SMART AGRICULTURE SYSTEM BASED ON IOT

I)INTRODUCTION:

Overview:

Smart Agriculture is an emerging concept because IOT sensors are capable of providing information about agricultural fields and then act upon based on user input.The development of Smart agriculture based on iot is day by day turning the face of agriculture production by not only enhancing it but also making it cost-effective and reducing wastage.In this project,it is proposed to develop a Smart agriculture system based on IOT using IOT Cloud Platform.

Purpose:

India has agriculture as its primary occupation.According to IBEF(India Brand Equity Foundation), 58% of the people living in the rural areas in India are dependent on agriculture.Under such a scenario ,the usage of water especially the fresh water resource by agriculture will be enormous and according to the current market surveys it is estimated that agriculture uses 85% of available fresh water resources worldwide,and this percentage will continue to be dominant because of population growth and increased food demand.

This calls for planning and strategies to use water sensibly by utilizing the advancements in science and technology.There are many systems to archieve water savings in various crops ,from basic ones to more technologically advanced ones.One of the existing systems use thermal imaging to monitor the plant water status and irrigation scheduling.

II)LITERATURE AND SURVEY:

Existing Problem:

The emerging global water crisis: In addition to managing scarcity and conflict between water users, the available fresh water is further contaminated by the human and animal population and the pollution levels have increased at an alarming rate.

This if continues, will be leading to limitation of food production which in turn will affect the human productivity and thus the entir ecosystem will be affected in the years

to come.

The primary and the most important reason for this problem is the tremendous increase in the population which has increased at a rate which is faster than the food production rate. This population growth especially in water short countries will directly have an impact on its growth on the world map.

Proposed Solution:

The food production needs to be increased by at least 50% for the projected population growth. Agriculture accounts for 85% of freshwater consumption globally. This leads to thewater availability problem and thus calls for a sincere effort in sustainable water usage.

For a variety of reasons, feasible expansion of irrigated agriculture will be able to accommodate only a portion of this increased demand, and the rest must come from an increase in the productivity of rain fed agriculture. In the absence of coordinated planning and international cooperation at an unprecedented scale, the next half century will be plagued by a host of severe water related problems,threatening the wellbeing of many terrestrial ecosystems and drastically impairing human health, particularly in the poorest regions of the world.

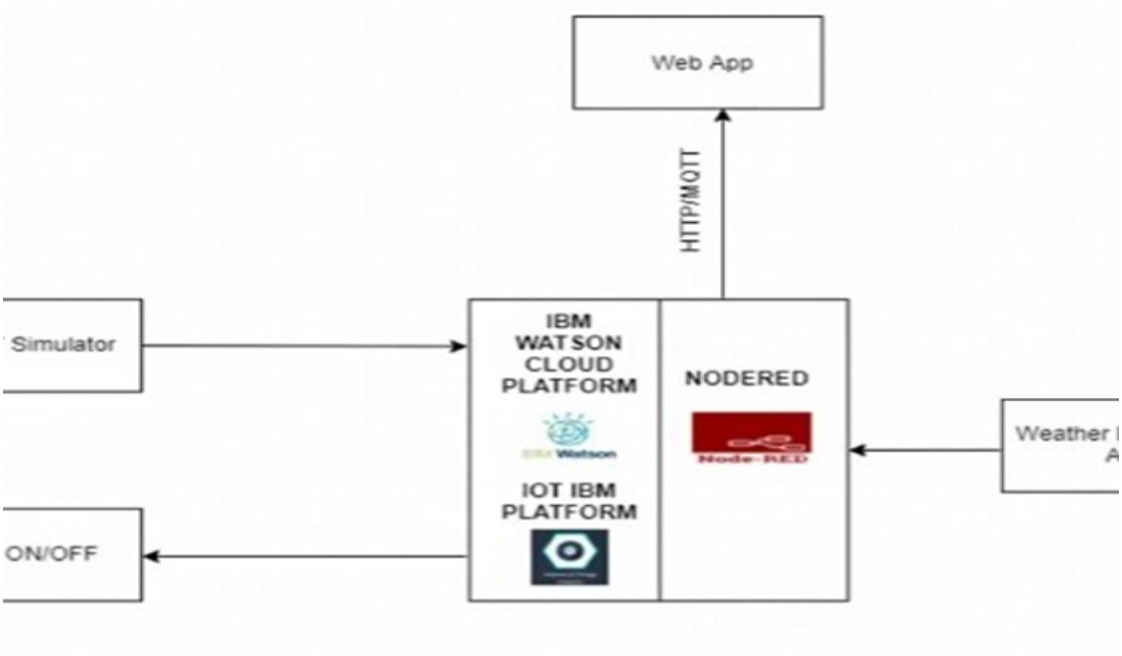
In this paper, a smart and intelligent agriculture system whiich can help the farmer to utilize the water level sensibly and also take care of other discrepancy factors like unrequired animal entry into the fields are discussed. The system consists of a microcontroller and sensors like moisture, temperature, humidity, motion etc. but not limited to only these. The system uses both wired and wireless connections for the communication between the sensors, microcontroller and
the internet.

So in this project we will be using IBM Cloud Platform for measuring the temperature,humidity,soil moisture and also the controlling of the motors.We will be creating the devices in the IBM platform and get connected to the Node-Red app so the data that is displaying in the IBM platform will be sent to the Node -Red app.A gateway unit handles sensor information ,triggers actuators and transmits data to a web application.

Whatever the data is collected or sensed ,according to it the motor should work.If the climate is hot,dry,sunny or windy then the need of water shoud be more.If the climate is cold ,humid,cloudy and little wind then the need of water for the crops is less.

III)THEORETICAL SOLUTION:

Block Diagram:



Hardware/Software designing:

Setup a Development Environment:

A)What is GITHUB?

GitHub is built for collaboration and to set up an organization to improve the way our team works together, and get access to more features.Github is a for-profit company that offers a cloud-based Git repository hosting service. Essentially, it makes it a lot easier for individuals and teams to use Git for version control and collaboration. Github is a web-based platform used for version control. Git simplifies the process of working with other people and makes it easy to collaborate on projects. Team members can work on files and easily merge their changes in with the master branch of the project.

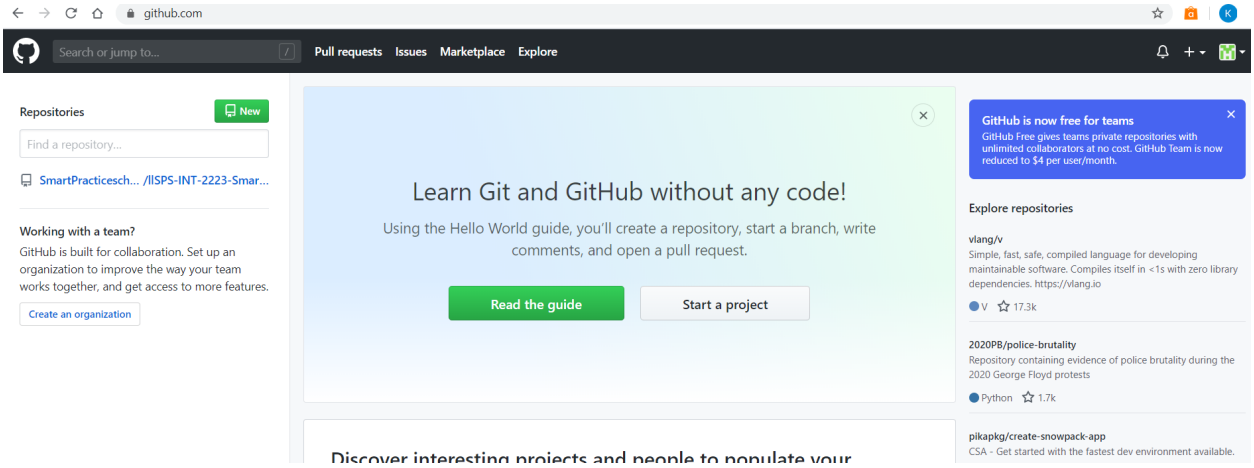
B)Create Github account:

First open github website and give all your credentials.Verify your email address and select your preferences and your account is created.

C)Slack account:

Install the Slack app from google play store or app store and join the slack channel from the provided link.

- We should also do Github collaboration for which we need to login into smart internz student account.
- Goto internship workspace and then to git repository.
- Open another tab and signup in github to create an account.
- Now,open your profile and copy the user name that is below the profile.
- Paste this in github username to collaborate.Check your mail and go to view invitation and accept it.
- Now,open git repository to upload existing files or create the one and selest commit changes.We can also add new fies there itself.



D)Document Writer:

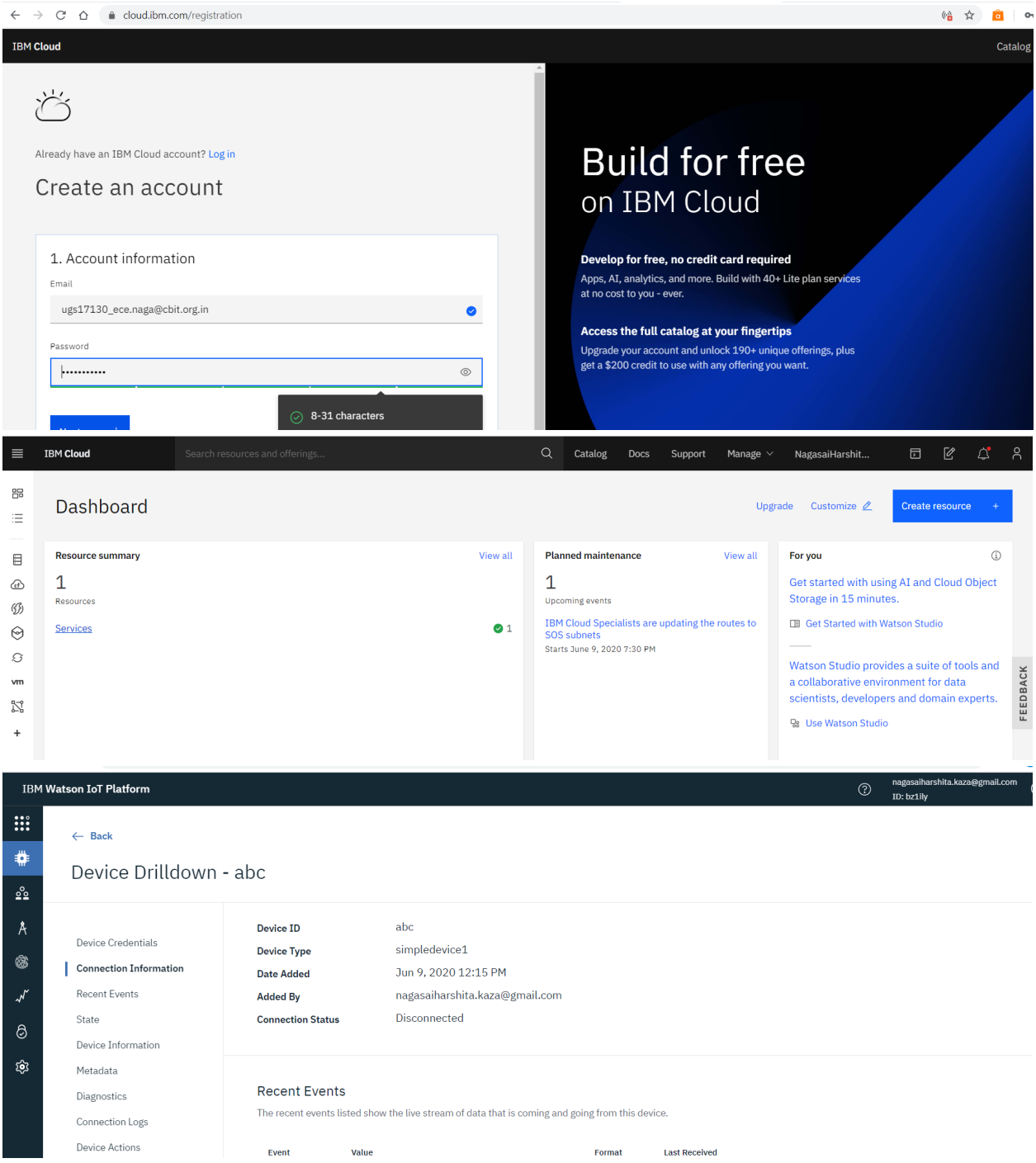
We use Zoho Writer to update the project documentation regularly.Individual activity status shall be updated in the Kanban Board without fail.It is the place where we write our project scope,deliverables,development environment etc,

Explore IBM cloud Platform:

1.Create IBM account:

Open ibm official website and provide the required credentials and create a password.

- Now,verify your mail which is a very important task and login into your ibm cloud account.
- Now ibm catalog is opened,go to services and search for internet of things(ioT).
- ioT platform appears,select the region and select free trial and select launch.
- After signing up,we will find a dashboard where many functions are present.
- After opening the dashboard we can get out of resources in the IBM cloud,where we can function with AI,IOT,ML services.The "catalog" feature present at the top must be selected to go to services and then choose Watson IOT platform where
- we can register the devices and work on smart agriculture project.

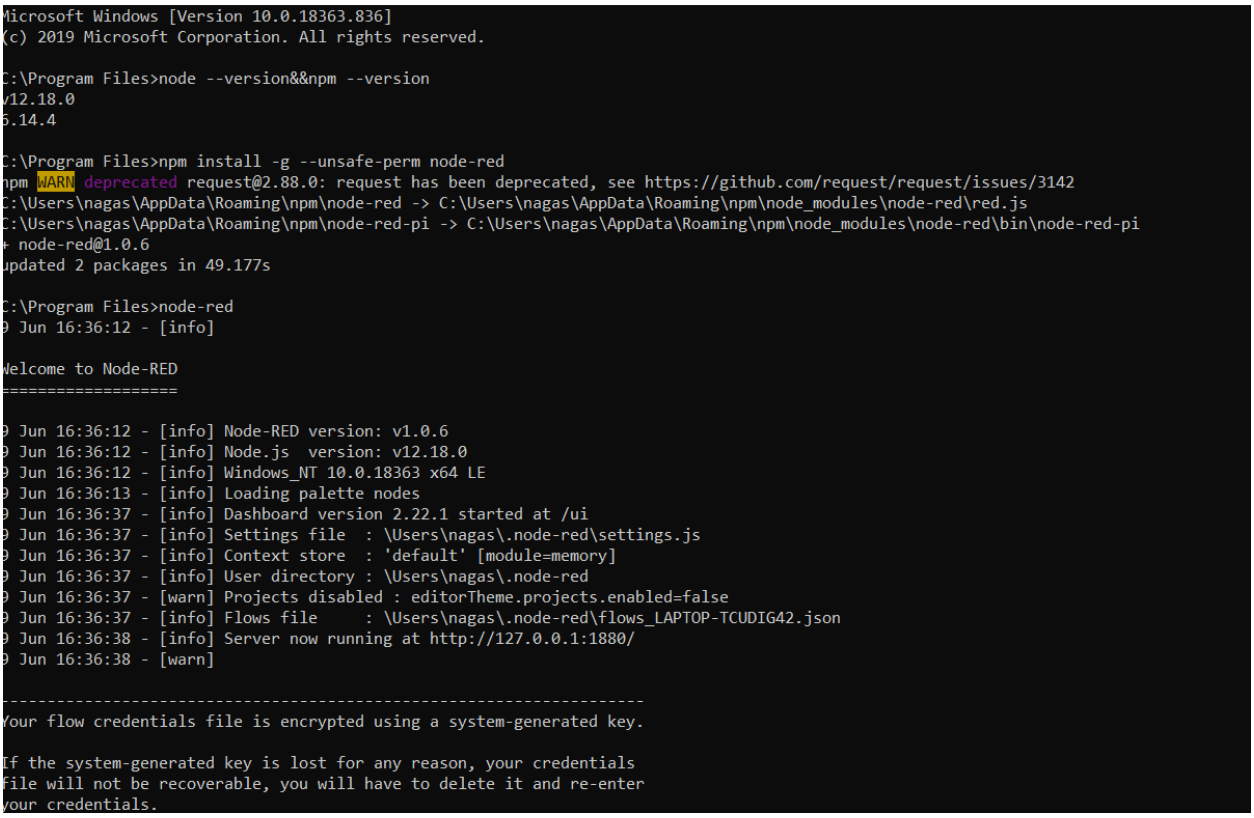


2.Installing Node-Red locally:

For installing the Node-Red locally, open nodejs.org link on google chrome

- Click on 12.17.0TS version,which is the latest version of nodejs.
- After downloading the version, open the command prompt and install nodered.
- For nodered installation we will be typing the commands present in nodered website.

