Internship Project Report

ON

"Smart Agriculture system based on IoT"

Submitted for the Internship of

Internet of Thing

BY

NAME: RAHUL P.BHERE

Internship ID: SPS_PRO_101

A project report submitted to:

Smart Bridge

SMARTBRIDGE

Let's Bridge the Gap

ACKNOWLEDGMENT:

The success and outcome of this project required guidance and assistance from **Smart Bridge**. I am extremely privileged to have got this all along with the completion of my project. All that I have done is only due to such supervision and assistance and I would not forget to thank them. I thank **Smart Bridge**, for providing me an opportunity to do the project work in the internship **Smart Agriculture system based on IoT** and giving me all support and guidance which made me complete the project duly. I am extremely thankful to smart bridge for providing such a nice support and guidance.

1. INTRODUCTION

1.1 Web Summarization

The main aim of this project is to build a system which is can be used by the farmers to monitor weather conditions and soil moisture. In olden Days Farmers Used to figure the ripeness of soil and influenced suspicions to develop which to kind of yield. They didn't think about the humidity, level of water and especially climate condition which terrible a farmers increasingly The Internet of things (IOT) is remodeling the agribusiness empowering the agriculturists through the extensive range of strategies. This project involves building a smart Internet of Things based agriculture system to monitor the weather conditions and soil conditions and help the farmer to gain better yield. This will be accomplished by using the IBM Watson IoT platform and Openweather API. We use Python language to interact with the system. The eye-catching features of this project include smart irrigation with smart control based on real time field data. Secondly temperature maintenance, humidity maintenance and other environmental parameters. And finally the recommendation to farmer for smart agriculture.

1.2 Purpose

The aim of the project is to provide the farmers with the data regarding the weather and soil conditions through a web app. This makes farming profitable and prevents the damage of the crop in a feasible manner.

Agriculture plays a crucial role in the life of an economy. It is the backbone of our economic system, so improving the quality and way of production is crucial. Here comes the Smart Agriculture system. Smart agriculture helps in automated farming, collection of data from the field and then analyses it so that the farmer can make accurate decision in order to grow high quality crop.

IoT based Smart Farming improves the entire Agriculture system by monitoring the field in real-time. With the help of sensors and interconnectivity, the Internet of Things in Agriculture has not only saved the time of the farmers but has also reduced the extravagant use of resources such as Water and Electricity.

2. LITERATURE SURVEY

2.1 Existing problem

Agriculture is extremely dependent on the climate. Temperature increases and carbon dioxide can boost some crop yields depending on the location; but other conditions must also exist, such as humidity, pressure, and water availability. Although slight warming and more carbon dioxide in the atmosphere could benefit some plants to grow faster, severe warming, floods, and drought would reduce yields. Farmer need to spend a lot of time to maintain these. Heat is not the only extreme weather. Extreme cold can benefit farmers by freezing the soil deep beneath the ground. In parts of the upper Midwest, frost depths exceed 40 inches. A deep frost depth can aid farmers in diverse ways. The cold helps nitrogen that is applied in the fall from vaporizing during the winter. The cycle of freezing and thawing of water helps soften the soil after the thaw. Extreme cold and frozen soils also reduce the survival rate of some insects.

Severe weather other than heat and cold can cause loss and devastation to a farm. Most farmers can’t avoid the results of extreme weather. Diverse extreme weather can affect farms in different ways. Because of this, it’s important that farmers have a proper system and need a mobile application to monitor the weather changes and to control the motor.

2.2 Proposed solution

As the climates are changing rapidly and weather is unpredictable, so farmers are facing difficulties so they need a system to tackle this, here we use “open weather API” to get weather information such as temperature, pressure, humidity and weather description at their current location.

Based on which they can decide whether to turn on the motors or turn off the motor if needed temperature and moisture sensors from IBM simulator is displayed on UI for monitoring the weather. An algorithm developed with threshold values of temperature, pressure, humidity is programmed to intimate the farmer if weather conditions go bad. He can control motors remotely from any place through IoT. Internet interface that allow data inspection and irrigation scheduling to be programmed through mobile application or Node-RED UI. The technological development in software and hardware make it easy to develop this which can make better monitoring and wireless network made it possible to use in monitoring and control of greenhouse parameter in precision agriculture.

3.THEORETICAL ANALYSIS

3.1 PROJECT SCOPE:

We create a device in the IBM Watson IoT platform and enable simulation. The simulation is done in the watson IOT sensor simulator. The sensors take reading every minute and upload to the cloud. Node-red is used to wire together the hardware, online services and APIs. To simulate weather information, we create an account in Openweather.org and provide through the sensors. Later, these are used through a web interface to control the motor.

3.2 Block Digram

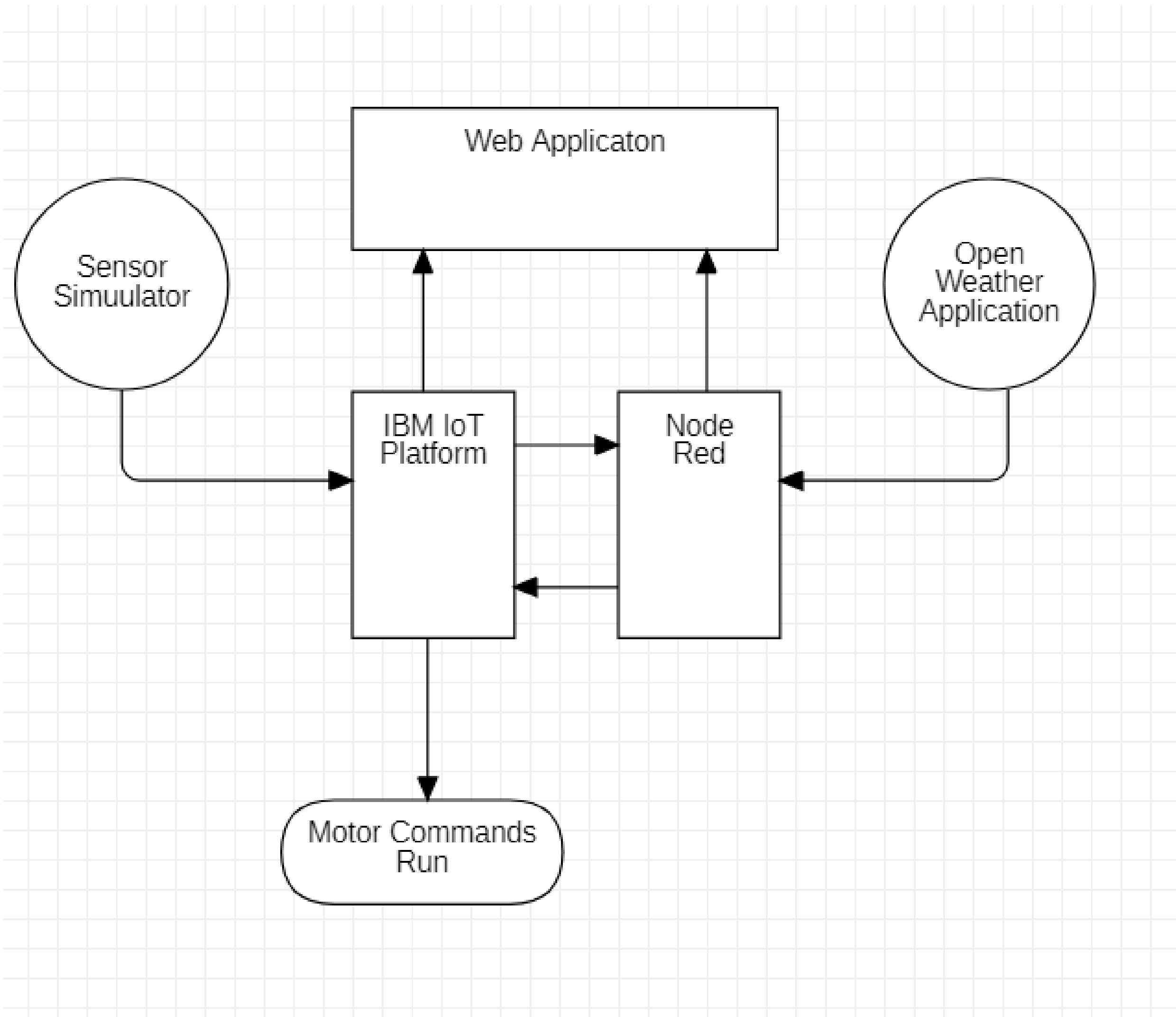


Fig. 2.*Block Digram*

3.3 Hardware/Software designing

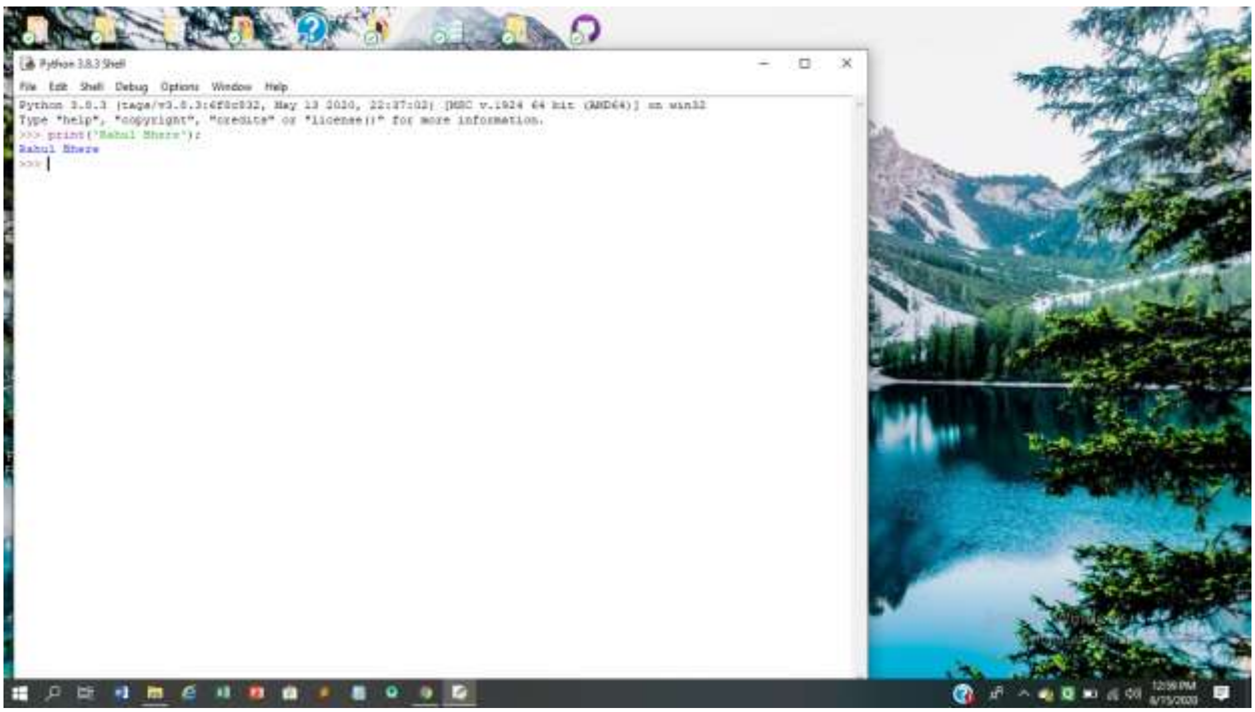
This is a web application based on node-red which uses javascript as its back end. Here, the user/farmer can interact with the web application which can inform the farmer about the sensor data recieved by the IBM IOT platform device. The Watson IOT sensor simulator is responsible for sending the sensor data. The node-red UI will also show the weather data of the farm returned by the

Openweather API. The farmer can set threshold value of temperature so that when the sensed temperature by simulator is greater than or equal to threshold temperature, a notification will be displayed in the node-red UI. The farmer can turn On/Off the motors for irrigating plants from a remote place.

