

IOT HOLIDAY ASSIGNMENT

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1) Write a Embedded C program to Create a Weather Reporting System that provides real-time environmental data to users.

```
#include <Wire.h>
#include <WiFi.h>
#include <ArduinoJson.h>
#include <Adafruit_GFX.h>
#include <Adafruit_SSD1306.h>
#include <ThingSpeak.h>

#define SCREEN_WIDTH 128
#define SCREEN_HEIGHT 64
```

```
Adafruit_SSD1306 display(SCREEN_WIDTH, SCREEN_HEIGHT, &Wire, -1);
```

```
const char* ssid = "Wokwi-GUEST"; const
char* password = "";
String APIKEY = "8c9f6eac52a56ea89b8c36162a6d60c7";
String CityID = "1185241"; // Example City ID
WiFiClient client;
char servername[] = "api.openweathermap.org";
String result;
```

```
unsigned long channelID = 2235258;
const char* writeAPIKey = "IU90PCW31HECJ1V5";
```

```
void setup() {
  Serial.begin(115200);

  WiFi.mode(WIFI_STA);
  WiFi.begin(ssid, password);
  display.begin(SSD1306_SWITCHCAPVCC, 0x3C);
  delay(200); display.clearDisplay();
  display.setTextSize(1);
  display.setTextColor(SSD1306_WHITE);
  display.setCursor(0, 0);
  display.print("Connecting...");
  display.display();
  while (WiFi.status() != WL_CONNECTED) {
    delay(500); Serial.print(".");
    display.print("."); display.display();
  }
}
```

```

display.clearDisplay();
display.setCursor(0, 0);
display.println("Connected to WiFi");
display.display(); delay(1000);
display.clearDisplay();
}

```

```

void loop() {
    if (client.connect(servername, 80)) { client.println("GET /data/2.5/weather?id=" + CityID
        + "&units=metric&APPID=" + APIKEY); client.println("Host: api.openweathermap.org");
        client.println("User-Agent: ArduinoWiFi/1.1"); client.println("Connection: close");
        client.println();
    } else {
        Serial.println("connection failed");
        Serial.println();
    }
}

```

```

while (client.connected() && !client.available())
    delay(1);
while (client.connected() || client.available()) {
    char c = client.read(); result = result + c;
}

```

```

client.stop();

```

```

// Parse JSON
DynamicJsonDocument doc(1024); deserializeJson(doc, result);

```

```

String location = doc["name"]; String country = doc["sys"]["country"];
float temperature = doc["main"]["temp"].as<float>(); int humidity =
doc["main"]["humidity"];
float windSpeed = doc["wind"]["speed"].as<float>();

```

```

// Send data to ThingSpeak
ThingSpeak.begin(client);
ThingSpeak.setField(1, temperature);
ThingSpeak.setField(2, humidity); ThingSpeak.setField(3,
windSpeed); int httpCode = ThingSpeak.writeFields(channelID,
writeAPIKey); if (httpCode == 200) {
    Serial.println("Data sent to ThingSpeak successfully");
} else {
    Serial.print("Error sending data to ThingSpeak. HTTP code: ");
    Serial.println(httpCode);
}

```

```

Serial.println();
Serial.print("Country: ");
Serial.println(country);
Serial.print("Location: ");
Serial.println(location);

```

```

Serial.print("Location ID: ");
Serial.println(CityID); // Print the City ID you used
Serial.printf("Temperature: %.2f°C\r\n", temperature);
Serial.printf("Humidity: %d %%\r\n", humidity);
Serial.printf("Wind speed: %.2f m/s\r\n", windSpeed);

```

```

display.clearDisplay(); display.setCursor(0, 0);
display.setTextColor(SSD1306_BLACK, SSD1306_WHITE);
display.print("      Location:      ");
display.print(country); display.print(" ");