- Copy the command below install "NodeRed" on the command prompt and cick enter to install nodered.



3)IBM Watson ioT platform:

IBM Watson IoT Platform can help you get a quick start on your next Internet of Things project. It is a fully managed, cloud-hosted service designed to make it simple to derive value from your Internet of Things devices. It provides capabilities such as device registration, connectivity, control, rapid visualization and storage of Internet of Things data.

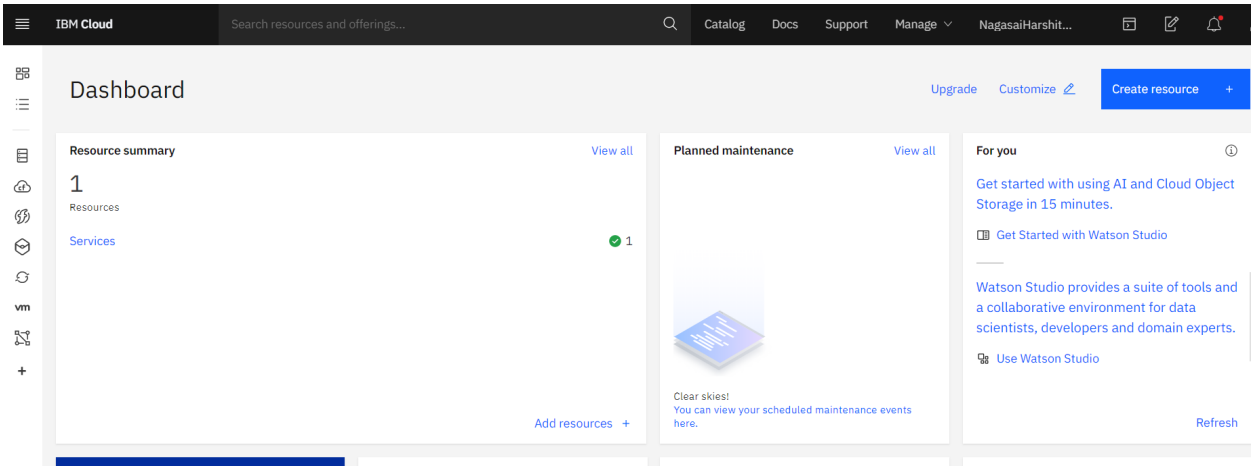
Watson IoT Platform enabled several benefits for companies:

- Connect and register: Easily register and connect sensors and mobile devices. Remotely monitor the connectivity of devices.
- Visually assemble events: With IBM Bluemix, visually assemble events from the IoT into logic flows. Use Node-Red in IBM Bluemix for easy drag-and-drop flow assembly.
- Collect data: Collect and manage a time-series view of data and see what is happening

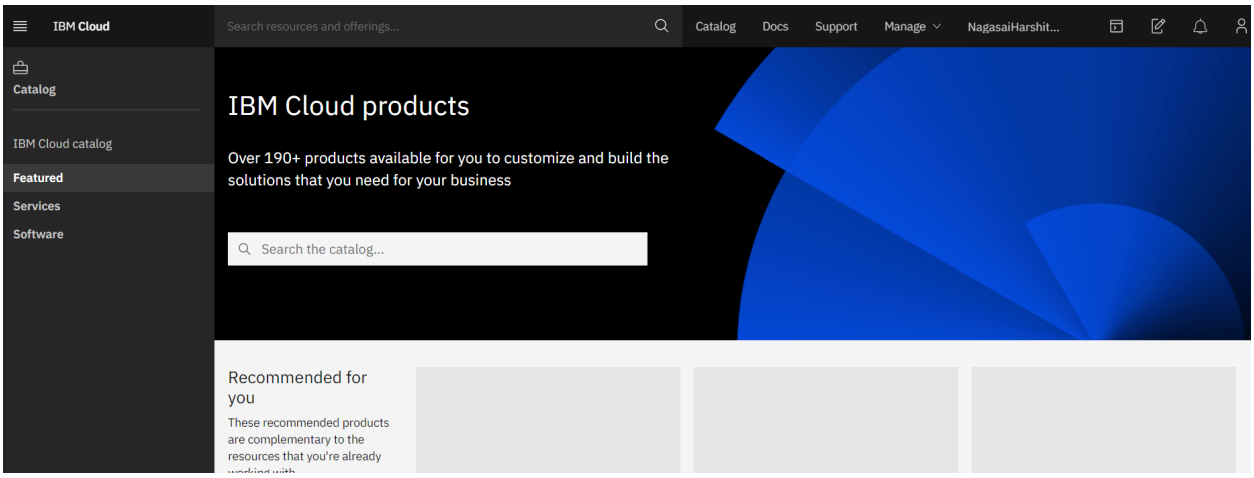
on your devices with near-real time IoT data visualization.

Create Device in Watson IOT Platform:

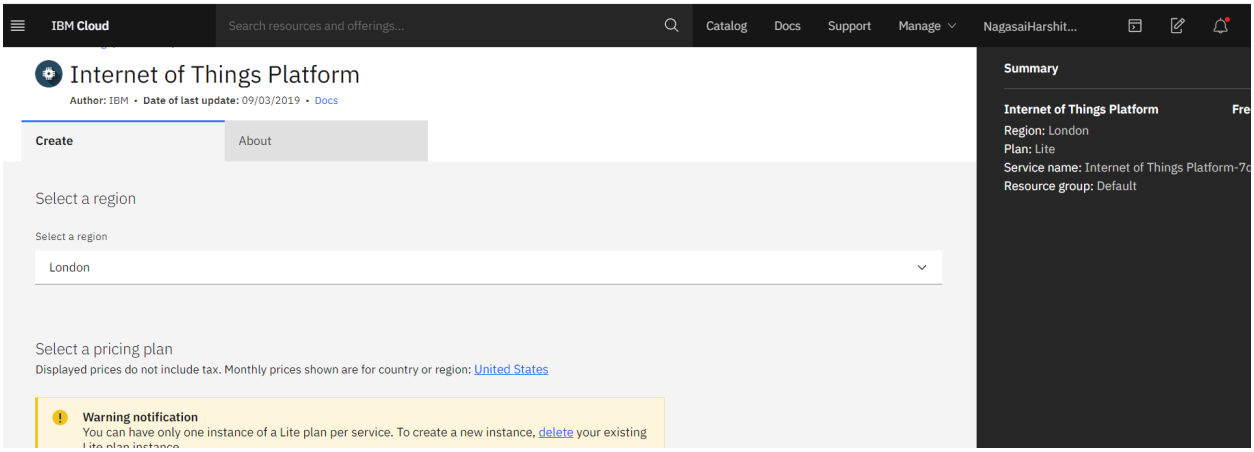
Open your ibm account in https://www.ibm.com/ . After getting logged in Dashboard picture gets appeared on the screen.



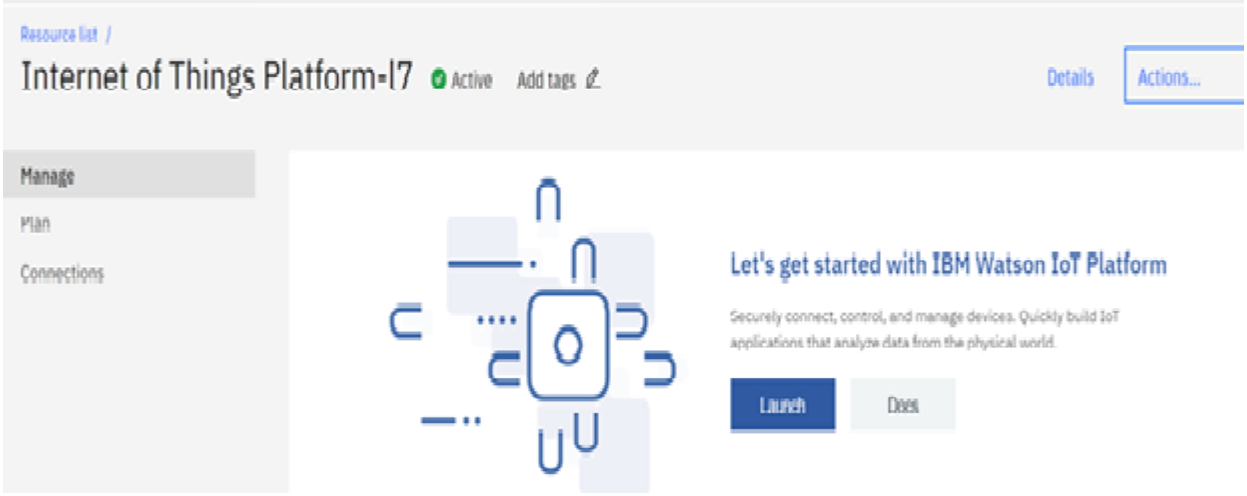
1.Click on the "Catalog" option present at the top of the above figure.Next on the search bar click "iot",then the resouces will be appeared.Click on the Internet of Things Platform as shown in below figure.



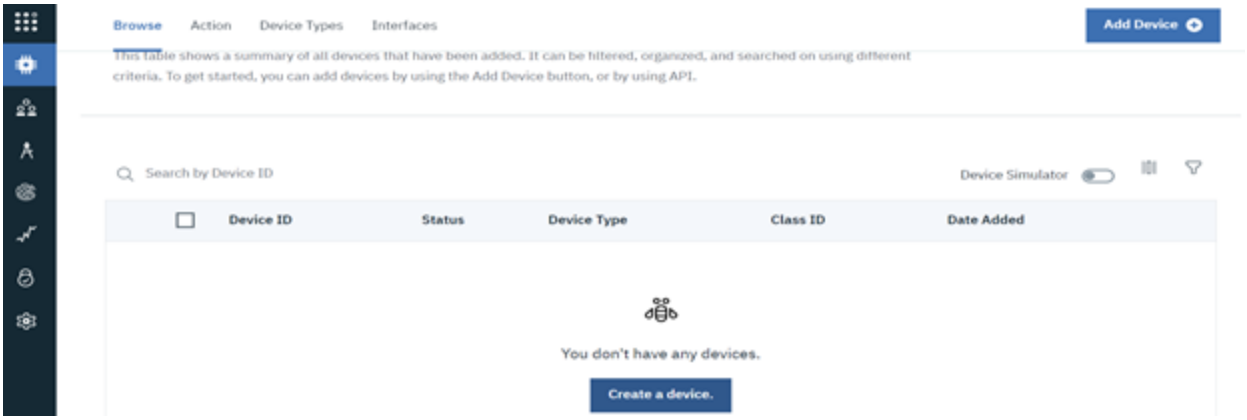
2.Select a region.Choose the free lite plan or else you can choose any other plan described below by doing the payment.By filling all the details just click on "Create" which is at the right side of the screen



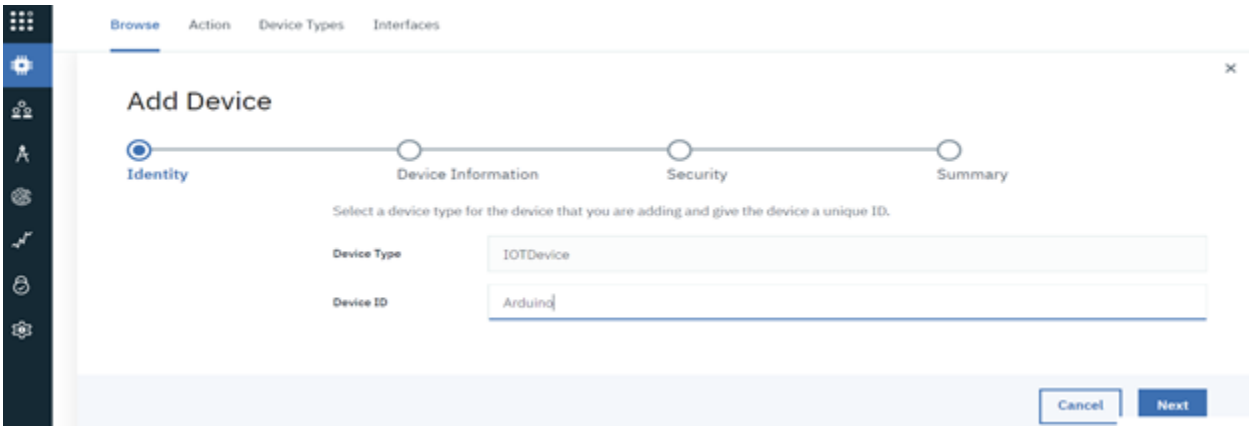
3.After creating the Iot platform you are redirected to the IBM IOT Watson Platform.Click on the Launch Button



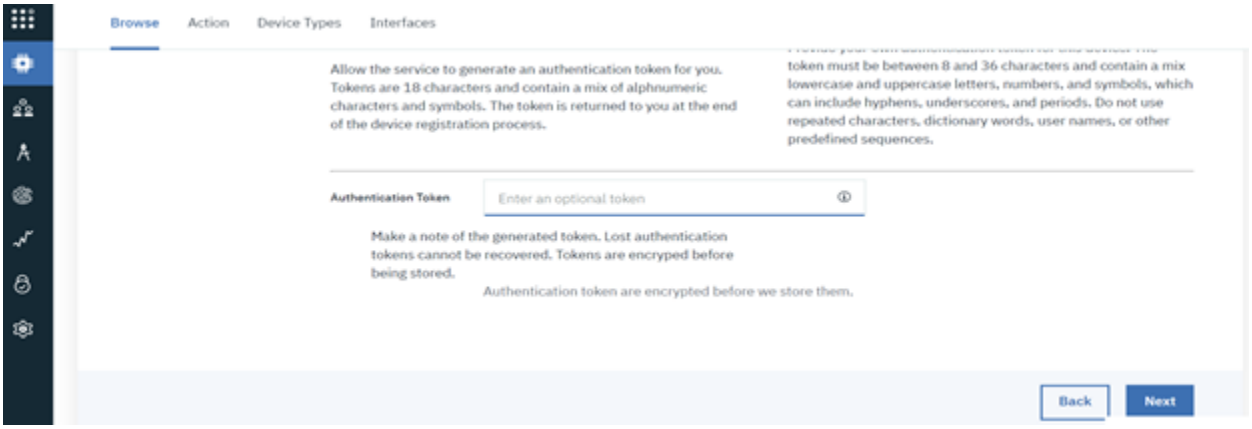
4.After launching we will be in the ibm iot dashboard where we can register a device.In the Browse action just click on "Create a device".



