SPRINT -1

Project	IoT Enabled Smart Farming Application
Team ID	PNT2022TMID41919
Date	09 November 2022

1. Introduction

The main aim of this project is to help farmers automate their farms by providing them with a Web App through which they can monitor the parameters of the field like Temperature, soil moisture, humidity and etc and control the equipment like water motor and other devices remotely via internet without their actual presencein the field.

2. Problem Statement

Farmers are to be present at farm for its maintenance irrespective of the weather conditions. They have to ensure that the crops are well watered and the farm status is monitored by them physically. Farmer have to stay most of the time in field in order to get a good yield. In difficult times like in the presence of pandemic also they have to work hard in their fields risking their lives to provide food for the country.

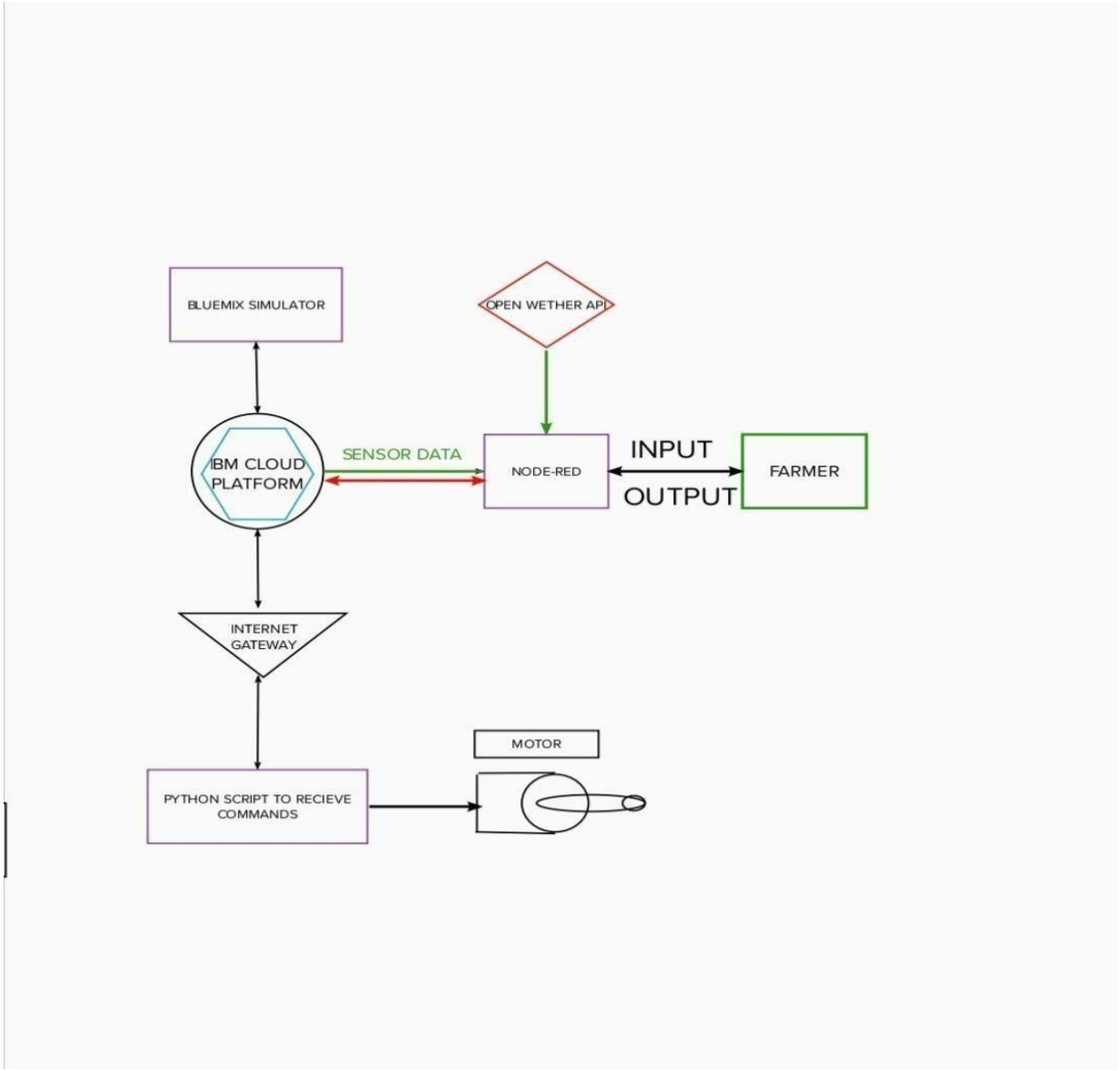
3. Proposed Solution

In order to improve the farmer's working conditions and make them easier, we introduce IoT services to him in which we use cloud services and internet to enable farmer to continue his work remotely via internet. He can monitor the field parameters and control the devices in farm.