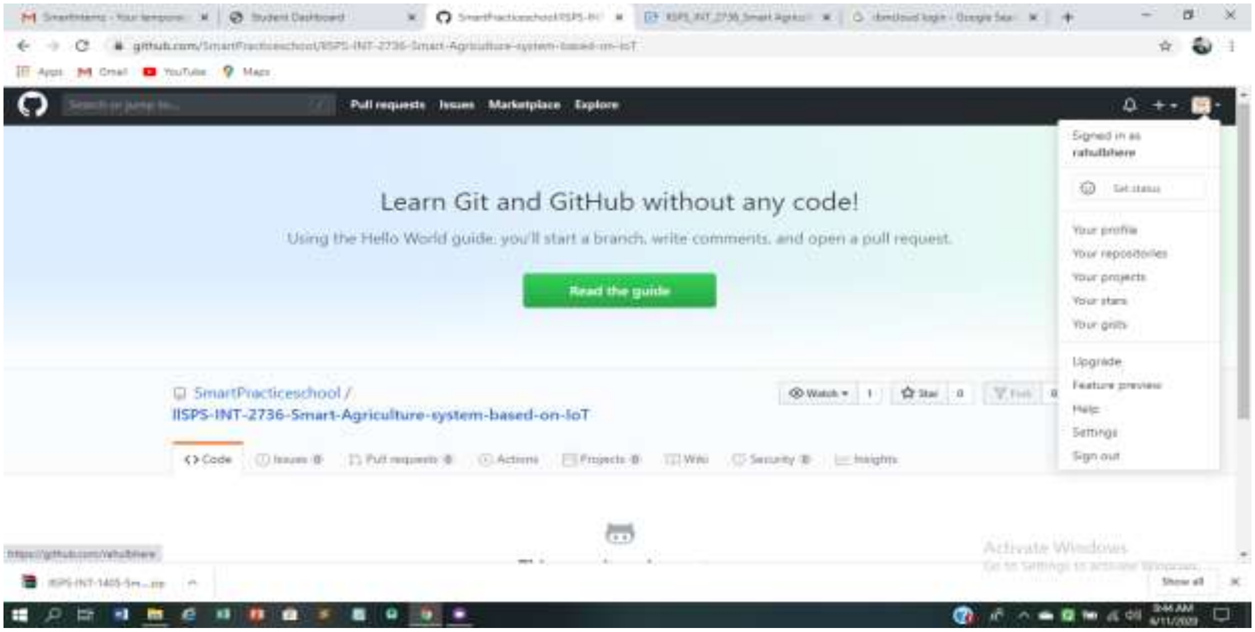
1. Install the required tools and create the required accounts.

SETTING UP IDE:

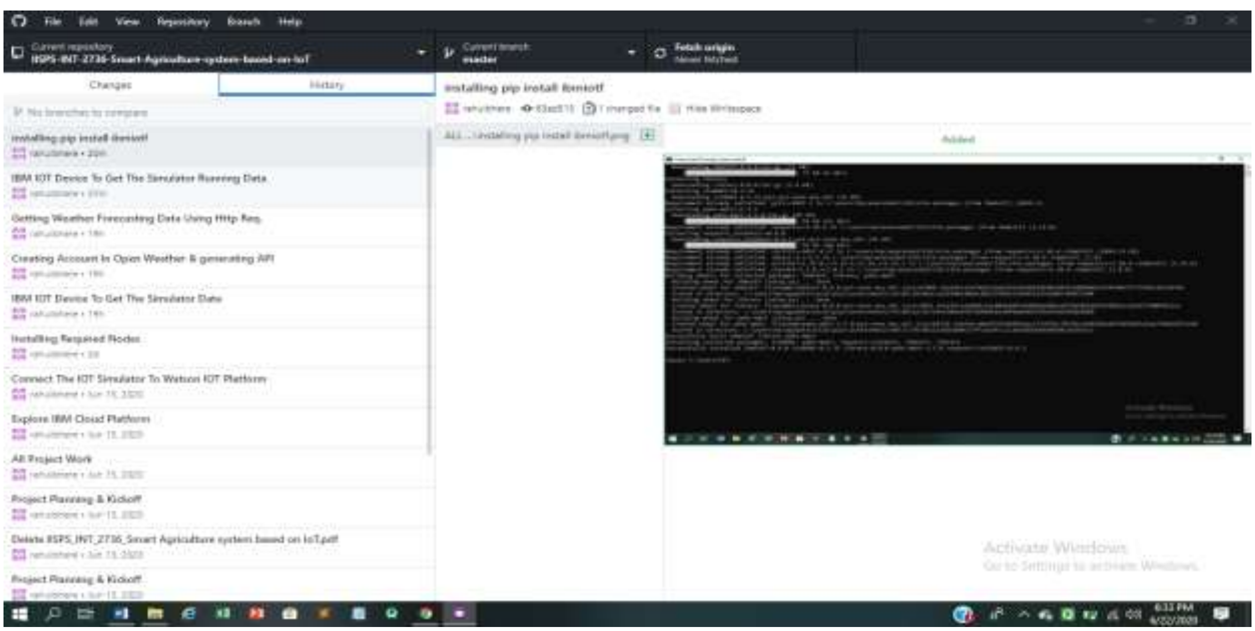
We use Python IDE for the project.



CREATE **ACCOUNT GIT:**

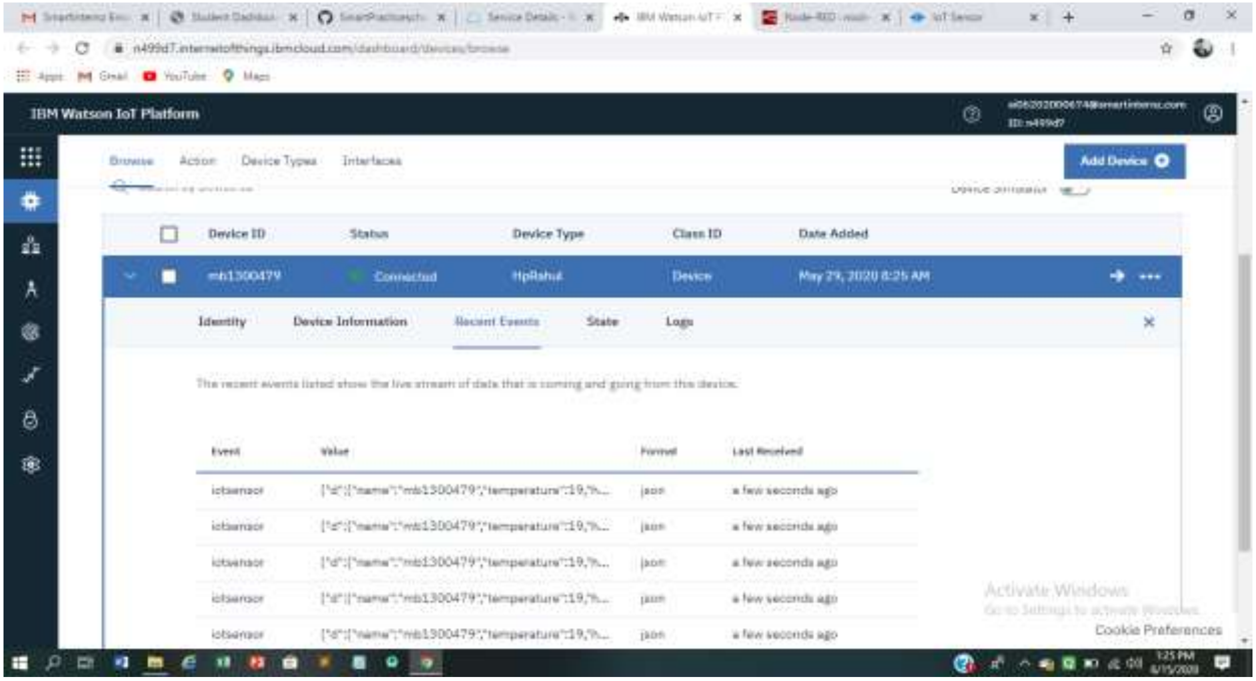


INSTALLING GIT DESKTOP:



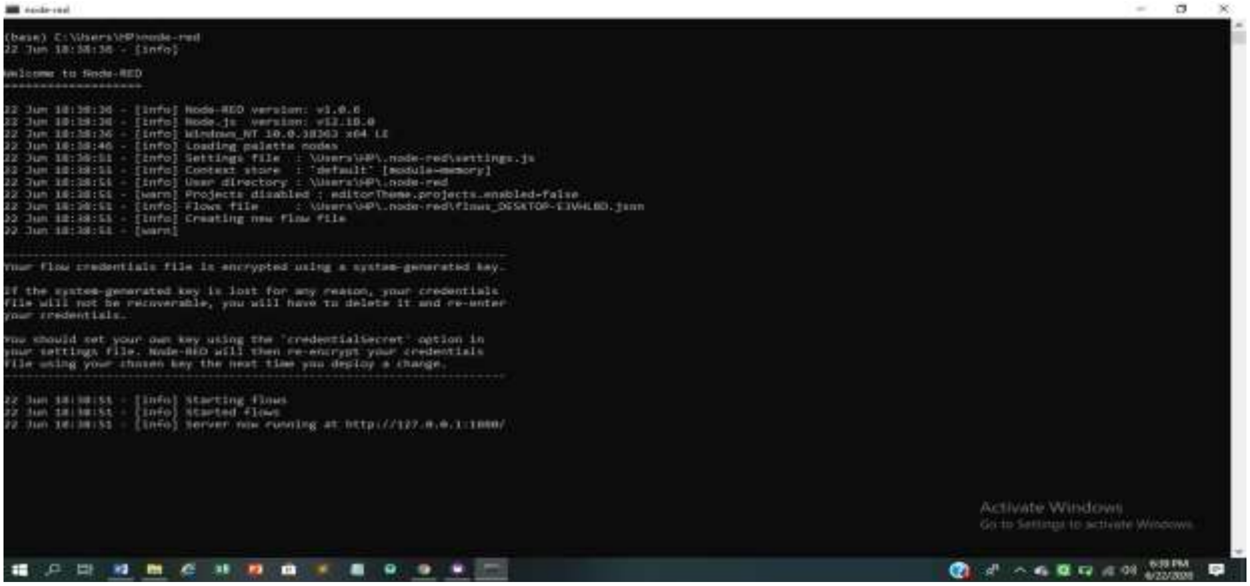
2. CREATE A DEVICE IN THE IBM WATSON IOT PLATFORM:

We need to create two devices in the platform. One acts as a processor for the sensor information and the other is an instance of a motor. Also create an API key-token pair and save in a safe place.

