INTERNET OF THINGS lab. Record

Subject Code:

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Remarks	
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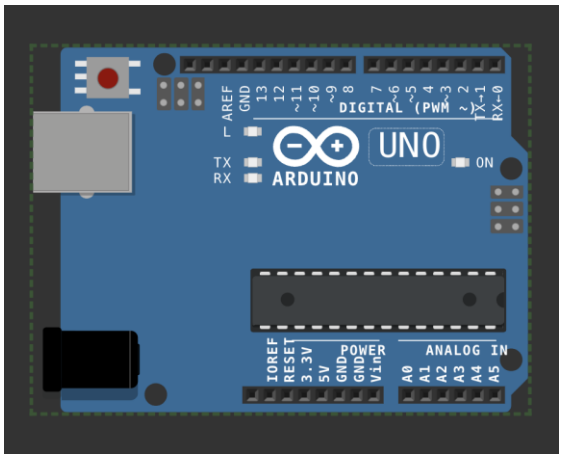
Sl. No.	Date	Experiment/Case Study	Page No.	Remark
1	14/08/2024	Blinking the inBuilt LED		
2	22/08/2024	Blinking an external LED		
3	29/08/2024	Using DHT sensor		
4	12/09/2024	Using Mosquitto MQTT (Pub-Sub)		
5	19/09/2024	Building a web app using Node-Red to fetch DHT sensor data and display it on the web app dashboard		
6	26/09/2024	Working with ultrasonic sensors.		
7	03/10/2024	Use of ESP32, upload code on ESP 32 to blink onboard LED.		
8	17/10/2024	Using breadboard		
9				
10				
11				
12				
13				
14				
15				
16				

LAB 1 : Blinking the inBuilt LED

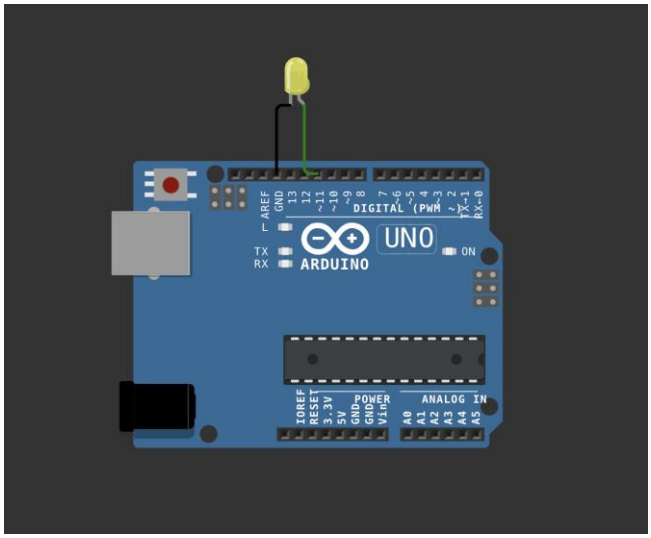
```
void setup() {
  pinMode(LED_BUILTIN,
OUTPUT);
}

void loop() {
  digitalWrite(LED_BUILTIN,
HIGH);
  delay(1000);

digitalWrite(LED_BUILTIN,LOW);
  delay(1000);
}
```



Wokwi 1

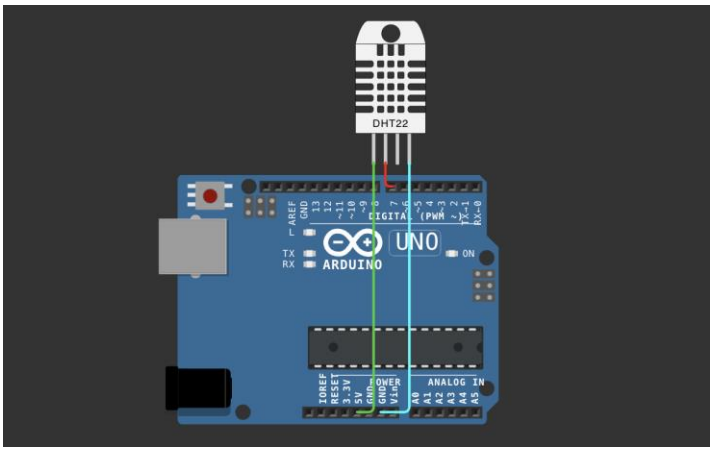
LAB 2 : Blinking an external LED

```
#define led_pin 11

void setup() {
  pinMode(led_pin, OUTPUT);
}

void loop() {
  digitalWrite(led_pin, HIGH);
  delay(1000);
  digitalWrite(led_pin,LOW);
  delay(1000);
}
```



