Microcontroller
Project

Weather Monitoring with ESP32

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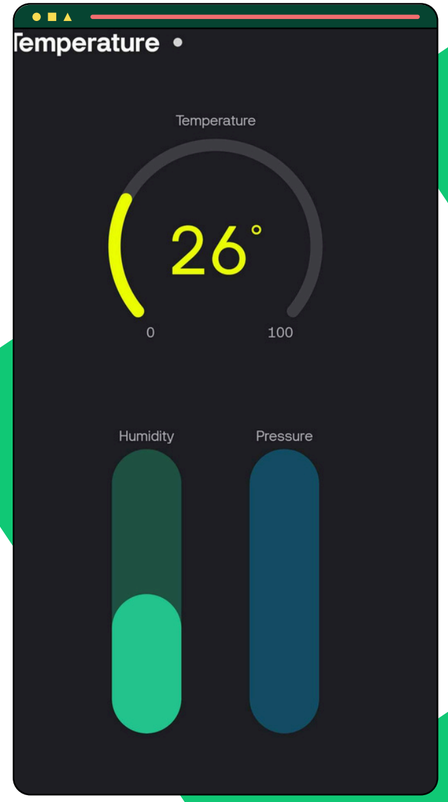
Objective

develop a smart IoT-based system using the Blynk platform that can:

- Tracks real-time data for temperature, humidity, and pressure in a given environment.

- Allows users to access and analyze data remotely via the Blynk mobile app or web dashboard.



Components

- Blynk Console and Blynk App for web & mobile dashboards
- Arduino IDE
- ESP32 Dev Module
- DHT21/AM2301A humidity & temperature sensor
- Barometer BMP280

Firmware

```
#define BLYNK_TEMPLATE_ID "TMPL6u1qPqP3T"
#define BLYNK_TEMPLATE_NAME "Temperature"
#define BLYNK_AUTH_TOKEN "TS_GeqDqwmX_MCQj_AKCj_NNDAukeq7W"

// WiFi credentials.
#define WIFI_SSID             "S2"
#define WIFI_PASS             "012345677"
```

- Need to include:

  TemplateID

  AuthToken (unique identifier of the device)

  Wi-Fi credentials

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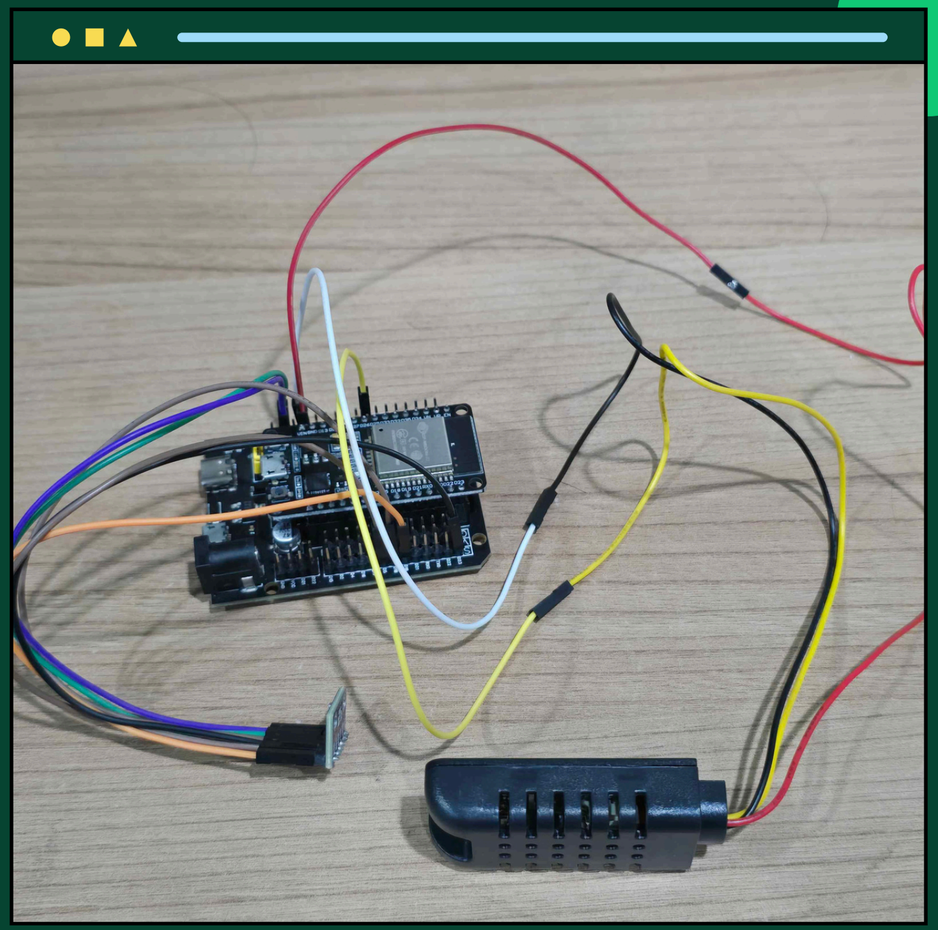
Circuit Prototyping