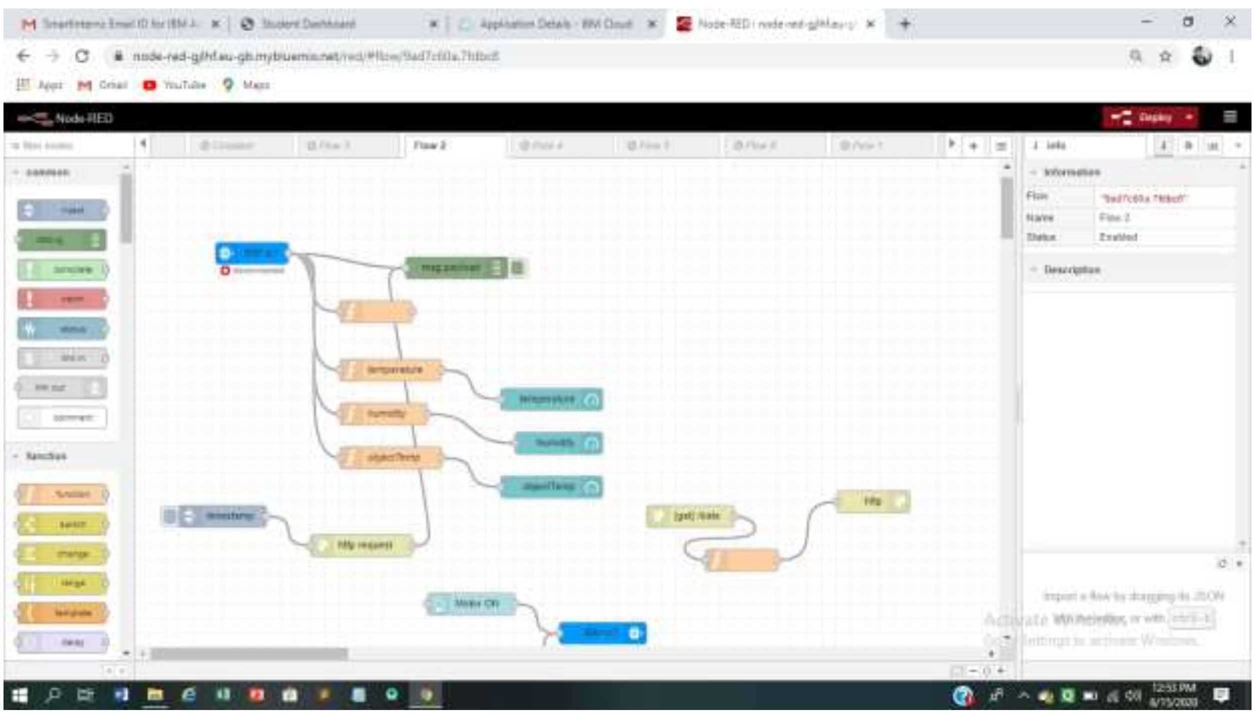


3. INSTALL NODE-RED LOCALLY:

Node-red is a Node.js based implementation and can be installed using chocolatey or yarn.By typing node-red in cmd promt we will get ip adress of node red loaclly and in node-red we can see different filter nodes.



NODE-RED ACCOUNT ON IBM ClOUD:



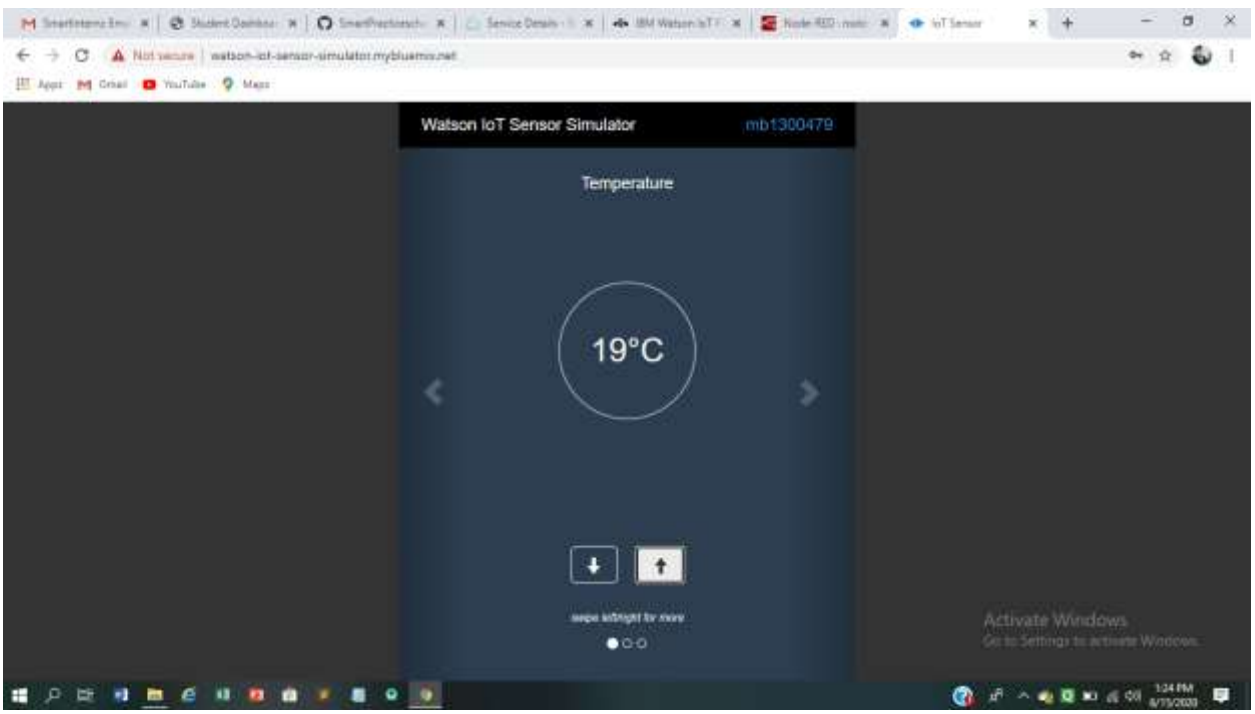
4. CONNECT THE IOT DEVICE TO A SIMULATOR

The IoT sensor simulator requires the following information.

1. Device organization
2. Device Type
3. Device Id
4. Device Token

Once given all the required instructions, the sensor is connected to the device created.

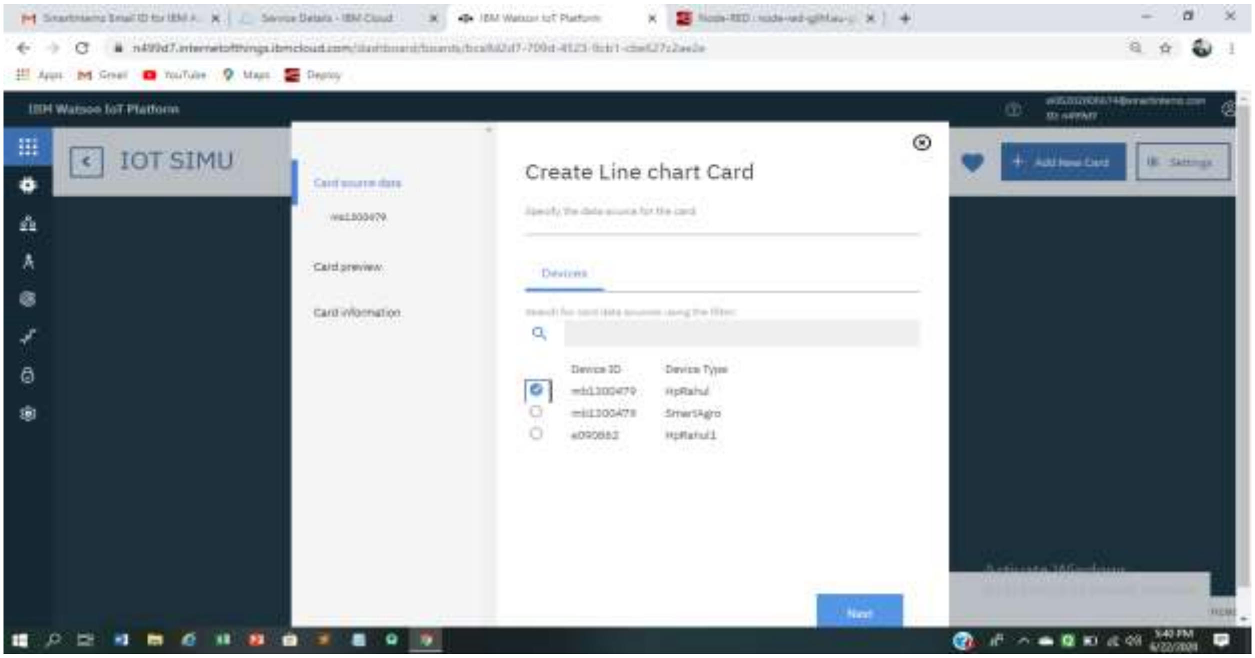
This can be verified by the device name in blue color on top right.

