IOT ENABLED SMART FARMING APPLICATION.

Sprint Delivery – 1

Date	19-11-2022
Team ID	PNT2022TMID34083
Project name	Smart farmer-IOT Enabled Smart Farming Application

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 presence in 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.

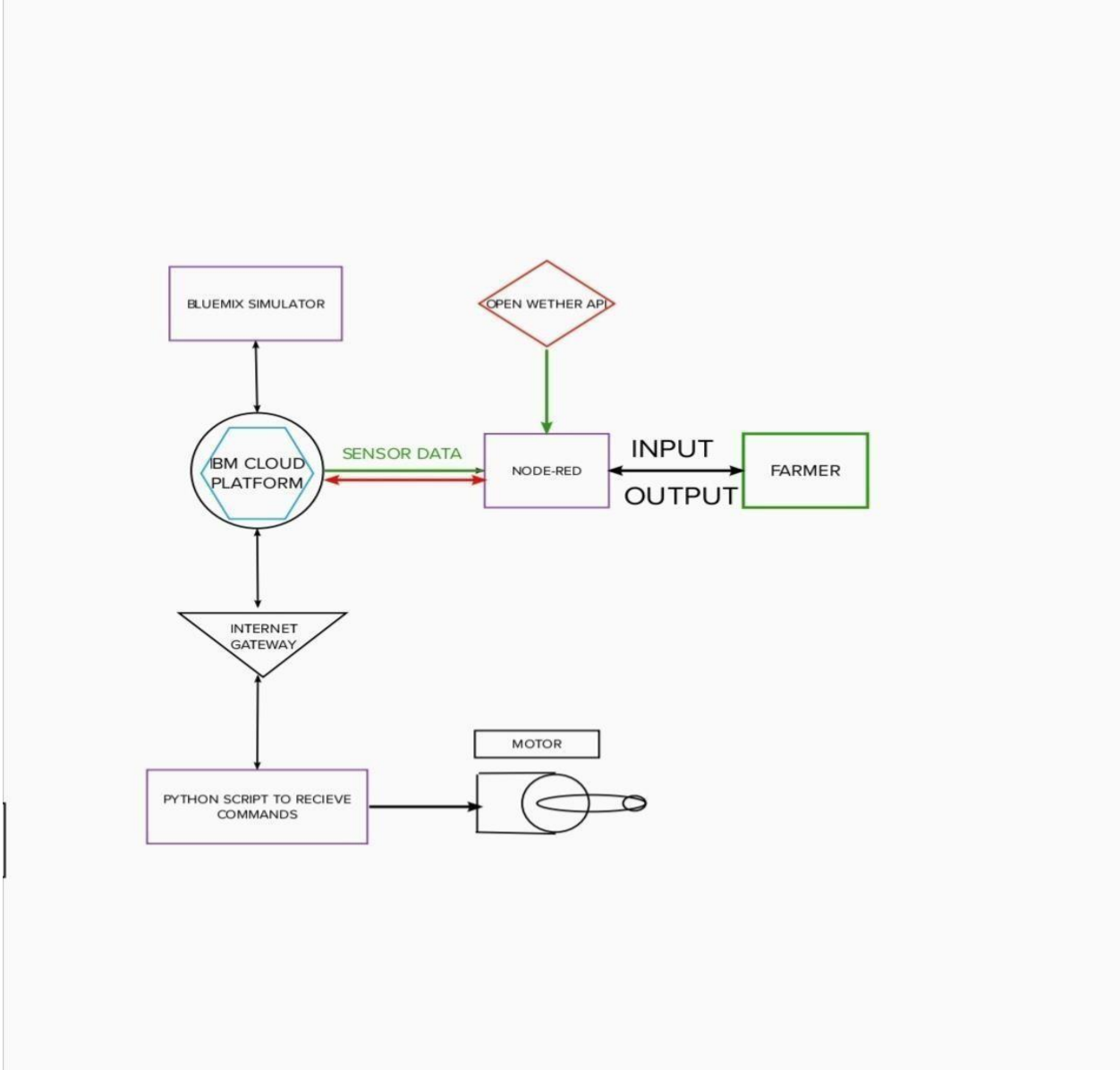
3. Proposed Solution

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 in the block diagram is used

