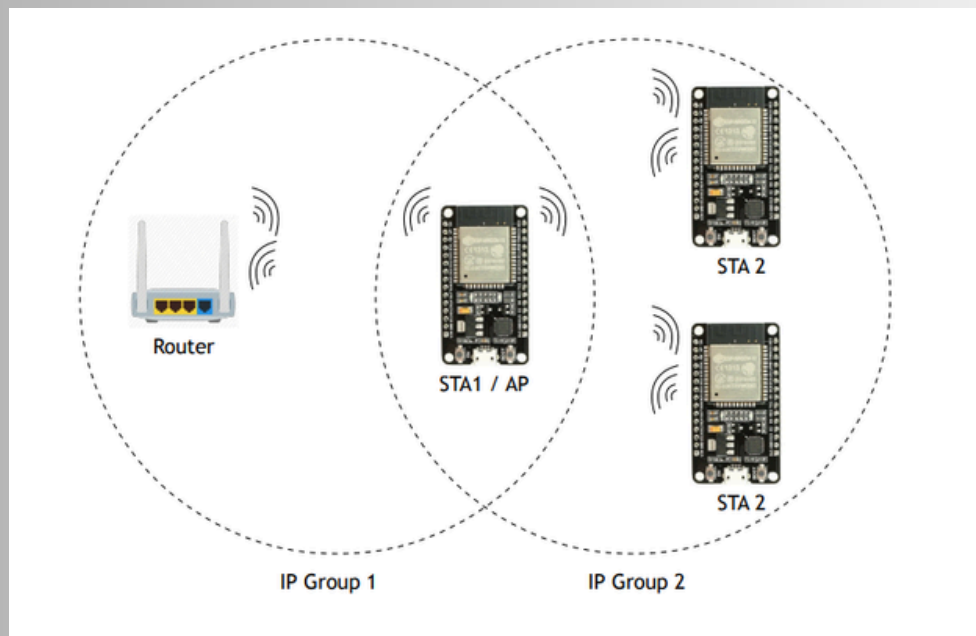


Industrial Machine State Monitoring System

The Industrial Machine State Monitoring System is designed to track and analyze **real-time** machine parameters such as temperature, pressure, current, and voltage.

It enables continuous monitoring of machine health and operational status using IoT-based sensors and communication. The system helps detect abnormalities early, supports predictive maintenance, and reduces downtime. It plays a vital role in achieving efficient and smart industrial automation.

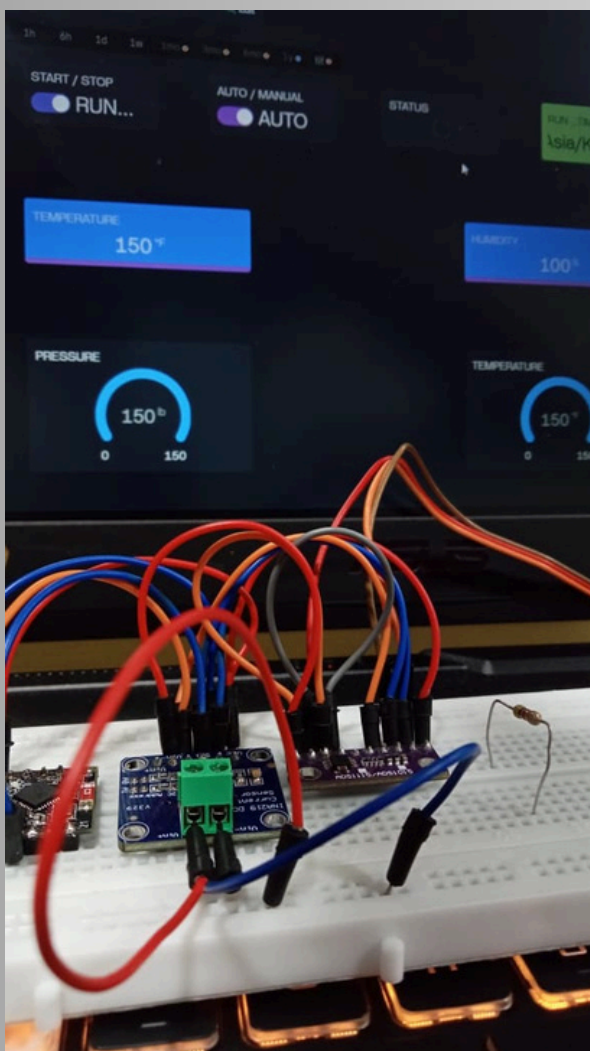


In this **Extended Service Set (ESS)** setup, you can have multiple ESP32 boards acting as Access Points with the same SSID and password and function in Dual mode **Access Point (AP)** and **Station (STA)**, each covering different areas of a factory or building.

