



SMARTBRIDGE
Let's Bridge the Gap

A
Project Report
On

SMART AGRICULTURE SYSTEM BASED ON IOT

Project ID: **SPS_PRO_101**

Submitted by
Mr.Sai Naveen Thota
SBID:SB20200015957

Guided by
Mr.Durga Prasad Bethi
Mentor

Submitted to
SMARTINTERNZ

Submitted On
Dt:31-07-2020

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1.INTRODUCTION

1.1 Overview:

Smart Agriculture System based on IoT can monitor soil moisture and climatic conditions to grow and yield a good crop.

The farmer can also get the real time weather forecasting data by using external platforms like Open Weather API.

Farmer is provided a mobile app using which he can monitor the temperature, humidity and soil moisture parameters along with weather forecasting details.

Based on all the parameters he can water his crop by controlling the motors using the mobile application.

Even if the farmer is not present near his crop he can water his crop by controlling the motors using the mobile application from anywhere.

Here we are using the Online IoT simulator for getting the Temperature, Humidity and Soil Moisture values.

2.2 Purpose:

Agriculture is done manually from ages. Farmers face many problems. Some of them included unpredictable weather leading to ruined crops. But using IOT we can predict weather conditions and water the crop, so that crop does no damage. Second thing is, when farmers need to ON their motor to water crop, they need to go to farm and ON it, even in the night time, where it's dangerous to his life.

Because, while he ON motor he can get electric shock and die. There are many such incidents happening in India. By connecting hardware IOT devices farmer can On or OFF motor from anywhere in this world, by just using a web application made out of this Project.

2.LITERATURE SURVEY

2.1 Existing Problem:

Main problem faced by farmers is Weather prediction.They can't predict what is going to happen in next minute .That is when the crop is to harvest,but it rains heavily before harvesting,crop gets damaged where it is a huge loss for farmer and country.If he can predict ,he can plan accordingly. Another major problem is electric shock.At farm lands when farmers go to their farm to on their motors they are dyeing due to electric shock.Using hardware devises we can on our motor from our home saving lives of farmers.



2.2 Proposed Solution:

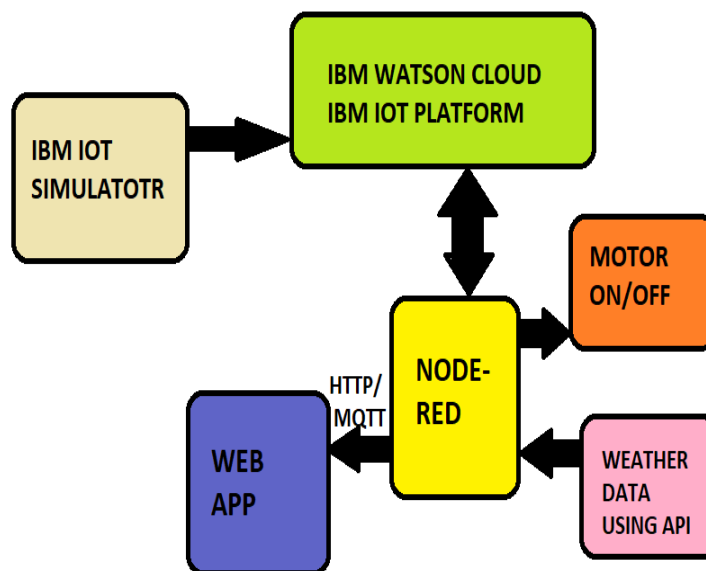
As the world is trending into new technologies and implementations it is a necessary goal to trend up with agriculture also. IOT plays a very important role in smart agriculture. IOT sensors are capable of providing information about agriculture fields. we have proposed an IOT and smart agriculture system using automation. This IOT based Agriculture monitoring system makes use of wireless sensor networks that collects data from different sensors deployed at various nodes and sends it through the wireless protocol.

Sensors sense the level of water if it goes down, it automatically starts the water pump.This all is also seen in IOT where it shows information of Humidity, Moisture and water level with date and time, based on per minute.

Temperature can be set on a particular level. If we want to close the water forcefully on IOT there is button given from where water pump can be forcefully stopped.

