Online Ride-Sharing Platform

(SmartRide)

Requirements Analysis & Design (RAD)

By Students:

1. **StudentID1 : Phạm Lê Anh Khôi**
2. **StudentID2 : Dương Thành Long**

Reference:	**Team_XX_RAD_Requirements_Modelling_v0.1**		
Audience:	**Mr. Pham Thai Ky Trung**	**Document Version:**	**May, 2025**
Outcome:	**Online Ride-Sharing Platform (SmartRide)**		

Abstract: This document provides an in-depth analysis of a proposed urban ride-sharing business that connects customers with drivers using vehicles for transportation

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Executive Summary

SmartRide is an urban ride-sharing business that connects customers with drivers using vehicles for transportation. It currently relies on manual operations, which is inefficient and prone to delays. The business goal is to digitally transform into an Online Ride-Sharing Platform (ORSP) to streamline operations, improve customer experience, and support scalability.

I. Initial Activities

1. System Vision Document

Project Name:

SmartRide – Online Ride-Sharing Platform (ORSP)

Business Problem:

SmartRide currently operates a manual ride-matching and payment system which results in long wait times, inefficient driver assignment, and slow payment processing. This leads to customer dissatisfaction, lost revenue, and an inability to scale the business.

Business Objectives:

- Provide a digital platform for booking and managing rides.
- Reduce wait times and improve ride matching efficiency.
- Enable real-time GPS tracking for better transparency.
- Facilitate secure online payments and digital receipts.
- Generate data-driven reports for management decision-making.
- Lay a foundation for scalable and feature-rich expansion.

Proposed Solution:

Develop a web and mobile-based Online Ride-Sharing Platform where:

- Customers can create accounts, book rides, track drivers, and make payments online.
- Drivers can manage their availability, receive bookings, and get optimized routes.
- Admins can monitor system performance and generate analytics.

Major Features:

- User registration and login (customers and drivers)
- Ride booking and automatic driver assignment.
- Real-time GPS tracking and ETA updates
- Online payment system with receipts
- Driver navigation and route optimization
- Admin reporting dashboard

Scope:

The initial release (MVP) will include core ride-sharing functionalities. Future enhancements like shared rides, loyalty programs, and dynamic pricing are out of scope for this phase but may be considered for future releases.

Risks:

- High demand could overload the system if scalability isn't meticulously designed.
- GPS accuracy issues may impact customer trust.
- Payment integration challenges.
- Ensuring user data privacy and system security.

Stakeholders:

Stakeholder	Role / Interest
Customers	**Request rides quickly and track drivers.**
Drivers	**Get ride requests, navigate efficiently, and get paid.**
Business Managers	**Monitor performance and improve service delivery.**
Developers	**Implement a scalable, reliable solution.**
Investors	**Ensure the platform generates ROI and supports growth.**

2. Stakeholder Engagement

Initial Stakeholder Interviews Conducted With:

- SmartRide Business Owners
- Operations Manager
- Current Drivers
- Frequent Customers

Purpose:
To understand:

- Pain points in the current system
- Expectations from the digital platform

- Feature priorities and critical use cases

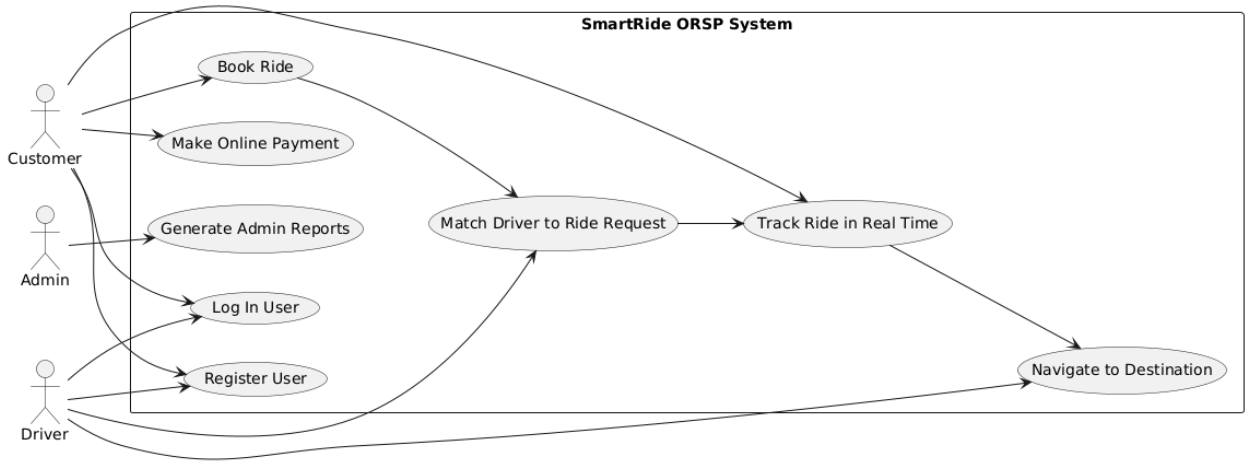
3. Obtain Project Approval

Actions Taken:

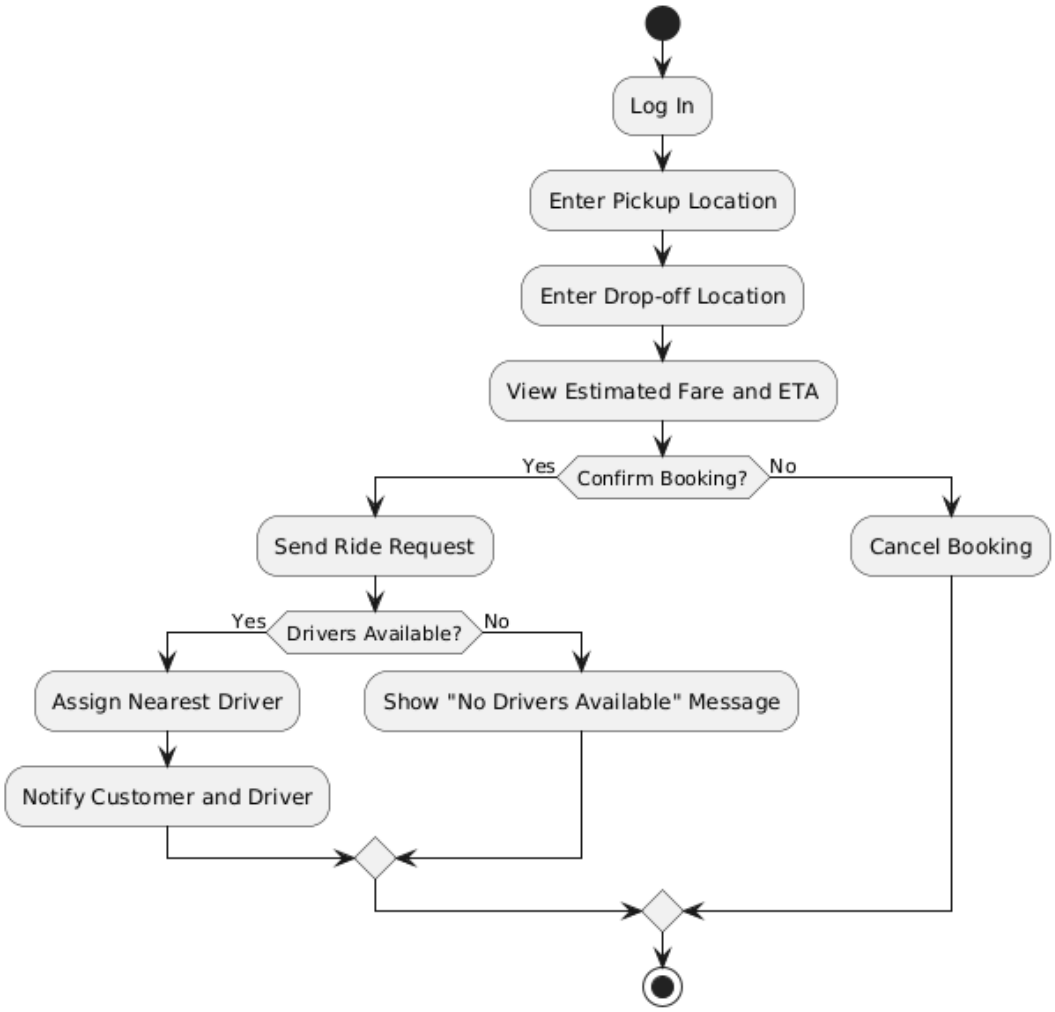
- Shared System Vision Document with stakeholders.
- Conducted a review meeting with business owners.
- Presented timeline and resource estimates.
- Incorporated initial feedback and revised project goals.

Approval Outcome: Project approved to proceed to planning and requirement gathering phases.

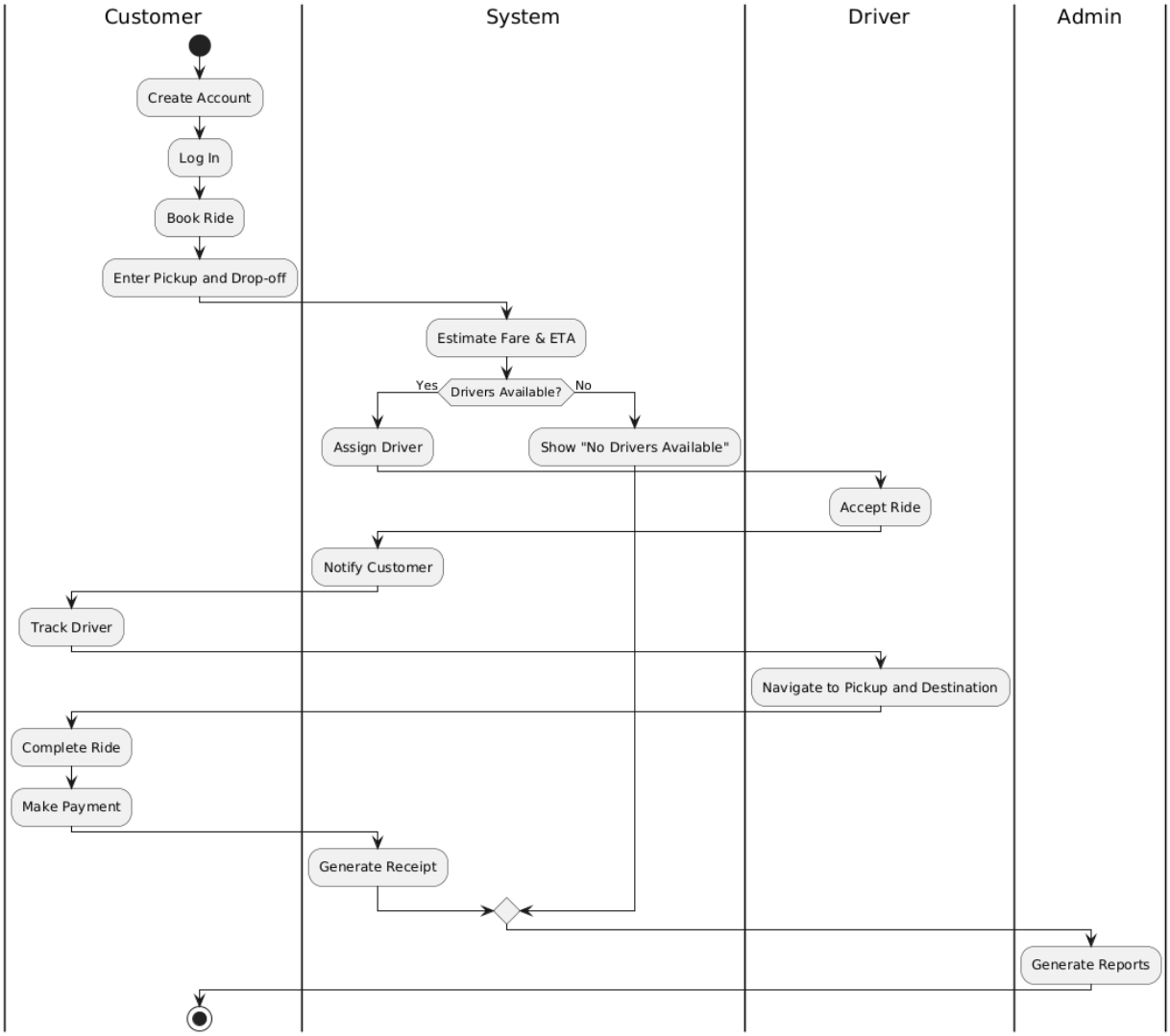
4. Business Modeling / Requirements



Scoped business use case: Book Ride



5. Business Processes / Flowchart of Requirements



6. List of Requirements

Functional Requirements:

- Users (drivers/customers) can register and log in.
- Customers can request a ride by entering pickup and drop-off locations.
- The system shows nearby available drivers and assigns the nearest one.
- Customers can see ETA and track driver in real time.
- Drivers get navigation instructions to customer pickup and destination.
- Users can make online payments and receive receipts.
- Admins can generate reports on ride demand, peak hours, and operational stats.

Non-Functional Requirements:

- The system must manage high user loads during peak hours with low latency.
- Should support city-wide expansion and increase the user base.
- User data and payments must be protected using encryption and secure protocols.
- Interfaces should be user-friendly for drivers and customers alike.
- The service must be available 99.9% of the time.
- Modular architecture to support future enhancements.

II. Plan your project.

1. Project Scope

In-Scope (MVP – Minimum Viable Product):

- User Registration and Authentication (Customer, Driver, Admin)
- Ride Booking: Pickup/Drop-off input, fare estimation
- Real-time Driver Matching
- GPS Tracking & ETA Updates
- Online Payment Integration
- Driver Navigation
- Admin Reports and Ride Analytics

Out-of-Scope (Future Enhancements):

- Shared Rides (Carpooling)
- Discounts, Coupons, Loyalty Programs
- Ratings & Reviews
- Multi-language support
- Inter-city rides

2. Project Objectives

- Digitize and streamline the ride-booking process.
- Improve customer satisfaction with faster and more reliable service.
- Enable secure, real-time payment and ride tracking.
- Provide business intelligence through data reporting.
- Lay the groundwork for future feature expansion.

