# ESP32 RTOS Sensor Dashboard

This project implements a real-time dashboard on the ESP32 using FreeRTOS. It reads the internal chip temperature and simulates motion data, then displays both live on a web dashboard that refreshes every 2 seconds.

## Features

- Real multitasking using FreeRTOS  
- Reads ESP32 chip temperature every 100 ms  
- Simulates motion data every 200 ms  
- Hosts an auto-refreshing HTML dashboard over Wi-Fi  
- Serial output for debugging and status  
- Reports the last reset reason for troubleshooting

## Hardware Required

- ESP32 (e.g., Arduino Nano ESP32 or ESP32 DevKit)  
- USB cable  
- (Optional) Real motion sensor if replacing simulated data

## Libraries Used

- WiFi.h – Wi-Fi communication  
- WebServer.h – HTTP web server  
- driver/temp\_sensor.h – ESP32 chip temperature sensor  
- FreeRTOS – built-in with the ESP32 Arduino core

## How to Set Up

1. Install the ESP32 Board Package:  
 In Arduino IDE → Boards Manager → install “esp32 by Espressif Systems”  
  
2. Open and Edit the Code:  
 Replace the Wi-Fi credentials in the following lines:  
 const char\* ssid = "insertRouterName";  
 const char\* password = "InsertRouterPassword";  
  
3. Upload the Sketch:  
 Connect your ESP32, select the correct board and port, and upload using Arduino IDE.  
  
4. Open Serial Monitor (115200 baud) and find your ESP32’s IP address.  
  
5. Open Web Dashboard:  
 Open your browser and go to http://<your-esp32-ip> (e.g., http://192.168.4.39).

## Example Output (Serial Monitor)

RESET REASON: Power-on Reset  
Connecting to insertRouterName...  
WiFi connected!  
IP address: 192.168.4.39  
[Processing] Chip Temp: 48.6 °C | Simulated Motion: 0.34  
[Status] System running...

## Concepts Demonstrated

- RTOS task creation with xTaskCreatePinnedToCore()  
- Shared data access with mutex (xSemaphoreCreateMutex)  
- Periodic sensor reading using vTaskDelay  
- Lightweight web server on embedded hardware  
- System reset reason diagnostics using esp\_reset\_reason()

## Project Structure

esp32-rtos-dashboard/  
├── src/  
│ └── main.ino # The full sketch  
├── README.docx # This file  
├── ESP32\_RTOS\_Flowchart.png # Optional visual overview

## License

This project is open-source and licensed under the MIT License.  
Feel free to modify and extend it for your own use!

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Platform: ESP32 + Arduino + FreeRTOS

Project Type: Real-Time Sensor Simulation and Dashboard