

IOT PROJECT REPORT

TITLE: HOUSE WEATHER MONITORING SYSTEM

(TEAM 1)

BY,

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Introduction

Have you ever been interested in monitoring the air quality in your home or outside where you live and work? This project will get you up with a setup to take readings of temperature, humidity, barometric pressure, and air quality, and provide a dashboard that you can access from anywhere to see the stats at a glance and monitor trends. This project is mainly focused with Balena Sense and used Balena Cloud with Grafana.

Video Demo: https://drive.google.com/file/d/1nq187oUwPRdoD_969N2_-6RRDi0z9EUe/view?usp=sharing

GitHub Project Link: <https://github.com/avinashganguri/House-Weather-Monitoring-System>

Website Link (for Dashboard): <https://c5fcf70dab79f0e9d782934ff059efae.balena-devices.com/>

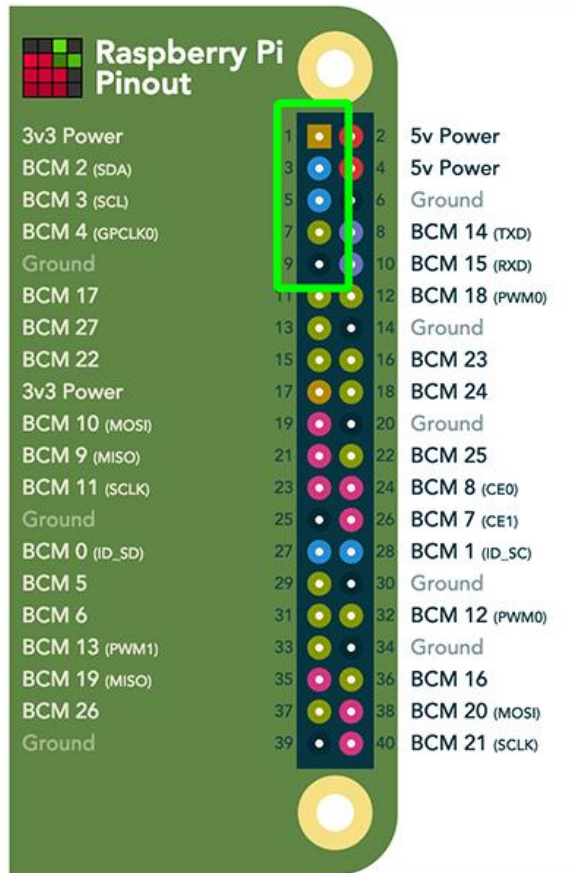
Hardware Required

- Raspberry PI Zero
- Micro SD Card with Card Reader
- Power Supply and cables
- BME680 sensor
- Connection wires

Software Required

- Balena Cloud Account
- Etcher to flash Balena OS to the SD Card
- Balena Sense code
- Balena CLI

Implementation



We will be attaching the BME 680 sensor with the correct numbers as seen in the above pinout diagram.

And then we will create our balena cloud account, where we will create and deploy our application.

Create application

Organization

avinashganguri's Organization

/

Application name

House_Monitoring

Default device type ?

Raspberry Pi (v1 / Zero / Zero W)

Application type [View docs](#)


Starter

recommended

Cancel

Create new application

Here we will create our application name select our device type as PI Zero.

 Add new device

Select device type ?

Raspberry Pi (v1 / Zero / Zero W)

Select OS type [View docs](#)


balenaOS

Select version

v2.54.2+rev1 (recommended)

☐ Show outdated versions

Select edition

☐ Development  Recommended for first time users

Development images should be used when you are developing an application and want to use the fast local mode workflow. This variant should never be used in production.

☒ Production


Production images are ready for production deployments, but don't offer easy access for local development.

Network Connection

☒ Ethernet only

☐ Wifi + Ethernet

+ Advanced

 **Warning!** The Raspberry Pi Zero W is not capable of connecting to 5GHz WiFi networks unless you use an external WiFi adapter that supports it.

