

Assignment -4 Python Programming

Assignment Date	27 October 2022
Student Name	D.Vijayalakshmi
Student Roll Number	422219104019
Project Name	Real-Time River Water Quality Monitoring and Control System

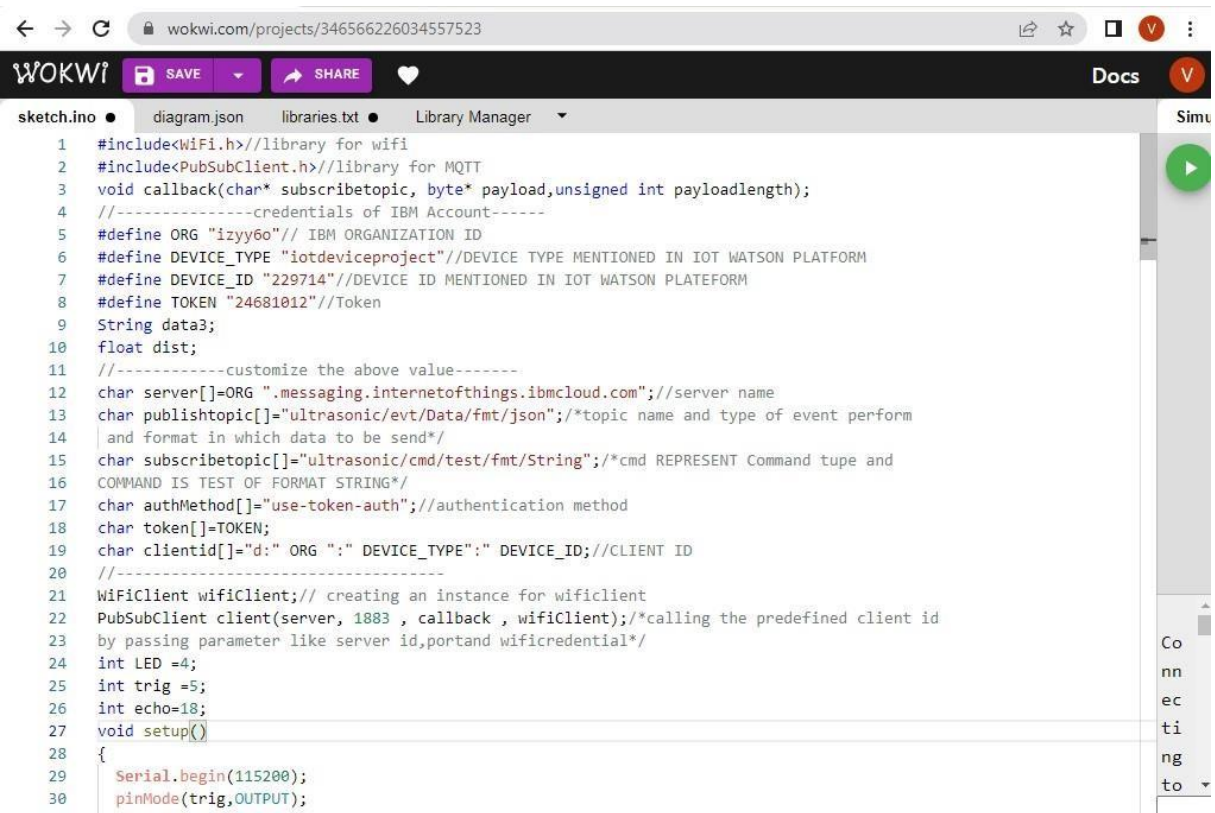
Question-1:

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.

Upload document with wokwi share link and images of ibm cloud

Solution:



```
1 #include<WiFi.h>//library for wifi
2 #include<PubSubClient.h>//library for MQTT
3 void callback(char* subscribtopic, byte* payload,unsigned int payloadlength);
4 //-----credentials of IBM Account-----
5 #define ORG "izyy6o"// IBM ORGANIZATION ID
6 #define DEVICE_TYPE "iotdeviceproject"//DEVICE TYPE MENTIONED IN IOT WATSON PLATFORM
7 #define DEVICE_ID "229714"//DEVICE ID MENTIONED IN IOT WATSON PLATFORM
8 #define TOKEN "24681012"//Token
9 String data3;
10 float dist;
11 //-----customize the above value-----
12 char server[]="ORG ".messaging.internetofthings.ibmcloud.com";//server name
13 char publishtopic[]="ultrasonic/evt/Data/fmt/json";/*topic name and type of event perform
14 |and format in which data to be send*/
15 char subscribtopic[]="ultrasonic/cmd/test/fmt/String";/*cmd REPRESENT Command tupe and
16 |COMMAND IS TEST OF FORMAT STRING*/
17 char authMethod[]="use-token-auth";//authentication method
18 char token[]=TOKEN;
19 char clientid[]="d:" ORG ":" DEVICE_TYPE":" DEVICE_ID;//CLIENT ID
20 //-----
21 WiFiClient wifiClient;// creating an instance for wificlient
22 PubSubClient client(server, 1883 , callback , wifiClient);/*calling the predefined client id
23 |by passing parameter like server id,portand wificredential*/
24 int LED =4;
25 int trig =5;
26 int echo=18;
27 void setup()
28 {
29   Serial.begin(115200);
30   pinMode(trig,OUTPUT);
```