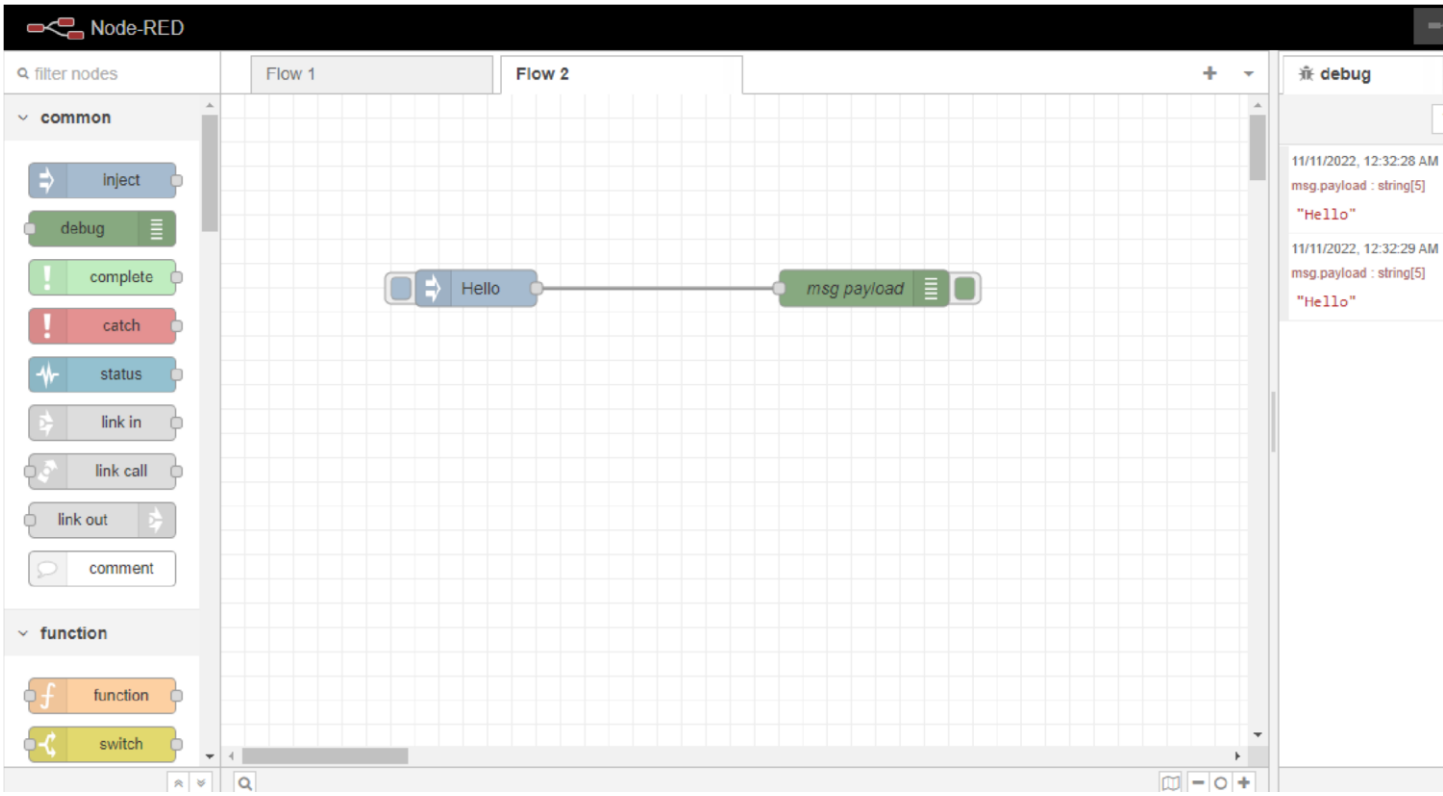


4.2 Required Software Installation

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 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

