Individual Weekly Report

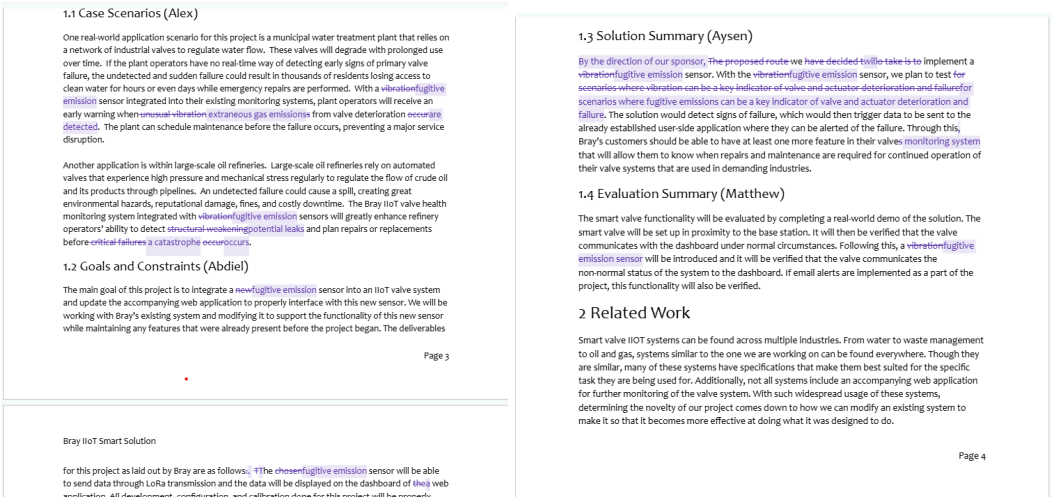
Name: Alex Kearney
Team: Bray IIoT Smart Solution
Date: 3/17/2025

Current Status

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

Task	Status	Time Spent
Configure the R-Pi server for data collection	Done	~1 hour
Report modifications	In Progress	~2 hours

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



1.1 Case Scenarios (Alex)

One real-world application scenario for this project is a municipal water treatment plant that relies on a network of industrial valves to regulate water flow. These valves will degrade with prolonged use over time. If the plant operators have no real-time way of detecting early signs of primary valve failure, the undetected and sudden failure could result in thousands of residents losing access to clean water for hours or even days while emergency repairs are performed. With a ~~vibration~~fugitive emission sensor integrated into their existing monitoring systems, plant operators will receive an early warning when ~~unusual vibration~~ extraneous gas emissions~~s~~ from valve deterioration ~~occur~~are detected. The plant can schedule maintenance before the failure occurs, preventing a major service disruption.

Another application is within large-scale oil refineries. Large-scale oil refineries rely on automated valves that experience high pressure and mechanical stress regularly to regulate the flow of crude oil and its products through pipelines. An undetected failure could cause a spill, creating great environmental hazards, reputational damage, fines, and costly downtime. The Bray IIoT valve health monitoring system integrated with ~~vibration~~fugitive emission sensors will greatly enhance refinery operators' ability to detect ~~structural weakening~~potential leaks and plan repairs or replacements before ~~critical failures~~ a catastrophe ~~occur~~occurs.

1.2 Goals and Constraints (Abdiel)

The main goal of this project is to integrate a ~~new~~fugitive emission sensor into an IIoT valve system and update the accompanying web application to properly interface with this new sensor. We will be working with Bray's existing system and modifying it to support the functionality of this new sensor while maintaining any features that were already present before the project began. The deliverables

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for this project as laid out by Bray are as follows.: ~~T~~The ~~chosen~~fugitive emission sensor will be able to send data through LoRa transmission and the data will be displayed on the dashboard of ~~the~~a web

1.3 Solution Summary (Aysen)

By the direction of our sponsor, ~~The proposed route~~ we ~~have decided t~~will~~o take is to~~ implement a ~~vibration~~fugitive emission sensor. With the ~~vibration~~fugitive emission sensor, we plan to test ~~for scenarios where vibration can be a key indicator of valve and actuator deterioration and failure~~for scenarios where fugitive emissions can be a key indicator of valve and actuator deterioration and failure. The solution would detect signs of failure, which would then trigger data to be sent to the already established user-side application where they can be alerted of the failure. Through this, Bray's customers should be able to have at least one more feature in their valves monitoring system that will allow them to know when repairs and maintenance are required for continued operation of their valve systems that are used in demanding industries.

1.4 Evaluation Summary (Matthew)

The smart valve functionality will be evaluated by completing a real-world demo of the solution. The smart valve will be set up in proximity to the base station. It will then be verified that the valve communicates with the dashboard under normal circumstances. Following this, a ~~vibration~~fugitive emission sensor will be introduced and it will be verified that the valve communicates the non-normal status of the system to the dashboard. If email alerts are implemented as a part of the project, this functionality will also be verified.

2 Related Work

Smart valve IIOT systems can be found across multiple industries. From water to waste management to oil and gas, systems similar to the one we are working on can be found everywhere. Though they are similar, many of these systems have specifications that make them best suited for the specific task they are being used for. Additionally, not all systems include an accompanying web application for further monitoring of the valve system. With such widespread usage of these systems, determining the novelty of our project comes down to how we can modify an existing system to make it so that it becomes more effective at doing what it was designed to do.

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2. What problems did you run into? What is your plan for them?
   We discovered that we needed to simulate the torque bracket sensor from last year and implement it in the system. We have acquired hardware from Bray that will spoof data from a torque bracket sensor so the system can run. However, this also necessitates that our frontend and backend code accommodate the torque bracket sensor. We plan to make the database to include a type of sensor for each entry.

3. What is the current overall project status from your perspective?
   The project is behind but I believe once we've overcome a few knowledge hurdles regarding firmware, progress will accelerate.

4. How is your team functioning from your perspective?
   The team hasn't been communicating very well lately.

5. What new ideas did you have or skills did you develop this week?
   I improved my understanding of docker documentation and usage.

6. Who was your most awesome team member this week and why?
   Matthew for acquiring additional necessary hardware from Bray and leading the charge on firmware.

Plans for Next Week

What are you going to work on this next week?

- Frontend code configuration
- Backend code configuration
- Backend server configuration (Raspberry Pi)
- Get every hardware component communicating with each other
- Modify and update Project Report