```

```

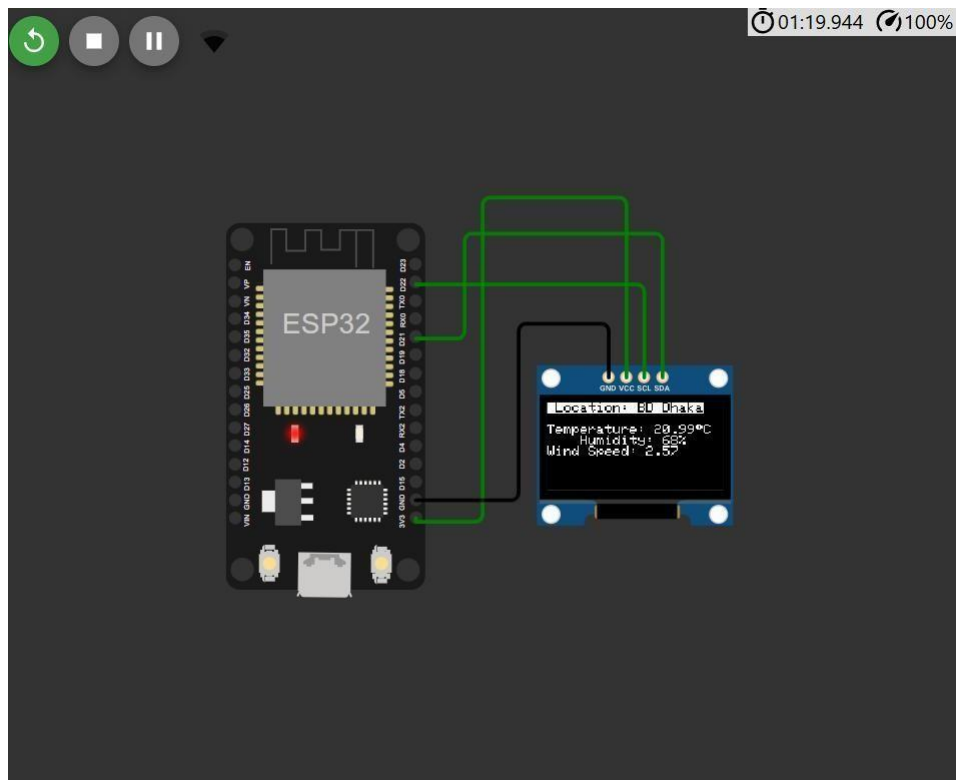
display.println(location);
display.println();
display.setTextColor(SSD1306_WHITE, SSD1306_BLACK);
display.print("Temperature:");
display.print(temperature, 2);
display.print((char)247); display.print("C ");
display.print("Humidity:");
display.print(humidity); display.println("% ");
display.print("Wind Speed:");
display.print(windSpeed, 2);

