# PROJECT SCOPE

## Project Summary-

- Smart Agriculture System based on IOT can monitor soil moisture and climatic conditions like temperature and humidity 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

## Project Requirements-

1. **Functional Requirements-**
   Basic working knowledge of IOT, Understanding of programming
2. **Technical Requirements-**
   Knowledge about IBM Cloud, IBM Watson IOT Platform, Node-RED, Python Programming Language, and Github Version Control System
3. **Software Requirements-**
   Web Browser, Github Version Control System, Python IDE.

## Project Deliverables-

Smart Agriculture System based on IOT that can get sensor data, weather data from Open Weather API and can control the motors

## Project Team-

This is a solo project to be completed by Karan Sharma.

## Project Schedule-

- **Week 1-** Project Planning and Kickoff, explore IBM Cloud Platform, install

Node-Red locally

- **Week 2-** Explore IBM Cloud Services, get Introduced to Watson IOT Platform
- **Week 3-**Configure Watson IOT Platform and create a device, build Node-RED Flow to integrate all services.
- **Week 4-** Write Python code to receive command on the device, test the IOT project and capture the results, prepare the Project Report and the NODE-RED Flow, create a Project Demo Video

# PROJECT REPORT

# SMART AGRICULTURAL SYSTEM BASED ON IOT

# 1. INTRODUCTION

## 1.1 OVERVIEW

The objectives of this report is to proposed IOT based Smart Farming System which will enable farmers to have live data of soil moisture, environment temperature and humidity at very low cost so that live monitoring can be done.

## 1.2 PURPOSE

- To provide a service using which farmers can monitor the temperature, humidity and soil moisture parameters along with weather forecasting details so that they can grow and yield a good crop.
- 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.

# 2. LITERATURE SURVEY

## 2.1 IOT: CONCEPT AND DEFINITION

Internet of things IOT consists of two words Internet and Things .The term things in IOT refers to various IOT devices having unique identities and have capabilities to perform remote sensing, actuating and live monitoring of certain sort of data. IOT devices are also enable to have live exchange of data with other connected devices and application either directly or indirectly, or collected data from other devices and process the data and send the data to various servers. The other term internet is define as Global communication Network connecting Trillions of computers across the planets enabling sharing of information .Thus the IOT can be define as :"A dynamic Global Network Infrastructure with self configuring capabilities based on standard and inter operable communication to protocol where physical and virtual things have identities, physical attributes ,and virtual personalities and use intelligent interfaces and are seamlessly integrated into the information network ,often communicate data associated with user and their environment."

IOT devices can be of various forms like wearable sensors, smart watches, IOT smart home monitoring, IOT intelligent transport systems, IOT smart health

devices etc.

Internet of Things has a strong backbone of various enabling technologies- Wireless Sensor Networks, Cloud Computing, Big Data, Embedded Systems, Security Protocols and Architectures, Protocols enabling communication, web services, Internet and Search Engines.

## 2.2 EXISTING PROBLEM

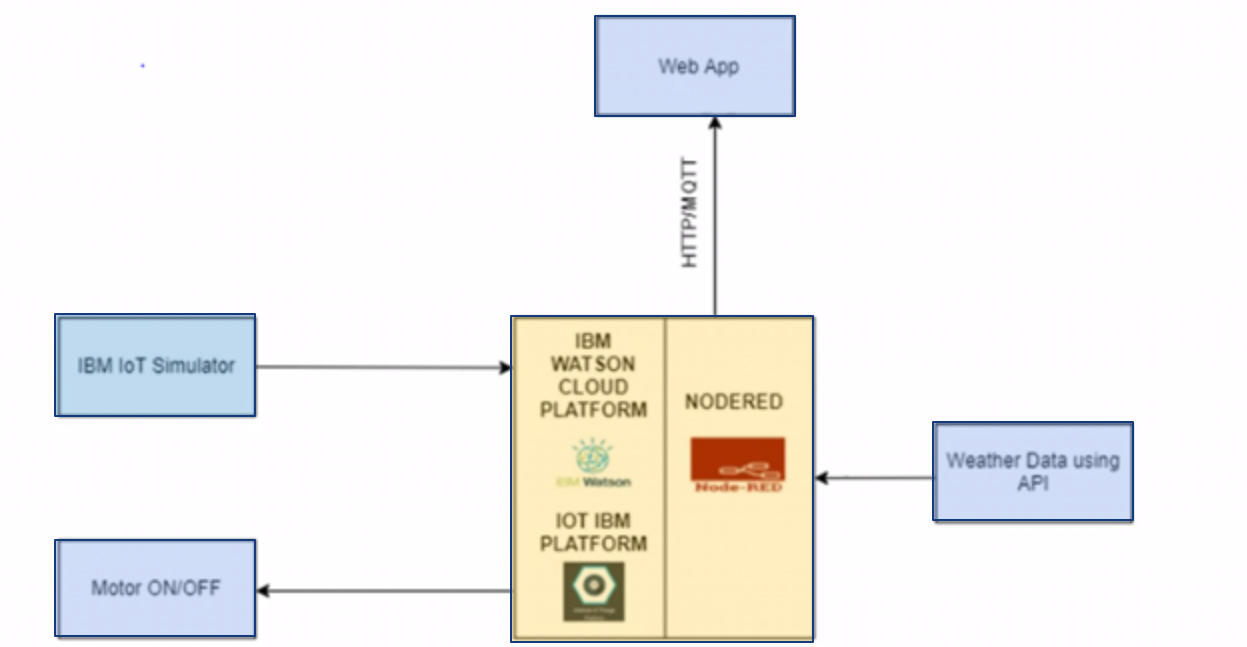
- The farmers have stay at their farms to take care of their crops and they are unable to get information about the crops remotely.
- They do not have scientific values about the requirement of the crops like how much water is needed by the crop. Excess usage of water leads to wastage of water and less usage of water can affect the growth of the crops.
- They cannot control their equipment remotely and have to go to the farm to operate and monitor the equipment.