As an ESP32 (station) device moves around, it automatically connects to the nearest AP with the strongest signal, maintaining continuous data transmission.

Hardware Architecture

- **ESP32-C3** – Core controller handling data processing, Wi-Fi communication, and IoT connectivity.
- **ADS1115 ADC** – Reads analog signals from pressure, temperature, and flow sensors with high precision.
- **Sensors** – Measure voltage, temperature, humidity, pressure, Flowrate and current for machine power monitoring.
- **Control Unit** – Includes Start, Auto/Manual, and Status controls for remote operation via Blynk.
- **Power Supply** – Provides stable 5V/3.3V to ESP32 and sensor modules for reliable operation.



```
Machine_monitoring.ino
// ESP32C3 Dev Module

// Libraries
#include <Arduino.h>
#include <Wire.h>
#include <Adafruit_ADS1115.h>
#include <BlynkEsp32.h>
#include <BlynkEsp32C3.h>

// Pins
#define BLYNK_WRITE(V0) { // Auto/Manual Button
  digitalWrite(A0, !digitalRead(A0));
  Serial.println(digitalRead(A0) ? "Mode: AUTO" : "Mode: MANUAL");
}

// Function to send sensor data
void sendSensorData() {
  // Read analog values from ADS1115
  int16_t adc_flow = ads_readADC_singleended(0);
  int16_t adc_pressure = ads_readADC_singleended(1);
  int16_t adc_temp = ads_readADC_singleended(2);

  // Convert to voltage (ADS1115: 16-bit, 4.096V range)
  float voltage_flow = (adc_flow * 4.096) / 32768.0;
  float voltage_pressure = (adc_pressure * 4.096) / 32768.0;
  float voltage_temp = (adc_temp * 4.096) / 32768.0;

  // Example conversion formulas (adjust for your sensor calibration)
  // ...
}

// Setup
void setup() {
  Blynk.begin(BLYNK_WRITE);
  Serial.begin(115200);
  Wire.begin();
  ads = new Adafruit_ADS1115();
  ads->begin(0x48);
  ads->setGain(GAIN_TWOTHIRDS);
}

// Loop
void loop() {
  sendSensorData();
}
```