3.THEORETICAL ANALYSIS

3.1 Block Diagram:



3.2 Software Designing:

i. IBM IOT platform:

We used IBM IOT platform for our project Smart Agriculture System based on IOT. IBM IOT platform provided us services to create devices and get data from simulator and we stored them on IBM cloud. IBM Watson IoT Platform is a managed, cloud-hosted service designed to make it simple to derive value from your IoT devices. Watson IoT Platform and its additional add on services - Blockchain service and analytic service - enable organizations to capture and explore data for devices, equipment, and machines, and discover insights that can drive better decision-making. IBM offers three hardware platforms for cloud computing.



IBM Cloud

These platforms offer built-in support for virtualization. For virtualization IBM offers IBM Websphere application infrastructure that supports programming models and open standards for virtualization.

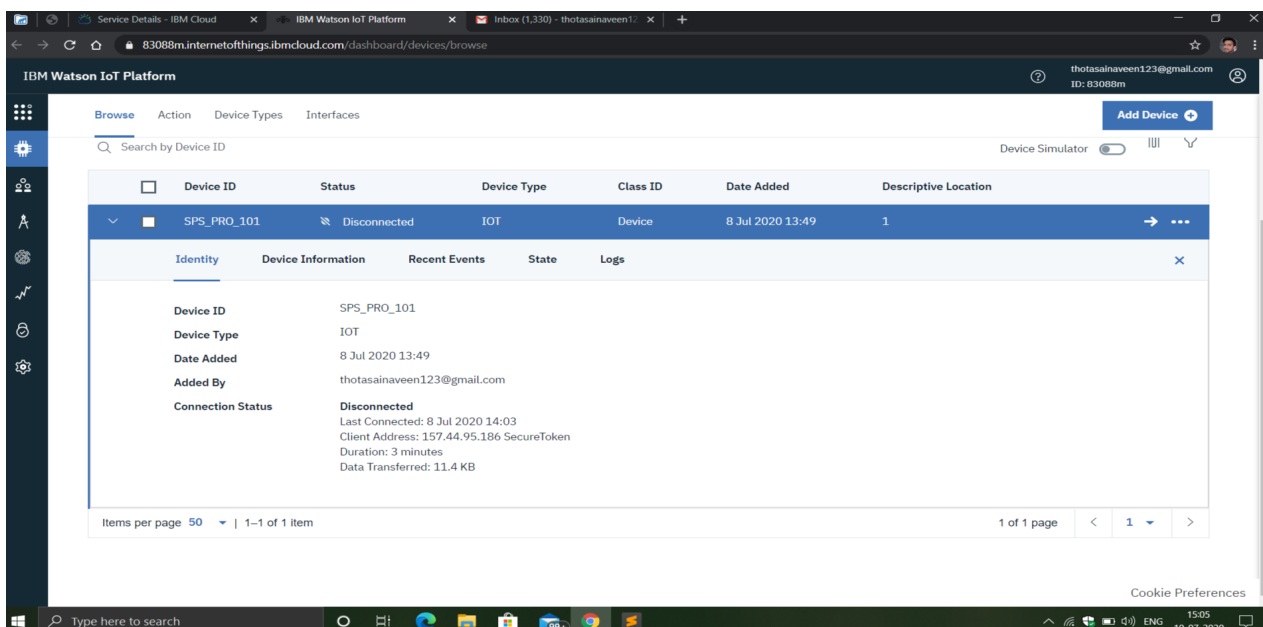
The Watson IoT Platform is a fully managed, cloud-hosted service on IBM Bluemix designed to simplify Internet of Things development so you can derive more value from your IoT data. As more and more devices connect together to form the Internet of Things, the volume of data is expanding at an exponential rate.



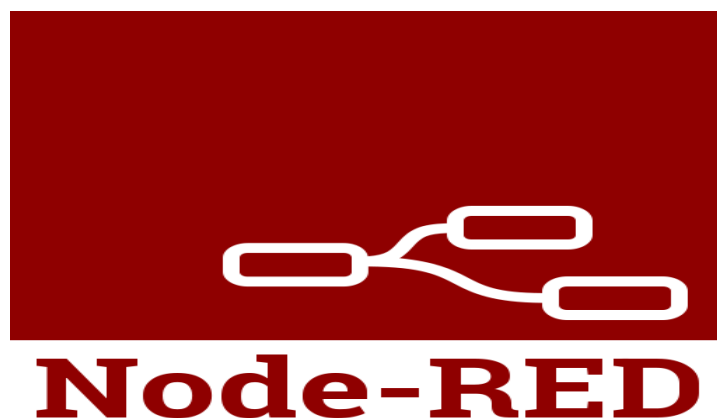
IBM® Watson™ IoT Platform is a foundational cloud offering that can connect and control IoT sensors, appliances, homes, and industries. Built on IBM Cloud, Watson IoT Platform provides an extensive set of built-in and add-on tools.