← → ↻ wokwi.com/projects/346566226034557523

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sketch.ino • diagram.json libraries.txt • Library Manager

```
31 pinMode(echo,INPUT);
32 pinMode(LED,OUTPUT);
33 delay(10);
34 wificonnect();
35 mqttconnect();
36 }
37 void loop();//recursive function
38 {
39   digitalWrite(trig,LOW);
40   digitalWrite(trig,HIGH);
41   delayMicroseconds(10);
42   digitalWrite(trig,LOW);
43   float dur=pulseIn(echo,HIGH);
44   float dist=(dur * 0.0343)/2;
45   Serial.print("distance in cm");
46   Serial.println(dist);
47   PublishData(dist);
48   delay(1000);
49   if (!client.loop()){
50     mqttconnect();
51   }
52 }
53 /*.....retriving to cloud.....*/
54 void PublishData(float dist){
55   mqttconnect();//function call for connecting to ibm
56   /*creating the string in form of JSON to update the data to ibm cloud*/
57   String object;
58   if(dist<100)
59   {
60     digitalWrite(LED,HIGH);
```

← → ↻ wokwi.com/projects/346566226034557523

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```
61 Serial.println("no object is near");
62 object="Near";
63 }
64 else
65 {
66   digitalWrite(LED,LOW);
67   Serial.println("no object found");
68   object="No";
69 }
70 String payload="{\"distance\": ";
71 payload +=dist;
72 payload +=", \"object\": \"";
73 payload += object;
74 payload += "\";";
75
76 Serial.print("Sending payload: ");
77 Serial.println(payload);
78 if(client.publish(publishtopic, (char*) payload.c_str())){
79   Serial.println("Publish ok");/* if its sucessfully upload data on the cloud then it will print
80   publish ok in serial monitor or else it will print publish failed*/
81 } else{
82   Serial.println("Publish failed");
83 }
84 }
85 void mqttconnect(){
86   if(!client.connected()){
87     Serial.print("Reconnecting client to ");
88     Serial.println(server);
89     while(!client.connect(clientid,authMethod, token)){
90       Serial.print(".");
91       delay(500);
```

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```
92 }
93 initManagedDevice();
94 Serial.println();
95 }
96 }
97 void wificonnect()//function definition for wificonnect
98 {
99   Serial.println();
100   Serial.print("Connecting to ");
101   WiFi.begin("Wokwi.GUEST", "",6);//PASSING THE WIFI CREDENTIALS TO ESTABLISH CONNECTION
102   while (WiFi.status() !=WL_CONNECTED){
103     delay(500);
104     Serial.print(".");
105   }
106   Serial.println("");
107   Serial.println("WiFi connected");
108   Serial.println("IP address");
109   Serial.println(WiFi.localIP());
110 }
111 void initManagedDevice(){
112   if(client.subscribe(subscribetopic)){
113     Serial.println((subscribetopic));
114     Serial.println("subscribe to cmd OK");
115   }else{
116     Serial.println("subscribe to cmd failed");
117   }
118 }
119 void callback(char* subscribetopic,byte*payload,unsigned int payloadLength)
120 {
121   Serial.print("callback invoked for topic: ");
122   Serial.println(subscribetopic);
```