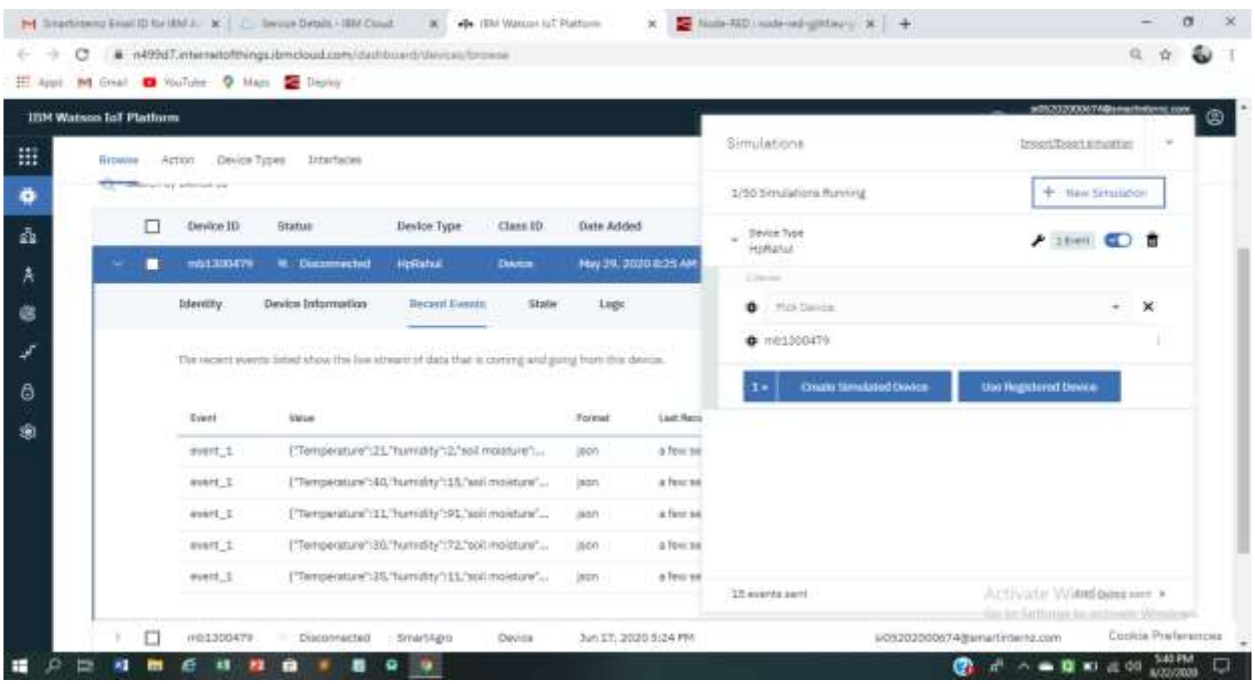


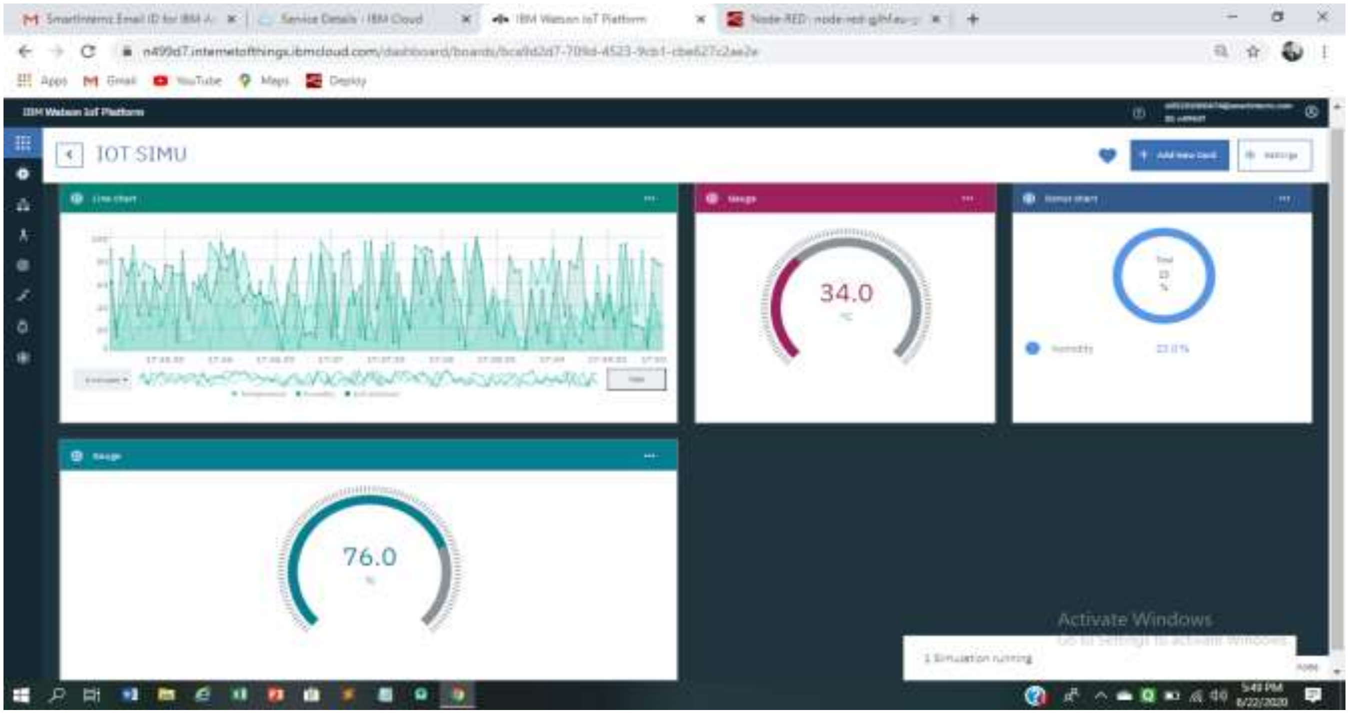
5. VISUALISING THE DATA:

Once the device is connected, we can create boards in the IBM IoT platform. Boards-->Create new board--> Add Cards

Different types of visualizations like line plot, gauge can be done in the IBM platform.

