IoT & Automation Lab. Record

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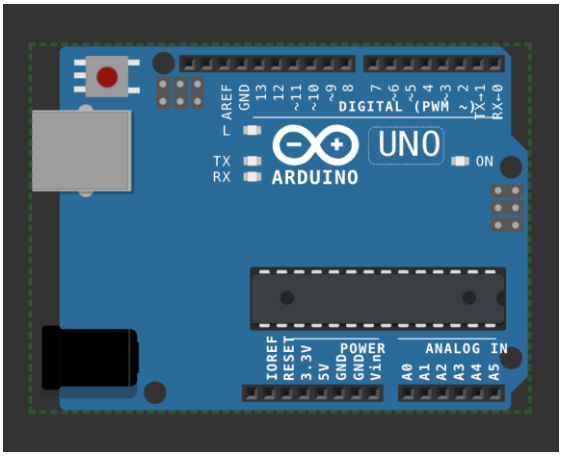
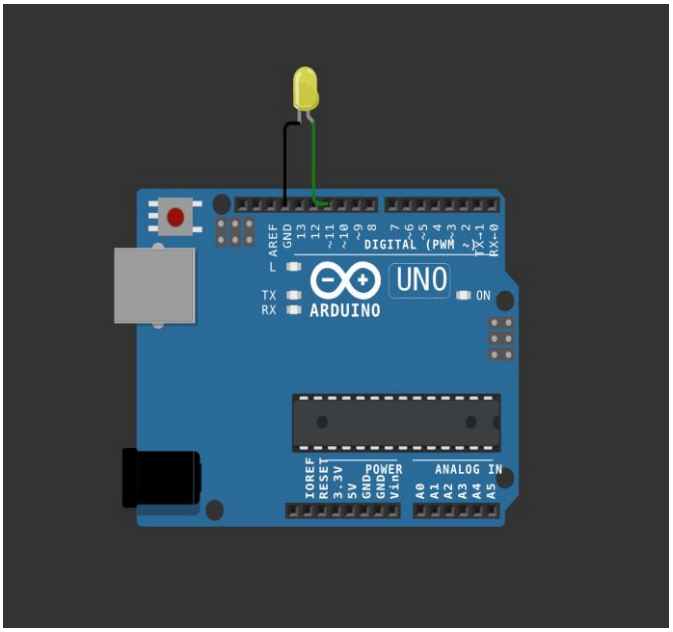
LAB 1: Blinking The In-Built LED




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

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

LINK - WOKWI 1

LAB 2: Blinking An External LED

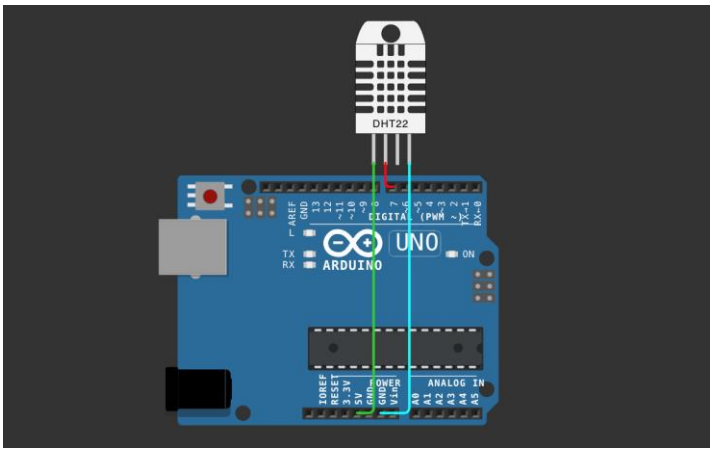



```
#define led pin 11

void setup() {
        pinMode(led pin, OUTPUT);
}

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

LINK - 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
```

