ASSIGNMENT 4

Ultrasonic sensor simulation in Wokwi

TEAM ID:PNT2022TMID36623

Degree & Branch: B.E.-FINAL YEAR-COMPUTER SCIENCE AND ENGINEERING

College: T.J.S ENGINEERING COLLEGE

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Subject: Professional Readiness for Innovation, Employability & Entrepreneurship (Nalaiya Thiran)

Question :

Write a code and connections in wokwi for the ultrasonic sensor. Whenever the distance is less than 100cms send an “Alert” to IBM cloud and display in the device recent events.

Solution:

Code:

```
#include <WiFi.h>
#include <PubSubClient.h>
void callback(char* subscribetopic, byte* payload, unsigned int
payloadLength);
//-------credentials of IBM Accounts------
#define ORG "9lxobn"//IBM ORGANITION ID
#define DEVICE_TYPE "ESP32PROJECT"//Device type mentioned in ibm watson IOT Platform
#define DEVICE_ID "ESP32"//Device ID mentioned in ibm watson IOT Platform
#define TOKEN "ESP32PROJECT" //Token
String data3;
char server[] = ORG ".messaging.internetofthings.ibmcloud.com";
char publishTopic[] = "iot-2/evt/Data/fmt/json";
char subscribetopic[] = "iot-2/cmd/test/fmt/String";
char authMethod[] = "use-token-auth";
char token[] = TOKEN;
char clientId[] = "d:" ORG ":" DEVICE_TYPE ":" DEVICE_ID;
WiFiClient wifiClient;
PubSubClient client(server, 1883, callback ,wifiClient);
const int trigPin = 5;
const int echoPin = 18;
#define SOUND_SPEED 0.034
long duration;
float distance;
void setup() {
Serial.begin(115200);
pinMode(trigPin, OUTPUT);
pinMode(echoPin, INPUT);
wificonnect();
mqttconnect();
}
void loop()
{
```

```
digitalWrite(trigPin, LOW);
delayMicroseconds(2);
digitalWrite(trigPin, HIGH);
delayMicroseconds(10);
digitalWrite(trigPin, LOW);
duration = pulseIn(echoPin, HIGH);
distance = duration * SOUND_SPEED/2;
Serial.print("Distance (cm): ");
Serial.println(distance);
if(distance<100)
{
Serial.println("ALERT!!");
delay(1000);
PublishData(distance);
delay(1000);
if (!client.loop()) {
mqttconnect();
}
}
delay(1000);
}
void PublishData(float dist) {
mqttconnect();
String payload = "{\"Distance\":";
payload += dist;
payload += ",\"ALERT!!\":""\"Distance less than 100cms\"";
payload += "}";
Serial.print("Sending payload: ");
Serial.println(payload);

if (client.publish(publishTopic, (char*) payload.c_str())) {
Serial.println("Publish ok");
} 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()
{
Serial.println();
Serial.print("Connecting to ");
WiFi.begin("Wokwi-GUEST", "", 6);
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];
}
Serial.println("data: "+ data3);
data3="";
}
```