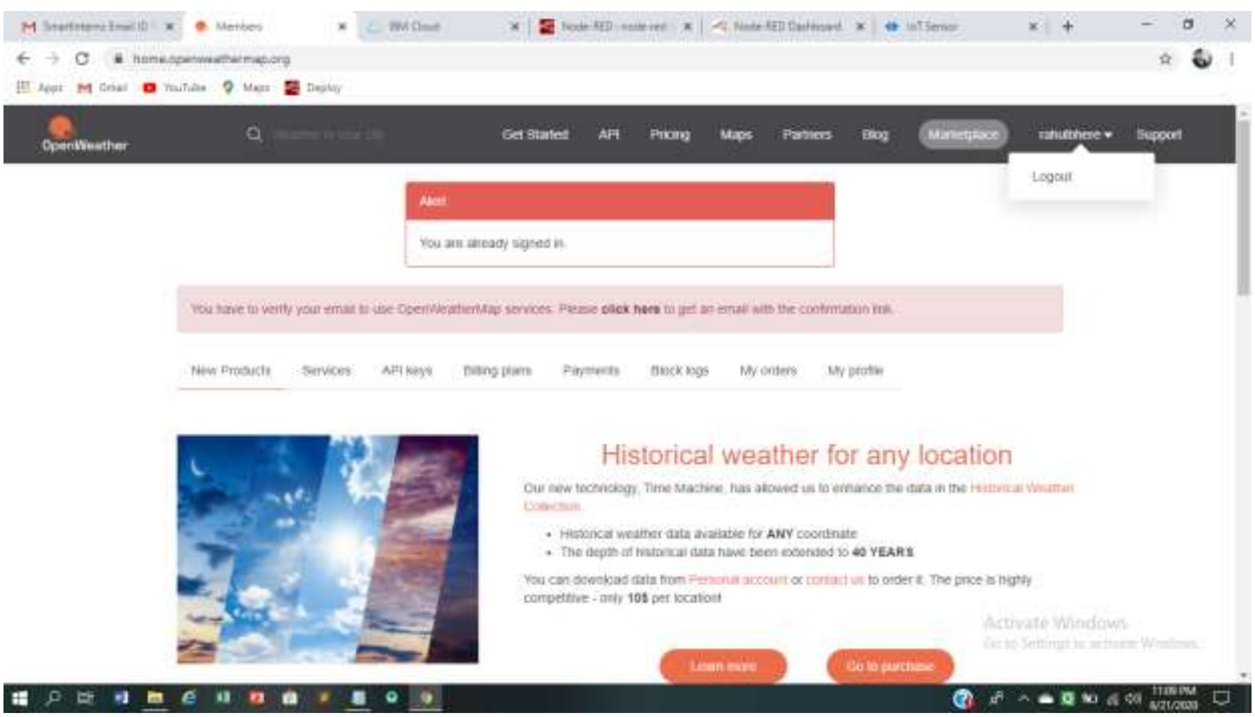




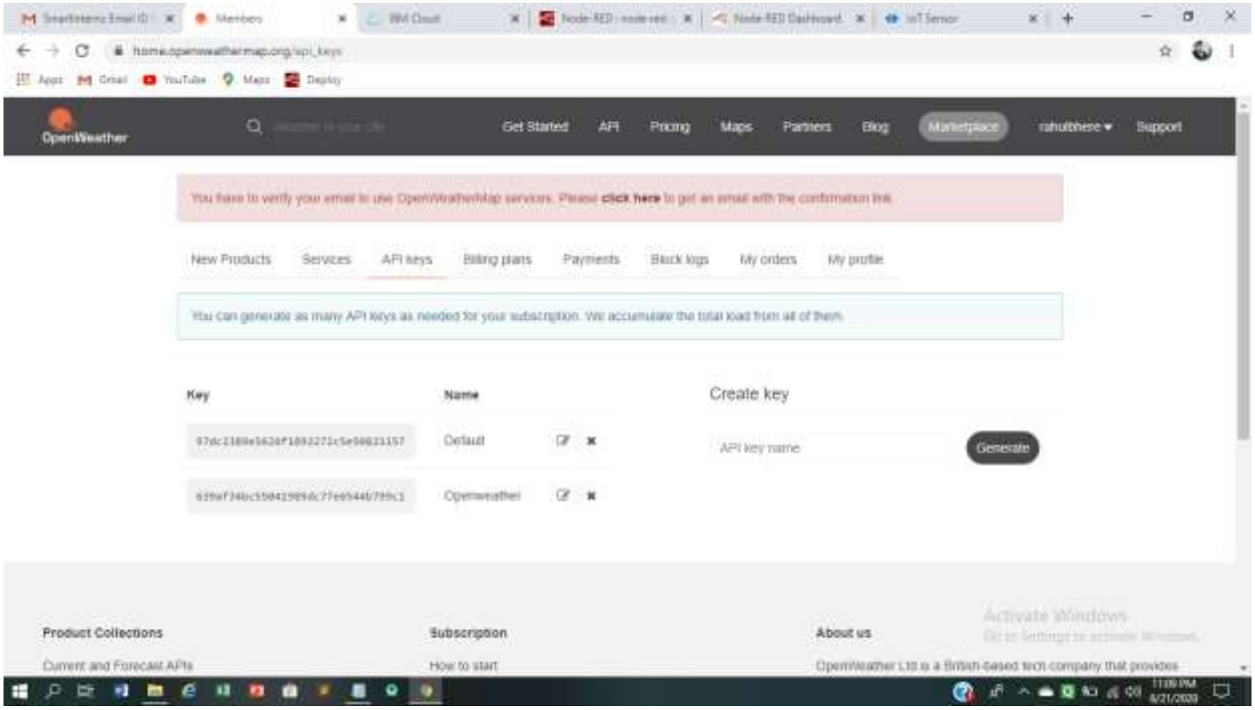


6. CONNECTING TO OPENWEATHER API:

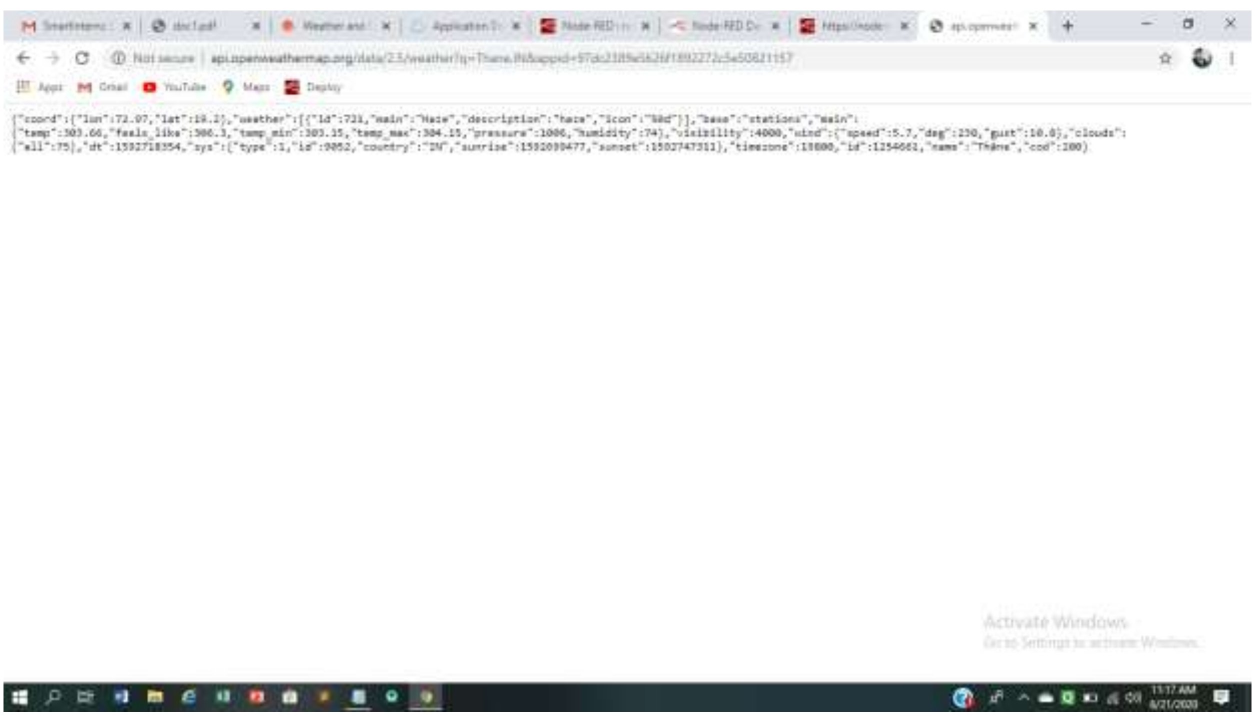
1. Create an account in openweather.org



2. Go to API marketplace and register a API key



3. Select "By city Name' in API options 4. Copy and save the API call to be used later.

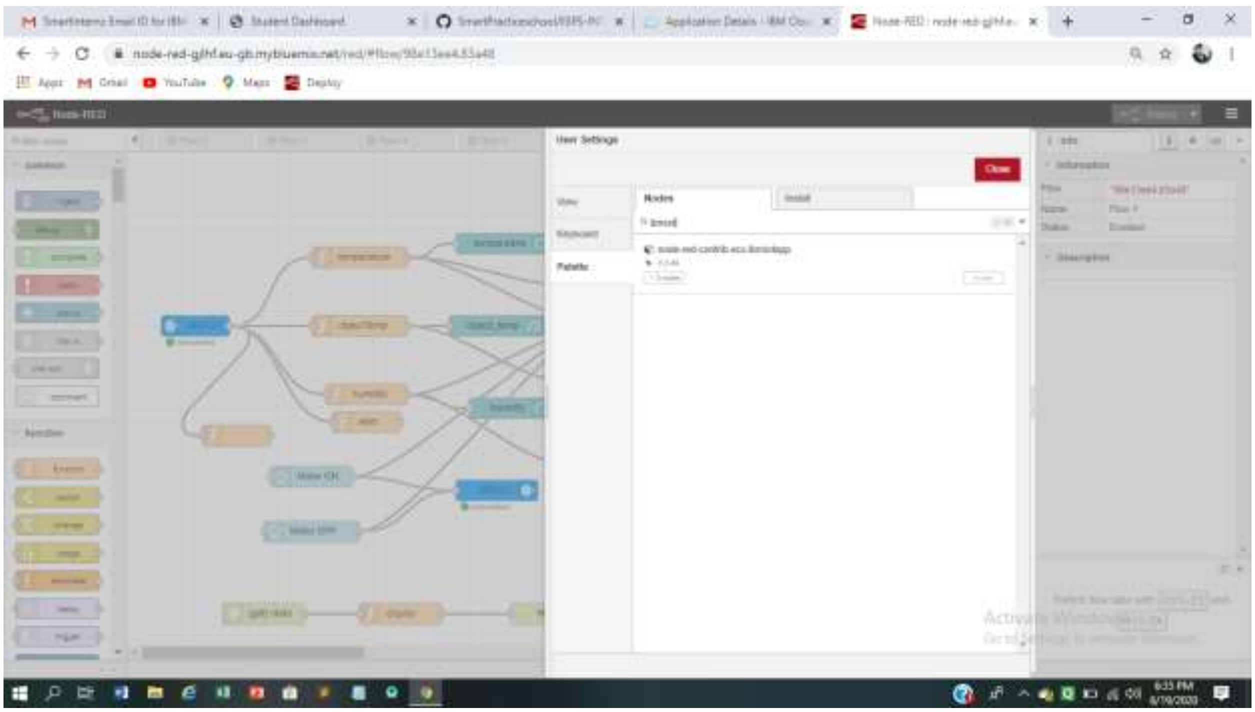


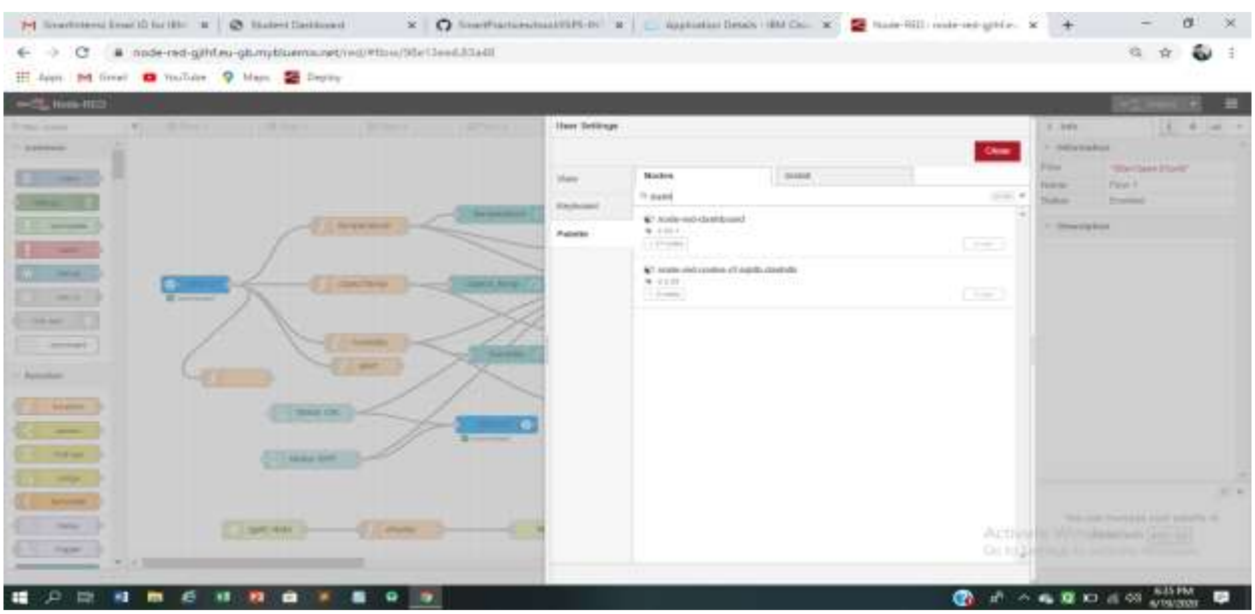
7. CREATING THE UI USING NODE-RED:

1. We need to create flows for our purposes.
2. We need to install the ibm iot node package and ibm watson package.

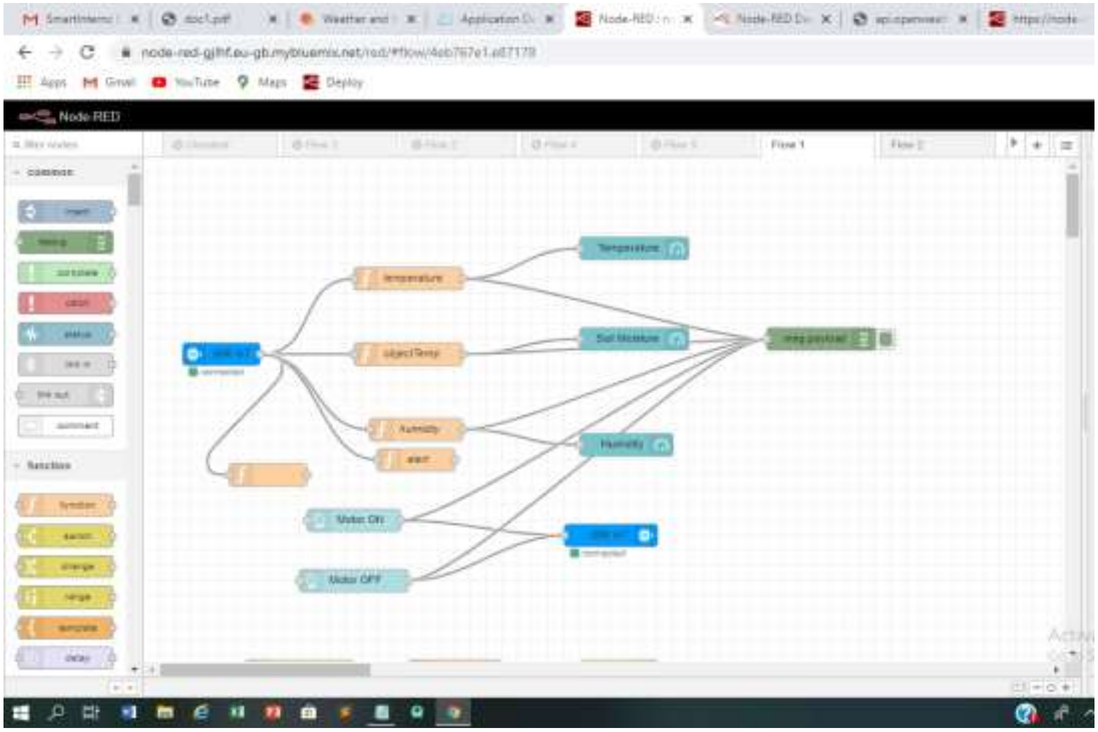
   To install a new node-set,

manage pallette-->install-->search for required nodes



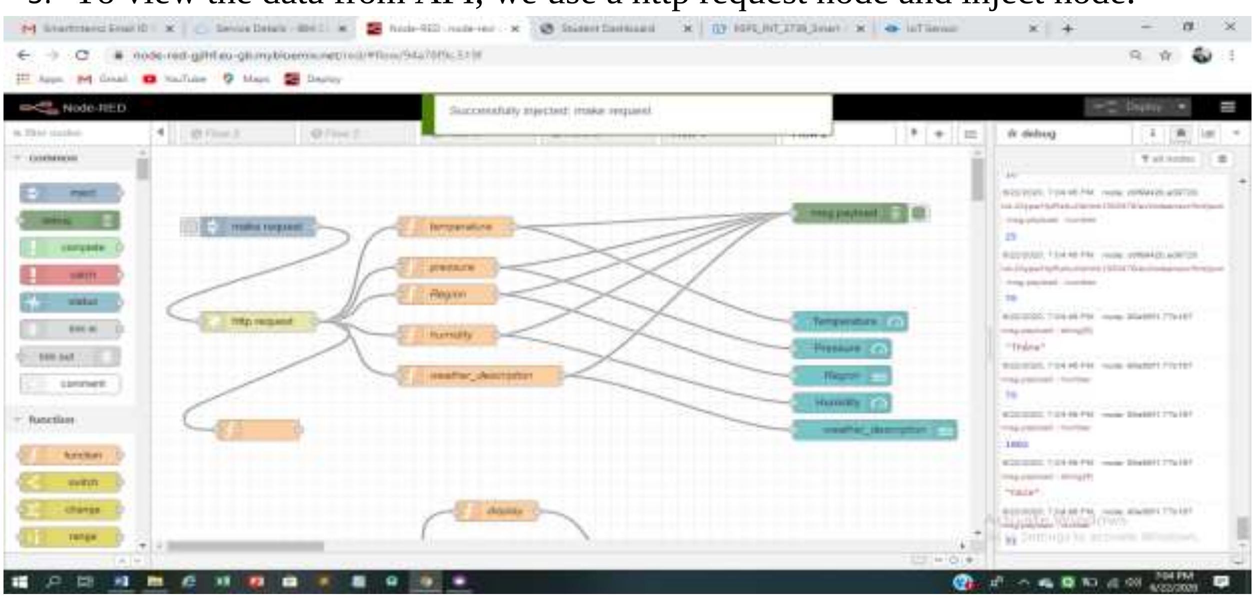


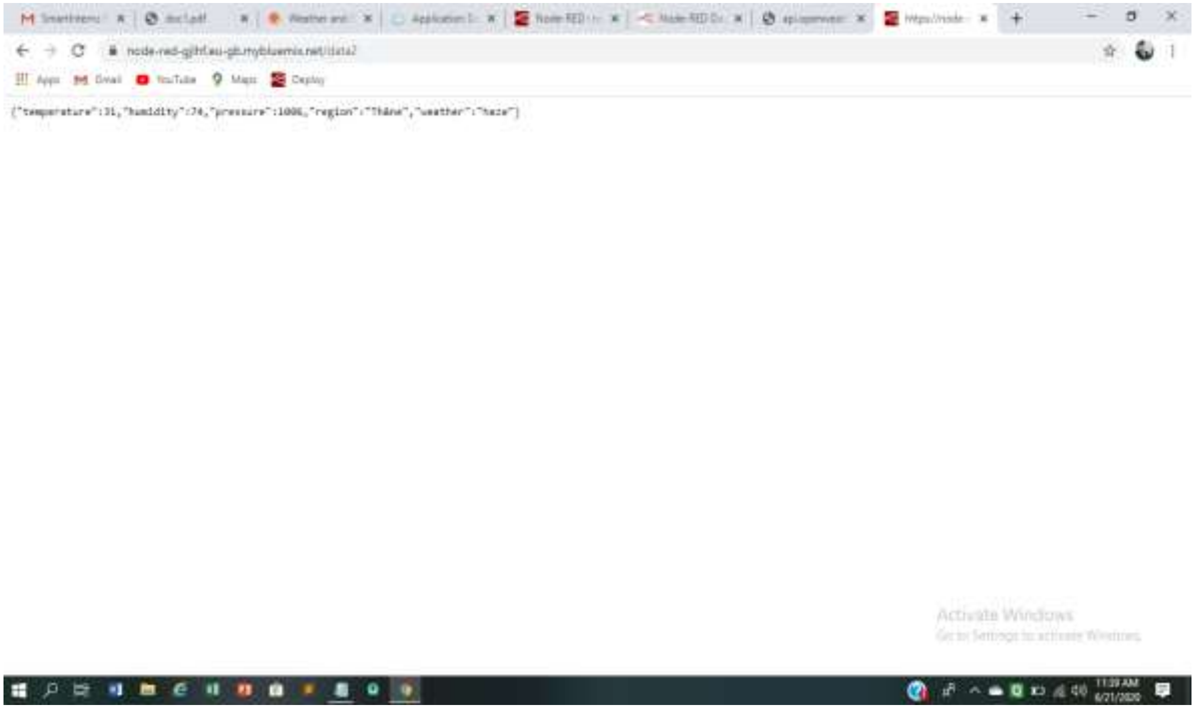
3. Firstly, to take the input data from the sensor we make the following flow .



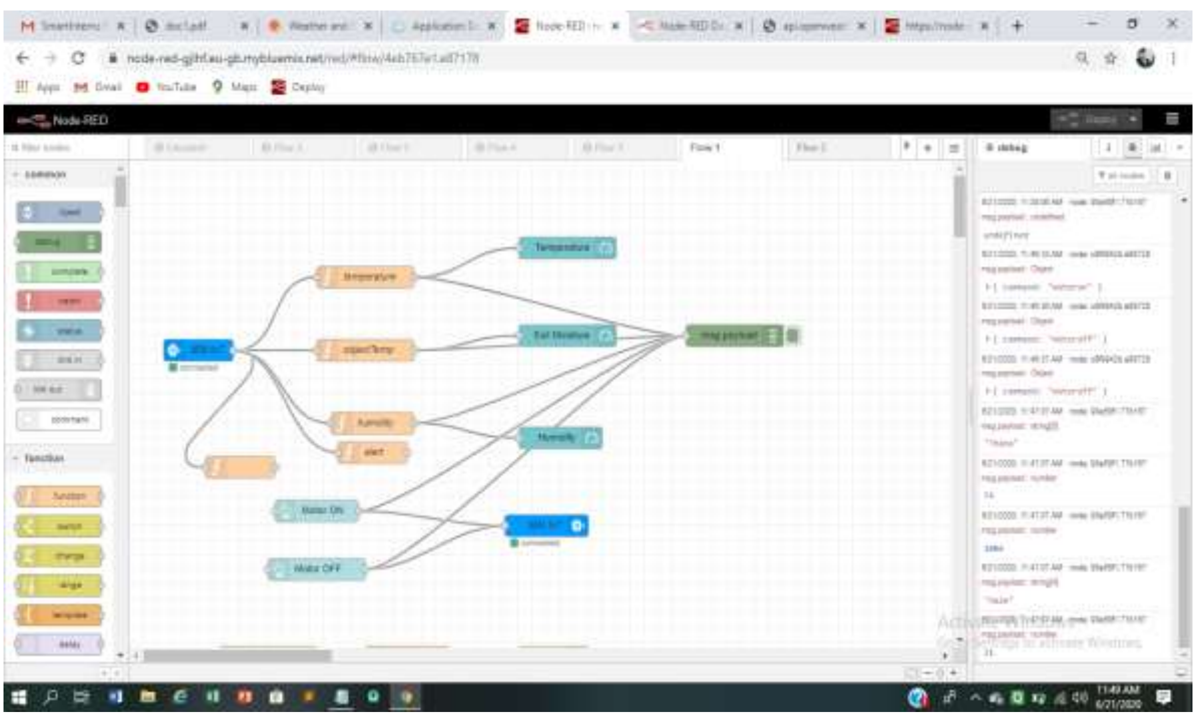
4. This also creates a UI for the user to interact with the data and the devices.