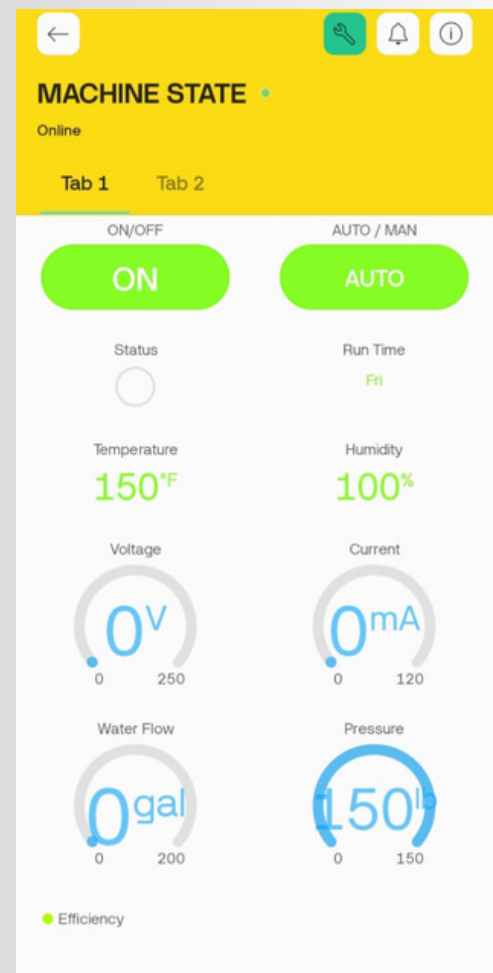
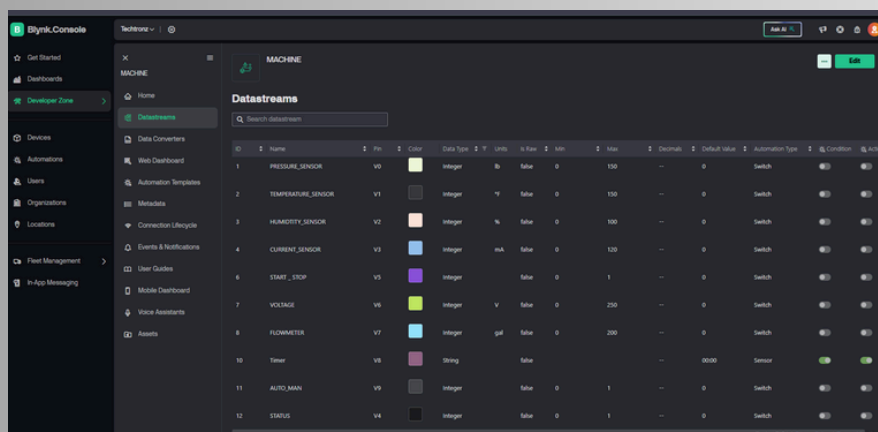
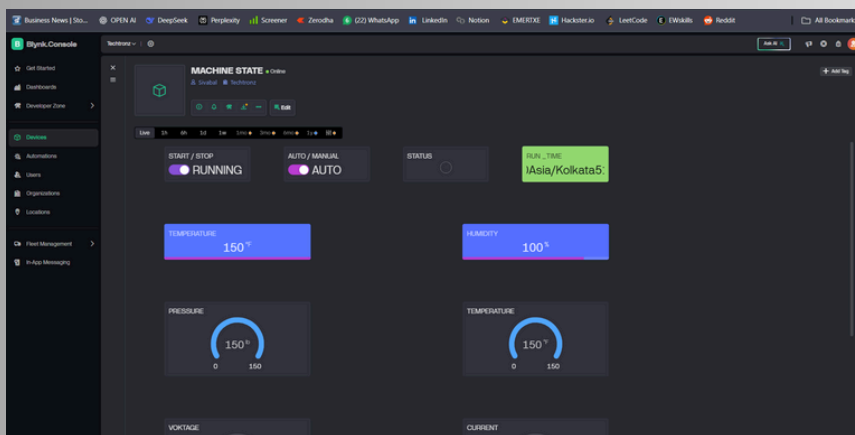
```
Output Serial Monitor x
Message (Enter to send message to 'ESP32-WROOM-DA Module' on 'COM3')

19:39:06.724 -> ets Jul 29 2019 12:21:46
19:39:06.724 ->
19:39:06.724 -> rst:0x1 (POWERON_RESET),boot:0x13 (SPI_FAST_FLASH_BOOT)
19:39:06.739 -> config:0: 0, SPIWP:0xee
19:39:06.739 -> clk_drv:0x00,q_drv:0x00,d_drv:0x00,cs0_drv:0x00,hd_drv:0x00,wp_drv:0x00
19:39:06.739 -> mode:DIO, clock div:1
19:39:06.739 -> load:0x3fff0030,len:1344
19:39:06.739 -> load:0x40078000,len:13964
19:39:06.739 -> load:0x40080400,len:3600
19:39:06.739 -> entry 0x400805f0
19:39:07.088 -> Connecting to WiFi...
19:39:07.609 -> ....
19:39:09.088 -> Connected to router!
19:39:09.088 -> Station IP: 10.21.219.37
19:39:09.135 -> Access Point started!
19:39:09.135 -> AP IP: 192.168.4.1
```

Blynk Web Dashboard

ESP32 updates Blynk every few seconds, syncing both web and mobile dashboards in real time.

- Provides a real-time visualization of machine parameters such as pressure, temperature, current, voltage, and flow rate.
- Features interactive controls (Start/Stop and Auto/Manual buttons) for remote machine operation.
- Displays live sensor data using widgets like gauges, graphs, and indicators.
- Allows cloud-based monitoring accessible from both web and mobile applications.
- Supports data logging and history view, helping in performance tracking and predictive maintenance.



THANK
you