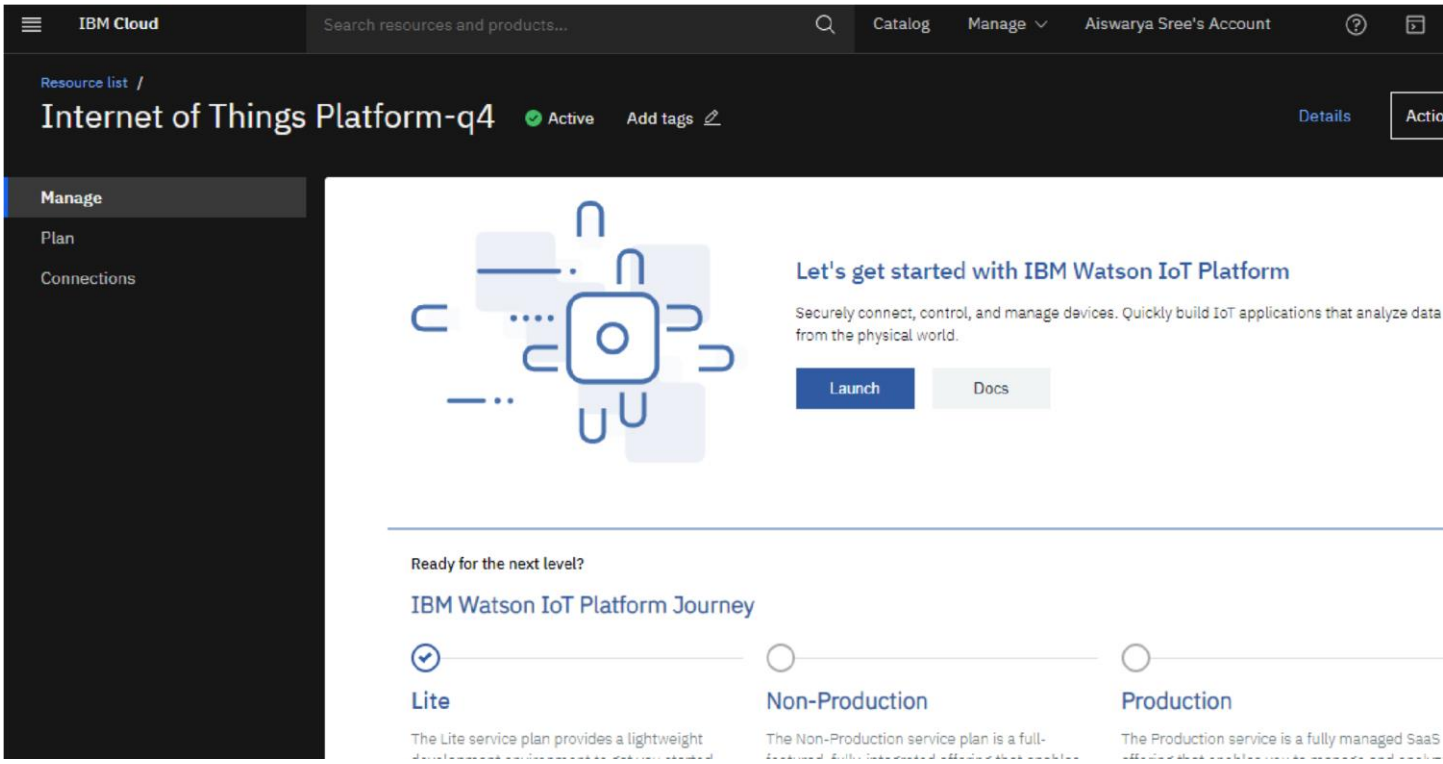
4.2.B IBM Watson IoT Platform

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

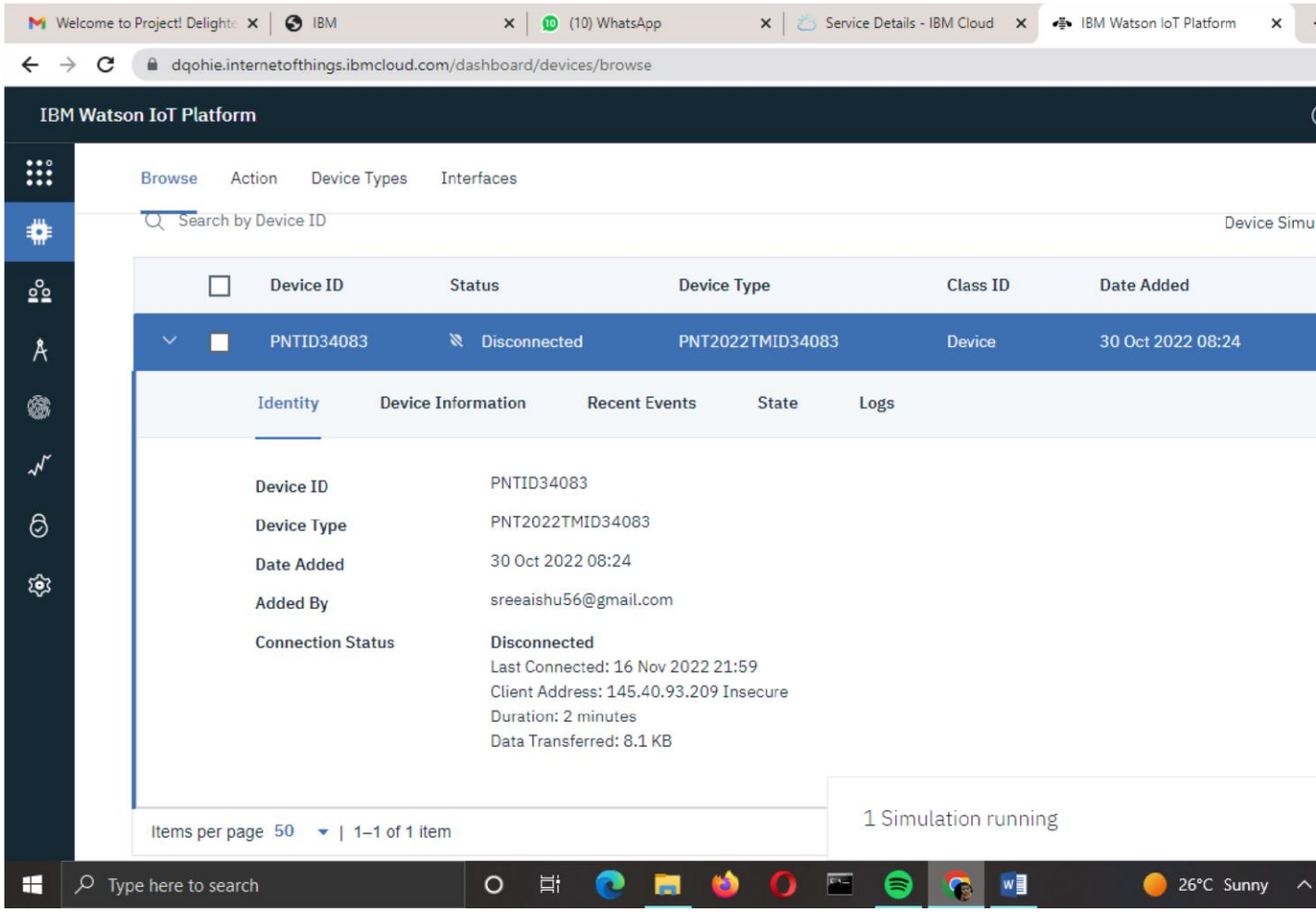
• Launch the IBM Watson IoT Platform



• 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

pythn1.py - C:\Users\ADHARSH\AppData\Local\Programs\Python\Python37-32\pythn1.py (3.7.0)

