IOT HOLIDAY ASSIGNMENT

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1) Write a Embeded 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);
  }
```

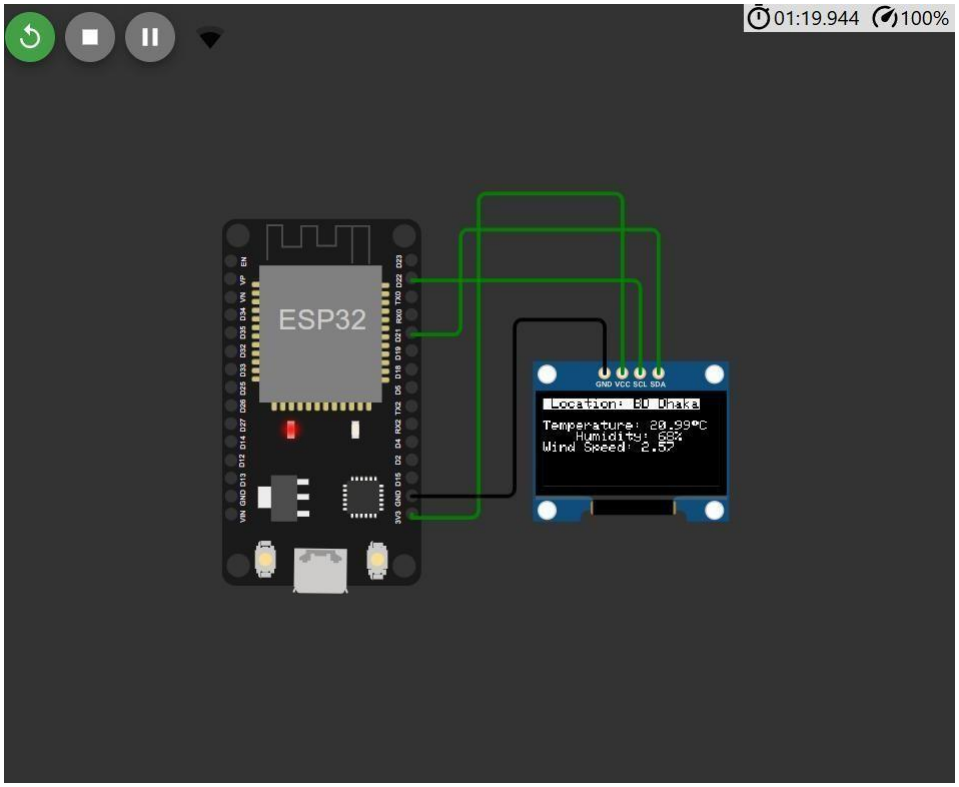
```
Serial.println();
Serial.print("Country: ");
Serial.println(country);
Serial.print("Location: ");
Serial.println(location);
```

```
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 Embeded C program to Create a Home Automation System that simpllifies 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);}
```

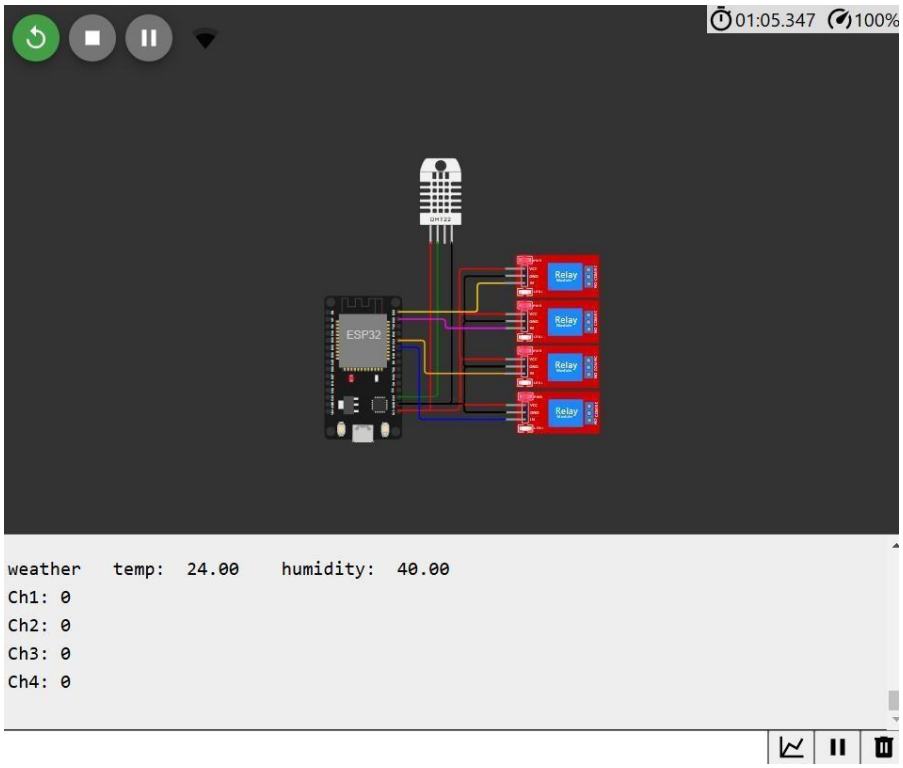
```
    if (ch3 >= 1){digitalWrite(ch3Pin, HIGH);} if
    (ch3  ==  0){digitalWrite(ch3Pin,  LOW);}  if
    (ch4 >= 1){digitalWrite(ch4Pin, HIGH);}
if (ch4 == 0){digitalWrite(ch4Pin, LOW);}
```

