Individual Weekly Report

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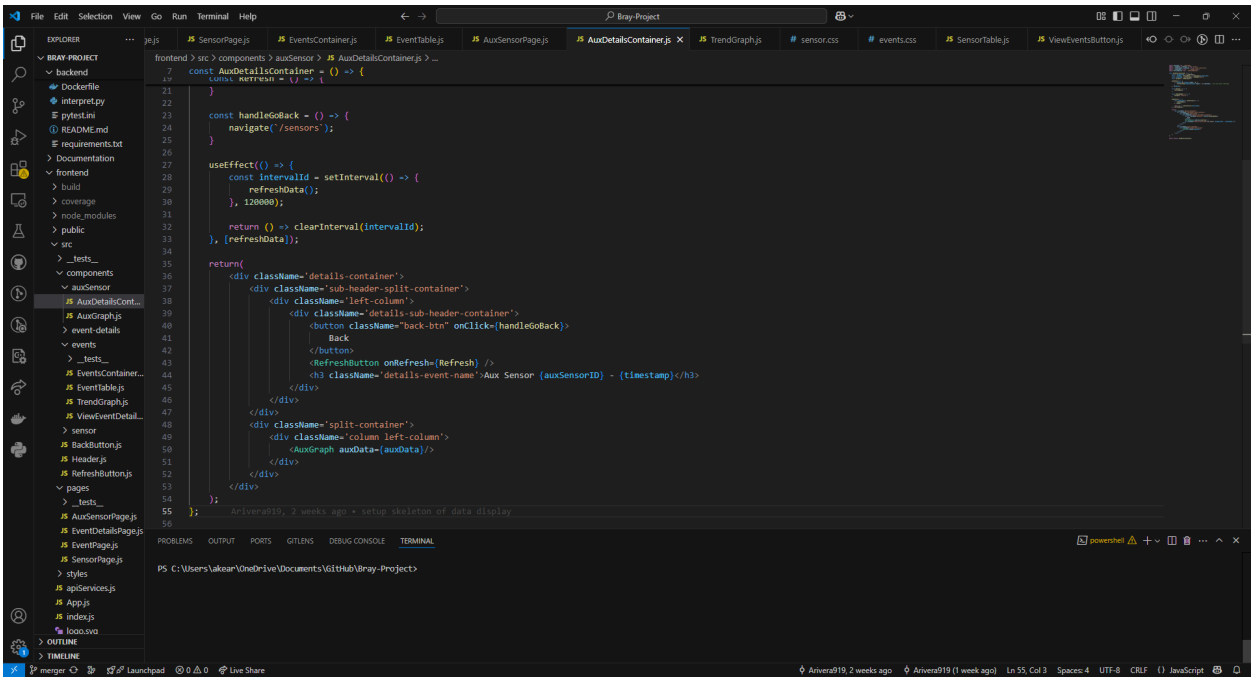
Team: Bray IIoT Smart Solution
Date: 4/21/2025

Current Status

1. What did you **personally** work on this past week?

Task	Status	Time Spent
Project Report Abstract	Complete	~1 hour
Project Report Modifications	In progress	~1 hour
Frontend Modifications	In progress	~1 hour

Include **screenshots/graphics** to illustrate what you did this past week:



Bray IIoT Smart Solution

Abstract

Industrial valve failures remain a major safety and environmental threat in sectors like oil and gas, where undetected leaks of hazardous gases can lead to catastrophic events. Fugitive emissions account for over 60% of total unintentional gas releases in industrial facilities, contributing not only to safety risks but also to significant regulatory violations and environmental harm. Existing valve monitoring systems often lack real-time emission detection, leaving critical blind spots that make it difficult to anticipate and mitigate valve degradation.

To address this, we partnered with Bray International in their development of their LoRaWAN-enabled IoT valve monitoring system by integrating fugitive emissions detection to their developing system. Our system intermittently detects the presence of CO_2 and transmits the data wirelessly to a centralized PostgreSQL database, where it is visualized through a React-based web interface. This solution is novel in its integration of long-range, low-power communication with accessible emission visibility, closing the gap left by traditional valve diagnostics and providing the tools for future predictive maintenance solutions.

We evaluated our system through layered functionality testing and a usability study involving 20 participants, including engineers and plant managers. The sensor showed high reliability in emission detection with minimal packet loss over LoRaWAN, and the dashboard was generally well rated on usability metrics such as clarity, responsiveness, and ease of navigation. Feedback also highlighted the value of historical data filtering and near real-time updates in an industrial context.

Our key contribution is a successful integration of fugitive emissions detections functions into Bray International's industrial valve monitoring system, promoting preventive maintenance, and supporting safety and compliance goals in high-stakes industrial environments.

2. What problems did you run into? What is your plan for them?
   We have not had any problems.

3. What is the current overall project status from your perspective?
   We have fulfilled Bray's requirements for the project, so we are now finalizing how we will display our data.

4. How is your team functioning from your perspective?
   Overall, the team is functioning smoothly.

5. What new ideas did you have or skills did you develop this week?
   I gained more experience in working with frontend web development.

6. Who was your most awesome team member this week and why?
   Abdiel has been doing consistently great work and has developed a way to display the CO2 data.

Plans for Next Week

What are you going to work on this next week?

- Finish Project Report
- Frontend: make changes according to user feedback, ensure data is displayed correctly