```

```

display.display();
delay(60000); // 1 minute delay
}

```



2) Write a Embedded C program to Create a Home Automation System that simplifies daily routines(Any 2 devices) by controlling devices remotely.

```
// Home Automation System
```

```
// Thingspeak Server dB Public View: https://thingspeak.com/channels/2052162
```

```
#include <DHT.h>
#define DHTPIN 15
#define DHTTYPE DHT22 DHT dht(DHTPIN, DHTTYPE);
```

```
#include <WiFi.h>
#include "ThingSpeak.h" // always include thingspeak header file after other header files and custom macros
```

```
char ssid[] = "Wokwi-GUEST"; // your network SSID (name) char
pass[] = ""; // your network password
int keyIndex = 0; // your network key Index number (needed only for WEP)
WiFiClient client;
```

```
// Weather station channel details unsigned long
weatherStationChannelNumber = 2052162; unsigned long
myChannelNumber = 2052162;
const char * myWriteAPIKey = "QS963Q0GCOTDY6GY";
```

```
// Timer variables unsigned long
lastTime = 0; unsigned long
timerDelay = 30000;
```

```
int statusCode = 0;
int field[8] = {1,2,3,4};
```

```
int ch1 = 0; int ch2 = 0; int ch3 = 0;
int ch4 = 0;
```

```
#define ch1Pin 23
#define ch2Pin 22
#define ch3Pin 21 #define ch4Pin 19
float Prevtemp = 0;
```

```
void setup() {
  Serial.begin(115200); // Initialize serial
```

```
  // Pin Mode declaration
  pinMode(ch1Pin,
    OUTPUT);
  pinMode(ch2Pin,
```

```
OUTPUT);  
pinMode(ch3Pin,  
OUTPUT);  
pinMode(ch4Pin,  
OUTPUT); dht.begin();
```

```
while (!Serial) { ; } // wait for serial port to connect. Needed for Leonardo native USB  
port only  
// WiFi.mode(WIFI_STA);  
ThingSpeak.begin(client); // Initialize ThingSpeak
```

```
// Connect or reconnect to WiFi if(WiFi.status() != WL_CONNECTED){  
Serial.print("Attempting to connect to SSID: ");  
Serial.println("Wokwi");  
  
while(WiFi.status() != WL_CONNECTED){  
WiFi.begin(ssid, pass); // Connect to WPA/WPA2 network. Change this line if using open  
or WEP network  
Serial.print(".");  
delay(5000);  
}  
Serial.println("WiFi Connected");  
delay(1000);  
}  
Serial.println("Welcome at Smart Home");  
delay(1000);  
}
```

```
void loop() {  
// use ThingSpeak.readMultipleFields(channelNumber, readAPIKey) for private channels  
statusCode = ThingSpeak.readMultipleFields(weatherStationChannelNumber);  
if(statusCode == 200) {  
// Fetch the stored data ch1 =  
ThingSpeak.getFieldAsInt(field[0]); // Field 1 ch2 =  
ThingSpeak.getFieldAsInt(field[1]); // Field 2 ch3 =  
ThingSpeak.getFieldAsInt(field[2]); // Field 3 ch4 =  
ThingSpeak.getFieldAsInt(field[3]); // Field 4  
} else{Serial.println("Problem reading channel. HTTP error code " +  
String(statusCode));}
```

```
float temp = dht.readTemperature();  
float humidity = dht.readHumidity();  
Serial.print("weather "); if  
(isnan(temp) || isnan(humidity)) {  
Serial.println("Failed to read from DHT sensor!");  
return;  
}  
String message = "temp: " + String(temp) + " humidity: " + String(humidity);  
Serial.println(message); delay(500);
```

```
if (temp >= 35){
    ch1 = 1;
} else{
    ch1 = 0;
}
```

```
Serial.println("Ch1: " + String(ch1));
Serial.println("Ch2: " + String(ch2));
Serial.println("Ch3: " + String(ch3));
Serial.println("Ch4: " + String(ch4));

// Hardware Control if (ch1 >= 1){digitalWrite(ch1Pin, HIGH);}
if (ch1 == 0){digitalWrite(ch1Pin, LOW);}
```

```
if (ch2 >= 1){digitalWrite(ch2Pin, HIGH);}
if (ch2 == 0){digitalWrite(ch2Pin, LOW);}
```