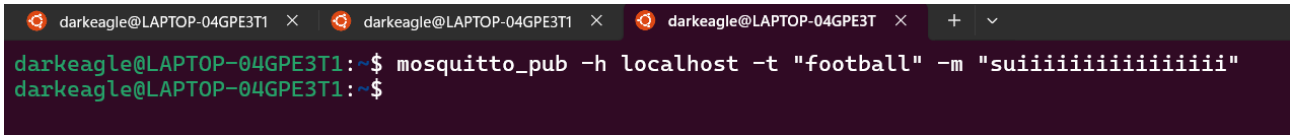
LINK - WOKWI 3

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

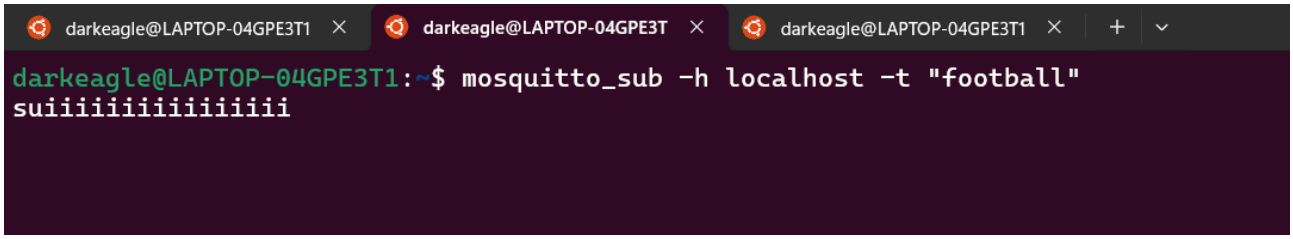
Starting Mosquitto MQTT:

```
darkeagle@LAPTOP-04GPE3T1:~$ sudo systemctl start mosquitto
[sudo] password for darkeagle:
Sorry, try again.
[sudo] password for darkeagle:
darkeagle@LAPTOP-04GPE3T1:~$ sudo systemctl start mosquitto
darkeagle@LAPTOP-04GPE3T1:~$
```

Setting up Publisher & Sending Message:



Setting up Subscriber & Receiving Message:



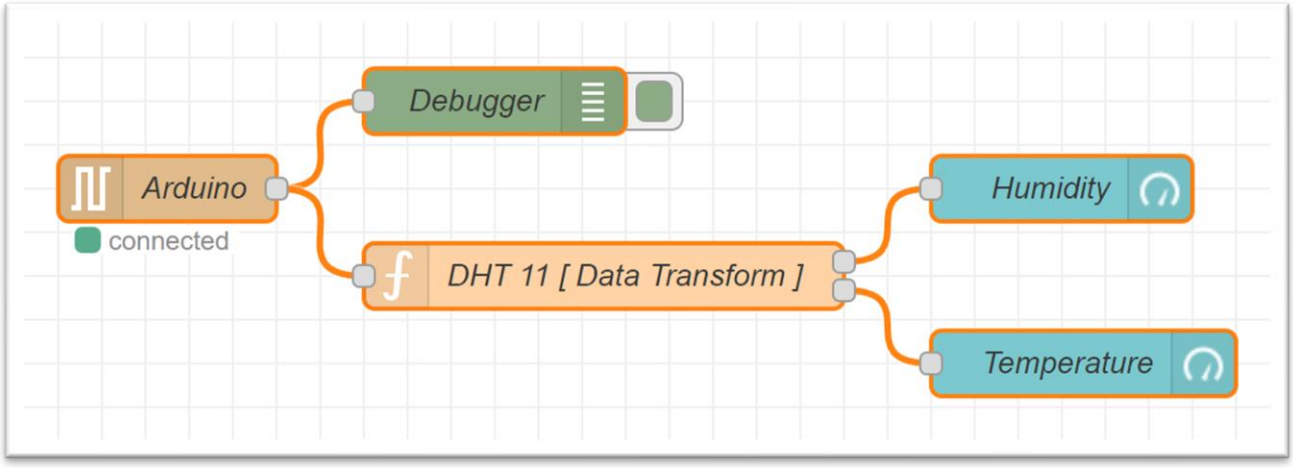
LAB 5: Building A Web App Using Node-Red To Fetch DHT Sensor Data And Display It On The Web App Dashboard:

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*

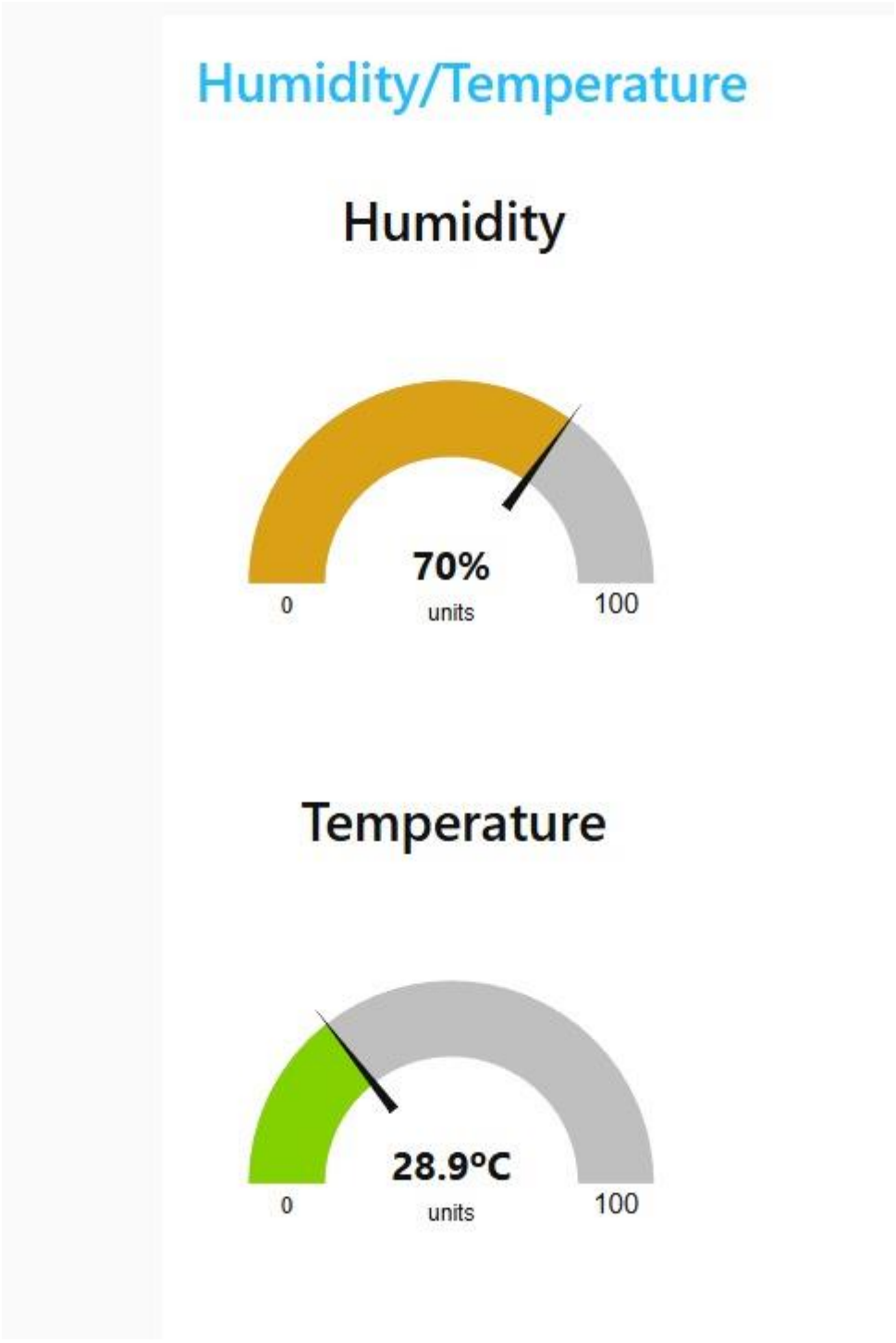
DEPLOYMENT:

- 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:

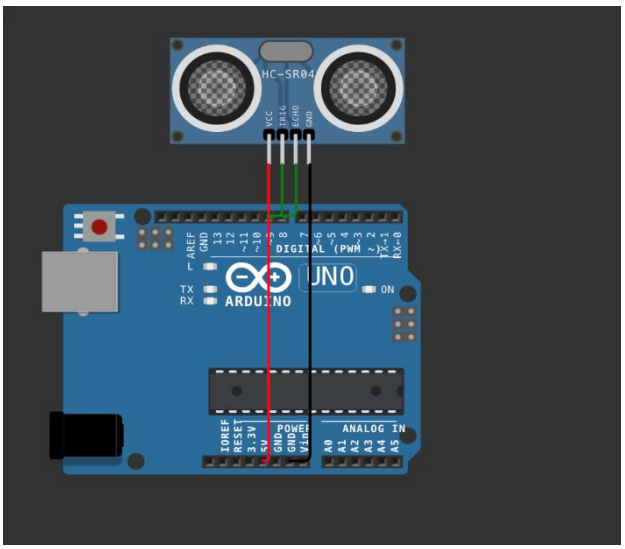


LAB 6: Working With Ultrasonic Sensors: Measuring Distance of a Somethings Using Ultrasonic Sensors

UltraSonic [HC-SR04]: For Measuring Distance

Step 1: Connect 4 jumper wires to the UltraSonic Sensor as [VCC: 5v], [Trigger: 9], [Echo: 8], & GND.

Step 2: After configuring the HC-SR04 w/ UNO R3, this sketch is to be uploaded and executed in the IDE:




```
#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);


        Serial.print("Distance in CM: ");
        Serial.println(duration / 58);

        Serial.print("Distance in inches: ");
        Serial.println(duration / 148);

        delay(1000);
}
```

Output: Distance in CM: 403; Distance in inches: 158

```
Distance in CM: 403
Distance in inches: 158
Distance in CM: 403
Distance in inches: 158
Distance in CM: 403
Distance in inches: 158
Distance in CM: 403
```

LAB 7: Use Of Breadboard

Breadboard usage guide:

A breadboard is an essential tool for building and testing electronic circuits without soldering. It allows you to prototype and experiment with circuits quickly and conveniently.

Key features:

1. **Rows And Columns:** Breadboards are organized into numbered rows and lettered columns. The central rows are connected horizontally, while the outer rows, or power rails, run vertically to help distribute power.

2. **Power Rails:** Located along the edges and marked with red (+) and blue (-) lines, power rails are designed to supply power across the board.

How to use a breadboard:

1. **Insert Components:** Place the leads of each component into the breadboard holes.

2. **Make Connections:** Use jumper wires to connect components as needed.

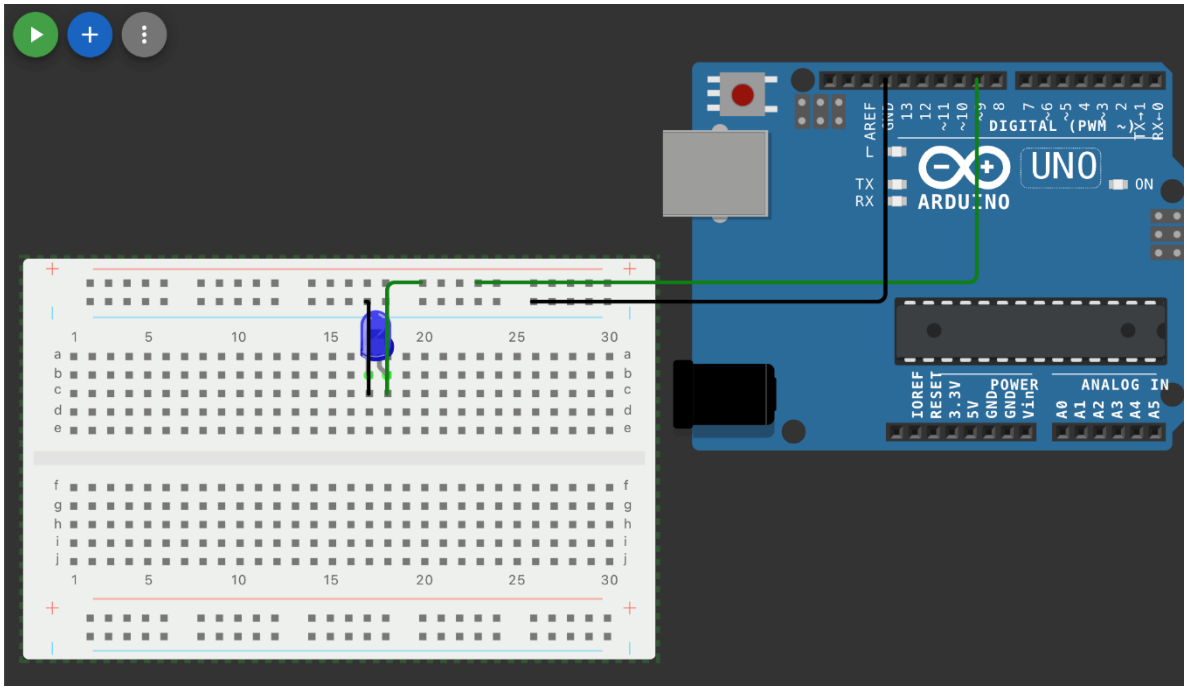
3. **Power Connections:** Connect the power source to the power rails to easily distribute power across the circuit.

