

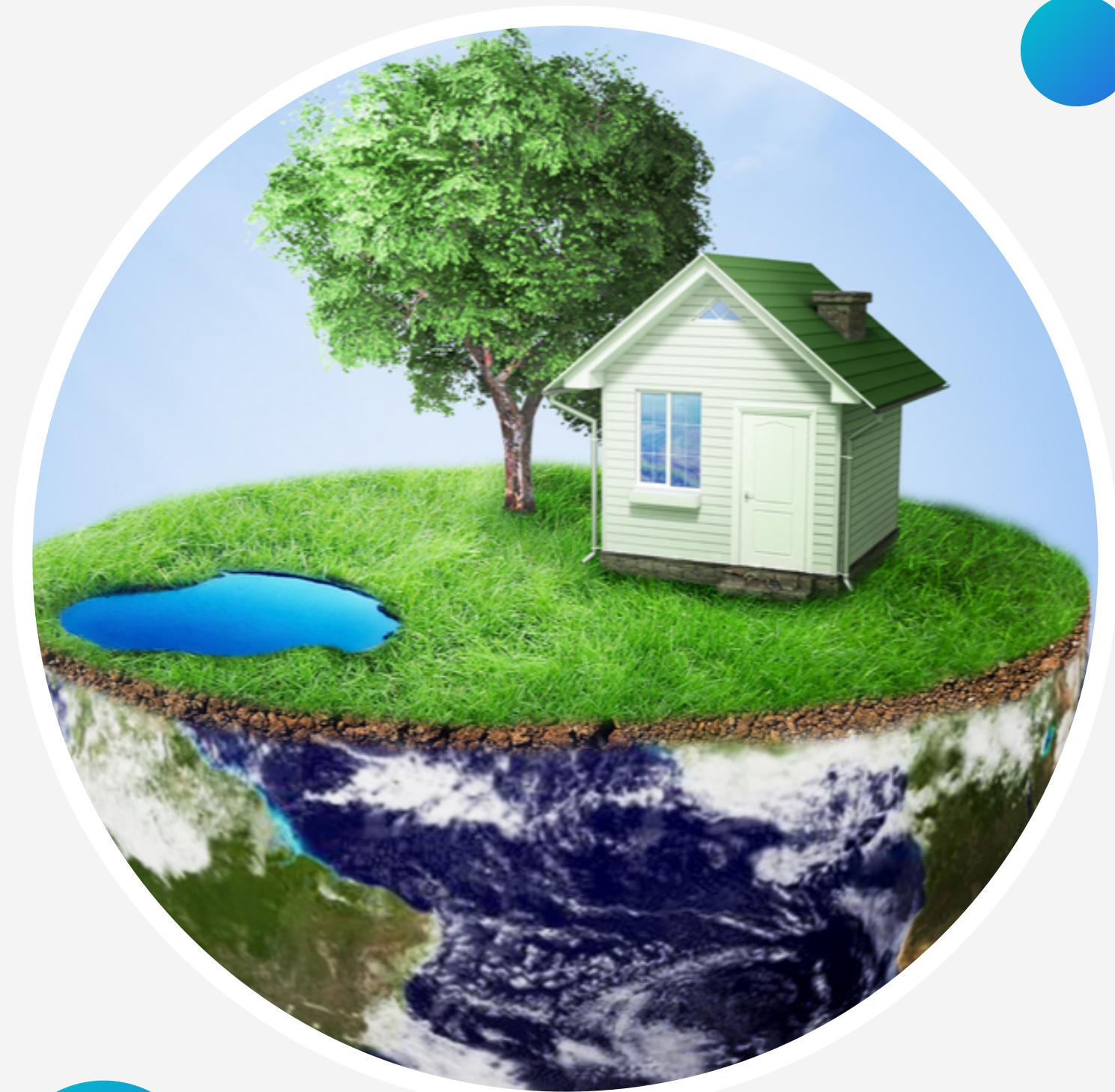
DUMPLING

TEAM 29: S

INDOOR AIR POLLUTION

TEAM MEMBERS :

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- 2) Obbineni Sai Nikhita
- 3) Penumalla Aditya Pavani
- 4) Thota Venkata Sai Lakshmi Geethika



28/11/2022

MOTIVATION

- Indoor air pollution is the degradation of indoor air quality by harmful chemicals and other materials; it can be up to 10 times worse than outdoor air pollution. This is because contained areas enable potential pollutants to build up more than open spaces.
- The ill-effects of indoor air pollution result in about 2 million premature deaths per year. Hence it is important to analyse the indoor air quality.
- In our project, we measure the CO₂ levels, Temperature, Humidity, VOC Index, Particulate Matter of size 2.5 microns and 10 microns using Prana CO₂, VOC sensor and Prana Air.
- This helps to analyse the quality of air inside the house. Using the data, required preventive measures could be taken to avoid health risks.

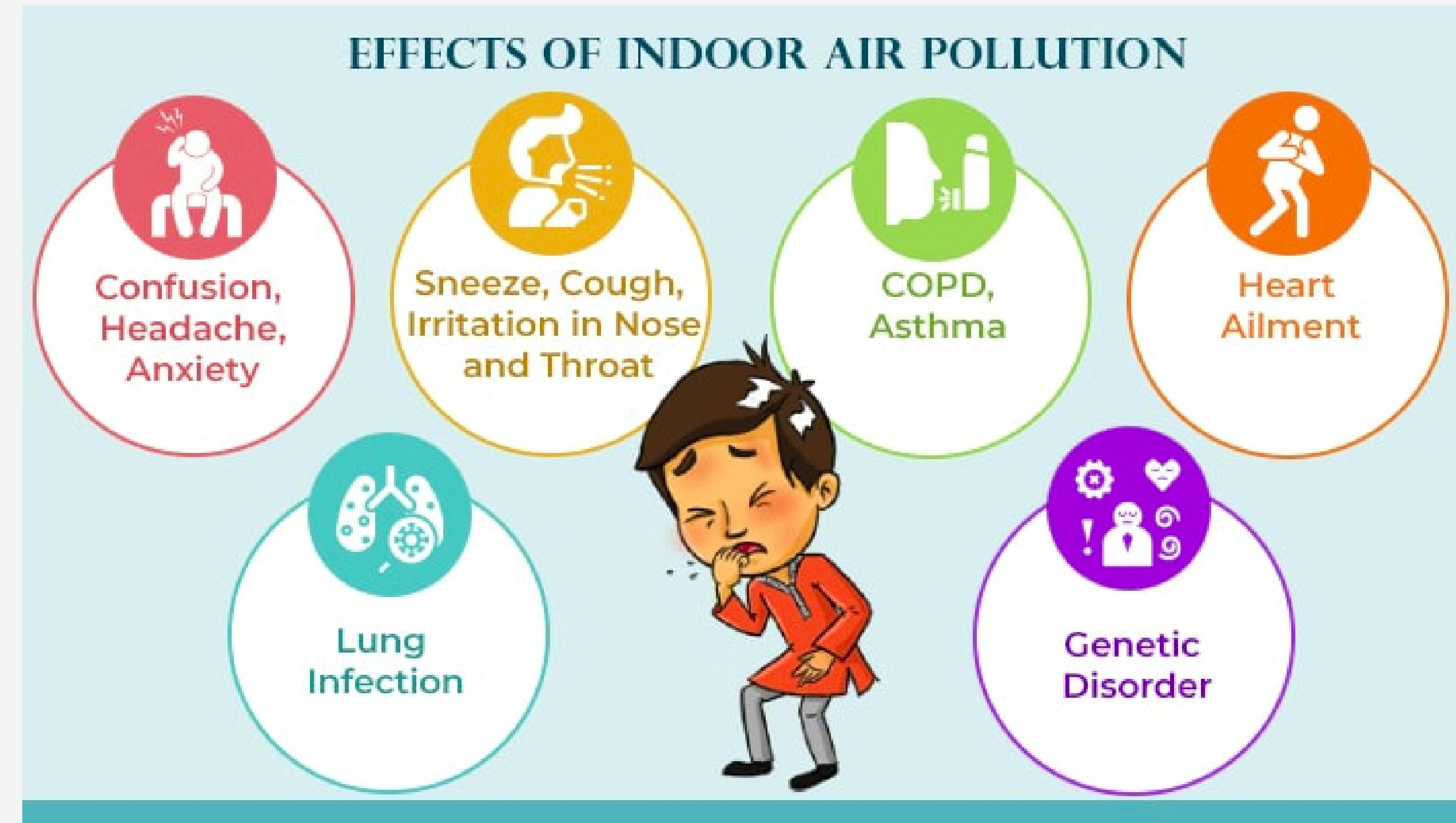
SOURCE:

[HTTPS://WWW.NCBI.NLM.NIH.GOV/PMC/ARTICLES/PMC4215499/](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4215499/)

SOURCES OF INDOOR AIR POLLUTION



EFFECTS



PROGRESS

Testing the working of the sensors and sending the data to Thingspeak.

Created dashboard. Data from Thingspeak is read and uploaded in the Dashboard. Graphs, Average Values and Values at a particular instant are included in the dashboard

WEEK 1

Basic understanding of the Project and division of work. Soldering of VOC Sensor and Prana CO2 on Zero PCB.