4. Theoretical Analysis

4.1 Block Diagram

In order to implement the solution , the following approach as shown inthe blockdiagram is used

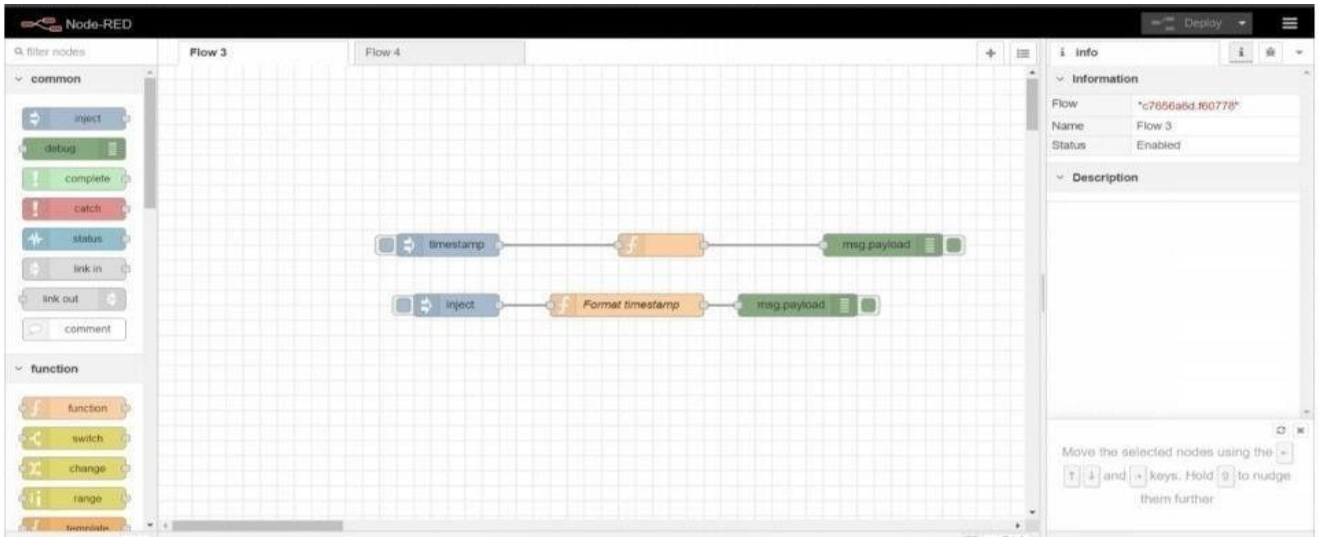


4.2 Required Software Installation

4.2.A Node-Red

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.

Installation:



- First install npm/node.js
- Open cmd prompt
- Type => npm install node-red

To run the application :

- Open cmd prompt
- Type=>node-red
- Then open http://localhost:1880/ in browser

Installation of IBM IoT and Dashboard nodes for Node-Red:

In order to connect to IBM Watson IoT platform and create the Web App UI these nodes are required 1. IBM IoT node

