Assignment – 4

Distance Detection using Ultrasonic Sensor

Assignment Date	24 October 2022
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Project Name	Project – Smart Solution for Railways

Question

Write code and connections in wokwi for ultrasonic sensor. Whenever distance is less than 100 cm, send “alert” to IBM cloud and display in device recent events.

Wokwi Simulation Link

https://wokwi.com/projects/347211284741096019

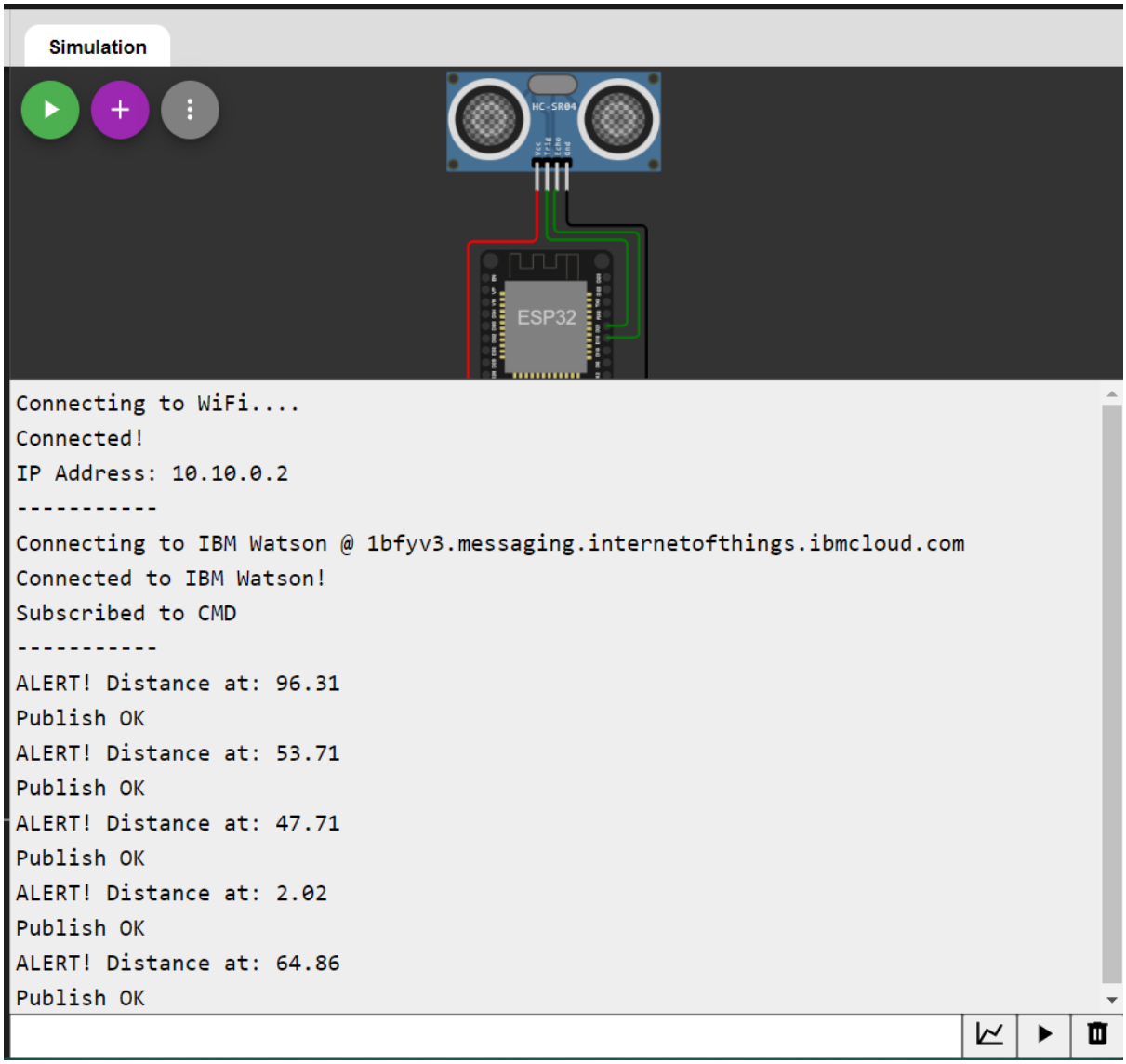
ESP32 Code

```
#include <WiFi.h>
#include "PubSubClient.h"

#define ORG "1bfyv3"
#define DEVICE_TYPE "ESP32"
#define DEVICE_ID "2019103005"

char deviceID[] = "d:"ORG":"DEVICE_TYPE":"DEVICE_ID;
char username[] = "use-token-auth";
char password[] = "lG?!&?2GwP!1Ja?qMf";
char serverURL[] = ORG".messaging.internetofthings.ibmcloud.com";
int port = 1883;

char publishTopic[] = "iot-2/evt/Data/fmt/json";
char subscribeTopic[] = "iot-2/cmd/Sub/fmt/String";

String lineBreak = "-----------";

WiFiClient wifiClient;
PubSubClient pubSubClient(serverURL,
  port,
  [](char* topic, byte* payload, unsigned int length) {
    Serial.println("Callback Invoked!");
    for (int i = 0; i < length; ++i)
      Serial.print((char)payload[i]);
  },
  wifiClient
);

int trigPin = 21;
int echoPin = 19;
```