5. To view the data from API, we use a http request node and inject node.





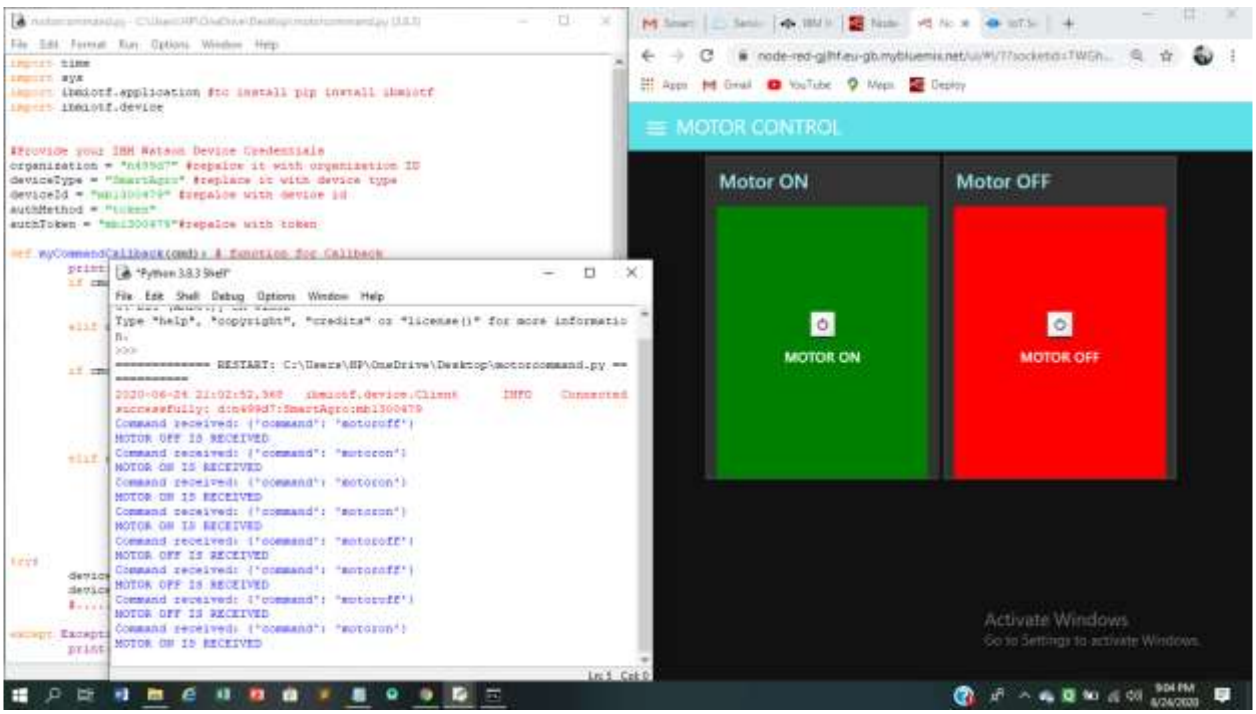
6. To give the instructions to the device,in our case motor we create another flow using the ibm out node and Motor ON and OFF buttons.



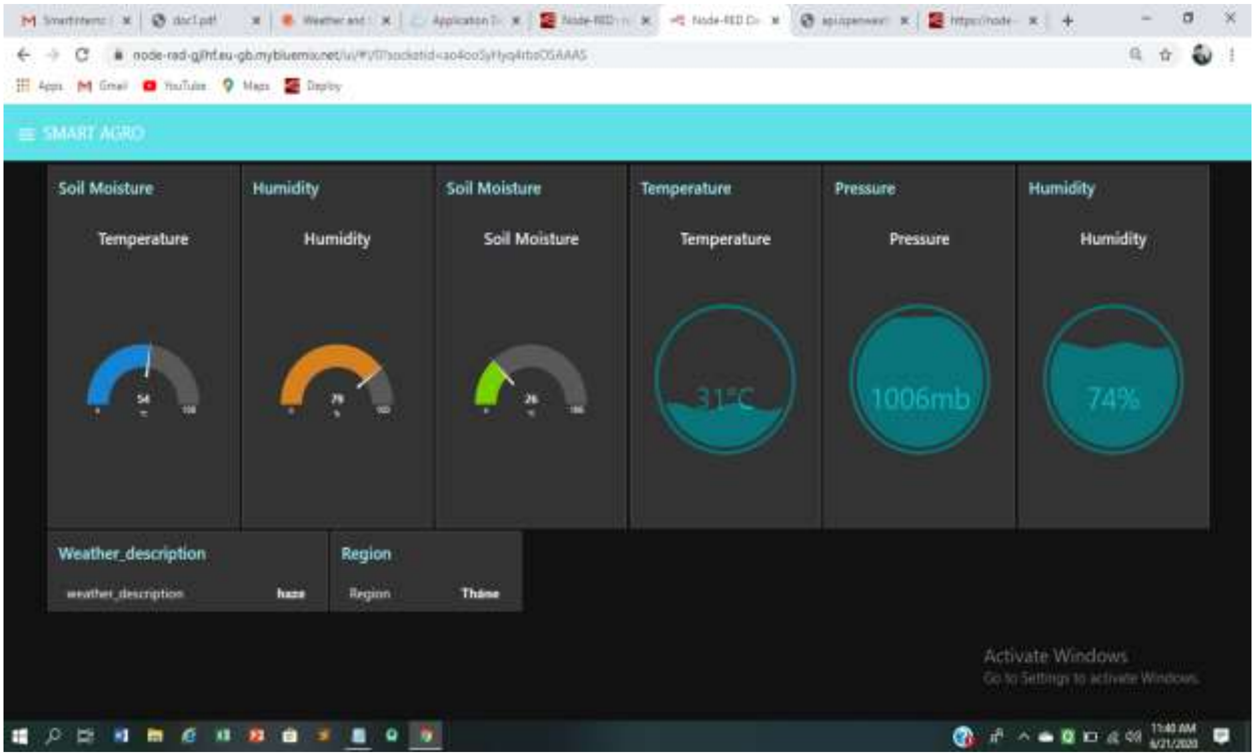
8. RUNNING THE PYTHON CODE AND TURNING MOTOR ON OR OFF:

We use the python programming language to interact with the devices and the cloud.

On clicking the button in the UI, the motor can be made ON or OFF.



9. RESULTS:


SMART AGRO
Soil Moisture
Temperature
Humidity
Humidity
Soil Moisture
Soil Moisture
Temperature
Temperature
31°C
Pressure
Pressure
1006mb
Humidity
Humidity
74%
Weather_description
weather_description
haze
Region
Region
Thāne
Activate Windows
Go to Settings to activate Windows.

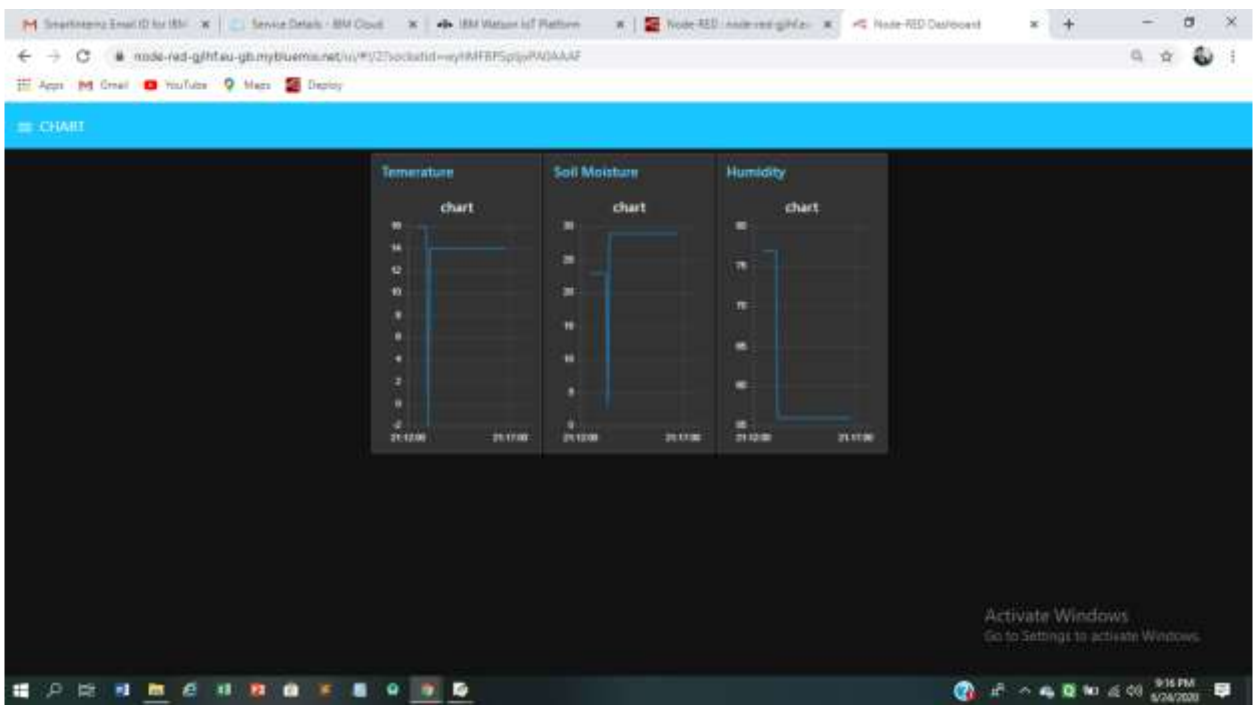
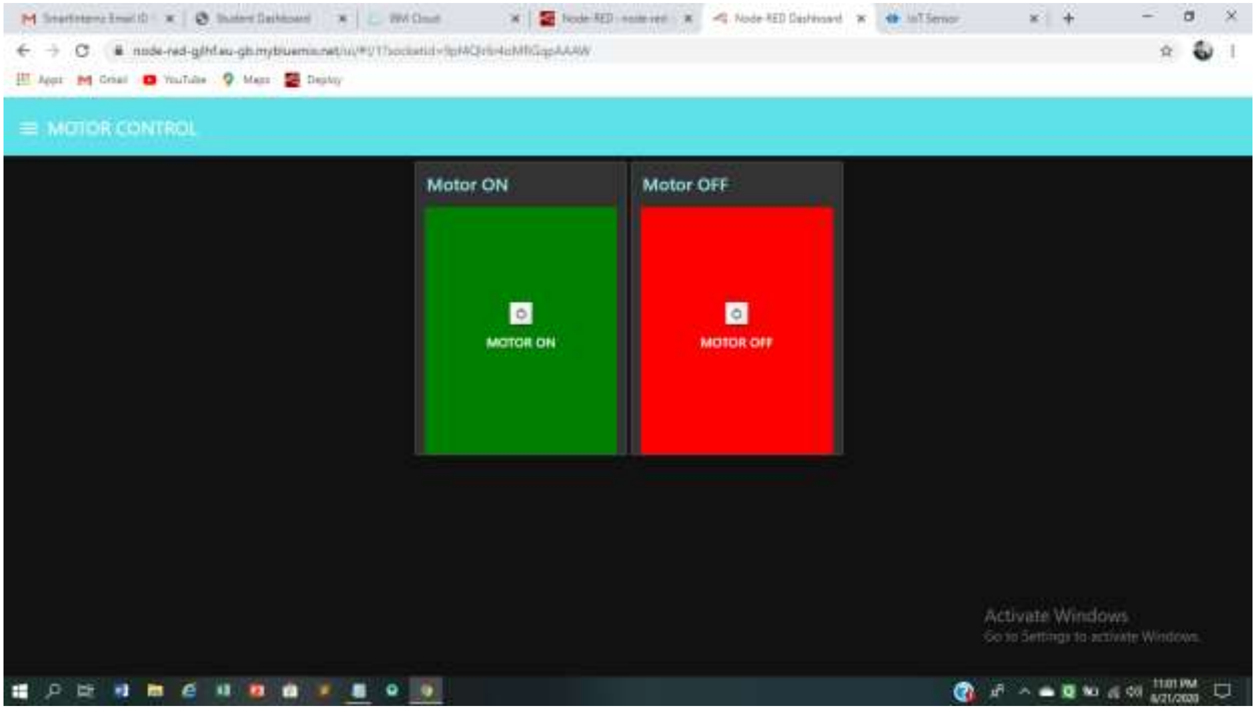