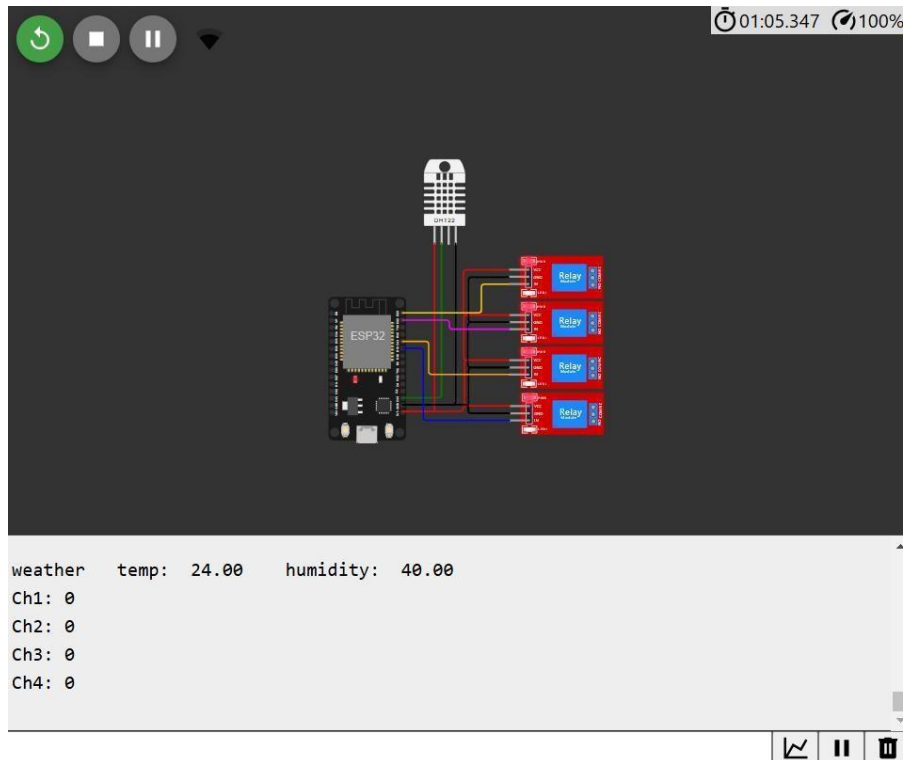
```
if (ch3 >= 1){digitalWrite(ch3Pin, HIGH);} if
(ch3 == 0){digitalWrite(ch3Pin, LOW);} if
(ch4 >= 1){digitalWrite(ch4Pin, HIGH);}
```

```
if (ch4 == 0){digitalWrite(ch4Pin, LOW);}
```

```
if (temp != Prevtemp){
    Prevtemp = temp;
    // Serial.println(temp); //
    Serial.println(Prevtemp);
    // upload data:
    ThingSpeak.setField(1, ch1);
    ThingSpeak.setField(2, ch2);
    ThingSpeak.setField(3, ch3);
    ThingSpeak.setField(4, ch4);
    ThingSpeak.setField(5, temp);
    ThingSpeak.setField(6, humidity);

    // Write to ThingSpeak.
    int x = ThingSpeak.writeFields(myChannelNumber, myWriteAPIKey);
    if(x == 200){
        Serial.println("Channel update successful.");
    }
    else{
        Serial.println("Problem updating channel. HTTP error code " + String(x));
    }
}

Serial.println(); delay(6000); // no need
to fetch too often
}
```