## 2.3 PROPOSED SOLUTION

- Smart Agriculture System based on IOT can monitor soil moisture and climatic conditions like humidity and temperature 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 I0T simulator for getting the Temperature, Humidity and Soil Moisture values.

# 3. THEORATICAL ANALYSIS

## 3.1 Block diagram




## 3.2 Hardware / Software designing

- **IBM Cloud Platform**
  To use services like IBM Watson IOT Platform

- **IBM Watson IOT Platform**
  To create an IOT device and to use IBM Watson Sensor Simulator

- **IBM Watson Sensor Simulator**
  To receive data as it act as a virtual IOT device

- **Node-Red**
  To create node-red dashboard (web app / UI) and to receive data from Open Weather API

- **Open Weather API**
  To receive weather related data of a particular location (say Delhi, IN)

## 4. EXPERIMENTAL INVESTIGATIONS

When correctly configured and connected appropriately, all the elements of the project are working correctly according to the plan. That is, we are getting weather data from the Open Weather API and the Watson IOT Sensor Simulator data. Also we are able to send motor on/off commands to the device.

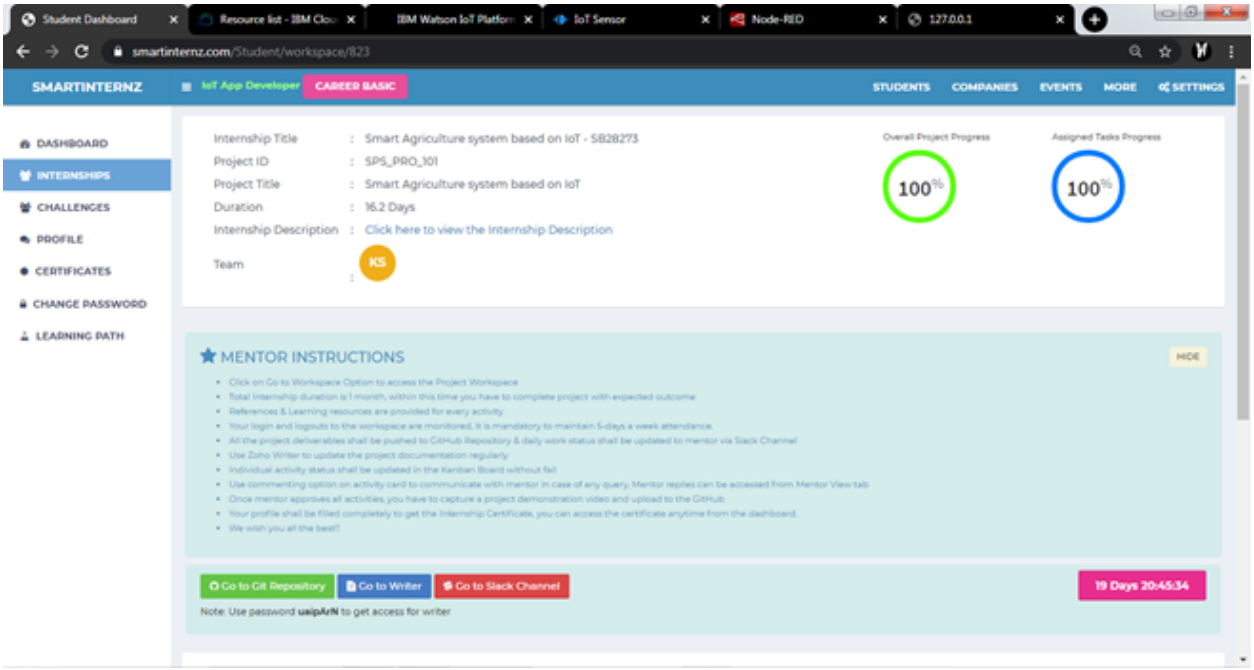



Figure 1: Internship Title

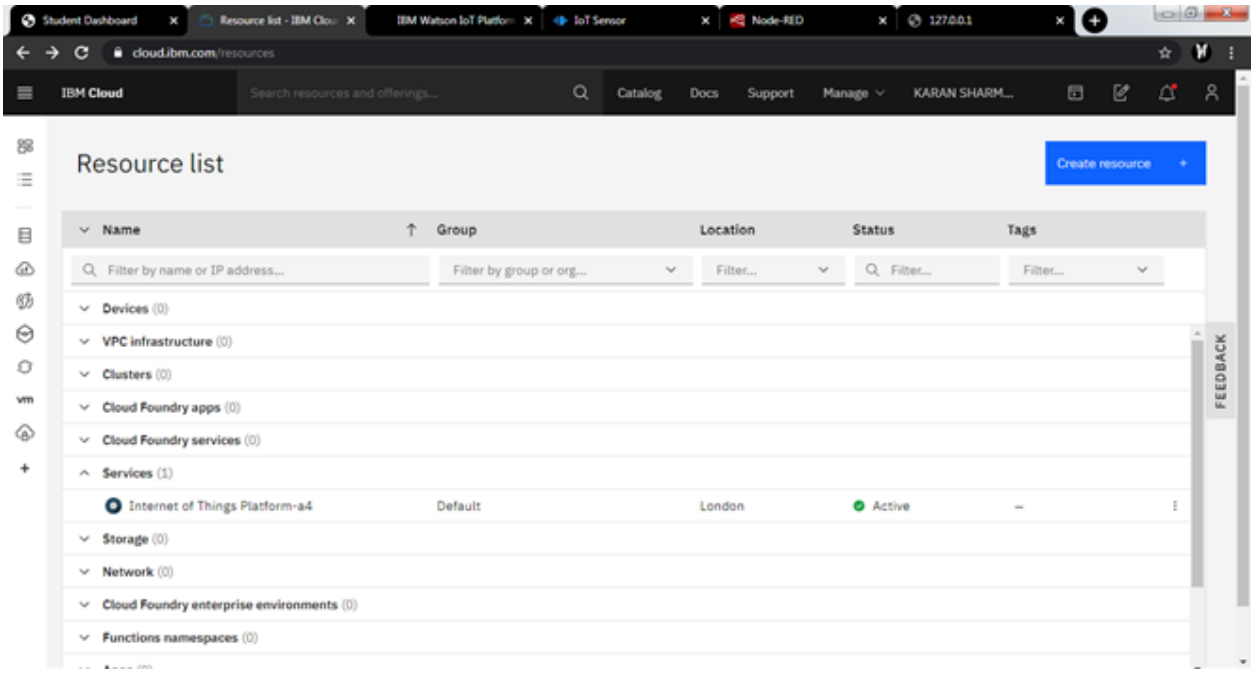



Figure 2: Internet of Things Platform service on IBM Cloud

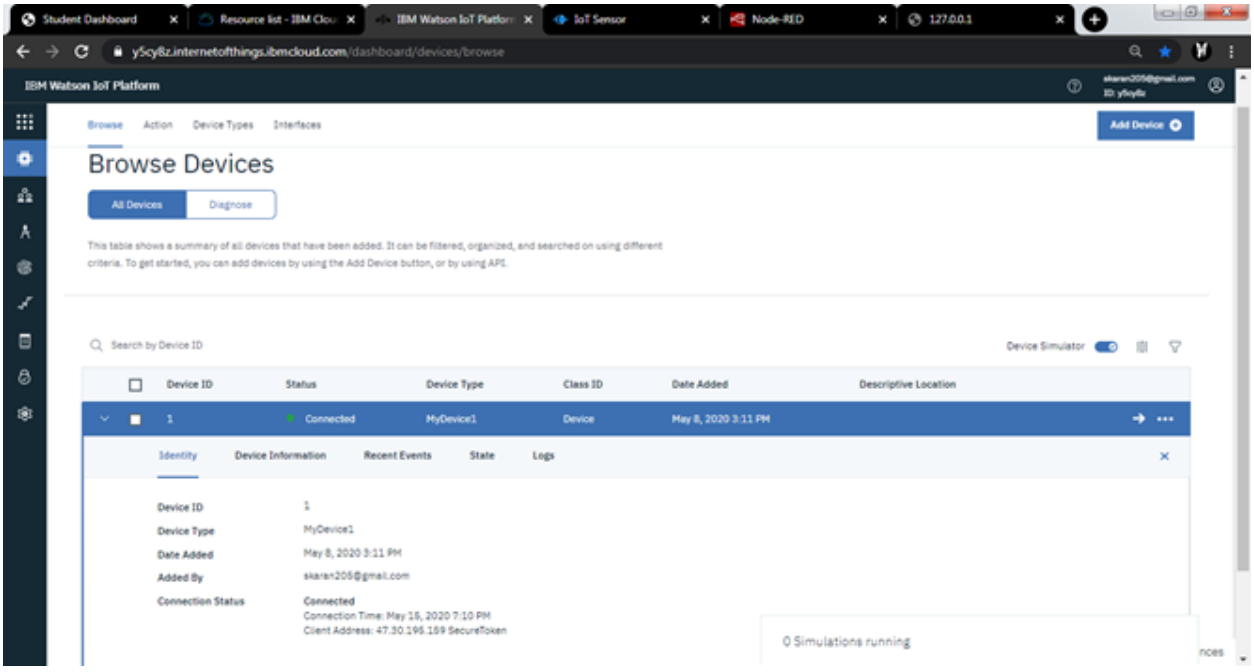



Figure 3: The device which we have created is showing status as “Connected” on IBM Watson IOT Platform