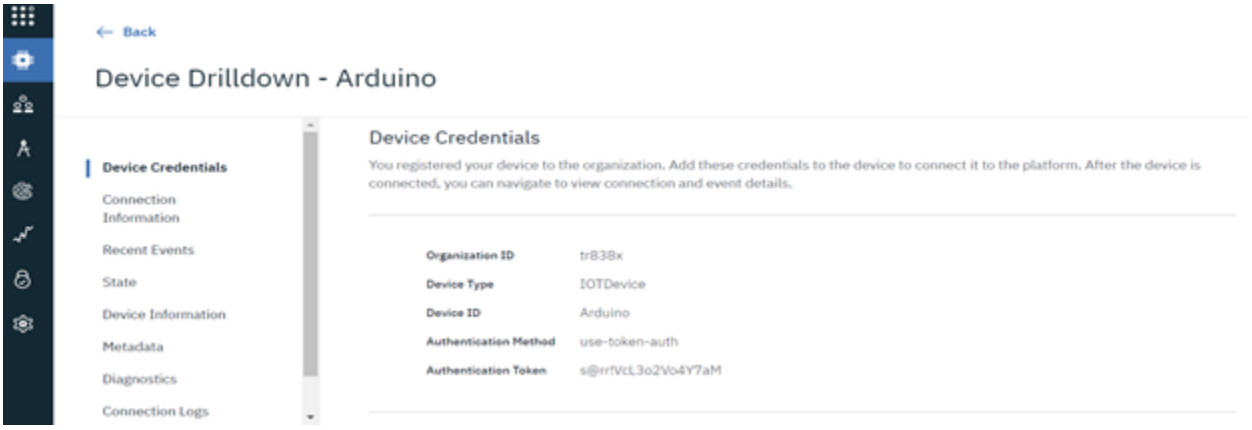
5.After clicking on the create a device give a name for the Device Type and Device ID and click on next.



6.Skip the Device Information part without filling any details and click on next.
7.For Authentication token we can give a token or it will be set by default.So click on next for the token generation. After click on next then click on "Finish".



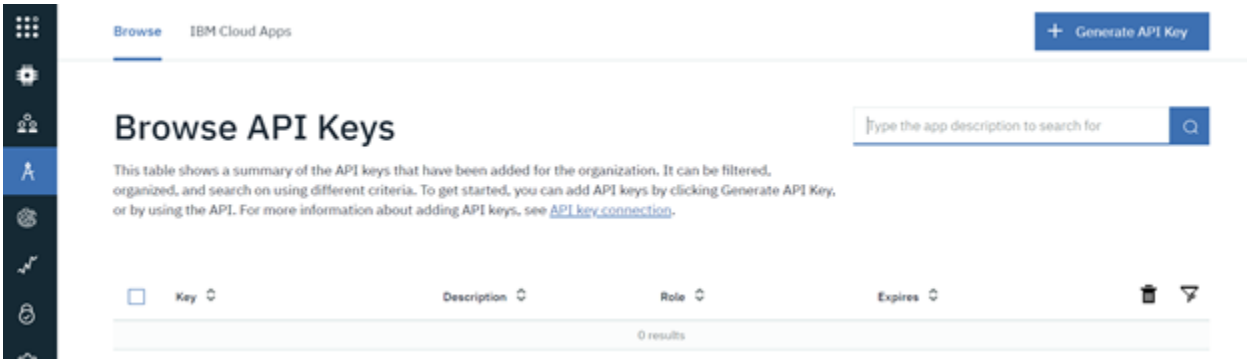
8.The details of the device registration will be appeared on the dashboard with the Authentication token that is developed by default.Copy the credentials in a notepad.



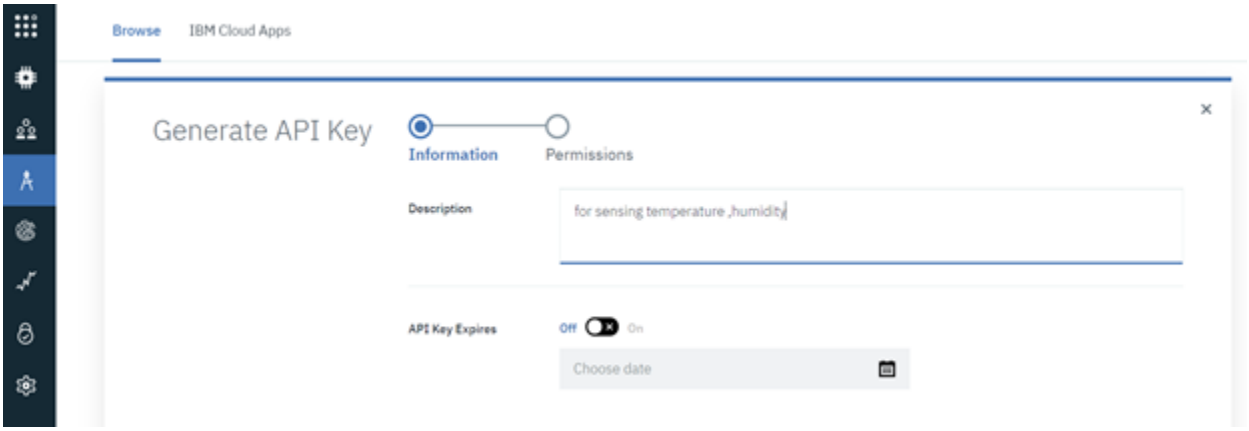
API Creation for Node-red application:

1.After registering a device and copying the credentials ,check out the various functions present at the left side of the scrren and click on "Apps" for API creation.

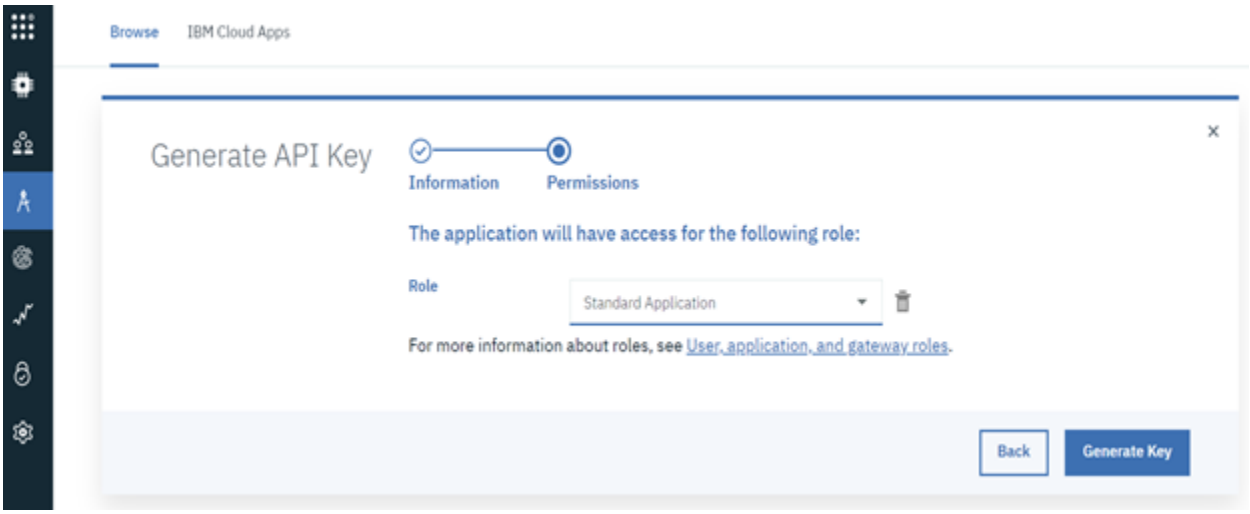
2.As shown in the below figure click on the "Generate API Key".



3.When you click on generate api key,a page gets displayed where we need to give a description about our project and there is an API key expires button which should be off. Then click on next.

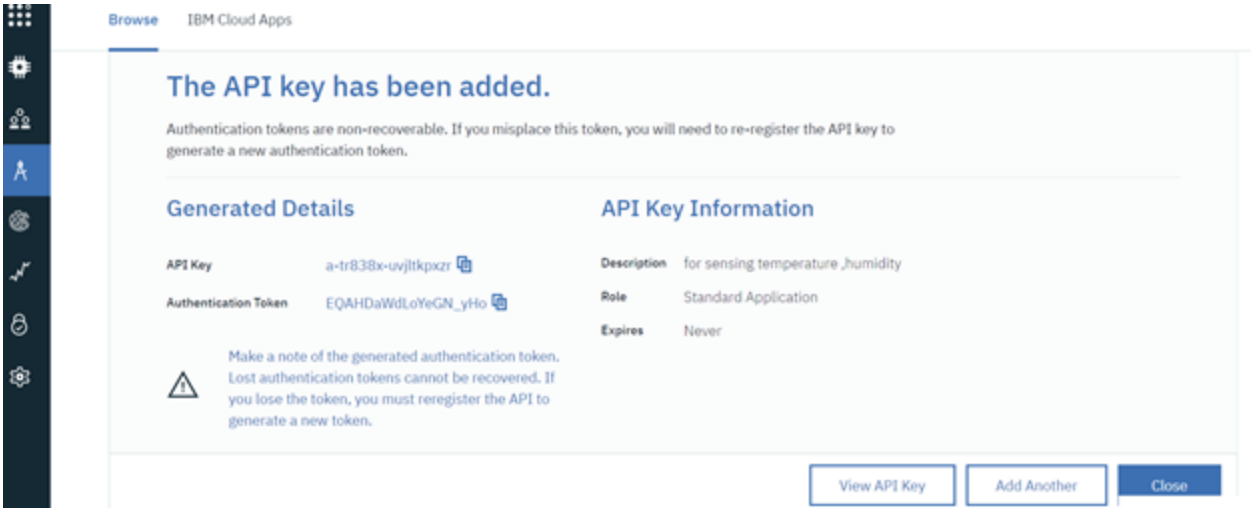


4.In the roles tab,select the role as standard application.Next click on "Generate Key".



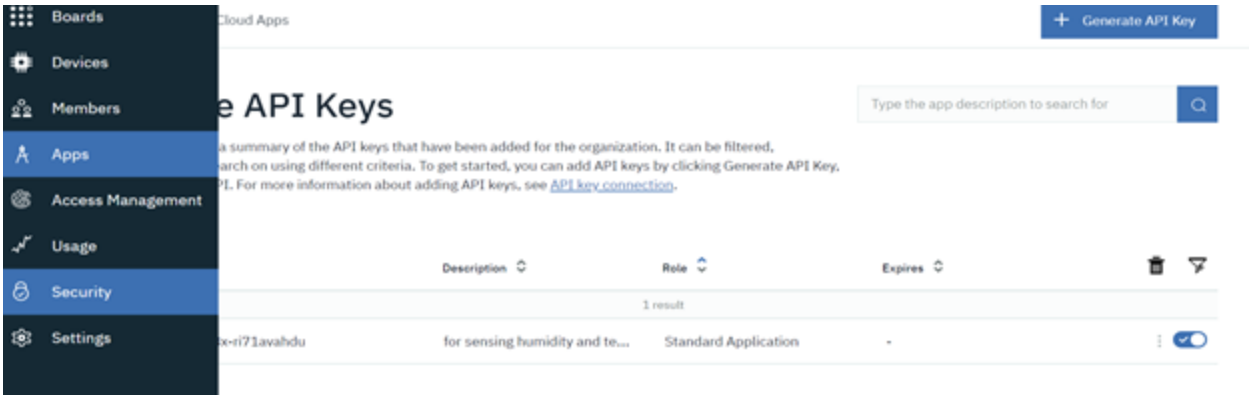
5.After that API Key credentials get dislayed on the screen.Copy the API key and its

Particular Authentication token in the notepad where the device registration details are present.

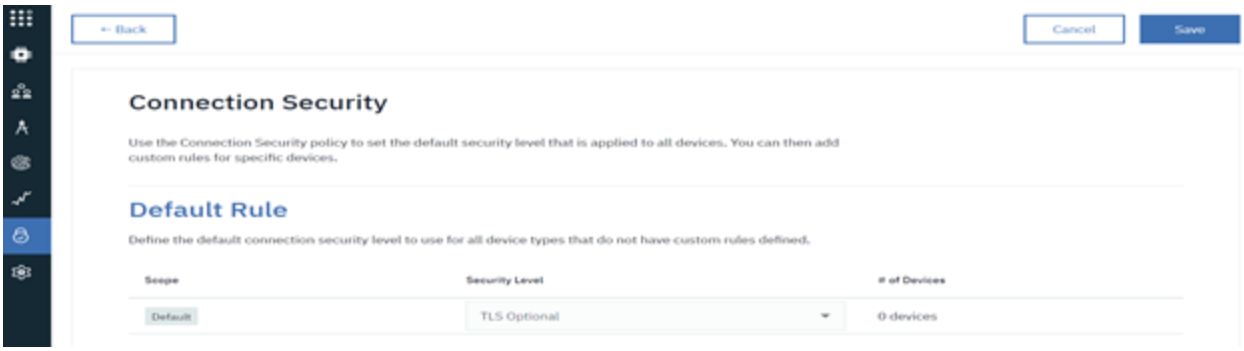


Connection security for the Device created:

1.After creating the API key,next click on the security present at the left side of the screen.



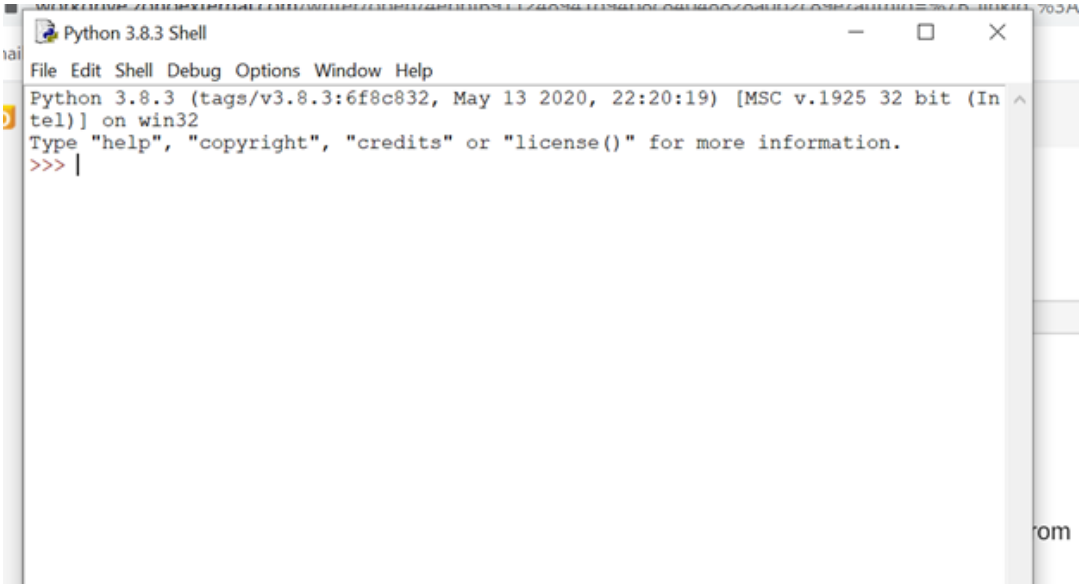
2.After clicking on the Security ,click on the connection security.In the connection security tab select the default rule as TLS Optional and click on "Save".



