PACKET SNIFFER WITH BIOMETRICS FOR SECURE NETWORK MONITORING

Team: Byte Builders

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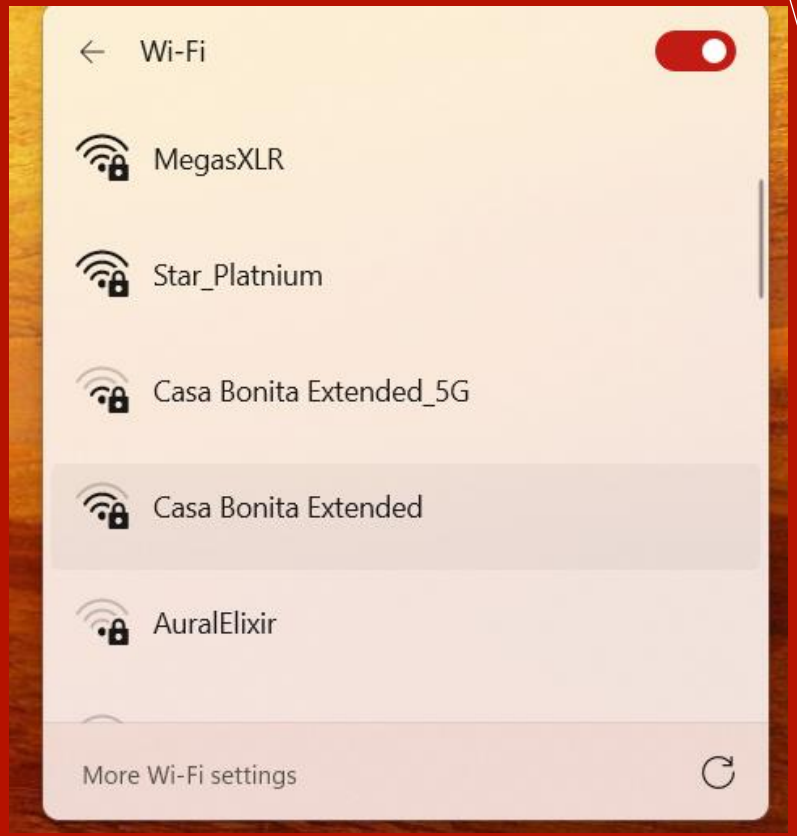
WHY?


Casa Bonita


Wi-Fi
MegasXLR
Star_Platnium
Casa Bonita Extended_5G
Casa Bonita Extended
AuralElixir
More Wi-Fi settings

PROJECT OVERVIEW

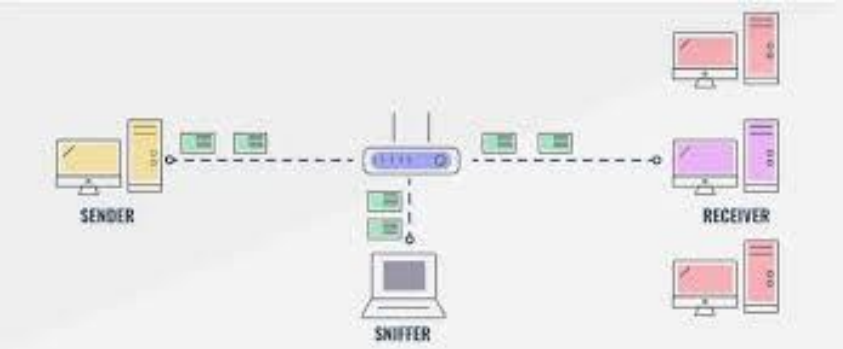
A secure embedded system for network monitoring