```
    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;
```

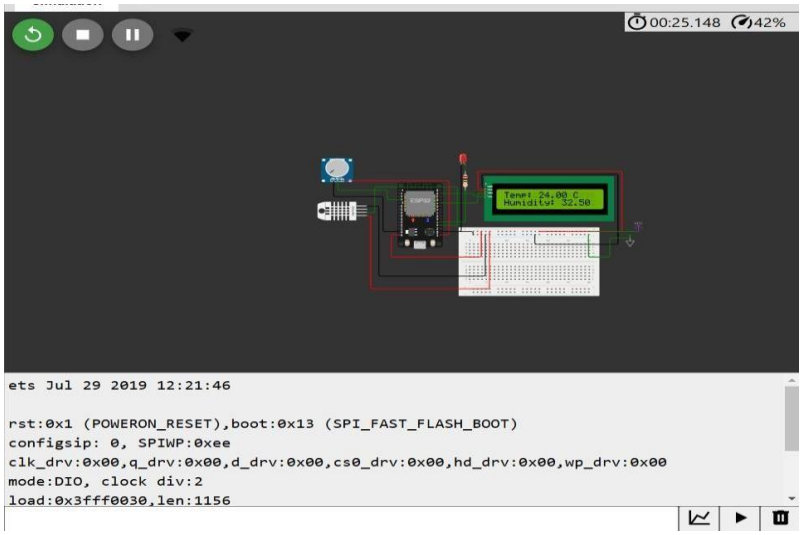
```
  if ((airLevel == "Good" || airLevel == "Normal") && (gasLevel == "Good" || gasLevel ==
"Normal")) { airQuality = "Good Air
    Quality";
  } else { airQuality = "Bad Air
    Quality";
  }
  // Display temperature and humidity on the LCD
  lcd.clear(); lcd.setCursor(0, 0); lcd.print("Temp:
  " + 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 = "54NGG6QX49UBG6O1"; //
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("%");
```

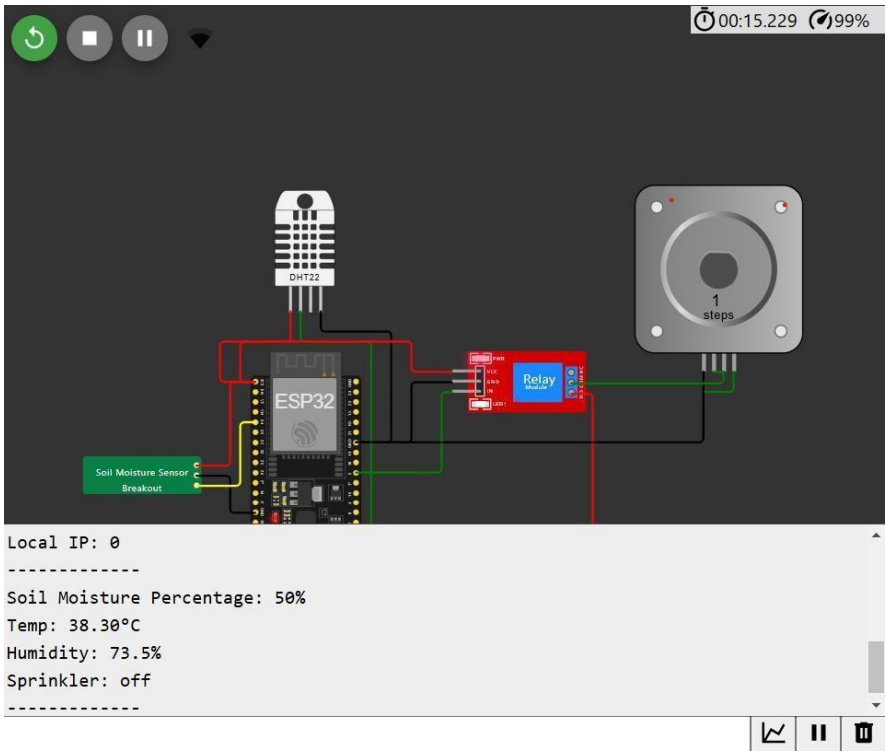
```
  Serial.println("Temp: " + String(data.temperature, 2) + "°C");
  Serial.println("Humidity: " + String(data.humidity, 1) + "%");
  Serial.print("Sprinkler: ");
  Serial.println(SPRINKLER_ACTIVATION_STATUS ? "on" : "off");
```