CHART
Temerature
chart
Soil Moisture
chart
Humidity
chart
Activate Windows
Go to Settings to activate Windows.


MOTOR CONTROL
Motor ON
Motor OFF
MOTOR ON
MOTOR OFF
Activate Windows
Go to Settings to activate Windows.

Experimental Investigations:

The weather forecast is obtained from the Open weather API and is displayed in the node-red UI to the farmer and a threshold is set, if temperature, pressure, humidity and soil moisture goes beyond certain value the farmer get intimated and he can turn on/off the motor accordingly.

Flowchart

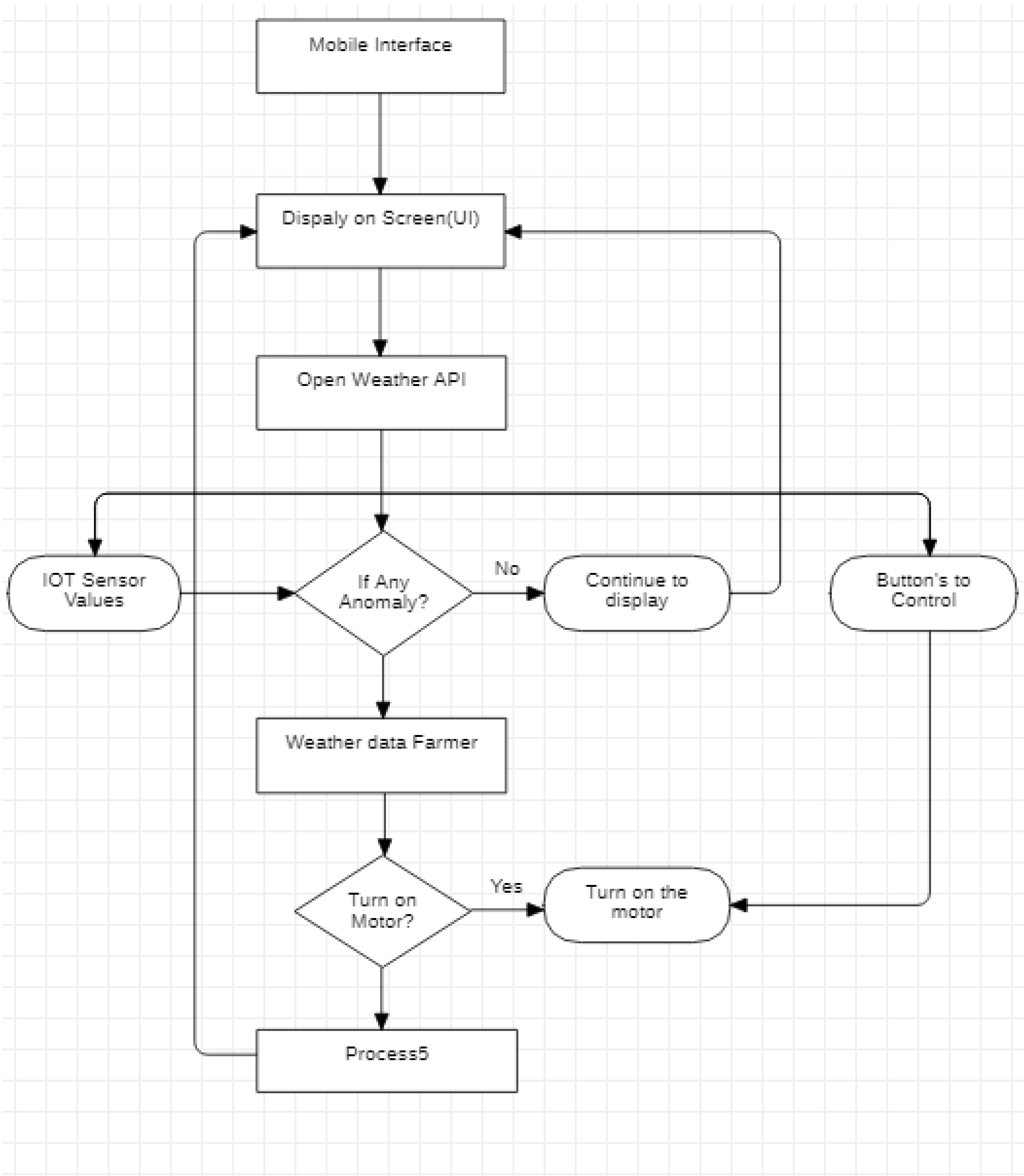


Fig. 2.*Flowchart*

Result:

Hence a helpful and useful system is built for farmers to assist them in farming and also prevent them from natural calamities. It also saves farmers time to maintain all these things as this is working on cloud he can turn on/off motor from anywhere so basically it helps farmers and make them relived thus helping our economy to grow.

Advantages & Disadvantages:

Advantage:

- monitoring weather parameters such as temperature, pressure, humidity, soil moisture remotely
- controlling motors easily through buttons
- alert farmers in case of any calamities
- threshold values are set any anomalies will be reported to the farmer
- user friendly and efficient
- low cost

Disadvantage:

- sensors may sometime malfunction
- maybe inaccurate sometimes
- farmer needs internet connectivity
- farmer must have a phone and have basic knowledge to operate it

Applications:

It can be used to develop a system which automatically fulfills the plants' requirements by watering the plants with specific quantity for a specific time based on the current and forecasted weather data.

Monitoring of Climate Conditions

Probably the most popular smart agriculture gadgets are weather stations, combining various smart farming sensors. Located across the field, they collect various data from the environment and send it to the cloud. The provided measurements can be used to map the climate conditions, choose the appropriate crops, and take the required measures to improve their capacity (i.e. precision farming).

Greenhouse Automation

In addition to sourcing environmental data, weather stations can automatically adjust the conditions to match the given parameters. Specifically, greenhouse automation systems use a similar principle.

Crop Management

One more type of IoT product in agriculture and another element of precision farming is crop management devices. Just like weather stations, they should be placed in the field to collect data specific to crop farming; from temperature and precipitation to leaf water potential and overall crop health, these can all be used to readily collect data and information for improved farming practices.

Cattle Monitoring and Management

Just like crop monitoring, there are IoT agriculture sensors that can be attached to the animals on a farm to monitor their health and log performance. This works similarly to IoT devices for pet care.

End-to-End Farm Management Systems

A more complex approach to IoT products in agriculture can be represented by the so-called farm productivity management systems. They usually include a number of agriculture IoT devices and sensors, installed on the premises as well as a powerful dashboard with analytical capabilities and in-built accounting/reporting features.

Conclusion

IoT based SMART AGRICULTURE SYSTEM for Live Monitoring of Temperature and Soil Moisture has been proposed using Arduino and Cloud Computing . The System has high efficiency and accuracy in fetching the live data of temperature and soil moisture. The IoT based smart farming. System being proposed via this report will assist farmers in increasing the agriculture yield and take efficient care of food production as the System will always provide helping hand to farmers for getting accurate live feed of environmental temperature and soil moisture with more than 99% accurate results.

Future Scope:

Future scope would be focussed on developing a AI-enabled system which will able to predict amount of water required by a specific crop for a particular period of time. This system will automatically control the irrigation system accordingly without the involvement of farmer. Also, sensors in the farm can be increased in order to ensure Pest control so that the crop produce is not damaged.

With the exponential growth of world population, according to the UN Food and Agriculture Organization, the world will need to produce 70% more food in 2050, shrinking agricultural lands, and depletion of finite natural resources, the need to enhance farm yield has become critical. Limited availability of natural resources such as fresh water and arable land along with slowing yield trends in several staple crops, have further aggravated the problem. Another impeding concern over the farming industry is the shifting structure of agricultural workforce. Moreover, agricultural labor in most of the countries has declined. As a result of the declining agricultural workforce, adoption of internet connectivity solutions in farming practices has been triggered, to reduce the need for manual labor.

IoT solutions are focused on helping farmers close the supply demand gap, by ensuring high yields, profitability, and protection of the environment. The approach of using IoT technology to ensure optimum application of resources to achieve high crop yields and reduce operational costs is called precision agriculture. IoT in agriculture technologies comprise specialized equipment, wireless connectivity, software and IT services.

Bibliography:

https://cloud.ibm.com/login

https://openweathermap.org/

https://smartinternz.com/assets/docs/Sending%20Http%20request%20to%20Open%20weath

e r%20map%20website%20to%20get%20the%20weather%20forecast.pdf

https://www.youtube.com/watch?v=cicTw4SEdxk

Appendix:

Python code for the motor is:

https://github.com/rachuriharish23/ibmsubscribe

FOR UI:

https://smartinternz.com/assets/docs/Smart%20Home%20Automation%20using%20IBM%20

cl oud%20Services%20(1).pdf

https://smartinternz.com/assets/docs/Smart%20Home%20Automation%20using%20IBM%20

cl oud%20Services%20(1).pdf