Before you can begin receiving data from your IoT devices, you must connect them to the Platform Service. You must also create logical interfaces, which are transformed into entity types in the Analytics Service.

Analytics Service uses entity types to group incoming metrics, dimensions, and events. To create entity types, you must first create and activate logical interfaces for your data types. Each logical interface creates a new logical entity type, and you can reuse that logical interface for multiple device types. A logical interface is used to define the normalized view into the device state in Platform Service.



ii.NODE-RED:



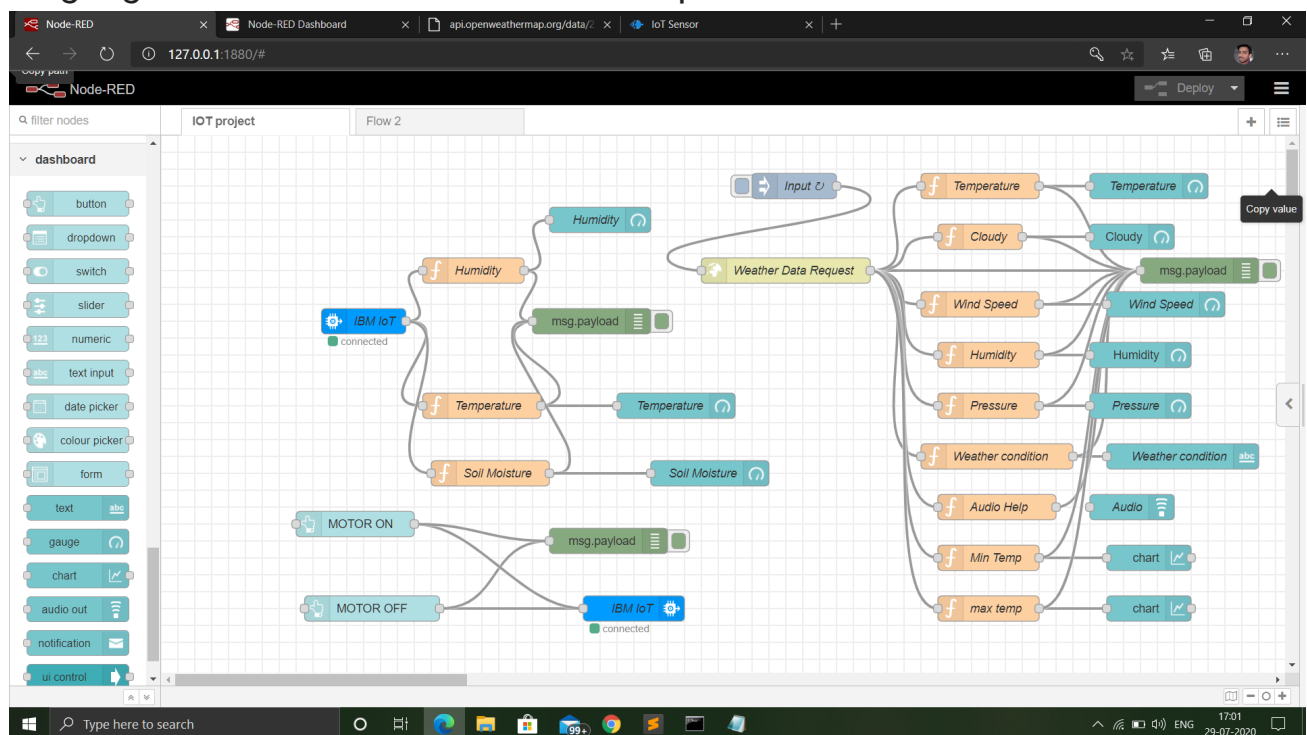
We used NODE-RED to make User Interface(UI).Web Application made with NODE-RED is used by farmers to know weather conditions and ON their MOTOR from their application from their home itself.**Node-RED** is a flow-based

development tool for visual programming developed originally by IBM for wiring together hardware devices, APIs and online services as part of the Internet of Things.