```
  // 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);      defualt();
   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 defualt()
{
  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);
```

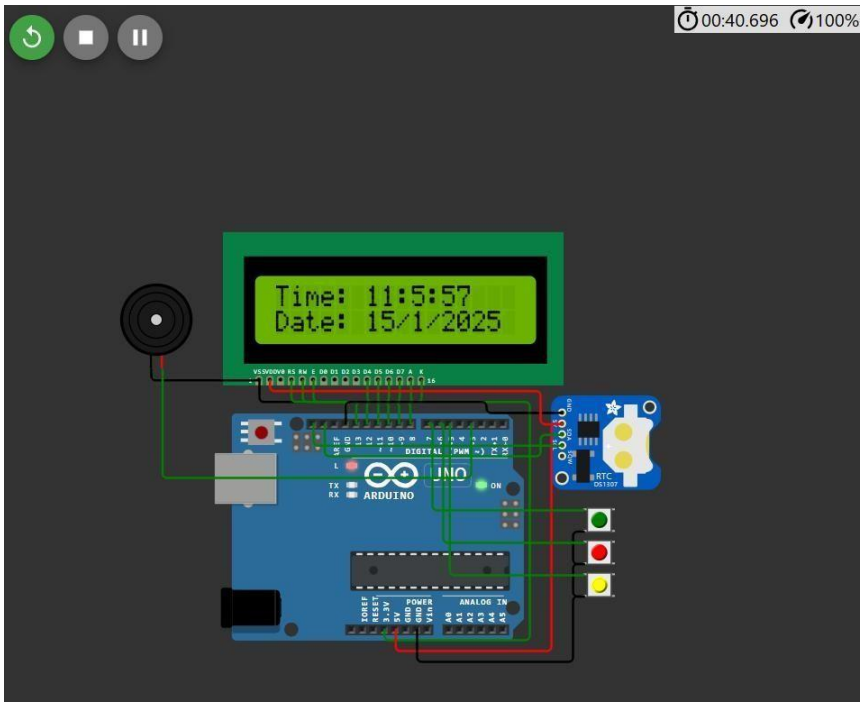
```
lcd.print("Set Alarm Time ");
//lcd.print(x);
lcd.setCursor(0,1);
lcd.print(HOUR);
 lcd.print(":");
 lcd.print(MINUT);
 lcd.print(":");
 lcd.print(SECOND);
 delay(100);
 if(digitalRead(next)==0)
 {
  hours1=HOUR;
 EEPROM.write(add++,hours1)
 ; temp=2;
 while(digitalRead(next)==0);
}
}


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);
}
```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100%
Time: 11:5:57
Date: 15/1/2025
UNO
ARDUINO
RTC
DS1307