wokwi 2

Lab 3 : Using DHT sensor



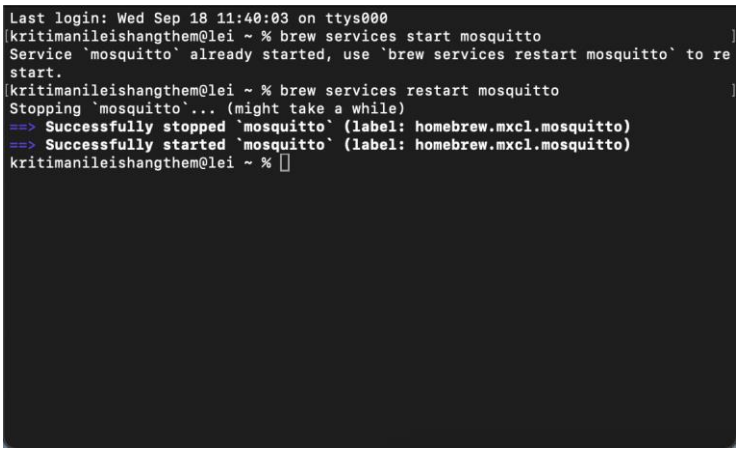

```
#include <DHT.h>

#define pin 7
#define DHTTYPE
DHT22

DHT dht(pin, DHTTYPE);

float humid, temp;

void setup() {
  Serial.begin(9600);
  dht.begin();
}

void loop() {
  delay(200);
  humid =
dht.readHumidity();
  temp =
dht.readTemperature();
  Serial.print("Humidity:");
  Serial.print(humid);
  Serial.print("%  Temperature: ");
  Serial.print(temp);
  Serial.println("°C");
  delay(1000);
}
```

```
Humidity: 40.00%  Temperature: 24.00°C
Humidity: 40.00%  Temperature: 24.00°C
Humidity: 40.00%  Temperature: 24.00°C
Humidity: 40.00%  Temperature: 24.00°C
```

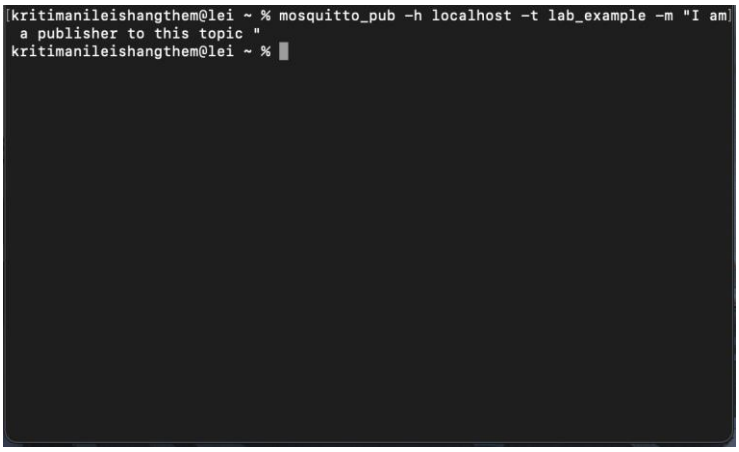
#Wokwi 3

Lab 4: Using Mosquitto MQTT (Pub-Sub):