Node-RED provides a web browser-based flow editor, which can be used to create JavaScript functions. Elements of applications can be saved or shared for re-use. The runtime is built on Node.js. The flows created in Node-RED are stored using JSON. Since version 0.14, MQTT nodes can make properly configured TLS connections.

In 2016, IBM contributed Node-RED as an open source JS Foundation project.

Node.js is an open-source, cross-platform, JavaScript runtime environment (Framework) that executes JavaScript code outside a web browser. Node.js lets developers use JavaScript to write command line tools and for server-side scripting—running scripts server-side to produce dynamic web page content before the page is sent to the user's web browser. Consequently, Node.js represents a "JavaScript everywhere" paradigm, unifying web-application development around a single programming language, rather than different languages for server- and client-side scripts.



iii. Open Weather API:

OpenWeatherMap is an online service that provides weather data. It is owned by OpenWeather Ltd, headquartered in London, United Kingdom. It provides current weather data, forecasts and historical data (starting from 1979) to more than 2M customers, including Fortune 500 companies and thousands of businesses.



The OpenWeatherMap service provides a Current Weather API, along with several types of forecasts with different depths and measurement steps:

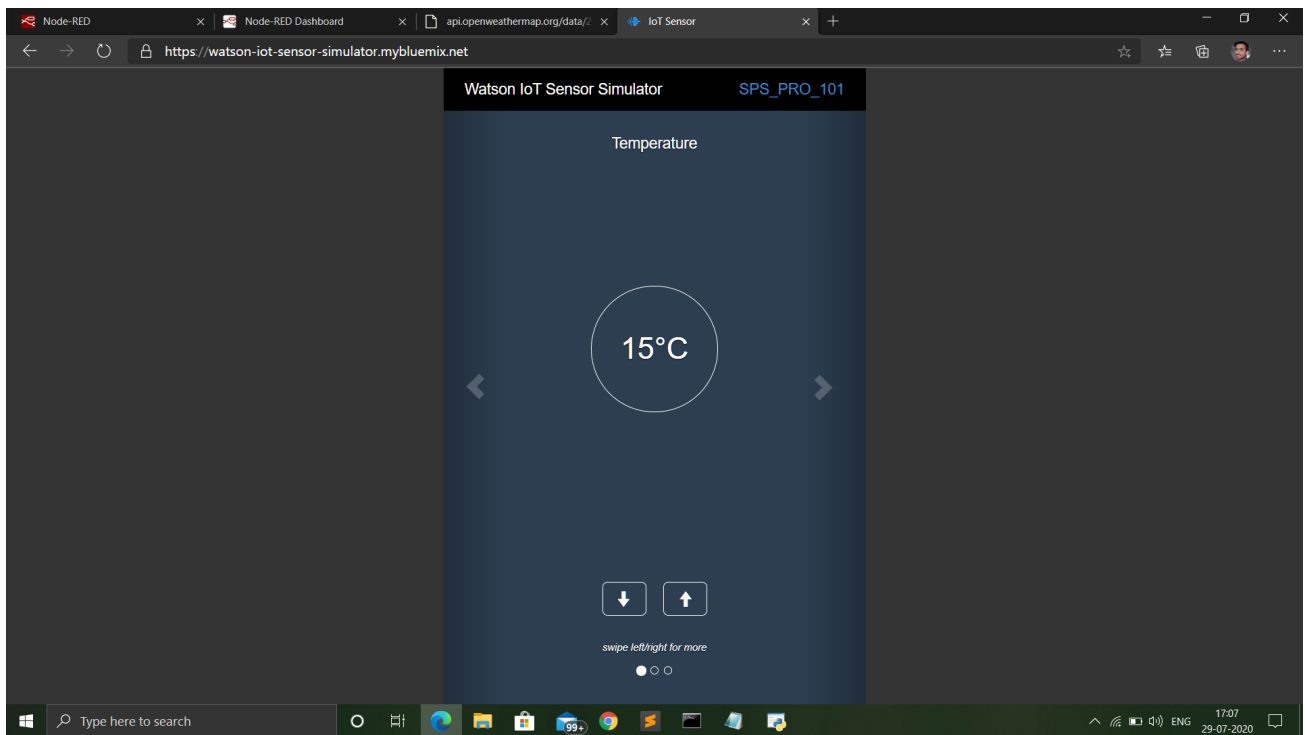
- Minute Forecast – for 1 hour
- Hourly Forecast – for 4 days
- 3-hour Step Forecast – for 5 days
- Daily Forecast – for 16 days
- Climate Forecast – for 30 days

4.EXPERIMENTAL INVESTIGATIONS

We learn more things when we investigate on something. Subject knowledge from books is very less when we compared to the knowledge attained when we do some project or experiment on something. Here also we learned many new things with the help of our mentor.