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```
import time
import sys
import ibmiotf.application
import ibmiotf.device
import random


#Provide your IBM Watson Device Credentials
organization = "b4hkg6"
deviceType = "12345"
deviceId = "54321"
authMethod = "token"
authToken = "cJG?hZd?IkkxL&ZO*b"

# Initialize GPIO


def myCommandCallback(cmd):
    print("Command received: %s" % cmd.data['command'])
    status=cmd.data['command']
    if status=="motoron":
        print ("motor is on")
    elif status=="motor off":
        print ("motor is off")
    else :
        print("please send proper comand")

    #print(cmd)



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()
```

pythn1.py - C:\Users\ADHARSH\AppData\Local\Programs\Python\Python37-32\pythn1.py (3.7.0)

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# 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

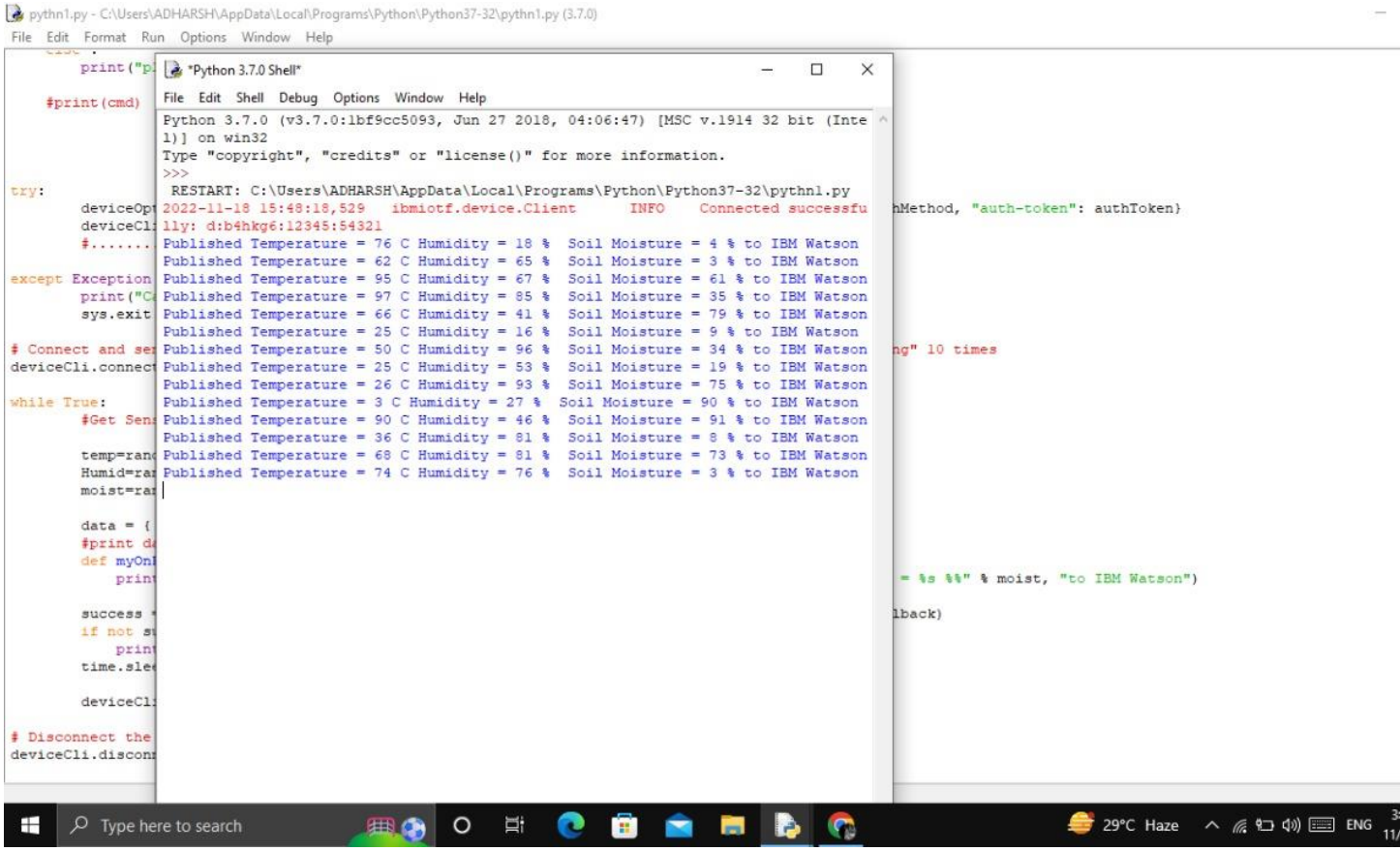
        temp=random.randint(0,100)
        Humid=random.randint(0,100)
        moist=random.randint(0,100)

        data = { 'temp' : temp, 'Humid': Humid,'Soil Moist': moist }
        #print data
        def myOnPublishCallback():
            print ("Published Temperature = %s C" % temp, "Humidity = %s %%" % Humid," Soil Moisture = %s %%" % moist, "to IBM Watson")

        success = deviceCli.publishEvent("IoTSensor", "json", data, qos=0, on_publish=myOnPublishCallback)
        if not success:
            print("Not connected to IoTF")
        time.sleep(1)

        deviceCli.commandCallback = myCommandCallback

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


pythn1.py - C:\Users\ADHARSH\AppData\Local\Programs\Python\Python37-32\pythn1.py (3.7.0)