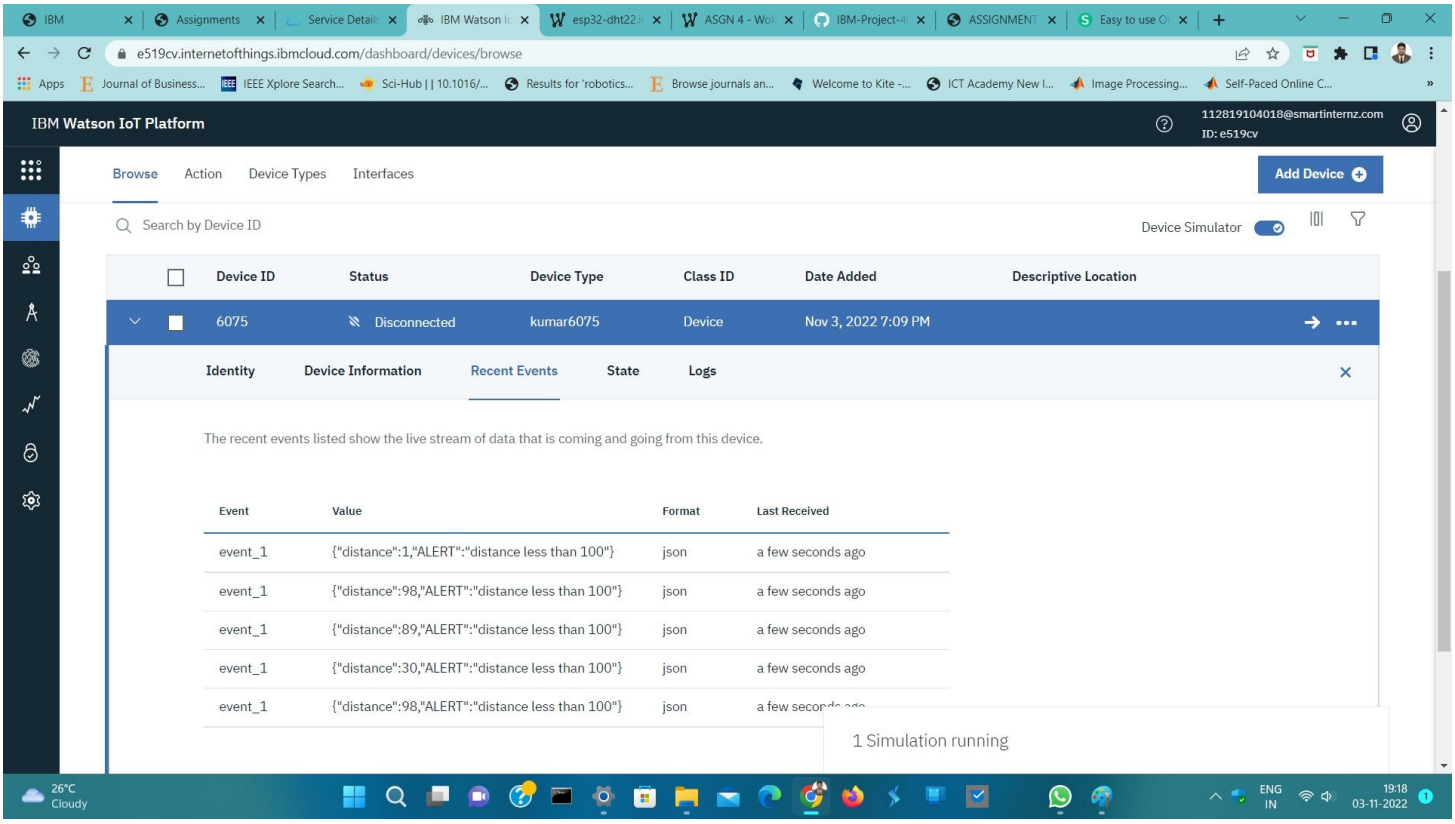
Diagram.json:

```
{
  "version": 1,
  "author": "KUMAR A",
  "editor": "wokwi",
  "parts": [
    { "type": "wokwi-esp32-devkit-v1", "id": "esp", "top": -87.68, "left": -233.71, "attrs": {} },
    { "type": "wokwi-hc-sr04", "id": "ultrasonic1", "top": -150.05, "left": -4.82, "attrs": {} }
  ],
  "connections": [
    [ "esp:TX0", "$serialMonitor:RX", "", [] ],
    [ "esp:RX0", "$serialMonitor:TX", "", [] ],
    [
```

```
    "esp:VIN",
    "ultrasonic1:VCC",
    "red",
    [ "h-37.16", "v-178.79", "h200", "v173.33", "h100.67"],
   [ "esp:GND.1", "ultrasonic1:GND", "black", [ "h39.87", "v44.04", "h170" ] ],
   [ "esp:D5", "ultrasonic1:TRIG", "green", [ "h54.54", "v85.07", "h130.67" ] ],
   [ "esp:D18", "ultrasonic1:ECHO", "green", [ "h77.87", "v80.01", "h110" ] ]
  ]
}
```