3) Write a Embedded C program to Create an Air Pollution Monitoring System that tracks air quality levels in real-time to ensure a healthier environment.

```
//Air Pollution Monitoring System
#define name value#define BLYNK_TEMPLATE_ID "TMPL6kWN92xgM" #define BLYNK_TEMPLATE_NAME
"Automated Air purifier"
#define BLYNK_AUTH_TOKEN "29-TfEOHXuD37x_ERtbiYVxHfZMiodqj"

#include <Wire.h>
#include <LiquidCrystal_I2C.h>
#include <Adafruit_Sensor.h>
#include <DHT.h>
#include <BlynkSimpleEsp32.h>
#include <WiFi.h>
```

```
// Define the pins for the DHT22 sensor
#define DHTPIN 2 // Replace with the actual pin connected to DHT22
#define DHTTYPE DHT22 DHT dht(DHTPIN, DHTTYPE);
```

```
LiquidCrystal_I2C lcd(0x27, 16, 2); // 0x27 is the I2C address of the LCD const int
potPin = 34; // Replace with the actual pin connected to the potentiometer const int
ledPin = 4; // Replace with the actual pin connected to the LED
```

```
char ssid[] = "Wokwi-GUEST";
char pass[] = "";
```

```
BlynkTimer timer;
```

```
void sendData() {
    // Read temperature and humidity from the DHT22 sensor
    float temperature = dht.readTemperature(); float
    humidity = dht.readHumidity();
```

```
// Read gas value from the potentiometer int  
gasValue = analogRead(potPin);
```

```
// Send data to Blynk  
Blynk.virtualWrite(V1, temperature);  
Blynk.virtualWrite(V2, humidity);  
Blynk.virtualWrite(V3, gasValue);  
}
```

```
void displayMessage(String line1, String line2, int delayTime = 2000) {  
  lcd.clear(); lcd.setCursor(0, 0); lcd.print(line1); lcd.setCursor(0, 1); lcd.print(line2);  
  delay(delayTime);  
}
```

```
void setup() {  
  // Initialize the LCD  
  lcd.init();  
  lcd.backlight();  
}
```

```
// Initialize DHT sensor dht.begin();
```

```
// Initialize the LED pin pinMode(ledPin,  
OUTPUT); // Connect to Wi-Fi  
WiFi.begin(ssid, pass); while  
(WiFi.status() != WL_CONNECTED) {  
  delay(250);  
}
```

```
// Initialize Blynk  
Blynk.begin(BLYNK_AUTH_TOKEN, ssid, pass);
```

```
// Map virtual pins  
Blynk.virtualWrite(V1, 0); // Initialize with 0  
Blynk.virtualWrite(V2, 0); // Initialize with 0  
Blynk.virtualWrite(V3, 0); // Initialize with 0
```

```
// Setup a function to be called every 5 seconds  
timer.setInterval(3000L, sendData);  
}
```

```
void loop() {  
  Blynk.run();  
  timer.run();  
}
```

```
// Read temperature and humidity from the DHT22 sensor  
float temperature = dht.readTemperature(); float  
humidity = dht.readHumidity();
```

```
// Read gas value from the potentiometer int  
gasValue = analogRead(potPin);
```

```
// Determine air level based on the specified conditions String  
airLevel;
```



```
// Check temperature and humidity conditions if ((temperature >= 22 && temperature
<= 30) && (humidity > 30 && humidity < 60)) { airLevel = "Good";
} else if ((temperature >= 30 && temperature <= 40) && (humidity >= 60 && humidity <= 70)) {
    airLevel = "Normal";
} else { airLevel
    = "Bad";
}
```

```
// Determine gas level based on the criteria String
gasLevel;
```

```
if (gasValue >= 0 && gasValue <= 1364) { gasLevel
    = "Good";
} else if (gasValue >= 1365 && gasValue <= 2730) {
    gasLevel = "Normal";
} else { gasLevel
    = "Bad";
}
```

```
// Determine air quality based on the criteria String
airQuality;
```

```
if ((airLevel == "Good" || airLevel == "Normal") && (gasLevel == "Good" || gasLevel ==
"Normal")) { airQuality = "Good Air
    Quality";
} else { airQuality = "Bad Air
    Quality";
}
```

```
// Display temperature and humidity on the LCD
lcd.clear(); lcd.setCursor(0, 0); lcd.print("Temp:
" + String(temperature) + " C"); lcd.setCursor(0,
1); lcd.print("Humidity: " + String(humidity) + "
%");
```