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Python 3.7.0 Shell
File Edit Shell Debug Options Window Help
Python 3.7.0 (v3.7.0:1bf9cc5093, Jun 27 2018, 04:06:47) [MSC v.1914 32 bit (Intel)] on win32
Type "copyright", "credits" or "license()" for more information.
>>>
RESTART: C:\Users\ADHARSH\AppData\Local\Programs\Python\Python37-32\pythn1.py
2022-11-18 15:48:18,529 ibmiotf.device.Client INFO Connected successfully: d:b4hkg6:12345:54321
Published Temperature = 76 C Humidity = 18 % Soil Moisture = 4 % to IBM Watson
Published Temperature = 62 C Humidity = 65 % Soil Moisture = 3 % to IBM Watson
Published Temperature = 95 C Humidity = 67 % Soil Moisture = 61 % to IBM Watson
Published Temperature = 97 C Humidity = 85 % Soil Moisture = 35 % to IBM Watson
Published Temperature = 66 C Humidity = 41 % Soil Moisture = 79 % to IBM Watson
Published Temperature = 25 C Humidity = 16 % Soil Moisture = 9 % to IBM Watson
Published Temperature = 50 C Humidity = 96 % Soil Moisture = 34 % to IBM Watson
Published Temperature = 25 C Humidity = 53 % Soil Moisture = 19 % to IBM Watson
Published Temperature = 26 C Humidity = 93 % Soil Moisture = 75 % to IBM Watson
Published Temperature = 3 C Humidity = 27 % Soil Moisture = 90 % to IBM Watson
Published Temperature = 90 C Humidity = 46 % Soil Moisture = 91 % to IBM Watson
Published Temperature = 36 C Humidity = 81 % Soil Moisture = 8 % to IBM Watson
Published Temperature = 68 C Humidity = 81 % Soil Moisture = 73 % to IBM Watson
Published Temperature = 74 C Humidity = 76 % Soil Moisture = 3 % to IBM Watson
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Code:

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```
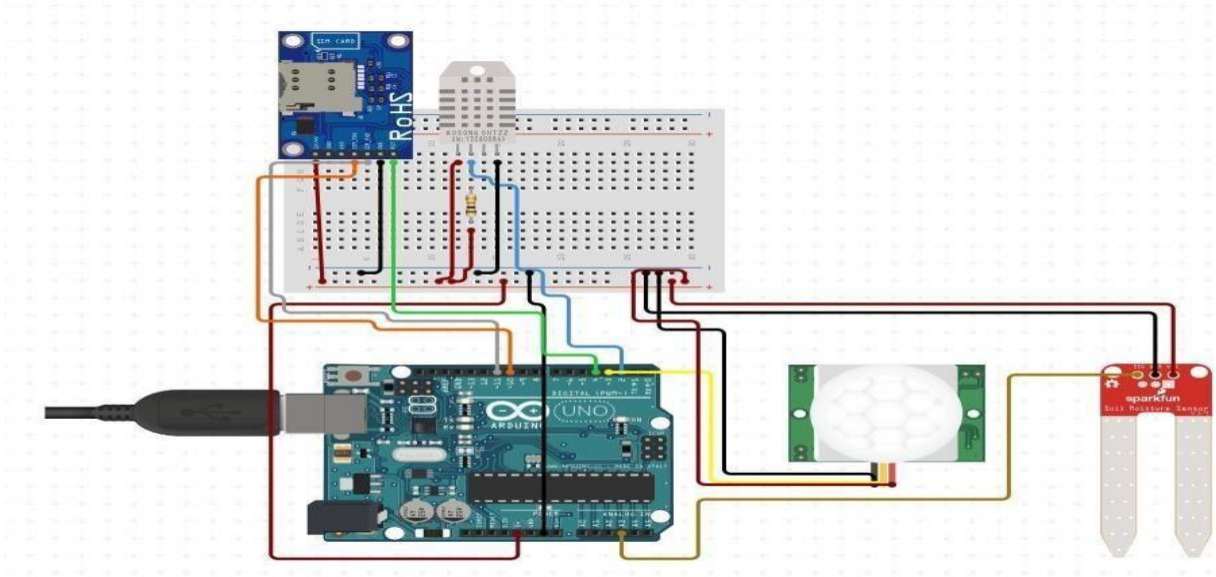

Aurdino code for C :

