Hackathon Challenge: WiFi CSI Terminal-based Logging

The existing open-source frameworks for collecting Channel State Information (CSI) from ESP32 devices, primarily built in C/C++, suffer from common limitations, including:

- Limited support for newer, more capable ESP32 device families.
- Collection frequency constrained by the UART interface.
- Lack of a spatially diverse, self-scalable solution.
- Overhead introduced by the ESP-IDF framework.
- Use of C/C++, which is not memory-safe, leads to reliability concerns.

The opportunity lies in leveraging the official Rust support for ESP devices (esp-rs and esp-wifi) to build a more reliable, performant, and scalable CSI collection ecosystem. A key missing component in the visualization and data analysis layer is a Terminal User Interface (TUI) tool for interactive, real-time data collection.

Hackathon Task: Create esp-csi-tui-rs

The goal is to create `esp-csi-tui-rs`**,** a terminal user interface application in Rust, utilizing the **Ratatui** Rust crate. The application should provide a terminal-friendly interface to visualize and collect CSI data while interacting with the ESP using esp-csi-cli-rs.

`esp-csi-tui-rs` must support the following specifications:

- **Device Interaction:** Interact with a connected ESP device using esp-csi-cli-rs over a serial interface to configure and then retrieve CSI data. TUI should include options for all configurations.
- **Data Visualization:**
  - Support live plotting of CSI data for different subcarriers.
  - Support different plot types for visualizing complex-number data: 3D, 2D, Heatmap, Color Domain, etc.
- **Remote Live Streaming:** Support live streaming of data to a rerun.io viewer instance that can be deployed anywhere (local or remote).
- **Data Storage:**
  - Support storing captured data in the **.rrd** format (for playback in the Rerun viewer).
  - Support storing raw CSI data in **.csv** format.
- **Camera Video Streaming (Bonus Feature)**:
  - Support camera live stream capture in TUI.

Tech Advisor Sessions:

Use Link to Schedule: https://calendar.app.google/Wh6e2BZ5FRUPMY9V8