Download balenaOS (~148 MB)

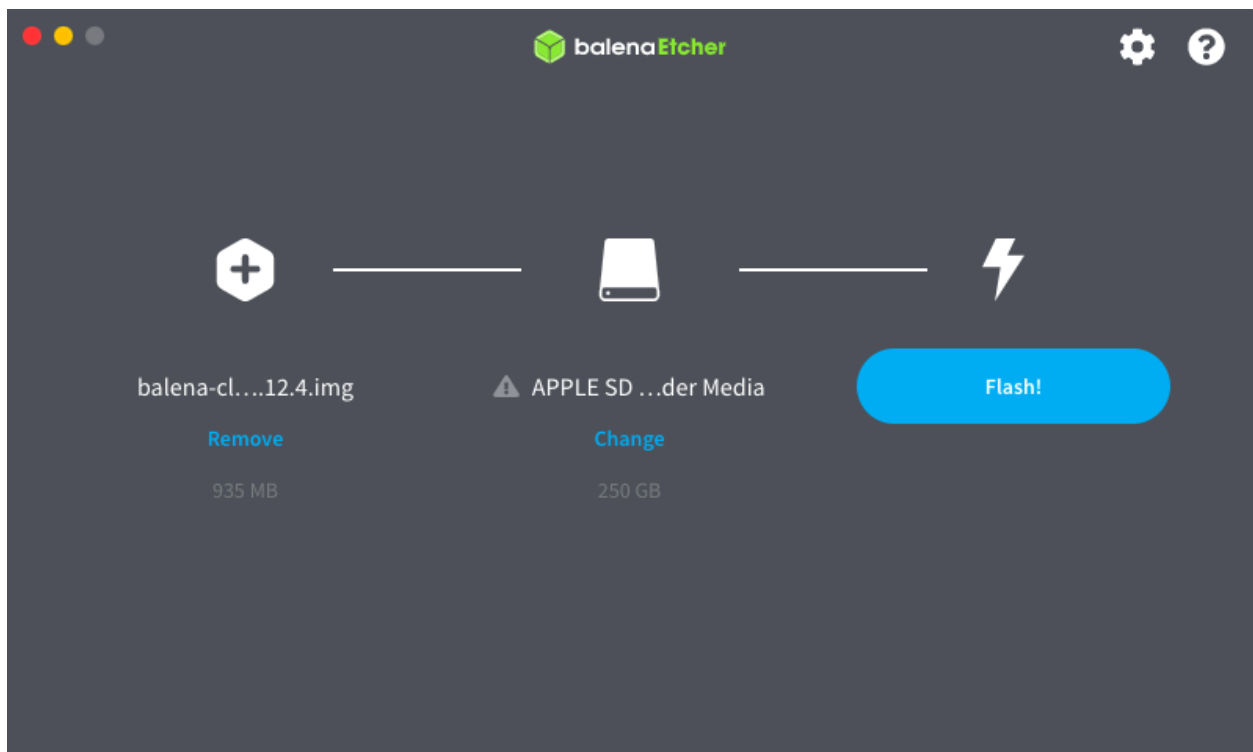
Instructions

- 1 Use the form on the left above to configure and download balenaOS for your new device.
- 2 Write the OS file you downloaded to your SD card. We recommend using [Etcher](#).
- 3 Insert the freshly burnt SD card into the Raspberry Pi (v1 / Zero / Zero W).
- 4 Connect your Raspberry Pi (v1 / Zero / Zero W) to the internet, then power it up.
- 5 Your device should appear in your application dashboard within a few minutes. Have fun!

For more details please refer to our [Getting Started Guide](#).

Here, we select the balenaOS and select network connection as WIFI + Ethernet and give our WIFI credentials. And then download our Balena OS.

Later we load the downloaded BalenaOS Image into Balena Etcher and then flash the SD card.



And now we will power the Raspberry PI Zero and insert the SD card flashed with BalenaOS.

Now we will open our Balena cloud and check our Application whether it is online.

Organizations > avinashgauri's Organization > house-monitor

Release policy track latest git remote add balena avinas...

