

 Raspberry Pi (v1 / Zero / Zero W)

Application type

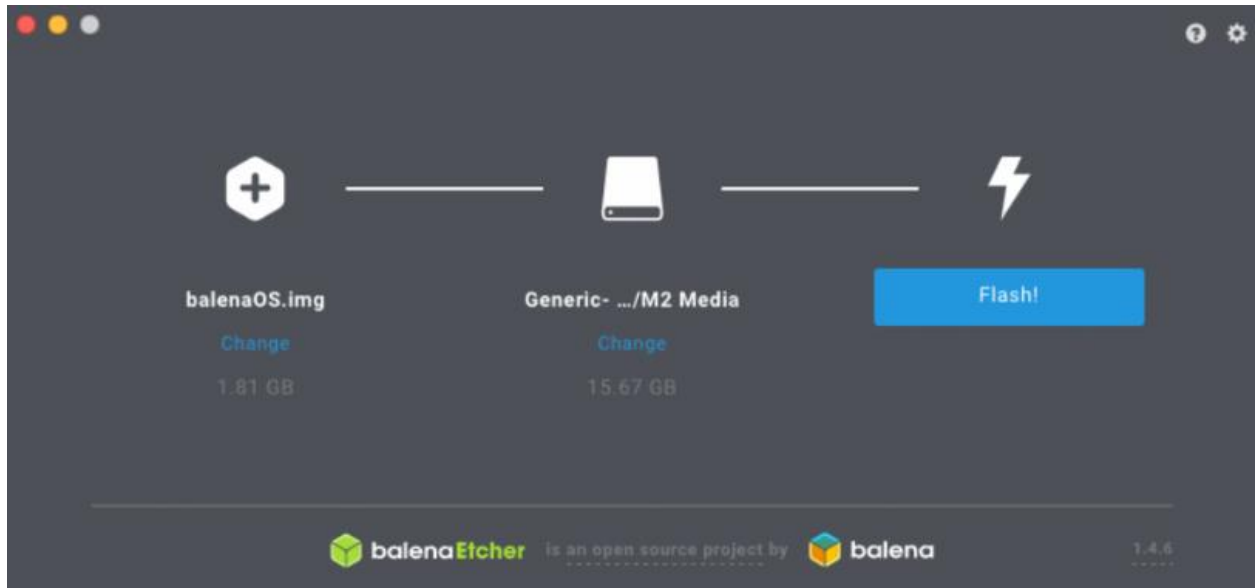
Starter

recommended

Cancel

Create new application

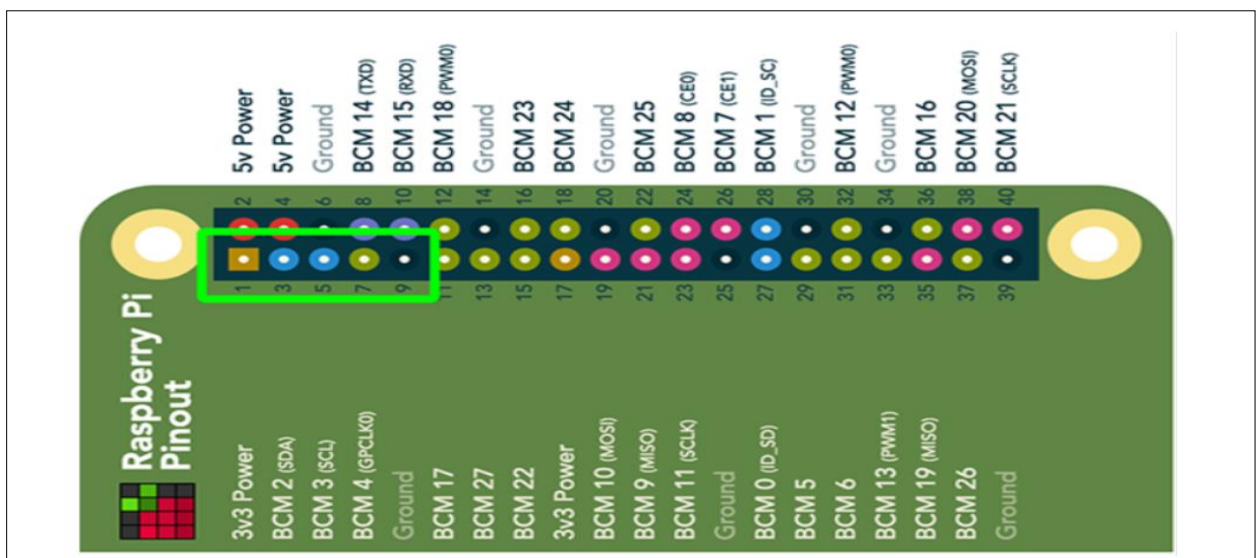
- Once we download the operating system image file then we will insert our SD card into card reader and connect the card reader to our laptop.
- Then we will flash the OS image file into SD card by means of balena Etcher as shown below.