In IOT temperature, humidity and moisture content are sent every second without any delay. So it is difficult to analyse and send the data to end user. So we need to create second device, so that there will be no error and the data will be forwarded to the User Interface.

Also data will be received by cloud only when we connect IOT sensor with our Device credentials.

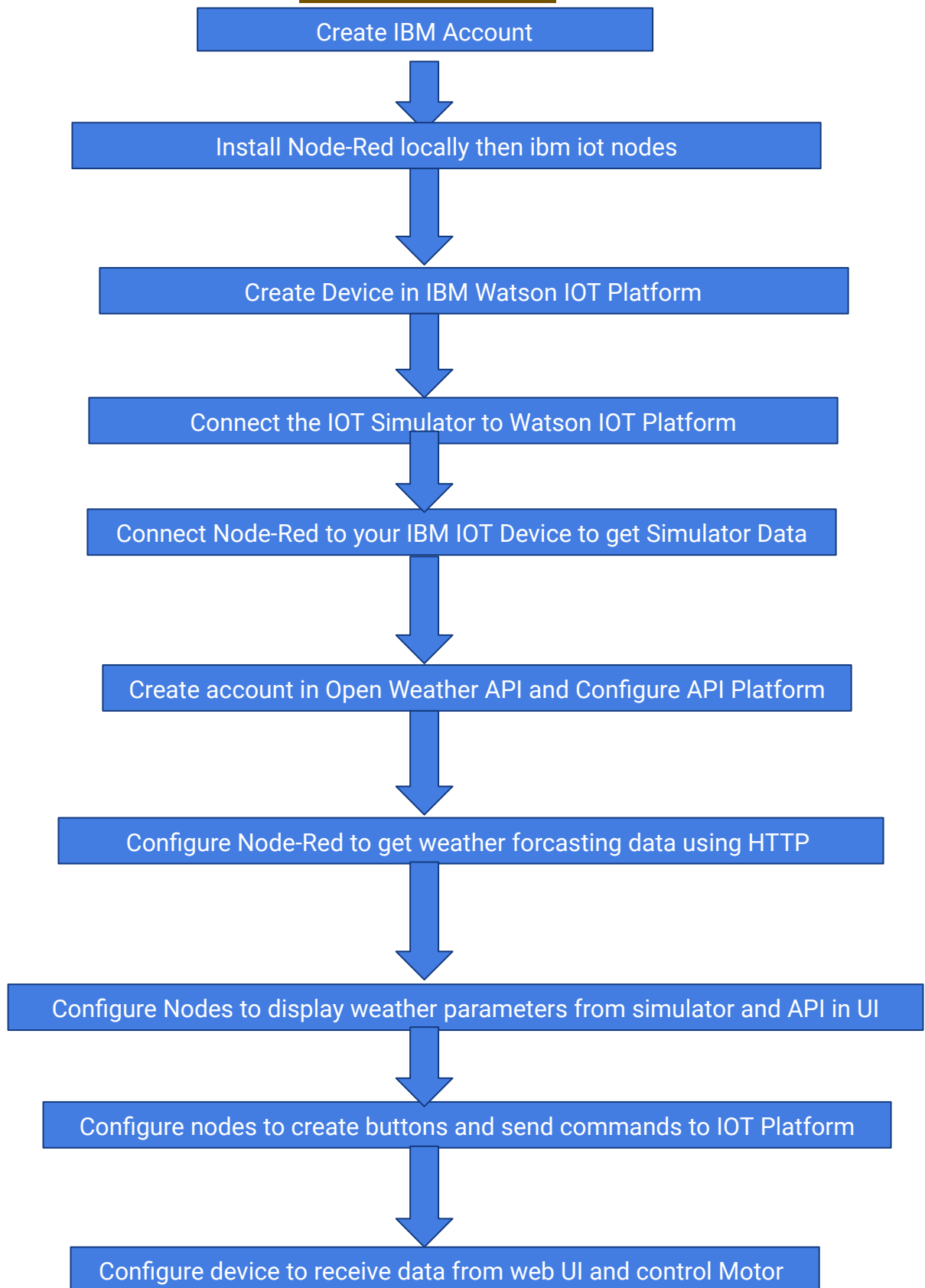


Also when we run our Python code in Python IDLE we need to install the required Libraries ,only then our Python code runs and gives expected output.Libraries we installed is "ibmiotf".Even in NODE-RED we need to install IBMIOT Nodes and give the credentials of our device , so that our data recorded by sensor is seen in UI.

