Sprint- 4

Python Script

Date	10 November 2022
Team ID	PNT2022TMID47379
Project Name	IOT BASED CROP PROTECTION SYSTEM FOR AGRICULTURE

Description:

The random sensor data’s are generated and automation has been implemented through the python code instead of using hardware to implement IOT based crop protection system. And the python code need to upload the data’s in IBM Watson through Node red are written in this python script.

Python Code:

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

#IBM Watson Device Credentials.
organization = "l1a82f"
deviceType = "cibie" deviceId
= "cibie123" authMethod =
"token" authToken =
"12345678"

def myCommandCallback(cmd):     print("Command
received: %s" % cmd.data['command'])     status =
cmd.data['command']     if status== "sprinkler_on":
print ("sprinkler is ON")     else :          print
("sprinkler is OFF")
#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()

#Connecting to IBM watson.
deviceCli.connect()
```

```
while True:
  temp_sensor = round( random.uniform(0,80),2)     PH_sensor = round(random.uniform(1,14),3)     camera
= ["Detected","Not Detected","Not Detected","Not Detected","Not Detected","Not Detected",]     camera_reading
= random.choice(camera)
  flame = ["Detected","Not Detected","Not Detected","Not Detected","Not Detected","Not Detected",]
flame_reading = random.choice(flame)     moist_level = round(random.uniform(0,100),2)     water_level = round(random.uniform(0,30),2)

#storing the sensor data to send in json format to cloud.

  temp_data = { 'Temperature' : temp_sensor }
PH_data = { 'PHLevel' : PH_sensor }
camera_data = { 'Animal attack' : camera_reading}
flame_data = { 'Flame' : flame_reading }     moist_data
= { 'Moisture Level' : moist_level}     water_data = {
'Water Level' : water_level}

# publishing Sensor data to IBM Watson for every 5-10 seconds.
  success = deviceCli.publishEvent("Temperature sensor", "json", temp_data, qos=0)
sleep(1)     if success:
    print ("   .................. .........publis h ok............................   ")
    print ("Published Temperature = %s C" % temp_sensor,  "to IBM Watson")     success
= deviceCli.publishEvent("PH sensor", "json", PH_data, qos=0)       sleep(1)     if  success:
    print ("Published PHLevel = %s" % PH_sensor,  "to IBM Watson")
success = deviceCli.publishEvent("camera", "json", camera_data, qos=0)       sleep(1)
if success:
    print ("Published Animal attack %s " % camera_reading,  "to IBM Watson")
success = deviceCli.publishEvent("Flame sensor", "json", flame_data, qos=0)       sleep(1)
if success:
    print ("Published Flame %s " % flame_reading,  "to IBM Watson")             success
= deviceCli.publishEvent("Moisture sensor", "json", moist_data, qos=0)       sleep(1)
if success:
    print ("Published Moisture Level = %s " % moist_level,  "to IBM Watson")
success = deviceCli.publishEvent("Water sensor", "json", water_data, qos=0)       sleep(1)
if success:
    print ("Published Water Level = %s cm" % water_level,  "to IBM Watson")
print ("")

#Automation to control sprinklers by present temperature an to send alert message to IBM Watson.
  if (temp_sensor > 35):

    print("sprinkler-1 is ON")
    success = deviceCli.publishEvent("Alert1", "json",{ 'alert1' : "Temperature(%s) is high, sprinkerlers are turned ON" %temp_sensor }  , qos=0)
    sleep(1)
if success:
    print( 'Published alert1 : ',  "Temperature(%s) is high, sprinkerlers are turned ON" %temp_sensor,"to IBM Watson")
print("")
else:
    print("sprinkler-1 is OFF")
    print("")
#To send alert message if farmer uses the unsafe fertilizer to crops.
if (PH_sensor > 7.5 or PH_sensor < 5.5):
    success = deviceCli.publishEvent("Alert2", "json",{ 'alert2' : "Fertilizer PH level(%s) is not safe,use other fertilizer" %PH_sensor } ,
qos=0)
    sleep(1)
if success:           print('Published alert2 : ' , "Fertilizer PH level(%s) is not safe,use other fertilizer" %PH_sensor,"to
IBM Watson")
```

```
print("")


#To send alert message to farmer that animal attack on crops.

   if (camera_reading == "Detected"):
      success = deviceCli.publishEvent("Alert3", "json", { 'alert3' : "Animal attack on crops detected" }, qos=0)
sleep(1)    if success:
      print('Published alert3 : ' , "Animal attack on crops detected","to IBM Watson","to IBM Watson")
print("")


#To send alert message if flame detected on crop land and turn ON the splinkers to take immediate action.

   if (flame_reading == "Detected"):        print("sprinkler-2 is ON")     success = deviceCli.publishEvent("Alert4", "json", { 'alert4' :
"Flame is detected crops are in danger,sprinklers turned ON" }, qos=0)       sleep(1)     if success:
      print( 'Published alert4 : ' , "Flame is detected crops are in danger,sprinklers turned ON","to IBM Watson")
print("")      else:
      print("sprinkler-2 is OFF")
print("")


#To send alert message if Moisture level is LOW and to Turn ON Motor-1 for irrigation.

   if (moist_level < 20):          print("Motor-1 is ON")     success = deviceCli.publishEvent("Alert5", "json", { 'alert5' : "Moisture
level(%s) is low, Irrigation started" %moist_level }, qos=0)       sleep(1)              if success:
      print('Published alert5 : ' , "Moisture level(%s) is low, Irrigation started" %moist_level,"to IBM Watson" )
print("")     else:
      print("Motor-1 is OFF")
print("")


    #To send alert message if Water level is HIGH and to Turn ON Motor-2 to take water out.

   if (water_level > 20):          print("Motor-2 is  ON")       success = deviceCli.publishEvent("Alert6", "json", { 'alert6' : "Water level(%s)
is high, so motor is ON to
take water out "  %water_level
}, qos=0)
   sleep(1)
if success:          print('Published alert6 : ' , "water level(%s) is high, so motor is ON to take water out " %water_level,"to
IBM Watson" )
print("")     else:
      print("Motor-2 of OFF")
print("")