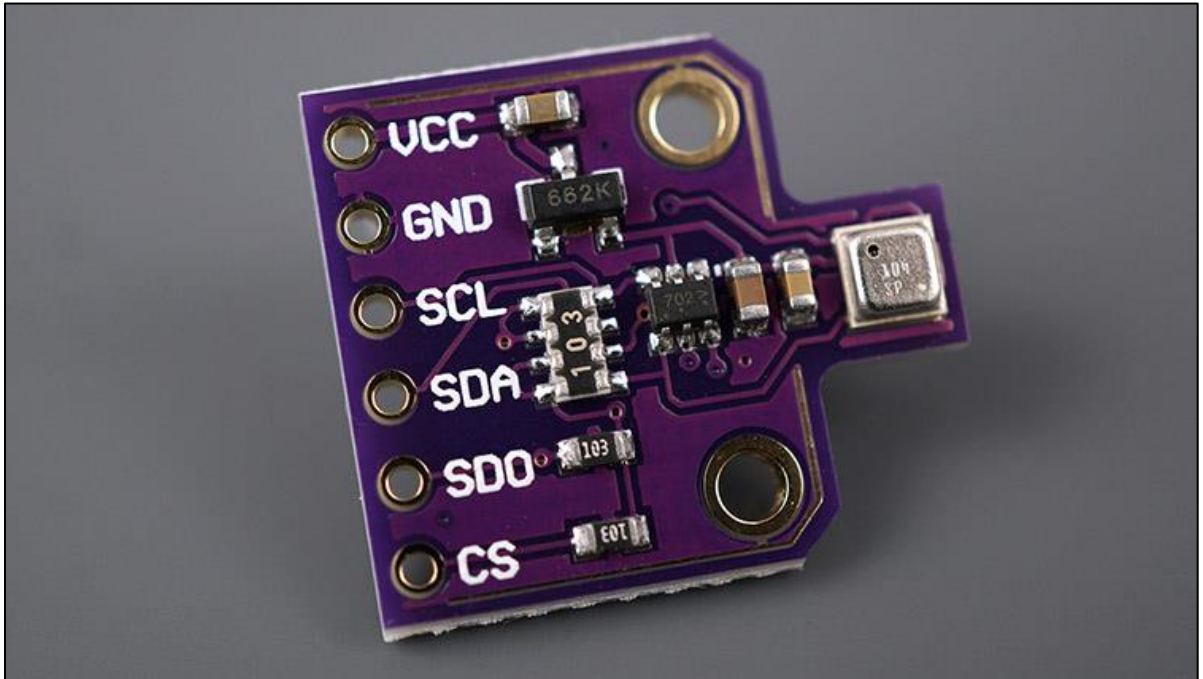
- By end of this system our SD card should be ready with the flashed operating system for insertion into our Raspberry Pi zero board.

Step-2:

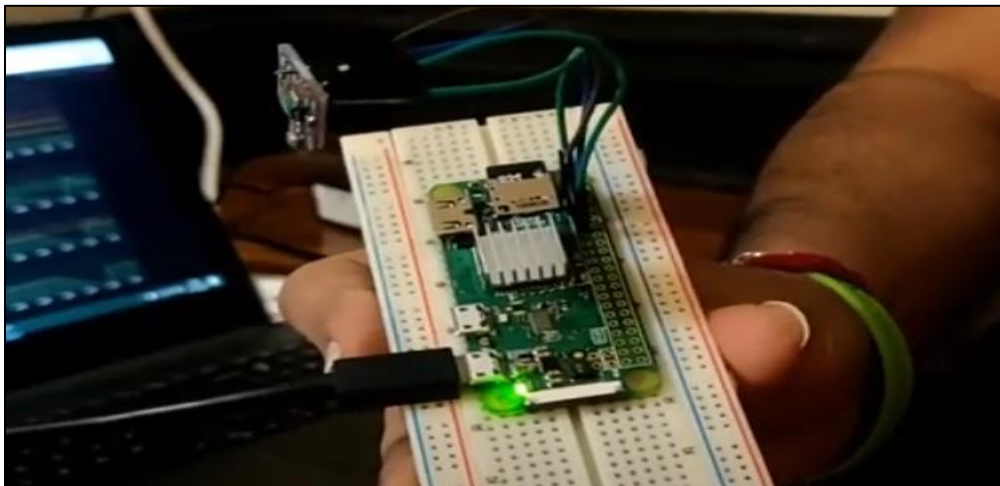
- The main aim of this step is to complete the hardware connections.
- Please find the pin configuration of Raspberry Pi zero below.