In Open Weather API ,we are giving http request(Hyper Text Transfer Protocal)to get weather data from Open Source.A specific URL(Unified Resource Locator)is created with our API key and the desired location.

We also found that Python code written in a specific version do not run in other version of language.Here we used Python3.8 version to write the program and run commands.

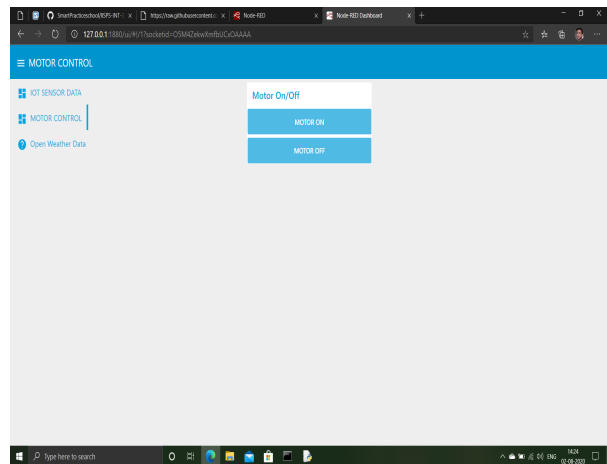
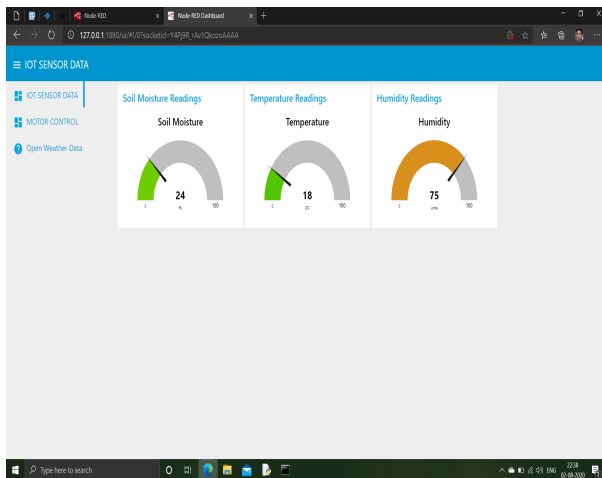
5.FLOW CHART