Output of Program:

Wokwi Project Link: https://wokwi.com/projects/347318045801185874



Explanation of Program:

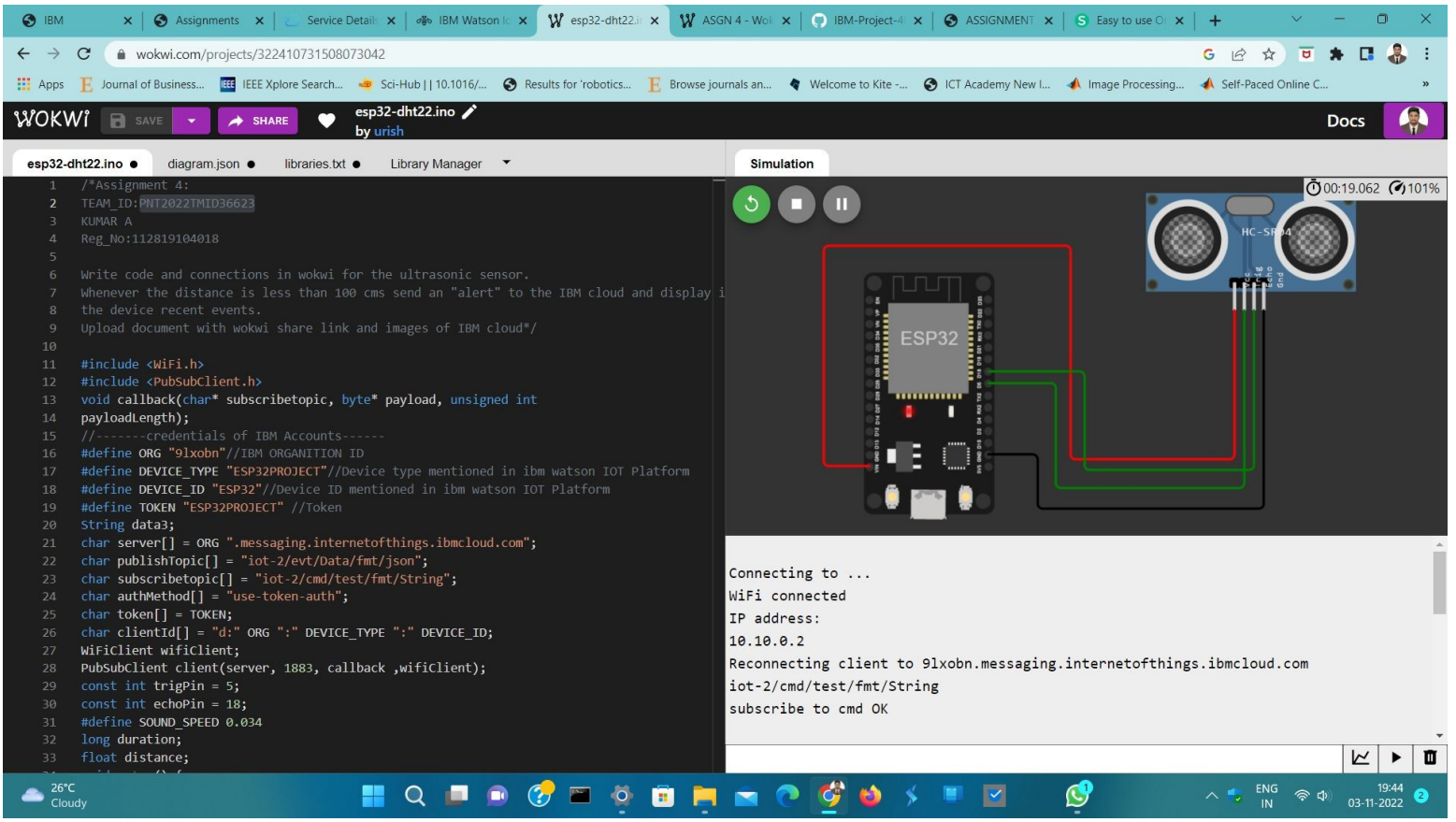
Initially, we have imported the <Wifi.h> and <PubSubClient.h> header files as they are needed to connect wifi and MQTT Protocol. Then, Define Trigger pin and Echo pin values where the ultrasonic sensor is connected with ESP32 module. Then, Define the IBM Account Credentials such as ORG, Device_Type, Device_ID and Token. Also define the server, publishTopic, SubscribeTopic, authMethod, Token and ClientID. Create Object for WifiClient and PubSubClient.