[+ Add device](#) [Add filter](#) [Views](#) [Actions](#) [Tags](#)

<input type="checkbox"/>	Status	Name	Last seen (VPN)	UUID	OS version	OS variant	Supervisor version	IP address	C
<input type="checkbox"/>	Online	solitary-shape	Online (for 9 hours)	c5fcf70	balenaOS 2.54.2+rev1	development	11.12.4	192.168.86.45	696d00f

1 - 1 of 1

Now we will download the Balena Sense code from the GitHub Repo,

The screenshot shows the GitHub repository page for **balenalabs / balena-sense**. The repository has 20 watches, 201 stars, and 1 fork. It includes tabs for Code, Issues (15), Pull requests (6), Actions, Projects, Wiki, Security, and Insights. The main content area displays a list of files and folders, including .github, grafana, images, influxdb, sensor, telegraf, .gitignore, CHANGELOG.md, CONTRIBUTING.md, LICENSE, README.md, and VERSION. The right sidebar contains an 'About' section with a description of the project, a link to the Balena blog, and a list of related repositories. Below this are sections for 'Releases' (43 tags) and 'Packages'.

balenalabs / balena-sense Watch 20 Star 201 Fork

<> Code Issues 15 Pull requests 6 Actions Projects Wiki Security Insights

ea4d466bb7 30 branches 43 tags Go to file Code

balena-ci and VersionBot v1.9.7 ea4d466 on 15 Jul 182 commits

File	Commit Message	Time Ago
.github	meta: Update codeowners to HHR team	11 months ago
grafana	Revert to balena base image	5 months ago
images	readme: Update repo logo	14 months ago
influxdb	Correct influxDB conf path closes #84	5 months ago
sensor	Add Sense-HAT pressure sensor support	7 months ago
telegraf	v1.8.0	12 months ago
.gitignore	Add images for readme	2 years ago
CHANGELOG.md	v1.9.7	5 months ago
CONTRIBUTING.md	Correct project name in CONTRIBUTING.md	15 months ago
LICENSE	Initial commit	2 years ago
README.md	Including masterclass link to readme	5 months ago
VERSION	v1.9.7	5 months ago

About

Take readings from a BME680 sensor or Sense-HAT on a Pi or Pi Zero, store with InfluxDB and view with Grafana

www.balena.io/blog/build-an-enviro...

balena balenacloud raspberrypi bme680 grafana-influxdb sense-hat raspberry-pi raspberry-pi-zero

Readme Apache-2.0 License

Releases

43 tags

Packages

Then we will install the Balena CLI using the source code from GitHub Repo,

The screenshot shows the GitHub repository page for **balena-io / balena-cli**. The repository has 38 watches, 287 stars, and 1 fork. It includes tabs for Code, Issues (279), Pull requests (17), Actions, Projects (4), Wiki, Security, and Insights. The main content area displays a list of files and folders, including .github, .versionbot, automation, bin, doc, lib, patches, tests, typings, .editorconfig, .gitattributes, and .gitignore. The right sidebar contains an 'About' section with a description of the project, a link to the README, and a list of related repositories. Below this are sections for 'Releases' (702 releases, latest v12.35.0) and 'Packages' (No packages published).

balena-io / balena-cli Watch 38 Star 287 Fork

<> Code Issues 279 Pull requests 17 Actions Projects 4 Wiki Security Insights

master 136 branches 702 tags Go to file Add file Code

balena-ci and VersionBot v12.35.0 f128eaf 14 hours ago 3,688 commits

File	Commit Message	Time Ago
.github	Revert styling of "balena CLI" as "balenaCLI"	2 months ago
.versionbot	v12.35.0	14 hours ago
automation	Make balena-cli build on refreshed on-prem workers	5 days ago
bin	Add bin/balena* scripts to linter paths	2 months ago
doc	Update various commands to support organizations	14 hours ago
lib	Update various commands to support organizations	14 hours ago
patches	Make balena-cli build on refreshed on-prem workers	5 days ago
tests	Update various commands to support organizations	14 hours ago
typings	scan: Print production devices' info on scan	15 days ago
.editorconfig	fix resin local push help message and lint errors	4 years ago
.gitattributes	Allow rebasing of npm-shrinkwrap	4 months ago
.gitignore	Generate/include an ocilif.manifest.json when packaging	6 months ago

About

The official balena CLI tool.