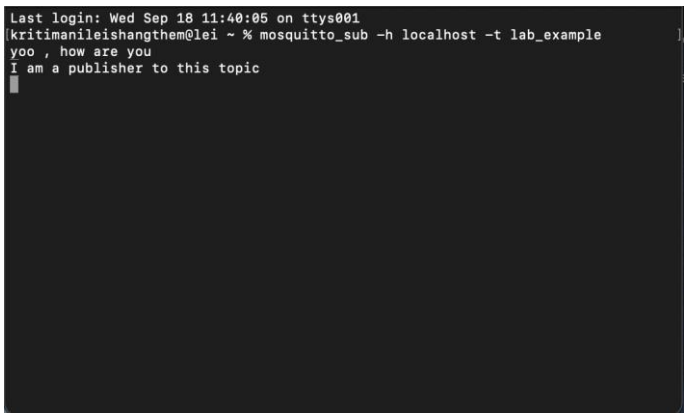
Starting Mosquitto MQTT:



Setting up Publisher & Sending Message:



Setting up Subscriber & Receiving Message:



The mosquitto server is downloaded and implemented in UNIX terminal of my laptop. the

There are 3 photos of which 1 of each represent the part of an mqtt (a broker and client(subscriber and publisher)):
1. Start the mosquitto server by the typing the code [brew services start mosquitto].
2. in another terminal we made a subcriber to the [lab_example] topic using the code [mosquitto_sub -h localhost -t lab_example]
3. in another terminal i made a publisher to the topic [lab_example] using [mosquitto_pub -h localhost -t lab_example -m "\\I am a publisher to this topic\\"]

4. stop the server with the code [brew services stop mosquitto]

We can also allow subscriber to subcribe to our topic using our network .

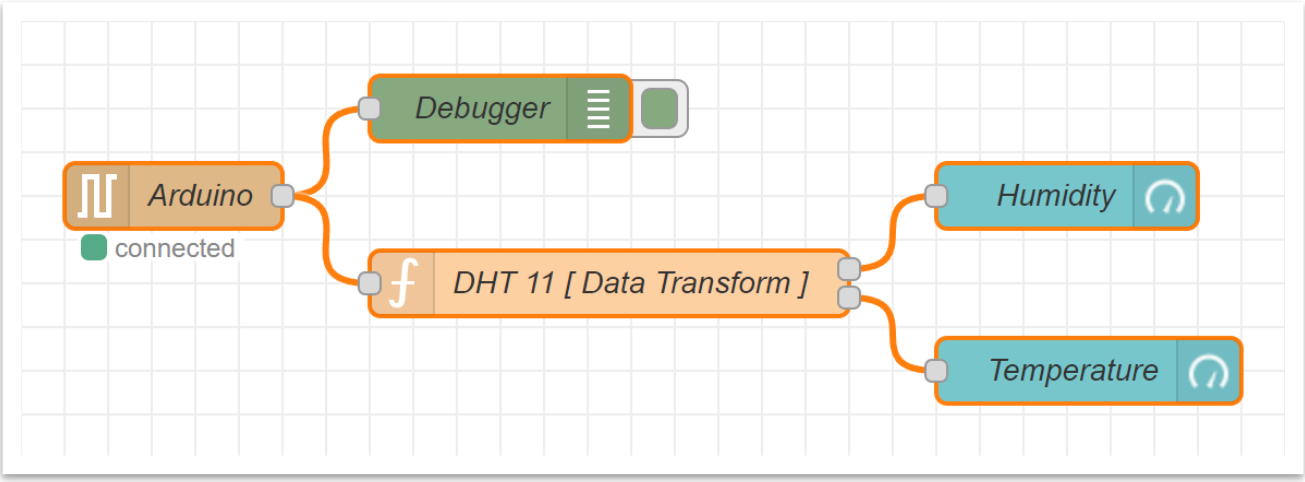
Lab 5: Building a web app using Node-Red to fetch DHT sensor data and display it on the web app dashboard

Installing & Initialising node red:

- Open node.js > npm install node-red-dashboard
- [postinstallation] > elevated cmd: node-red

In client application, browsed localhost:1880 [accessing node red]:

- Inside the nodered window, a flow was created w/ the nodes as:
  > serial-in (arduino uno r3 board)
  > debugger
  > dht function
  > 2 gauges (humidity & temperature)



- Serial in node: configured it to read from the correct serial port where my arduino is connected (e.g., com7) > set the baud rate to 9600.
- Configure the dht function as:

```
var m = msg.payload.split(',');
if (m.length === 2) {
var h = { payload: parsefloat(m[0]) };
    var t = { payload: parsefloat(m[1]) };
    return [h, t];
} else {
return null; }
```

- ADJUSTING GAUGE NODES:

HUMIDITY:

- TITLE AS “ HUMIDITY ”.
- VALUE FORMAT AS ‘ {{VALUE}}% ’.
- RANGE VALUE: 0 ~ 100 %.