4)Install python IDE:

Next to get connected with IBM Platform install Python IDE from http://www.python.org/download. After installing when you open python ide the following figure gets displayed.

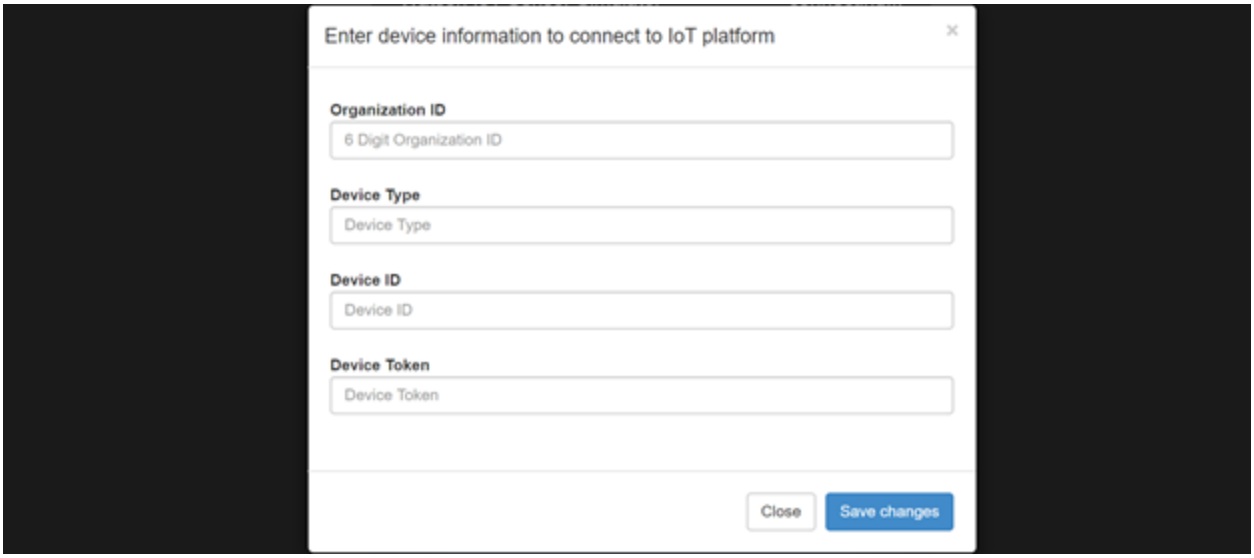
Click on file-->open new window-->in the new windor type the code -->save the file-->click on debug--->click on run module-->output gets deisplayed.



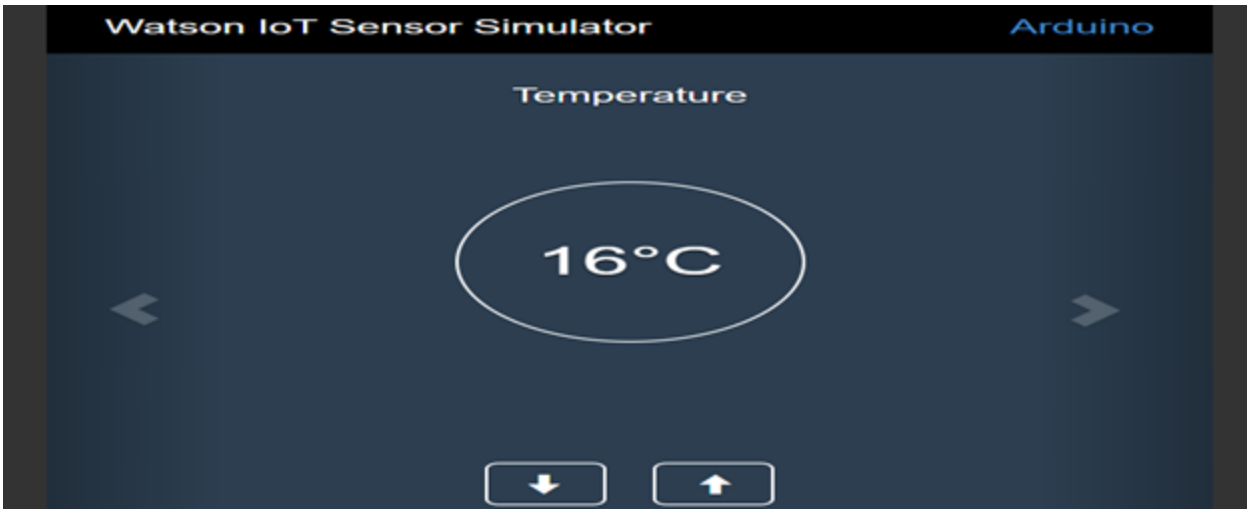
IOT simulator to IBM Watson Platform:

Connect the IOT simulator to the Watson IOT Platform:

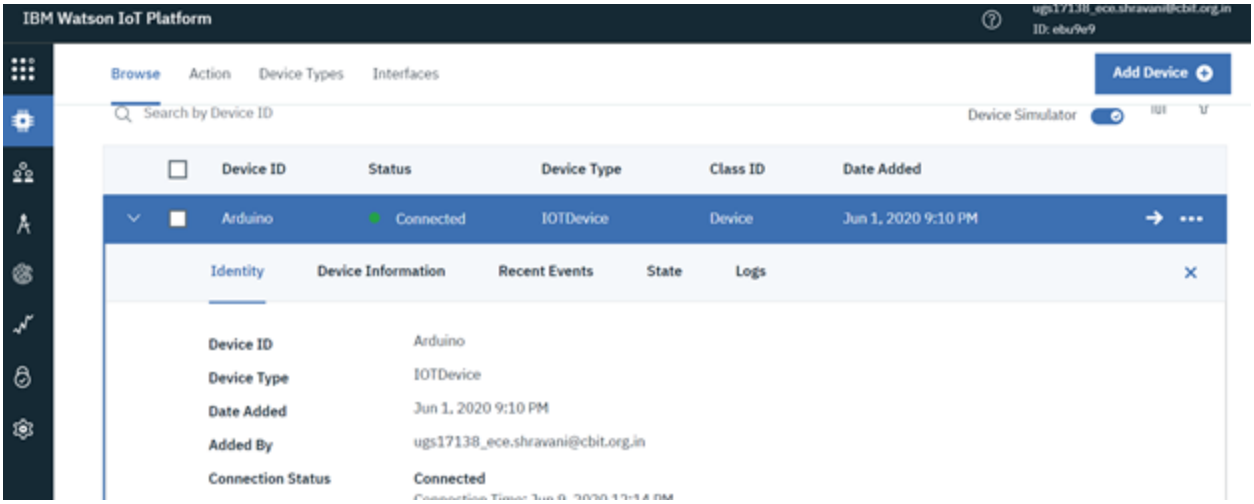
1.Click IOT simulator sensor in google chrome.Then click on iot sensor.



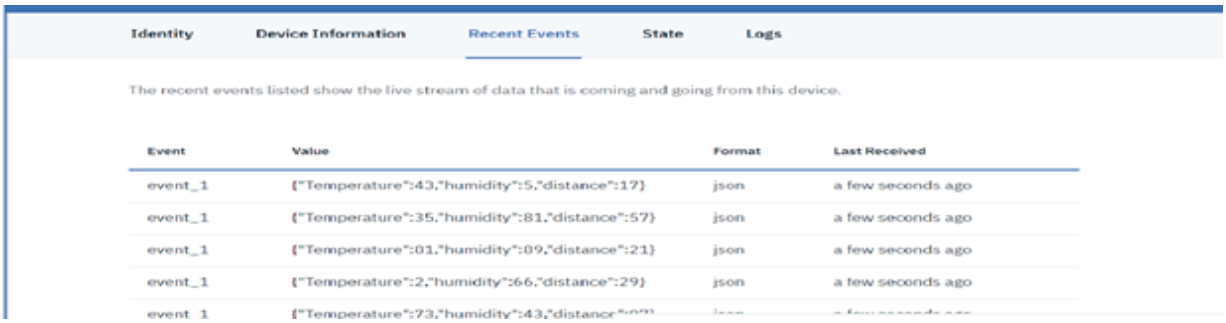
2.The above image gets displayed when you click on iot simulator sensor.Fill the ibm credentials saved in the notepad in respective blocks of iot simulator sensor.



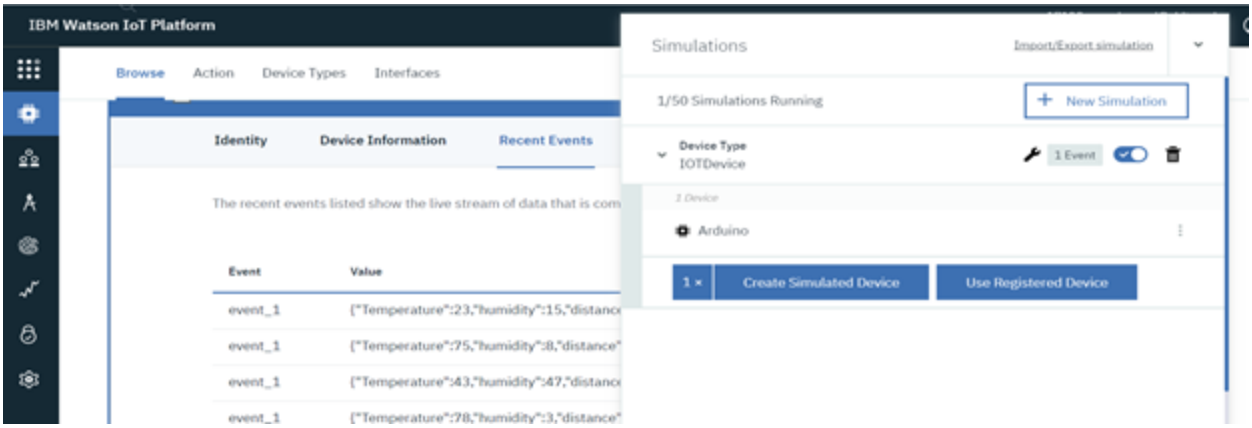
3.After giving the credentials to the sensor it gets connected to the IBM platform and the temeperature,humidity,object temperature gets displayed.You can see in the IBM platform it shows "connected".



In recent events the temperature ,humidity ,soil moisture values gets dislayed.

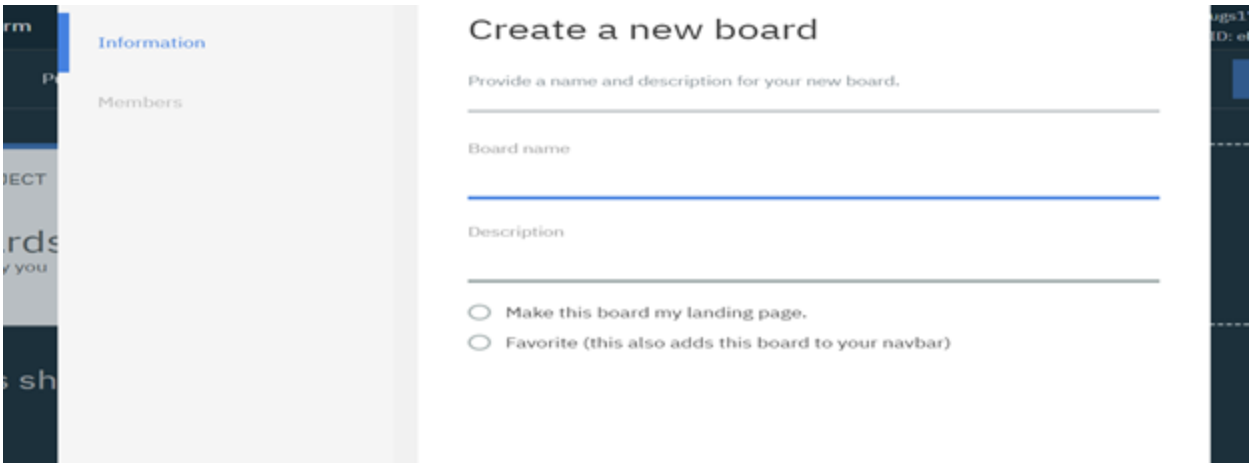


The other method you can do is on the Device Simulator and write the code for temperature,humidity,object temperature and save it.

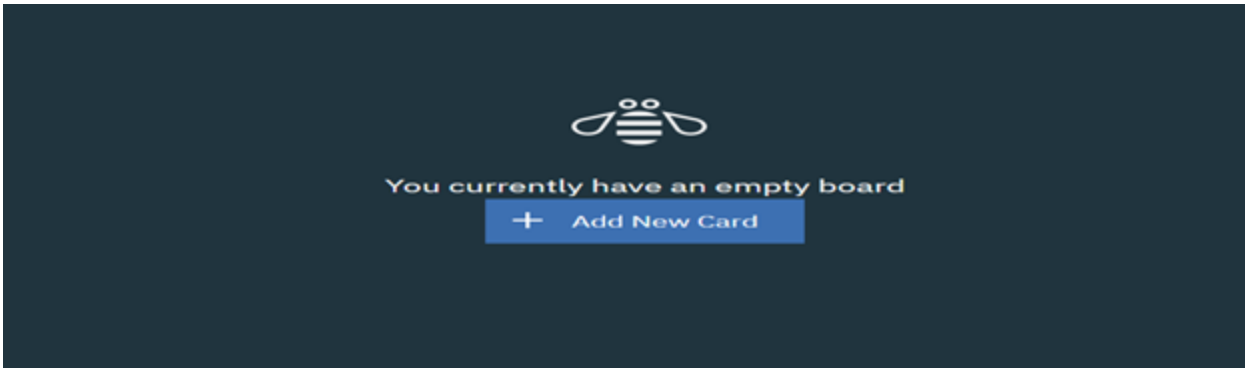


To display the changes in the temperature ,humidity and soil mositure we can show it in a graphical analysis.