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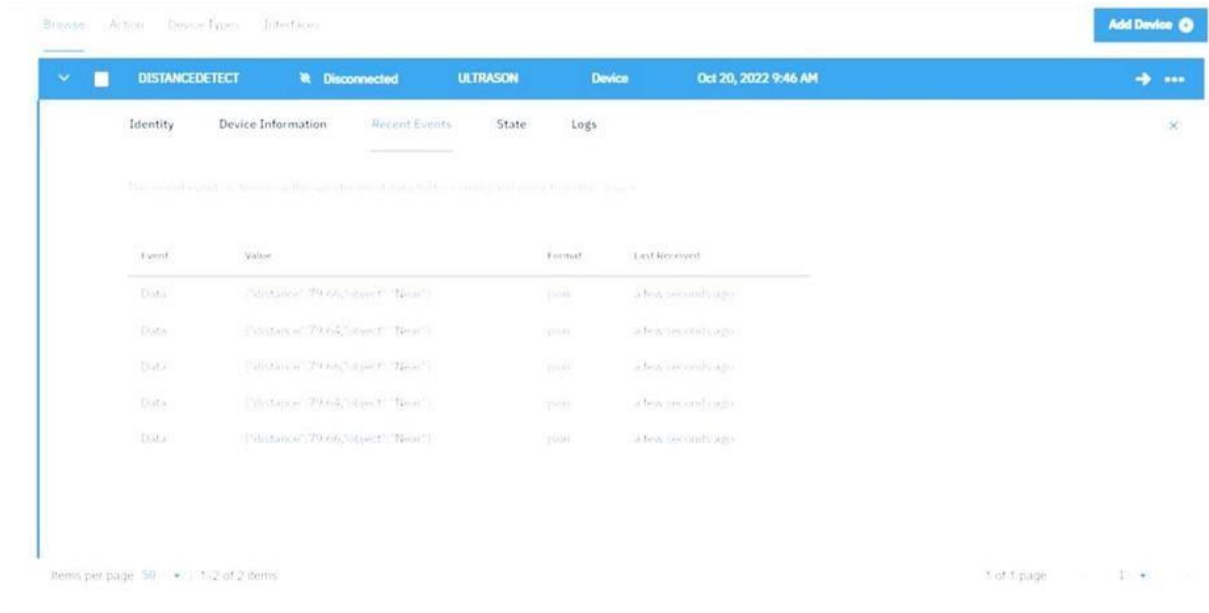
sketch.ino diagram.json libraries.txt Library Manager

```
123 for(int i=0; i< payloadLength; i++){
124   //Serial.print((char)payload[i]);
125   data3 +=(char)payload[i];
126 }
127 //Serial.println("dta: "+ data3);
128 //if(data3=="Near")
129 //{
130 //Serial.println(data3);
131 //digitalWrite(LED,HIGH);
132 //}
133 //else
134 //{
135 //Serial.println(data3);
136 //digitalWrite(LED,LOW);
137 //}
138 data3="";
139 }
```

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OUTPUT:

<https://wokwi.com/projects/346572482591851092> DATA SENT TO IBM CLOUD ON NO OBJECT DETECTED