WEEK 2

Soldering of Prana Air Sensor, sent its data to Thingspeak. Pushing the data to Om2m.

WEEK 3

WEEK 4



PROGRESS

Outlier Detection
Calibration

WEEK 5

WEEK 6

WEEK 7



We have done
OneM2M

Updated our
Dashboard
and pushed it to git.

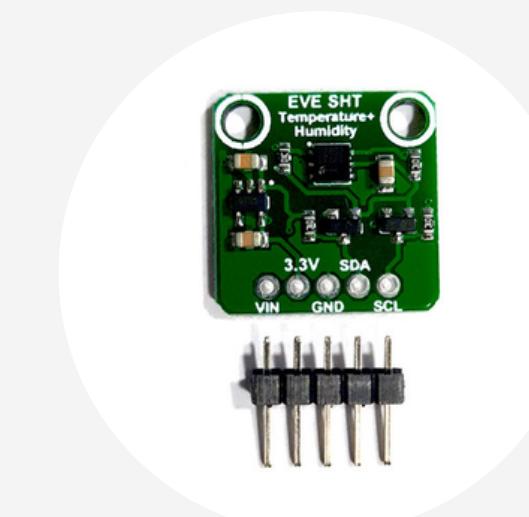
SENSORS USED

The sensors we used in our Project :



PRANA CO2

Prana Air **CO2 sensor** is a NDIR (Non Dispersive Infrared Radiation) sensor for carbon dioxide air quality monitoring. The resolution ranges from 0 ppm to 10,000 ppm.



VOC

The **VOC sensor** module works on the photoionization detector (PID) technology. PIDs can measure Volatile Organic Compounds (VOCs) to very low concentrations.



PRANA AIR

The **Prana Air** particulate matter sensor is created with high precision and accuracy. The sensor gives real time data for both PM 2.5 and PM 10.

CIRCUIT DIAGRAM

● PRANA CO2 CONNECTIONS:

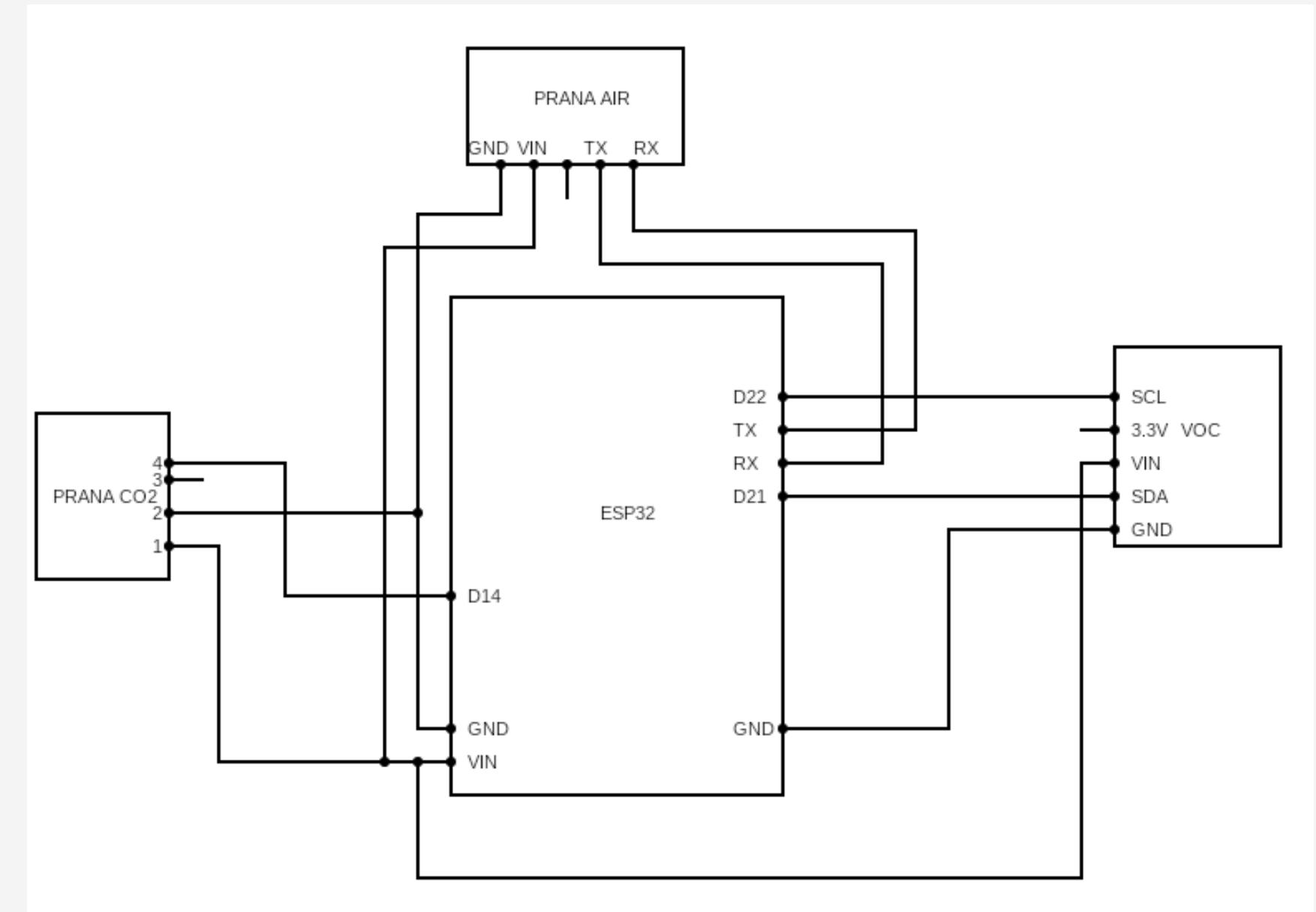
- VIN (ESP) - Pin 1 (Prana CO2)
- GND (ESP) - Pin 2 (Prana CO2)
- D14 (ESP) - Pin 4 (Prana CO2)

● VOC CONNECTIONS:

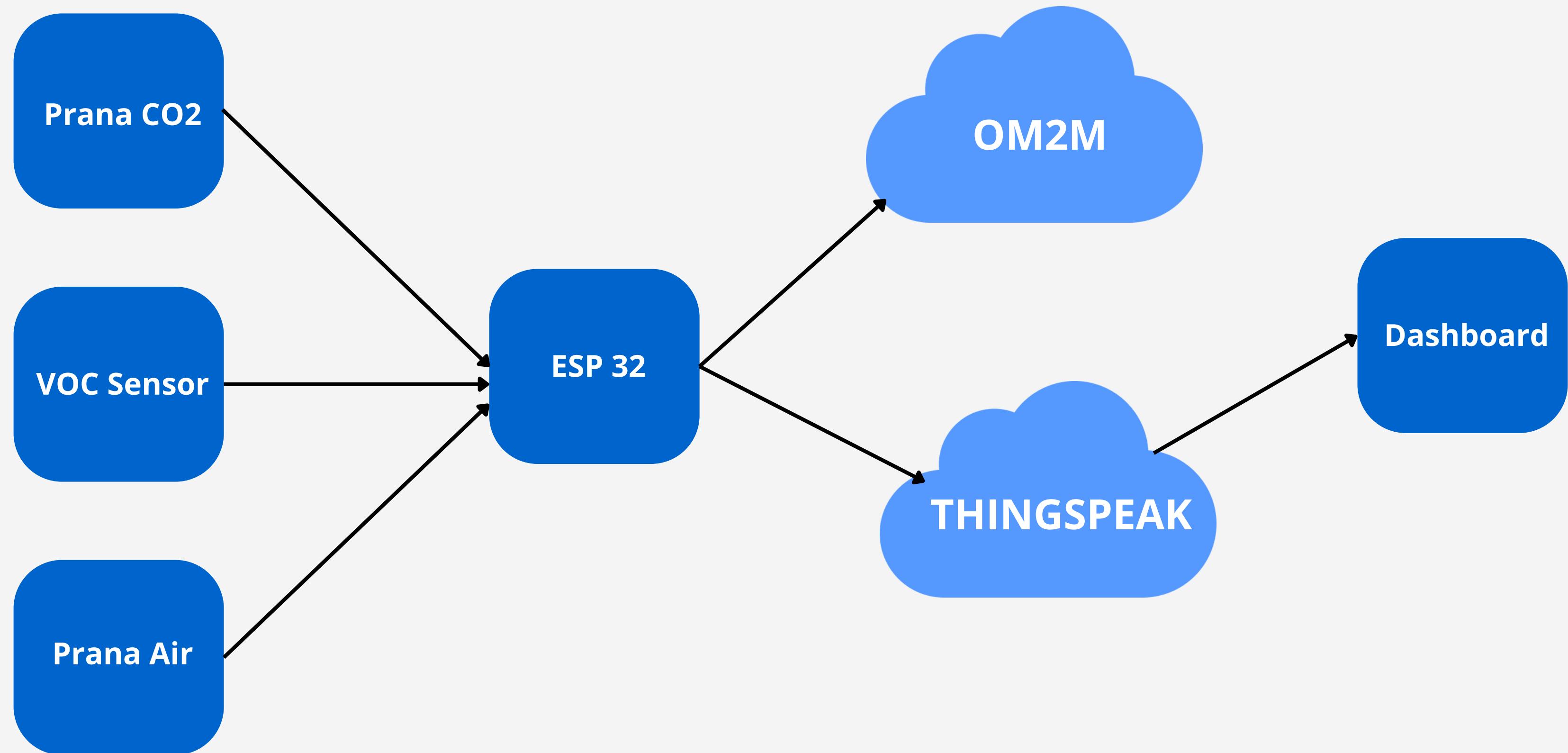
- VIN (ESP) - VIN (VOC)
- GND (ESP) - GND (VOC)
- D21 (ESP) - SDA (VOC)
- D22 (ESP) - SCL(VOC)