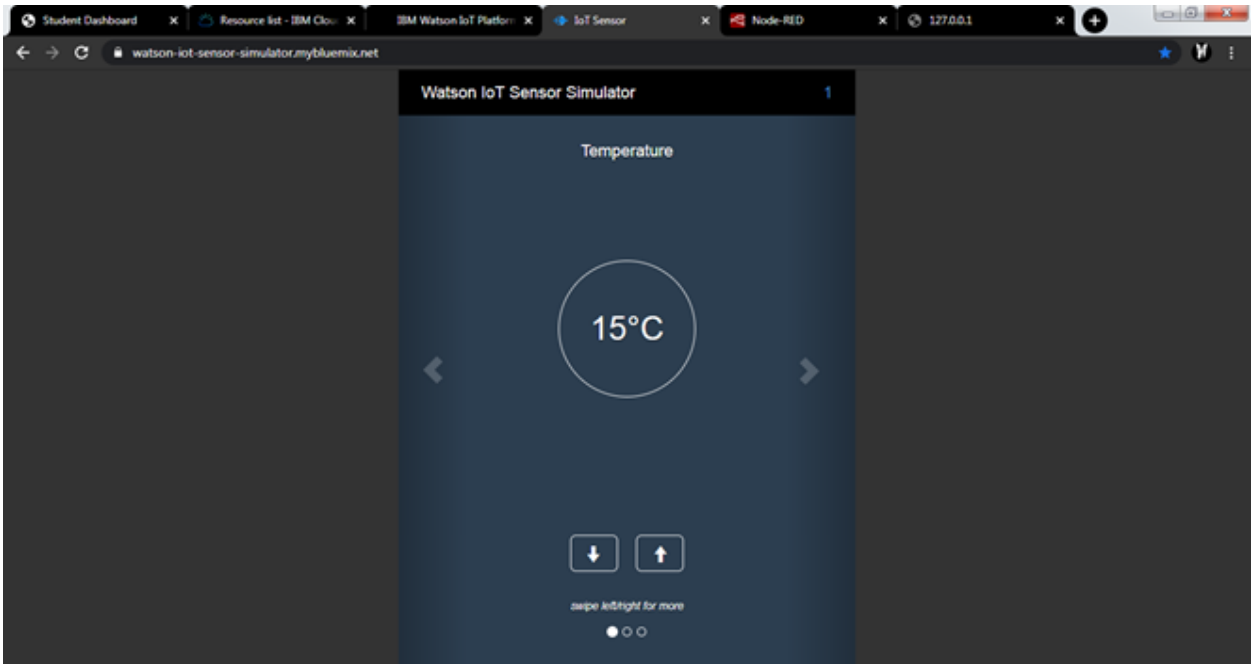



Figure 4: Watson IOT Sensor Simulator is connected and sending data to the Cloud

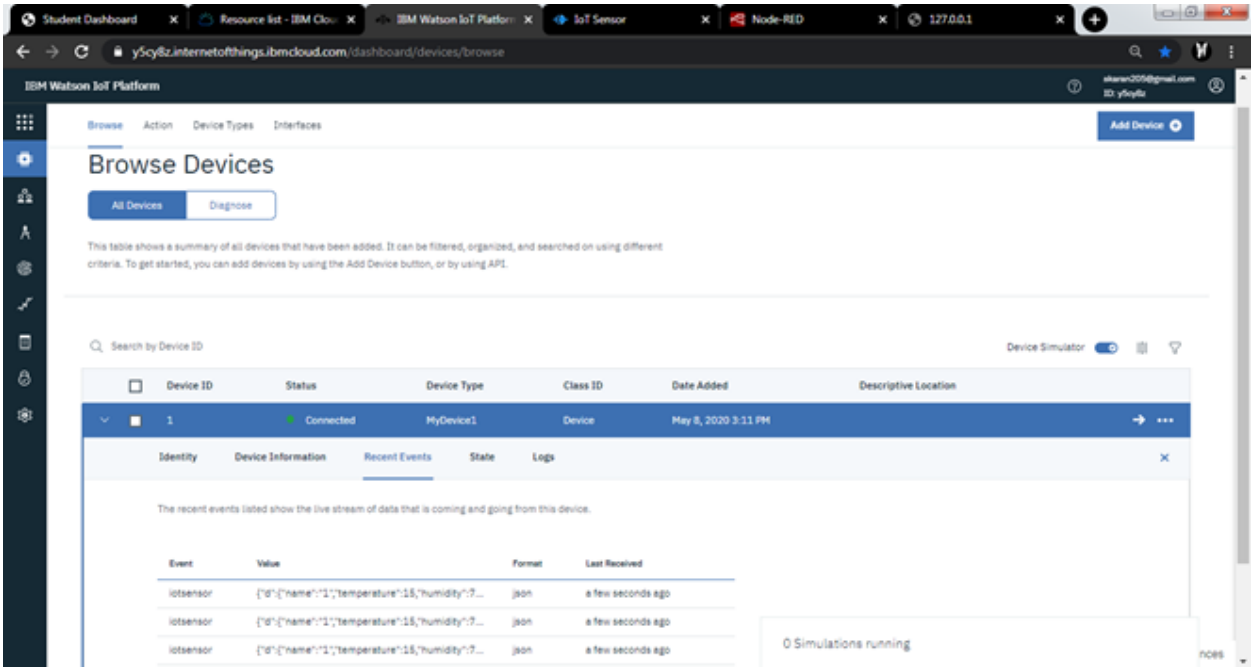



Figure 5: We are receiving data from the Watson IOT Sensor Simulator