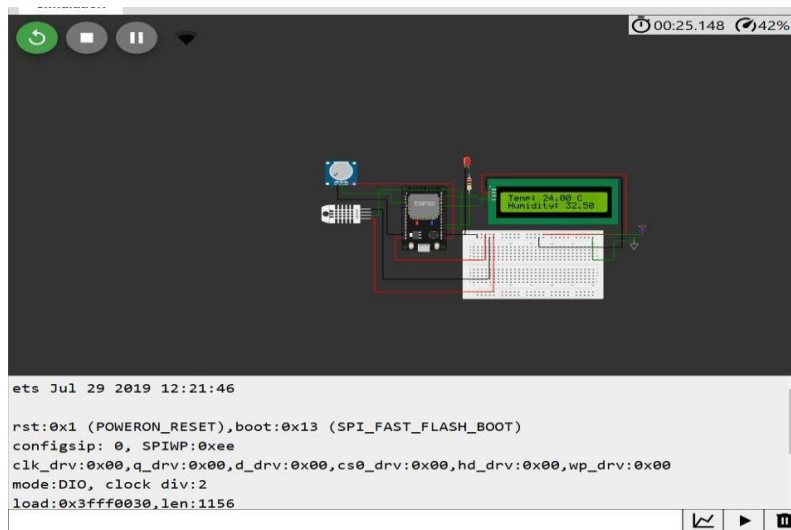
```
delay(2000); // Display temperature and humidity for 2 seconds
```

```
// Display air level on the LCD lcd.clear();
lcd.setCursor(0, 0); lcd.print("Air Level: " +
airLevel); delay(2000); // Display air level for
2 seconds
```

```
// Display gas level and gas value on the LCD lcd.clear();
lcd.setCursor(0, 0); lcd.print("Gas Level: " + gasLevel);
lcd.setCursor(0, 1); lcd.print("Gas Value: " + String(gasValue));
delay(2000); // Display gas level and value for 2 seconds
```

```
// Display air quality on the LCD lcd.clear(); lcd.setCursor(0,
0); lcd.print("Air Quality: "); lcd.setCursor(0, 1);
lcd.print(airQuality);
delay(2000); // Display air quality for 2 seconds
```

```
// Control the LED based on air quality if
(airQuality == "Bad Air Quality") {
    digitalWrite(ledPin, HIGH); // Turn on the LED
} else { digitalWrite(ledPin, LOW); // Turn off
the LED }
}
```



4) Write a Embedded C program to Create an IOT-based Smart Irrigation System for Agriculture that Automates Watering based on weather and Soil Conditions.

// IoT-based Irrigation System for ThingSpeak // Based on ESP32 WOKWI Simulator by ThinkIoT
 // ThingSpeak channel can be found here: <https://thingspeak.com/channels/2383114>

```
#include <WiFi.h>
#include "ThingSpeak.h"
#include "DHTesp.h"
```

```
const int SOIL_MOISTURE_PIN = 34;
const int SPRINKLER_CONTROL_PIN = 5;
const int DHT_PIN = 15; DHTesp
dhtSensor;
```

```
int MOISTURE_THRESHOLD_LOW = 15;           // Set Activation threshold in percentage
int MOISTURE_THRESHOLD_HIGH = 55; bool     // Set Deactivation threshold in percentage
SPRINKLER_ACTIVATION_STATUS = false;
```

```
char* WIFI_NAME = "Wokwi-GUEST"; char* WIFI_PASSWORD = ""; int myChannelNumber
= 2546422; // ThingSpeak channel ID char* myApiKey = "54NGG6QX49UBG601"; //
ThingSpeak channel write API key
WiFiClient client;
```

```
void setup()
{
  Serial.begin(115200);
  dhtSensor.setup(DHT_PIN, DHTesp::DHT22);
  WiFi.begin(WIFI_NAME, WIFI_PASSWORD);
  Serial.println("Connecting...");
  Serial.println("Wi-Fi connected");
  Serial.println("Local IP: " + String(WiFi.localIP()));
  Serial.println("-----");
  WiFi.mode(WIFI_STA);
  ThingSpeak.begin(client);
}
```

```
pinMode(SPRINKLER_CONTROL_PIN, OUTPUT);
}
```

```

void loop()
{ int soilMoisturePercentage = map(analogRead(SOIL_MOISTURE_PIN), 0, 4095, 0,
  100);
  TempAndHumidity data = dhtSensor.getTempAndHumidity();
  ThingSpeak.setField(2,data.temperature);
  ThingSpeak.setField(3,data.humidity);

```

```

if (    soilMoisturePercentage    <    MOISTURE_THRESHOLD_LOW){
  SPRINKLER_ACTIVATION_STATUS = true;
  digitalWrite(SPRINKLER_CONTROL_PIN, HIGH); //
}else{
  SPRINKLER_ACTIVATION_STATUS = false;
  digitalWrite(SPRINKLER_CONTROL_PIN, LOW); // Turn off sprinkler and LED
}