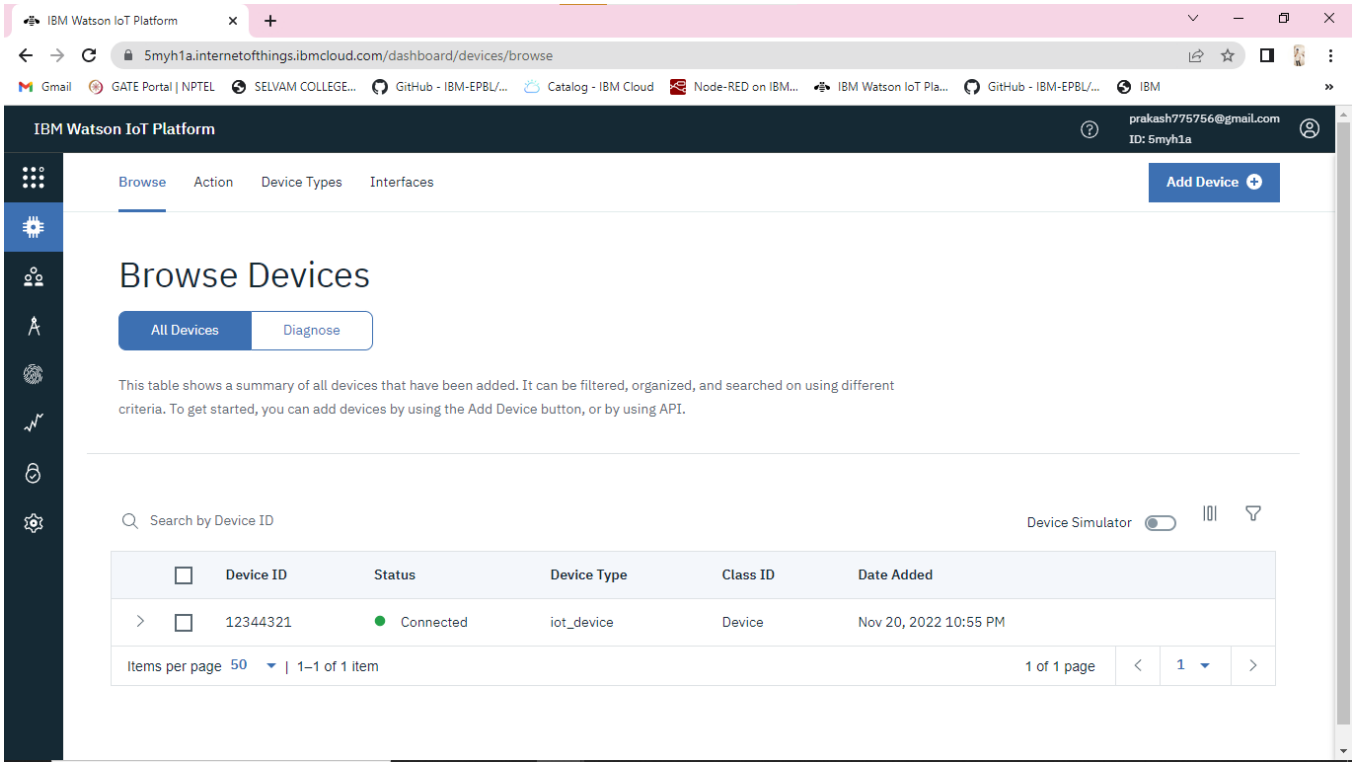
2. Dashboard node

4.2.B IBM Watson IoT Platform

A fully managed, cloud-hosted service with capabilities for device registration, connectivity, control, rapid visualization and data storage. IBM Watson IoT Platform is a managed, cloud-hosted service designed to make it simple to derive value from your IoT devices.

Steps to configure:

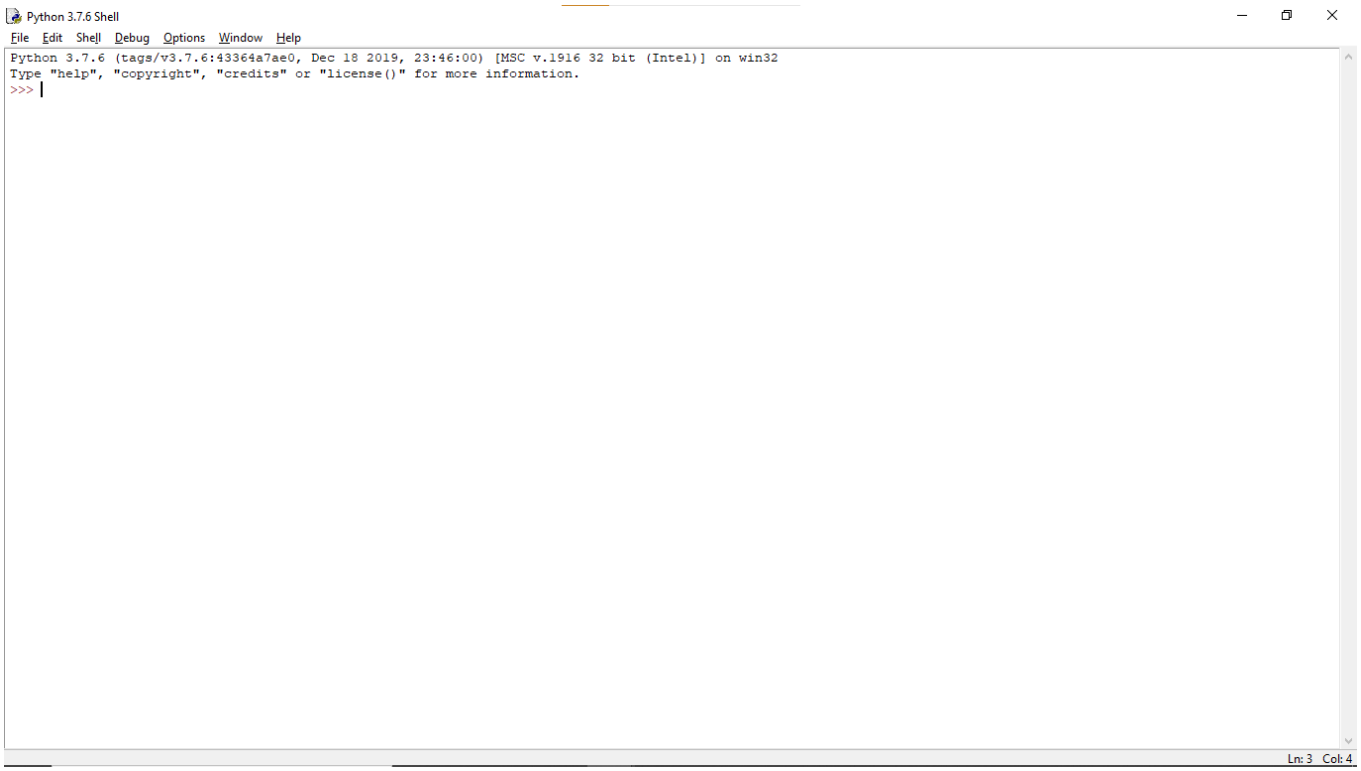
- Create an account in IBM cloud using your email ID
- Create IBM Watson Platform in services in your IBM cloud account
- Launch the IBM Watson IoT Platform
- Create a new device
- Give credentials like device type, device ID, Auth. Token
- Create API key and store API key and token elsewhere.



4.2.C Python IDE

Install Python3 compiler

Install any python IDE to execute python scripts, in my case I used Spyder to execute the code.



Code:

```
import time
import sys
import ibmiotf.application
import ibmiotf.device
import random
#Provide your IBM Watson Device Credentials
organization = "5myh1a" #replace the ORG ID
deviceType = "iot_device"#replace the Device type wi
deviceId = "12344321"#replace Device ID
authMethod = "token"
authToken = "1234567890" #Replace the authtoken
# Initialize GPIO
#Receives Command from Node-red
```

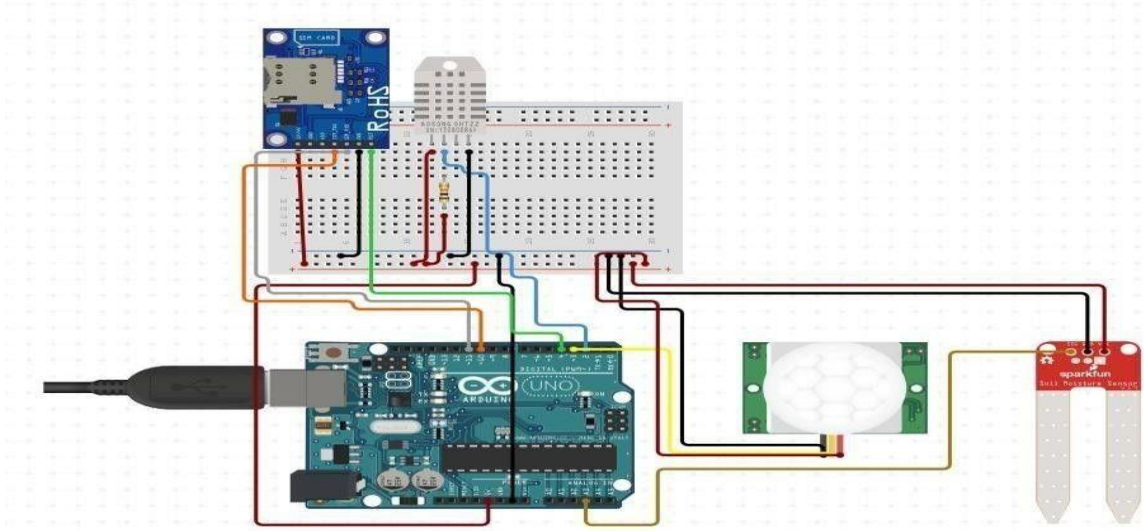
```
def myCommandCallback(cmd):
    print ("Command received: %s" % cmd.data['command'])
    status=cmd.data['command']
    if status=="motoron":
        print ("motor is on")
    elif status == "motoroff" :
        print ("motor is off")
try:
    deviceOptions = {"org": organization, "type": deviceType, "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:
#Get Sensor Data from DHT11
    temp=random.randint(0,100)
    Humid=random.randint(0,100)
    soilmoisture=random.randint(0,100)
    data = { 'temp' : temp, 'Humid': Humid, 'soilmoisture': soilmoisture }
#print data
    def myOnPublishCallback():
        print ("Published Temperature = %s C" % temp, "Humidity = %s %%" %
Humid, "soilmoisture = %s %%"%soilmoisture, "to IBM Watson")
    success = deviceCli.publishEvent("IoTSensor", "json", data, qos=0,
on_publish=myOnPublishCallback)
    if not success:
        print("Not connected to IoTF")
    time.sleep(5)
    deviceCli.commandCallback = myCommandCallback
# Disconnect the device and application from the cloud
deviceCli.disconnect()
```