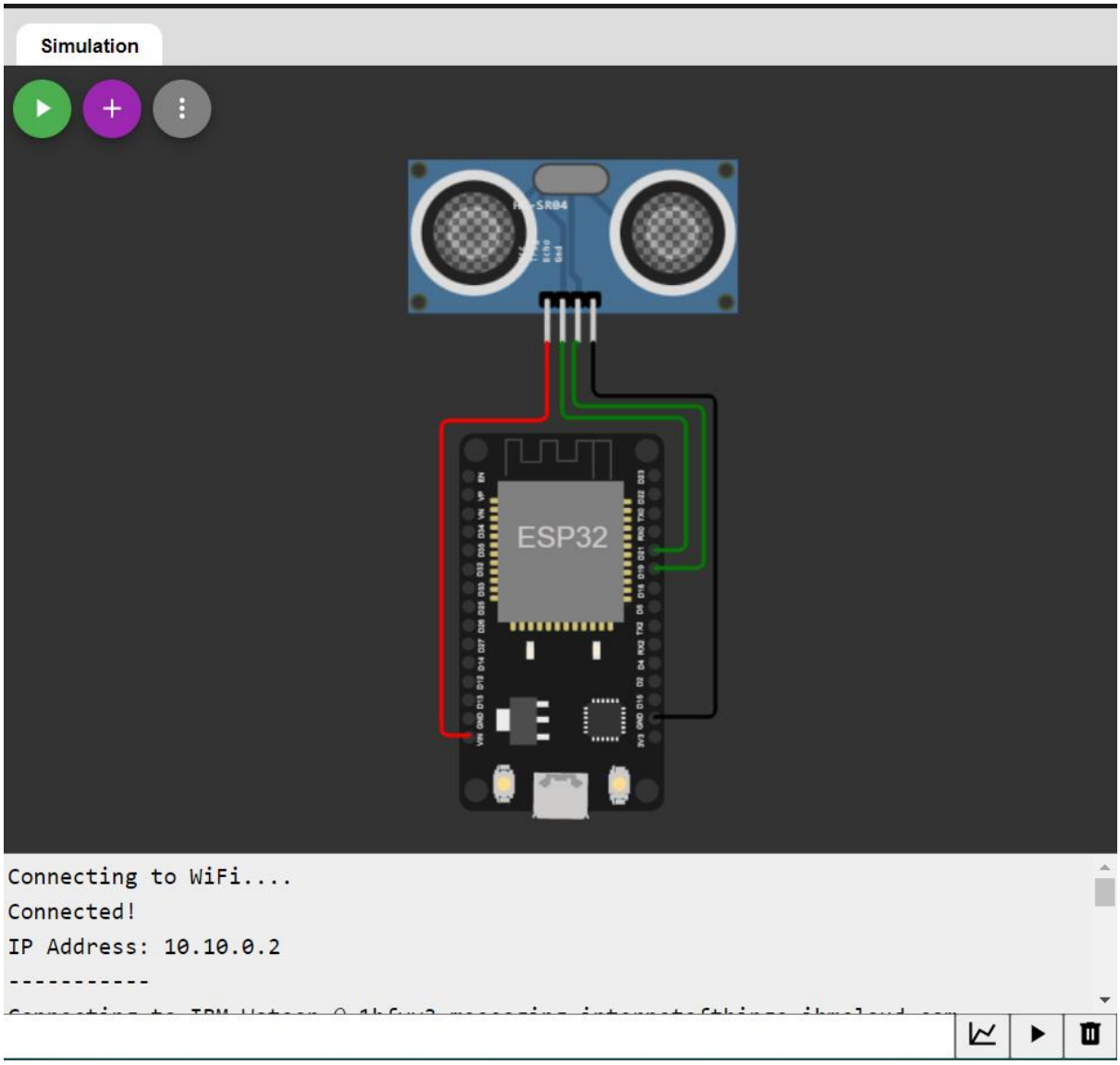
```
void setup() {
  Serial.begin(115200);
  pinMode(trigPin, OUTPUT);
  pinMode(echoPin, INPUT);

  connectWiFi();
  connectMQTT();
}

void loop() {
  refreshMQTTConn();

  float distance = getUltraSonicDistance();
  if (distance < 100) {
    Serial.print("ALERT! Distance at: ");
    Serial.println(distance);
    publishData(distance);
  }

  delay(5000);
}

float getUltraSonicDistance() {
  digitalWrite(trigPin, LOW);
  delayMicroseconds(2);

  digitalWrite(trigPin, HIGH);
  delayMicroseconds(10);

  digitalWrite(trigPin, LOW);
  return (float) pulseIn(echoPin, HIGH) / 58.0f;
}

void publishData(float distance) {
  refreshMQTTConn();
  String payload = "{";
  payload += "\"Message\": \"Distance less than 100cm\"";
  payload += ", ";
  payload += "\"Distance\": ";
  payload += distance;
  payload += "}";

  if (pubSubClient.publish(publishTopic, (char*)payload.c_str())) {
    Serial.println("Publish OK");
  }
  else Serial.println("Publish FAILED");
}
```

```
void connectWiFi() {
  WiFi.begin("Wokwi-GUEST", "", 6);
  Serial.print("Connecting to WiFi");
  while (WiFi.status() != WL_CONNECTED) {
    Serial.print(".");
    delay(500);
  }
  Serial.println("\nConnected!");
  Serial.print("IP Address: ");
  Serial.println(WiFi.localIP());
  Serial.println(lineBreak);
}

void connectMQTT() {
  Serial.print("Connecting to IBM Watson @ ");
  Serial.print(serverURL);
  while (!pubSubClient.connect(deviceID, username, password)) {
    Serial.print(".");
    delay(500);
  }
  Serial.println("\nConnected to IBM Watson!");

  if (pubSubClient.subscribe(subscribeTopic)) {
    Serial.println("Subscribed to CMD");
  }
  else {
    Serial.println("Subscribe FAILED");
  }
  Serial.println(lineBreak);
}

void refreshMQTTConn() {
  if (!pubSubClient.loop()) {
    connectMQTT();
  }
}
```