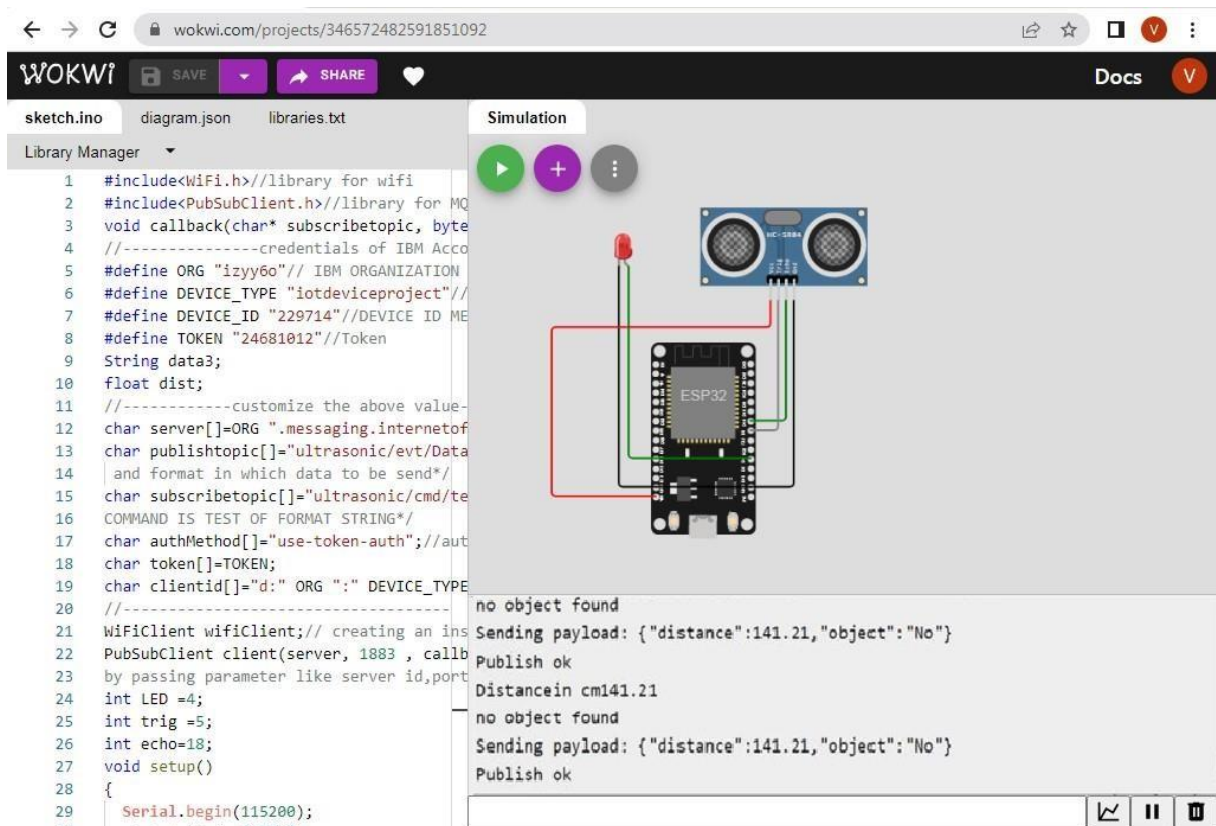


The screenshot shows the Wokwi IoT dashboard for a project named "DISTANCEDETECT". The device is an "ULTRASONIC" sensor, currently "Disconnected". The dashboard displays a table of recent events, showing data sent to IBM Cloud when no object was detected.

Event	Value	Format	Last Received
Data	["distance":79.66,"object":"No"]	json	a few seconds ago
Data	["distance":79.66,"object":"No"]	json	a few seconds ago
Data	["distance":79.66,"object":"No"]	json	a few seconds ago
Data	["distance":79.66,"object":"No"]	json	a few seconds ago
Data	["distance":79.66,"object":"No"]	json	a few seconds ago

Items per page: 50 | 1 of 2 items

WHEN NO OBJECT DETECTED BY ULTRASONIC DETECTOR



The screenshot shows the Wokwi IDE interface for the project "DISTANCEDETECT". The code is written in C++ and uses the Arduino IDE. The code includes the necessary libraries for WiFi and PubSubClient, and defines the device type, ID, and token. The code also includes the setup and loop functions, which send data to IBM Cloud when no object is detected.

```
1 #include<WiFi.h>//library for wifi
2 #include<PubSubClient.h>//library for MQTT
3 void callback(char* subscribetopic, byte
4 //-----credentials of IBM Account
5 #define ORG "izyy6o"// IBM ORGANIZATION
6 #define DEVICE_TYPE "iotdeviceproject"//
7 #define DEVICE_ID "229714"//DEVICE ID ME
8 #define TOKEN "24681012"//Token
9 String data3;
10 float dist;
11 //-----customize the above value-
12 char server[]=ORG ".messaging.internetof
13 char publishstopic[]="ultrasonic/evt/Data
14 and format in which data to be send*/
15 char subscribetopic[]="ultrasonic/cmd/te
16 COMMAND IS TEST OF FORMAT STRING*/
17 char authMethod[]="use-token-auth";//aut
18 char token[]=TOKEN;
19 char clientid[]="d:" ORG ":" DEVICE_TYPE
20 //-----
21 WiFiClient wifiClient;// creating an ins
22 PubSubClient client(server, 1883 , callb
23 by passing parameter like server id,port
24 int LED =4;
25 int trig =5;
26 int echo=18;
27 void setup()
28 {
29   Serial.begin(115200);
```

The simulation window shows the circuit diagram of the ESP32 microcontroller connected to an ultrasonic sensor. The output of the simulation is displayed in the console, showing the following messages:

```
no object found
Sending payload: {"distance":141.21,"object":"No"}
Publish ok
Distancein cm141.21
no object found
Sending payload: {"distance":141.21,"object":"No"}
Publish ok
```

DATA SENT TO IBM CLOUD ON OBJECT BEING DETECTED

Wokwi IoT Dashboard showing data sent to IBM Cloud on object detection.

Device: DISTANCEDETECT, Disconnected, ULTRASON, Device, Oct 20, 2022 9:46 AM

Identity | Device Information | Recent Events | State | Logs

Recent Events

Event	Value	Format	Last Received
Data	{\"distance\":79.66,\"object\":\"Near\"}	json	a few seconds ago
Data	{\"distance\":79.64,\"object\":\"Near\"}	json	a few seconds ago
Data	{\"distance\":79.64,\"object\":\"Near\"}	json	a few seconds ago
Data	{\"distance\":79.64,\"object\":\"Near\"}	json	a few seconds ago
Data	{\"distance\":79.66,\"object\":\"Near\"}	json	a few seconds ago

Items per page: 50 | 1 of 2 items

WHEN OBJECT DETECTED BY ULTRASONIC DETECTOR SENSOR

Wokwi IoT Dashboard showing the simulation of an ESP32 connected to an HC-SR04 ultrasonic sensor.

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Simulation

HC-SR04

ESP32

object is near
Sending payload: {\"distance\":97.82,\"object\":\"Near\"}
Publish ok
Distance in cm 97.82
object is near
Sending payload: {\"distance\":97.82,\"object\":\"Near\"}
Publish ok