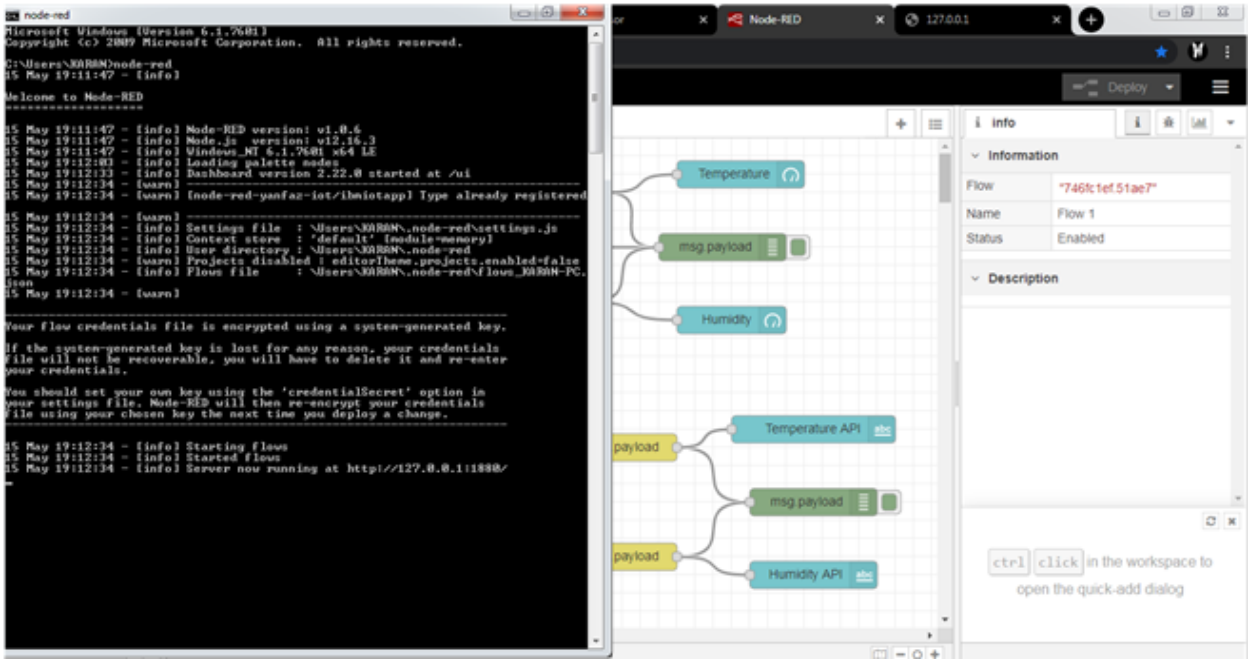



Figure 6: Running Node-RED locally

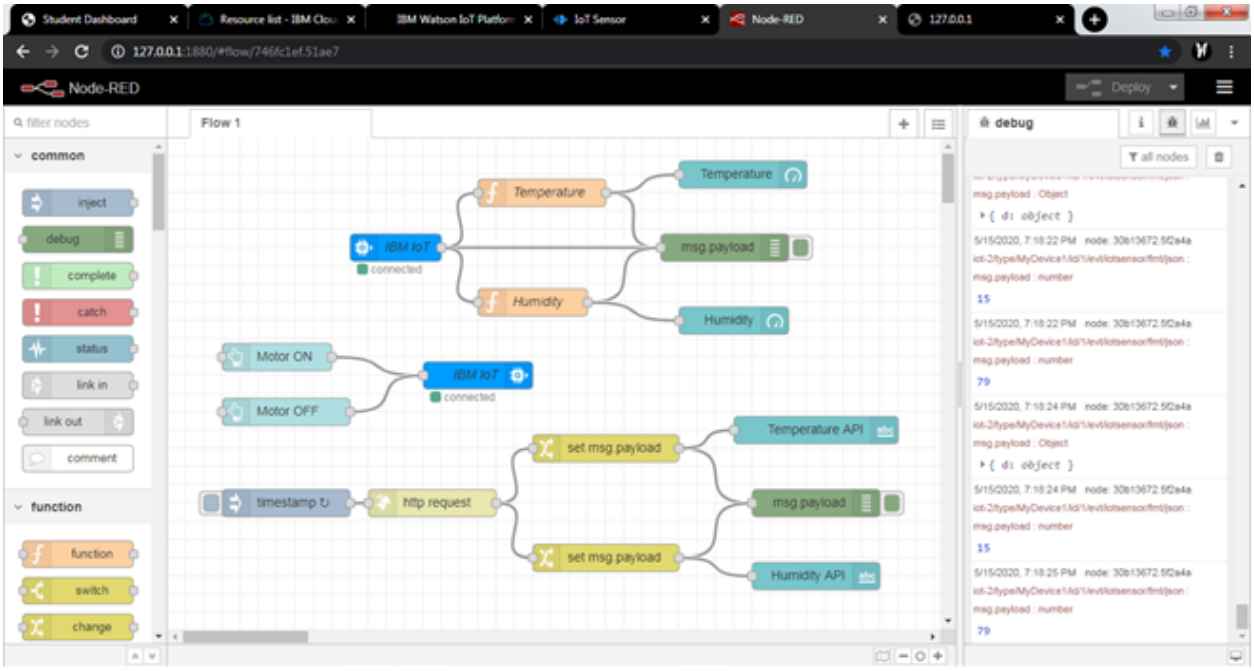



Figure 7: Watson IOT Sensor Simulator data is being received on Node-RED using IBM IOT Input node