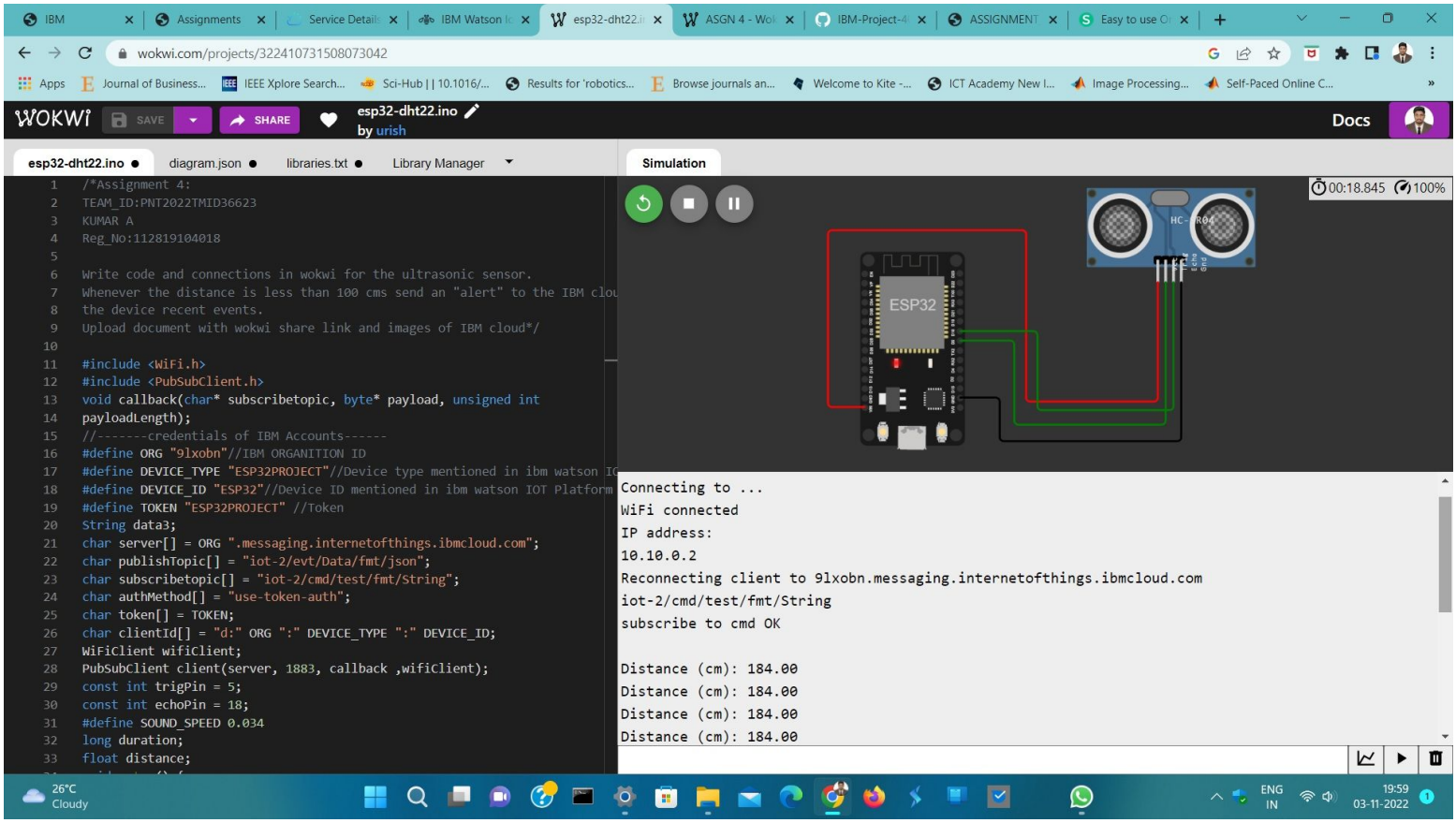
Then, Start the void Setup() Function, Begin the Serial Monitor and set PinMode of Trigger Pin as Output and Echo Pin as Input and call wificonnect() and mqttconnect() to initialize wifi and mqtt Connection and Define their methods to make the Connection.

