SOFTWARE ARCITECTURE AND DESIGN

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LAB ASSIGNMENT 1

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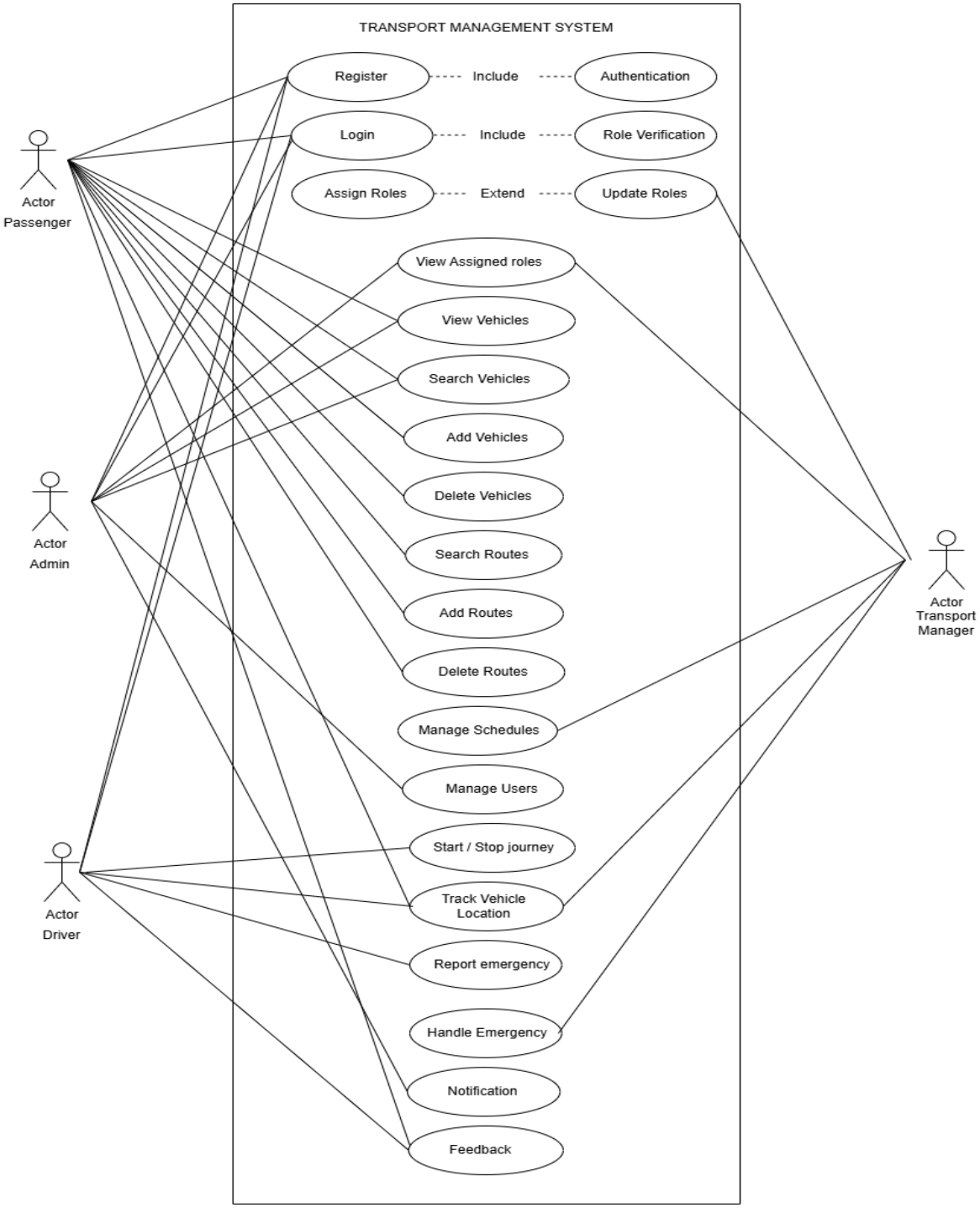
TRANSPORT MANAGEMENT SYTSEM