TEMPERATUE:

- TITLE AS ' TEMPERATURE '.
- VALUE FORMAT AS ‘ {{VALUE}}°C ’.

***ENSURE THAT HUMIDITY & TEMPERATURE ARE IN THE SAME GROUP*

DEPLOYMENT:

- UPLOADED DHT11 /22 SKETCH TO THE ARDUINO BOARD THROUGH ITS IDE:

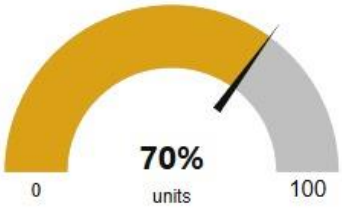
```
#include <dht.h>
#define dhtpin 3
#define dhttype dht11
dht dht(dhtpin, dhttype);

void setup() {
      serial.begin(9600);
      dht.begin();
}

void loop()  {
      float h = dht.readhumidity();
      float t = dht.readtemperature();
      if (isnan(h) || isnan(t)) {
          serial.println("failed to read from dht sensor!");
      }
      else {
          serial.println(string(h) + "," + string(t));
       }
      delay(2000);
}
```

- AFTER UPLOADING THIS SKETCH, CLOSE THE IDE.
- DEPLOY THE FLOW IN NODERED.
- CHECK THE DASHBOARD IN THE UPPER-RIGHT CORNER, FOR THE HUMIDITY AND TEMPERATURE GAUGE.

OUTPUT ON THE DASHBOARD:

Humidity/Temperature

Humidity



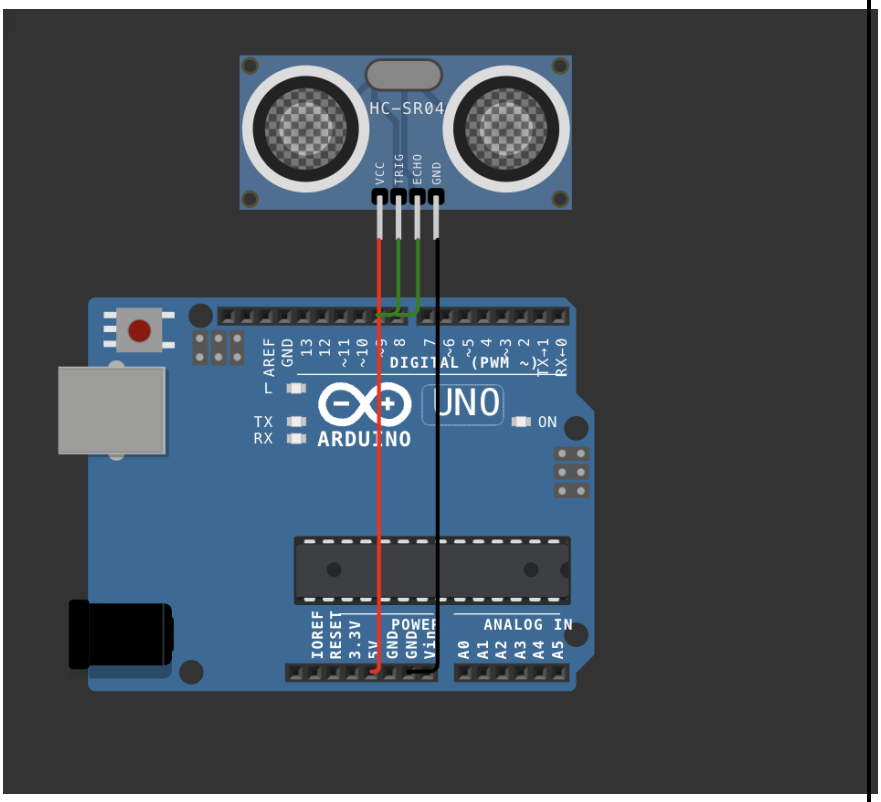
Temperature

LAB 6: Working with ultrasonic sensors .