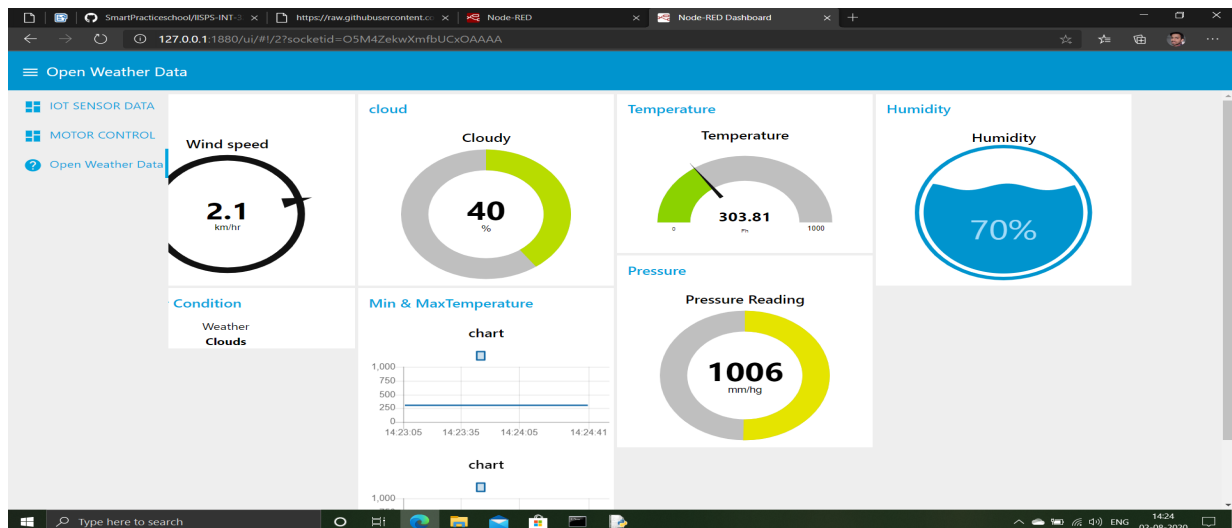
6.RESULT

Smart Agriculture System based on IOT project is to create Web Application where a farmer can control his motor from home itself. Here we used NODE-RED to create User Interface. In web application we also created meters to show weather parameters, so that the farmer can decide himself to go to farm for farming. We collected weather data from virtual simulator (IOT Simulator) also from Open Weather API.

Results basically refer to any particular output or end point that comes as a result of the completion of the activities and or processes that have been performed as part of the project or as part of a particular project component.



Similarly, here in our project also output is creating a web application where farmers can get info about temperature, humidity, soil moisture, wind speed, rain forecasting updates time to time. So that he can water his crop accordingly. In our web application we provided three tabs, each consisting of a specific content. One tab consists of data of IOT simulator i.e., temperature, humidity and object temperature which is considered as soil moisture in this project. Second tab consists of data received from Open Weather API. It consists of temperature, wind speed and direction, humidity, maximum and minimum temperature, pressure, cloudy or not, rain data i.e., will it rain or not in specific region we selected, if rains, will it thunder or not and so on..... All this information is displayed on User Interface created using Node-Red.



Another tab ie, third tab consists of two switches indicating whether to ON or OFF motor based on weather conditions. If we click on switches, commands will be seen on python console. As it is a summer remote internship, we are using only software devices and no hardware devices to practically work on motor on or off conditions. So here if we can see the commands to ON or OFF motor on Python console then we are done with the project.

7.ADVANTAGES AND DISADVANTAGES

Everything what we do cannot be 100% accurate, there will be some errors or disadvantages on frontend or backend. Even here we got some problems where we can solve few and some we cannot. A product or project will be more successful if it is more efficient.

Let us see advantages and benefits of our Project.

- Since it is an IOT based application, our field motor can be controlled from any part of our world.
- Based on weather data from open weather API weather prediction efficiency is increased and water crops based on rains and humidity and considering some more parameters to protect farm and grow healthier.

- As farmer need not go to farm to ON/OFF motor ,his work is reduced,time is saved,also farmer is stopped to work on motor in bad weather condition where it would become threat to his life.
- Through this project we made agriculture smart,where a farmer using software device to make his life bettere survivable at hard times of weather.

Where there are advantages ,there will be disadvantages also.Similarly here also some are there where they might be minute for someone and very huge for someone.

- First and foremost thing is cost effective.Farmer need to buy a smart mobile to use web application, IOT sensor and connect it to the motor to get realtime data.Also to ON/OFF motor IOT devices should be connected like Rasberrypi,Aurdino,etc, where it could be burden to them to buy devices and connect.
- Another disadvantage is a farmer might not be enough literated to control motor on or off functions throuh smart mobiles,which can be achieved by educating them.
- As this project is based on IOT,improper intenet connection be one of the major disadvantage.

8.APPLICATIONS

A project is a realtime application of science and engineering techniques learned from books and institutions.So a project without any realtime application is useless.A project gets more accomplishments when it enhances its applications.Every project manager ,and his team members tries their best to increase the application users of their project.

Here,in this project the end user is a farmer.The output of our project is a web application based on IOT.So here all the applications of iot and related to weather forcasting are applications of this project.Here we targeted farmers,as agriculture is the major accupation of our country.We need to protect our crops in an advanced way using recent technologies.In Smart Agriculture system based on iot project ,with the help of Internet of Things technology , and sensors we'll help farmers to control their motors from their home itself.

Using IOT technology and sensors, this project can be used in industries too, where it replaces a worker. These sensors and IoT devices can be used wherever necessary, where people cannot work like in Pharmaceutical industries, metal industries ...etc,. So here we can say that the main focus is on farmers to control their crop growth through controlling motors. But as we said before as it is a booming technology, it can be used wherever necessary.