● PRANA AIR CONNECTIONS:

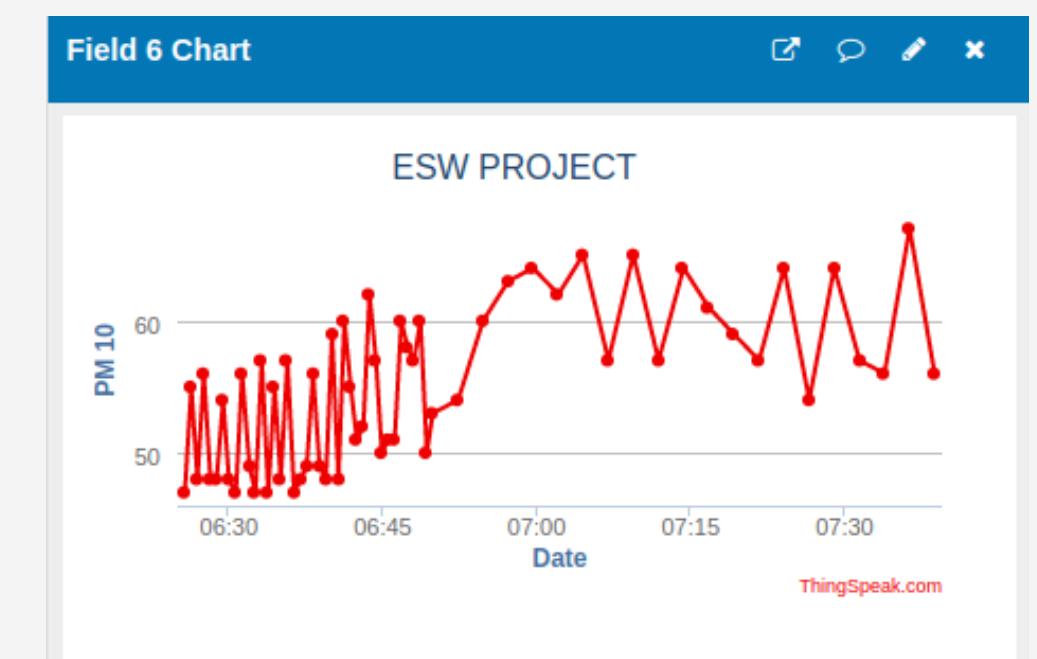
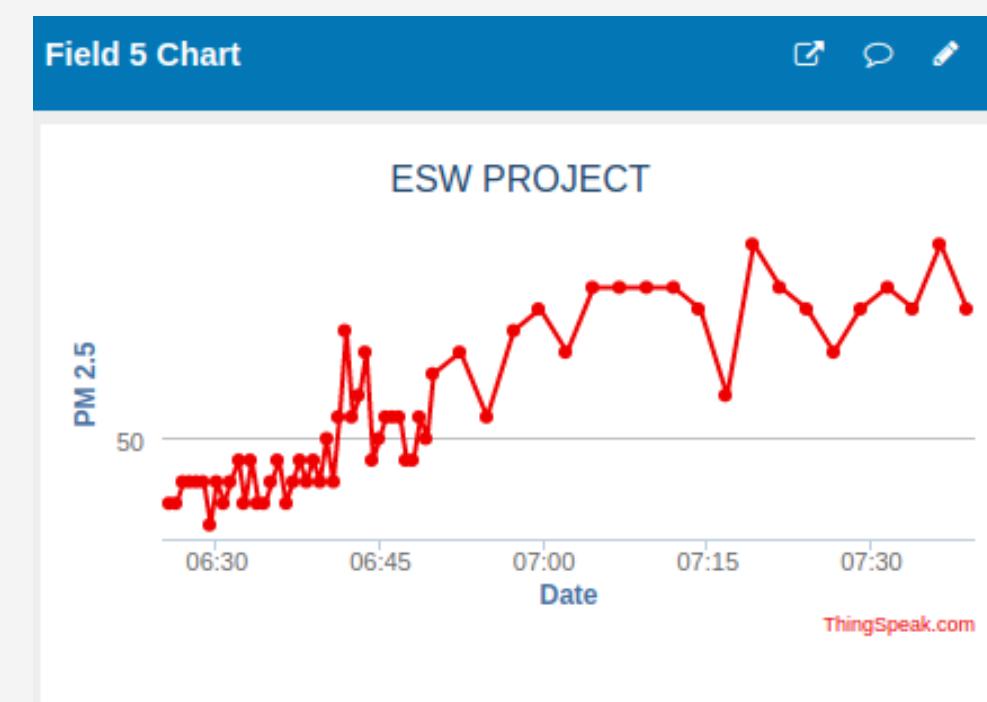
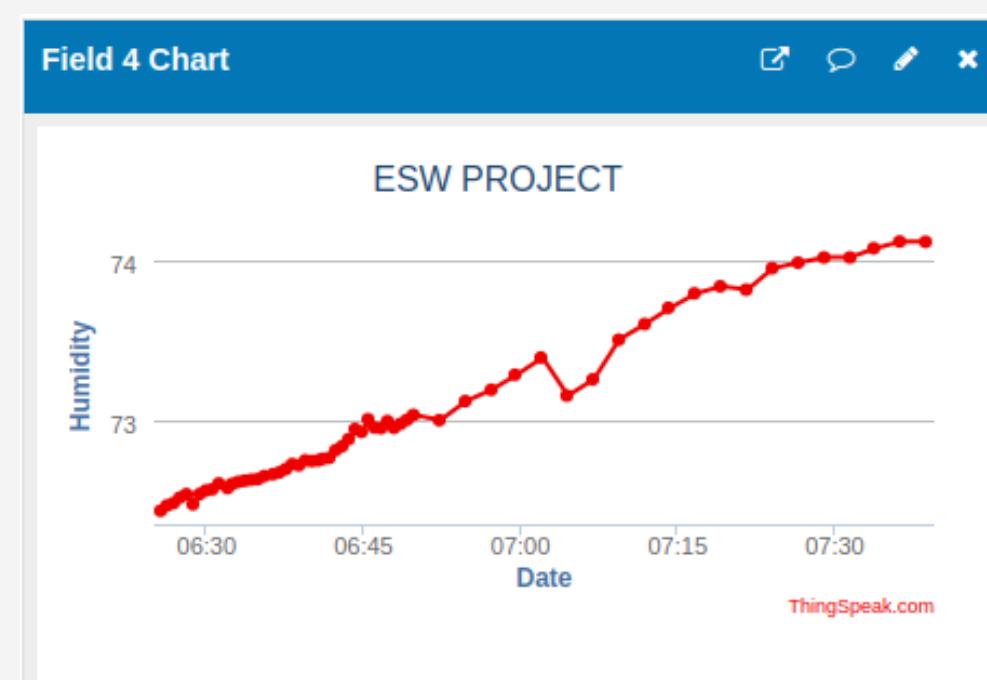
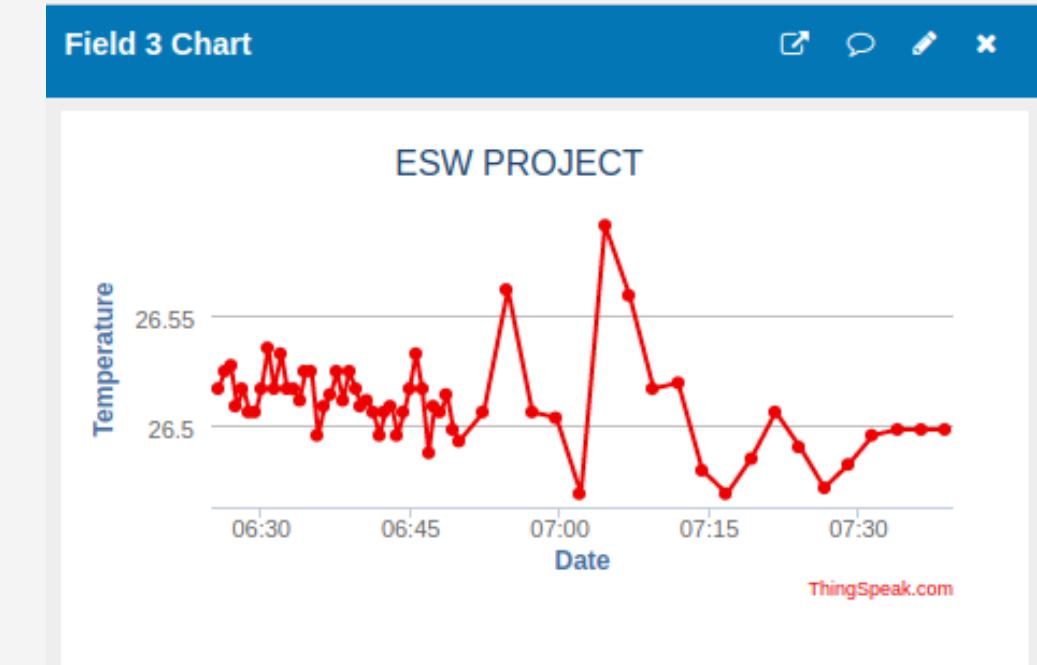
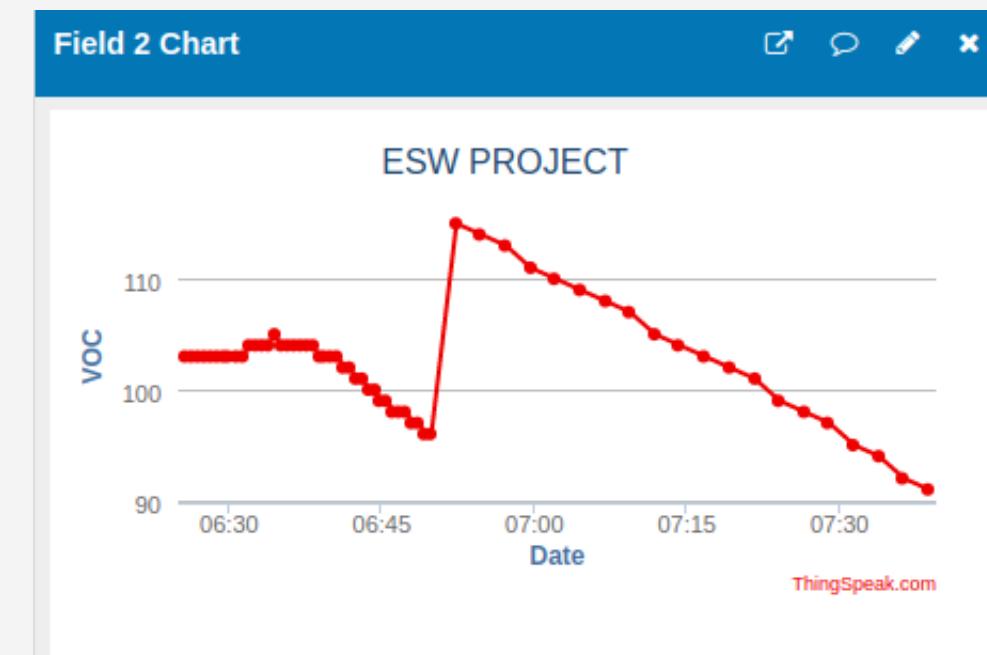
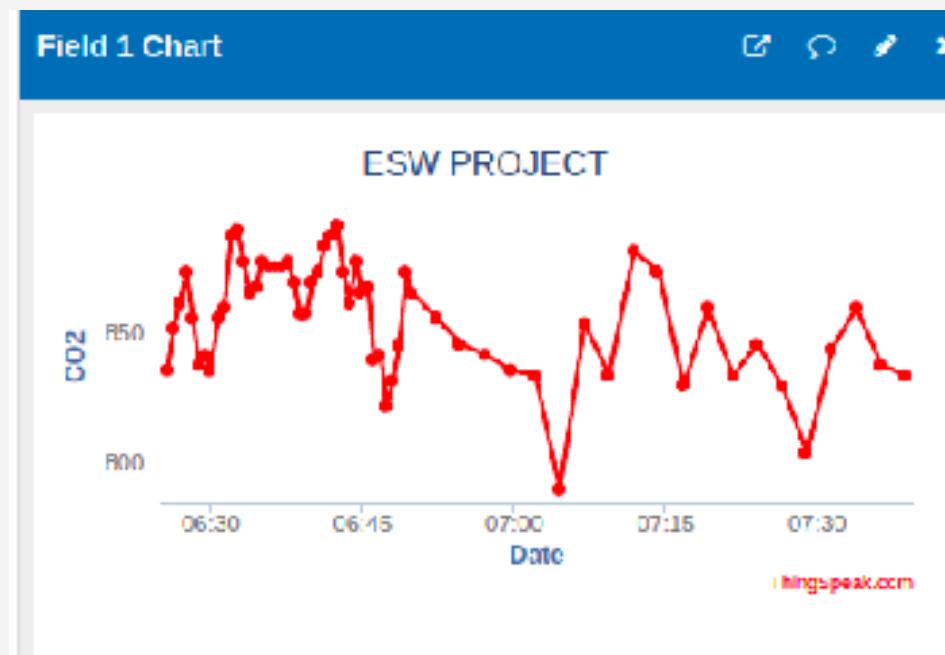
- VIN (ESP) - VIN (Prana AIR)
- GND (ESP) - GND (Prana AIR)
- TX (ESP) - RX (Prana AIR)
- RX (ESP) - TX (Prana AIR)



