

# Transportation System Project Report

## 1. Object-Oriented Analysis (OOA)

In this project, we analyzed the transportation system and identified the following objects:

- Vehicle: Represents buses, express buses, and potentially trains.
- Station: Manages schedules and station information.
- Passenger: Allows booking and canceling rides.
- Schedule: Represents the arrival or departure of a vehicle.

## 2. Class Design and Inheritance

The class design uses inheritance to represent specialized types of vehicles. The base class is Vehicle, which defines common attributes such as route, capacity, and status. The Bus class inherits from Vehicle and adds the attribute numberOfStops, overriding the method calculateTravelTime to include stop delays. The ExpressBus class inherits from Bus and applies a speed multiplier to reduce travel time. This demonstrates the 'is-a' relationship: an ExpressBus is a Bus, and a Bus is a Vehicle.

## 3. Code Walkthrough

Key parts of the C++ code include: - Vehicle class: Base class with attributes (route, capacity, status) and a virtual calculateTravelTime method. - Bus class: Derived from Vehicle, adds numberOfStops and overrides calculateTravelTime. - ExpressBus class: Derived from Bus, modifies calculateTravelTime to account for faster travel. - Station class: Manages schedules using a vector of Schedule\_Entry structs. - Passenger class: Manages bookings with methods to book, cancel, and show rides.

## 4. Test Results

Sample outputs from running the main program include: - Displaying station and vehicle information. - Adding schedules for departures and arrivals. - Passengers booking and canceling rides. - Travel time comparison: Express buses show approximately 20% reduced travel time compared to regular buses.

## 5. Use of LLM AI Model

An LLM (ChatGPT) was used during this project in the following ways: - Brainstorming class hierarchies (e.g., suggesting that ExpressBus inherit from Bus). - Debugging assistance (e.g., identifying missing 'public' in inheritance declaration). - Explaining concepts such as 'for(auto &s; : schedules)' syntax. The actual code and design decisions were written by the student. The LLM was used as an assistant for learning and debugging, not as the primary code generator.