Measuring distance of a somethings using ultrasonic sensors

CODE:

```
#include <DHT.h>

#define PIN_TRIG 9
#define PIN_ECHO 8

void setup() {
  Serial.begin(9600);
  pinMode(PIN_TRIG, OUTPUT);
  pinMode(PIN_ECHO, INPUT);
}

void loop() {
  digitalWrite(PIN_TRIG, HIGH);
  delayMicroseconds(10);
  digitalWrite(PIN_TRIG, LOW);

  int duration = pulseIn(PIN_ECHO,
HIGH);
  float distanceCm = duration / 58.0;

  Serial.print("Distance in CM: ");
  Serial.println(distanceCm);

  delay(1500);
}
```



Lab#7 Use of ESP32, upload code on ESP 32 to blink onboard LED

Step 1: install esp32 board from the board manager
Step 2 : choose the esp32 board from the port
Step 3: compile and upload the code .

Code 1 : blinking inbuilt led

```
#define LED_PIN 2
void setup() {
  pinMode(LED_PIN, OUTPUT);
}

void loop() {
  digitalWrite(LED_PIN, HIGH);
  delay(1000);
  digitalWrite(LED_PIN, LOW);
  delay(1000);
}
```

Code 2 : Finding nearby using esp32

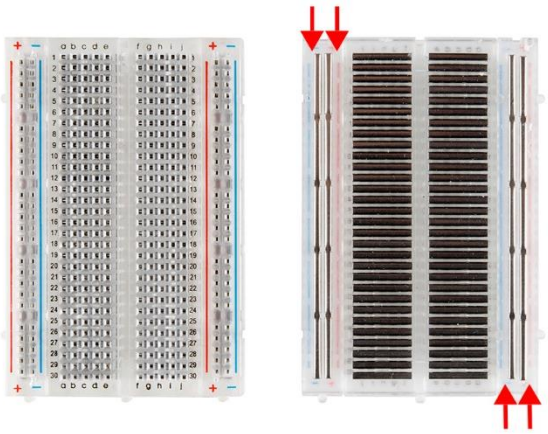
```
#include "WiFi.h"

void setup() {
  Serial.begin(9600);
  WiFi.mode(WIFI_STA);
  WiFi.disconnect();
  delay(100);

  Serial.println("Setup done");
}

void loop() {

  Serial.println("Scan start");
  int n = WiFi.scanNetworks();
  Serial.println("Scan done");

  if (n == 0) {
    Serial.println("no networks found");
  } else {
    Serial.print(n);
    Serial.println(" networks found");
    Serial.println("Nr | SSID                             | RSSI | CH | Encryption");
    for (int i = 0; i < n; ++i) {

      Serial.printf("%2d", i + 1);
      Serial.print(" | ");
      Serial.printf("%-32.32s", WiFi.SSID(i).c_str());
      Serial.print(" | ");
```