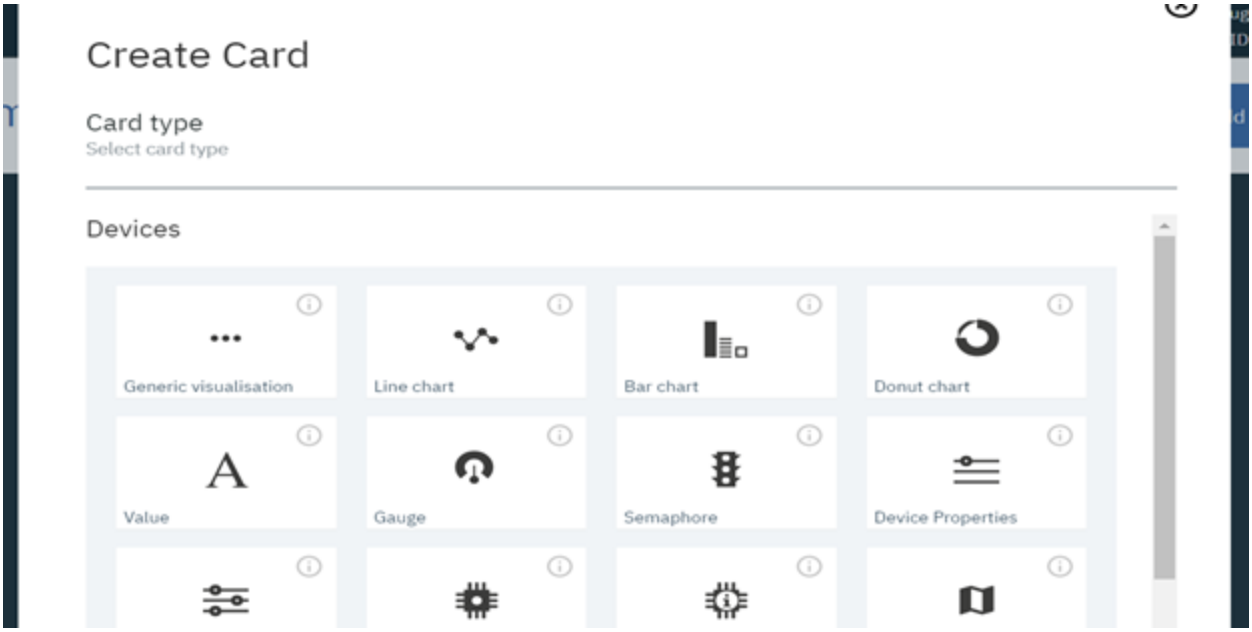
1.Click on the "Boards" on the left side panel of IBM platform.Next click on "create new board".A window gets popped up.



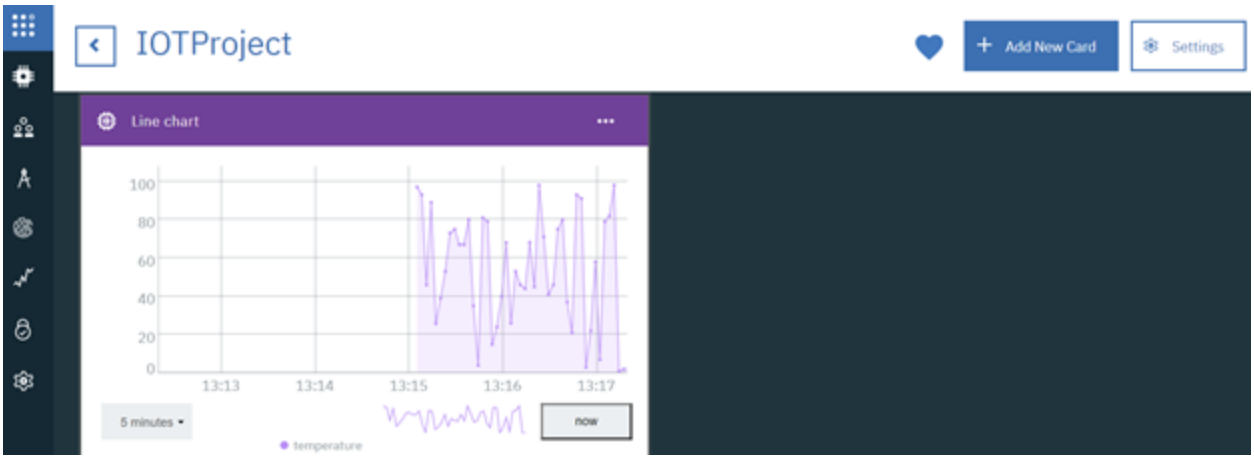
2.Provide the details and click on next.Click on Submit.A card gets created by the name which you have given.Click on that card and a window gets popped up.



3.Now an another window gets popped up.



4.Click on the chart you would like to see the values.Then click on the next,now click on connect new data set,then fill the details of Name,Property ,Event,Type,Unit and click on next.



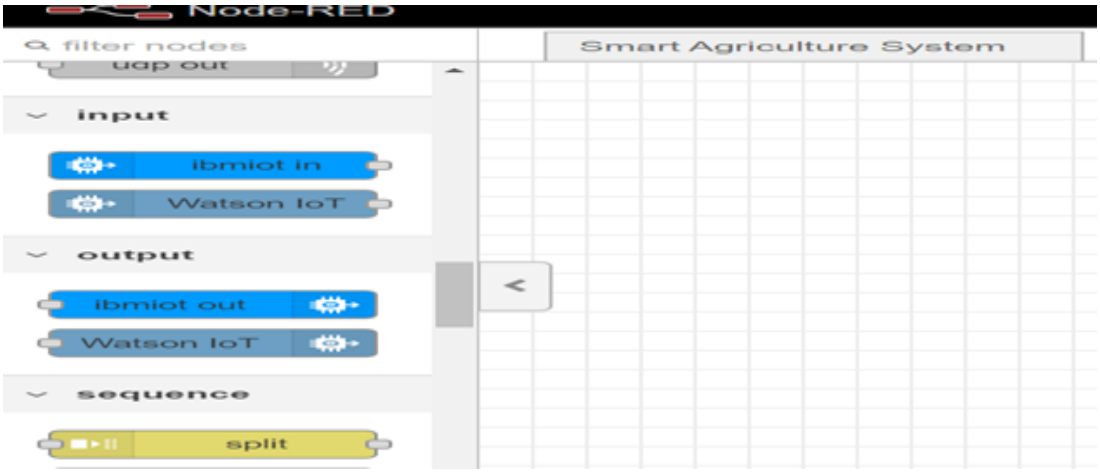
5.So for the temperature the graph is shown in above picture.As the same wy we can create for humidty and distance.

Configuring nodered to get data from IBM IoT and platform and open weather API:

Creating a Node-Red UI to view data in graphical form:

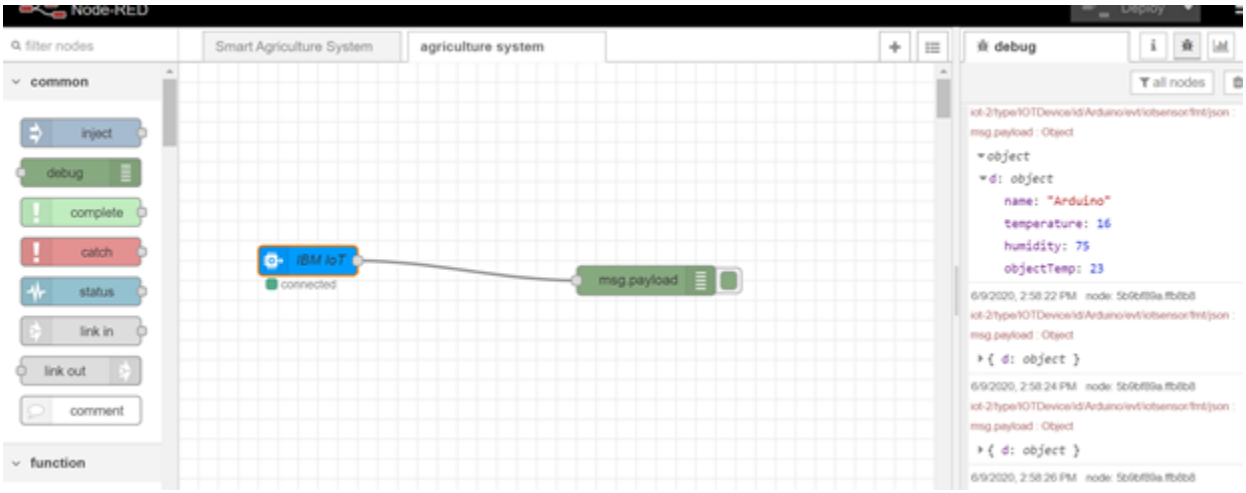
1.Open the node-red from the command prompt.The following image will be displayed.The left side of the image are called as node-red pallette.

2.Double click on the "Flow 1" and name it as Smart Agriculture System and click on done.Next click on the manage pallette and we need to install the Node-red ibm iot app from Node-red documentation.So after installing you will be getting input and output ibm iot buttons on the manage pallette

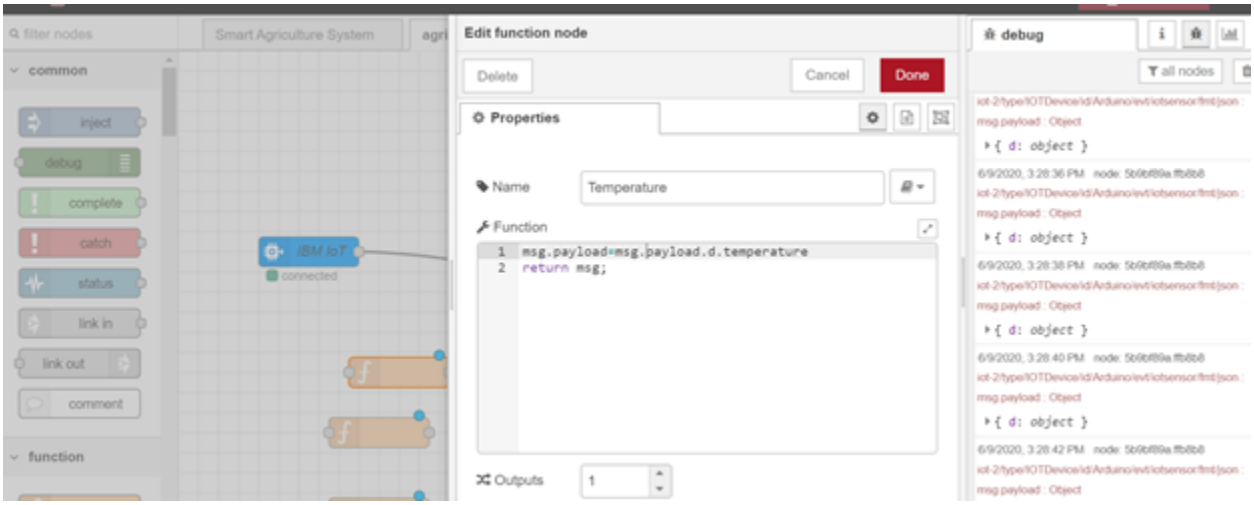


3.Drag the "ibmiot in" on to the screen and click on it.A window gets popped up. Select the API key option and below that click the edit symbol and fill the API key and API token in the blocks and click update.Next You fill the device details created in the ibm platform in the respective blocks and select the Input type as "Device Event" and then click OK.

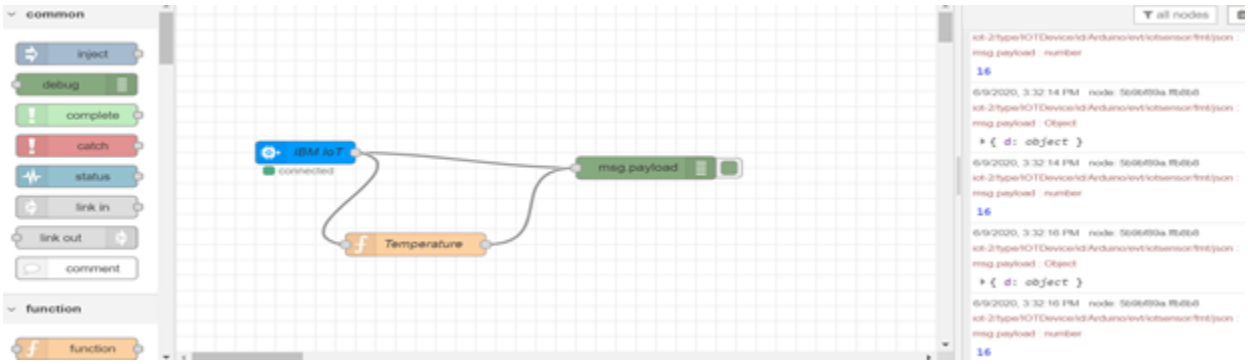
4.Next from the manage pallete in that from common function drag the debug button to the screen.Now connect the ibm iot input to the Debug.Then click on the deploy button present at the top right of the screen.After deploy you can see the values of the iot Sensor simulator in the debug section as shown in below figure.



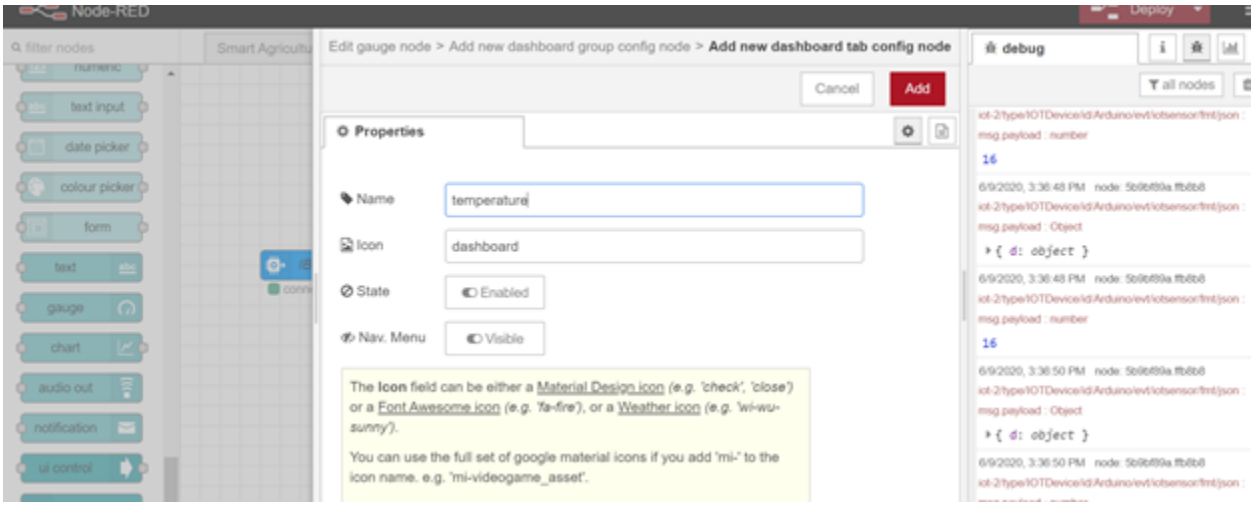
5.Now to check out the values seperately we can use a node called as "function".Click on the function button drag it to the screen and name it as respective field name you want to give.From the debug section click on the temperature "path" and copy into the edit function node and type the code as per shown below.Do the same for humidity and soil moisture.