BLOCK DIAGRAM



THINGSPEAK



OM2M

The screenshot shows the OM2M CSE Resource Tree interface. The tree structure includes:

- in-name
 - acp_admin
 - DHT11
 - SmartHome
 - PIR_SENSOR
 - CO2
 - PranaCO2
 - CO2
 - VOC
 - VOC
 - Temperature
 - Humidity
 - PMSensor
 - PM10
 - PM2.5

On the right, there is a detailed view of the "PranaCO2" entity, showing its attributes and their values:

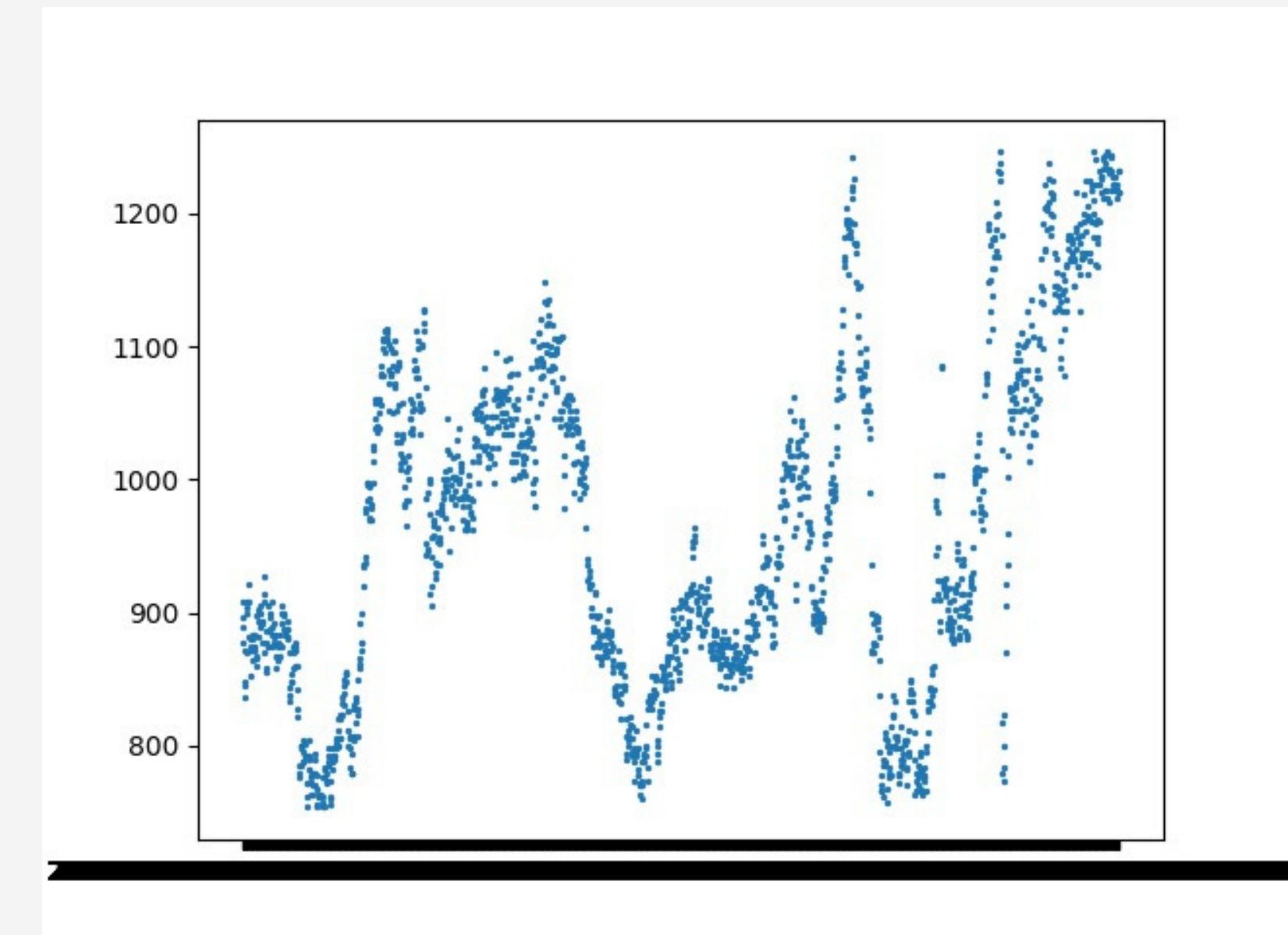
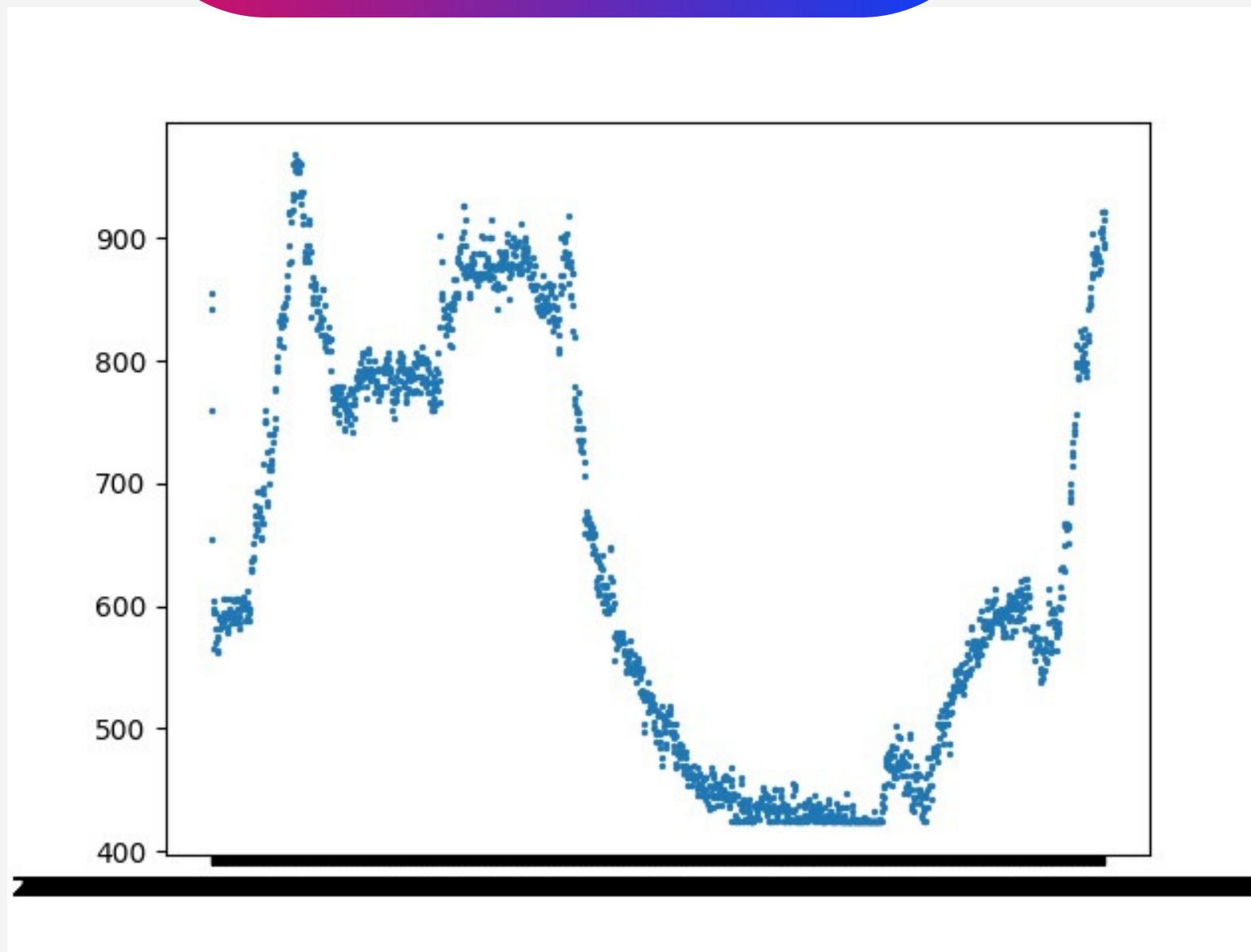
Attribute	Value		
rn	PMsensor		
ty	2		
ri	/in-cse/CAE781367737		
pi	/in-cse		
ct	20221105T024441		
lt	20221105T024441		
lbl	*		
acpi	<table border="1"><thead><tr><th>AccessControlPolicyIDs</th></tr></thead><tbody><tr><td>/in-cse/acp-590911978</td></tr></tbody></table>	AccessControlPolicyIDs	/in-cse/acp-590911978
AccessControlPolicyIDs			
/in-cse/acp-590911978			
et	20231105T024441		
api	acp_admin		
aei	CAE781367737		
rr	true		

- Three Application Entities were created.
- Containers will be created and the values are updated in OM2M as soon as the sensor detects the values.

- Application Entity 1 : Prana CO2
 - Containers
 - CO2
- Application Entity 2 : VOC
 - Containers
 - VOC
 - Temperature
 - Humidity
- Application Entity 3 : PM Sensor
 - Containers
 - PM 2.5
 - PM 10