9.CONCLUSION

The general idea of us is to apply knowledge gained from books in real life applications that could make life more comfortable. Here we applied the technology of IoT in agricultural sector. Smartinternz helped to explore to new platforms and use their services in a way useful to the society. But here in our project we didn't use any hardware devices. As in lockdown period Smartinternz provided us with the virtual devices where we use only software devices instead of hardware. It can be a sample of our work and user interface displays on our local host only. We didn't spend money as it is our first project. Actually it should be placed on a server, so that everyone who uses get benefitted with it.

As of now it cannot be used by other users as it is not provided with any server. Also we can just see the commands being displayed on python console received from user interface created by node red. But the data received from open weather api is accurate one as it is data providing api. Using HTTP (Hyper Text Transfer Protocol) request we request data from api and using MQTT (Message Queuing Telemetry Transport) protocol we send commands to devices to either turn on or off the motor here.

Till now we have seen IoT technology being used in smart homes and smart cities. From that we got inspired to apply the same technology in agricultural

system so that farmers are getting benefitted with our work who are the back bones of our nation. Here from this project I would like to conclude that a technology can be utilized in different sectors. One thing we need to remember is every year new technology come into the picture and we must use it in a useful way so that it humans can live in a better way.

10.FUTURE SCOPE

Trending technologies in present situation are Artificial Intelligence, Data Science, IOT, Cyber Security etc., also we can see in future 5G technology is going to boom in this world where internet speed is going to increase enormously. It will help to improve IOT devices like smart home automation, smart agriculture system and many more IoT based system applications.

In today's world IOT is being one of the major technologies which would be long lasting for so many days and can change or advance the life of today's and tomorrow's people. Software and IT industry is getting so much of advancement where internet plays major role. Hopefully every future farmer use IoT based application to control his motor even many more activities possible with IoT and many other technologies.

Without internet there's nothing in today's situation. To run any software industry or institutions or hospitals we need internet which made works easier. Also it made world smaller connecting people together with online meetings and online classes made education easier to reach every student anywhere in this world. So applications based on internet also enhance in future. Our project based on IoT can be made changes in future according to the requirements for more number of features and users.

11.BIBILOGRAPHY

In this project all the reference links were given by Smartinternz dashboard to us to make us more clear with the project as we are not priorly learned the technology require. So Smartbridge helped us with step by step process to complete the project. Another major role in completing our project is our mentor Mr.Dura Prasad Bethi. Sir conducted online sessions to solve our queries. Smartbridge provided us with a Slack channel to interact with our mentor and project team members.

Also links provided helped us to refer to the cloud sources and smart devices and so on. Youtube links were also provided to get the knowledge about the sources. In our project making our mentor and smartbidge provided all the informaton such that we need not refer to any external links.

12.APPENDIX

A.Source Code:

Python code to subscribe to IBM IOT and receive commands

```
import time
import sys
import ibmiotf.application # to install pip install ibmiotf
import ibmiotf.device
```

```
#Provide your IBM Watson Device Credentials
organization = "83088m" #replace the ORG ID
deviceType = "IOT"#replace the Device type wi
deviceId = "SPS_PRO_101"#replace Device ID
authMethod = "token"
authToken = "sainaveenthota" #Replace the authtoken
```

```

def myCommandCallback(cmd): # function for Callback
    print("Command received: %s" % cmd.data)
    if cmd.data['command']=='motoron':
        print("MOTOR ON IS RECEIVED")

    elif cmd.data['command']=='motoroff':
        print("MOTOR OFF IS RECEIVED")

    if cmd.command == "setInterval":

        if 'interval' not in cmd.data:
            print("Error - command is missing required information:
'interval'")
        else:
            interval = cmd.data['interval']
    elif cmd.command == "print":
        if 'message' not in cmd.data:
            print("Error - command is missing required information:
'message'")
        else:
            output=cmd.data['message']
            print(output)

try:
    deviceOptions = {"org": organization, "type": deviceType, "id": deviceId,
"auth-method": authMethod, "auth-token": authToken}
    deviceCli = ibmiotf.device.Client(deviceOptions)
    #.....

except Exception as e:
    print("Caught exception connecting device: %s" % str(e))
    sys.exit()

```

```
# Connect and send a datapoint "hello" with value "world" into the cloud as an  
event of type "greeting" 10 times  
deviceCli.connect()
```

```
while True:
```

```
    deviceCli.commandCallback = myCommandCallback
```

```
# Disconnect the device and application from the cloud  
deviceCli.disconnect()
```

THE END