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

Wowki code:

```
//UV - Sensor
const int trigPin = 12;
const int echoPin = 14;

//define sound velocity in cm/uS
#define SOUND_VELOCITY 0.034
#define CM_TO_INCH 0.393701

long duration;
int distanceCm;
float distanceInch;
const char f[14]="flamedetected";
const char reg[8]="notfire";
const char ani[15]="animaldetected";
const char an[5]="safe";

//defining DHT22 sensor
#include <WiFi.h>//library for wifi
#include <PubSubClient.h>//library for MQtt
#include "DHT.h"// Library for dht11
#define DHTPIN 15     // what pin we're connected to
#define DHTTYPE DHT22   // define type of sensor DHT 11

//Fire - Sensor
int Buzzer = 32;
//int Fire_analog = 4;
int Fire_digital = 2;
//int Buzzer = 32;        // used for ESP32
//int Fire_analog = 4;    // used for ESP32
//int Fire_digital = 2;   // used for ESP32
// These constants should match the photoresistor's "gamma" and "rl10" attributes
#define LIGHT_SENSOR_PIN 34


DHT dht (DHTPIN, DHTTYPE);// creating the instance by passing pin and typr of dht connected

void callback(char* subscribetopic, byte* payload, unsigned int payloadLength);

//-------credentials of IBM Accounts------

#define ORG "l1a82f"//IBM ORGANITION ID
#define DEVICE_TYPE "cibie"//Device type mentioned in ibm watson IOT Platform
#define DEVICE_ID "cibie123"//Device ID mentioned in ibm watson IOT Platform
#define TOKEN "12345678"     //Token
String data3;
float h, t;
```

```
//-------- Customise the above values --------
char server[] = ORG ".messaging.internetofthings.ibmcloud.com";// Server Name
char publishTopic[] = "iot-2/evt/Data/fmt/json";// topic name and type of event perform and format in which data to be send
char subscribetopic[] = "iot-2/cmd/command/fmt/String";// cmd  REPRESENT command type AND COMMAND IS TEST OF FORMAT STRING
char authMethod[] = "use-token-auth";// authentication method
char token[] = TOKEN;
char clientId[] = "d:" ORG ":" DEVICE_TYPE ":" DEVICE_ID;//client id


//-----------------------------------------
WiFiClient wifiClient; // creating the instance for wificlient
PubSubClient client(server, 1883, callback ,wifiClient); //calling the predefined client id by passing parameter like server id,portand wificredential


void setup()// configureing the ESP32
{
  //DHT22 - Sensor
  Serial.begin(115200);
  dht.begin();
  delay(10);
  Serial.println();
  wificonnect();
  mqttconnect();

//UV-Sensor
  Serial.begin(115200); // Starts the serial communication
  pinMode(trigPin, OUTPUT); // Sets the trigPin as an Output
  pinMode(echoPin, INPUT); // Sets the echoPin as an Input
  delay(10);
  Serial.println();
  wificonnect();
  mqttconnect();

 // Fire-sensor
 Serial.begin(115200);
  pinMode(Buzzer, OUTPUT);
  pinMode(Fire_digital, INPUT);
  delay(10);
  Serial.println();
  wificonnect();
  mqttconnect();

}
```

```
void loop()// Recursive Function
{

//DHT22 - Sensor
  h = dht.readHumidity();
  t = dht.readTemperature();
  Serial.print("temp:");
  Serial.println(t);
  Serial.print("Humid:");
  Serial.println(h);

  PublishData(t, h);
  delay(1000);
  if (!client.loop()) {
    mqttconnect();
  }


  // UV - Sensor
  // Clears the trigPin
  digitalWrite(trigPin, LOW);
  delayMicroseconds(2);
  // Sets the trigPin on HIGH state for 10 micro seconds
  digitalWrite(trigPin, HIGH);
  delayMicroseconds(10);
  digitalWrite(trigPin, LOW);

  // Reads the echoPin, returns the sound wave travel time in microseconds
  duration = pulseIn(echoPin, HIGH);

  // Calculate the distance
  distanceCm = duration * SOUND_VELOCITY/2;

  // Convert to inches
  distanceInch = distanceCm * CM_TO_INCH;

  // Prints the distance on the Serial Monitor
  Serial.print("Distance (cm): ");
  Serial.println(distanceCm);
  Serial.print("Distance (inch): ");
  Serial.println(distanceInch);
  if(distanceCm<175)
  {
   digitalWrite (Buzzer, HIGH) ; //send tone
    delay(1000);
    digitalWrite (Buzzer, LOW) ;
  }
  PublishData(distanceCm, distanceCm);
  delay(1000);
  if (!client.loop()) {
    mqttconnect();
  }


  // reads the input on analog pin (value between 0 and 4095)
  int analog = analogRead(LIGHT_SENSOR_PIN);
  int digital = digitalRead(Fire_digital);
  Serial.print("flame:");
  Serial.println(analog);
  Serial.print("flame:");
  Serial.println(digital);
  // We'll have a few threshholds, qualitatively determined
   Data(analog,digital);
   delay(1000);
   if (!client.loop())
   {
     mqttconnect();
   }


}

/*.....................................retrieving to Cloud...............................*/

void PublishData(float temp, float humid) {
  mqttconnect();//function call for connecting to ibm
  /*
     creating the String in in form JSon to update the data to ibm cloud
  */
  String payload = "{\"temp\":";
  payload += temp;
  payload += "," "\"Humid\":";
  payload += humid;
  payload += "}";


  Serial.print("Sending payload: ");
  Serial.println(payload);


  if (client.publish(publishTopic, (char*) payload.c_str())) {
    Serial.println("Publish ok");// if it sucessfully upload data on the cloud then it will print publish ok in Serial monitor or else it will print publish failed
  } else {
    Serial.println("Publish failed");
  }

}
String payload;
void PublishData(int distanceCm  , int distanceInch  ) {
  mqttconnect();//function call for connecting to ibm
  /*
     creating the String in in form JSon to update the data to ibm cloud
  */
  if (distanceCm<175){
   payload = "{\"animalattack\":";
  //payload += duration;
  //payload += "," "\"distanceCm\":";
   payload += ani;
   payload += "}";
    Serial.print("Sending payload: ");
  Serial.println(payload);
  if (client.publish(publishTopic, (char*) payload.c_str())) {
    Serial.println("Publish ok");// if it sucessfully upload data on the cloud then it will print
publish ok in Serial monitor or else it will print publish failed
  } else {
    Serial.println("Publish failed");
  }
  }

}

void Data(int analog  , int digital  ) {
  mqttconnect();//function call for connecting to ibm
  /*
     creating the String in in form JSon to update the data to ibm cloud
  */
  String payload;
  if (analog>200){
   payload = "{\"flame\":";
  //payload += duration;
  //payload += "," "\"distanceCm\":";
   payload += f;
   payload += "}";
    Serial.print("Sending payload: ");
  Serial.println(payload);
  if (client.publish(publishTopic, (char*) payload.c_str())) {
    Serial.println("Publish ok");// if it sucessfully upload data on the cloud then it will print
publish ok in Serial monitor or else it will print publish failed
  } else {
    Serial.println("Publish failed");
  }
  }

}
void mqttconnect() {
  if (!client.connected()) {
    Serial.print("Reconnecting client to ");
    Serial.println(server);
    while (!!!client.connect(clientId, authMethod, token)) {
      Serial.print(".");
      delay(500);
    }

     initManagedDevice();
     Serial.println();
  }
}
void wificonnect() //function defination for wificonnect
{
  Serial.println();
  Serial.print("Connecting to ");

  WiFi.begin("Wokwi-GUEST", "", 6);//passing the wifi credentials to establish the connection
  while (WiFi.status() != WL_CONNECTED) {
    delay(500);
    Serial.print(".");
  }
  Serial.println("");
  Serial.println("WiFi connected");
  Serial.println("IP address: ");
  Serial.println(WiFi.localIP());
}

void initManagedDevice() {
  if (client.subscribe(subscribetopic)) {
    Serial.println((subscribetopic));
    Serial.println("subscribe to cmd OK");
  } else {
    Serial.println("subscribe to cmd FAILED");
  }
}

void callback(char* subscribetopic, byte* payload, unsigned int payloadLength)
{

  Serial.print("callback invoked for topic: ");
  Serial.println(subscribetopic);
  for (int i = 0; i < payloadLength; i++) {
    //Serial.print((char)payload[i]);
    data3 += (char)payload[i];
  }

}
```

output :

```
Connecting to ..
WiFi connected
IP address:
10.10.0.2
Reconnecting client to l1a82f.messaging.internetofthings.ibmcloud.com
iot-2/cmd/command/fmt/String
subscribe to cmd OK



Connecting to ..
WiFi connected
IP address:
10.10.0.2
Reconnecting client to l1a82f.messaging.internetofthings.ibmcloud.com
iot-2/cmd/command/fmt/String
subscribe to cmd OK

temp:38.50
Humid:40.00
Sending payload: {"temp":38.50,"Humid":40.00}
Publish ok
Distance (cm): 68
Distance (inch): 26.77
Sending payload: {"animalattack":animaldetected}
Publish ok
flame:1001
flame:0
Sending payload: {"flame":flamedetected}
Publish ok
temp:38.50
Humid:40.00
Sending payload: {"temp":38.50,"Humid":40.00}
Publish ok
Distance (cm): 68
Distance (inch): 26.77
Sending payload: {"animalattack":animaldetected}
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flame:1001
flame:0
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```
temp:38.50
Humid:40.00
Sending
Distance (cm): 68
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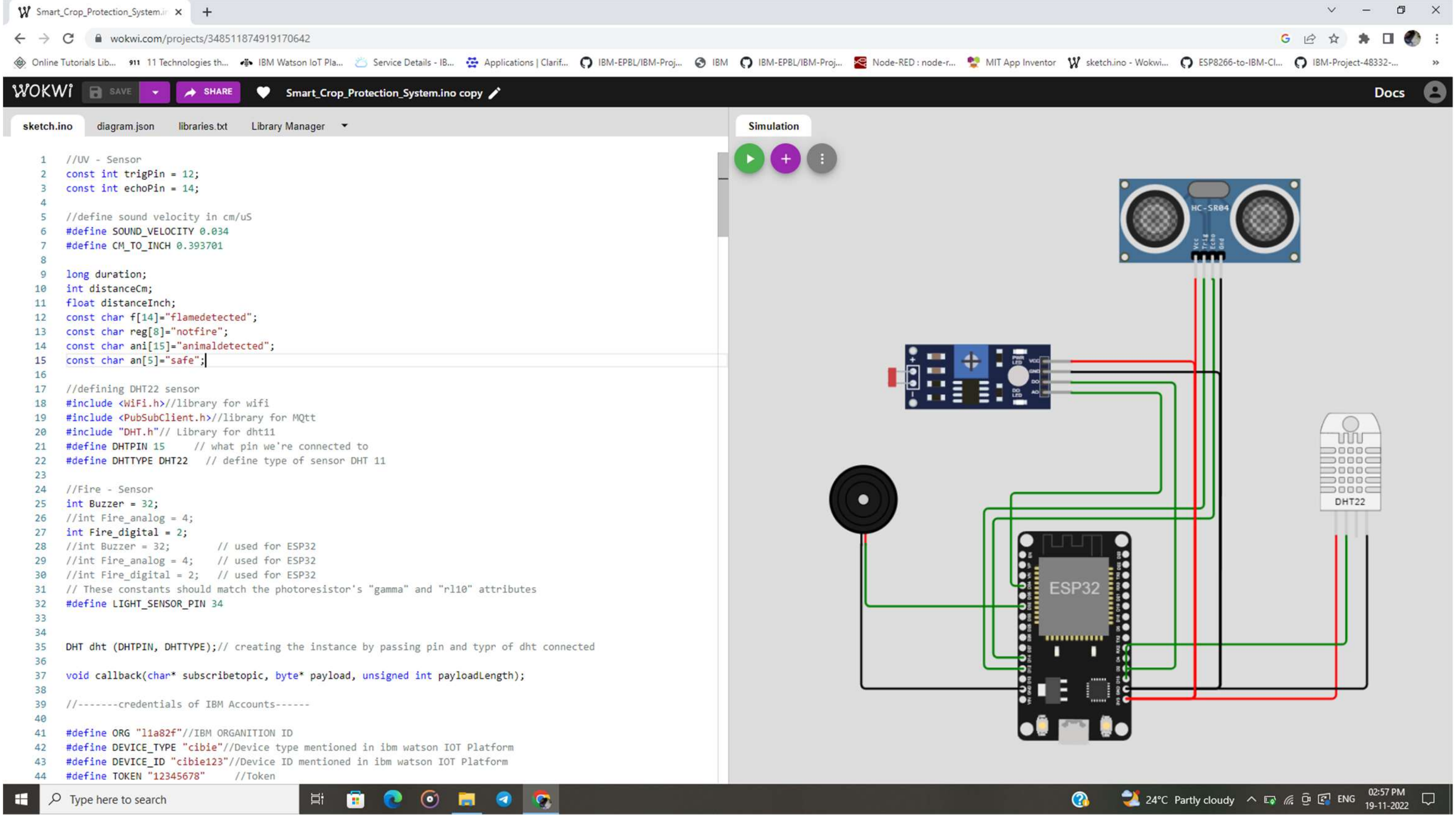
Publish ok
temp:38.50
Humid:40.00
Sending payload: {"temp":38.50,"Humid":40.00}
Publish ok
```