- connect BMP280 to ESP32 with SPI communication
- connect DHT21 to ESP32 with single-wire digital communication

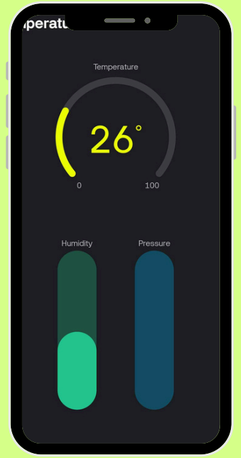
```
// DHT sensor
#define DHT_BLYNK_VPIN_TEMPERATURE V0 // Virtual pin on Blynk
#define DHT_BLYNK_VPIN_HUMIDITY V1 // Virtual pin on Blynk

#define DHTPIN 25
#define DHTTYPE DHT21
DHT dht(DHTPIN, DHTTYPE);

// BMP sensor
#define BMP_BLYNK_VPIN_PRESSURE V4 // Virtual pin on Blynk

#define BMP_SCK  (18)
#define BMP_MISO (19)
#define BMP_MOSI (23)
#define BMP_CS   (5)
Adafruit_BMP280 bmp(BMP_CS, BMP_MOSI, BMP_MISO,  BMP_SCK);
```

Data Flow



sensor → ESP32 → Blynk Cloud → Dashboard

1. Data Collection: DHT22 sensor collects temperature data.
2. Data Transmission: ESP32 sends data to Blynk Cloud via Wi-Fi.
3. Data Visualization: Blynk dashboard displays real-time and historical data.
4. Alerts: Notifications are sent to the user if temperature exceeds set limits.