```

```

// Print status
Serial.print("Soil Moisture Percentage: ");
Serial.print(soilMoisturePercentage);
Serial.println("%");

```

```

Serial.println("Temp: " + String(data.temperature, 2) + "°C");
Serial.println("Humidity: " + String(data.humidity, 1) + "%");
Serial.print("Sprinkler: ");
Serial.println(SPRINKLER_ACTIVATION_STATUS ? "on" : "off");

```

```

// Send data to ThingSpeak
ThingSpeak.setField(1, soilMoisturePercentage);
ThingSpeak.setField(4, SPRINKLER_ACTIVATION_STATUS);

```

```

int x = ThingSpeak.writeFields(myChannelNumber, myApiKey);

```

```

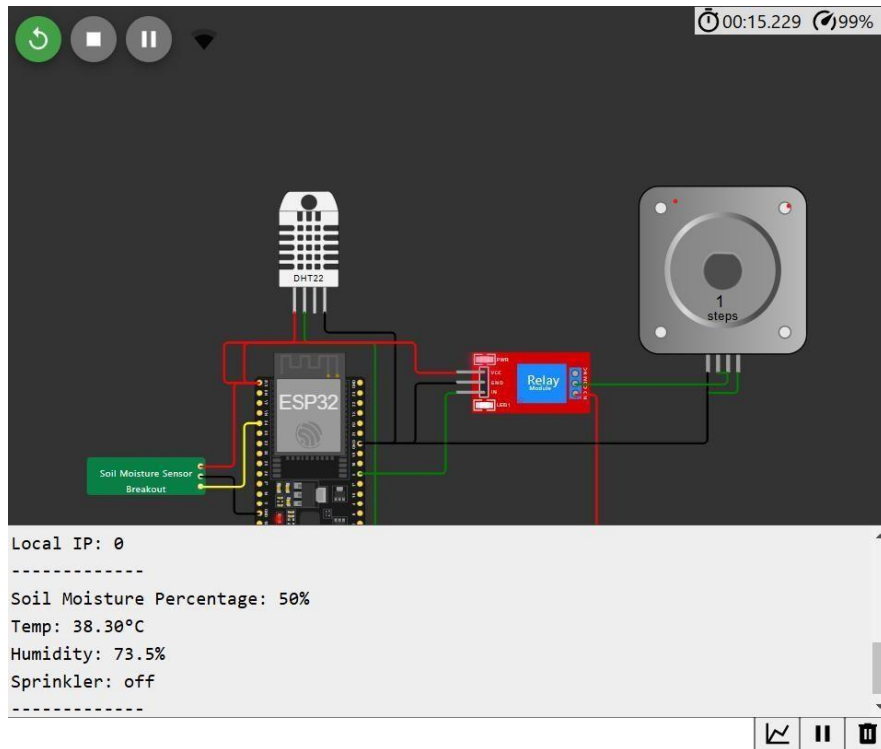
Serial.println("----- ");

```

```

  delay(15000); // Thingspeak allows for an update every 15 seconds
}

```



5) Write a Emedded C Program to Create a Smart Alarm Clock that adjusts to your schedule and Environment,Waking you up intelligently.