Wowki test cases:



```
//UV - Sensor
const int trigPin = 12;
const int echoPin = 14;

//define sound velocity in cm/uS
#define SOUND_VELOCITY 0.034
#define CM_TO_INCH 0.393701

long duration;
int distanceCm;
float distanceInch;
const char f[14]="flamedetected";
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const char ani[15]="animaldetected";
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#include <WiFi.h>//library for wifi
#include <PubSubClient.h>//library for MQtt
#include "DHT.h"// Library for dht11
#define DHTPIN 15     // what pin we're connected to
#define DHTTYPE DHT22   // define type of sensor DHT 11

//Fire - Sensor
int Buzzer = 32;
//int Fire_analog = 4;
int Fire_digital = 2;
//int Buzzer = 32;        // used for ESP32
//int Fire_analog = 4;    // used for ESP32
//int Fire_digital = 2;   // used for ESP32
// These constants should match the photoresistor's "gamma" and "rl10" attributes
#define LIGHT_SENSOR_PIN 34


DHT dht (DHTPIN, DHTTYPE);// creating the instance by passing pin and typr of dht connected

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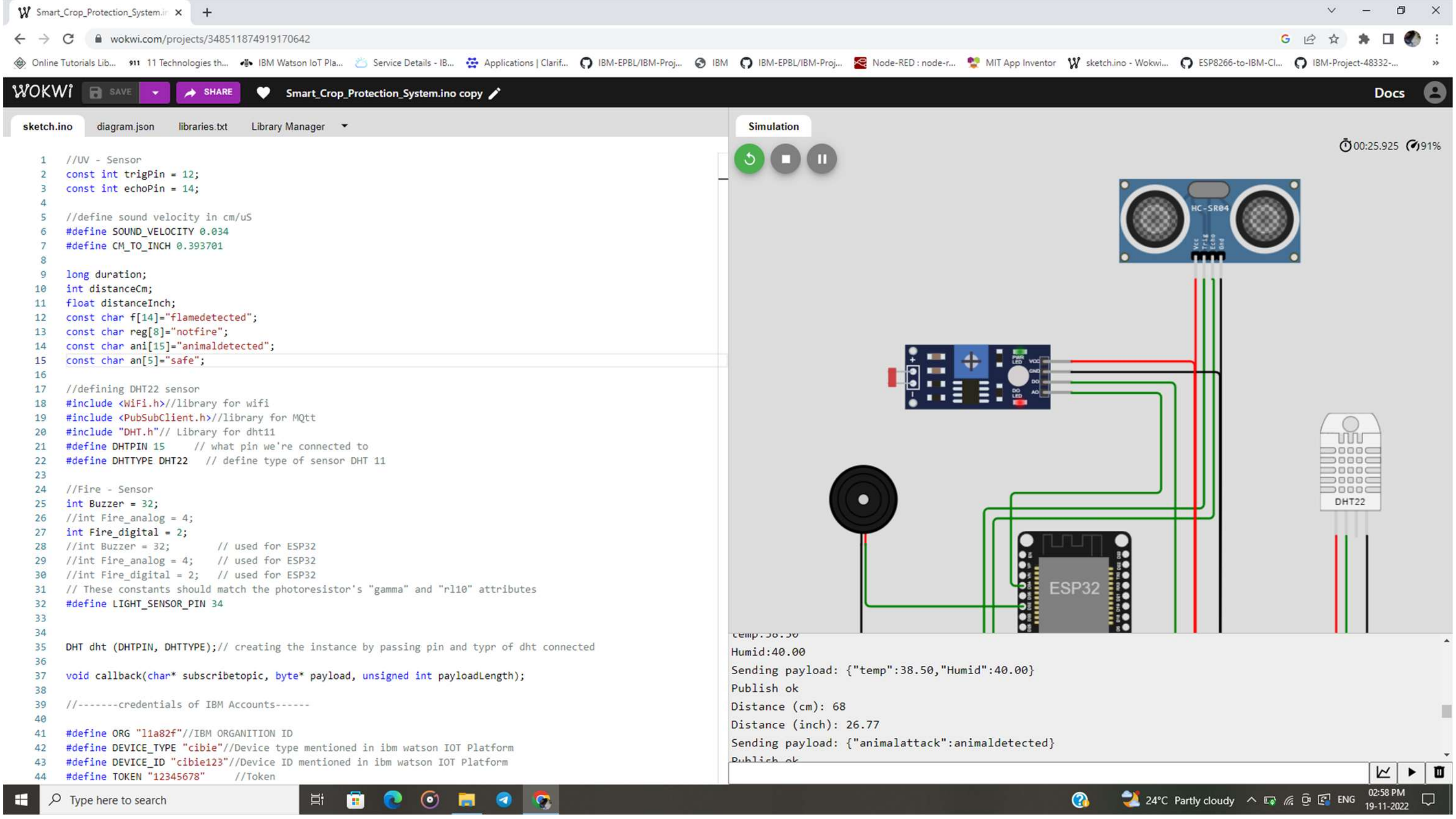
#define TOKEN "12345678"     //Token
```



```
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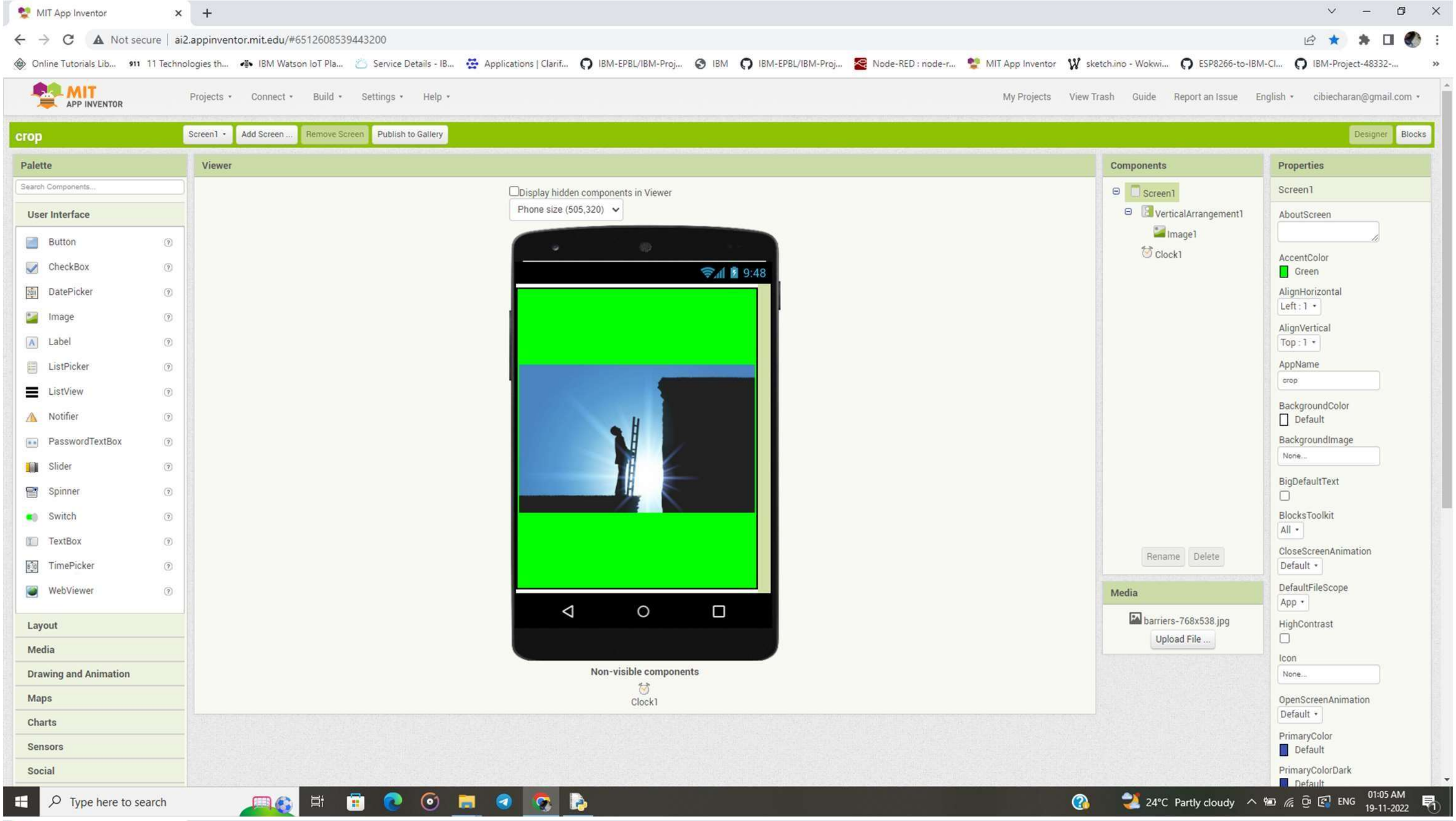
```

```
temp:38.50
Humid:40.00
Sending payload: {"temp":38.50,"Humid":40.00}
Publish ok
Distance (cm): 68
Distance (inch): 26.77
Sending payload: {"animalattack":animaldetected}
Publish ok
```