Arduino code for C :

```
#include <dht.h>
#include <SoftwareSerial.h>

//define pins
#define dht_apin A0 // Analog Pin sensor is connectedSoftwareSerial
mySerial(7,8);//serial port of gsm
```

```
const int sensor_pin = A1; // Soil moisture sensor O/P pinint pin_out = 9;
//allocate Variablesdht DHT;



int c=0;
void setup()
{
pinMode(2, INPUT); //Pin 2 as INPUT pinMode(3, OUTPUT); //PIN 3 as
OUTPUTpinMode(9, OUTPUT);//output for pump
}
void loop()
{
if (digitalRead(2) == HIGH)
{
digitalWrite(3, HIGH);
delay(10000);
digitalWrite(3, LOW);
delay(100);
}
Serial.begin(9600);
delay(1000);
DHT.read11(dht_apin); //temprature
float h=DHT.humidity;
float t=DHT.temperature;
delay(5000);
Serial.begin(9600);
float moisture_percentage;//moisture
int sensor_analog;
sensor_analog = analogRead(sensor_pin);
moisture_percentage = ( 100 - ( (sensor_analog/1023.00) * 100 ) );
float m=moisture_percentage;delay(1000);
if(m<40)//pump
{
while(m<40)
{
digitalWrite(pin_out,HIGH);//open pumpsensor_analog = analogRead(sensor_pin);
moisture_percentage = ( 100 - ( (sensor_analog/1023.00) * 100 ) );
m=moisture_percentage;
delay(1000);
}
digitalWrite(pin_out,LOW);//closepump
```

```
}
if(c>=0)
{
mySerial.begin(9600);
delay(15000);
Serial.begin(9600);
delay(1000);
Serial.print("\r");
delay(1000);
Serial.print("AT+CMGF=1\r");
delay(1000);
Serial.print("AT+CMGS=\"+XXXXXXXXXX\"\r");
delay(1000);
Serial.print((String)"update-
>"+(String)"Temprature="+t+(String)"Humidity="+h+(String)"Moisture="+m);
delay(1000);
Serial.write(0x1A);delay(1000);
mySerial.println("AT+CMGF=1");
delay(1000);
  mySerial.println("AT+CMGS=\"+XXXXXXXXXX\"\r");
delay(1000);
mySerial.println((String)"update-
>"+(String)"Temprature="+t+(String)"Humidity="+h+(String)"Moisture="+m);
mySerial.println();
delay(100);
Serial.write(0x1A);
delay(1000);
c++;

}


}
```


RoHS
UNO
sparkfun

4.3 IoT Simulator

In our project in the place of sensors we are going to use IoT sensor simulator which give random readings to the connected cloud.

The link to simulator:

https://watson-iot-sensor-simulator.mybluemix.net/

We need to give the credentials of the created device in IBM Watson IoT Platformtoconnect cloud to simulator.

4.4 OpenWeather API

OpenWeatherMap is an online service that provides weather data. It provides current weather data, forecasts and historical data to more than 2 million customer.

Website link: https://openweathermap.org/guide

Steps to configure:

- Create account in OpenWeather o Find the name ofyour city by searching

o Create API key to your account

- Replace “city name” and “your api key” with yourcityand API key in below red text

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