Readme Apache-2.0 License

Releases 702

v12.35.0 Latest 13 hours ago

+ 701 releases

Packages

No packages published

Used by 9

```
avi — -bash — 85x25
Last login: Tue Dec 15 19:25:50 on ttys000
mac-air:~ avi$ 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/http%253A%252F%252F127.0.0.1%253A59821%252Fauth
Successfully logged in as: avinashganguri

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
mac-air:~ avi$
```

And then we push our source code in the Balena CLI to our application device.

Here we can see our application name and our device,

```
avi — -bash — 85x25
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/http%253A%252F%252F127.0.0.1%253A59821%252Fauth
Successfully logged in as: avinashganguri





















Find out about the available commands by running:

$ balena help

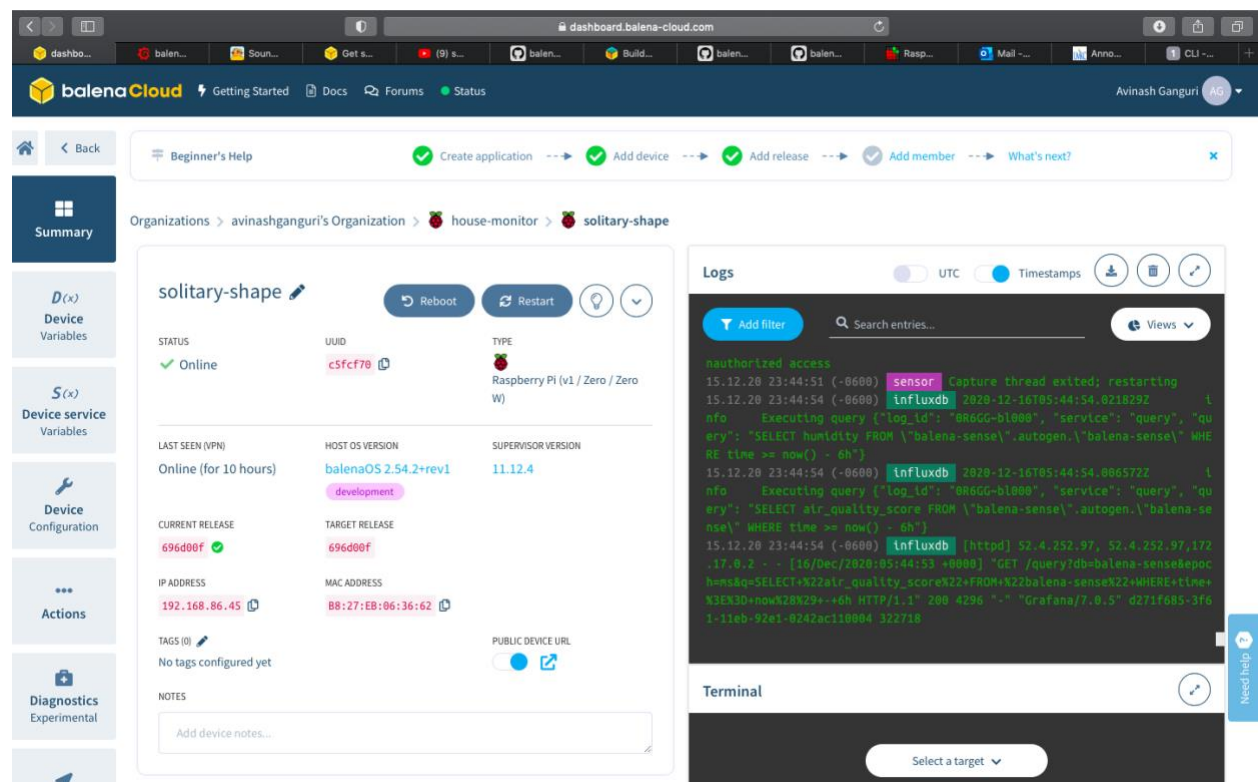
For further help or support, visit:
https://www.balena.io/docs/reference/balena-cli/#support-faq-and-troubleshooting
mac-air:~ avi$ balena apps
ID      APP NAME      SLUG      DEVICE TYPE  ONLINE  DEVICES  DEVICE
COUNT
1769332 house-monitor avinashganguri/house-monitor raspberry-pi 1          1
mac-air:~ avi$ balena devices
ID      UUID      DEVICE NAME      DEVICE TYPE  APPLICATION NAME  STATUS  IS ONLINE  SUPERVISOR VERSION  OS VERSION      DASHBOARD URL
4085451 c5fcf70 solitary-shape raspberry-pi house-monitor  Idle    true       11.12.4
          balenaOS 2.54.2+rev1 https://dashboard.balena-cloud.com/devices/c5fcf70da
b79f0e9d782934ff059efae/summary
mac-air:~ avi$
```