MIT App Inventor
Not secure | ai2.appinventor.mit.edu/#6512608539443200
Online Tutorials Lib... 11 Technologies th... IBM Watson IoT Pla... Service Details - IB... Applications | Clarif... IBM-EPBL/IBM-Proj... IBM IBM-EPBL/IBM-Proj... Node-RED : node-r... MIT App Inventor sketch.ino - Wokwi... ESP8266-to-IBM-Cl... IBM-Project-48332-...
MIT APP INVENTOR
Projects Connect Build Settings Help
My Projects View Trash Guide Report an Issue English cibiecharan@gmail.com
crop
Screen1 Add Screen ... Remove Screen Publish to Gallery
Designer Blocks
Palette
Search Components...
User Interface
Button
CheckBox
DatePicker
Image
Label
ListPicker
ListView
Notifier
PasswordTextBox
Slider
Spinner
Switch
TextBox
TimePicker
WebViewer
Layout
Media
Drawing and Animation
Maps
Charts
Sensors
Social
Viewer
9:48
Rename Delete
Upload File ...
Type here to search
24°C Partly cloudy ENG
01:05 AM
19-11-2022

□Display hidden components in Viewer

Phone size (505,320)

Non-visible components

Clock1

Components

- Screen1
  - VerticalArrangement1
    - Image1
  - Clock1

Media

barriers-768x538.jpg

Properties

Screen1

AboutScreen

AccentColor
🟩 Green

AlignHorizontal
Left : 1

AlignVertical
Top : 1

AppName
crop

BackgroundColor
□ Default

BackgroundImage
None...

BigDefaultText
□

BlocksToolkit
All

CloseScreenAnimation
Default

DefaultFileScope
App

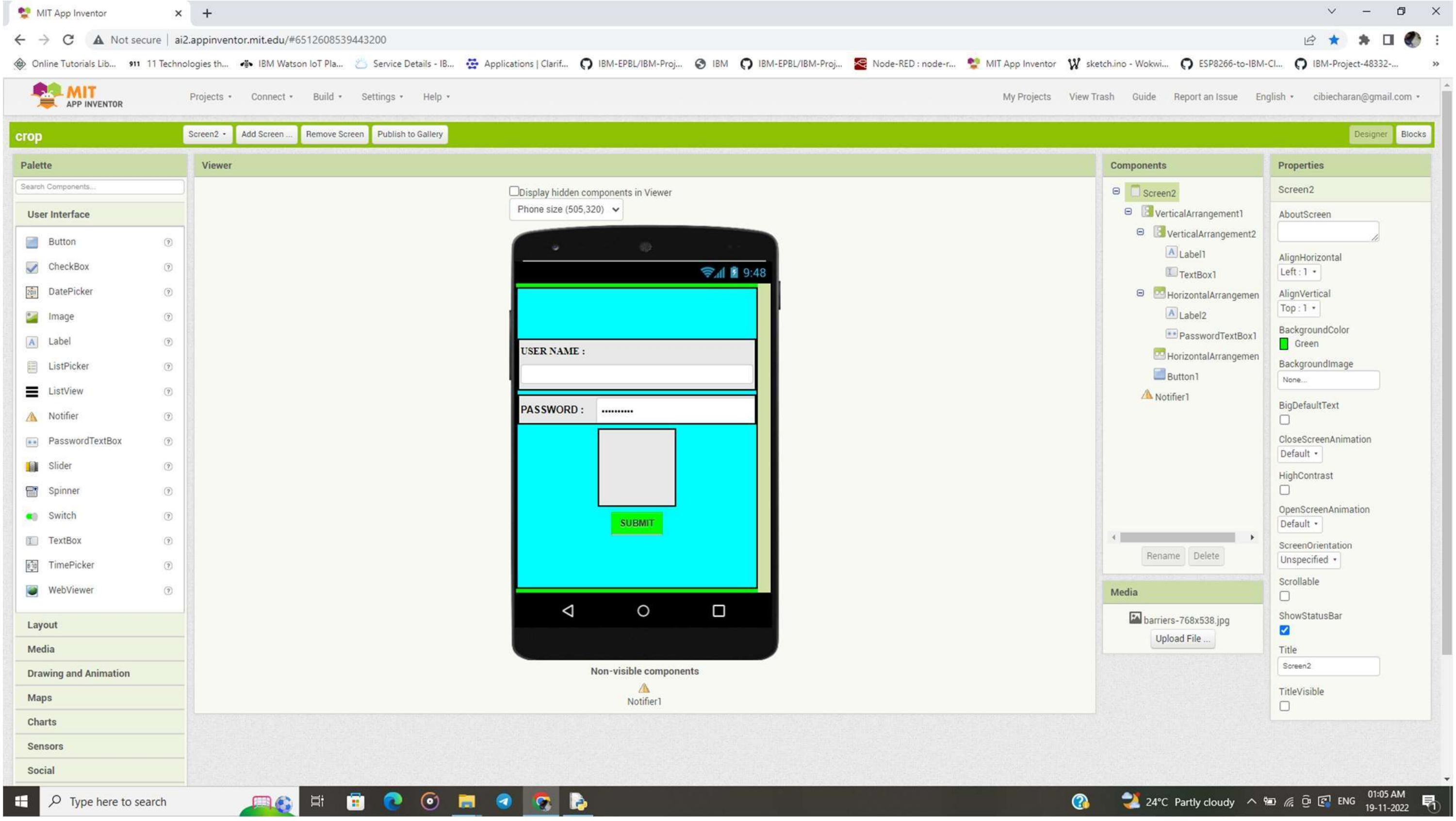
HighContrast
□

Icon
None...

OpenScreenAnimation
Default

PrimaryColor
Default

PrimaryColorDark
Default


MIT App Inventor
Not secure | ai2.appinventor.mit.edu/#6512608539443200
Online Tutorials Lib... 11 Technologies th... IBM Watson IoT Pla... Service Details - IB... Applications | Clarif... IBM-EPBL/IBM-Proj... IBM IBM-EPBL/IBM-Proj... Node-RED : node-r... MIT App Inventor sketch.ino - Wokwi... ESP8266-to-IBM-Cl... IBM-Project-48332-...
MIT APP INVENTOR
Projects Connect Build Settings Help
My Projects View Trash Guide Report an Issue English cibiecharan@gmail.com
crop
Screen2 Add Screen ... Remove Screen Publish to Gallery
Designer Blocks
Palette
Search Components...
User Interface
Button
CheckBox
DatePicker
Image
Label
ListPicker
ListView
Notifier
PasswordTextBox
Slider
Spinner
Switch
TextBox
TimePicker
WebViewer
Layout
Media
Drawing and Animation
Maps
Charts
Sensors
Social
Viewer
9:48
SUBMIT
Rename Delete
Upload File ...
Type here to search
24°C Partly cloudy ENG
01:05 AM
19-11-2022

□Display hidden components in Viewer

Phone size (505,320)

USER NAME :

PASSWORD : ....

Non-visible components

Notifier1

Components

- Screen2
  - VerticalArrangement1
    - VerticalArrangement2
      - Label1
      - TextBox1
    - HorizontalArrangemen
      - Label2
      - PasswordTextBox1
    - HorizontalArrangemen
    - Button1
  - Notifier1

Media

barriers-768x538.jpg

Properties

Screen2

AboutScreen

AlignHorizontal
Left : 1

AlignVertical
Top : 1

BackgroundColor
🟩 Green

BackgroundImage
None...