- Please find the pin configuration of BME680 sensor below.

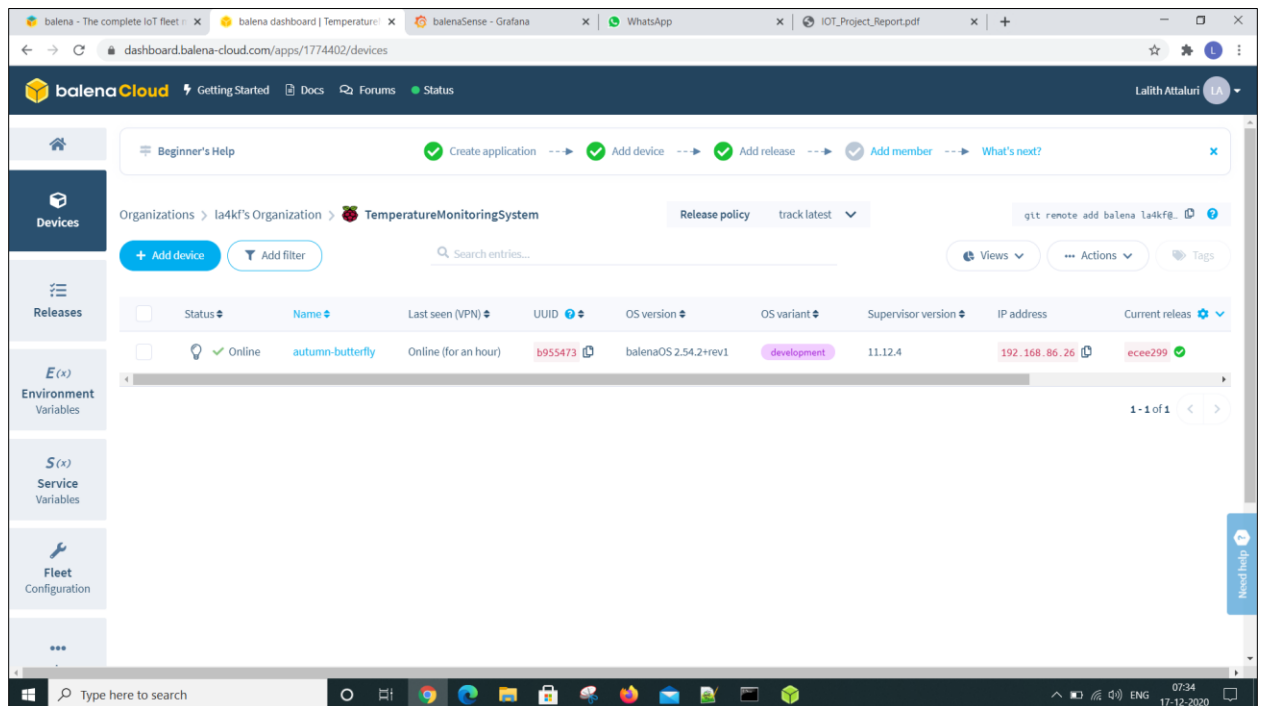


- The connections are listed below:
 - Pin1 of Raspberry Pi zero ---- VCC pin of BME680
 - Pin3 of Raspberry Pi zero ---- SDA pin of BME680
 - Pin 5 of Raspberry Pi zero ---- SCL pin of BME680
 - Pin 9 of Raspberry Pi zero ---- GND pin of BME680
- Once we complete the connections to BME680 sensor then we have to insert the flashed SD card into SD card slot of our Raspberry Pi zero board.
- Please find the Raspberry Pi zero board after the connections are done as below:



Step-3:

- Once we completed step-2 then we have to power up our Raspberry Pi zero board and then we have to open balena cloud.
- If everything goes right our device must automatically be listed in balena cloud as shown below.