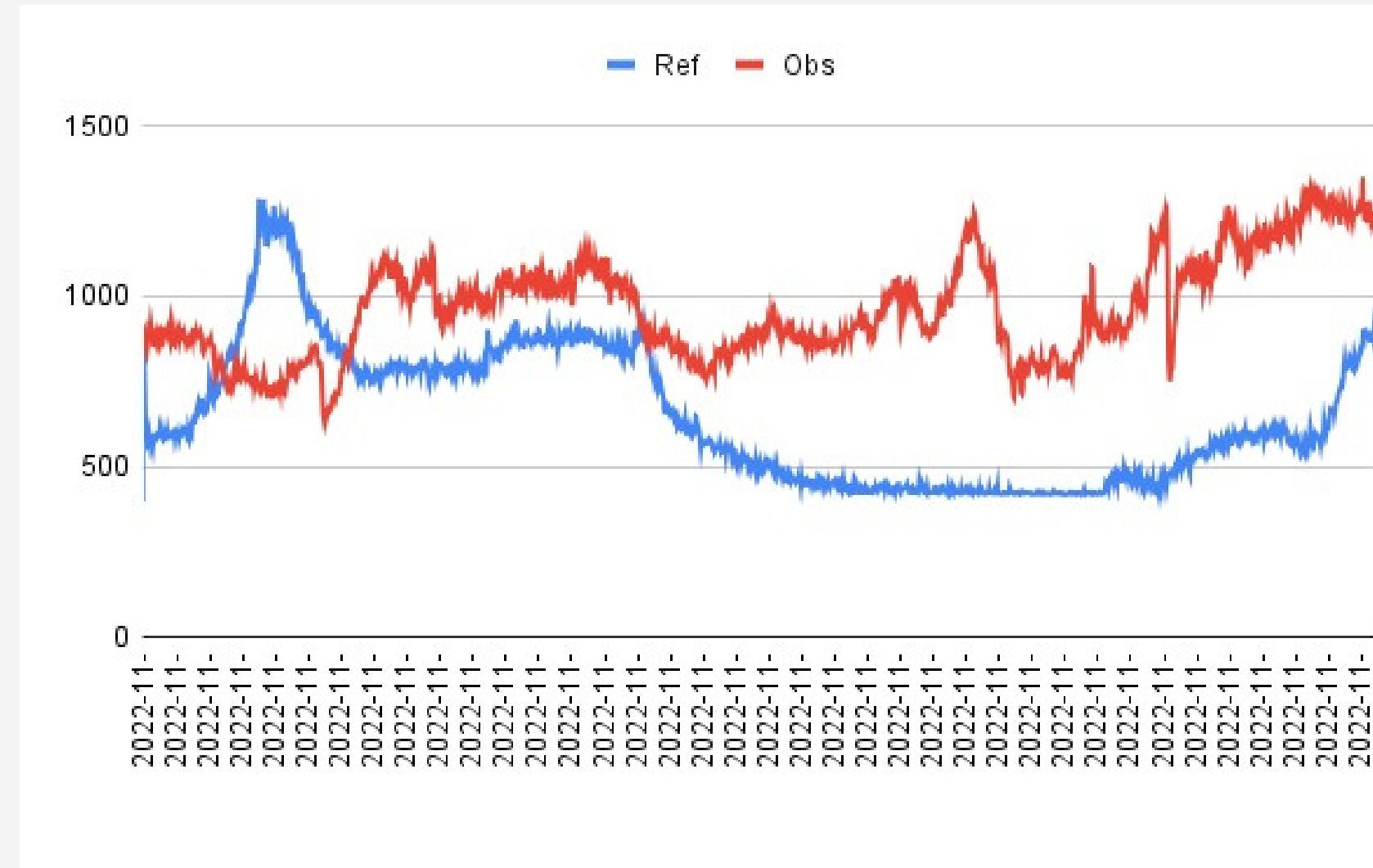
OUTLIER DETECTION

REFERENCE
SENSOR



PRANA AIR
SENSOR

COMPARISON



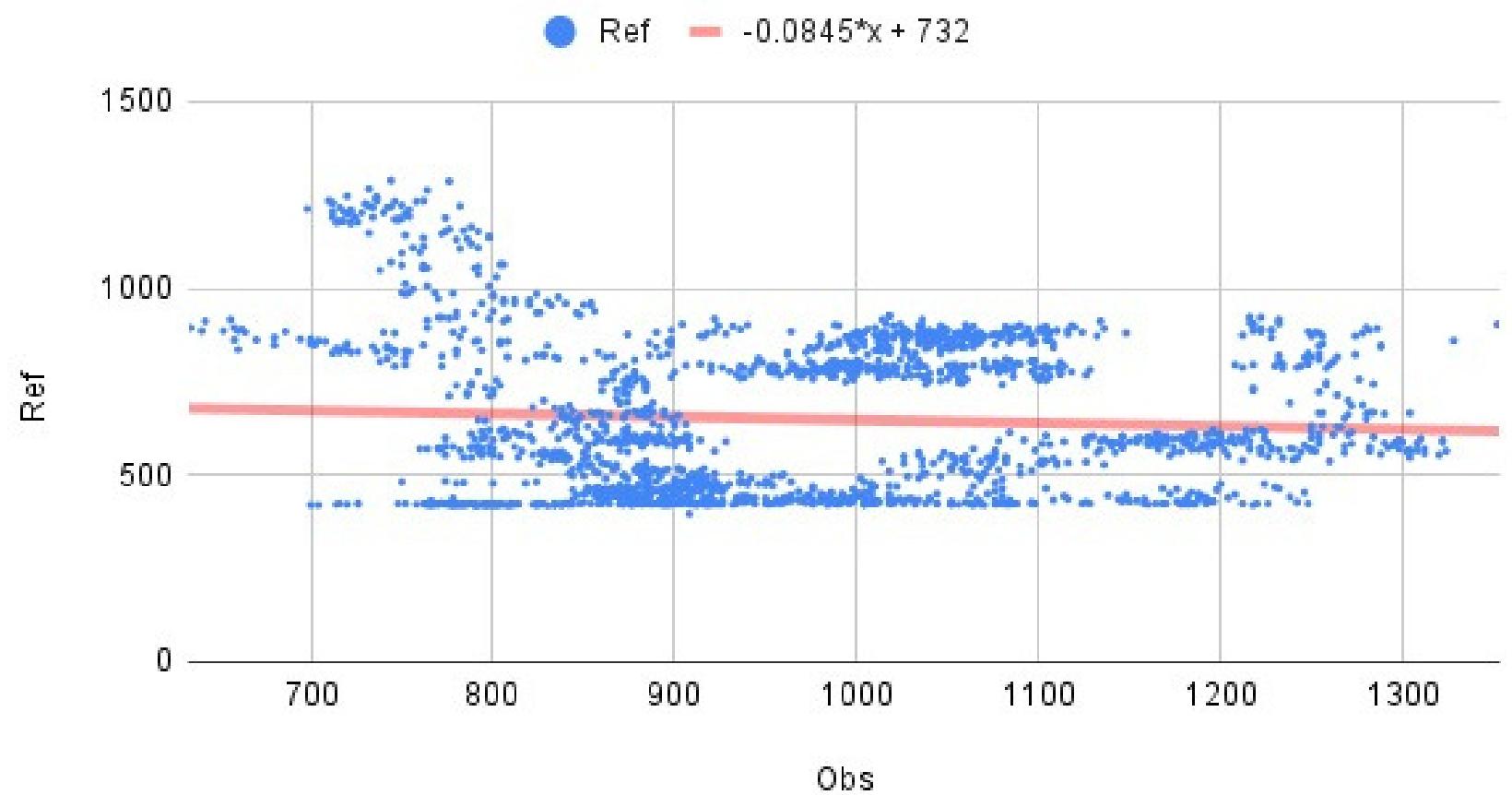
ABOUT

This graph is about the comparison of trends between the values obtained after outlier detection of our reference sensor (Aeroqual) and our sensor (Prana Air)