BigDefaultText
□

CloseScreenAnimation
Default

HighContrast
□

OpenScreenAnimation
Default

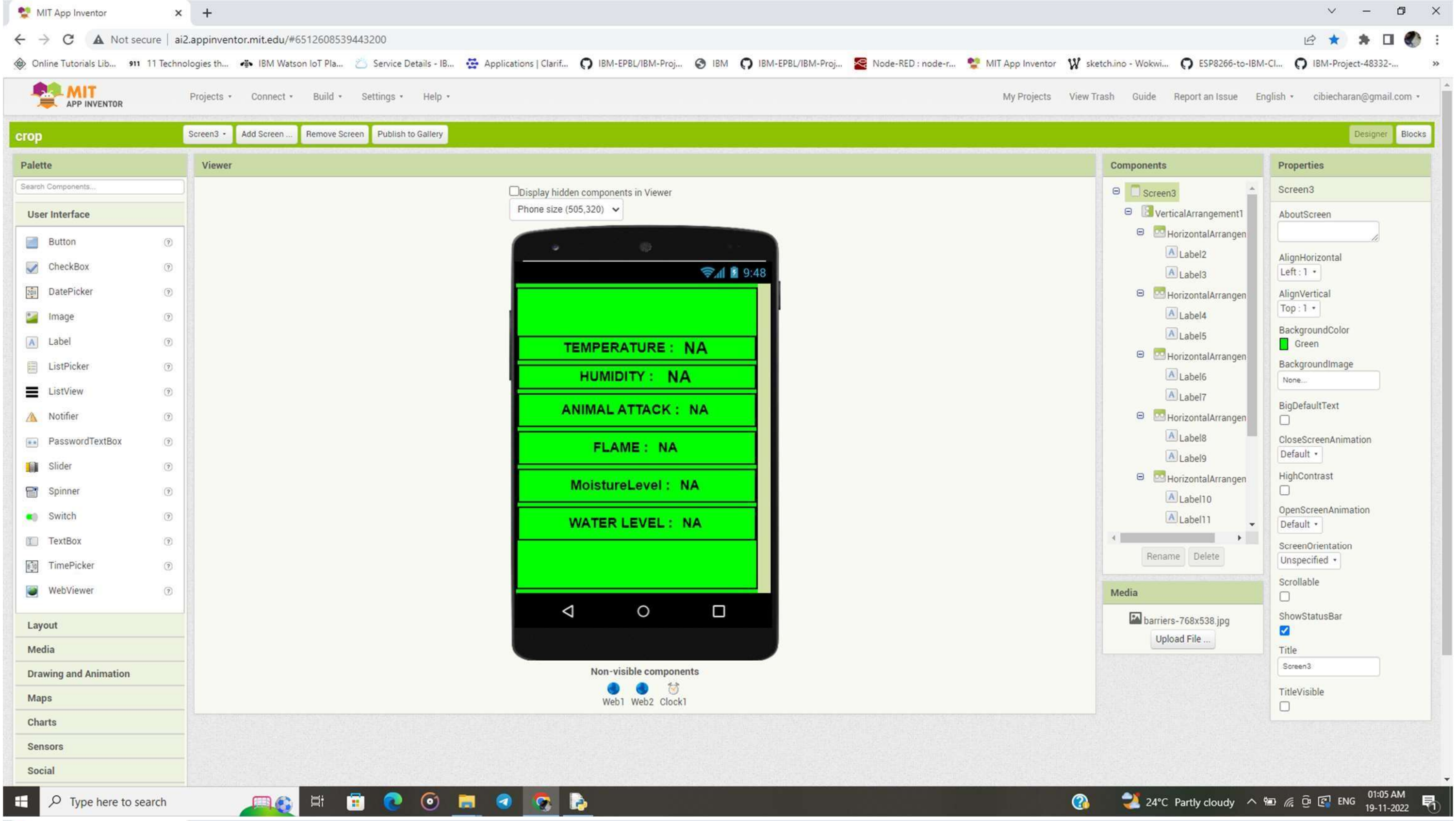
ScreenOrientation
Unspecified

Scrollable
□

ShowStatusBar
☑

Title
Screen2

TitleVisible
□



□ Display hidden components in Viewer

Phone size (505,320)

TEMPERATURE : NA

HUMIDITY : NA

ANIMAL ATTACK : NA

FLAME : NA

MoistureLevel : NA

WATER LEVEL : NA

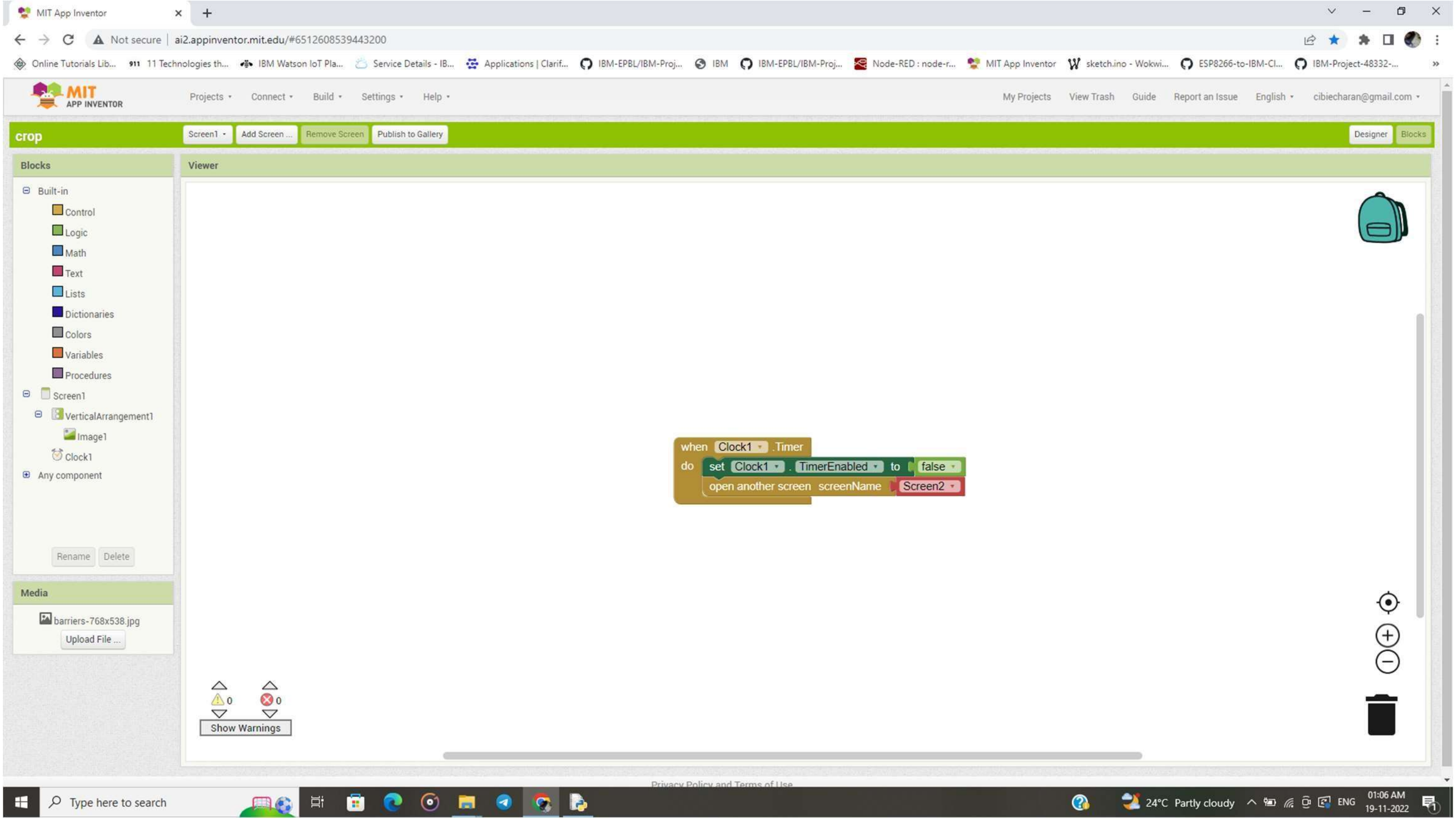
Components:

```
Screen3
  VerticalArrangement1
    HorizontalArrangen
      Label2
      Label3
    HorizontalArrangen
      Label4
      Label5
    HorizontalArrangen
      Label6
      Label7
    HorizontalArrangen
      Label8
      Label9
    HorizontalArrangen
      Label10
      Label11
```