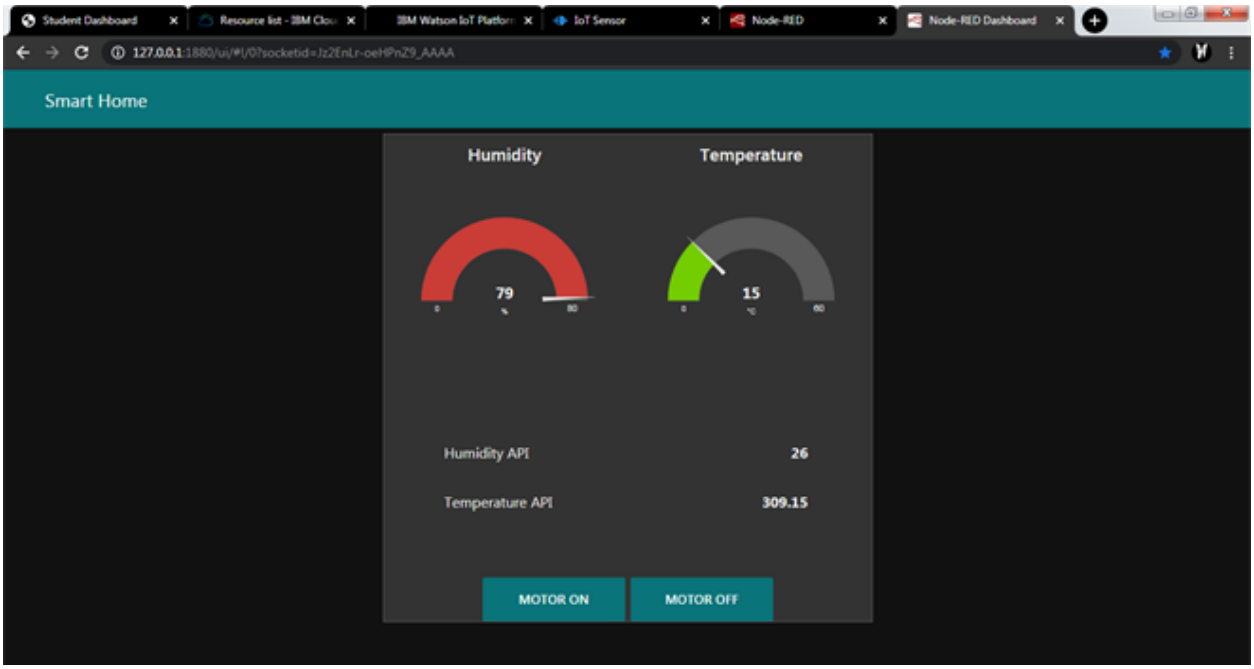



Figure 8: Node-RED Dashboard / UI / WEB APP showing

1. Data received from Watson IOT Sensor Simulator ( using IBM IOT Input node),