USE CASE: Track Vehicle Location



FULLY DRESSED USE CASE OF TRACK VEHICLE LOCATION

USE CASE 1D	UC-1
USE CASE NAME	Track Vehicle Location in a Transport Management System
Actor	Primary Actor: Passenger, Transport Manager Secondary Actor: System
Description	This use case allows fleet managers and passengers to view a vehicle's real-time location on a map using GPS data, helping with monitoring, route tracking, and arrival updates.
Trigger	The user (Transport Manager or passenger) selects the option to track a vehicle's location from the system dashboard or mobile app.
Pre-Condition	PRE-1: The vehicle is equipped with a GPS tracking device or mobile tracking app. PRE-2: The tracking system is connected and actively transmitting location data. PRE-3: The user (dispatcher/fleet manager) is logged in and authorized to access tracking data.
Post Condition	POST-1: The user is able to view the real-time location of selected vehicles on a map. POST-2: Location data is refreshed regularly (e.g., every 10 seconds). POST-3: Historical location data is optionally stored for analytics.
Normal Flow	13.0 Track Vehicle Location 1. The user logs into the TMS dashboard. 2. The user navigates to the "Track Vehicle Location" section. 3. The system displays a list of active vehicles. 4. The user selects a vehicle from the list. 5. The system retrieves the latest GPS coordinates of the selected vehicle. 6. The system displays the vehicle's current location on an interactive map. 7. The location auto-refreshes at set intervals (e.g., 10s or 30s). 8. The user optionally views additional data (speed, route, last stop, ETA).

Alternative Flow	**4a. No Vehicles Available** 4a1. System displays a message: "No vehicles are currently active or tracked." **5a. Vehicle Not Sending Location Data** 5a1. System shows last known location. 5a2. Displays a warning: Vehicle not connected. Last update at [timestamp]. **6a. Map API Fails** 6a1. System displays a fallback list view of coordinates. 6a2. Shows message: Map failed to load. Please check connection or try later.

Exceptions	• **Vehicle Not Connected:**
	  • GPS device is offline or not transmitting data.
	  • System displays the last known location with a warning.
	• **Map API Fails:**
	  • If the map fails to load, show fallback coordinates or an error message.
	• **Unauthorized Access:**
	  • A user tries to access tracking without proper permissions. System denies access.
	• **Vehicle Not Found:**
	  • The selected vehicle ID doesn't exist or has been removed from the system.