Media: barriers-768x538.jpg

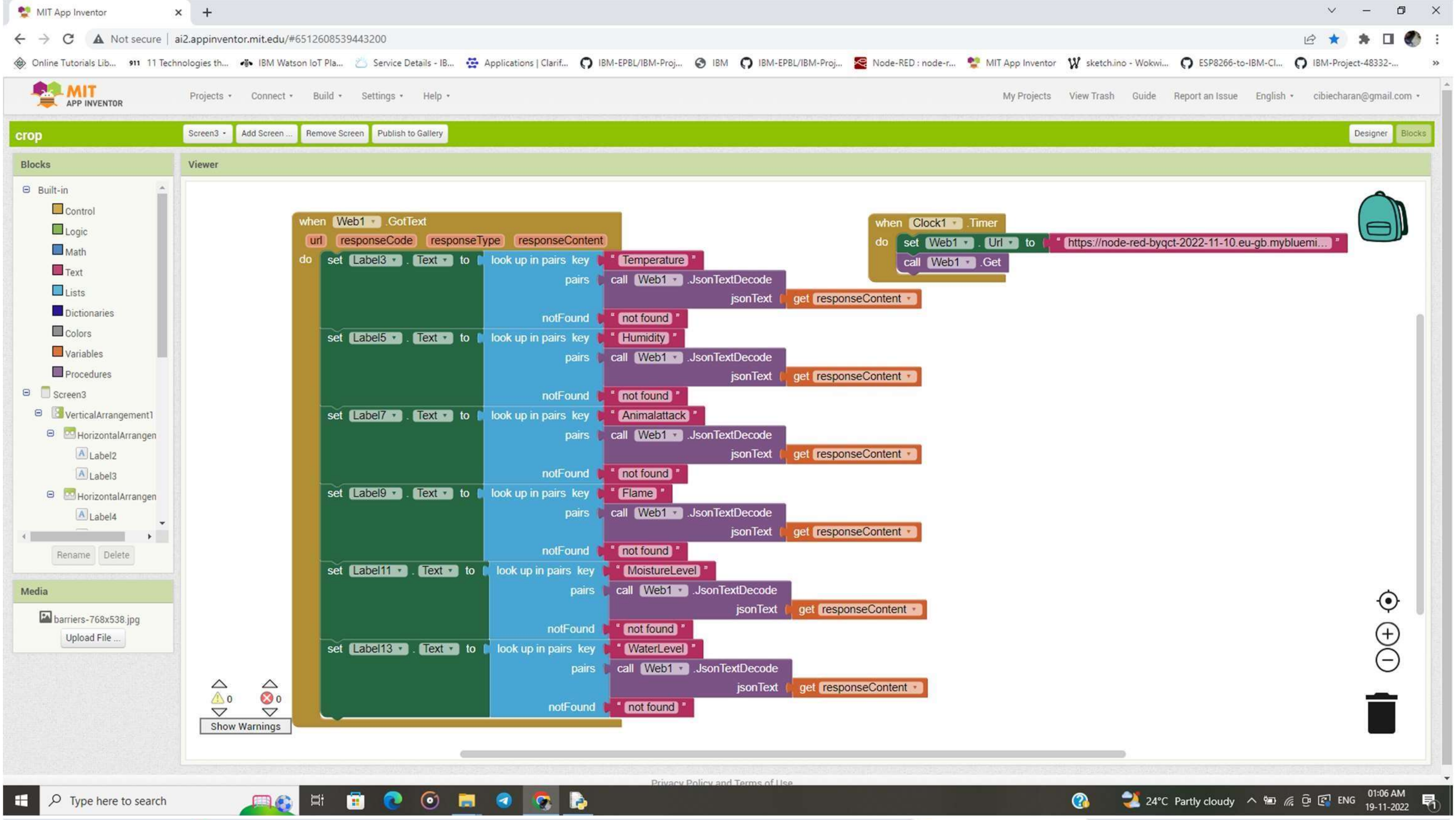
Properties: Screen3

- AboutScreen
- AlignHorizontal: Left : 1
- AlignVertical: Top : 1
- BackgroundColor: 🟩 Green
- BackgroundImage: None...
- BigDefaultText: □
- CloseScreenAnimation: Default
- HighContrast: □
- OpenScreenAnimation: Default
- ScreenOrientation: Unspecified
- Scrollable: □
- ShowStatusBar: ☑
- Title: Screen3
- TitleVisible: □



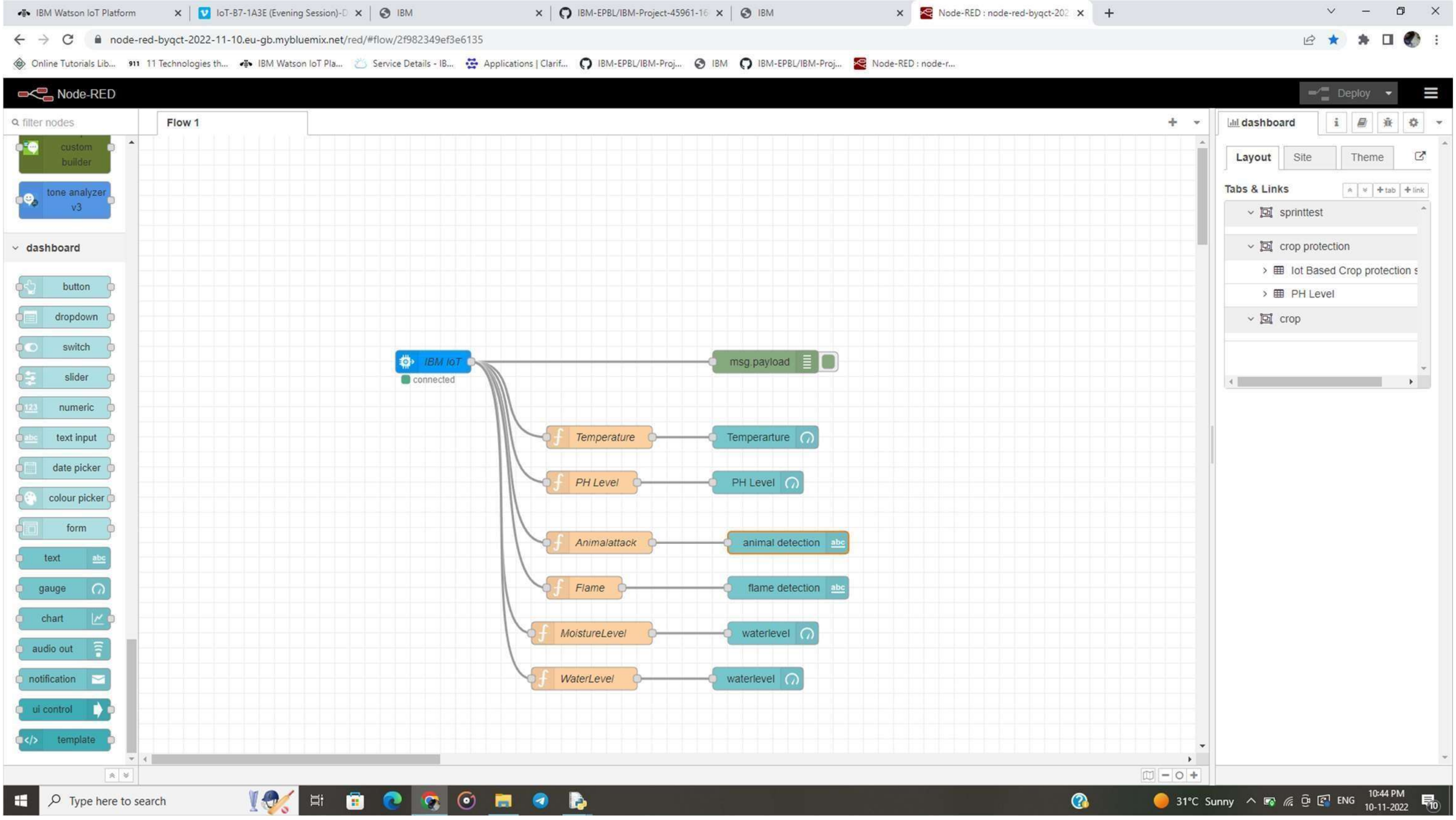
```
when Clock1 .Timer
do  set Clock1 . TimerEnabled to false
    open another screen screenName "Screen2"
```

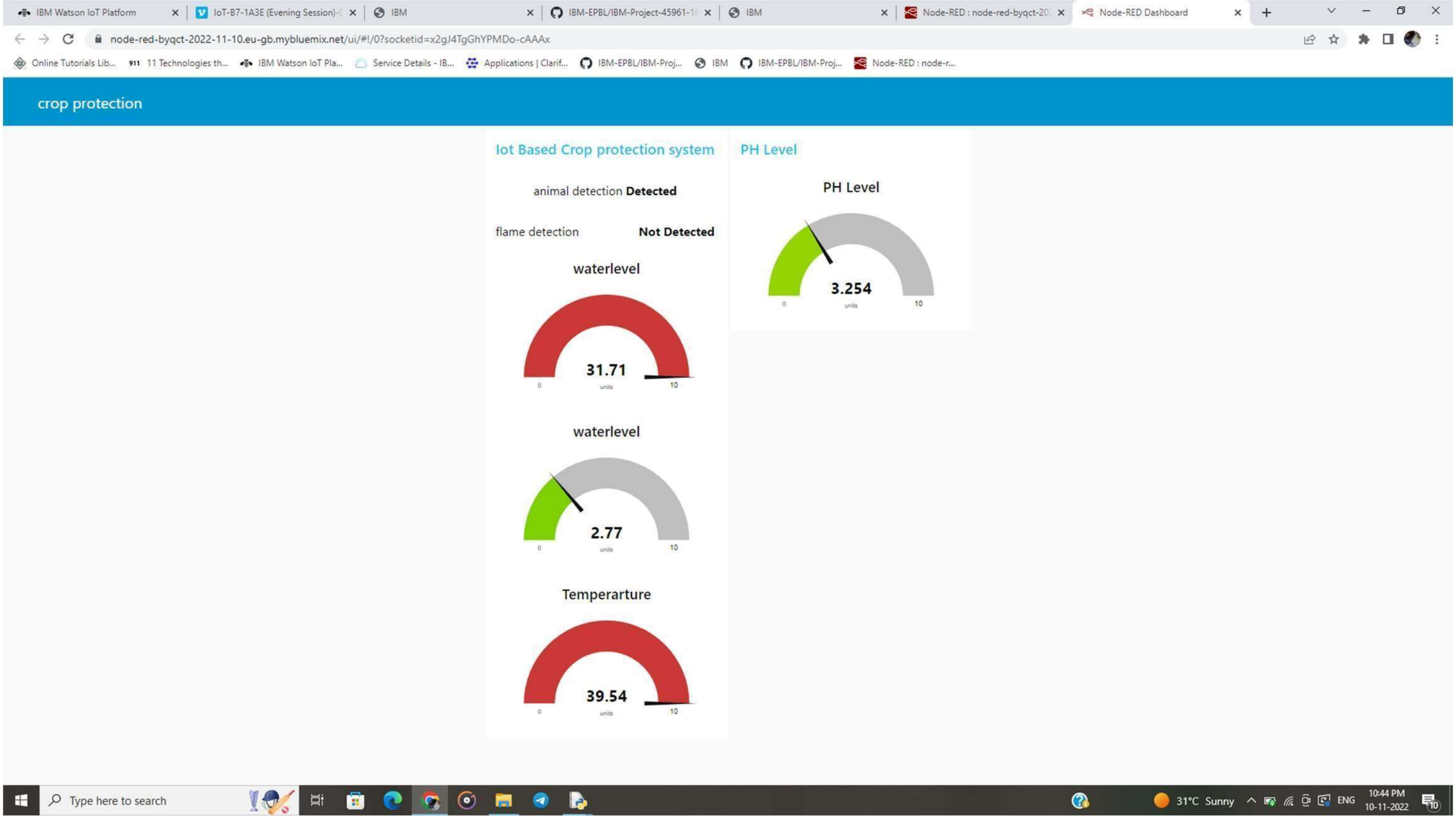
Node red test cases:



```
when Web1.GotText
  url responseCode responseType responseContent
do set Label3.Text to look up in pairs key "Temperature"
                         pairs call Web1.JsonTextDecode
                                    jsonText get responseContent
                         notFound "not found"
   set Label5.Text to look up in pairs key "Humidity"
                         pairs call Web1.JsonTextDecode
                                    jsonText get responseContent
                         notFound "not found"
   set Label7.Text to look up in pairs key "Animalattack"
                         pairs call Web1.JsonTextDecode
                                    jsonText get responseContent
                         notFound "not found"
   set Label9.Text to look up in pairs key "Flame"
                         pairs call Web1.JsonTextDecode
                                    jsonText get responseContent
                         notFound "not found"
   set Label11.Text to look up in pairs key "MoistureLevel"
                          pairs call Web1.JsonTextDecode
                                     jsonText get responseContent
                          notFound "not found"
   set Label13.Text to look up in pairs key "WaterLevel"
                          pairs call Web1.JsonTextDecode
                                     jsonText get responseContent
                          notFound "not found"

when Clock1.Timer
do set Web1.Url to "https://node-red-byqct-2022-11-10.eu-gb.mybluemi..."
   call Web1.Get
```