2. Data received from Open Weather API ( using http request node),
3. Buttons to send command to the motor ( using IBM OUT Output node)

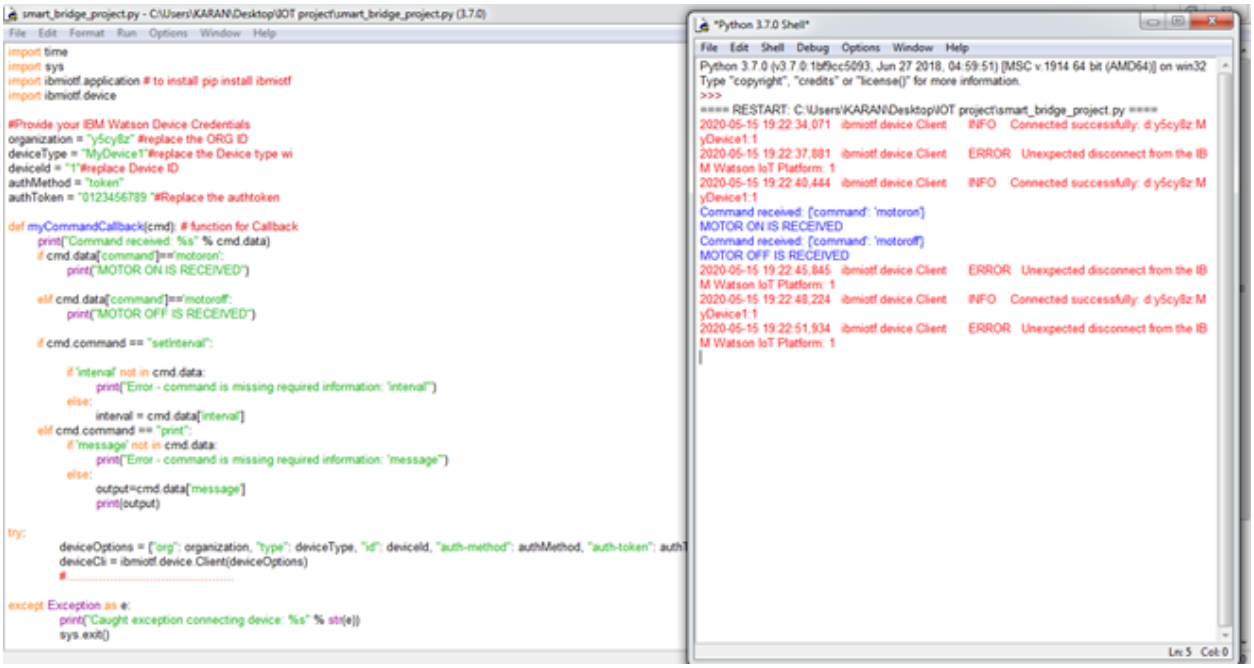
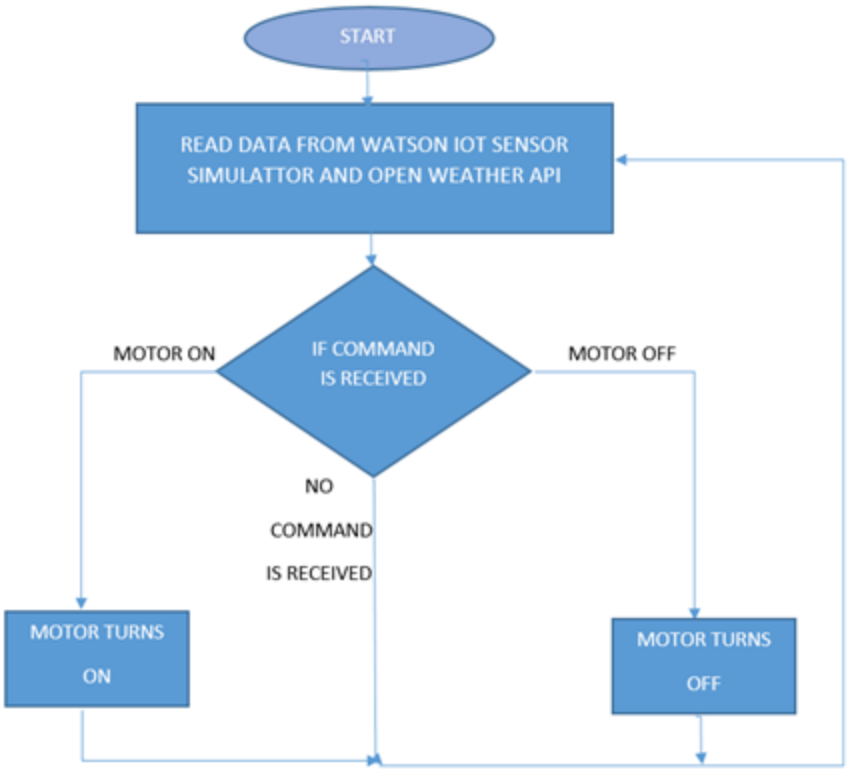