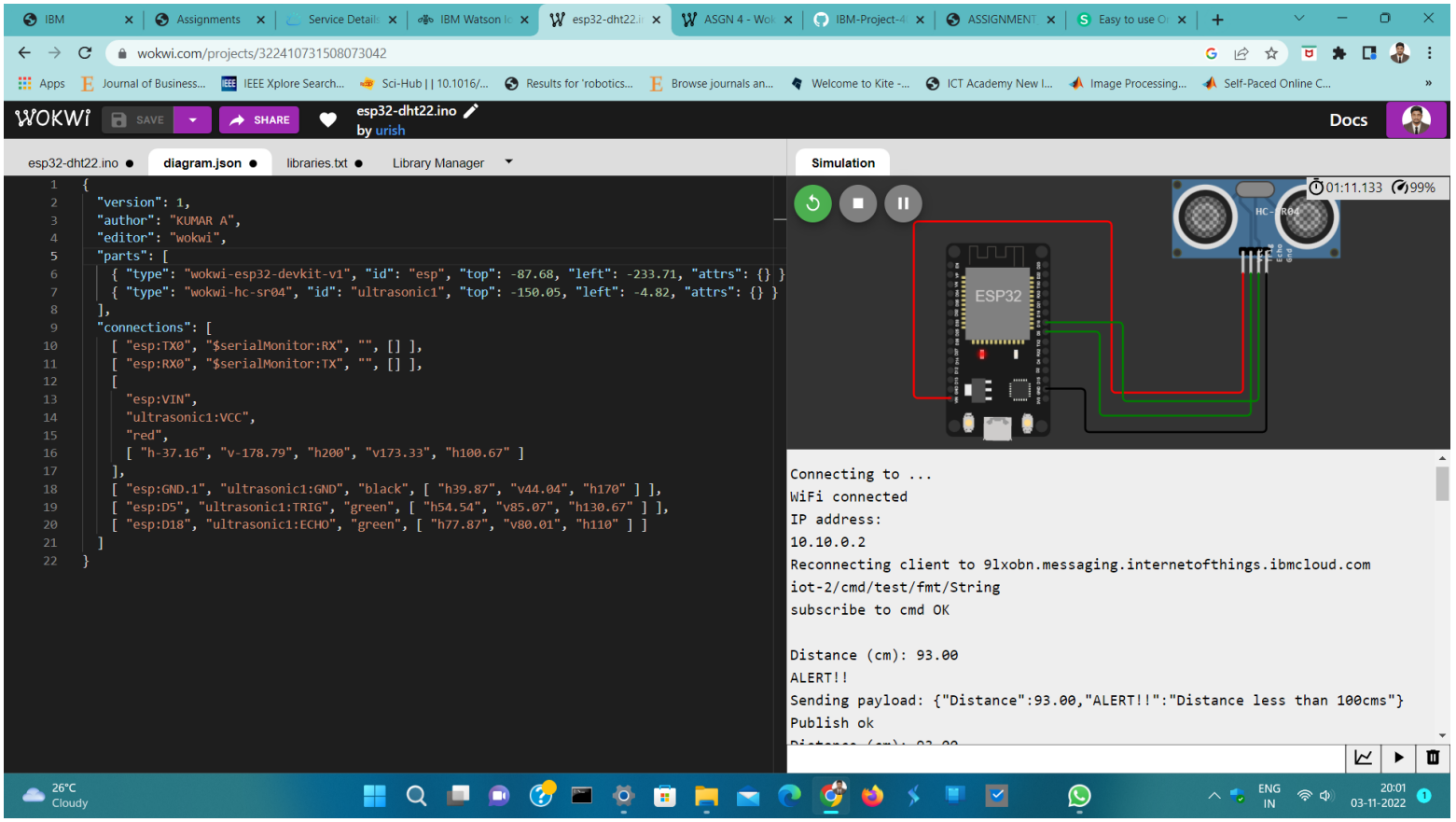
Then, Begin the void loop() function, digitalWrite HIGH to Trigger Pin and create a delay of 10 microseconds and write back LOW. Then, use pulseIn() function with Echo Pin to calculate the Duration and calculate the distance. If the Distance is less than 100cm call PublishData() Function to publish the Data to IoT Watson Device.