And then we will check the services downloaded and running successfully,

SERVICES

Service	Status	Release	
grafana	Running	696d00f	   
influxdb	Running	696d00f	   
mqtt	Running	696d00f	   
sensor	Running	696d00f	   
telegraf	Running	696d00f	   

And this is our application device status check and logs,



The screenshot displays the Balena Cloud dashboard for a device named 'solitary-shape'. The device is online and running the '696d00f' release of 'balenaOS 2.54.2+rev1'. The dashboard includes a sidebar with navigation options like Summary, Device Variables, Service Variables, Configuration, Actions, and Diagnostics. The main content area shows the device's status, including its IP address (192.168.86.45) and MAC address (BB:27:EB:06:36:62). A 'Logs' panel on the right shows the device's output, including messages from 'sensor' and 'influxdb'.

Device Status:

- Organization: avinashganguri's Organization
- Device: solitary-shape
- Status: Online
- UUID: c5fcf70
- Type: Raspberry Pi (v1 / Zero / Zero W)
- Supervisor Version: 11.12.4
- Current Release: 696d00f
- Target Release: 696d00f
- IP Address: 192.168.86.45
- MAC Address: BB:27:EB:06:36:62
- Public Device URL: [https://dashb...](#)

Logs:

```
authorized access
15.12.20 23:44:51 (-0600) sensor Capture thread exited; restarting
15.12.20 23:44:54 (-0600) influxdb 2020-12-16T05:44:54.021829Z l
nfo Executing query ("log_id": "8R6GG-bl000", "service": "query", "qu
ery": "SELECT humidity FROM \"balena-sense\".autogen.\"balena-sense\" WHE
RE time >= now() - 6h")
15.12.20 23:44:54 (-0600) influxdb 2020-12-16T05:44:54.086572Z l
nfo Executing query ("log_id": "8R6GG-bl000", "service": "query", "qu
ery": "SELECT air_quality_score FROM \"balena-sense\".autogen.\"balena-se
nse\" WHERE time >= now() - 6h")
15.12.20 23:44:54 (-0600) influxdb [httpd] 52.4.252.97, 52.4.252.97,172
.17.0.2 - - [16/Dec/2020:05:44:53 +0000] "GET /query?db=balena-sense&epoc
hms&q=SELECT+X22air_quality_score%22+FROM%22balena-sense%22+WHERE+time+
%3E%3D+now%28%29+-+6h+HTTP/1.1" 200 4296 "-" "Grafana/7.0.5" d271f685-3f6
1-11eb-92e1-0242ac10004 322718
```


solitary-shape 

 Reboot

 Restart



STATUS

 Online

UUID

c5fcf70 

TYPE



Raspberry Pi (v1 / Zero / Zero W)

LAST SEEN (VPN)

Online (for 10 hours)