3. Project Phases and Timeline

Description	Duration	Estimated Timeframe
Initial Activities & Vision	**1 week**	**Week 1**
Project Planning	**1 week**	**Week 2**
Requirements Gathering & Analysis	**2 weeks**	**Weeks 3–4**
System Design (Architecture, UI, DB)	**2 weeks**	**Weeks 5–6**
Build, Unit Test & Integrate Components	**4 weeks**	**Weeks 7–10**
System Testing & Deployment	**2 weeks**	**Weeks 11–12**

4. Team Roles and Responsibilities

Role	Responsibilities
Project Manager	Oversees planning, progress, and resource allocation
Business Analyst	Gathers and models requirements, interfaces with stakeholders
UX/UI Designer	Designs intuitive interfaces for web and mobile
Backend Developer	Implements server-side logic and APIs
Frontend Developer	Develops responsive client interfaces
Mobile Developer	Builds mobile app versions (iOS/Android)
QA Engineer	Performs functional, integration, and system testing
DevOps Engineer	Sets up CI/CD pipelines, deployment, and infrastructure support

5. Tools and Technologies

Area	Tools / Technologies
Project Management	Jira / Trello / Microsoft Project
Requirements Modeling	PlantUML, Lucidchart, Visual Paradigm
Version Control	Git, GitHub/GitLab
Development Stack	ASP.NET Core (Backend), React/Flutter (UI)
Database	SQL Server / PostgreSQL
Testing Tools	Postman, Selenium, xUnit
Deployment	Docker, Azure / AWS / Heroku
Communication	Slack, Microsoft Teams, Email

6. Risk Management Plan

Risk	Mitigation Strategy
Feature creep	**Lock MVP scope; introduce change request process**
Resource unavailability	**Assign backups or cross-train critical roles**
Delay in third-party integrations (e.g., payment, GPS)	**Use mocks initially; communicate early with vendors**
System scalability problems	**Design for modularity and cloud scaling from the start**
Security and privacy issues	**Use encryption, secure APIs, and follow best practices**

7. Communication Plan

- Weekly Status Meetings: Project Manager + Team Leads
- Stakeholder Demos: At the end of major milestones (P3, P4, P5)
- Issue Tracking: Through Jira/Trello
- Documentation: Stored in a shared repository (e.g., Notion, Confluence)

III. Discovery and Understanding the Details

1. System Narrative

Booking a Ride with SmartRide

A customer opens the SmartRide app and logs in. They enter their pickup and drop-off locations to request a ride. The system calculates the estimated fare and ETA based on traffic and distance, then displays this information to the customer.

The customer confirms the booking. The system automatically finds the nearest available driver and notifies them. The driver accepts the ride and heads to the pickup location. The customer can track the driver's approach in real time.

Once the driver arrives, they begin the trip. After reaching the destination, the system calculates the final fare and charges the customer through their saved payment method. A digital receipt is generated, and both the customer and the driver can view it in their trip history. The ride details are logged for future reporting and analytics.

Alternate scenario – No drivers available

If there are no available drivers nearby when a customer requests a ride, the system notifies the customer and suggests trying again after some time.

2. Actors and their goals

Actor	Description	Primary Goals
Customer	A city resident or visitor who uses SmartRide to book rides.	- Register and log in- Book a ride quickly and easily- Track driver in real time- Pay online securely- View trip history and receipts
Driver	A contracted individual who provides transportation using a car or motorbike.	- Register and verify driving credentials- Receive and accept ride requests- Navigate to locations- View trip and earnings history
Admin	A SmartRide staff member managing operations and overseeing system performance.	- Monitor customer and driver activity- Generate reports and insights- Ensure smooth operation and service quality
System (ORSP)	The automated online platform managing all ride-sharing operations.	- Match customers with drivers efficiently- Process payments- Maintain data integrity and security- Provide real-time tracking and notifications

3. List of Events

Event	Trigger	Source	Use Case	System Response	Destination
User registration	New user submits registration form	Customer/Driver	Register Account	Validate input, create user account, send confirmation	Customer/Driver
User login	User submits login credentials	Customer/Driver	Log In	Authenticate user, start session	Customer/Driver
Ride request submitted	Customer inputs pickup and destination	Customer	Book Ride	Estimate fare/ETA, search for available driver	System
Driver assigned to ride	System finds closest available driver	System	Assign Driver	Notify driver and customer, update ride status	Driver and Customer
Driver accepts ride	Driver accepts incoming ride request	Driver	Accept Ride	Confirm assignment, start navigation	Customer
Ride begins	Driver marks arrival and starts ride	Driver	Start Ride	Update ride status to “In Progress”	System and Customer
Ride ends	Driver marks trip as completed	Driver	Complete Ride	Finalize fare, initiate payment	Customer and System
Payment processed	Ride is completed	System	Process Payment	Charge customer, update payment status, send receipt	Customer

Event	Trigger	Source	Use Case	System Response	Destination
Ride cancellation	User cancels ride before start	Customer/Driver	Cancel Ride	Update ride status, notify counterpart	Driver/Customer
No drivers available	System can't find driver in time	System	Book Ride	Notify customer, log unfulfilled request	Customer
Report generation	Admin requests usage reports	Admin	Generate Report	Fetch ride and system data, compile report	Admin

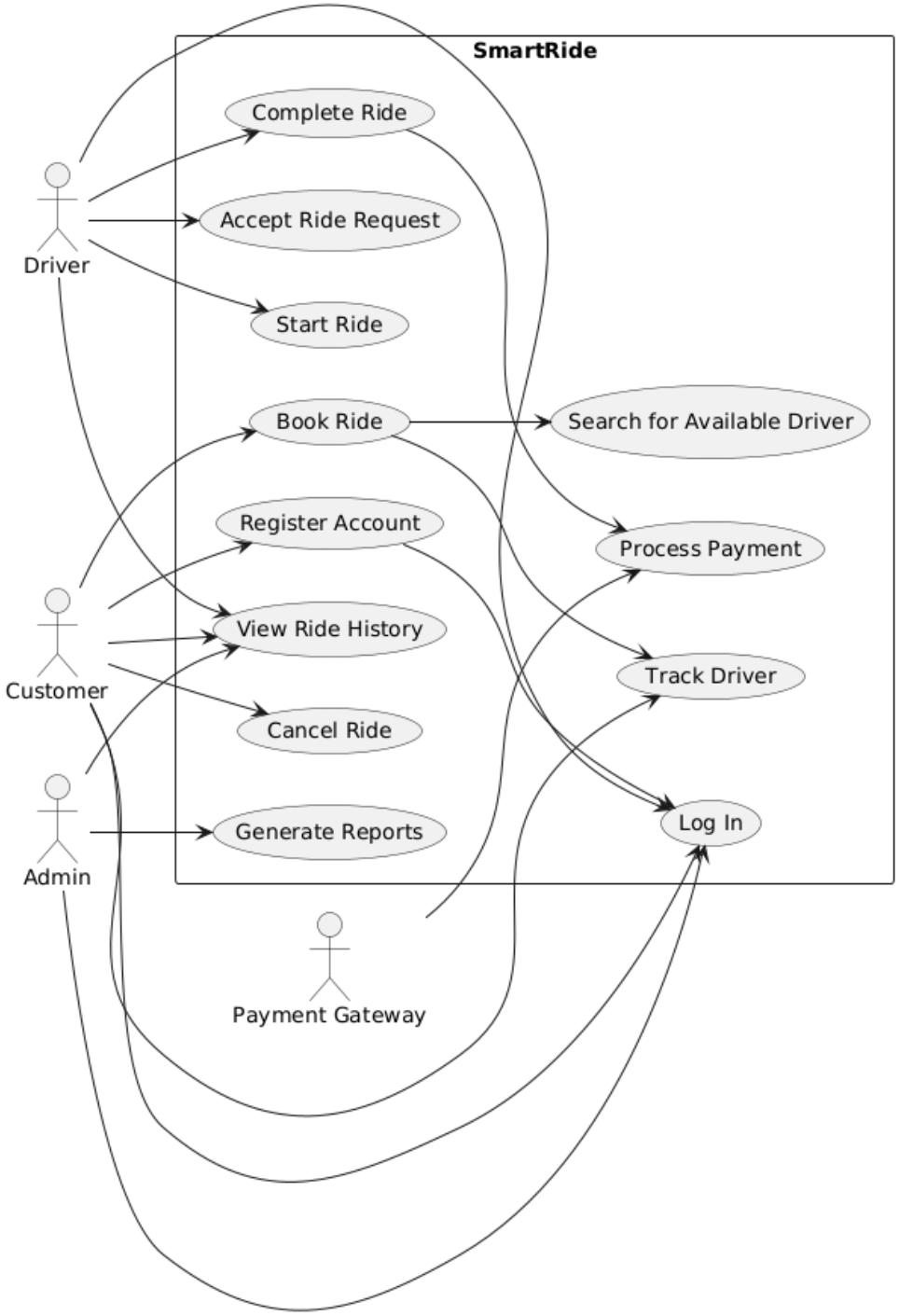
4. List of Actors

- **Customer**: A person who uses the SmartRide platform to book rides. They can be a city resident or visitor.
- **Driver:** An individual who provides transportation services through SmartRide using their own car or motorbike.
- **Admin:** A staff member of SmartRide who manages the operations, monitors system performance, and generates reports.
- **System (ORSP):** The automated online platform that handles ride bookings, driver assignments, payments, and real-time tracking.
- **Payment Gateway:** Third-party system that processes payments from customers and drivers. It manages all transactions securely.
- **GPS Service:** A third-party service responsible for providing location tracking and route optimization for both drivers and customers.

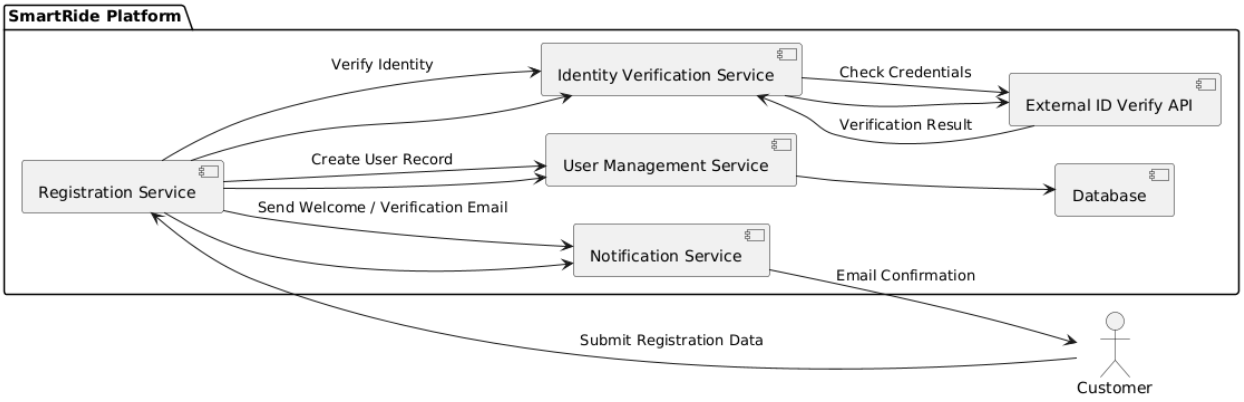
5. List of Use Cases

- **Register Account:** Users create an account by providing personal details (e.g., name, email, phone number) and credentials.
- **Log In:**Customer Users log into the system with their credentials to access the platform.
- **Book Ride:** Customer inputs pickup and drop-off locations, receives fare estimate, and confirms booking.
- **Search for Available Driver**: System searches for available drivers based on the customer's location and request.
- **Accept Ride Request**: A driver receives and accepts a ride request from a customer.
- **Start Ride:** begins the ride by marking the start of the trip once they reach the customer’s location.
- **Complete Ride:** marks the trip as completed once they reach the destination, and fare is calculated.
- **Process Payment:** Customer’s payment is processed after the ride is completion.
- **Cancel Ride:** Either the customer or driver can cancel the ride before it begins.
- **View Ride History:** Users (customer, driver, or admin) can view historical ride data, including completed rides and earnings.
- **Generate Reports**: Admin generates reports on system usage, ride data, and financials to monitor performance and trends.
- **Track Driver:** Customer can track their assigned driver in real time via GPS integration.
- **Update Account Information:** Users can update personal information, including phone number, payment method, etc.
- **Manage System Configuration:** Admin manages the settings and configurations for the platform, such as service areas or driver eligibility.