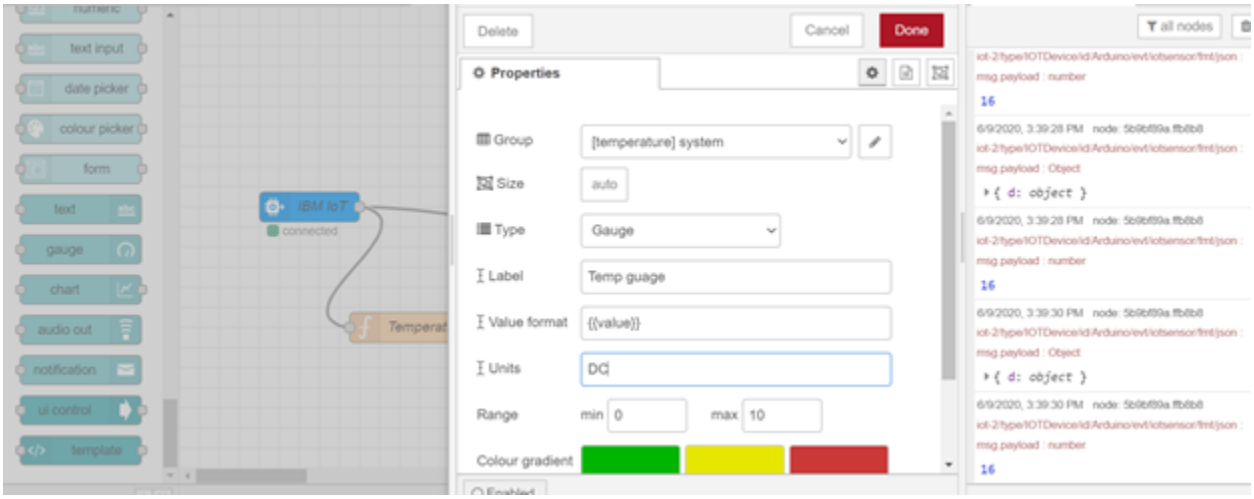
6.Then connect the temp node with ibm input and debug nodes.Then click on deploy .You will be able to see the independent temperature values on the debug section.



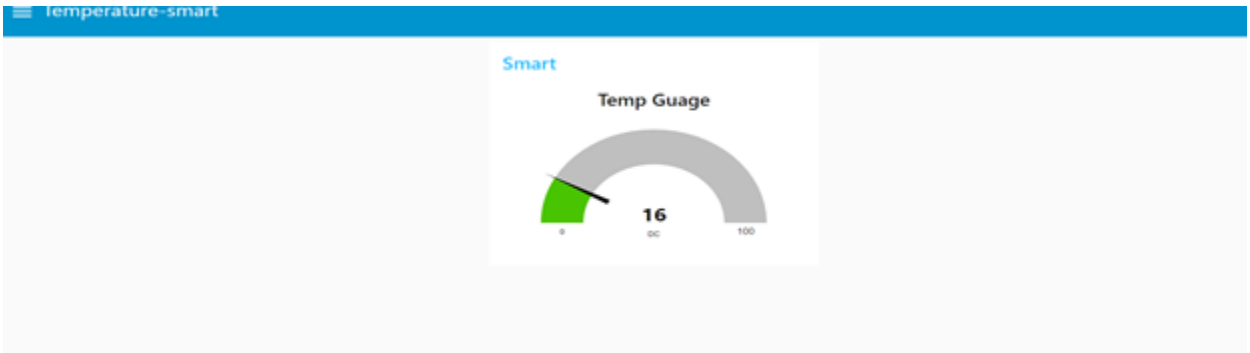
7.Now click on manage pallette and click on install and install the node-red-dashboard. After installing is done from the manage pallete click on the guage function and drag it to the screen.Click on the guage node and fill the details available in it.



8.Click on add after filling th details and fill the other details as shown in below figure.

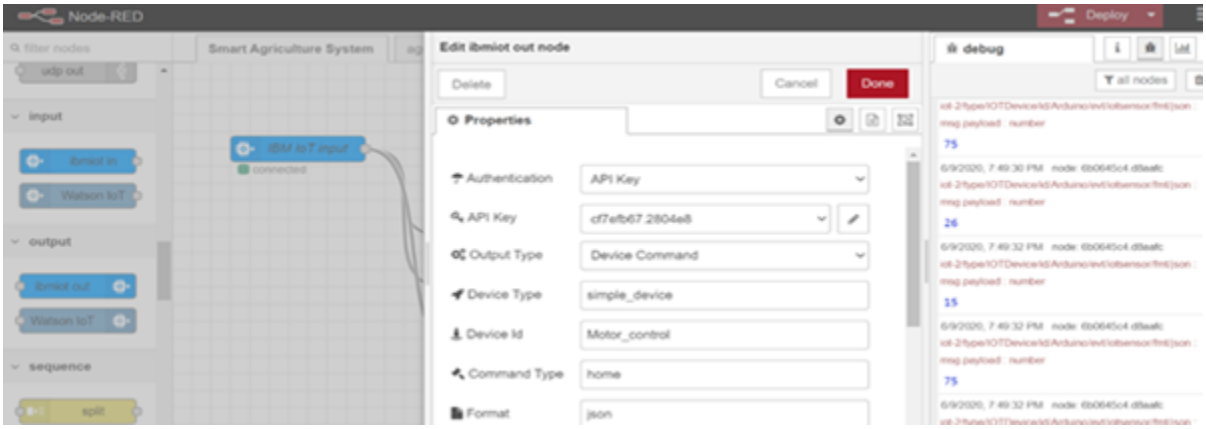


9.Now connect the function node to the guage.Then click on Deploy.After deploying to see the guage of temperature copy the link "http://127.0.0.1:1880/" to the browser and after "/" just type ui like "http://127.0.0.1:1880/ui" ,then the guage gets displayed on the screen.

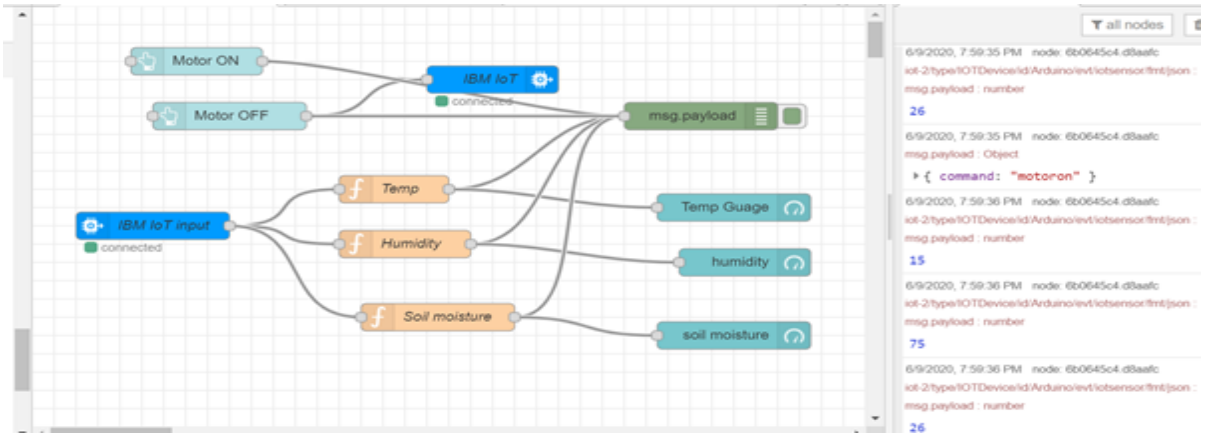


10.Similarly as we did in the temperature ,we can do same process for the humidity and soil moisture.

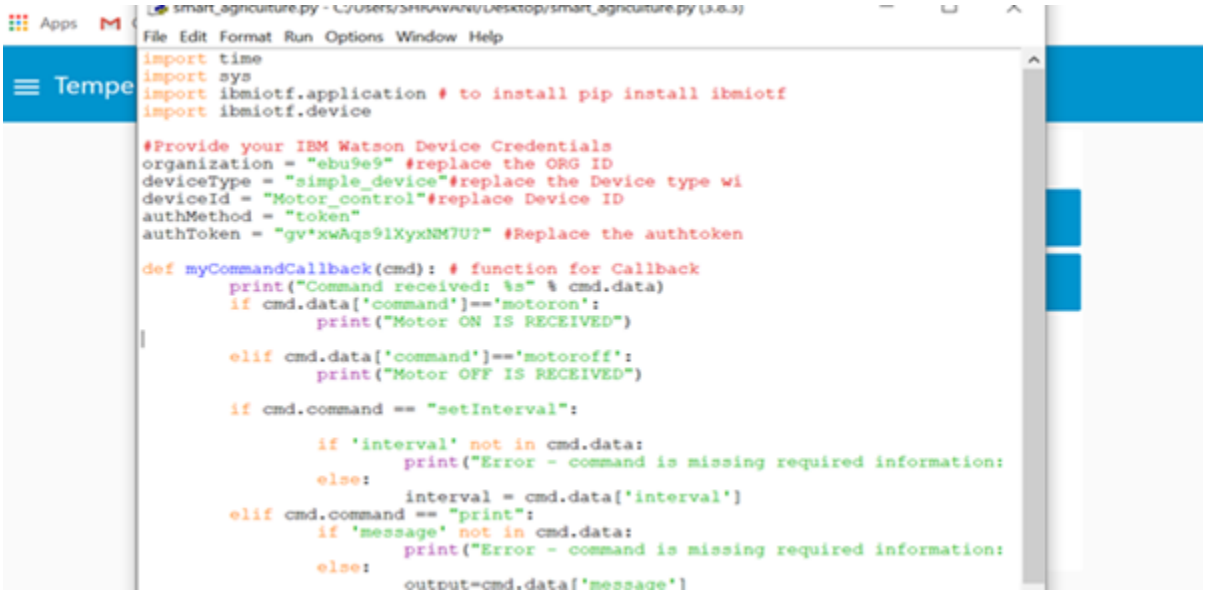
11.Next IBM watson platform create an other device for motor controlling.Save the credentials of the motor control in the notepad.In node-red open IBM IOT output drag it on the screen.Double click on the node and fill the details by clicking on the API key.In the place of output type click on "Device command" as it indicates the output.



12.Next click on the button nodes on the manage pallette .click two button nodes and name them as "motoron" and "motoroff" by double clicking on the buttons.Json format has to be selected and th command should be given like {"command":"motoron"}.After naming them click on done and connect the motor buttons to the ibm iot output node and the debug node and click on deploy.At the ui page we find the motor on and motor off buttons,when you click on one of them that information or the command gets displayed at the debug section as shown in the figure.

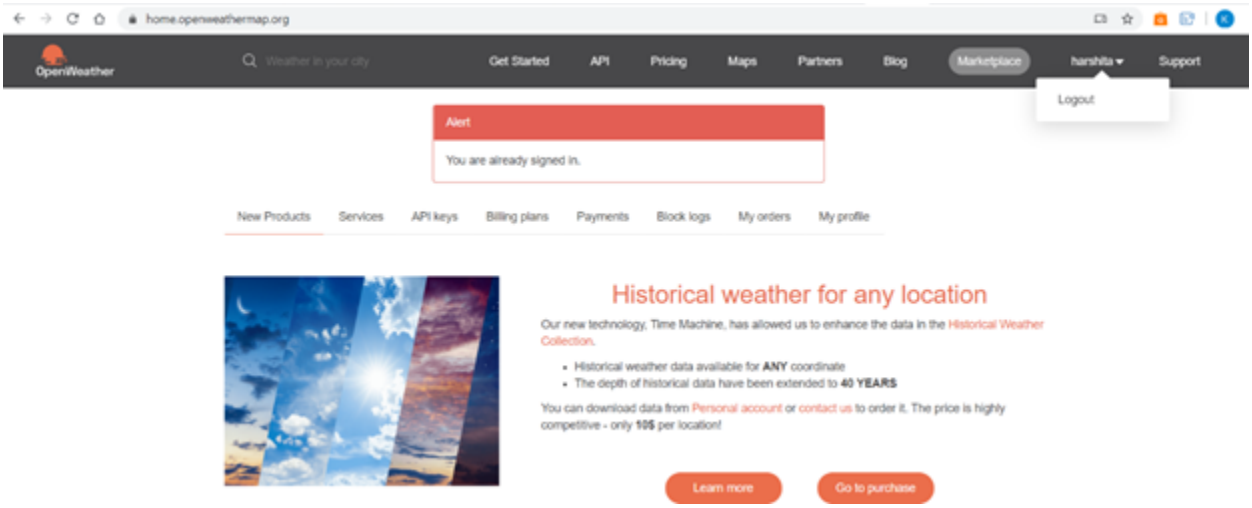


13.Now open python IDLE .Write a code in python with its instructions for Motor controlling and run the program.So when you click on the ui page "Motor on",in the python console the message gets appeared.If we click on Motor OFF the message gets displayed on the console.

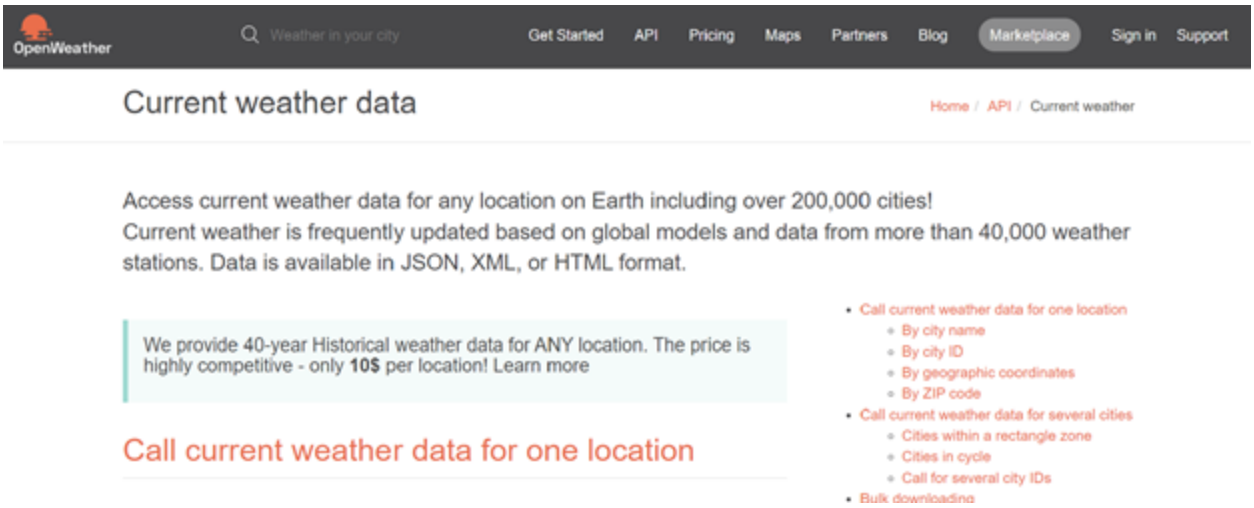


Open Weather Account:

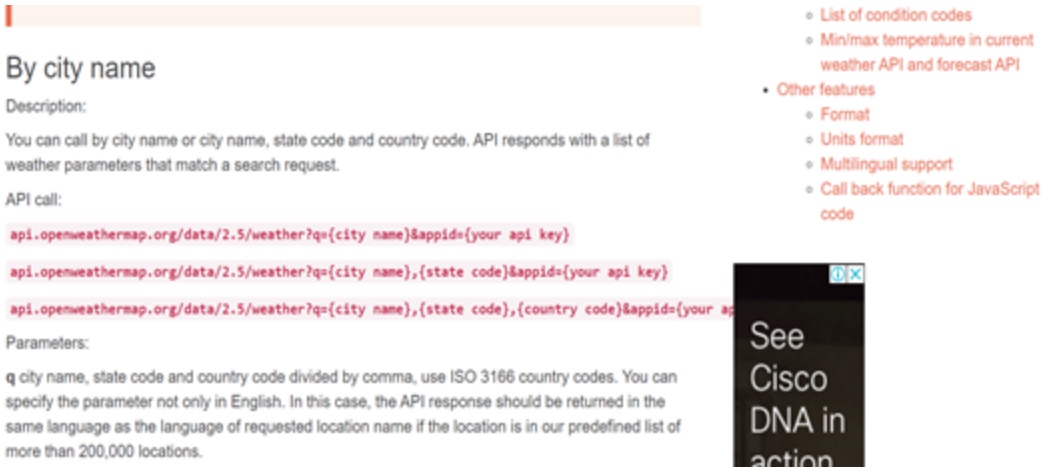
1.Click on the link https://home.openweathermap.org/and create an account in open weather API .



