

**Question-1:**

Write code and connections in wokwi for ultrasonic sensor. Whenever distance is less than 100 cms send "alert" to IBM cloud and display in device recent events. WOKWI LINK:  
<https://wokwi.com/projects/346502216516895315>

**CODE:**

```

#include <WiFi.h>//library for wifi #include
<PubSubClient.h>//library for MQTT

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

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

#define ORG "f59trs"//IBM ORGANITION ID
#define DEVICE_TYPE "ultrasonicsensor"//Device type mentioned inibm watson IOT
Platform
#define DEVICE_ID "distancedetection"//Device ID mentioned in ibmwatson IOT
Platform
#define TOKEN "A1GMGaaF01nawa1QA3" //Token
String data3;
float dist;

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

//
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

int LED = 4; int trig
= 5; int echo =
18; void setup()
{
  Serial.begin(115200);
  pinMode(trig,OUTPUT);
  pinMode(echo,INPUT);
  pinMode(LED, OUTPUT);
  delay(10); wificonnect();
  mqttconnect();
}
void loop()// Recursive Function
{

  digitalWrite(trig,LOW); digitalWrite(trig,HIGH);
  delayMicroseconds(10);
  digitalWrite(trig,LOW);
  float dur = pulseIn(echo,HIGH); float dist
  = (dur * 0.0343)/2; Serial.print
  ("Distancein cm"); Serial.println(dist);

  PublishData(dist);
  delay(1000); if
  (!client.loop()) {
    mqttconnect();
  }
}

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

void PublishData(float dist) { mqttconnect();//function call for connecting to
  ibm
  /* creating the String in in form JSon to update the data to ibm cloud
  */
  String object;

```

```

if (dist < 100)
{ digitalWrite(LED, HIGH);
  Serial.println("object is near"); object =
  "Near";
}
else
{ digitalWrite(LED, LOW); Serial.println("no
  object found"); object = "No";
}

String payload = "{\"distance\": "; payload +=
dist;
payload += ", \"object\": \""; payload +=
object; payload += "\"}";

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

if (client.publish(publishTopic, (char*) payload.c_str())) {
  Serial.println("Publish ok");// if it successfully 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];
    }

    // Serial.println("data: "+ data3);
    // if(data3=="Near")
    // {
    // Serial.println(data3);
    // digitalWrite(LED,HIGH);

    // }

    // else
    // {
    // Serial.println(data3);

```

```

// digitalWrite(LED,LOW);

// }
data3="";

}

```

## OUTPUT:

**When object is not near to the ultrasonic sensor**

The screenshot displays the Arduino IDE interface with a simulation running. The left pane shows the code for an ESP32 connected to an HC-SR04 ultrasonic sensor. The code includes headers for WiFi and MQTT, defines credentials and device information, and sets up a callback function to send distance data to the IBM cloud via MQTT. The right pane shows the simulation of the hardware, with the ESP32 and sensor connected. The console output indicates that no object was found, and the sensor sent a payload to the cloud.

```

1 #include <WiFi.h>//library for wifi
2 #include <PubSubClient.h>//library for MQTT
3
4
5 void callback(char* subscribetopic, byte* payload, unsigned int payloadLength);
6
7 //-----credentials of IBM Accounts-----
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9 #define ORG "f59trs"//IBM ORGANITION ID
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12 #define TOKEN "ALGMGaaF0inawaIQa3" //Token
13 String data3;
14 float dist;
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16
17 //----- Customise the above values -----
18 char server[] = ORG ".messaging.internetofthings.ibmcloud.com";// Server Name
19 char publishTopic[] = "iot-2/evt/Data/fmt/json";// topic name and type of event perform and
20 char subscribetopic[] = "iot-2/cmd/test/fmt/String";// cmd REPRESENT command type AND COMM
21 char authMethod[] = "use-token-auth";// authentication method
22 char token[] = TOKEN;
23 char clientId[] = "d:" ORG ":" DEVICE_TYPE ":" DEVICE_ID;//client id
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25
26 //-----
27 WiFiClient wificlient; // creating the instance for wificlient
28 PubSubClient client(server, 1883, callback ,wificlient); //calling the predefined client id
29
30 int LED = 4;
31 int trig = 5;
32 int echo = 18;
33 void setup()

```

Simulation window output:

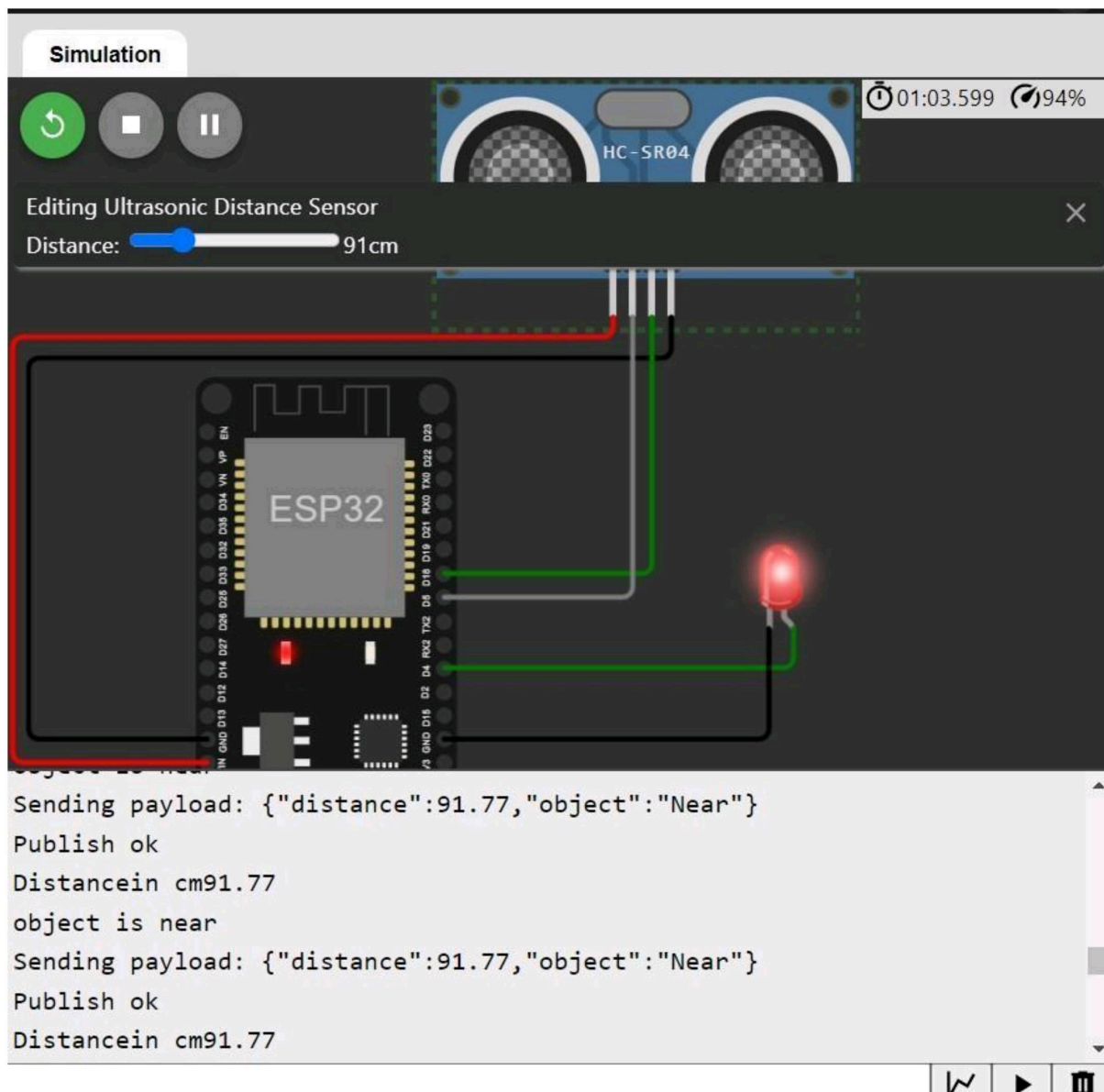
```

no object found
Sending payload: {"distance":403.45,"object":"No"}
Publish ok
Distancein cm233.00
no object found
Sending payload: {"distance":233.00,"object":"No"}
Publish ok

```

**Data sent to the IBM cloud device when the object is far**





**Data sent to the IBM cloud device when the object is near**



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Q

	Device ID	Status	Device Type	Class ID	Date Added	Descriptive Location
▼	distance-detection	Connected	ultrasonic-sensor	Device	Oct 19, 2022 11:56 AM	→ ...

Identity Device Information Recent Events State Logs X

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

Event	Value	Format	Last Received
Data	{"distance":91.77,"object":"Near"}	json	a few seconds ago
Data	{"distance":91.75,"object":"Near"}	json	a few seconds ago
Data	{"distance":91.77,"object":"Near"}	json	a few seconds ago
Data	{"distance":91.79,"object":"Near"}	json	a few seconds ago
Data	{"distance":91.8,"object":"Near"}	json	a few seconds ago

0 Simulations running