Finally, Define the PublishData() function with message as parameter. Then Define string that contains the payload with the message to be sent in the Json Format. Call Client.publish() function with publishTopic and payload as parameter. Also define the wificonnect() and mqttconnect() to make intial connection with wifi and mqtt connection.

WOKWI OUTPUT:






wokwi.com/projects/322410731508073042
WOKWI
SAVE
SHARE
esp32-dht22.ino
by urish
Docs
esp32-dht22.ino
diagram.json
libraries.txt
Library Manager
{
"version": 1,
"author": "KUMAR A",
"editor": "wokwi",
"parts": [
{ "type": "wokwi-esp32-devkit-v1", "id": "esp", "top": -87.68, "left": -233.71, "attrs": {} }
{ "type": "wokwi-hc-sr04", "id": "ultrasonic1", "top": -150.05, "left": -4.82, "attrs": {} }
],
"connections": [
["esp:TX0", "$serialMonitor:RX", "", []],
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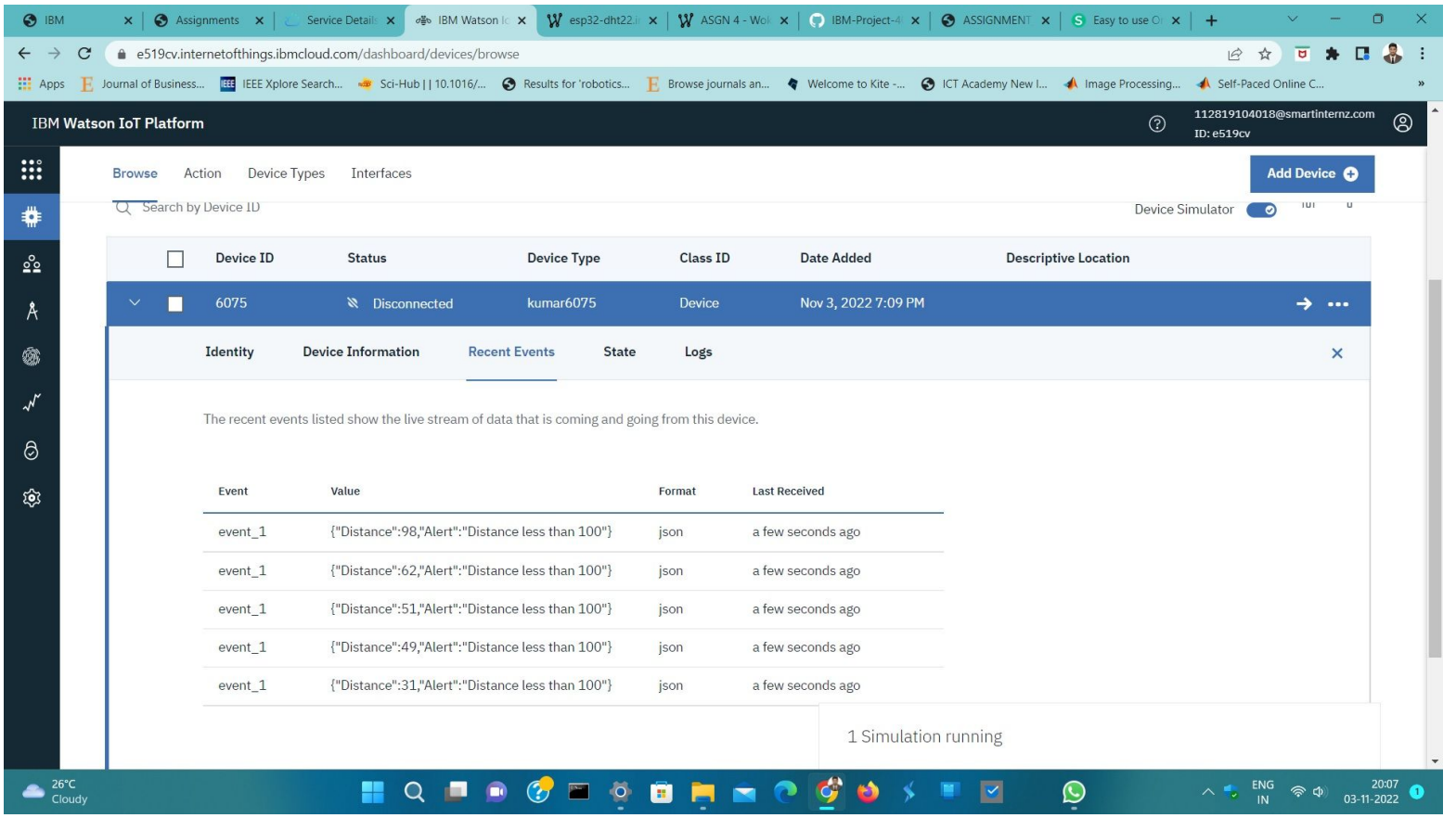
[
"esp:VIN",
"ultrasonic1:VCC",
"red",
["h-37.16", "v-178.79", "h200", "v173.33", "h100.67"]
],
["esp:GND.1", "ultrasonic1:GND", "black", ["h39.87", "v44.04", "h170"]],
["esp:D5", "ultrasonic1:TRIG", "green", ["h54.54", "v85.07", "h130.67"]],
["esp:D18", "ultrasonic1:ECHO", "green", ["h77.87", "v80.01", "h110"]]
]
}
Simulation
