# OOA Analysis for Public Transportation Management System (based on your code)

## 1. Objects (Nouns)

From your code, the main objects are:

- Vehicles

- Bus (inherits from Vehicles)

- ExpressBus (inherits from Bus)

- Stations

- Passenger

## 2. Attributes (Descriptive Nouns)

Vehicles: route, capacity, status

Bus: inherits Vehicles, adds speed = 40 km/h

ExpressBus: inherits Bus, adds fewerStops

Stations: name, location, type, scheduled (vector<string>), vehicles (vector<Vehicles>)

Passenger: name, ID, bookedTicket

## 3. Methods (Verbs)

Vehicles: displayInfo(), calculateTravelTime()

Bus: displayInfo() override, calculateTravelTime()

ExpressBus: displayInfo() override, calculateTravelTime() override (20% faster)

Stations: addScheduled(), removeScheduled(), displayInfo(), assignVehicle()

Passenger: displayInfo(), bookTicket(), cancelTicket()

## 4. Inheritance Relationships

Vehicles is the base class.

Bus inherits from Vehicles.

ExpressBus inherits from Bus.

Passenger and Stations are independent, not inheriting from Vehicles.

# Explanation of Class Design

The system is structured around three domains: vehicles, stations, and passengers.

Vehicles: Represent general transport units with route, capacity, and status.

Bus: Specialized vehicle with default speed of 40 km/h.

ExpressBus: More specific type of Bus with fewer stops and faster travel time (20% less).

Stations: Manage schedules and store a list of vehicles.

Passengers: Represent individual travelers who can book or cancel tickets.

# Code Walkthrough

Vehicles: Base class with attributes and displayInfo().

Bus: Derived from Vehicles, overrides displayInfo() and adds travel time calculation.

ExpressBus: Derived from Bus, overrides travel time (20% faster) and adds fewerStops attribute.

Stations: Hold station information, schedules, and assigned vehicles.

Passenger: Hold passenger details and manage booking/canceling tickets.

# Test Results

Sample outputs when running the program:

=== Test Vehicles ===

Bus - Route:

Vehicle - Route: Route A, Capacity: 40, Status: On-time

Bus travel time (100 km): 2.5 hours

Express Bus - Route: Route B, Capacity: 30, Fewer Stops: 3, Status: Delayed

Express bus travel time (100 km): 2 hours

=== Test Stations ===

Station: Central (Bus) at Downtown

Schedules:

08:00 Arrival

09:00 Departure

After adding schedule:

Station: Central (Bus) at Downtown

Schedules:

08:00 Arrival

09:00 Departure

10:00 Arrival

After removing schedule:

Station: Central (Bus) at Downtown

Schedules:

08:00 Arrival

10:00 Arrival

=== Test Passenger ===

Passenger: Alice (ID: P001)

No ticket booked.

Alice booked ticket: Route A - 08:00

Passenger: Alice (ID: P001)

Booked ticket: Route A - 08:00

Alice canceled ticket: Route A - 08:00

Passenger: Alice (ID: P001)

No ticket booked.

Bob booked ticket: Route B - 09:00

Passenger: Bob (ID: P002)

Booked ticket: Route B - 09:00

Program ended with exit code: 0