HOST OS VERSION

balenaOS 2.54.2+rev1

development

SUPERVISOR VERSION

11.12.4

CURRENT RELEASE

696d00f 


TARGET RELEASE

696d00f

IP ADDRESS

192.168.86.45 

MAC ADDRESS

B8:27:EB:06:36:62 

TAGS (0) 

No tags configured yet

PUBLIC DEVICE URL



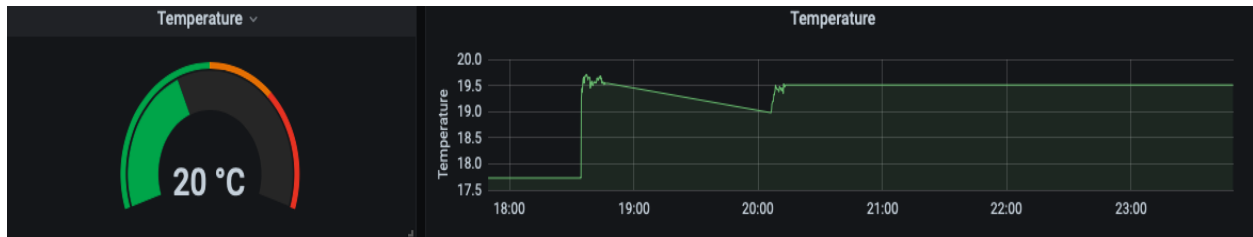
NOTES

Here we can use the IP ADDRESS or use the PUBLIC DEVICE URL to generate the dashboard for our AIR QUALITY.