- 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

DEMO

CHALLENGES AND SOLUTIONS

CHALLENGES

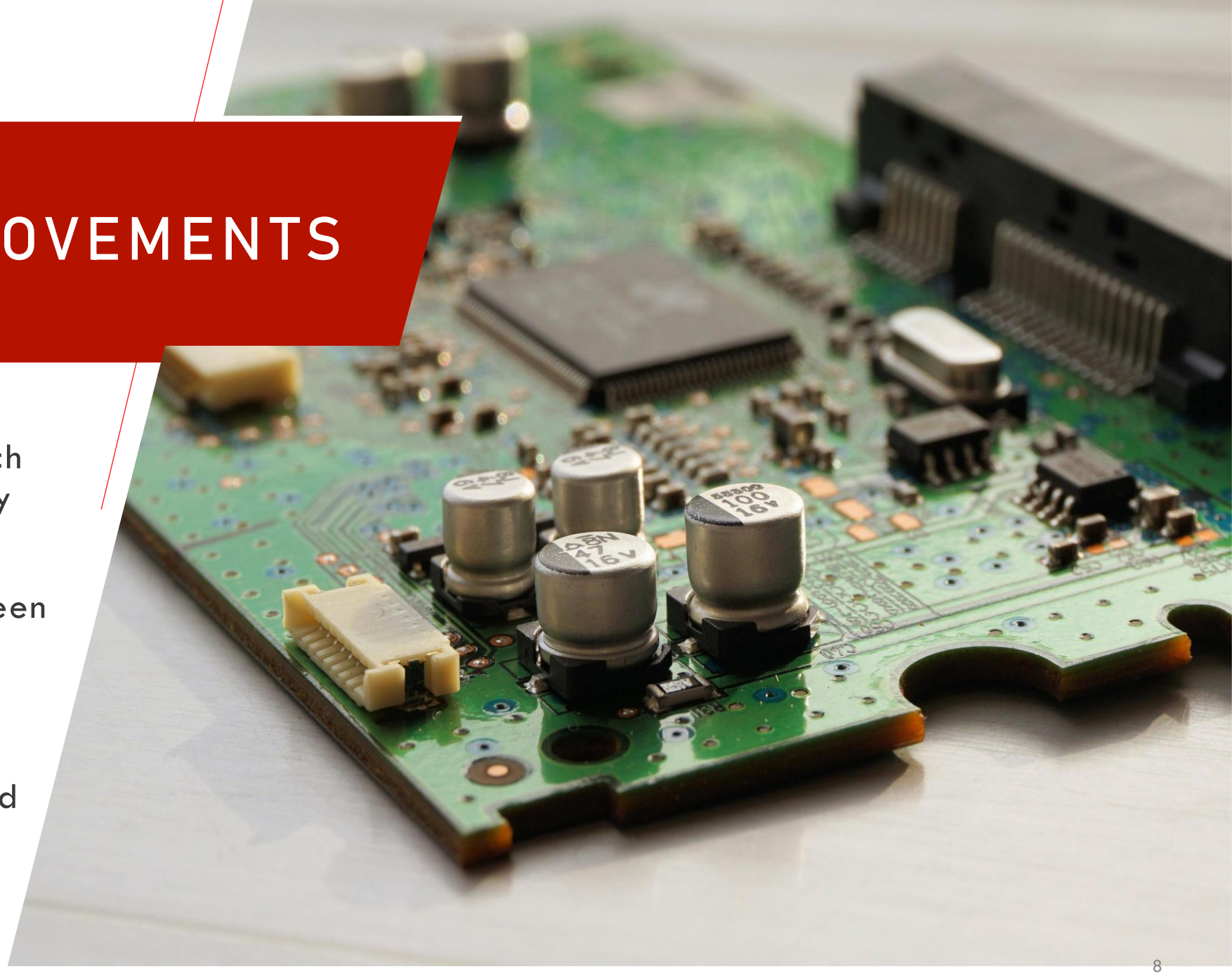
1. **ESP32 NOT SCANNING INITIALLY**
2. **Unreliable Stop Signal Handling**
3. **Integration of Biometric Authentication**
4. **LCD UI Freezing / Delays**
5. **ISR and Timer Conflicts**
6. **Power and Voltage Compatibility**
7. **Packet Sniffer Debugging**

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 standout

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

THANK YOU