Fabric-Style Telemetry Demo - Project Overview

Project Summary

This project simulates a scalable, secure telemetry system inspired by UNION's Fabric platform. It integrates ESP32-based edge sensors with both cloud-native (AWS IoT Core, Timestream, Grafana) and custom agent (Rust/Go) pipelines. This dual-path architecture allows real-time data monitoring, alerting, and command control for factory simulation environments.

Architecture Highlights

- Dual telemetry ingest via MQTT (HiveMQ and AWS IoT Core)

- Structured JSON schema includes temp, uptime, RSSI, heap, and alerts

- TLS-secured comms, credentialized edge nodes

- Grafana Cloud dashboards (multi-panel, multi-device)

- Rust and Go agents parse and react to MQTT feeds

- Full SBOM and vulnerability scanning in CI/CD pipeline (Syft, Grype)

Roadmap: Next Steps and Execution Plan

1. Modularize Node Firmware

   - Configurable ESP32 templates to quickly add sensors

   - Structured telemetry with shared schemas

2. CI/CD with DevSecOps Tools

   - GitHub Actions pipeline with Syft, Grype, and artifact signing

   - Multi-language support (Rust, Go, Arduino)

3. Improve Operator Dashboard

   - Add thresholds, alert colors, uptime stats

   - Normalize panels by device

4. Host-to-Node Command Pattern

   - Enable ESP32 to subscribe and act on MQTT commands

   - Secure validation and return channel

5. Edge Resilience Logging

   - Local storage on SD/flash for offline buffering

   - Resend logic with sync status

Optional Additions

- OTA updates

- Edge anomaly detection

- Palantir Foundry or AIP bridge

- Custom frontends for operator control

- Digital twin mapping interface