Here is our Humidity Graph,



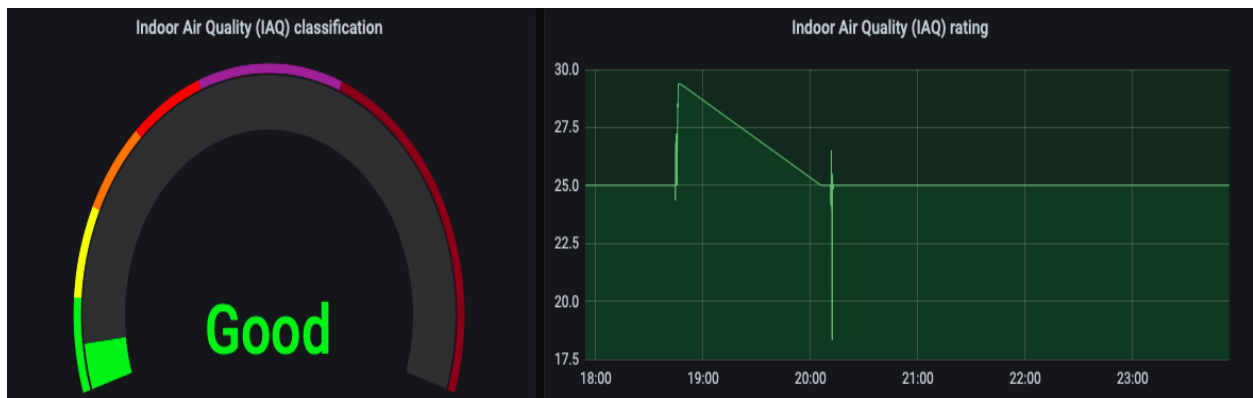
This is our Temperature Graph,



This is the Barometric Graph,



And the overall Classified Indoor Air Quality of our Room Temperature is,



And the Air Quality is based on the following measurements,

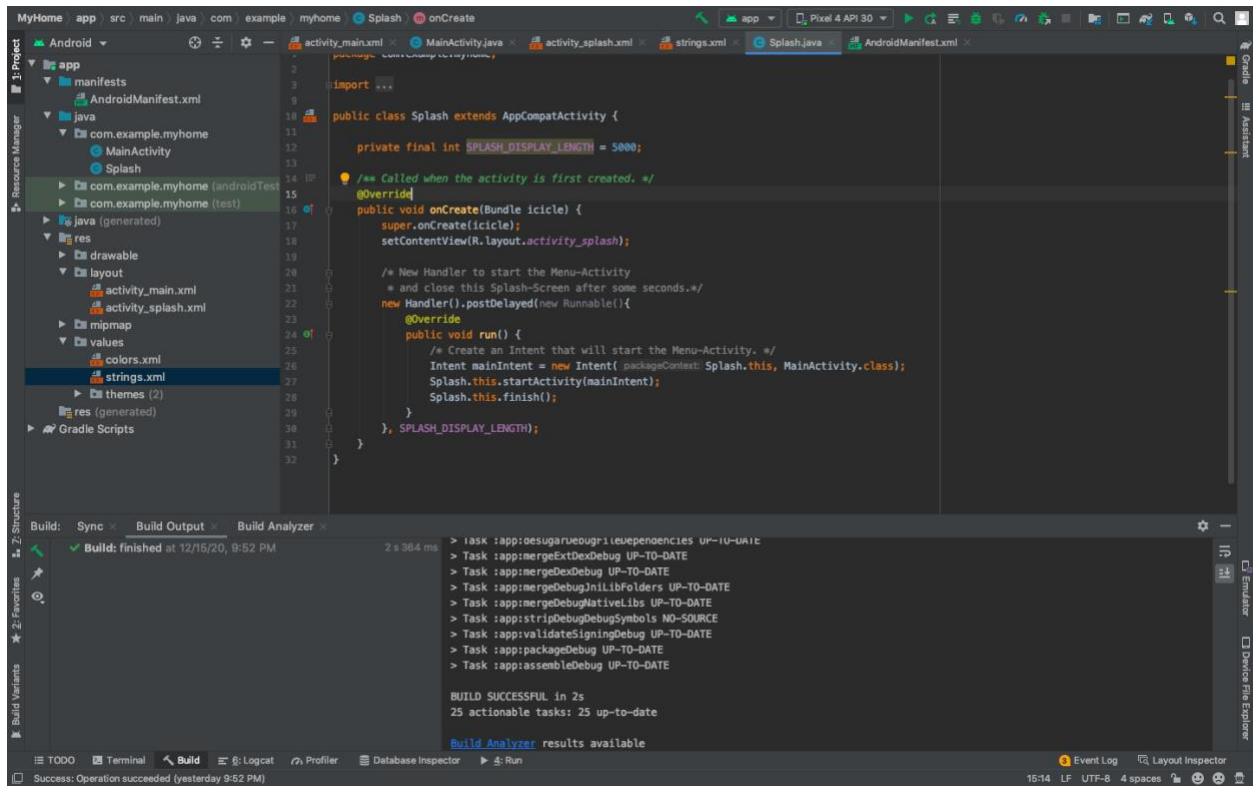
Table 4: Indoor air quality (IAQ) classification and color-coding⁹

IAQ Index	Air Quality
0 – 50	good ¹⁰
51 – 100	average
101 – 150	little bad
151 – 200	bad
201 – 300	worse ²
301 – 500	very bad

And this is the dashboard where we can monitor all the humidity, temperature, barometric pressure and the air quality.



Code for the android app,





These are the screens that can be monitored from the Android APP.

Team Contribution

Avinash Ganguri – Setting up the software through Balena Cloud and pushing the code and worked on Android App for monitoring the Air Quality dashboard.

Geetanjali Makineni – Handling the Hardware components and making sure the connections are set and maintained properly and helped Avinash with the App.

Conclusion

We can monitor the room temperature, humidity, pressure and air quality of the house from anywhere in the world and can assess what other things you can try to do it with. Has the access through web link and through the Android App.

Future Work

- Can have notifications through mail or app, based on certain threshold value where we can extend features through Grafana.
- Can add new sensors such as sound sensors and monitor surrounding environment, but the present version of Balena Cloud doesn't provide such.

References

<https://github.com/balenalabs/balena-sense/tree/ea4d466bb75698acef18c60de97a4d94df808a9e>

<https://www.balena.io/blog/build-an-environment-and-air-quality-monitor-with-raspberry-pi/>

<https://www.balena.io/blog>