4. **Avoid Overload:** Breadboards are suitable for low-power circuits. High currents can damage the contacts, so avoid overloading them.

Tips:

- **Plan The Layout:** Arrange components and wires to keep the layout organized and clear.

- **Check Connections:** Ensure each wire and component is securely inserted to maintain good connections.



LAB 8: 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.

Step 4: Now, for establishing the connection, we would need to configure our mainframe w/ the cp210x usb-to-uart bridge virtual com port (vcp) driver avaliable at cp210x usbtouart driver.

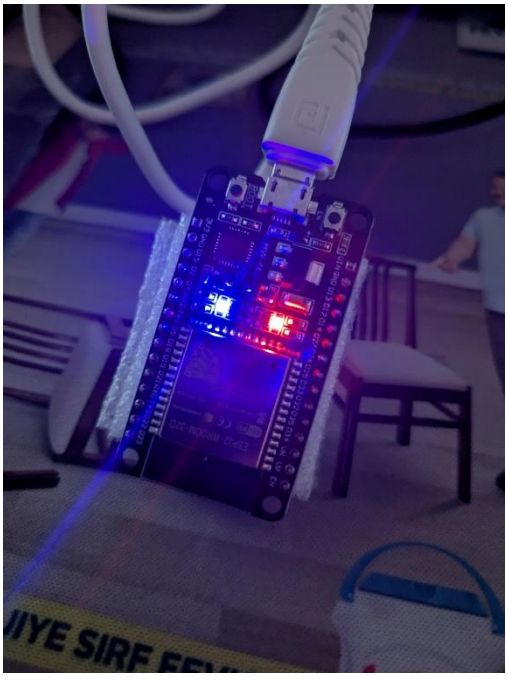
Step 5: After a superfluous reboot, the mainframe is ready to be used w/ an espressif32, as in the arduino ide, we first select the correct com port (*here, com12*), and esp32 dev module as the board.

- **Note:** While executing a sketch, the board reuires to be in download mode /boot mode, so for, the boot button is to be pressed while uploading the code onto the board, exactly post connecting... For 3-4 seconds.

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);
}
```

OUTPUT:



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);
}
```

OUTPUT:

```
Scan done
5 networks found
Nr | SSID                             | RSSI | CH | Encryption
 1 | DIRECT-XNLAPTOP-04GPE3T1msUJ     |  -40 | 10 | WPA2
 2 | Taambdi_Chaamdi                  |  -65 | 10 | WPA2
 3 | TP-Link_56E8                     |  -89 |  2 | WPA2
 4 | TP-Link_68D8                     |  -89 | 10 | WPA2
 5 | No Internet                      |  -92 |  4 | WPA2

Scan start
Scan done
4 networks found
Nr | SSID                             | RSSI | CH | Encryption
 1 | DIRECT-XNLAPTOP-04GPE3T1msUJ     |  -49 | 10 | WPA2
 2 | Taambdi_Chaamdi                  |  -59 | 10 | WPA2
 3 | TP-Link_56E8                     |  -87 |  2 | WPA2
```