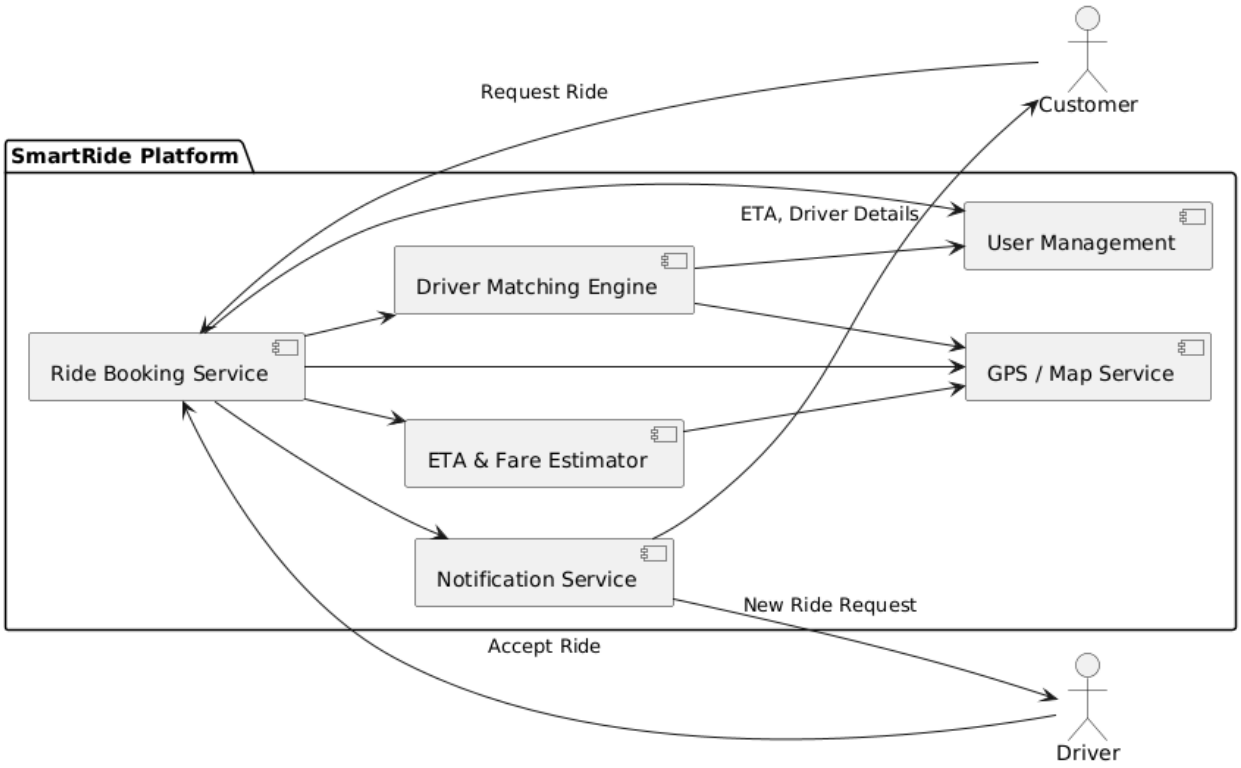
6. Use Case Diagram



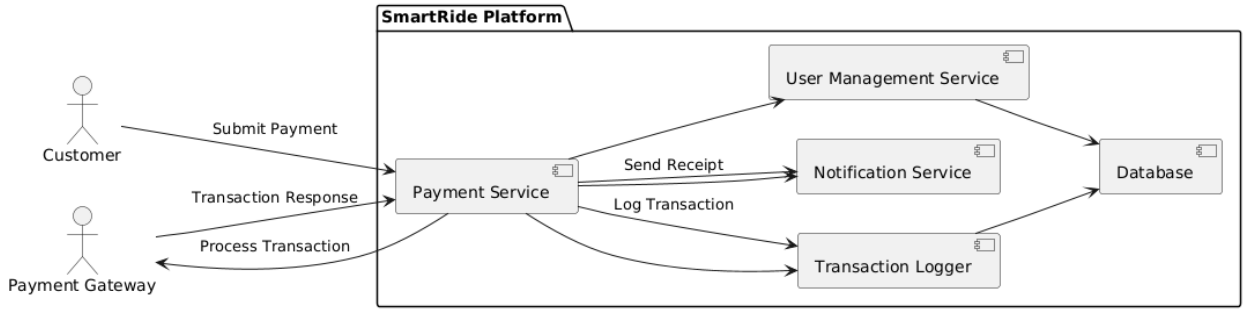
i. Register Account Subsystem:



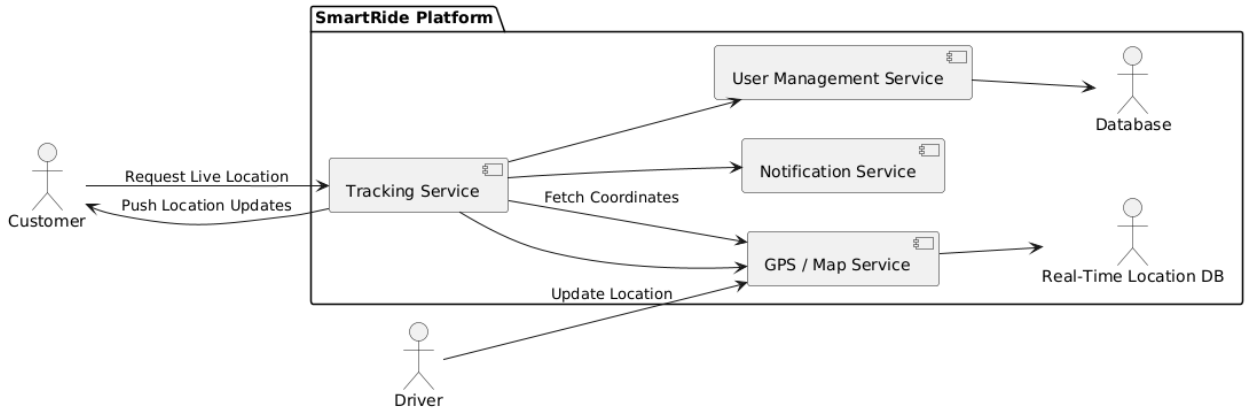
ii. Book Ride Subsystem:



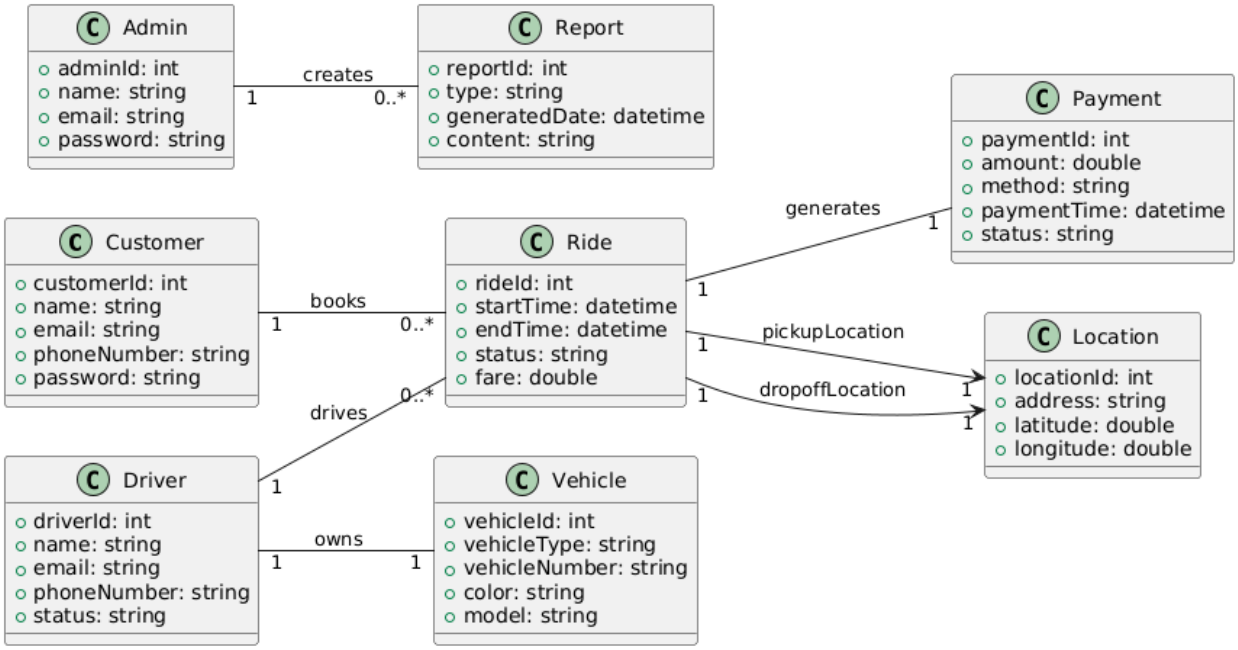
iii. Process Payment Subsystem:



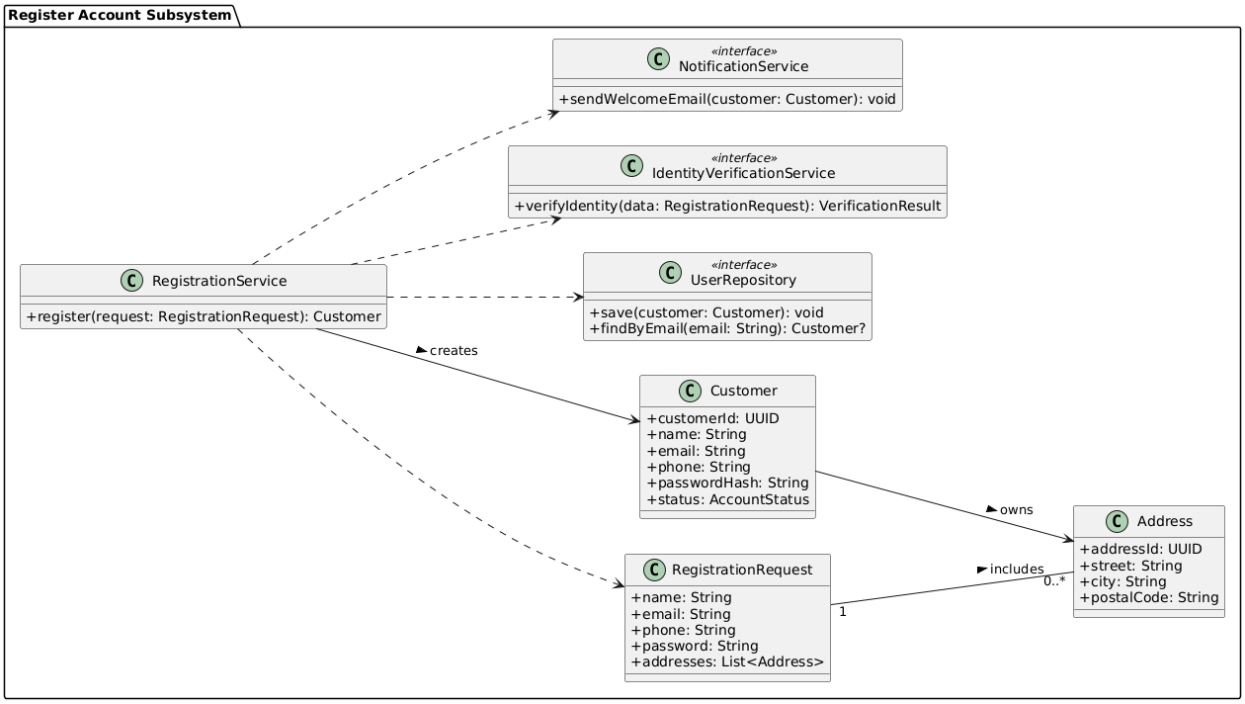
iv. Track Driver Subsystem:



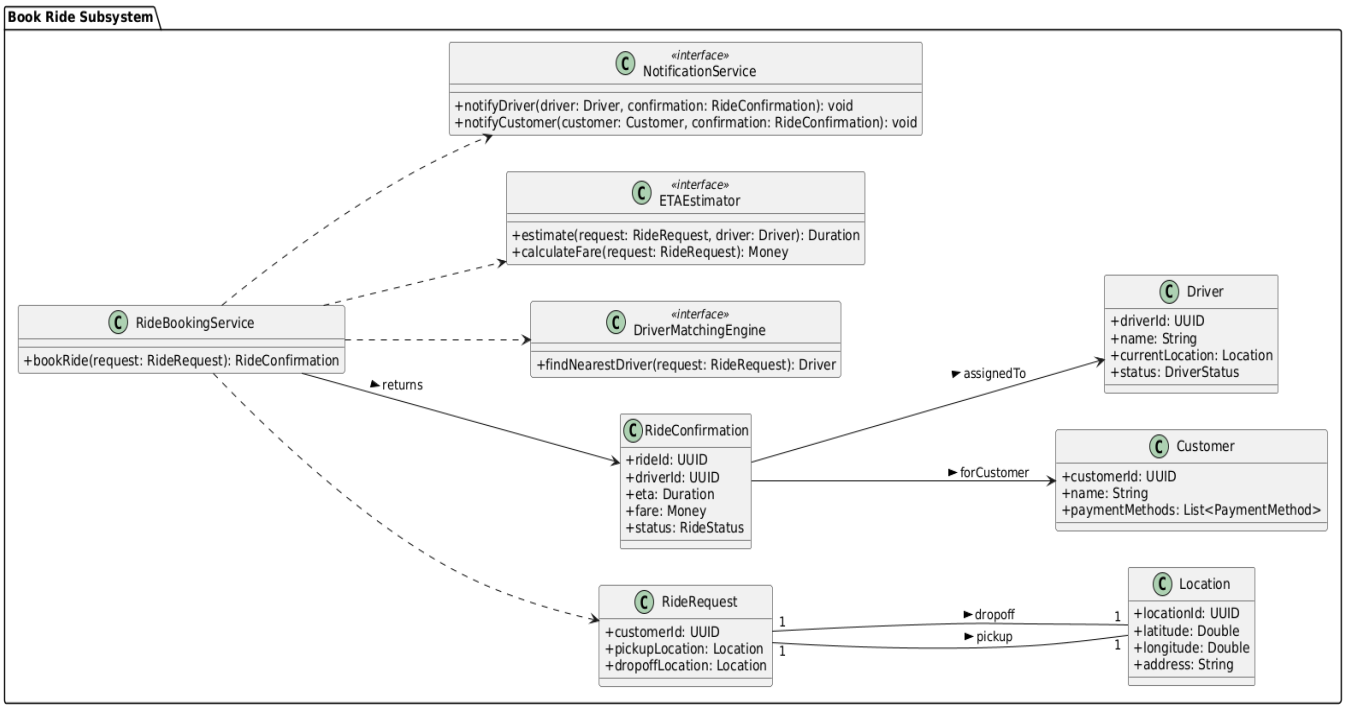
7. Domain Class Model



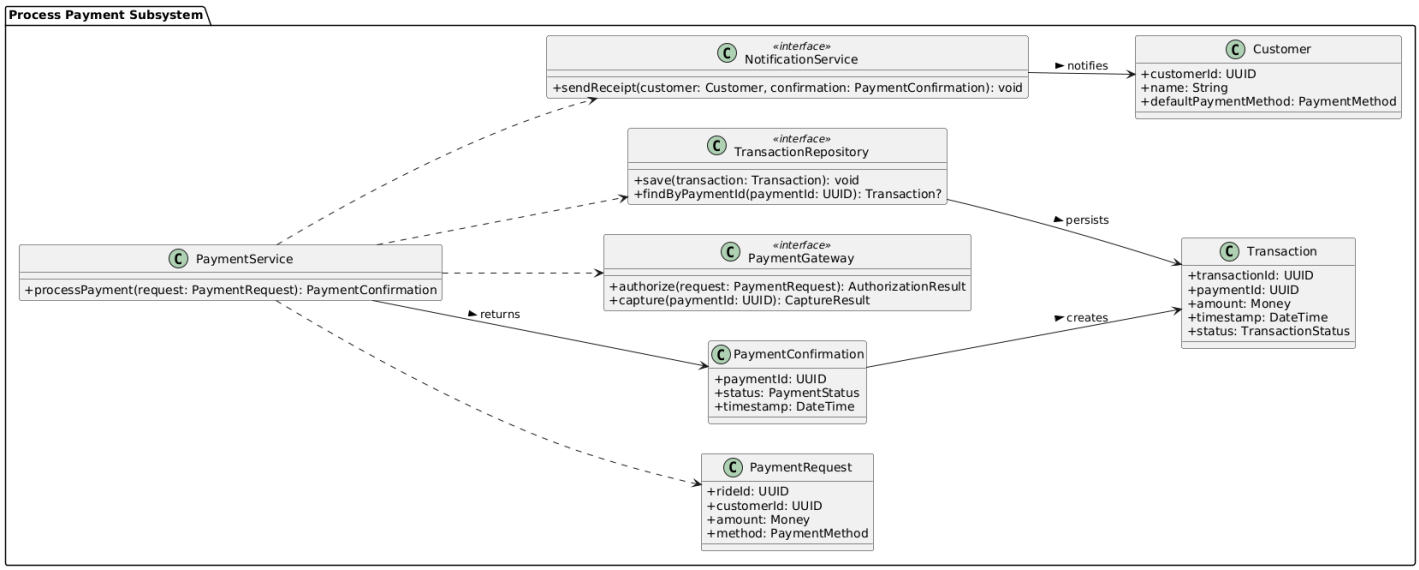
i. Register Account Subsystem:



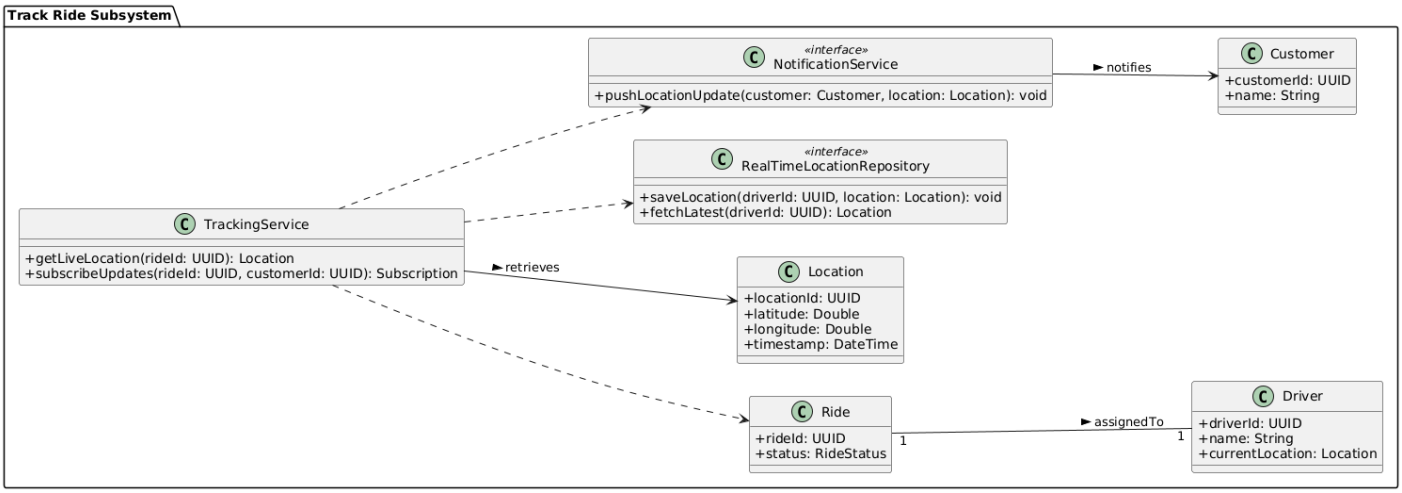
ii. Book Ride Subsystem:



iii. Process Payment Subsystem:



iv. Track Driver Subsystem:



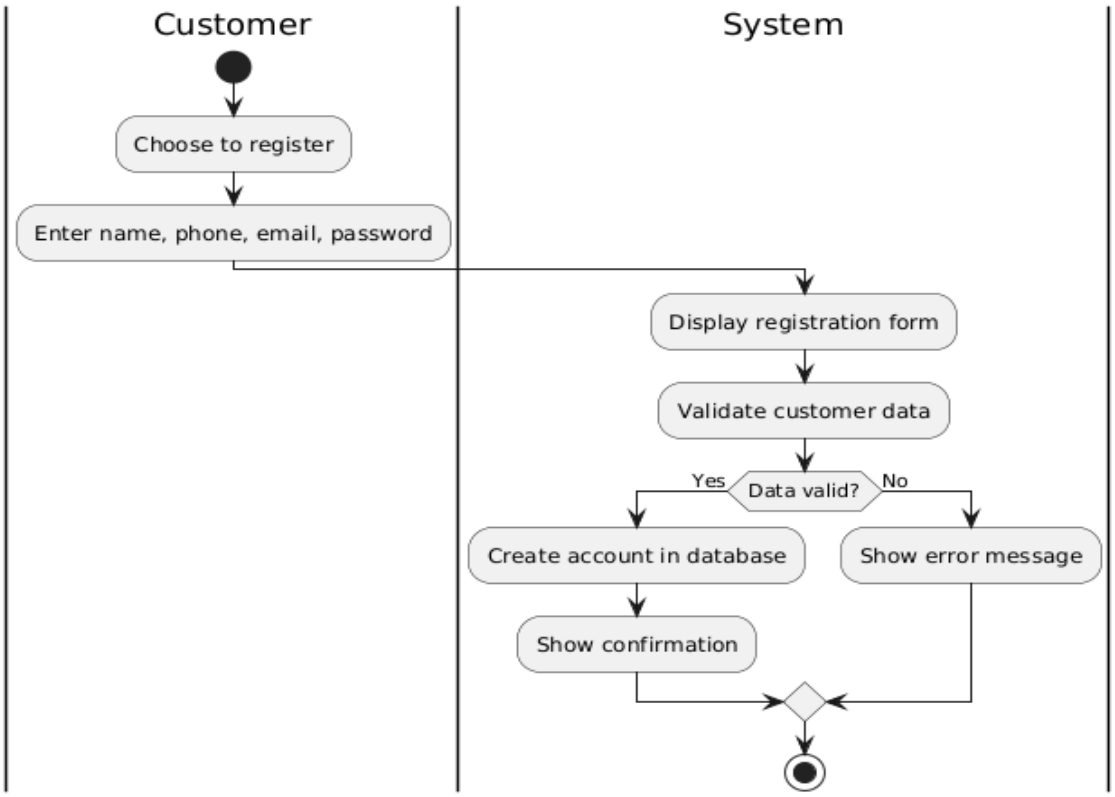
8. Use Case Descriptions

i. Use Case: Register Account

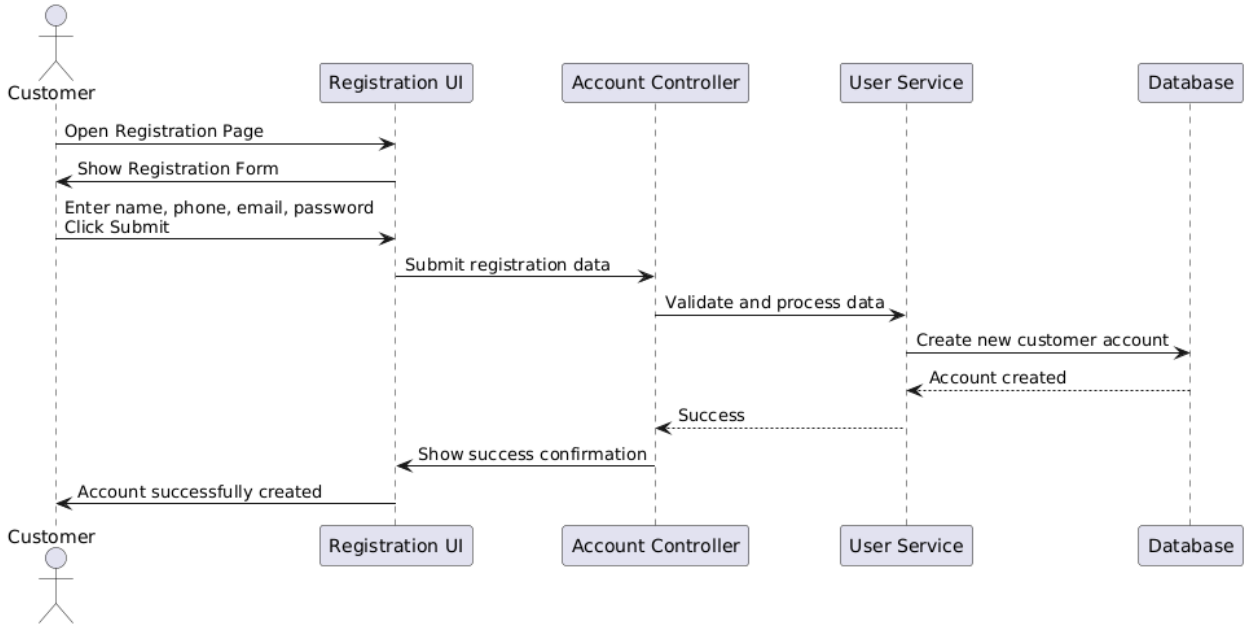
Use Case Description

Use case name:	Register Account
Scenario:	Customer registers for a SmartRide account.
Triggering event:	A new customer wants to use the ride booking service.
Brief description:	Customer provides personal information and login details to create an account.
Actors:	Customer
Related use cases:	Login, Book Ride
Stakeholders:	Customer Support, Marketing
Preconditions:	Registration service must be available.
Postconditions:	Account is created and stored in the system.
Flow of activities:	
Actor	System
1. Customer chooses to register.	1.1 System displays registration form.
2. Customer fills in name, phone, email, and password.	2.1 System validates input fields.
3. Customer submits registration.	2.2 System creates new accounts and confirms registration.
Exception conditions:	2.1 Missing or invalid data. Email already exists.

Activity Diagram:



Sequence Diagram:

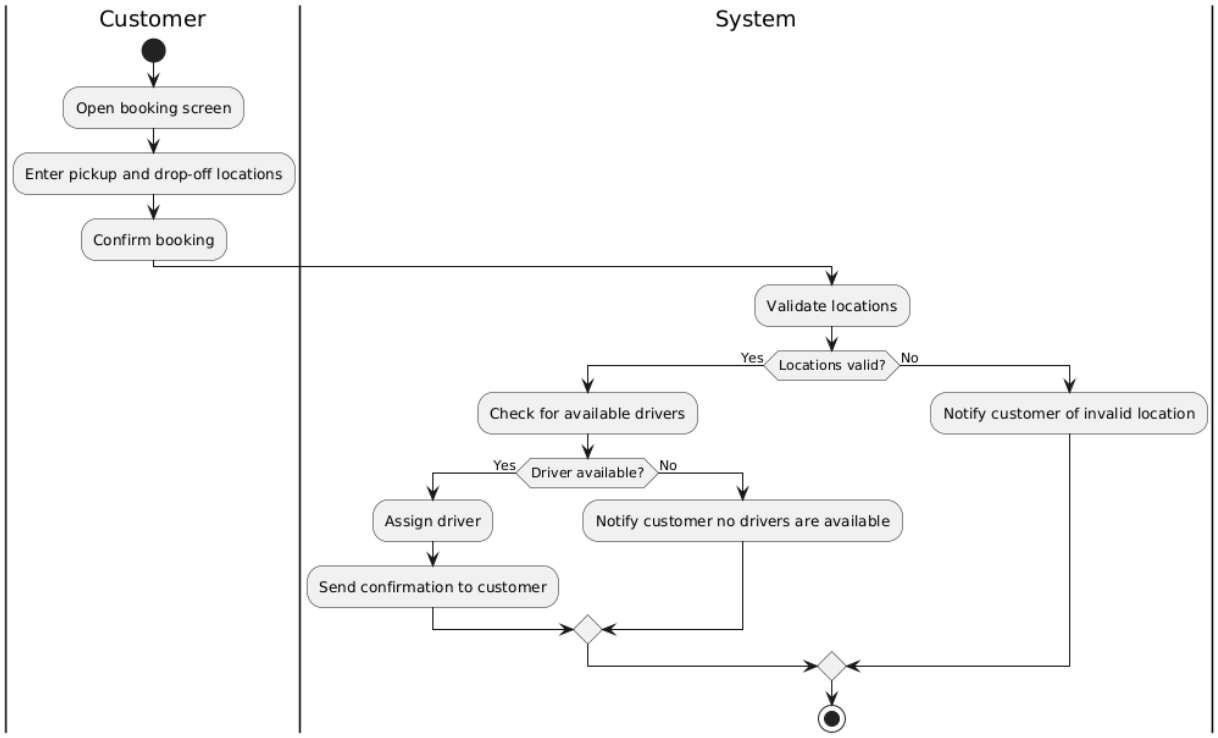


ii. Use Case 2: Book ride

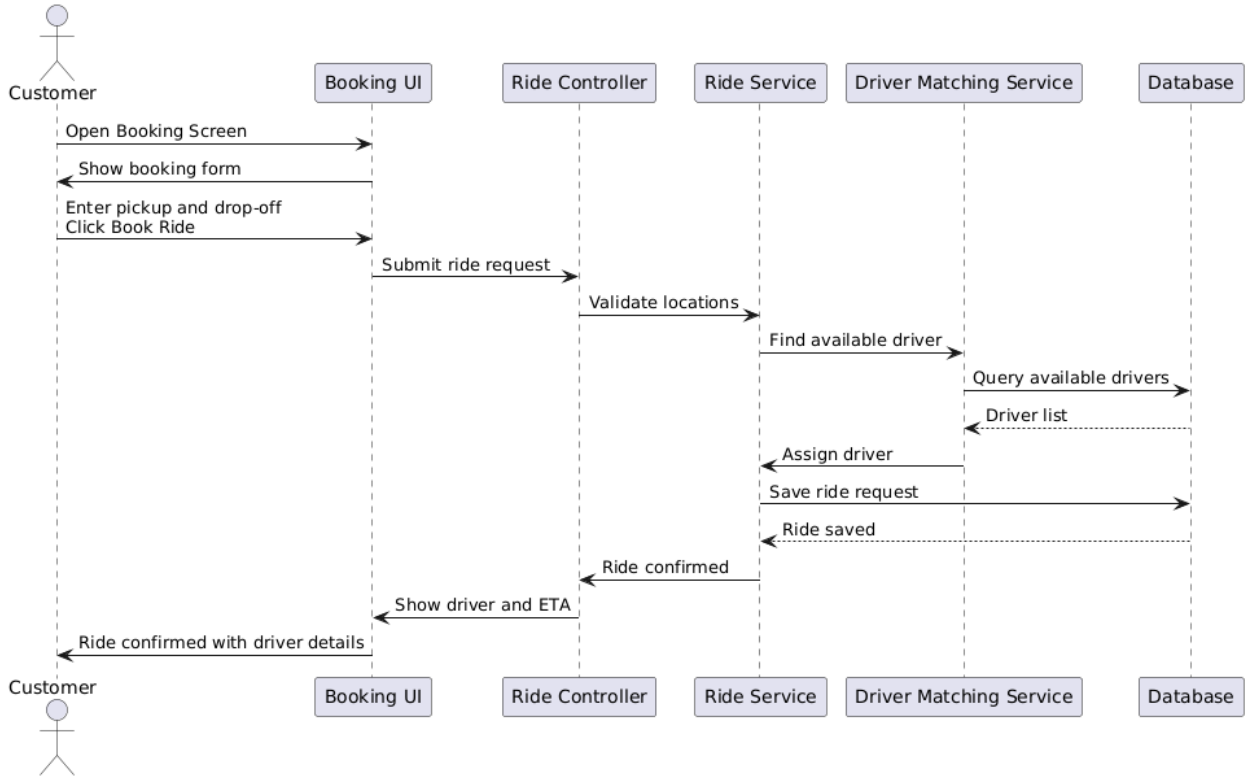
Use case description:

Use case name:	Book ride
Scenario:	Customer books a ride via the mobile app or website.
Triggering event:	Customer opens the booking screen and enters trip details.
Brief description:	The system processes the ride request and assigns an available driver.
Actors:	Customer, System, Driver
Related use cases:	Track Driver, Make Payment
Stakeholders:	Customers, Operations Team
Preconditions:	User must be logged in. Location services must be available.
Postconditions:	Ride is booked and driver is notified.
Flow of activities:	
Actor	System
1. Customer enters pickup and dropoff location.	1.1 System verifies location validity.
2. Customer confirms ride.	1.2 System matches with available driver. 1.3 System notifies driver and confirms booking to customer.
Exception conditions:	1.1 No drivers available. 1.2 Invalid location.

Activity Diagram



Sequence Diagram

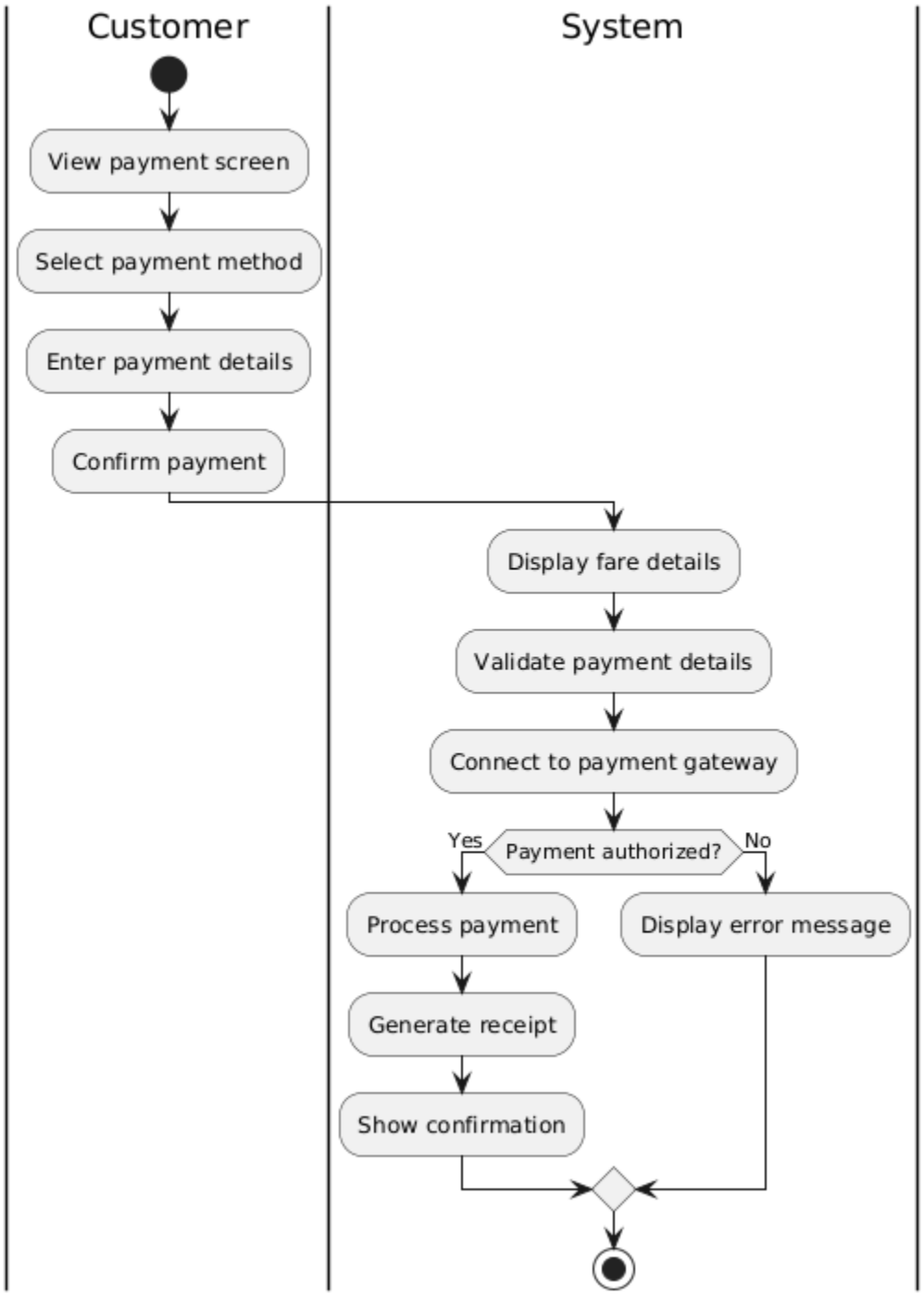


iii. Use Case 3: Process payment

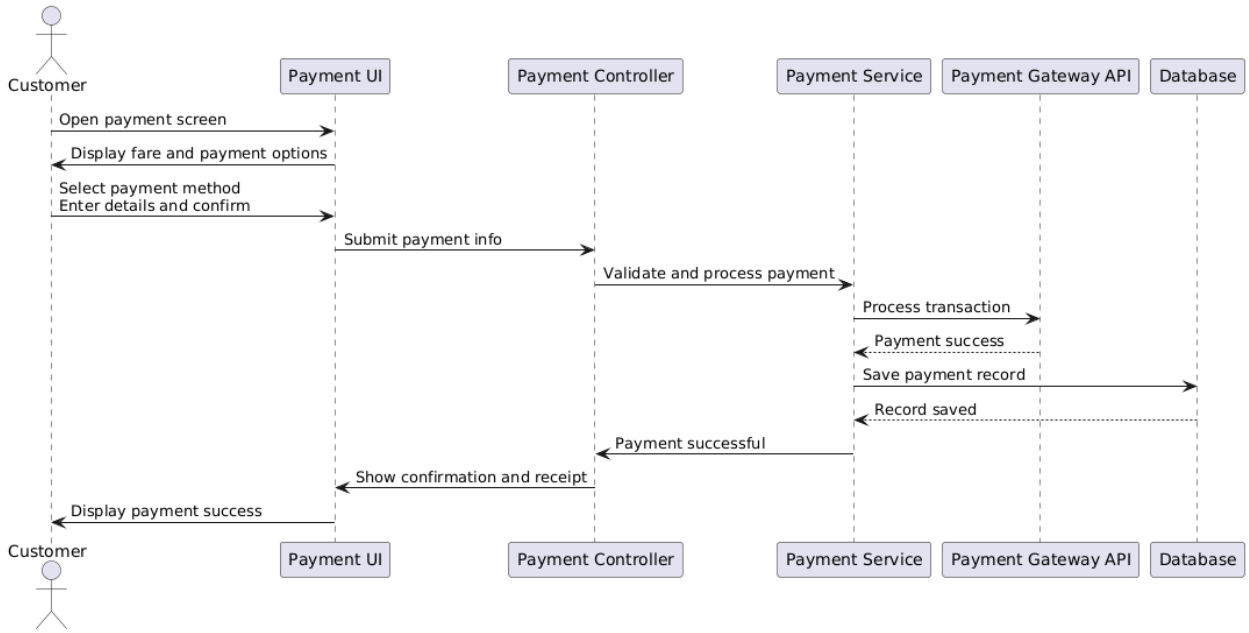
Use case description:

Use case name:	Process payment
Scenario:	Customer pays for a completed ride.
Triggering event:	Ride is completed and fare is calculated.
Brief description:	Customer chooses a payment method and the system processes the transaction.
Actors:	Customer, Payment Gateway
Related use cases:	Book Ride
Stakeholders:	Customers, Finance Department
Preconditions:	Ride must be completed. Payment gateway must be operational.
Postconditions:	Payment is successful and receipt is issued.
Flow of activities:	
Actor	System
1. Customer chooses to pay.	1.1 System displays fare and payment options.
2. Customer selects payment method and confirms.	1.2 System connects to payment gateway. 1.3 System processes payment. 1.4 System issues receipt.
Exception conditions:	1.2 Invalid card or insufficient funds. 1.3 Payment gateway fails.

Activity Diagram:



Sequence Diagram:

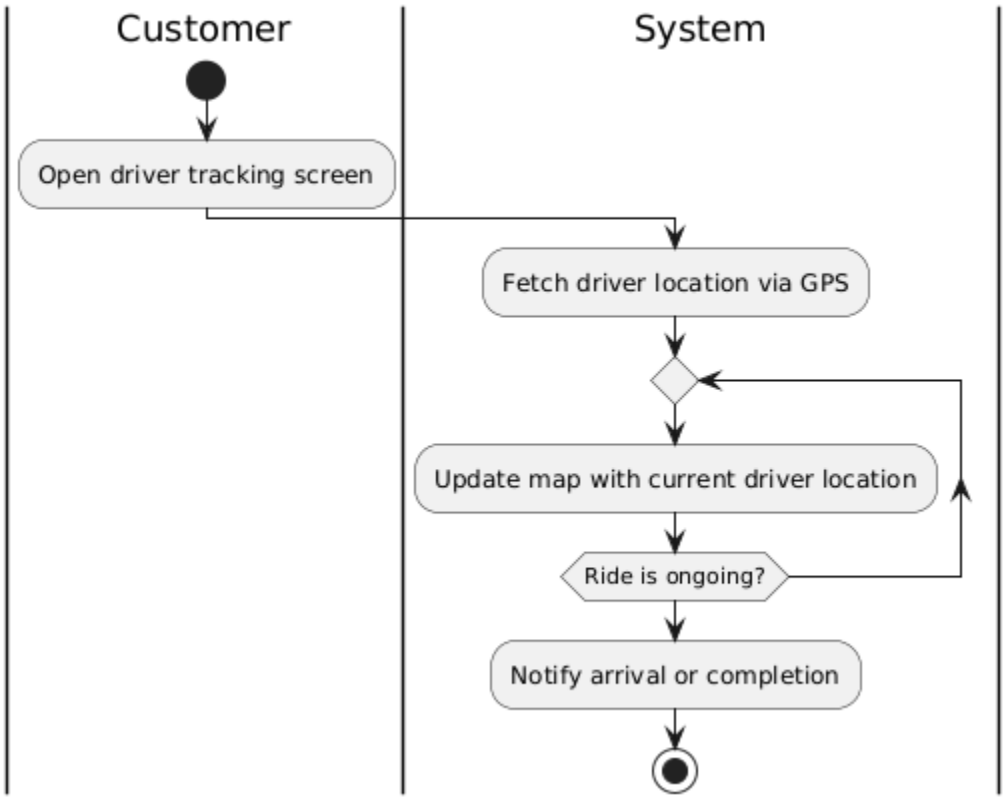


iv. Use Case 4: Track Driver

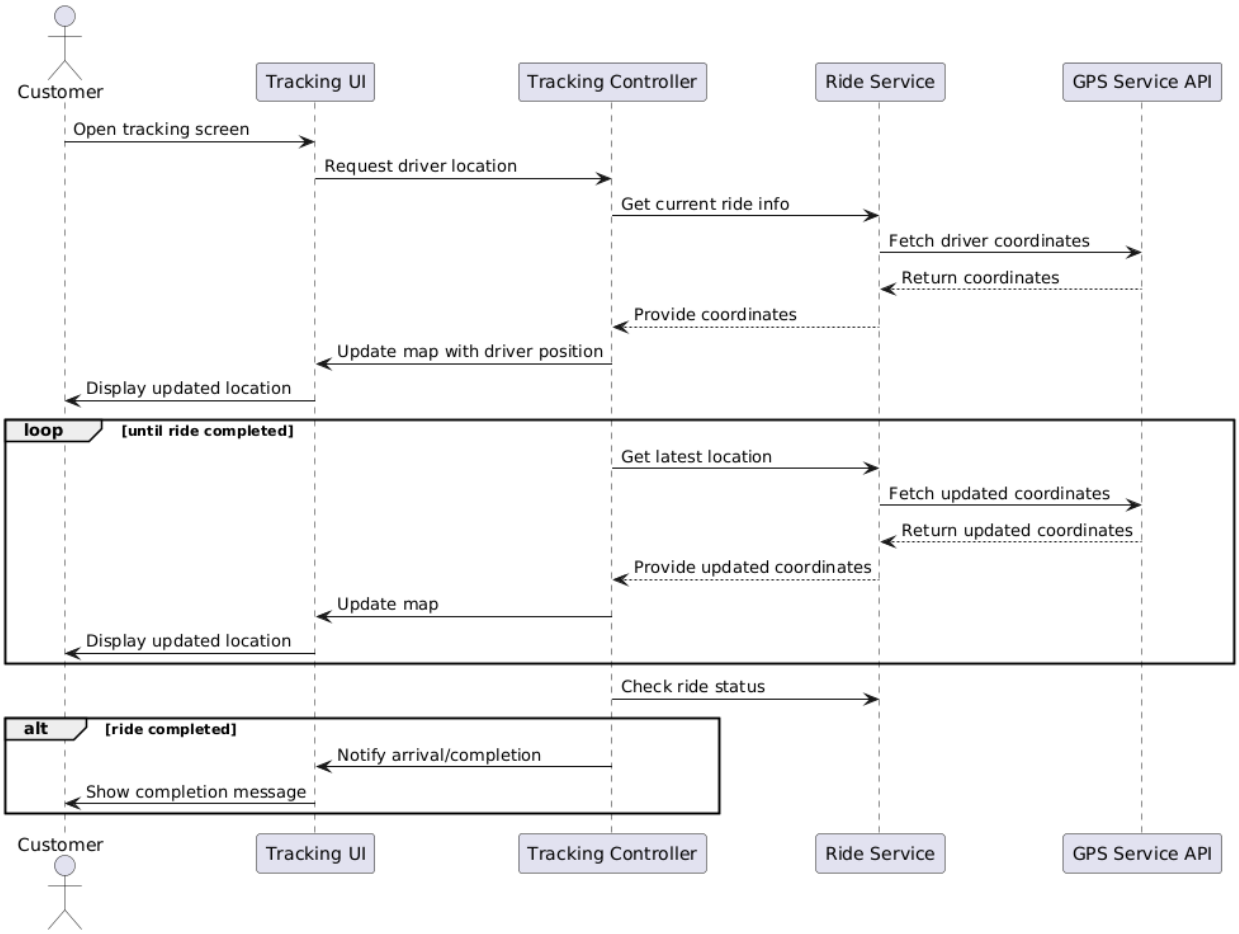
Use Case Description:

Use case name:	Track Driver
Scenario:	Customer wants to monitor their ride's progress.
Triggering event:	A ride has been accepted by a driver.
Brief description:	The system provides real-time GPS tracking of the driver's location.
Actors:	Customer, Driver
Related use cases:	Book Ride
Stakeholders:	Customers, Operations Team
Preconditions:	A driver has accepted the ride. GPS service is available.
Postconditions:	Customer can view updated driver location until arrival.
Flow of activities:	
Actor	System
1. Customer opens track screen.	1.1 System retrieves and displays current driver location.
2. Customer refreshes or waits.	1.2 System updates location in real-time using GPS.
Exception conditions:	1.1 GPS service fails or is unavailable.

Activity Diagram:



Sequence Diagram:



9. Verifying use cases for Actor

i. Verifying use cases for Customer

Data entity/domain class	C R U D	Verified use case
Customer	Create	Create customer account
	Read/report	Look up customerView ride history
	Update	Update customer accountUpdate payment info
	Delete	Deactivate customer account (soft delete)
Ride	Create	Book ride
	Read	Track rideView ride history
	Update	Cancel ride
	Delete	Cancel ride (remove future scheduled ride)
Payment	Create	Make payment
	Read	View payment history
	Update	Update payment method
	Delete	Remove payment method

ii. Verifying use cases for Driver

Data entity/domain class	C R U D	Verified use case
Driver	Create	Register as driver
	Read/report	View assigned ridesCheck payment status
	Update	Update driver profileUpdate vehicle info
	Delete	Deactivate driver account
Ride	Read	View assigned rides
	Update	Accept/decline ride requestMark ride as complete
Vehicle	Create	Register vehicle
	Read	View registered vehicle
	Update	Update vehicle details
	Delete	Remove vehicle (on deactivation)
Payment	Read	View earnings summaryView completed payments

iii. Verifying use case for Admin

Data entity/domain class	C R U D	Verified use case
Customer	Read	View customer profileGenerate usage reports
	Update	Process account adjustments
	Delete	Archive/deactivate customer account
Driver	Read	View driver profile
	Update	Approve/reject driver registrationModify driver details
	Delete	Remove/deactivate driver account
Ride	Read	Monitor ongoing ridesView ride history
	Update	Reassign ride (if needed)Cancel ride
Payment	Read	Review transaction historyGenerate financial reports
	Update	Adjust/refund transactions
Report	Create	Generate ride usage reportsGenerate financial summaries
	Read	View past generated reports
	Update	Refresh or modify report filters
	Delete	Remove outdated reports

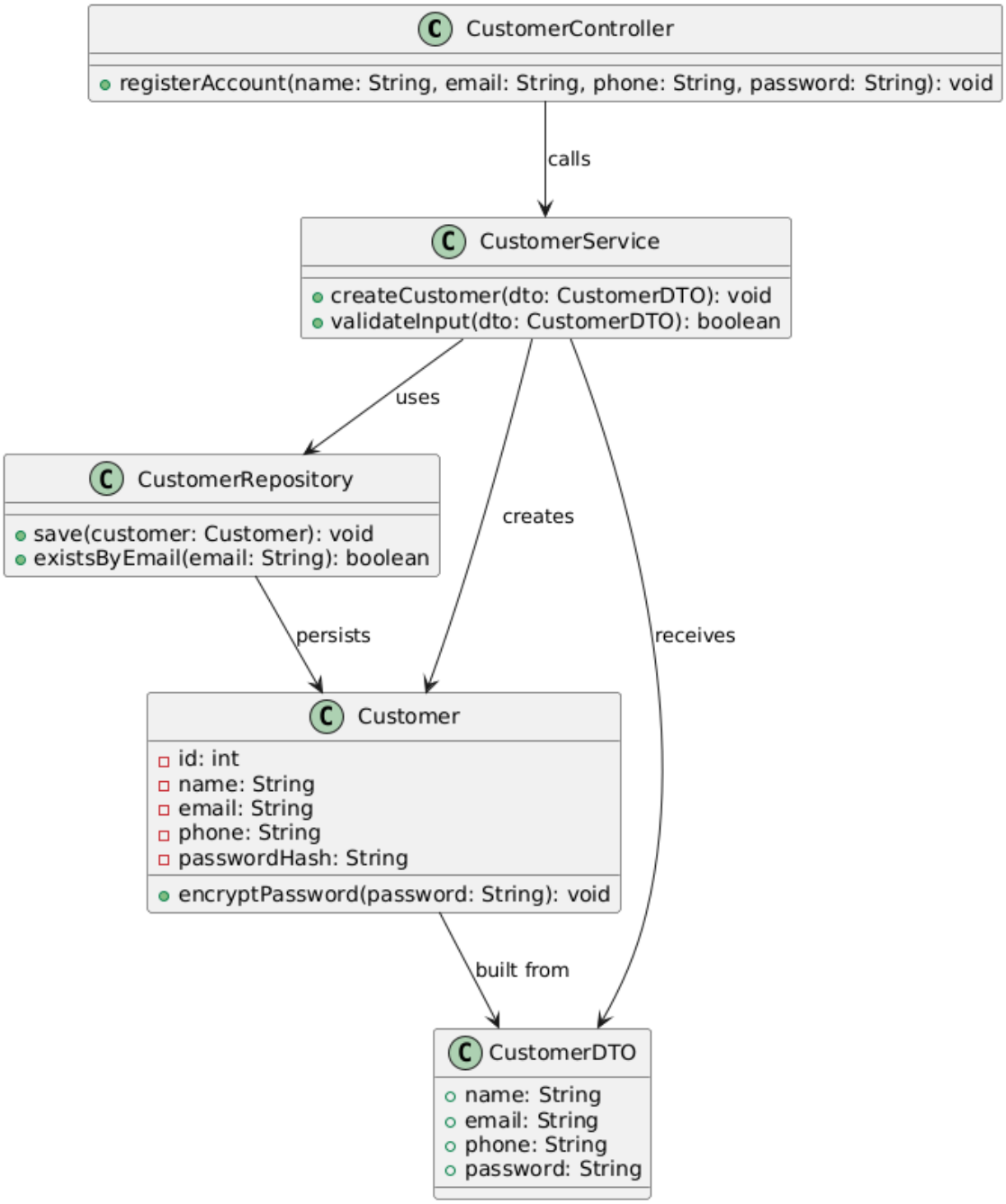
iv. Verifying use cases for Payment Gateway

Data entity/domain class	C R U D	Verified use case
Payment	Create	Process customer payment
	Read	Verify transaction status
	Update	Retry failed transactionApply partial refunds
	Delete	Cancel a pending/unverified payment