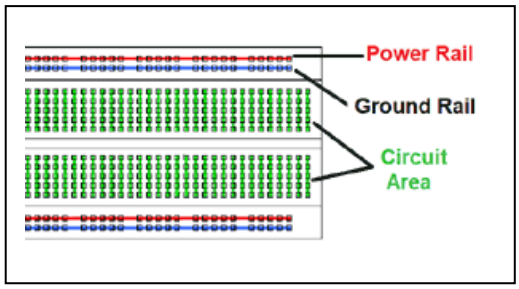
```
      Serial.printf("%4ld", WiFi.RSSI(i));
      Serial.print(" | ");
      Serial.printf("%2ld", WiFi.channel(i));
      Serial.print(" | ");
      switch (WiFi.encryptionType(i)) {
        case WIFI_AUTH_OPEN:                Serial.print("open"); break;
        case WIFI_AUTH_WEP:                 Serial.print("WEP"); break;
        case WIFI_AUTH_WPA_PSK:             Serial.print("WPA"); break;
        case WIFI_AUTH_WPA2_PSK:             Serial.print("WPA2"); break;
        case WIFI_AUTH_WPA_WPA2_PSK:        Serial.print("WPA+WPA2"); break;
        case WIFI_AUTH_WPA2_ENTERPRISE:     Serial.print("WPA2-EAP"); break;
        case WIFI_AUTH_WPA3_PSK:            Serial.print("WPA3"); break;
        case WIFI_AUTH_WPA2_WPA3_PSK:       Serial.print("WPA2+WPA3"); break;
        case WIFI_AUTH_WAPI_PSK:            Serial.print("WAPI"); break;
        default:                            Serial.print("unknown");
      }

      Serial.println();
      delay(10);
    }
  }
  Serial.println(“");

  WiFi.scanDelete();

  delay(5000);
}
```

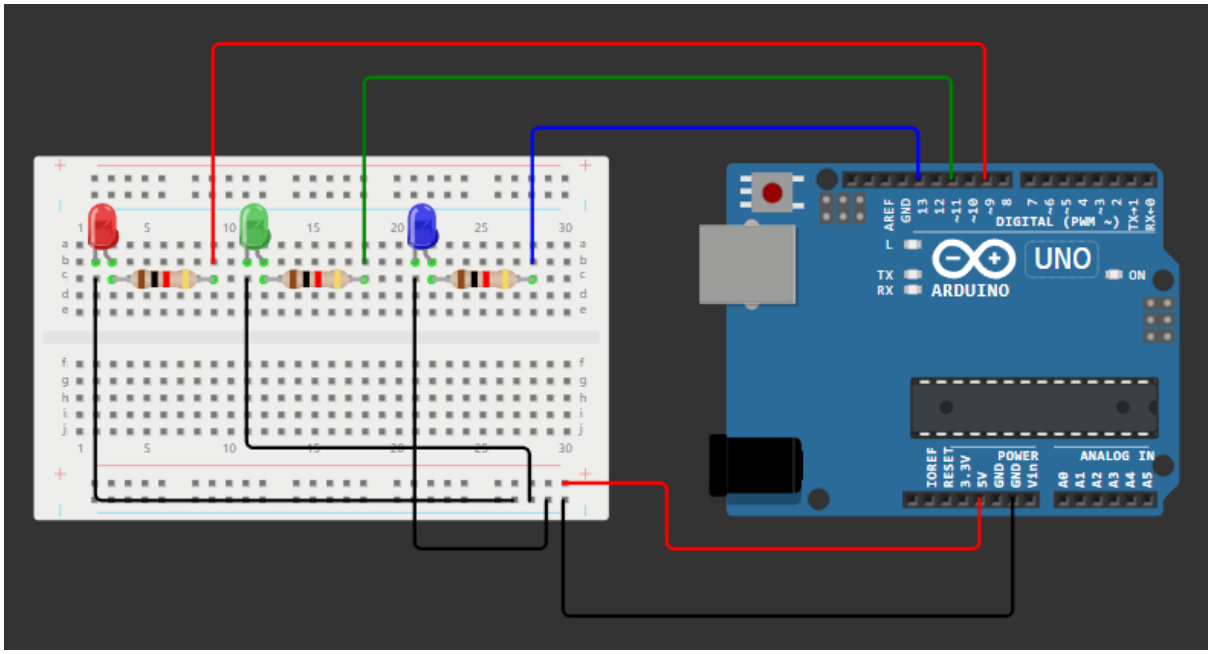
Lab Exercise 8: Use of Breadboard

Objective: Learn basic breadboard interfacing and circuit assembly.

Components: Breadboard, jumper wires, resistors, LEDs.







In this project, we did the process to blink three LEDs using for loop. The three LEDs will light up one after the other.

Expected Outcome: Familiarity with breadboard layout and component arrangement.