ABOUT

The type of Calibration we used is "Linear Regression"
Idea : Plot the trend line from the scattered points.

Ref vs Obs



CALIBRATION

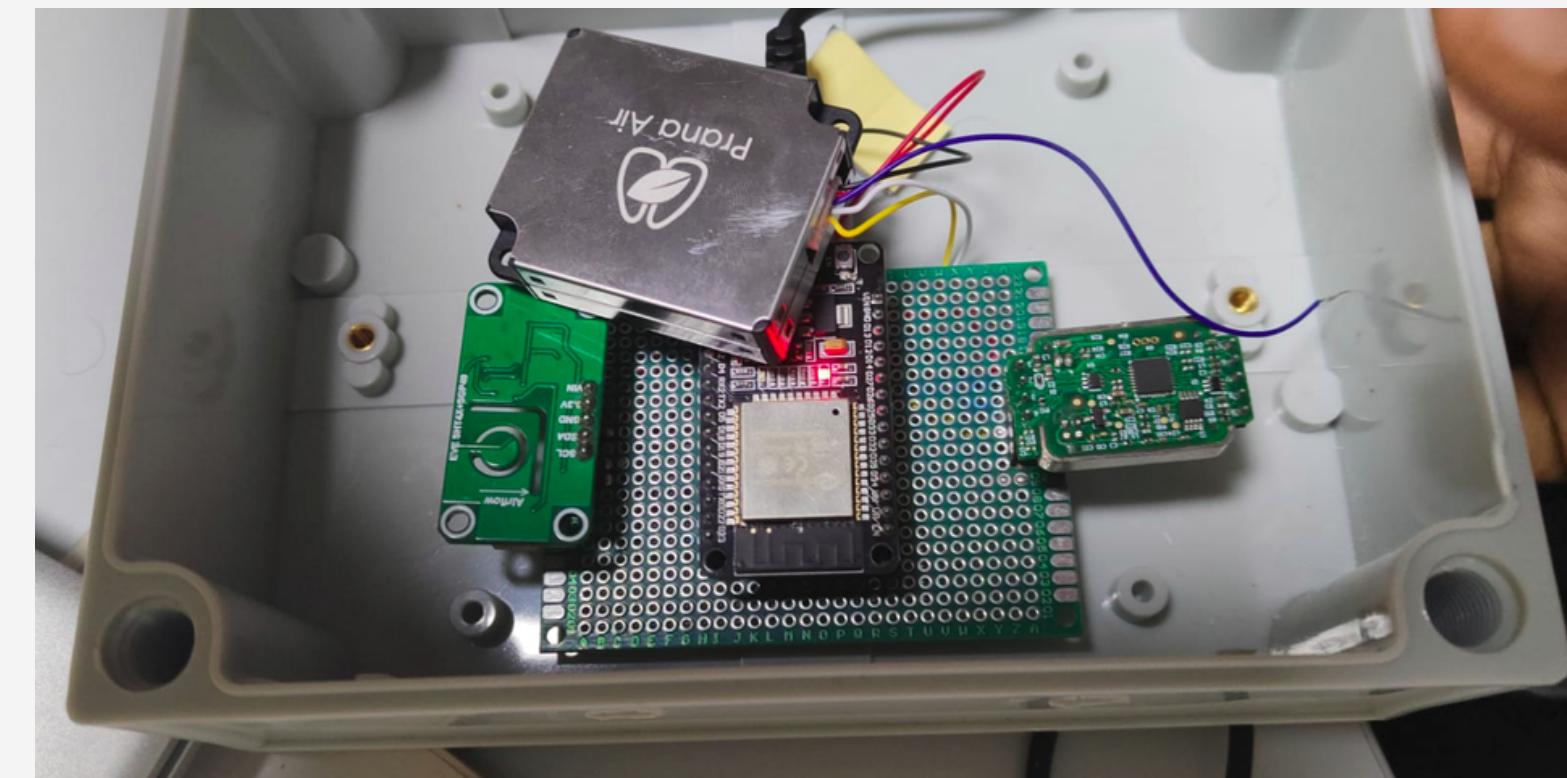
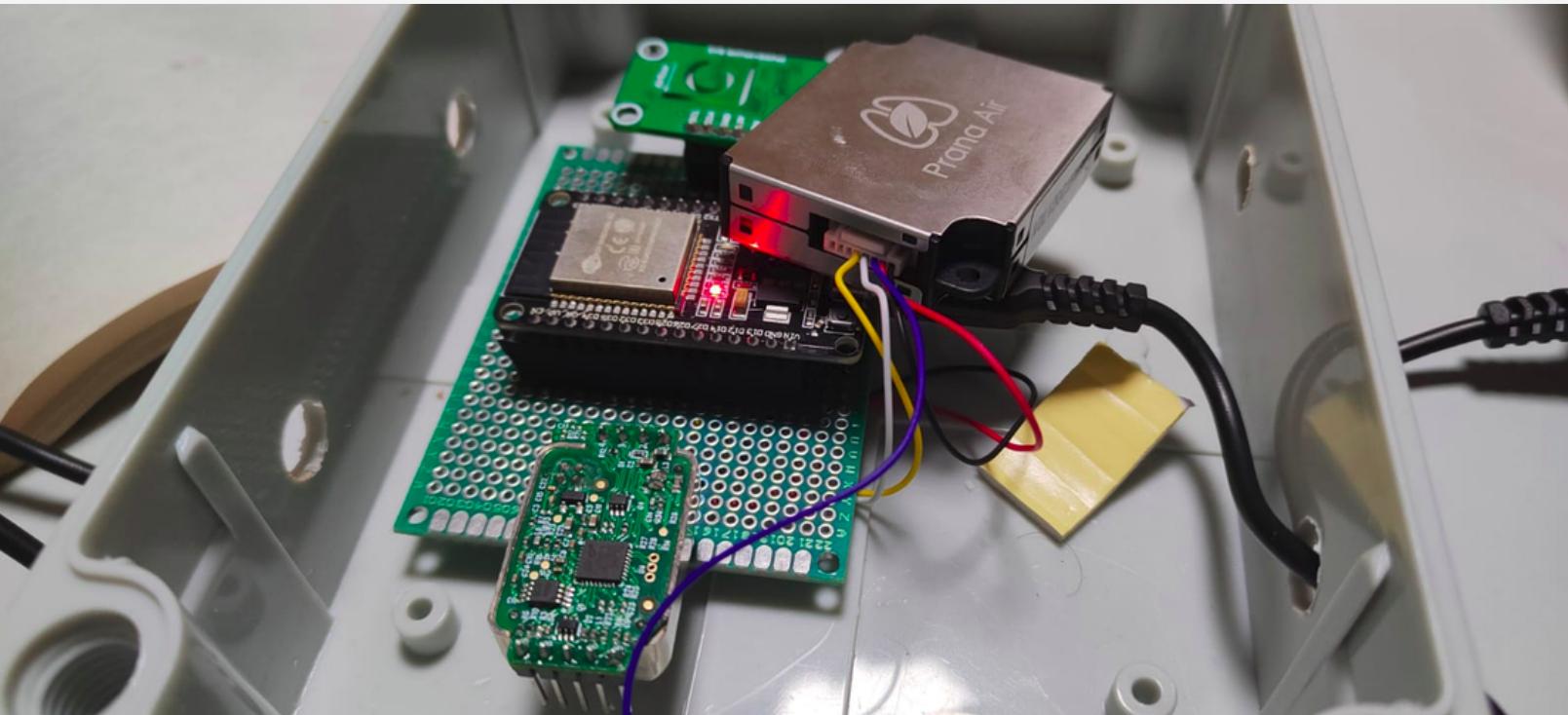
DATA ANALYSIS