- Then we have to install Balena command line interface for pushing the services code.
- Then we have to push balena sense code into our board by using push command.
- Please find the balena CLI below:

```
Microsoft Windows [Version 10.0.19041.605]
(c) 2020 Microsoft Corporation. All rights reserved.

C:\Users\Lalith Chandra A>balena login

balena

Logging in to balena-cloud.com
How would you like to login? Web authorization (recommended)
Opening web browser for URL:
https://dashboard.balena-cloud.com/login/cli/http3253a3252f3252f127.0.0.13253a57953252fauth
Successfully logged in as: lalith

Find out about the available commands by running:
$ balena help

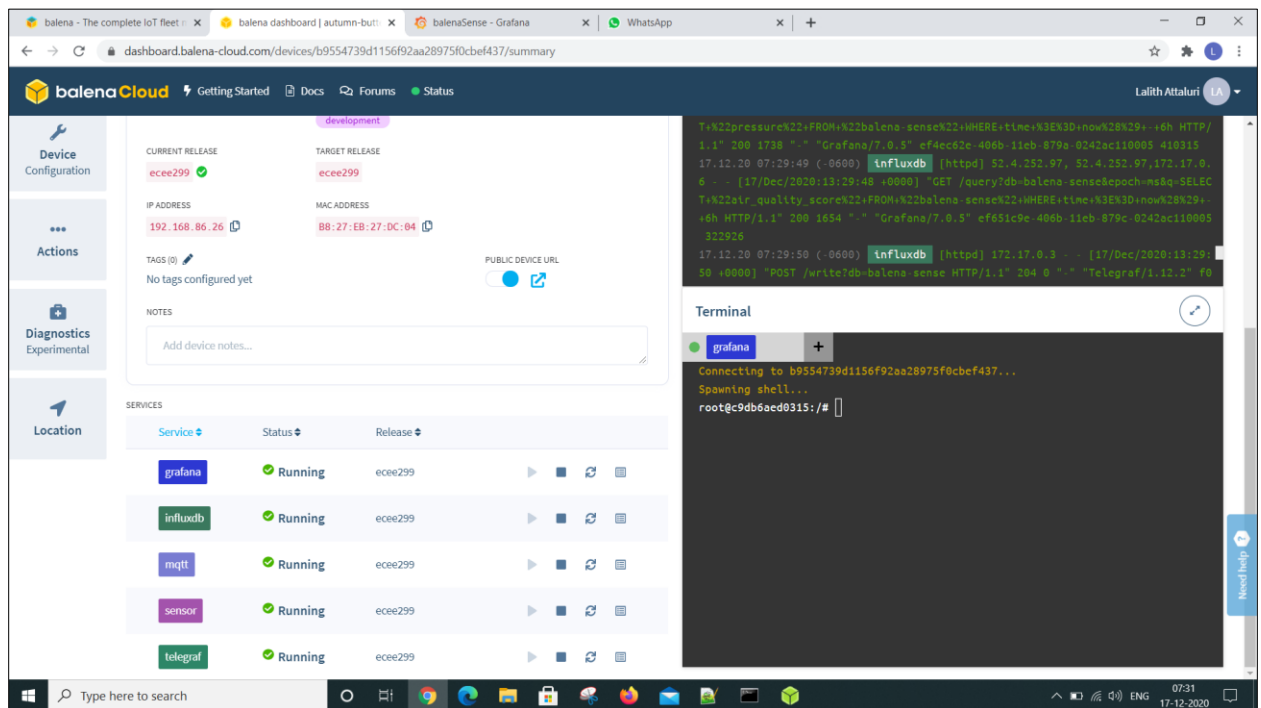
