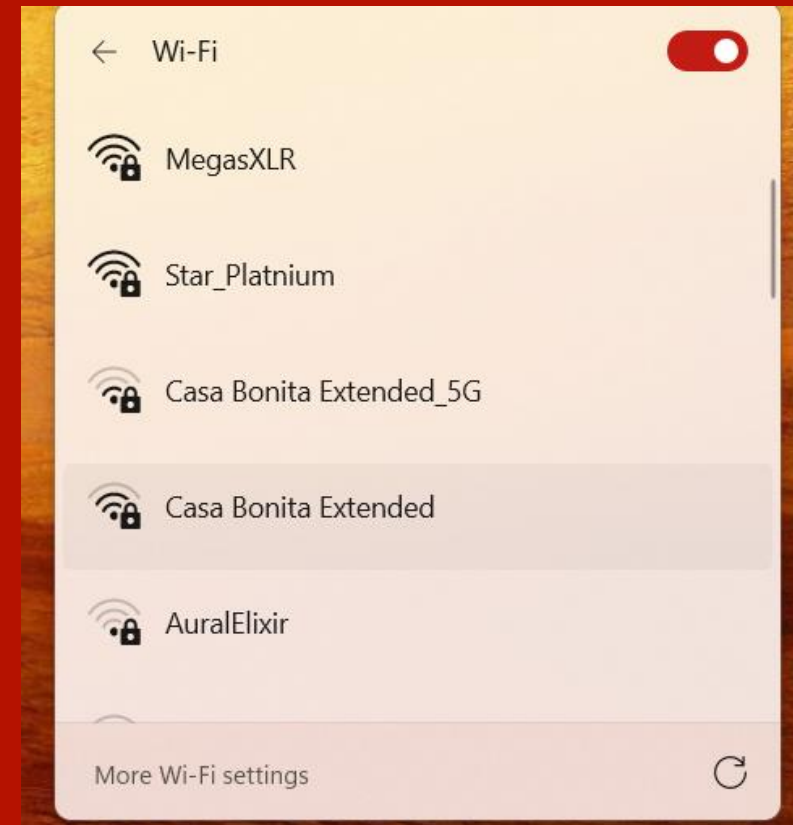




# PACKET SNIFFER WITH BIOMETRICS FOR SECURE NETWORK MONITORING

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# WHY?



# PROJECT OVERVIEW

A secure embedded system for network monitoring

- Combines packet sniffing and biometric authentication
  - Built with a LCD display and fingerprint sensor



# SYSTEM COMPONENTS

## PACKET SNIFFER

Captures and analyzes real-time network traffic



## BIOMETRIC AUTHENTICATION

Restricts access to authorized users(fingerprint)