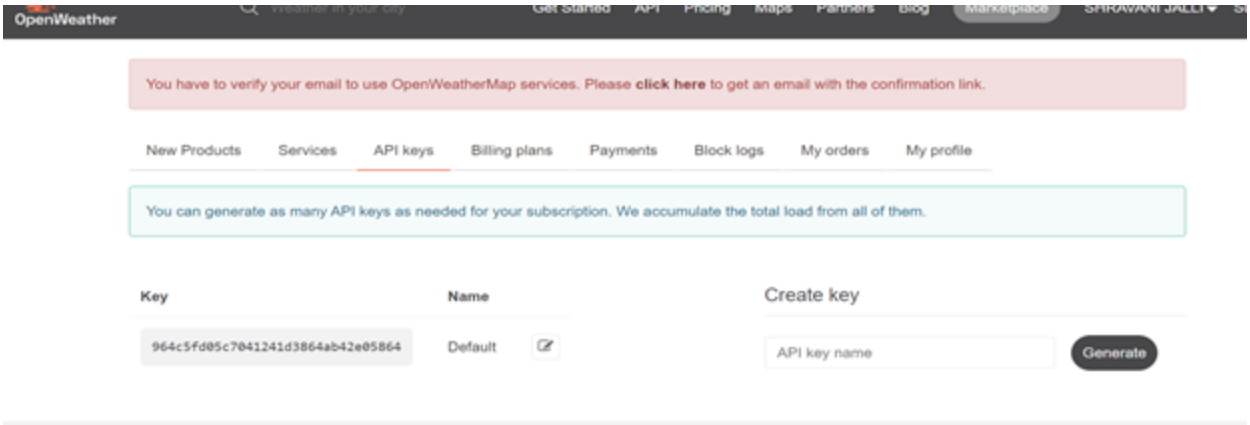
2.Next click on API which is placed at the top .After clicking on the API ,in Current Weather Data ,click on API doc button,at the left side you will see "by city name" function.Click on it.



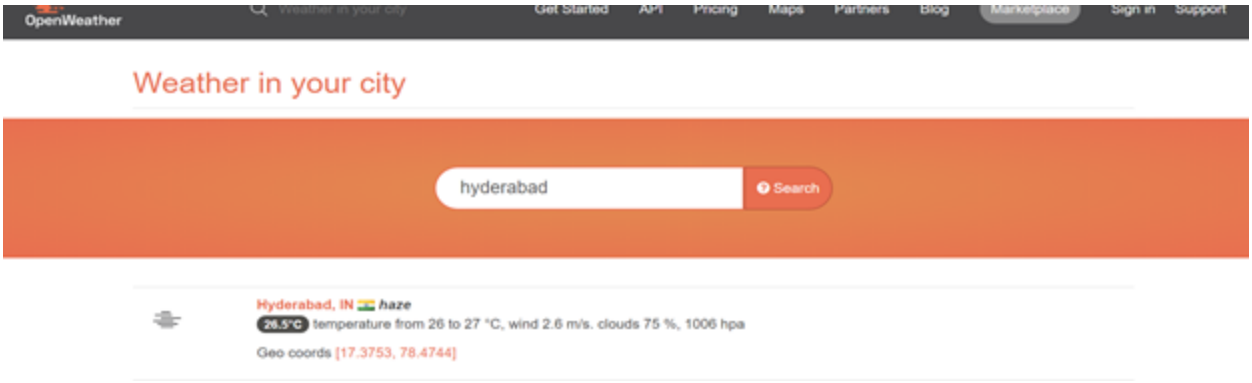
3.After clicking on the city name,select the first API link call that is displayed on the screen and copy it in notepad.



4.Go to home page and click on "API Keys" , a default key gets generated.Copy the Key in the notepad.



5.On the search button which is on the top of the open weather page,click the city name where you are staying,it will be redirected to the city weather page.



6.Now copy the "Hyderabad,IN" in your link which you had copied before in the notepad.Just put the "Hyderabad.IN" in the city name section and the Key that is created by default in the Api key section .
api.openweathermap.org/data/2.5/weather?q=Hyderabad,IN&appid=964c5fd05c7041241d3864ab42e05864

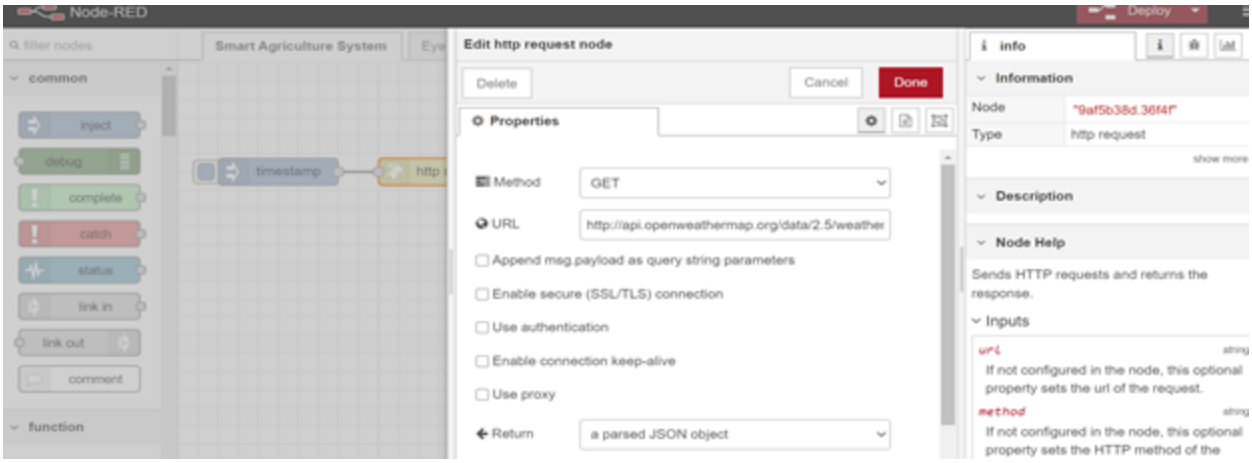
7.Copy the above url in the browser and you will get the output as shown in below figure.

If you get the weather data. Then you can proceed further.using this url you can get the data in your web or mobile app also.

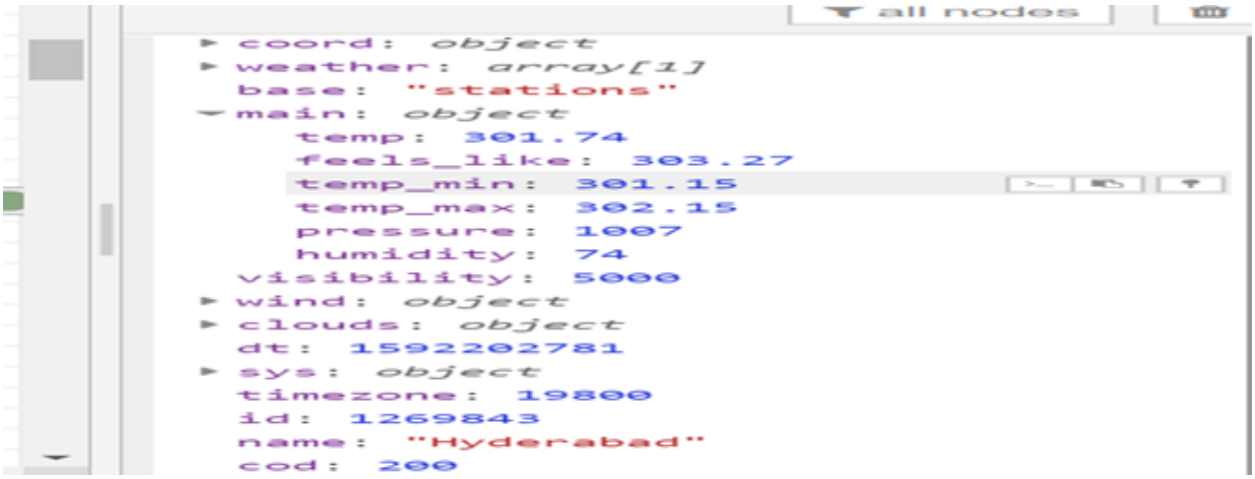
Configure your NodeRed to get the weather forcasting data using Http requests:

1.After creating the openweather api key and the location ,open the nodered platform.
2.Now select the inject node,http request node and debug node on to the nodered screen.
3.Now click on the http request and select the "method" to be "GET".Below the method there is a URL block present where we need to give the openweather api as shown in below link and image.

http://api.openweathermap.org/data/2.5/weather?q=Hyderabad,IN&appid=964c5fd05c7041241d3864ab42e05864

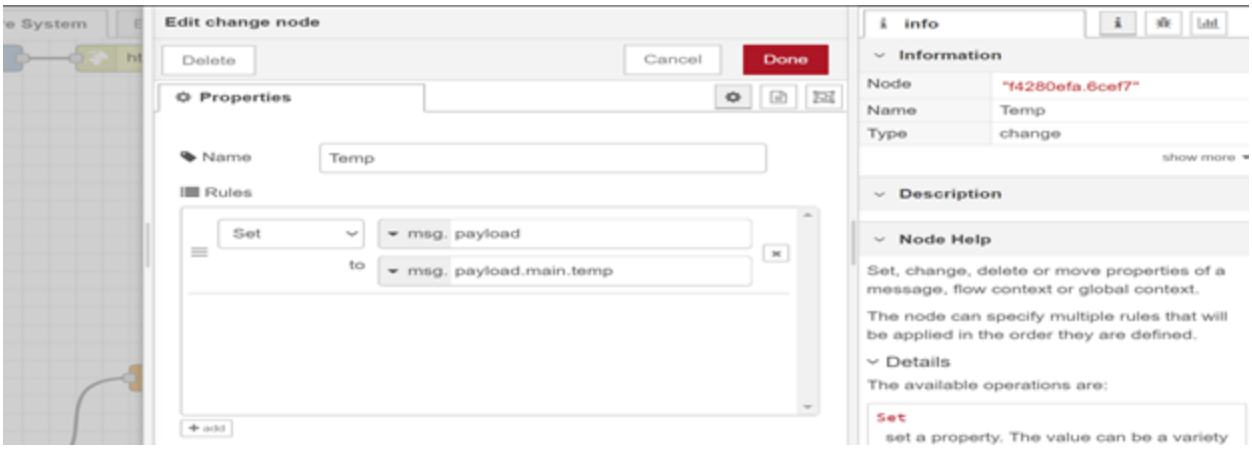


4.After filling the details click on done option.Now connect the inject node to http request node and http request node to debug node.Next click on deploy,then click on the inject button node and in the debug section the weather format gets displayed.

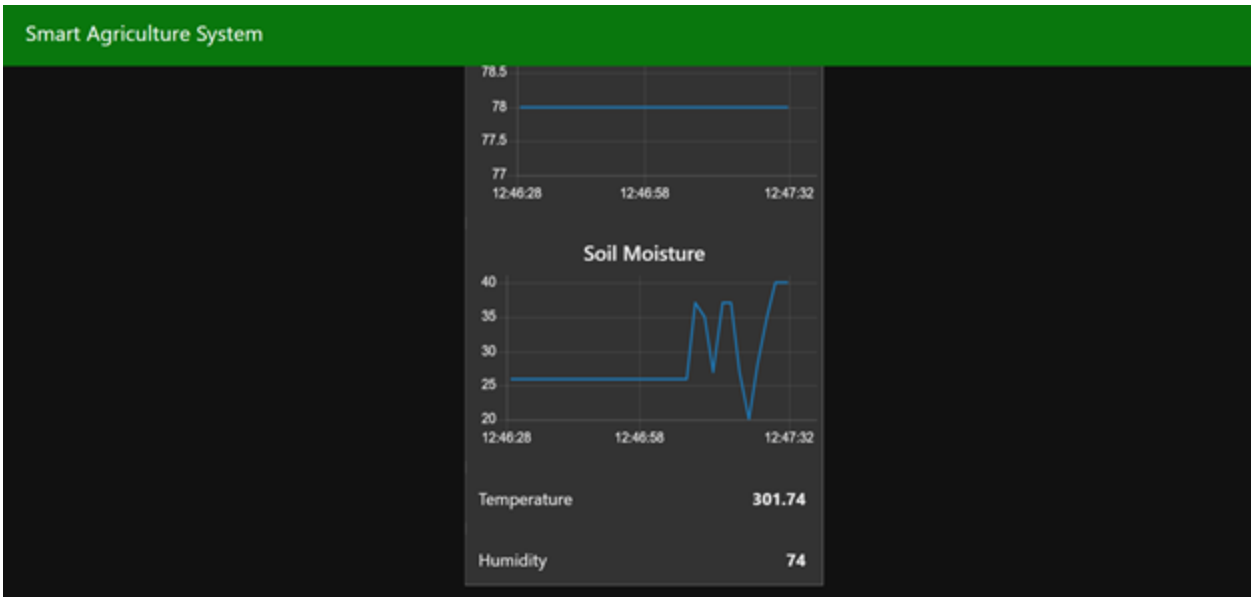


5.To get the seperate values of temperature humidity ,take two more debug nodes and place it one the nodered screen.Click on the one of the debug node and give the command as "msg.payload.main.temp" as the temp is from the main section so we do in that way .After giving the command click on ok.Do the same process for humidity by selecting the other debug node and giving command as "msg.payload.main.humidity". Connect the http request node to the temp and humidity nodes and click on deploy.The seperate values get displayed on the Nodered.

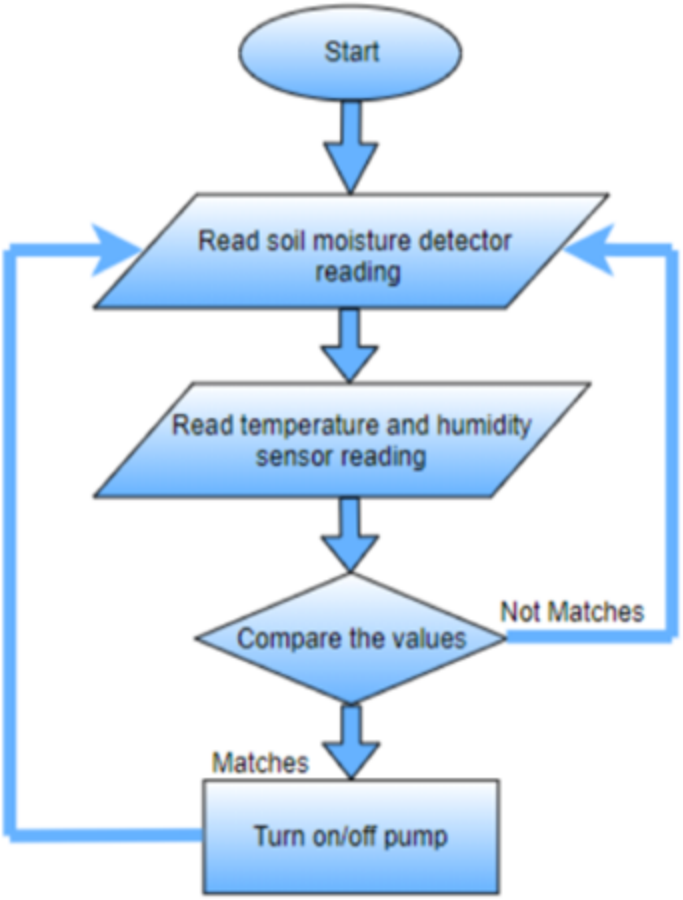
6.Now select the change node and text node .Now in the change node click on it and type the command as sown in figure and click done.Do the same for the humidity.