For further help or support, visit:
https://www.balena.io/docs/reference/balena-cli/#support-faq-and-troubleshooting

C:\Users\Lalith Chandra A>balena devices

Update available 12.35.0 -> 12.35.2
https://github.com/balena-io/balena-cli/blob/master/INSTALL.md

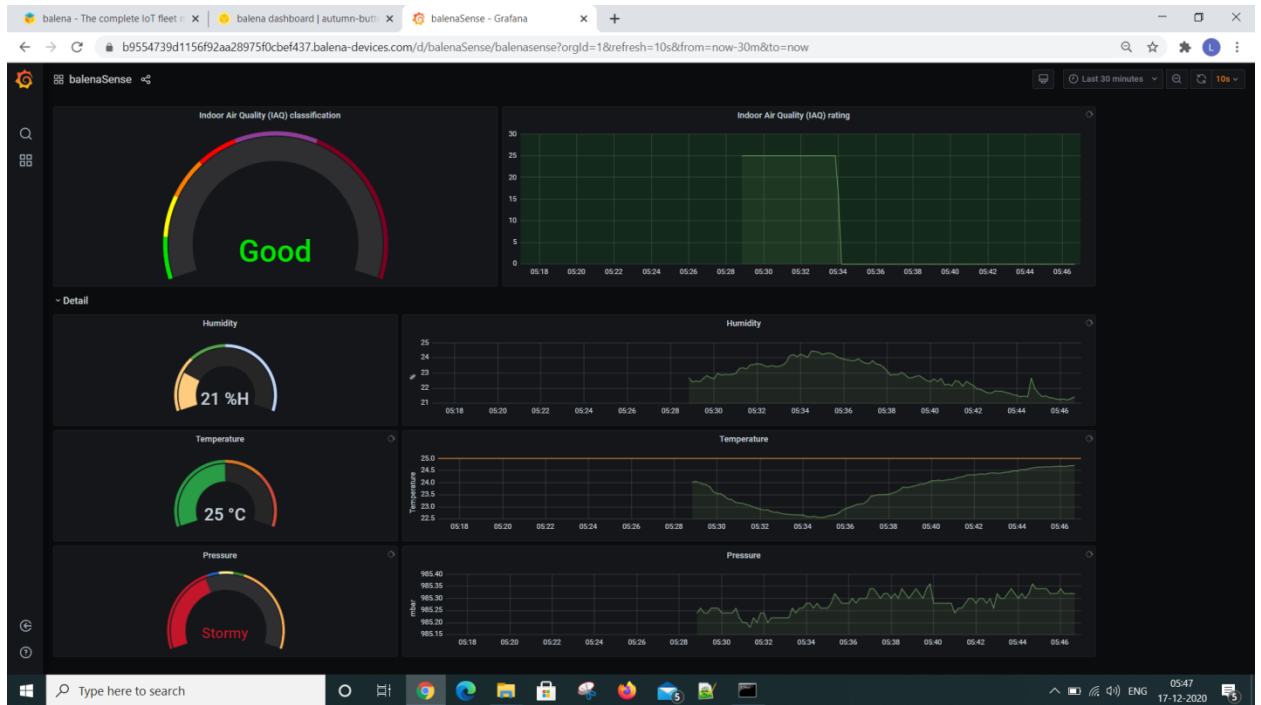
ID      UUID      DEVICE NAME      DEVICE TYPE      APPLICATION NAME      STATUS IS ONLINE SUPERVISOR VERSION OS VERSION      DASHBOARD URL
---      ---      ---      ---      ---      ---      ---      ---      ---      ---
b955473 b955473 autumn-butterfly raspberry-pi TemperatureMonitoringSystem Idle false 11.12.4 balenaOS 2.54.2+rev1 https://dashboard.balena-cloud.com/devices/b9554739d1156f92aa28975f0cbe437/summary
```