/* ----- C Program for Arduino based Alarm Clock ----- */

```
#include <Wire.h>
```

```
#include<EEPROM.h>
```

```
#include <RTCLib.h> #include
```

```
<LiquidCrystal.h>
```

```
const int rs = 8; const int en =
9; const int d4 = 10; const int
d5 = 11; //DISPLAY
const int d6 = 12; const
int d7 = 13;
```

```
LiquidCrystal lcd(rs, en, d4, d5, d6, d7);
RTC_DS1307 RTC;
```

```
int temp,inc,hours1,minut,add=11;
```

```
int next=7;
```

```
int INC=6;
```

```
int set_mad=5; #define
```

```
buzzer 3
```

```
int HOUR,MINUT,SECOND;
```

```
void setup()

{

Wire.begin();

RTC.begin();

lcd.begin(16,2);

pinMode(INC,      INPUT);

pinMode(next,     INPUT);

pinMode(set_mad,  INPUT);

pinMode(buzzer,  OUTPUT);

digitalWrite(next,    HIGH);

digitalWrite(set_mad, HIGH);

digitalWrite(INC, HIGH);


    lcd.setCursor(0,0);

    lcd.print("Real Time Clock");

    lcd.setCursor(0,1);

    lcd.print("Circuit Digest ");

    delay(2000);


if(!RTC.isrunning())

{

RTC.adjust(DateTime(_DATE_,_TIME_));
}

}


void loop()
```

```

{ int temp=0,val=1,temp4; DateTime now =
  RTC.now(); if(digitalRead(set_mad) == 0) //set
  Alarm time
  {
    lcd.setCursor(0,0);
    lcd.print(" Set Alarm ");
    delay(2000);    default();
    time();    delay(1000);
    lcd.clear();
    lcd.setCursor(0,0);
    lcd.print(" Alarm time ");
    lcd.setCursor(0,1);
    lcd.print(" has been set ");
    delay(2000);
  }

  lcd.clear(); lcd.setCursor(0,0);
  lcd.print("Time:");
  lcd.setCursor(6,0);
  lcd.print(HOUR=now.hour(),DEC);
  lcd.print(":");
  lcd.print(MINUT=now.minute(),DEC);
  lcd.print(":");
  lcd.print(SECOND=now.second(),
  DEC); lcd.setCursor(0,1);
  lcd.print("Date: ");
  lcd.print(now.day(),DEC);
  lcd.print("/");
  lcd.print(now.month(),DEC);

```

```

lcd.print("/");

lcd.print(now.year(),DEC);

match();

delay(200);

}

void default()

{

    lcd.setCursor(0,1);

    lcd.print(HOUR);

    lcd.print(":");

    lcd.print(MINUT);

    lcd.print(":");

    lcd.print(SECOND);

}

/*Function to set alarm time and feed time into Internal eeprom*/

void time()

{

    int temp=1,minuts=0,hours=0,seconds=0;

    while(temp==1)

    {

        if(digitalRead(INC)==0)

        {

            HOUR++;

            if(HOUR==24) {

                HOUR=0;

            }

            while(digitalRead(INC)==0);

        } lcd.clear();

        lcd.setCursor(0,0);

```

```

lcd.print("Set Alarm Time ");

//lcd.print(x);

lcd.setCursor(0,1);

lcd.print(HOUR);

lcd.print(":");

lcd.print(MINUT);

lcd.print(":");

lcd.print(SECOND);

delay(100);

if(digitalRead(next)==0)
{

    hours1=HOUR;

    EEPROM.write(add++,hours1)

    ; temp=2;

    while(digitalRead(next)==0);

}

}

while(temp==2)

{

    if(digitalRead(INC)==0)

    {

        MINUT++;

        if(MINUT==60)

        {MINUT=0;}

        while(digitalRead(INC)==0);

    }

}

```



```

// lcd.clear();

lcd.setCursor(0,1);

lcd.print(HOUR);

lcd.print(":");

lcd.print(MINUT);

lcd.print(":");

lcd.print(SECOND);

delay(100);

if(digitalRead(next)==0)

{

    minut=MINUT;

    EEPROM.write(add++, minut);

    temp=0;

    while(digitalRead(next)==0);

}

}

delay(1000);

}

/* Function to chack medication time */

void match()

{

    int tem[17];

    for(int i=11;i<17;i++)

    {

        tem[i]=EEPROM.read(i);

    }

    if(HOUR == tem[11] && MINUT == tem[12])

    {

        beep();

```

```
beep();

beep();

beep();

lcd.clear();

lcd.print("Wake Up.....");

lcd.setCursor(0,1);

lcd.print("Wake Up..... ");

beep();

beep();

beep();

beep();

}

}

/* function to buzzer indication */

void beep()

{ digitalWrite(buzzer,HIGH);

  delay(500);

  digitalWrite(buzzer, LOW);

  delay(500);

}
```