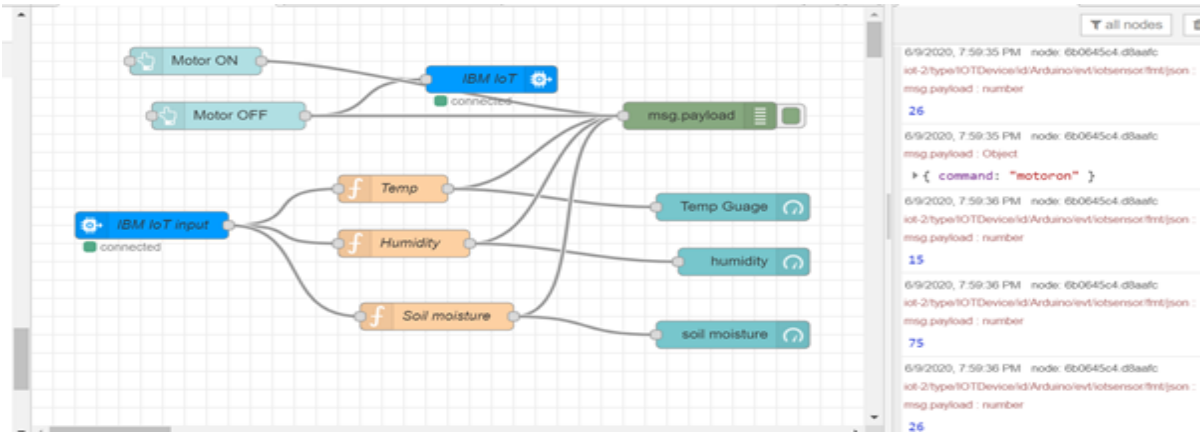
7.Now connect the http request node to change nodes of temp and humidity.Now connect the change node ouput of temperature to text node of temperature.Before connecting click on the text node and label a name for it.The process is same for the humidity also.After connecting the nodes click on deploy.In the ui page the temperature and humidity values gets displayed on the page as shown in figure.

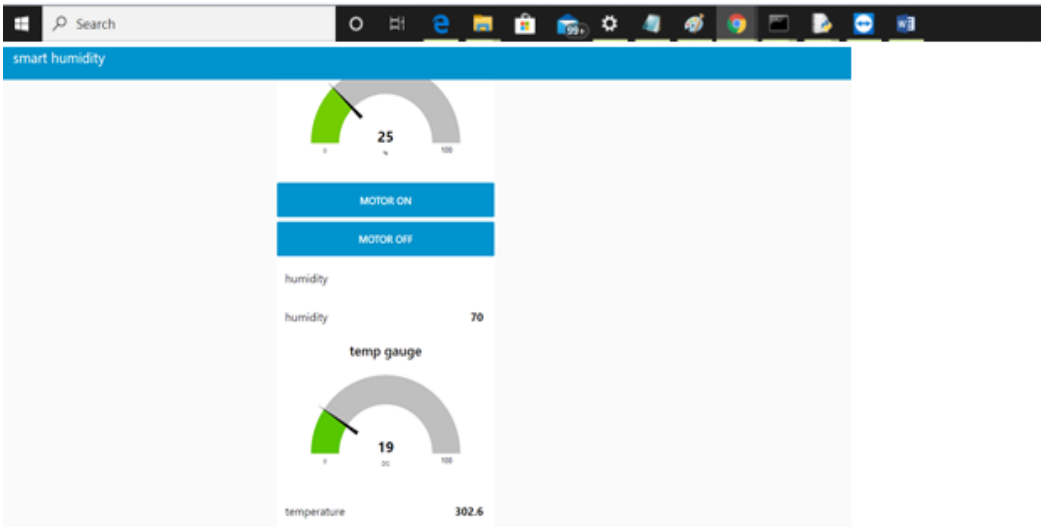


V)FLOW CHART:



VI)RESULT:





VII)ADVANTAGES AND DISADVANTAGES:

There are many advantages of using smart agriculture using iot ,some of which are listed below:

1)Increased Production:

Optimized crop treatment such as accurate planting, watering, pesticide application and harvesting directly affects production rates.

2)Water Conservation:

Weather predictions and soil moisture sensors allow for water use only when and where needed.

3)Real-Time Data and Production Insight:

Farmers can visualize production levels, soil moisture, sunlight intensity and

more in real time and remotely to accelerate decision making process.

4)Lowered Operation Costs:

Automating processes in planting, treatment and harvesting can reduce resource consumption, human error and overall cost.

5)Increased Quality of Production:

Analyzing production quality and results in correlation to treatment can teach farmers to adjust processes to increase quality of the product.

6)Accurate Farm and Field Evaluation:

Accurately tracking production rates by field over time allows for detailed predicting of future crop yield and value of a farm.

7)Improved Livestock Farming:

Sensors and machines can be used to detect reproduction and health events earlier in animals. Geofencing location tracking can also improve livestock monitoring and management.

8)Reduced Environmental Footprint:

All conservation efforts such as water usage and increased production per land unit directly affect the environmental footprint positively.

9)Remote Monitoring:

Local and commercial farmers can monitor multiple fields in multiple locations around the globe from an internet connection. Decisions can be made in real-time and from anywhere.

10)Equipment Monitoring:

Farming equipment can be monitored and maintained according to production rates, labor effectiveness and failure prediction.

The **Internet of Things** has truly enhanced many industries by providing

data collection, real-time insight and process automation through low cost sensors and IoT platform implementation. As seen in the above benefits, the farming and agriculture industry overall can really benefit from implementation of such an IoT solution or platform.

Not only is a smart agriculture solution the innovative farming method of today, it is the key solution to the growing concern of the global population's food consumption and environmental footprint.

DISADVANTAGES:

Internet of things is basically the internet connection between things, people, process, animals, surrounding etc. in a virtual way.In the concept of the Internet of Things, almost everything in our surroundings will be able to communicate with one another without the help of humans.

This concept will be highly beneficial in various sectors. But like any other technology, this concept has its own challenges.It also has some issues which have to be tracked properly in order to attain the full benefit of it.

Some disadvantages of using this modern technology in the field of agriculture are listed below.

Challenges in Using Smart Technologies in Farming:

The use of technology in farming and agriculture making it smart agriculture, is of course, a good initiative and a much-needed one with the present increasing demand in the food supply.But there is the chance where smart farming will require certain skill sets in particular in order to understand and operate the equipment.

In the case of equipment like robots and computer-based intelligence for running the devices, it is highly unlikely that a normal farmer will be able to possess this knowledge or even develop them.Farmers are not used to these

high-end technologies. They do not understand computer language or the artificial intelligence.

For the smart agriculture, Internet of Things is essential which will require artificial intelligence and computer-based intelligence. This cannot be balanced here.To overcome this challenge, the devices will have to be changed in a dramatic fashion so as to make it understandable for farmers.

This also means that the devices should be somewhere in between where the technology experts and farmers can both communicate about it.

The Cost Involved in Smart Agriculture:

While the use of smart technology in agriculture is impressive, it does incur a lot of costs.As said earlier, if the devices are to be altered according to the level of the farmers, it will involve a lot of money to transform these types of equipment.

This, on the other hand, means that the process will cost huge money.Since the farming industry does not see higher profits, huge investments in this space are unlikely.Even after the altering of machines, there are chances where the farmers might tend to operate the machines wrongly causing it to damage or send it to repair.Since these pieces of equipment are already costly, repairing it or replacing it will again cost a lot of money.The cost of maintenance becomes high whether there is a repair or not.

There could be wrong Analysis of Weather Conditions:

In the case of agriculture, most of the process is dependent on weather conditions.It is a natural phenomenon which in spite of the updated technology can become unpredictable.There is no force which can change or control the weather conditions such as rain, sunlight, drought etc.Even when the smart systems are in place, the importance of natural occurrences can not be changed.

There is an issue where the machines used in smart agriculture can impact the environment in a negative manner.Since technology involves a lot of machines, there are chances where the data might get wrong at times.If there are faulty data processing

equipment or sensors then it will lead to the situation where the wrong decisions are taken.This will lead to the overuse of resources like fertilizers or water.It might even lead to the over-application of fertilizers or pesticides on crops.This excessive use of chemicals might destroy the crop and reduce the richness of the land.

VIII)APPLICATIONS:

In IoT-based **smart farming**, a system is built for monitoring the crop field with the help of sensors (light, humidity, temperature, soil moisture, etc.) and automating the irrigation system. ... **IoT**-based **smart farming** is highly efficient when compared with the conventional approach.

The IoT technology has realized the smart wearable's, connected devices, automated machines, and driverless cars. However, in agriculture, the IoT has brought the greatest impact.There are many applications of using smart agriculture system using iot which makes our process of farming more easier and productive.

1)Precise Farming:

Precision agriculture is one of the most famous applications of IoT in the agricultural sector and numerous organizations are leveraging this technique around the world.CropMetrics is a precision agriculture organization focused on ultra-modern agronomic solutions while specializing in the management of precision irrigation.

The products and services of CropMetrics include VRI optimization, soil moisture probes, virtual optimizer PRO, and so on. VRI (Variable Rate

Irrigation) optimization maximizes profitability on irrigated crop fields with topography or soil variability, improve yields, and increases water use efficiency.The soil moisture probe technology provides complete in-season local agronomy support, and recommendations to optimize water use efficiency. The virtual optimizer PRO combines various technologies for water management into one central, cloud-based, and powerful location designed for consultants and growers to take advantage of the benefits in precision irrigation via a simplified interface.

2)Agriculture Drones:

The major benefits of using drones include crop health imaging, integrated GIS mapping, ease of use, saves time, and the potential to increase yields. With strategy and planning based on real-time data collection and processing, drone technology will give a high-tech makeover to the agriculture industry.PrecisionHawk is an organization that uses drones for gathering valuable data via a series of sensors that are used for imaging, mapping, and surveying of agricultural land. These drones perform in-flight monitoring and observations. The farmers enter the details of what field to survey and select an altitude or ground resolution.

Drones are being used in agriculture in order to enhance various agricultural practices. The ways ground-based and aerial-based drones are being used in agriculture are crop health assessment, irrigation, crop monitoring, crop spraying, planting, and soil and field analysis.From the drone data, we can draw insights regarding plant health indices, plant counting and yield prediction, plant height measurement, canopy cover mapping, field water ponding mapping, scouting reports, stockpile measuring, chlorophyll measurement, nitrogen content in wheat, drainage mapping, weed pressure mapping, and so on.The drone collects multispectral, thermal, and visual imagery during the flight and then lands in the same location it took off.

3)Livestock Monitoring:

Large farm owners can utilize wireless IoT applications to collect data regarding the location, well-being, and health of their cattle. This information helps them in identifying animals that are sick so they can be separated from the herd, thereby preventing the spread of disease. It also lowers labor costs as ranchers can locate their cattle with the help of IoT based sensors.

JMB North America is an organization that offers cow monitoring solutions to cattle producers. One of the solutions helps the cattle owners observe cows that are pregnant and about to give birth. From the heifer, a sensor powered by a battery is expelled when its water breaks. This sends information to the herd manager or the rancher. In the time that is spent with heifers that are giving birth, the sensor enables farmers to be more focused.

4)Smart GreenHouse:

Greenhouse farming is a methodology that helps in enhancing the yield of vegetables, fruits, crops, etc. Greenhouses control the environmental parameters through manual intervention or a proportional control mechanism. As manual intervention results in production loss, energy loss, and labor costs, these methods are less effective.

A smart greenhouse can be designed with the help of IoT; this design intelligently monitors as well as controls the climate, eliminating the need for manual intervention.For controlling the environment in a smart greenhouse, different sensors that measure the environmental parameters according to the plant requirement are used.

We can create a cloud server for remotely accessing the system when it

is connected using IoT.This eliminates the need for constant manual monitoring. Inside the greenhouse, the cloud server also enables data processing and applies a control action.

This design provides cost-effective and optimal solutions for farmers with minimal manual intervention.Illuminum Greenhouses is a drip installation and Agri-Tech greenhouse organization and uses new modern technologies for providing services. It builds modern and affordable greenhouses by using solar-powered IoT sensors. With these sensors, the greenhouse state and water consumption can be monitored via SMS alerts to the farmer with an online portal.

Automatic Irrigation is carried out in these greenhouses.The IoT sensors in the greenhouse provide information on the light levels, pressure, humidity, and temperature. These sensors can control the actuators automatically to open a window, turn on lights, control a heater, turn on a mister or turn on a fan, all controlled through a WiFi signal.

IX)CONCLUSION:

Thus, the IoT agricultural applications are making it possible for ranchers and farmers to collect meaningful data. Large landowners and small farmers must understand the potential of IoT market for agriculture by installing smart technologies to increase competitiveness and

sustainability in their productions. With the population growing rapidly, the demand can be successfully met if the ranchers, as well as small farmers, implement agricultural IoT solutions in a prosperous manner.

X)FUTURE SCOPE:

- •IoT in agriculture technologies comprise specialized equipment, wireless connectivity, software and IT services.
- •BI Intelligence survey expects that the adoption of IoT devices in the agriculture industry will reach 75 million in 2020, growing 20% annually. At the same time, the global smart agriculture market size is expected to triple by 2025, reaching $15.3.
- •Smart farming based on IoT technologies enables growers and farmers to reduce waste and enhance productivity ranging from the quantity of fertilizer utilized to the number of journeys the farm vehicles have made, and enabling efficient utilization of resources such as water, electricity, etc.
- •Predictive analytics for smart farming Crop predication plays a key role, it helps the farmer to decide future plan regarding the production of the crop, its storage, marketing techniques and risk management.
- •Farmers have started to realize that the IoT is a driving force for increasing agricultural production in a cost-effective way.
- •Because the market is still developing, there is still ample opportunity for businesses willing to join in.

As the project is being done in cloud platform,ibm cloud works very well for doing the projects and the output gets displayed without any errors.As there is a built in ibm iot simulator the values get displayed automatically in the recent events of device.
As we have used the concept of iot nd cloud platform in building up this project,it does not require components like humidity sensor,soil sensor, nodemcu etc, the project can be completed at a low cost and is more effective and the results are more accurate.

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XII)APPENDIX:

Github ibm cloud node-red watson platform iot simulator

user interface nodejs pip ibmiotf idle python gitbash git repository