- Once the push is successful then automatically the services gets installed as shown below:

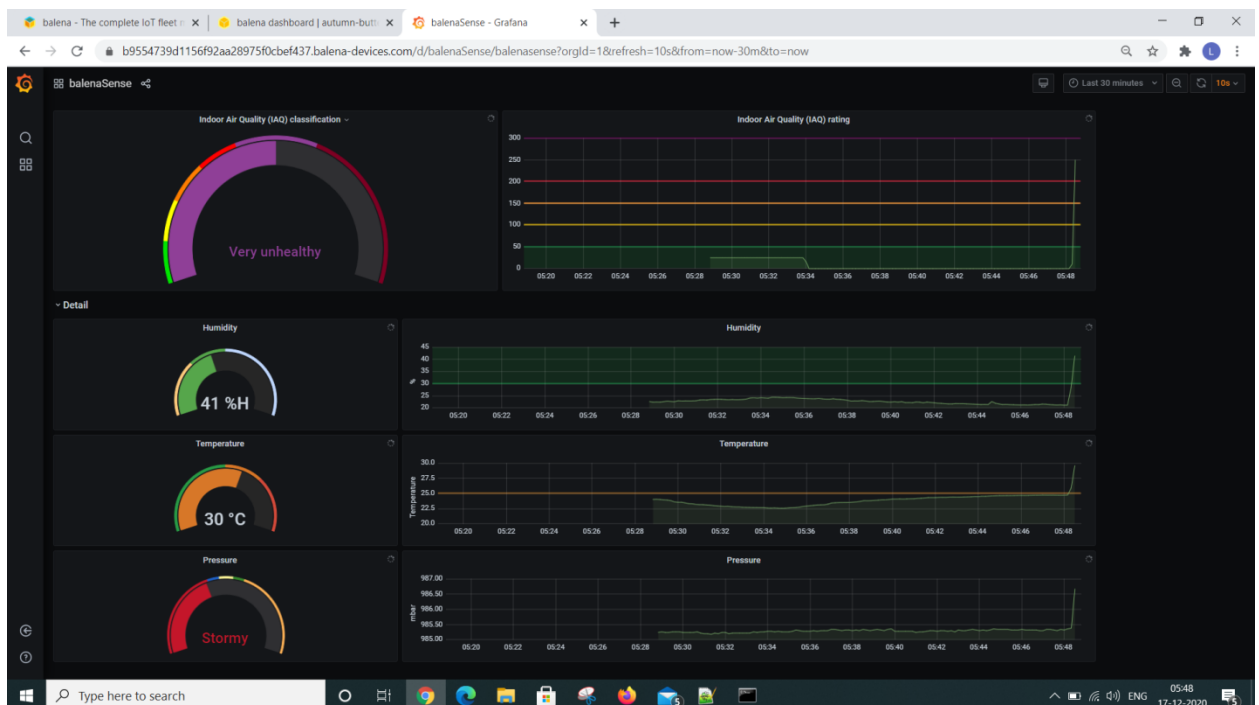


Step-4:

- When above three steps are successful then our cloud starts pulling the data from sensor.
- To see the readings in dashboards we need to enable the public device URL and we can copy the URL we can access the dashboards in any device in which a web browser is installed across any geographic location.
- Please find the screenshot of the dashboards below:



- Then for testing purpose I have started breathing on the sensor. As we all know human breath contains CO_2 and it is warm we can see on the dashboards as Indoor Air Quality showing Unhealthy and temperature is also raised as below.



- After I have stopped breathing on the sensor within some time the IAQ has returned to Good and also we can see temperature started dropping as below.



- As I have mentioned earlier every individual having the public device URL can monitor the dashboards from any electronic device which has web browser installed in it. Please find the dashboards in opened from mobile phone.

7:19



...1156f92aa28975f0cbef437.balena-devices.com



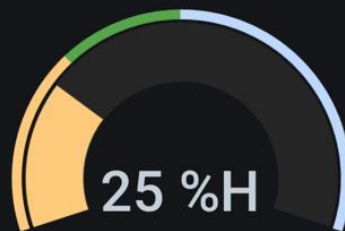
balenaSense

Last 6 hours



Detail

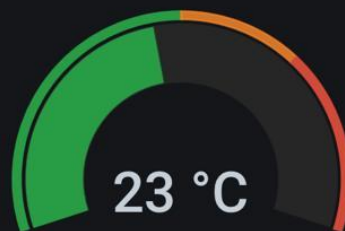
Humidity



Humidity



Temperature



11



7:19



...1156f92aa28975f0cbef437.balena-devices.com



balenaSense

Last 6 hours



Indoor Air Quality (IAQ) classification



Indoor Air Quality (IAQ) rating



Detail



11



7:19



...1156f92aa28975f0cbef437.balena-devices.com



balenaSense

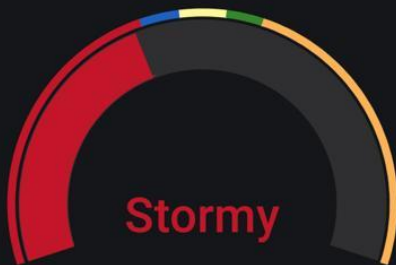
Last 6 hours



Temperature



Pressure



Pressure



11



- Hence the device placed in a car with wifi module connected to it our device starts sending the data to cloud. Hence even though the pet owners leave their pets in cars and left for shopping can monitor the temperature and air quality and can make sure their pet is safe.

Links for source code and demo video:

- **Source Code:**
https://github.com/LalithChandraAttaluri/Temperature_Air_quality_Monitoring
- **Demo Video:**
<https://www.youtube.com/watch?v=hZfCQpVF6IU&t=54s>