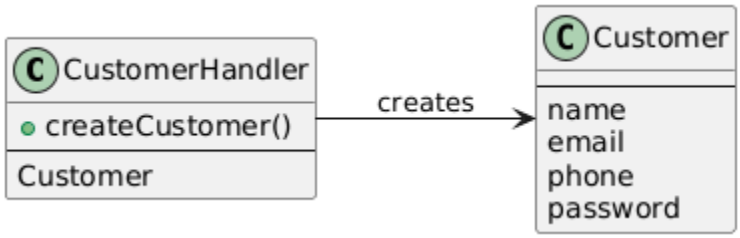
IV. Design System Components

1. Design class for Register Account

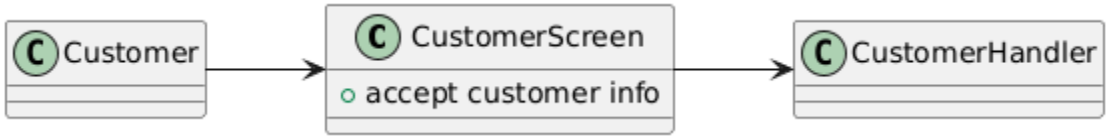
i. Domain Design Class



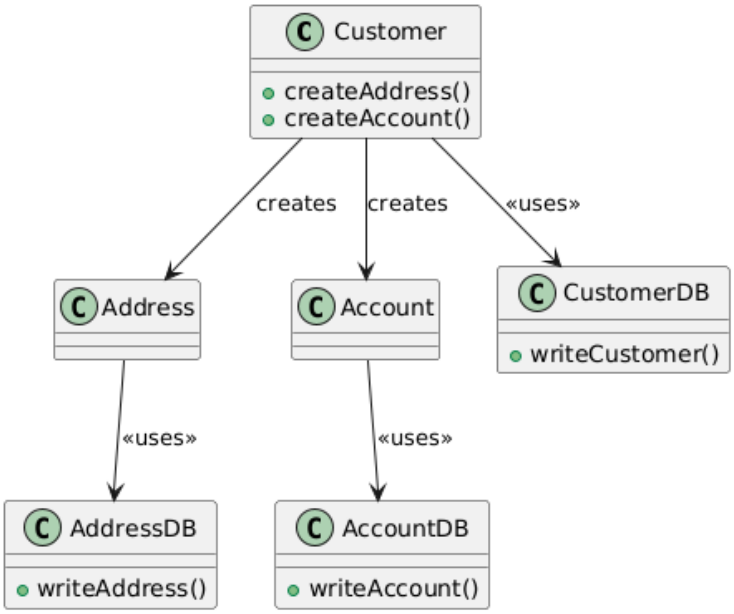
ii. Controller



iii. UI

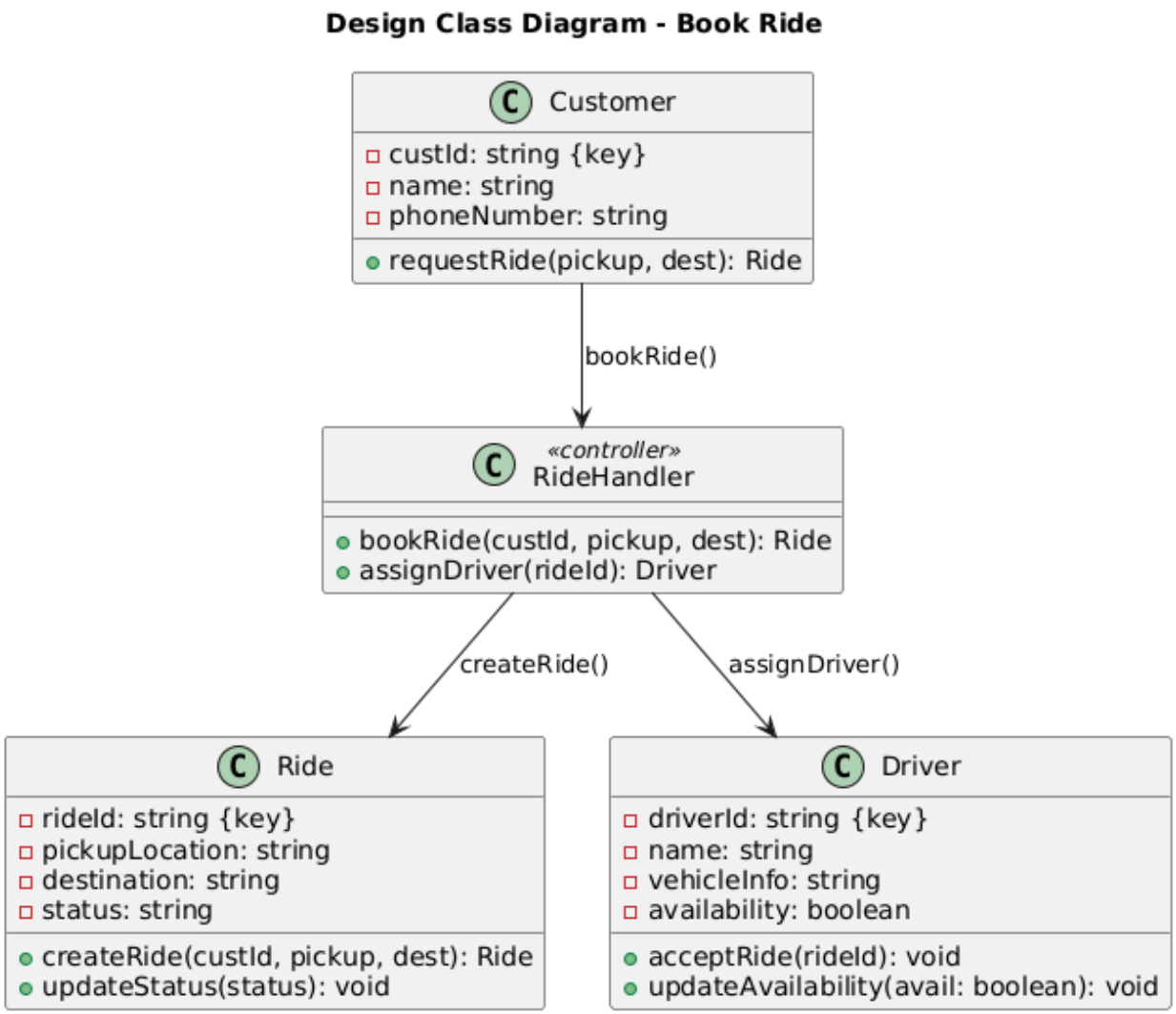


iv. Data Access

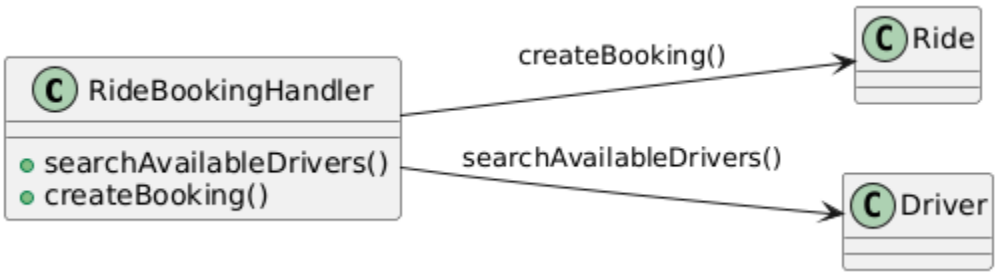


2. Design class for Book Ride

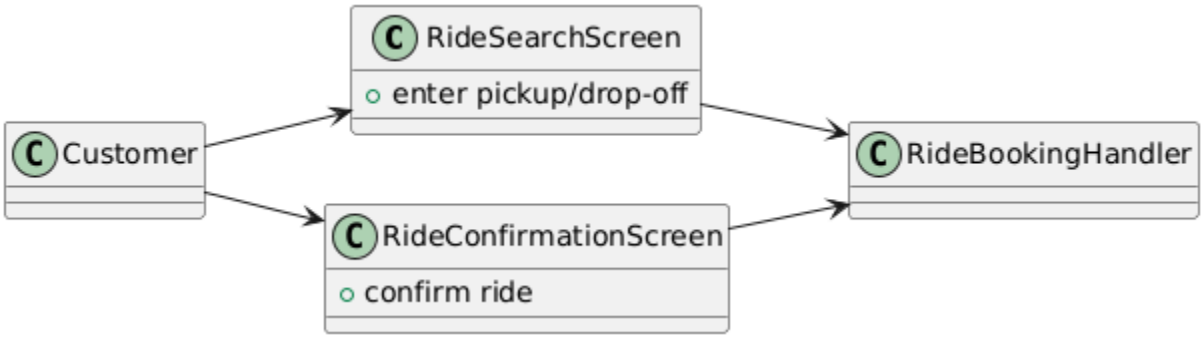
i. Domian Design Class



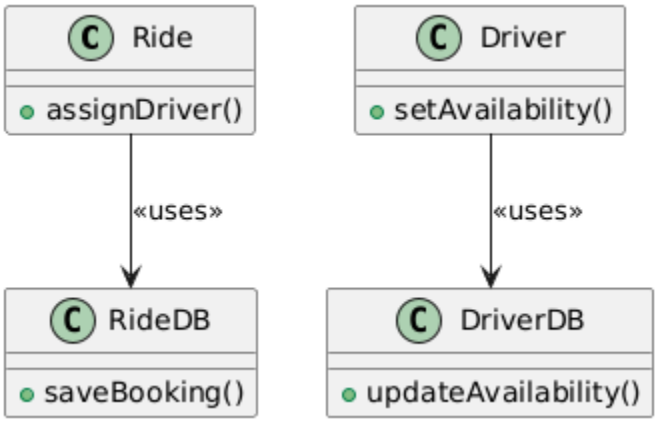
ii. Controller



iii. UI

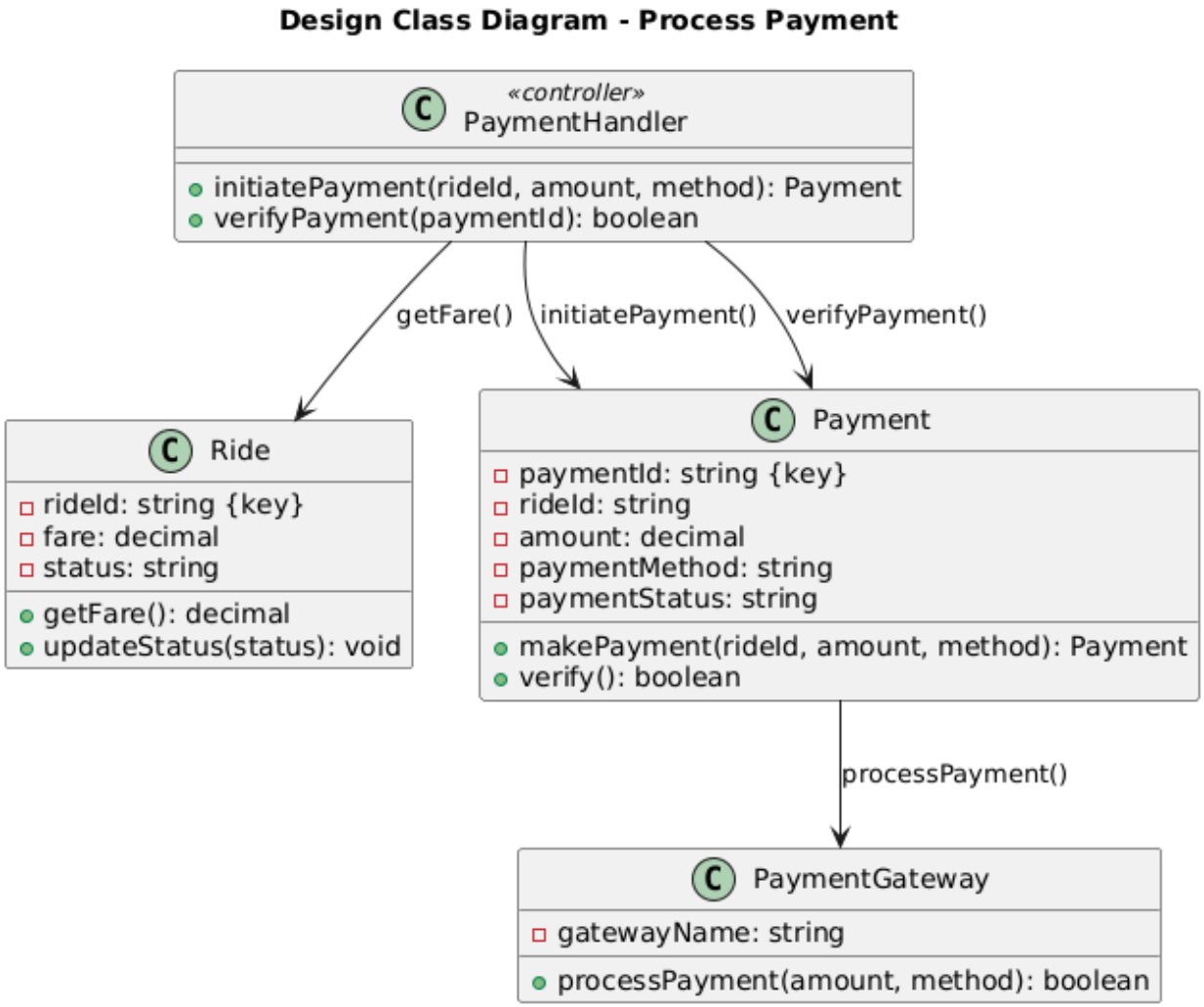


iv. Data Access

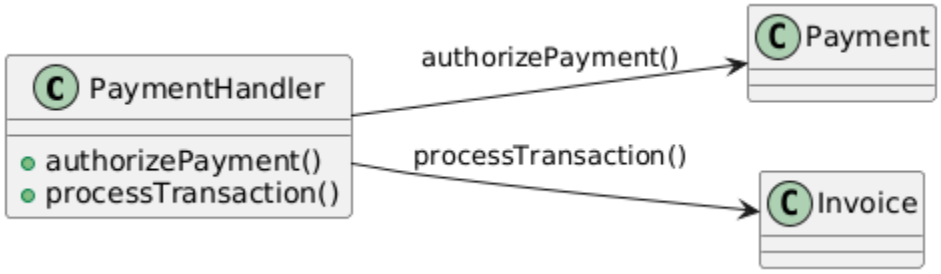