```
//include libraries
 #include <dht.h>
```

```
#include <SoftwareSerial.h>

//define pins
#define dht_apin A0 // Analog Pin sensor is connected
SoftwareSerial mySerial(7,8);//serial port of gsm   const int
sensor_pin = A1;  // Soil moisture sensor O/P pin   int
pin_out = 9;   //allocate variables   dht DHT;
int c=0;

void setup()
{
pinMode(2, INPUT); //Pin 2 as INPUT
pinMode(3, OUTPUT); //PIN 3 as OUTPUT
pinMode(9, OUTPUT);//output for pump
}
void loop()
{
  if (digitalRead(2) == HIGH)
  {
  digitalWrite(3, HIGH);   // turn the LED/Buzz ON
delay(10000);  // wait for 100 msecond      digitalWrite(3,
LOW);   // turn the LED/Buzz OFF     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 pump
sensor_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"); //replace X with 10 digit mobil e
number       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");//Sets the GSM Module in Text Mode
delay(1000);
  mySerial.println("AT+CMGS=\"+XXXXXXXXXX\"\r"); //replace X with 10 digit
mobile number
delay(1000);
  mySerial.println((String)"update-
>"+(String)"Temprature="+t+(String)"Humidity="+h+(String)"Moisture="+m);//
message format
  mySerial.println();
delay(100);    Serial.write(0x1A);
```

```
delay(1000);
  c++;

    }


 }
```



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 Platform to connect 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 of your city by searching o Create API key to your account
- Replace “city name” and “your api key” with your city and API key in below red text api.openweathermap.org/data/2.5/weather?q={city name}&appid={your api key}