ESP32 Output



Circuit Diagram



IBM IoT Platform

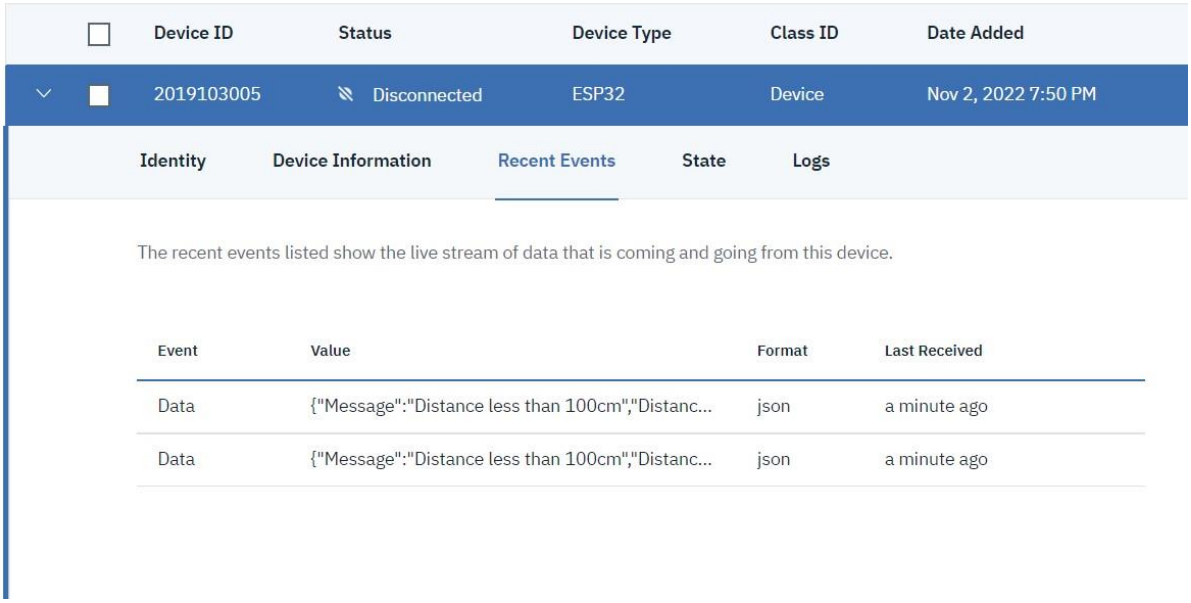


Figure 1: List of events received at IBM cloud IoT platform

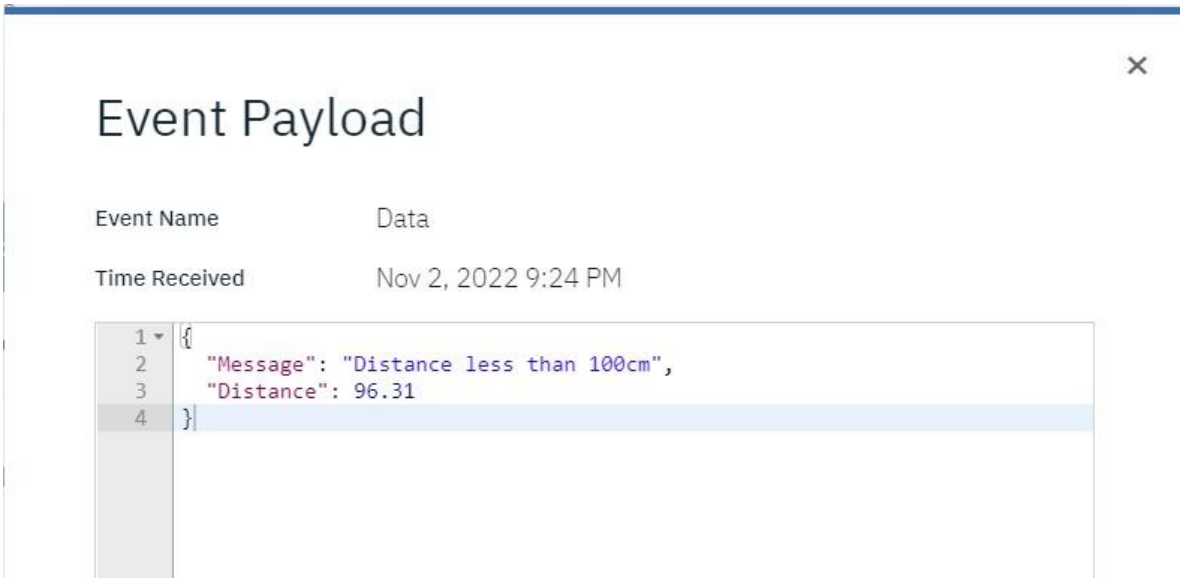


Figure 2: Expanded view of a single event

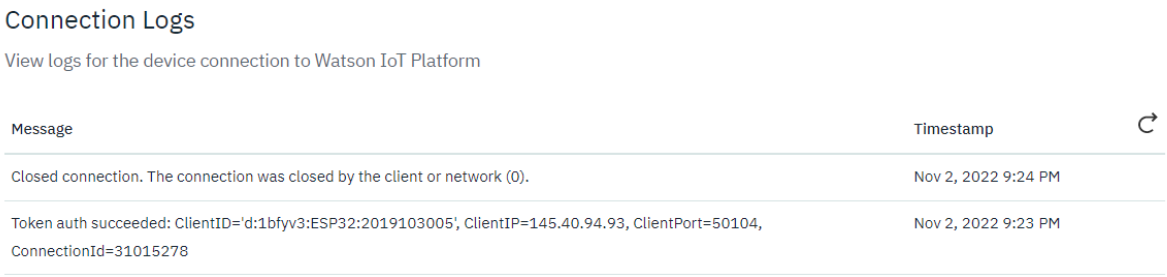


Figure 3: Connection Log

Diagram.json File

```
{
  "version": 1,
  "author": "Arun TK",
  "editor": "wokwi",
  "parts": [
    { "type": "wokwi-esp32-devkit-v1", "id": "esp", "top": 98, "left": 40,
"attrs": {} },
    {
      "type": "wokwi-hc-sr04",
      "id": "ultrasonic1",
      "top": -40.67,
      "left": 13.64,
      "attrs": { "distance": "64" }
    }
  ],
  "connections": [
    [ "esp:TX0", "$serialMonitor:RX", "", [] ],
    [ "esp:RX0", "$serialMonitor:TX", "", [] ],
    [ "esp:VIN", "ultrasonic1:VCC", "red", [ "h-14.3", "v-162.47", "h52.98" ]
],
    [ "esp:GND.1", "ultrasonic1:GND", "black", [ "h31.4", "v-165.63", "h-
63.33", "v-31.9" ] ],
    [ "esp:D21", "ultrasonic1:TRIG", "green", [ "h16.07", "v-68.2", "h-64.67"
] ],
    [ "esp:D19", "ultrasonic1:ECHO", "green", [ "h25.4", "v-83.5", "h-67.33",
"v-6.67" ] ]
  ]
}
```