1. Object-Oriented Analysis (OOA)

1.1 Objects (Nouns)

- **Station**
- **Vehicle**
- **ExpressBus** (specialized vehicle)
- **Passenger**
- **Schedule**
- **Ticket**

1.2 Attributes (Descriptive Nouns)

- **Station**: name, location, type, list of schedules
- **Schedule**: vehicle name, start time, end time
- **Vehicle**: route, capacity, status
- **ExpressBus (inherits Vehicle)**: adds speed
- **Passenger**: name, ID, list of booked tickets
- **Ticket**: passenger name, route, vehicle type, start time, end time

1.3 Methods (Verbs)

- **Station**: addSchedule(), removeSchedule(), displaySchedule()
- **Schedule**: display()
- **Vehicle**: assignToStation(), calculateTravelTime(), reduceCapacity(), increaseCapacity(), displayInfo()
- **ExpressBus**: calculateTravelTime() *(override)*, displayInfo2()
- **Passenger**: bookTicket(), cancelTicket(), displayPassenger()
- **Ticket**: displayTicket()

1.4 Inheritance Relationships

- **Vehicle → ExpressBus** (ExpressBus is a specialized Vehicle with higher speed and fewer stops).

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2. Thiết kế class (Class Design)

- **Base Class**: Vehicle
- **Derived Class**: ExpressBus
- **Supporting Classes**: Station, Schedule, Passenger, Ticket
- **Encapsulation**: thuộc tính private, phương thức public
- **Composition**: Passenger chứa nhiều Ticket
- **Error Handling**:
    - Không thêm schedule khi vượt quá 10.
    - Không book vé khi capacity = 0.

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3. Code Walkthrough

3.1 Station

- Quản lý lịch trình (Schedule).
- Giới hạn số schedule là **10**.
- In ra toàn bộ lịch trình.

3.2 Vehicle & ExpressBus

- Vehicle: route, capacity, status.
- calculateTravelTime(distance): giả sử bus thường chạy **50 km/h**.
- ExpressBus: có thêm tốc độ riêng (ví dụ **80 km/h**) → override phương thức để tính nhanh hơn.

3.3 Passenger & Ticket

- Passenger: có danh sách ticket.
- bookTicket(): tạo ticket mới nếu vehicle còn chỗ, giảm capacity.
- cancelTicket(): xóa ticket và tăng capacity.
- Ticket: chứa thông tin passenger + chuyến đi.

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4. Kết quả Test (Testing Results)

=== Station Schedule ===

Station: Central Station

Location: Downtown

Type: Bus

1. Vehicle: Bus-01

Start time: 08:00

End time: 10:00

2. Vehicle: Bus-02

Start time: 10:30

End time: 12:00

=== Vehicle Info ===

-------Vehicle infomation-------

Route: Route A

Capacity: 2

Status: Available

-------Vehicle infomation-------

Route: Route B

Capacity: 1

Status: Available

Speed: 80

=== Travel Time Test ===

Travel Time: 2 h

Travel Time: 1.25 h

=== Booking Ticket ===

Booked successfully

Booked successfully

Vehicle is full for passenger

Booked successfully

Vehicle is full for passenger

=== Cancel Ticket ===

=== Passenger Info ===

Passenger Information

Name: Alice

Id: P001

Passenger Information

Name: Bob

Id: P002

Passenger Information

Name: Charlie

Id: P003

-----Ticket-----

Name passenger: Alice

Route: Route A

Vehicle type: Bus-01

Start time: 08:00

End time: 10:00

-----Ticket-----

Name passenger: Alice

Route: Route B

Vehicle type: Bus-02

Start time: 10:30

End time: 12:00

-----Ticket-----

Name passenger: Bob

Route: Route A

Vehicle type: Bus-01

Start time: 08:00

End time: 10:00

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5. LLM Usage

Tôi đã sử dụng **ChatGPT** để:

- Gợi ý bước **OOA** (objects, attributes, methods).
- Hỗ trợ xác định **quan hệ kế thừa** (Vehicle → ExpressBus).
- Giải thích bug khi viết cancelTicket().
- Đề xuất **test case** để kiểm thử toàn bộ tình huống.

👉 Tôi **không copy code hoàn toàn** từ LLM. Code và tài liệu do tôi viết, LLM chỉ đóng vai trò **tư vấn và gợi ý**.