Whenever CO2 levels are high than some threshold, we are sending alert notification mail to the user.

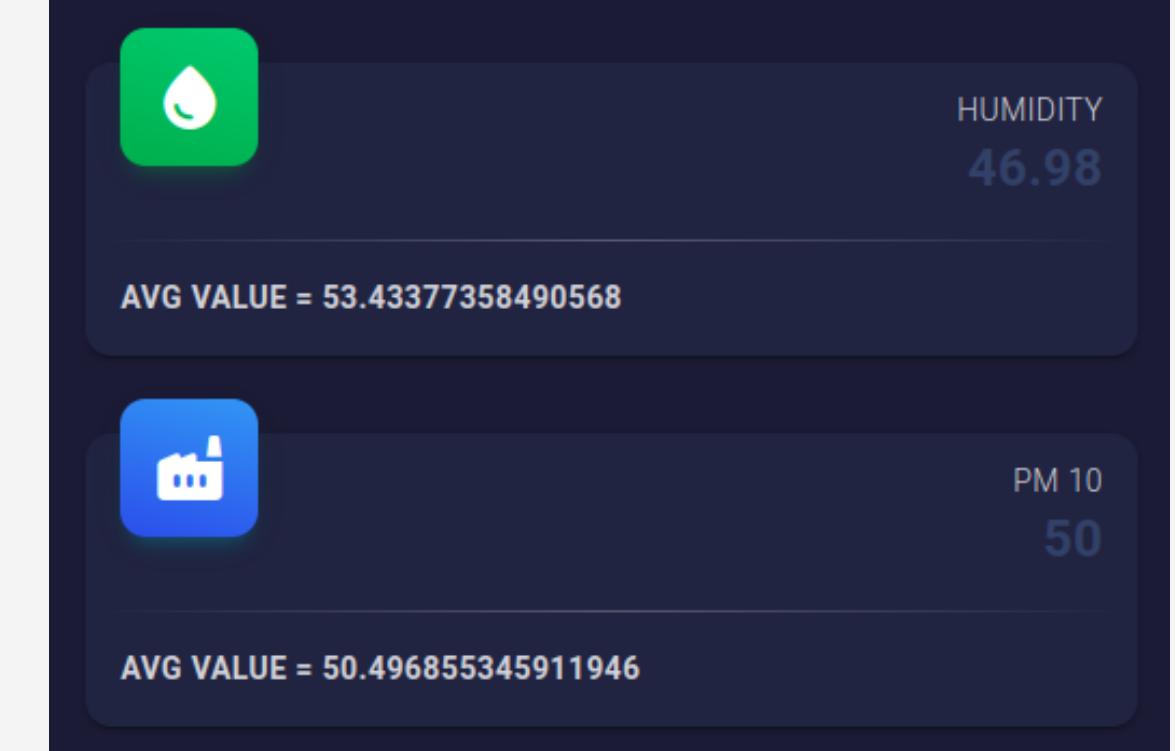
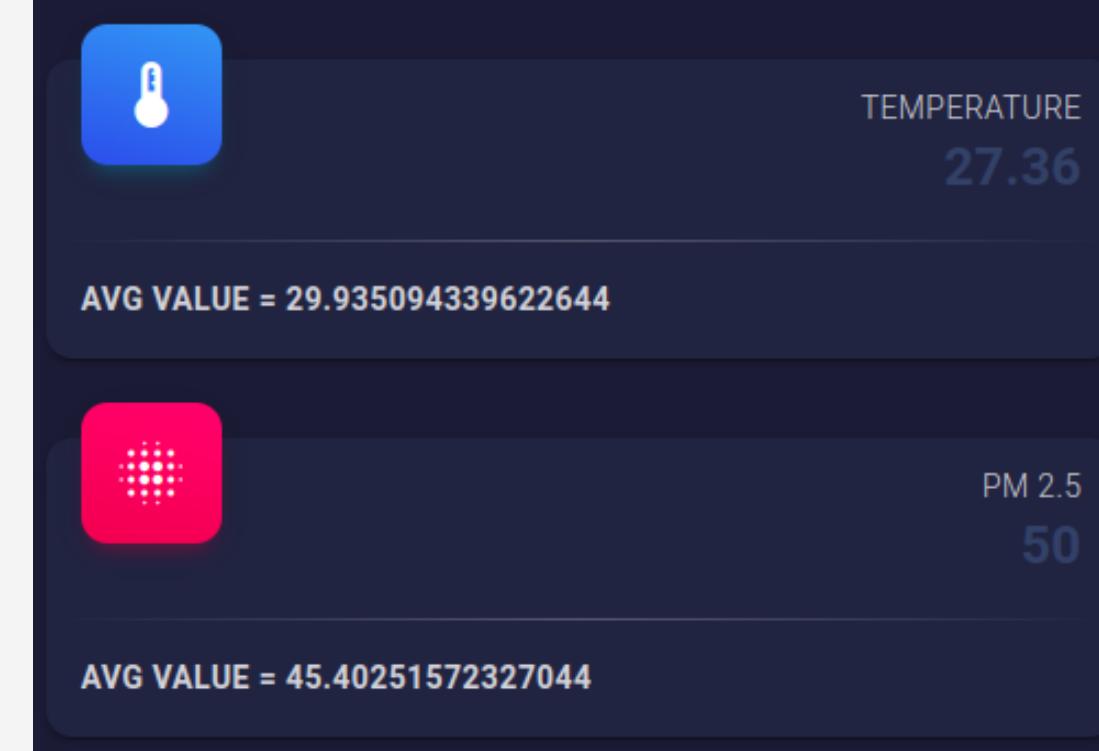
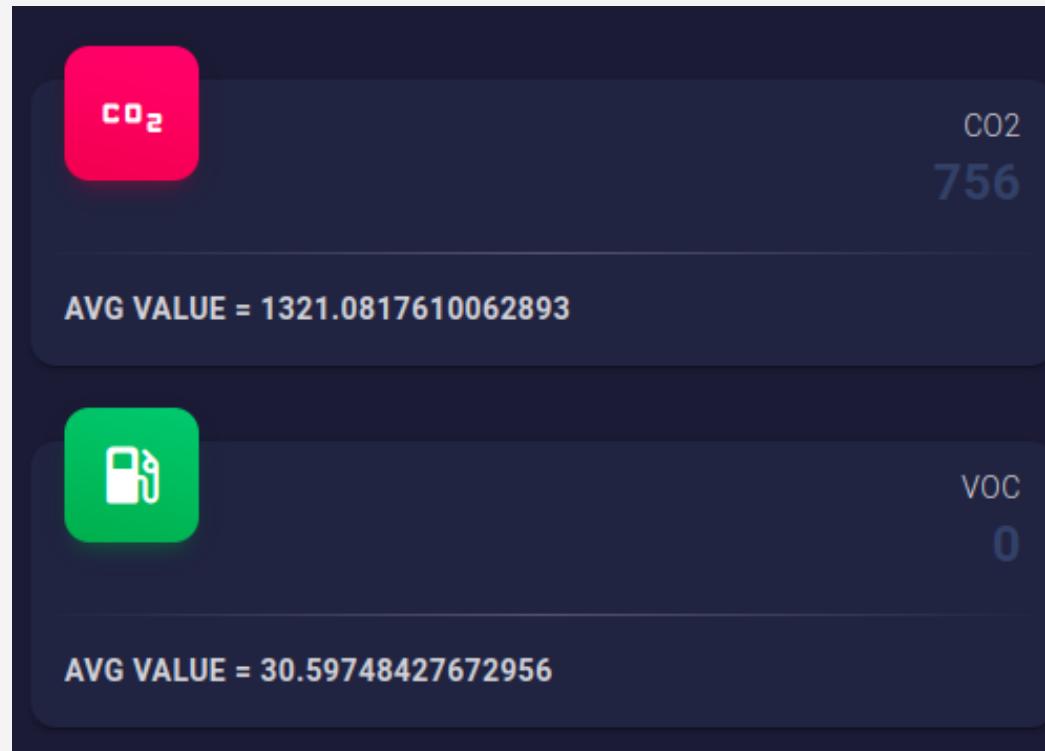
HARDWARE

