PRACTICAL 10 : Storing Real-Time Data in Firebase

Aim : To store real-time sensor data in Firebase using Arduino and NodeMCU. (Optional)

Overview :

This project involves interfacing a sensor with Firebase using Arduino and NodeMCU to store real-time sensor data in a cloud database. It introduces IoT cloud computing, real-time database integration and data retrieval for smart applications.

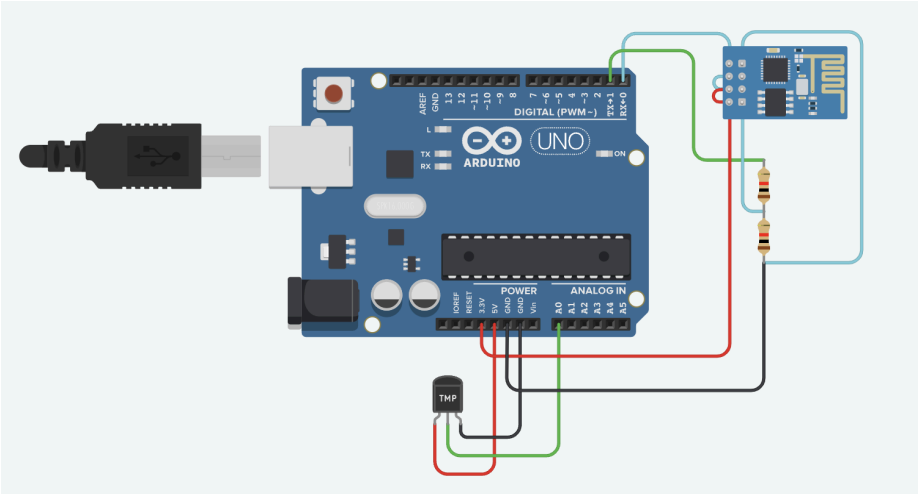
Materials Required :

- Arduino Uno R3
- 2 x 1 kΩ Resistor
- Temperature Sensor (TMP36)
- Wifi Module (ESP8266)
- Jumper Wires
- Arduino IDE (Installed on your Computer)

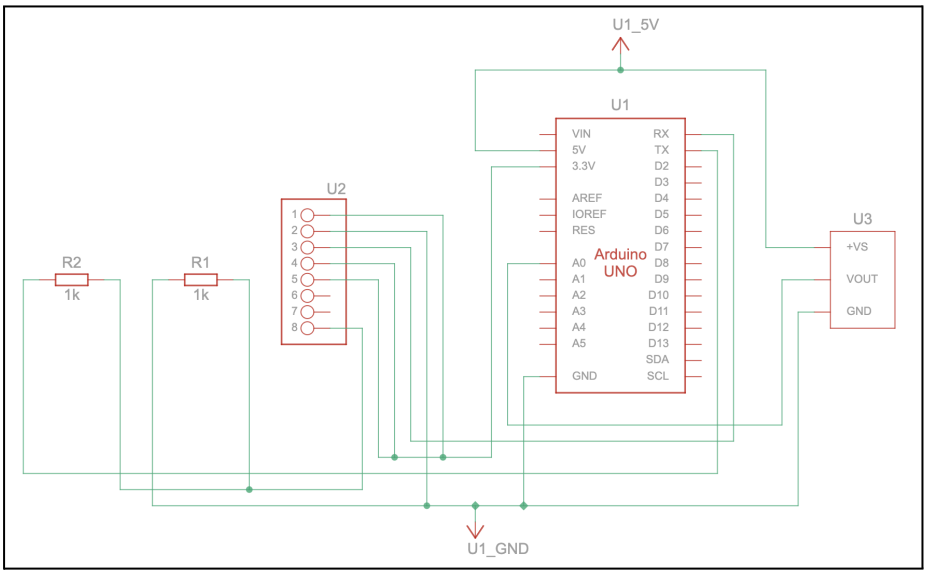
Circuit Connection and Steps :