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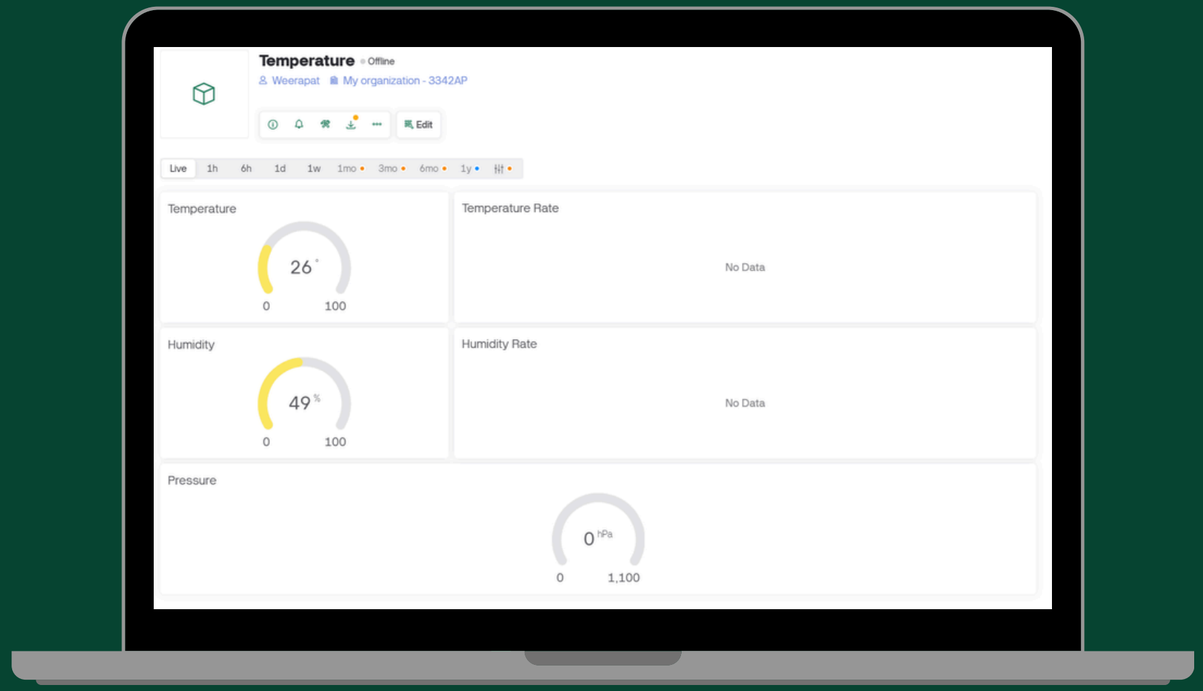
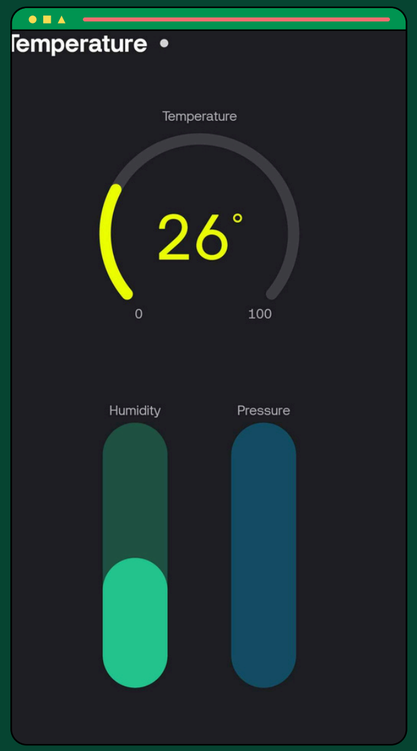
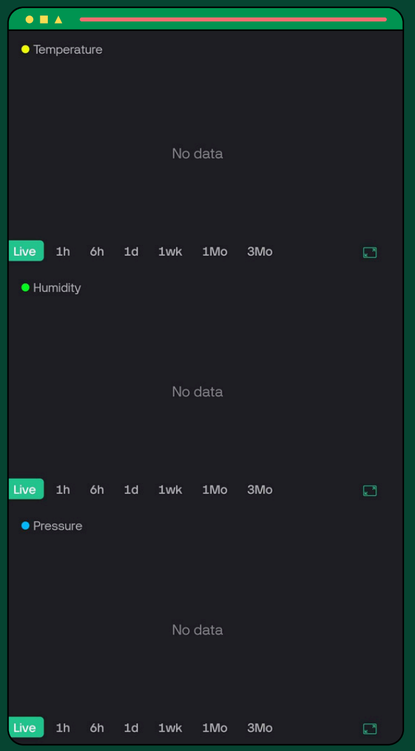
Dashboard Overview







Datastream V0 - Temperature

Datastream V1 - Humidity

Datastream V4 - Pressure

Web widgets: Gauge (current value), Chart (historical data)

Mobile widgets: Enhanced Gauge (current value), Chart (historical data)

Thank You