01:11.133
99%
ESP32
Connecting to ...
WiFi connected
IP address:
10.10.0.2
Reconnecting client to 9lxobn.messaging.internetofthings.ibmcloud.com
iot-2/cmd/test/fmt/String
subscribe to cmd OK
Distance (cm): 93.00
ALERT!!
Sending payload: {"Distance":93.00,"ALERT!!":"Distance less than 100cms"}
Publish ok


e519cv.internetofthings.ibmcloud.com/dashboard/devices/browse
IBM Watson IoT Platform
112819104018@smartinternz.com
ID: e519cv
Browse
Action
Device Types
Interfaces
Add Device
Search by Device ID
Device Simulator
Device ID
Status
Device Type
Class ID
Date Added
Descriptive Location
6075
Disconnected
kumar6075
Device
Nov 3, 2022 7:09 PM
Identity
Device Information
Recent Events
State
Logs
The recent events listed show the live stream of data that is coming and going from this device.
Event
Value
Format
Last Received
event_1
{"Distance":98,"Alert":"Distance less than 100"}
json
a few seconds ago
event_1
{"Distance":62,"Alert":"Distance less than 100"}
json
a few seconds ago
event_1
{"Distance":51,"Alert":"Distance less than 100"}
json
a few seconds ago
event_1
{"Distance":49,"Alert":"Distance less than 100"}
json
a few seconds ago
event_1
{"Distance":31,"Alert":"Distance less than 100"}
json
a few seconds ago
1 Simulation running