1. **Power Connections :**
   - TMP36 VCC → 5V (Arduino), GND → GND (Arduino)
   - ESP8266 VCC & CH_PD → 3.3V (Arduino), GND → GND (Arduino)
2. **Sensor & ESP8266 Wiring :**
   - TMP36 VOUT → A0 (Arduino)
   - ESP8266 TX → RX (Arduino) via 1kΩ resistor
   - ESP8266 RX → TX (Arduino) via voltage divider (two 1kΩ resistors)

Circuit Diagram :



Schematic Diagram :

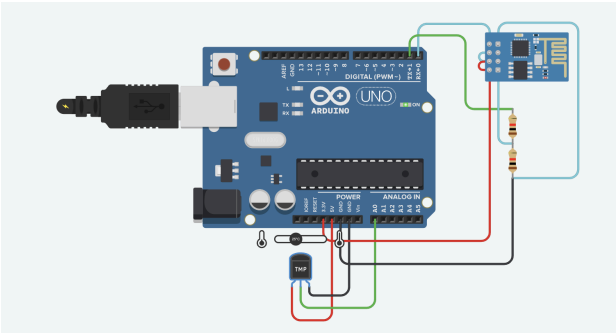


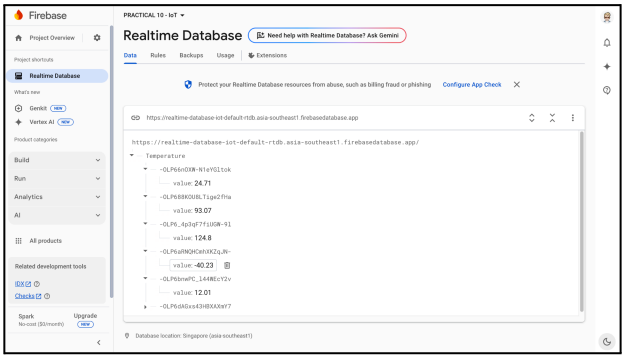
Code :

```
// WiFi Credentials
String ssid = "Simulator Wifi";
String password = "";

// Firebase Configuration
String host =
"realtime-database-iot-default-rtdb.asia-southeast1.firebasedatabase.app";
const int httpPort = 80;
String firebasePath = "/Temperature.json"; // Firebase RTDB Path
String firebaseAuth = "uLsBh7JKrBOSQY8IsnmjOrFB58xZ8ZZABLT708Qv";

// Sensor Pin
const int tempPin = A0;

void setup() {
    Serial.begin(115200);
    Serial.println("AT");  // Check ESP8266 response
    delay(500);

    // Connect to WiFi using AT commands
    Serial.println("AT+CWJAP=\"" + ssid + "\",\"" + password + "\"");
    delay(5000);

    // Establish TCP Connection with Firebase
    Serial.println("AT+CIPSTART=\"TCP\",\"" + host + "\"," +
String(httpPort));
    delay(500);
}
```

```
void loop() {
    // Read Temperature Sensor
    float temperature = ((analogRead(tempPin) * 0.0048828125) - 0.5) * 100;

    // Construct HTTP request for Firebase
    String httpRequest = "POST " + firebasePath + "?auth=" + firebaseAuth +
                         " HTTP/1.1\r\nHost: " + host + "\r\nContent-Type:
application/json\r\n" +
                         "Content-Length: " +
String(String(temperature).length() + 14) + "\r\n\r\n" +
                         "{\"value\": " + String(temperature) + "}";

    // Send Data to Firebase
    Serial.println("AT+CIPSEND=" + String(httpRequest.length()));
    delay(500);
    Serial.println(httpRequest);
    delay(5000);
}
```

Results :





Conclusion :

This project successfully stores real-time sensor data in Firebase using Arduino and NodeMCU. It introduces the concept of cloud storage and real-time database management, forming a critical step toward developing smart IoT systems for data logging and remote access applications.