OUR CIRCUIT



DASHBOARD

- Average Values of Temperature , Humidity, PM 2.5, PM 10, CO₂ levels and VOC Index is shown in the home page of the dashboard along with the values at the particular instant.



DASHBOARD

GRAPHS



● CO2 VS Time



● VOC INDEX VS Time



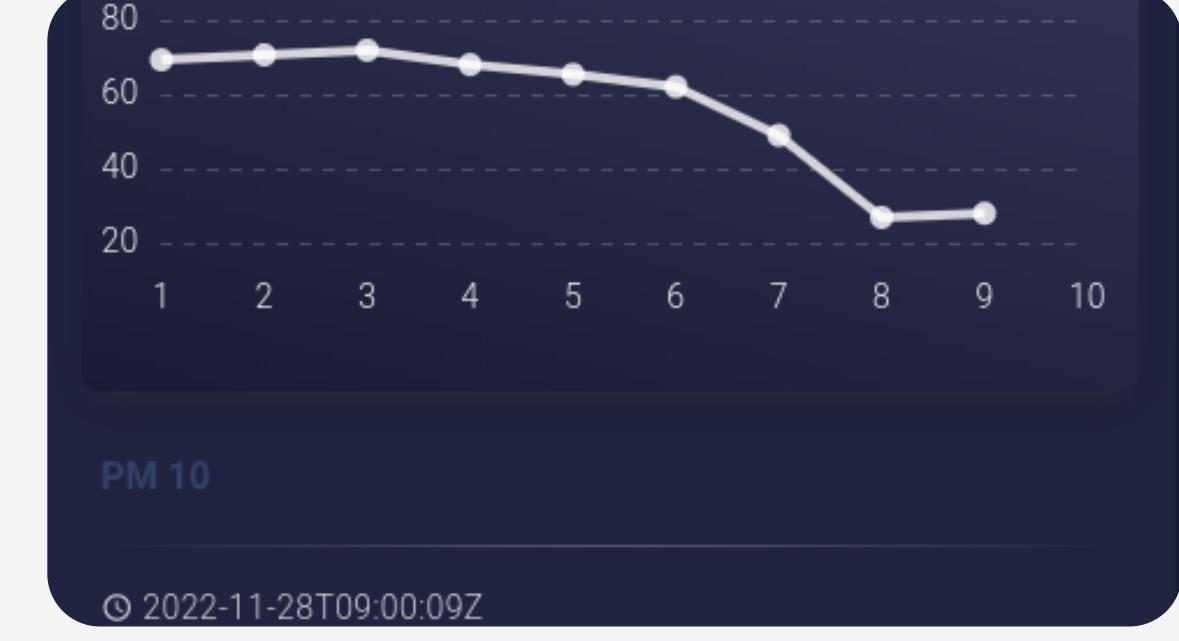
● Temperature VS Time



● Humidity VS Time



● PM2.5 VS Time



● PM10 VS Time

1

THINGSPEAK

We have sent our data from Arduino Uno to THingspeak.

2

DASHBOARD

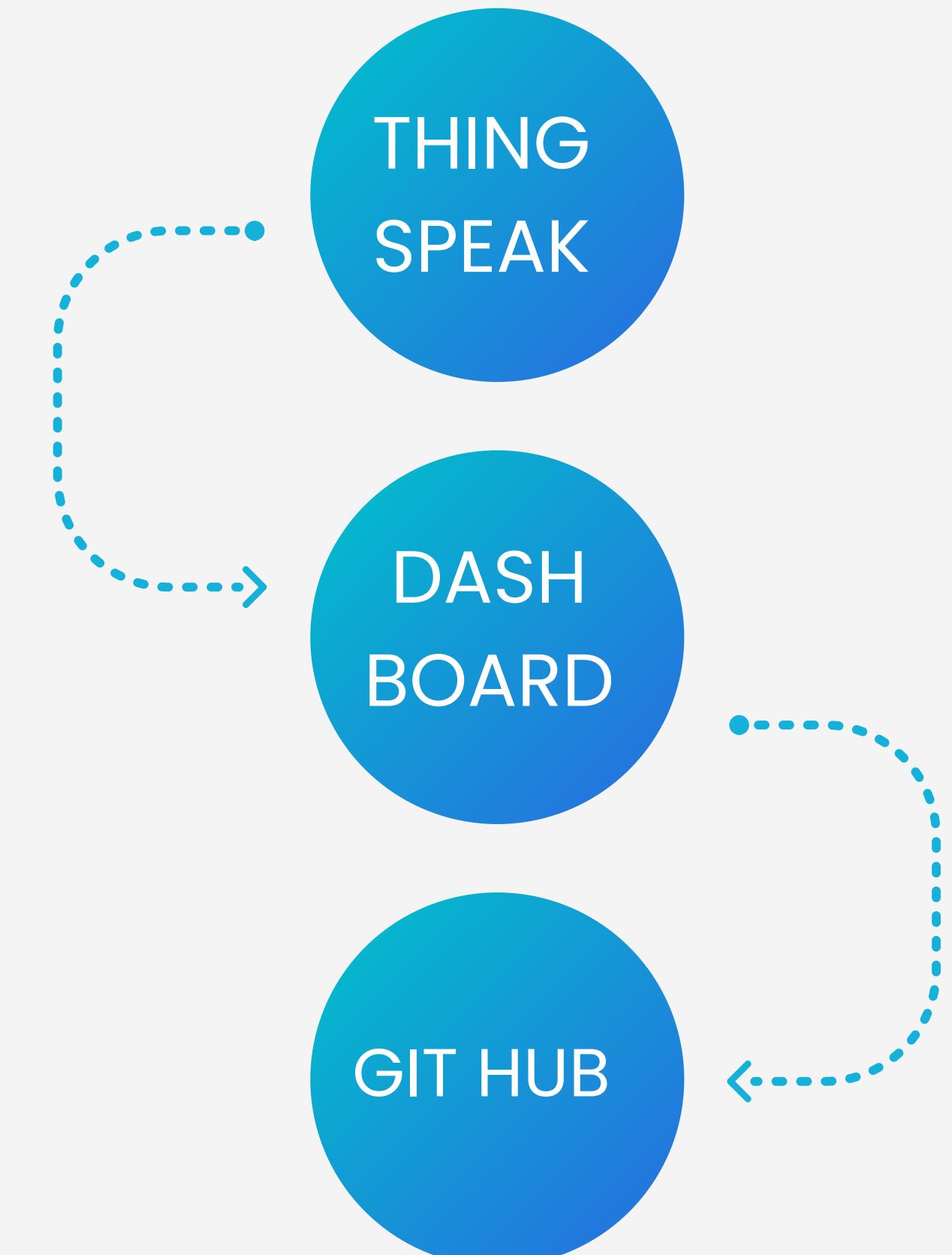
We have created Dashboard which has graphs of all the values (CO₂, VOC, Temperature, Humidity, PM 2.5, PM 10)

3

GITHUB

We pushed our Dashboard to Git Hub

WEB SERVICES



INDOOR AIR QUALITY



Through all the data collected, the air conditions and the quality could be monitored frequently.

Our main motive of the project is achieved through the analysis of data.

This will be deployed in one of the messes, which helps in real time data analysis.

CONCLUSION

CHALLENGES FACED



- During Soldering
- Outlier Detection
- Using React
- Using PM Sensor

THANK YOU

DUMPLING

TEAM 29: S