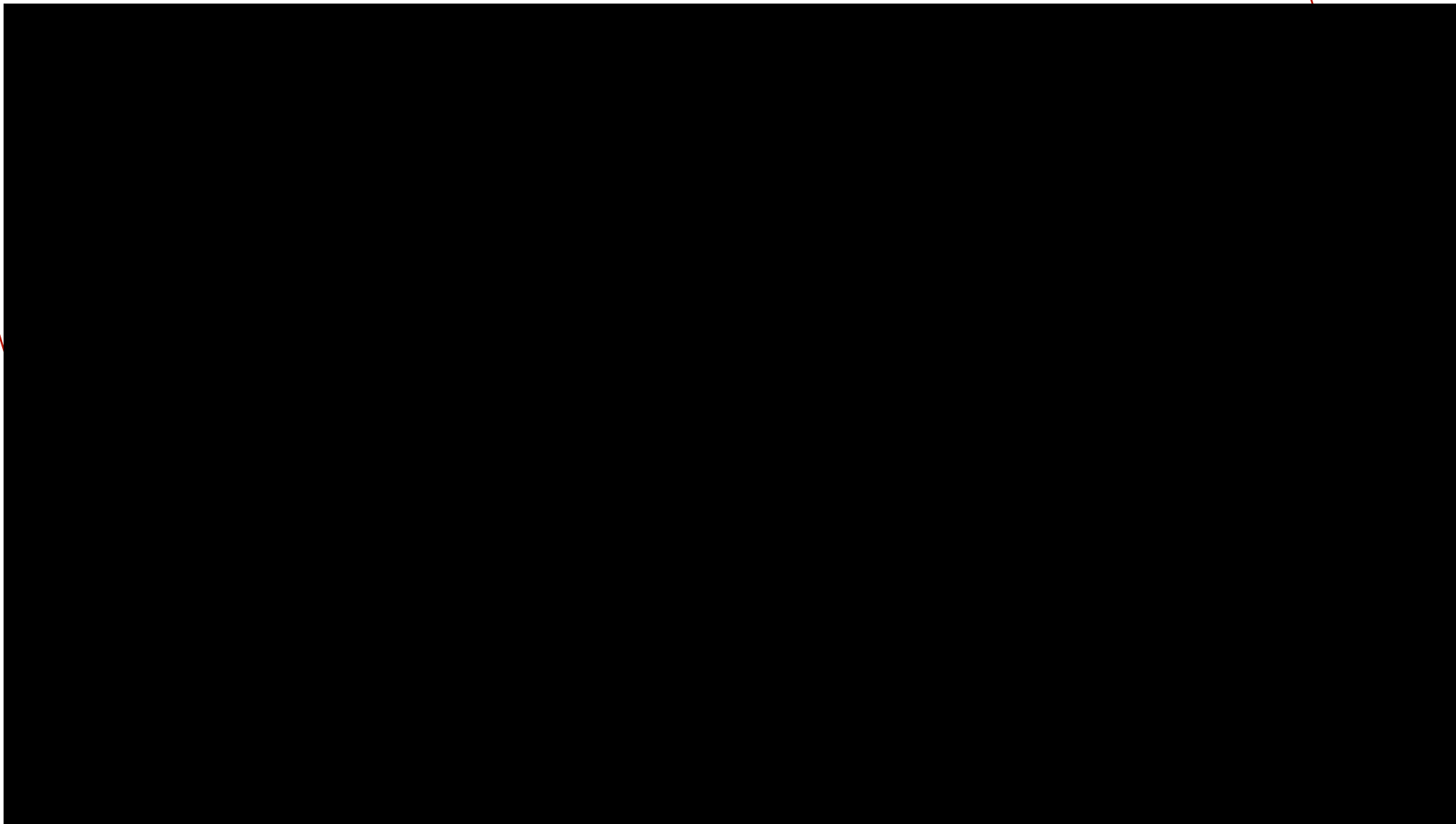
## LCD DISPLAY

Shows system status and alerts



A 3D rendered scene depicting a presentation or training session. A yellow 3D stick figure stands on the right, holding a thin black pointer and gesturing towards a large, blank white flip chart. On the left, a blue 3D stick figure is seated in a grey office chair, facing the presenter. The scene is set against a plain white background. A large, solid red horizontal banner with slightly angled ends is positioned across the middle of the image, partially obscuring the figures. The word "DEMO" is written in white, bold, sans-serif capital letters on this banner. The entire image is framed by four thin red lines extending from the corners towards the center.