Figure 9: Device is receiving motor ON/OFF commands via IBM IOT Output node

## 5. FLOWCHART




## 6. RESULT

We have successfully designed the Smart agricultural system based on iot as we are getting weather data from the Open Weather API and the Watson IoT Sensor Simulator data. Also we are able to send motor on/off commands to the device.

## 7. BENEFITS OF IOT IN AGRICULTURE

The following are the benefits of IoT in Agriculture:

- IoT enables easy collection and management of tons of data collected from sensors and with integration of cloud computing services like Agriculture fields maps, cloud storage etc., data can be accessed live from anywhere and everywhere enabling live monitoring and end to end connectivity among all the parties concerned.
- IoT is regarded as key component for Smart Farming as with accurate sensors and smart equipment's, farmers can increase the food production by 70% till year 2050 as depicted by experts.
- With IoT productions costs can be reduced to a remarkable level which will in

turn increase profitability and sustainability.

- With IoT, efficiency level would be increased in terms of usage of Soil, Water, Fertilizers, Pesticides etc.
- With IoT, various factors would also lead to the protection of environment.

## 8. IOT APPLICATIONS IN AGRICULTURE

With the adoption of IoT in various areas like Industry, Homes and even Cities, huge potential is seen to make everything Intelligent and Smart. Even the Agricultural sector is also adopting IoT technology these days and this in turn has led to the development of "*AGRICULTURAL Internet of Things (IoT)"*

## 9. CONCLUSION

IoT based SMART FARMING SYSTEM for Live Monitoring of Temperature and Soil Moisture has been proposed using IBM Cloud and Node-red . 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.

## 10. FUTURE SCOPE

Future work would be focused more on increasing sensors on this system to fetch more data especially with regard to Pest Control and by also integrating GPS module in this system to enhance this Agriculture IoT Technology to full-fledged Agriculture Precision ready product.

## 11. BIBILOGRAPHY


1. https//:www.ibm.com
2. https//:www.youtube.com
3. https//:www.researchgate.net

# APPENDIX

## API AND DEVICE CREDENTIALS

### Device Credentials:

| | |
|---|---|
| Organization ID: | y5cy8z |
| Device Type: | MyDevice1 |
| Device ID: | 1 |
| Authentication Method: | use-token-auth |
| Authentication Token: | 0123456789 |

### Web Application:

| | |
|---|---|
| API Key: | a-y5cy8z-r95mdkbjlu |
| Authentication token: | -*0xJS2tRjzGXnDO?l |

### Open Weather API details:

**API call:** api.openweathermap.org/data/2.5/weather?q={city name}&&appid={your api key}

**API Key on open weather:**aa7b3fb12910baa639d1a90db0b3ee65

**City:** Delhi, IN

**URL:**

api.openweathermap.org/data/2.5/weather?q=Delhi,IN&&appid=aa7b3fb12910baa639d1a90db0b3ee65ddd

# PYTHON CODE

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

#Provide your IBM Watson Device Credentials
organization = "y5cy8z" #replace the ORG ID
deviceType = "MyDevice1"#replace the Device type wi
deviceId = "1"#replace Device ID
authMethod = "token"
authToken = "0123456789 "#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
```

## NODE-RED FILE

https://github.com/SmartPracticeschool/llSPS-INT-823-Smart-Agriculture-system-based-on-IoT/blob/master/flows.json

## PRESENTATION VIDEO LINK

https://drive.google.com/open?id=1taNP_kcYCBMSyeCPsZjaBT3MGGKpgAZY

## PYTHON FILE

https://github.com/SmartPracticeschool/llSPS-INT-823-Smart-Agriculture-system-based-on-IoT/blob/master/smart_bridge_project.py