TrainPulse – Capstone Project Proposal

---

1. Project Idea

The project I decided to work on is called **TrainPulse**.

TrainPulse is a web application that allows commuters to **track trains in real time (or near real time)** and plan their journeys more effectively. The app is inspired by ride-hailing applications such as Uber or InDrive, where users can see vehicles moving on a map, track progress, and get estimated arrival times.

The initial focus of the project is on **Cape Town's Southern Line (Cape Town → Retreat)**. Many commuters experience uncertainty due to delayed, cancelled, or unpredictable train services. TrainPulse aims to reduce this uncertainty by presenting train movement, status, and estimated arrival times in a clear and familiar interface.

The current implementation uses a **simulation MVP** to demonstrate how the system would work if connected to real train data, while still solving a real problem and showing strong technical design.

---

2. Project Features

The project will have the following features:

Core Features

- Interactive map showing the Southern Line stations
- Visual train movement along the railway line
- Station-to-station movement with realistic stops
- Live status updates (Moving, Stopped, Arrived)
- Estimated Time of Arrival (ETA) updates
- Stops-away indicator (how many stations away the train is)

User-Focused Features

- "Your station" selector so users can choose where they want to board
- ETA specifically calculated for the selected station
- Uber-style bottom dashboard for quick information

- Track / follow train functionality that keeps the train centered on the map

Planned Enhancements

- Support for multiple trains
- Bi-directional routes (Cape Town → Retreat and Retreat → Cape Town)
- Alerts and notifications
- Historical reliability data

---

3. API Usage

At the moment, the project uses **simulated data** to represent train movement and timing. This approach allows the core functionality and architecture to be demonstrated without relying on unreliable or unavailable real-time data sources.

Planned / Possible APIs

In future versions, the application can integrate with:

- **GTFS (General Transit Feed Specification)** for scheduled train data
- **GTFS-Realtime** feeds for live train positions and delays (if available)
- **Crowdsourced reporting APIs** where users submit arrival and delay information
- A custom backend API built with FastAPI or Express to aggregate and serve data

The frontend is designed so that simulated data can easily be replaced with real API responses.

---

4. React Components (Planned)

The final version of the project is planned to be implemented using **React**. The following components are expected:

- **App** – Root component
- **MapView** – Displays the Leaflet map and route
- **TrainMarker** – Handles train position and animation
- **StationMarker** – Displays individual stations
- **BottomPanel** – Uber-style dashboard UI
- **StationSelector** – Dropdown for selecting the user's station
- **ETAInfo** – Displays ETA and stops-away information
- **TrackButton** – Toggles train tracking mode

These components will be designed to be reusable and scalable as more lines and trains are added.

---

5. Project Plan (5 Weeks)

Week 1 – Planning & Setup

- Finalize project idea and scope
- Design UI wireframes
- Set up project repository
- Build basic map with stations

Week 2 – Core Functionality

- Implement train movement logic
- Station-to-station simulation
- Train status management

Week 3 – User Interaction & UX

- Add bottom dashboard UI
- Implement station selector
- Add ETA and stops-away calculations
- Improve responsiveness and layout

Week 4 – React Refactor & Structure

- Convert project to React
- Split logic into reusable components
- Clean up state management
- Prepare for API integration

Week 5 – Polish & Documentation

- Fix bugs and edge cases
- Improve UI/UX consistency
- Write final documentation
- Prepare demo and presentation

---

6. Conclusion

TrainPulse is a practical and locally relevant project that addresses real commuter challenges in Cape Town. It demonstrates front-end development skills, real-time system design, user-focused UX, and scalable architecture planning, making it well-suited for a capstone project.

Author: Michael khan tal
ALX Software Engineering – Capstone Project