crop protection

Iot Based Crop protection system

animal detection **Detected**

flame detection **Not Detected**

waterlevel

31.71

waterlevel

2.77

Temperarture

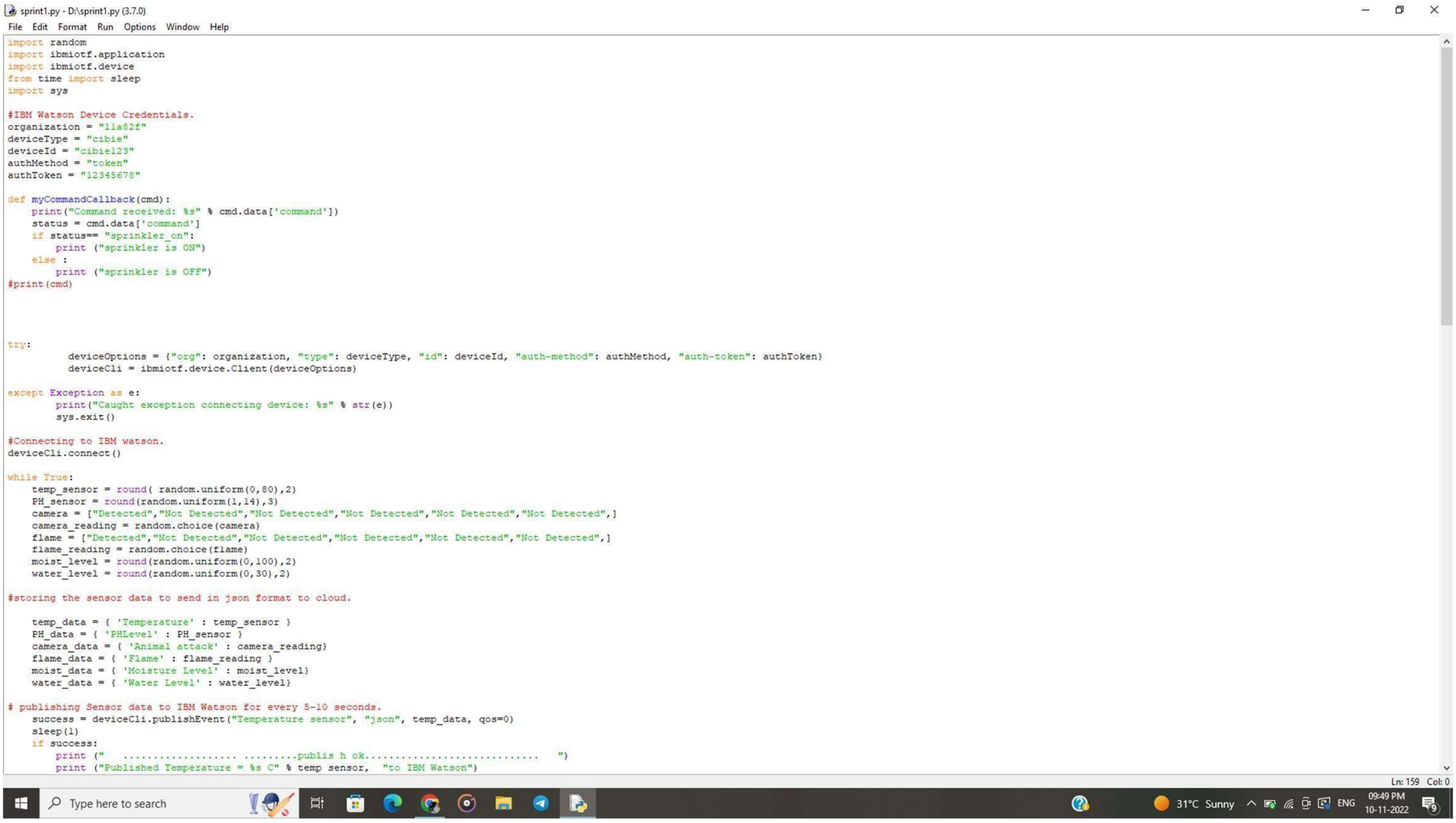
39.54

PH Level

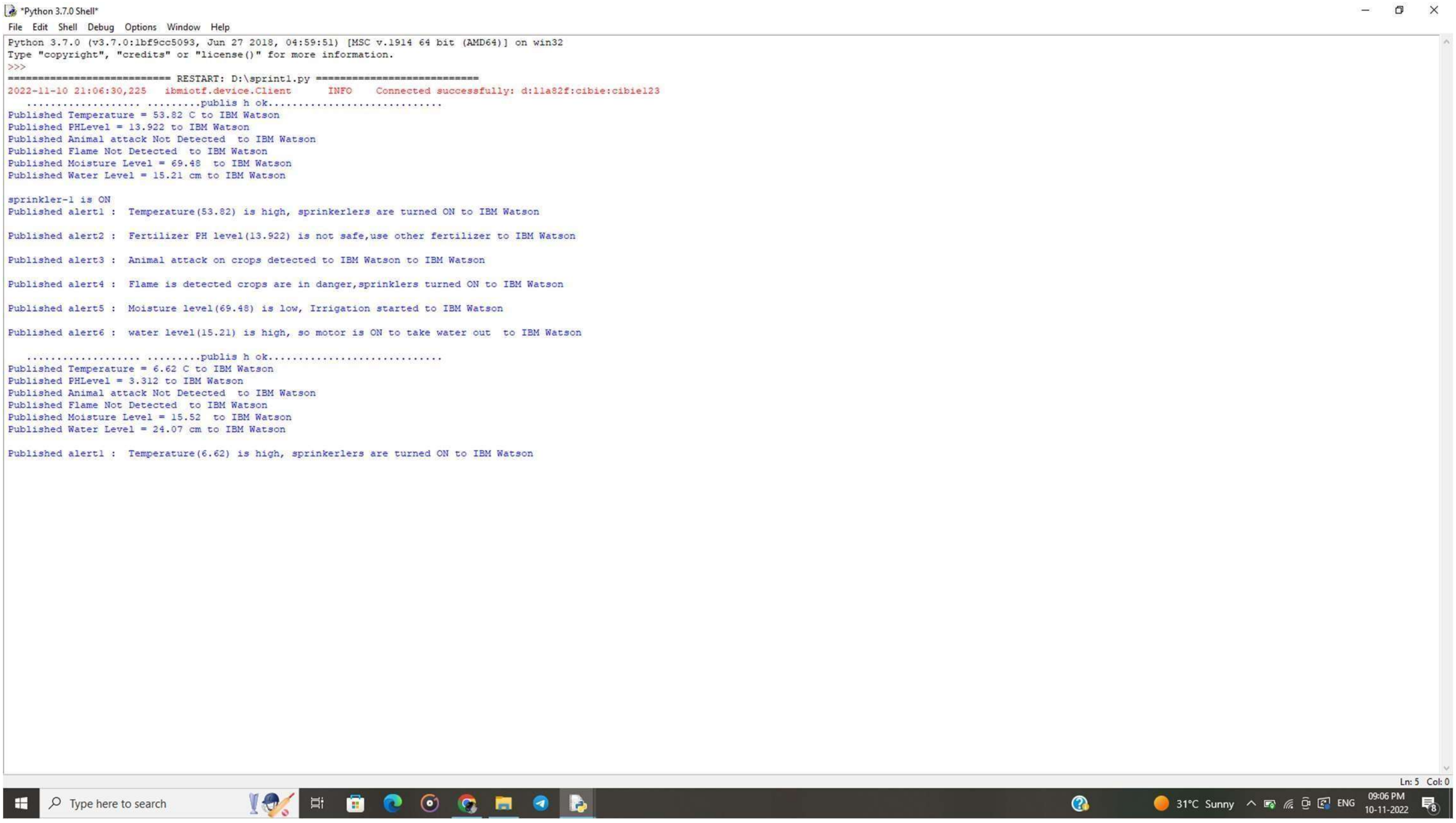
PH Level

3.254

Python code test cases:

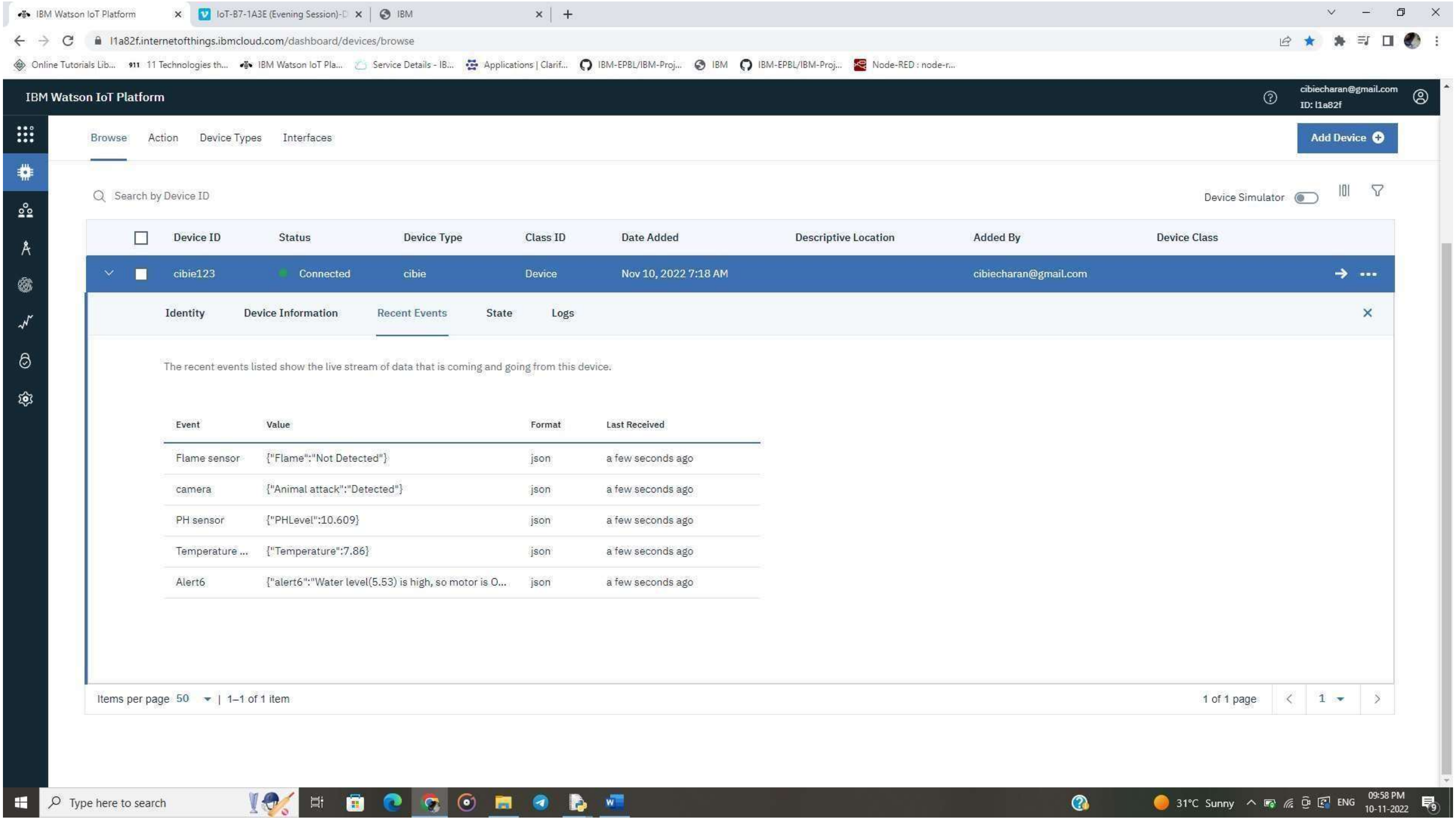


```python
import random
import ibmiotf.application
import ibmiotf.device
from time import sleep
import sys

#IBM Watson Device Credentials.
organization = "11a82f"
deviceType = "cibie"
deviceId = "cibie123"
authMethod = "token"
authToken = "12345678"

def myCommandCallback(cmd):
    print("Command received: %s" % cmd.data['command'])
    status = cmd.data['command']
    if status== "sprinkler_on":
        print ("sprinkler is ON")
    else :
        print ("sprinkler is OFF")
#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()

#Connecting to IBM watson.
deviceCli.connect()

while True:
    temp_sensor = round( random.uniform(0,80),2)
    PH_sensor = round(random.uniform(1,14),3)
    camera = ["Detected","Not Detected","Not Detected","Not Detected","Not Detected","Not Detected",]
    camera_reading = random.choice(camera)
    flame = ["Detected","Not Detected","Not Detected","Not Detected","Not Detected","Not Detected",]
    flame_reading = random.choice(flame)
    moist_level = round(random.uniform(0,100),2)
    water_level = round(random.uniform(0,30),2)

#storing the sensor data to send in json format to cloud.

    temp_data = { 'Temperature' : temp_sensor }
    PH_data = { 'PHLevel' : PH_sensor }
    camera_data = { 'Animal attack' : camera_reading}
    flame_data = { 'Flame' : flame_reading }
    moist_data = { 'Moisture Level' : moist_level}
    water_data = { 'Water Level' : water_level}

# publishing Sensor data to IBM Watson for every 5-10 seconds.
    success = deviceCli.publishEvent("Temperature sensor", "json", temp_data, qos=0)
    sleep(1)
    if success:
        print ("   ................... .........publis h ok.............................   ")
        print ("Published Temperature = %s C" % temp sensor,  "to IBM Watson")
```



```
Python 3.7.0 (v3.7.0:1bf9cc5093, Jun 27 2018, 04:59:51) [MSC v.1914 64 bit (AMD64)] on win32
Type "copyright", "credits" or "license()" for more information.
>>> 
========================== RESTART: D:\sprint1.py ==========================
2022-11-10 21:06:30,225   ibmiotf.device.Client      INFO    Connected successfully: d:l1a82f:cibie:cibie123
   .................... .........publis h ok.............................
Published Temperature = 53.82 C to IBM Watson
Published PHLevel = 13.922 to IBM Watson
Published Animal attack Not Detected  to IBM Watson
Published Flame Not Detected  to IBM Watson
Published Moisture Level = 69.48  to IBM Watson
Published Water Level = 15.21 cm to IBM Watson

sprinkler-1 is ON
Published alert1 :  Temperature(53.82) is high, sprinkerlers are turned ON to IBM Watson

Published alert2 :  Fertilizer PH level(13.922) is not safe,use other fertilizer to IBM Watson

Published alert3 :  Animal attack on crops detected to IBM Watson to IBM Watson

Published alert4 :  Flame is detected crops are in danger,sprinklers turned ON to IBM Watson

Published alert5 :  Moisture level(69.48) is low, Irrigation started to IBM Watson

Published alert6 :  water level(15.21) is high, so motor is ON to take water out  to IBM Watson

   .................... .........publis h ok.............................
Published Temperature = 6.62 C to IBM Watson
Published PHLevel = 3.312 to IBM Watson
Published Animal attack Not Detected  to IBM Watson
Published Flame Not Detected  to IBM Watson
Published Moisture Level = 15.52  to IBM Watson
Published Water Level = 24.07 cm to IBM Watson

Published alert1 :  Temperature(6.62) is high, sprinkerlers are turned ON to IBM Watson
```

Ibm Watson:



Device ID	Status	Device Type	Class ID	Date Added	Descriptive Location	Added By	Device Class
cibie123	Connected	cibie	Device	Nov 10, 2022 7:18 AM		cibiecharan@gmail.com	

The recent events listed show the live stream of data that is coming and going from this device.

Event	Value	Format	Last Received
Flame sensor	{"Flame":"Not Detected"}	json	a few seconds ago
camera	{"Animal attack":"Detected"}	json	a few seconds ago
PH sensor	{"PHLevel":10.609}	json	a few seconds ago
Temperature ...	{"Temperature":7.86}	json	a few seconds ago
Alert6	{"alert6":"Water level(5.53) is high, so motor is O...	json	a few seconds ago