

# Assignment – 4

Distance Detection using Ultrasonic Sensor

Assignment Date	24 October 2022
Student Name	Arun Tiilak Karthe
Team ID	PNT2022TMID35177
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);
}

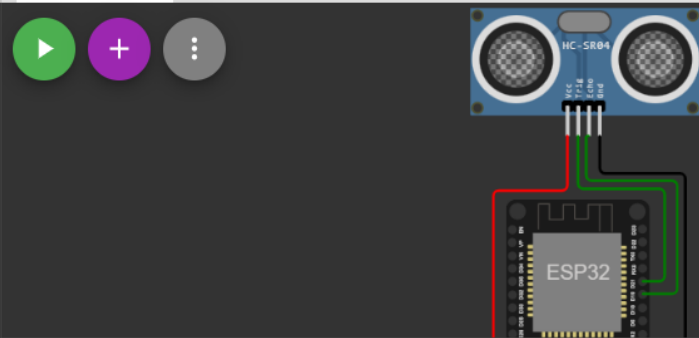
void connectMQTT() {
  Serial.print("Connecting to IBM Watson @ ");
  Serial.print(serverURL);
  while (!pubSubClient.connect(deviceID, username, password)) {
    Serial.print(".");
    delay(500);
  }
  Serial.println("\nConnected to IBM Watson!");

  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

Simulation

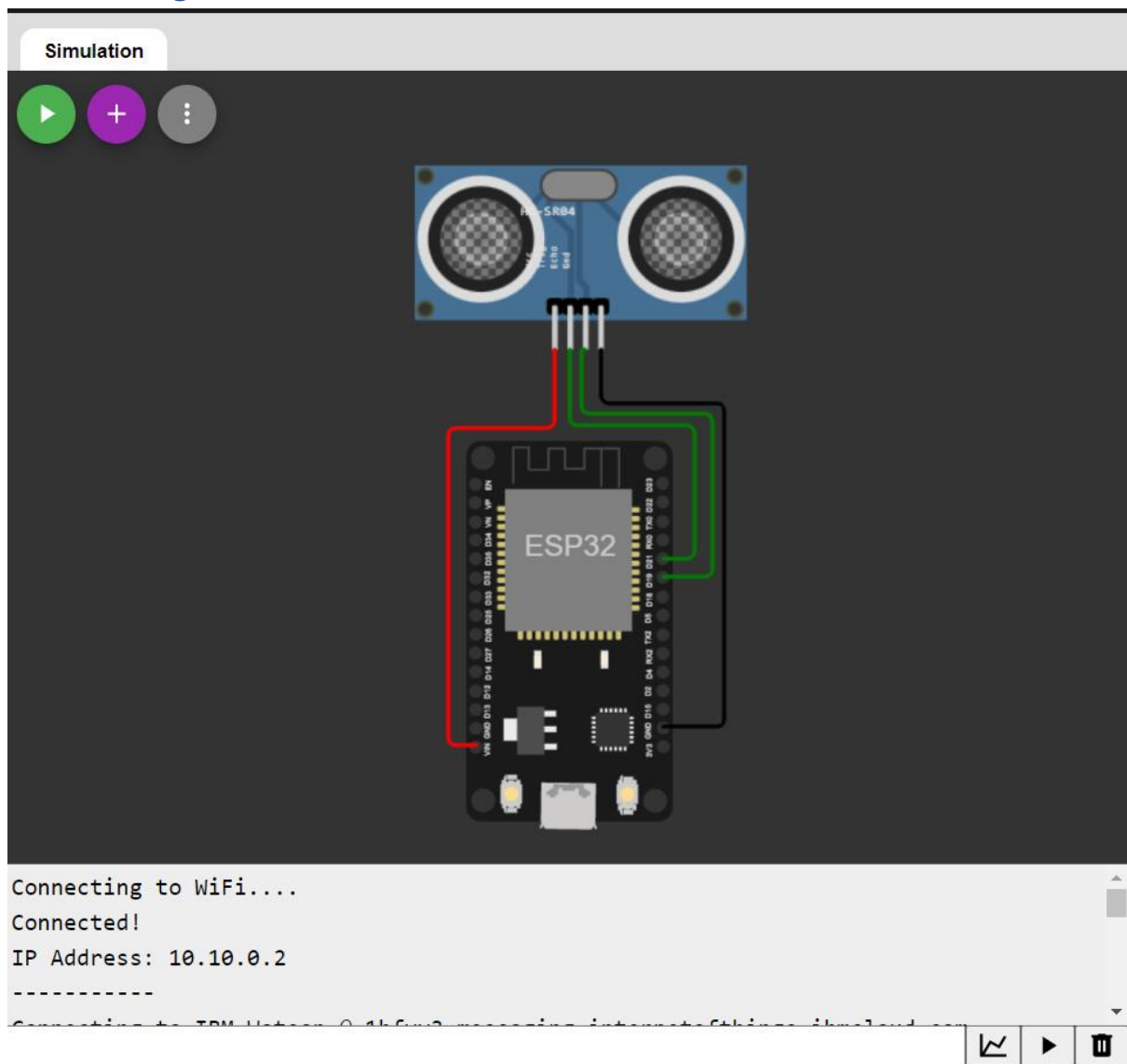


```
Connecting to WiFi...
Connected!
IP Address: 10.10.0.2
-----
Connecting to IBM Watson @ 1bfyv3.messaging.internetofthings.ibmcloud.com
Connected to IBM Watson!
Subscribed to CMD
-----
ALERT! Distance at: 96.31
Publish OK
ALERT! Distance at: 53.71
Publish OK
ALERT! Distance at: 47.71
Publish OK
ALERT! Distance at: 2.02
Publish OK
ALERT! Distance at: 64.86
Publish OK
```

Simulation controls: Play, Add, and Settings buttons are visible in the top left corner of the simulation area.

Simulation status bar: Contains icons for Save, Play, and Stop.

## Circuit Diagram



## IBM IoT Platform

<input type="checkbox"/>	Device ID	Status	Device Type	Class ID	Date Added
▼ <input type="checkbox"/>	2019103005	Disconnected	ESP32	Device	Nov 2, 2022 7:50 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		
Data	{"Message":"Distance less than 100cm","Distanc...	json	a minute ago		
Data	{"Message":"Distance less than 100cm","Distanc...	json	a minute ago		

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

Event Payload		×
Event Name	Data	
Time Received	Nov 2, 2022 9:24 PM	
1 ▼	{	
2	"Message": "Distance less than 100cm",	
3	"Distance": 96.31	
4	}	

Figure 2: Expanded view of a single event

### Connection Logs

View logs for the device connection to Watson IoT Platform

Message	Timestamp	↻
Closed connection. The connection was closed by the client or network (0).	Nov 2, 2022 9:24 PM	
Token auth succeeded: ClientID='d:1bfyv3:ESP32:2019103005', ClientIP=145.40.94.93, ClientPort=50104, ConnectionId=31015278	Nov 2, 2022 9:23 PM	

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" ] ]
  ]
}
```