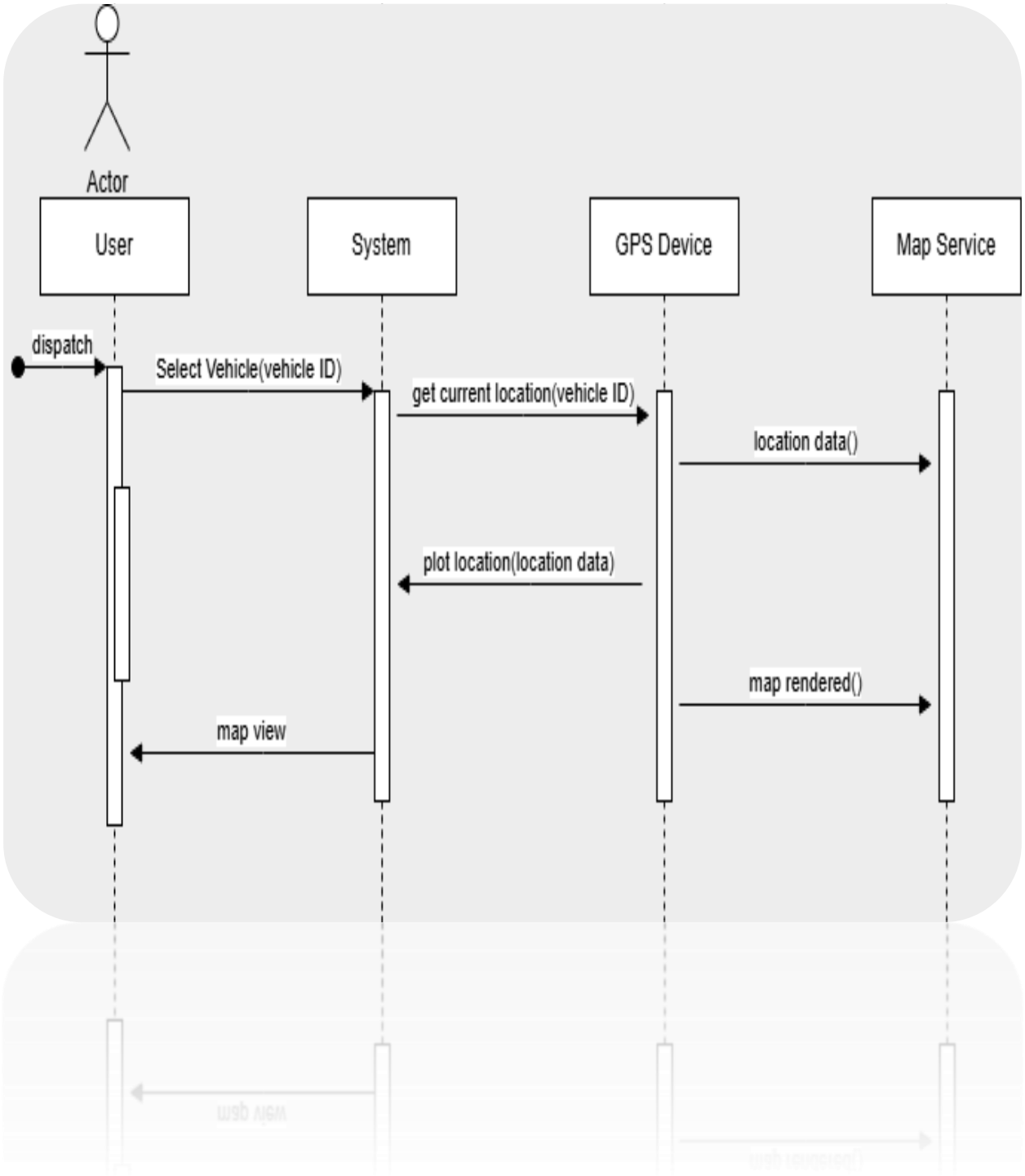
Business Rules	• Vehicle location data must refresh at regular intervals (e.g., every 10 seconds). • Only authorized users (fleet managers or assigned passengers) can access tracking information. • Passengers can only track vehicles assigned to their specific trip or booking. • All tracking actions should be logged for audit and security purposes. • The system should store vehicle location history for reporting and analysis. • Map display must be consistent and accurate based on the GPS coordinates received. • If a vehicle stops transmitting location, the system must indicate it with the last known location timestamp. • Users must not be able to spoof or modify location data manually.

Assumptions	1. All vehicles are equipped with functioning GPS tracking devices. 2. There is a reliable internet connection for both GPS and user devices. 3. Passengers are informed of which vehicle they are linked to (e.g., via booking ID). 4. Map API integration is properly configured and available. 5. Users are familiar with basic map interaction (zoom, pan, select vehicle).

OPERATIONAL CONTRACT

OC-1D	1
OC- NAME	trackVehicle (vehicleID: VehicleID)
Cross Ref	Use Case: Track Vehicle Location Actors: Transport Manager, Passenger
Pre Conditions	The user is authenticated and authorized (fleet manager or passenger). – The vehicle is registered and equipped with an active GPS tracking device.
Post Conditions	A Location instance `loc` was retrieved or created *(instance creation or retrieval)*. – `loc` was associated with the selected Vehicle *(association formed)*. – `loc.latitude` and `loc.longitude` were updated based on GPS data *(attribute modification)*. – The system displayed `loc` on a map interface *(UI update)*. – If real-time data is unavailable, the last known location was shown *(fallback behavior triggered)*.

SYSTEM SEQUENCE DISGRAM



CLASS DIAGRAM