DEMO



# CHALLENGES AND SOLUTIONS

## CHALLENGES

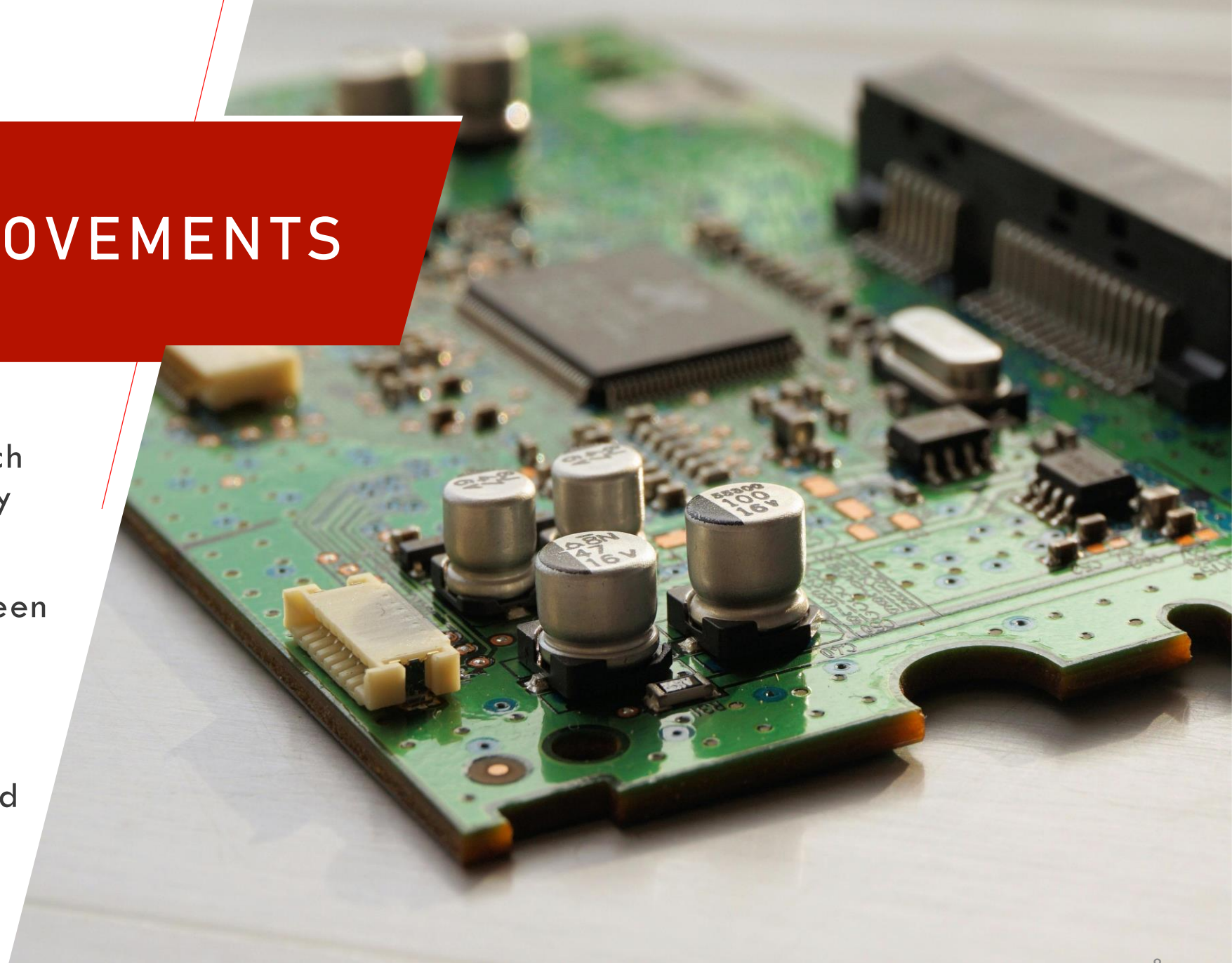
1. **ESP32 NOT SCANNING INITIALLY**
2. **Unreliable Stop Signal Handling**
3. **Integration of Biometric Authentication**
4. **LCD UI Freezing / Delays**
5. **ISR and Timer Conflicts**
6. **Power and Voltage Compatibility**
7. **Packet Sniffer Debugging**

## SOLUTIONS

1. **Enabling sniffer mode to allow for system stabilization after boot.**
2. **Dedicated GPIO pin with RISING or FALLING mode and debounce logic.**
3. **Implement a non-blocking UART handshake with timeouts and confirmation codes**
4. **SR with buffered updates using a flag system to trigger redraws only when needed.**
5. **ISR with buffered updates using a flag system to trigger redraws only when needed.**
6. **Protect shared resources and avoid nested interrupts.**
7. **4-channel bidirectional logic level shifter (e.g., TXS0108E)**
8. **Filter and log raw packet headers**

# FUTURE IMPROVEMENTS

- User access logs
  - Track and timestamp each authorized user's activity
- Touchscreen interface
  - Replace LCD with touchscreen for easier user interaction and system control
- Support multiple biometric users
  - Manage multiple registered users with different access levels





# FINAL TIPS & TAKEAWAYS

## **PRACTICE MAKES PERFECT**

EE majors have my respect

Packets are quick and never ending

- Filtering is tricky if you want certain things to stand out

Timing and transitions

- Not easy to create such a sleek device

I never got Mexican food...

## **GITHUB LINK:**

[https://github.com/CMBorjas/Biometrics\\_Packet\\_Sniffer.git](https://github.com/CMBorjas/Biometrics_Packet_Sniffer.git)

THANK YOU