3. Design class for Process Payment

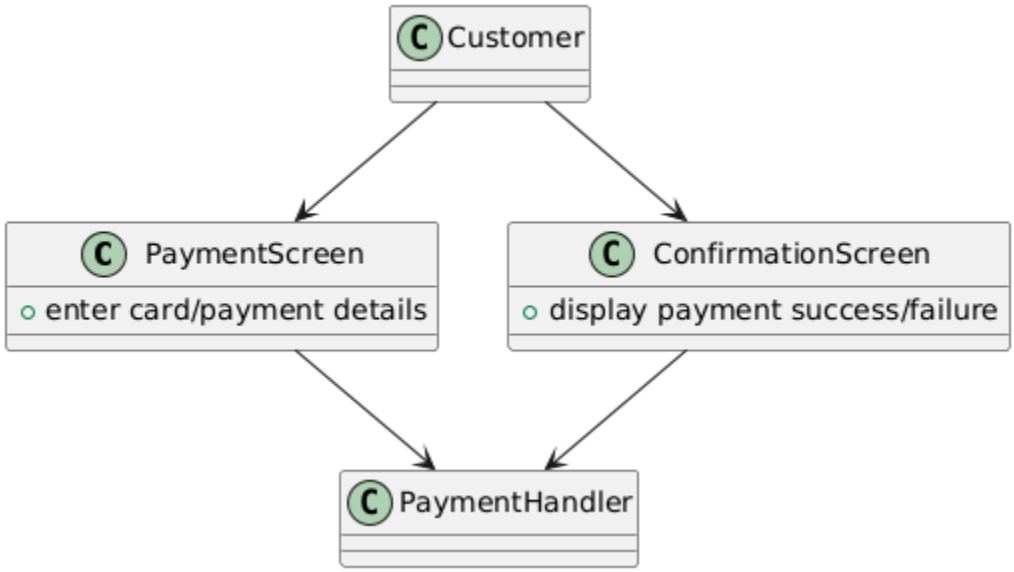
i. Domian Design Class



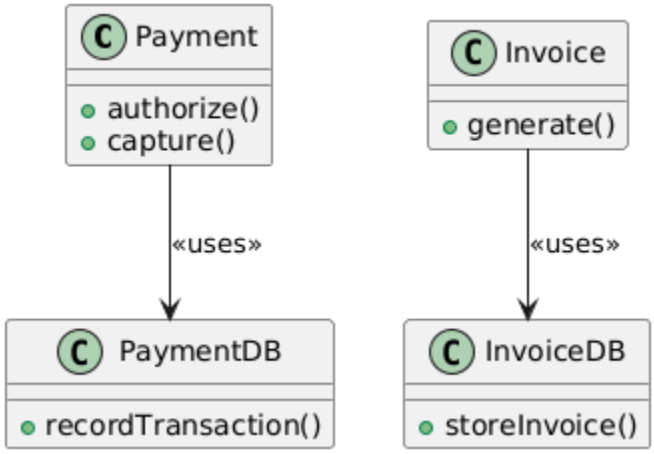
ii. Controller



iii. UI

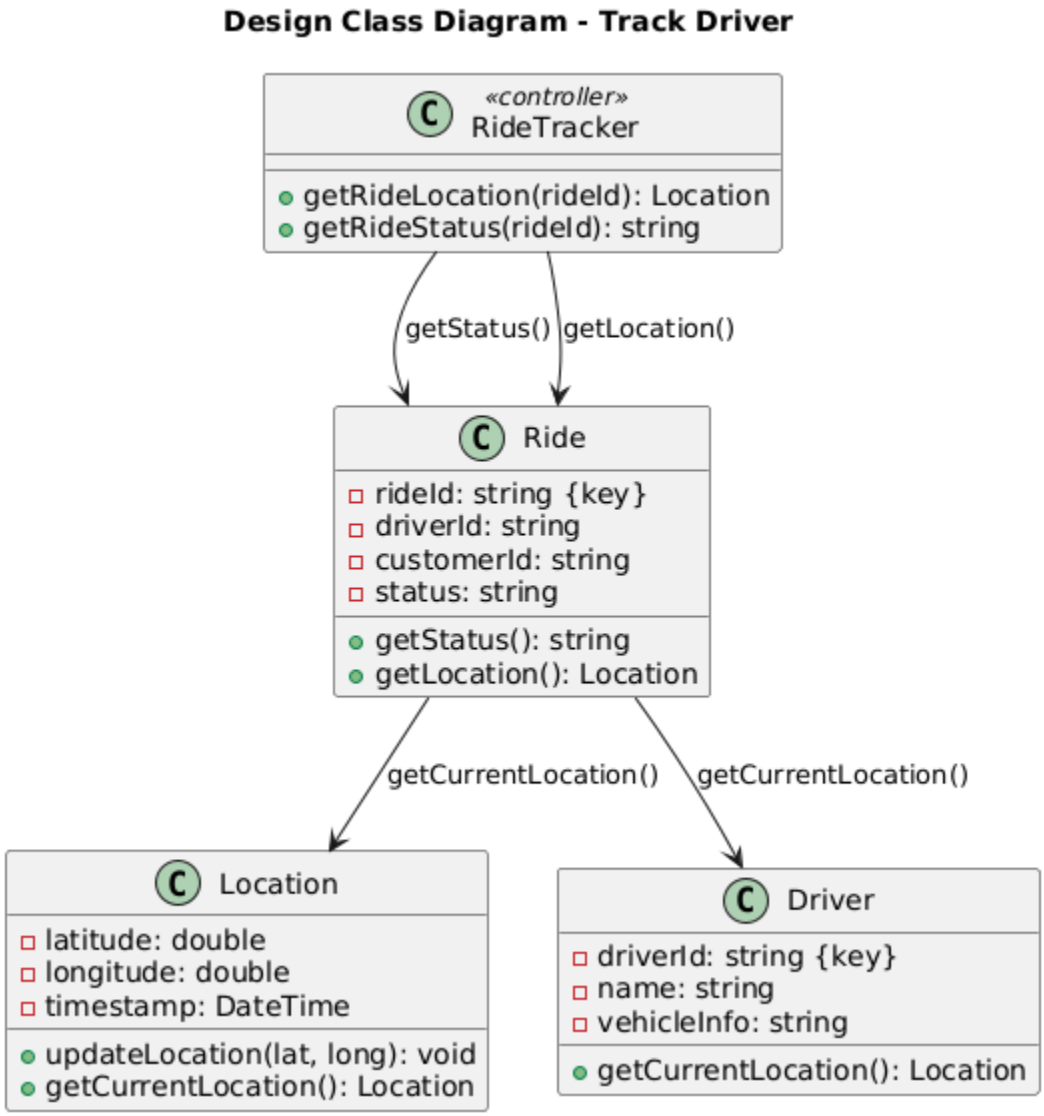


iv. Data Access

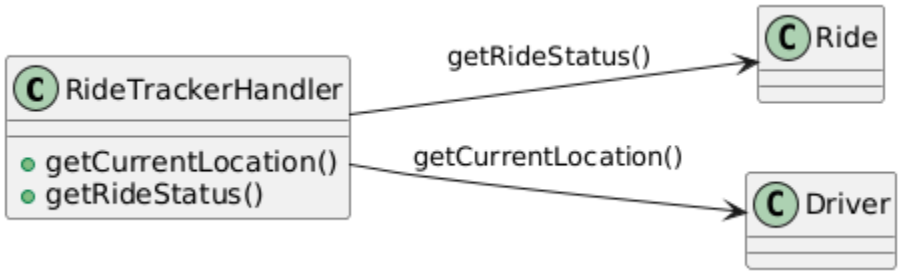


4. Design class for Track Driver

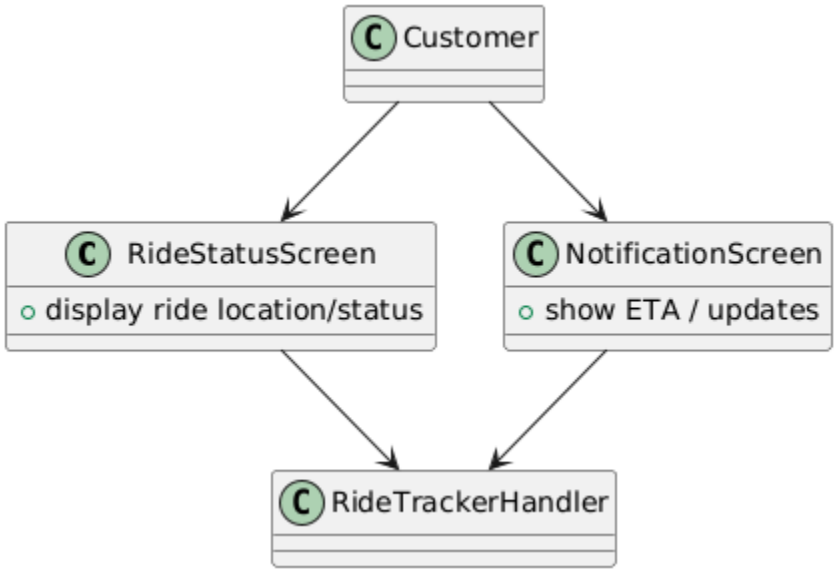
i. Domain Design Class



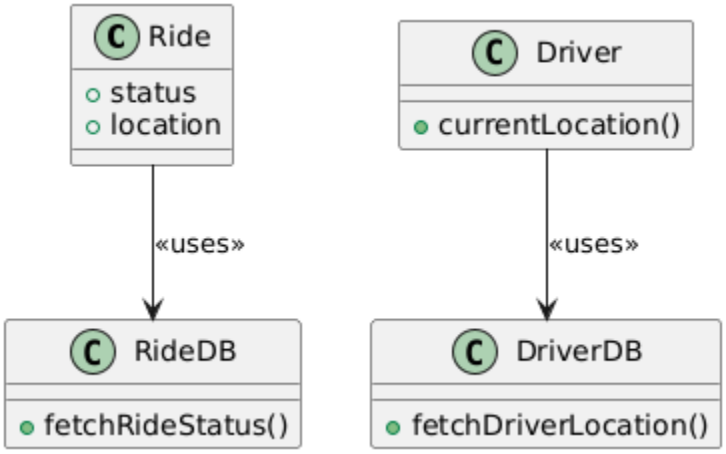
ii. Controller



iii. UI



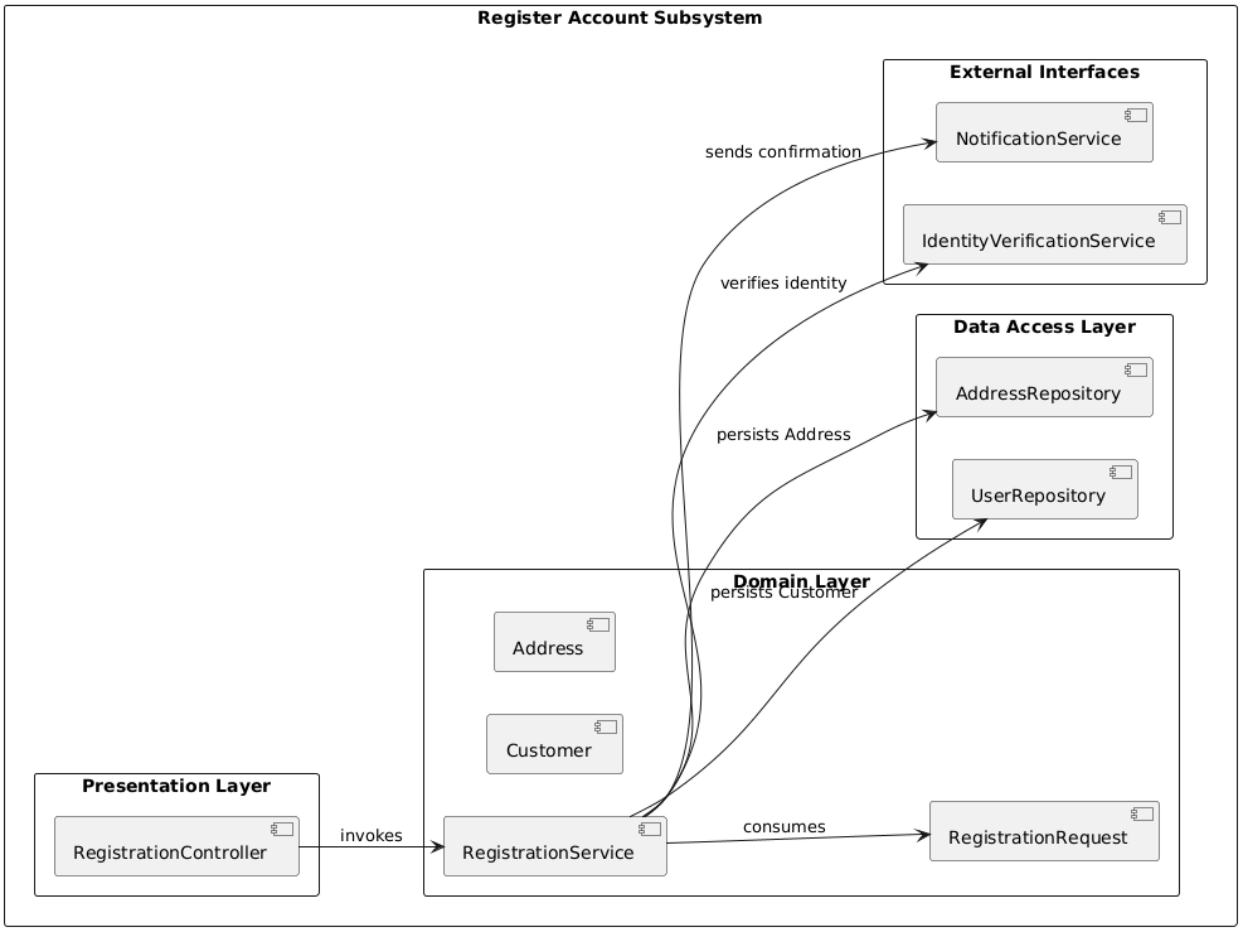
iv. Data Access



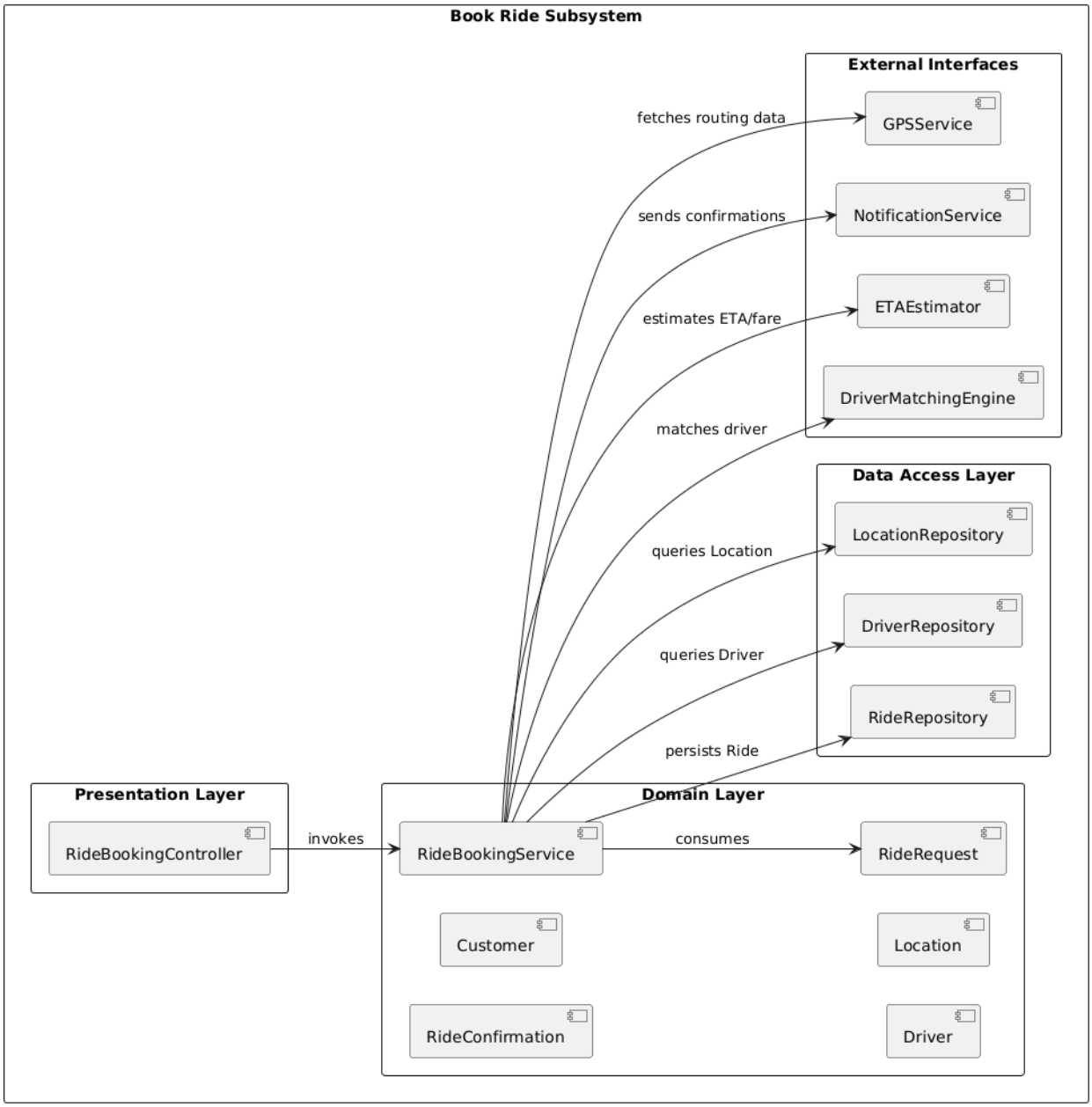
V. Build, Test, Integrated System Component

1. Package Diagram for Subsystem

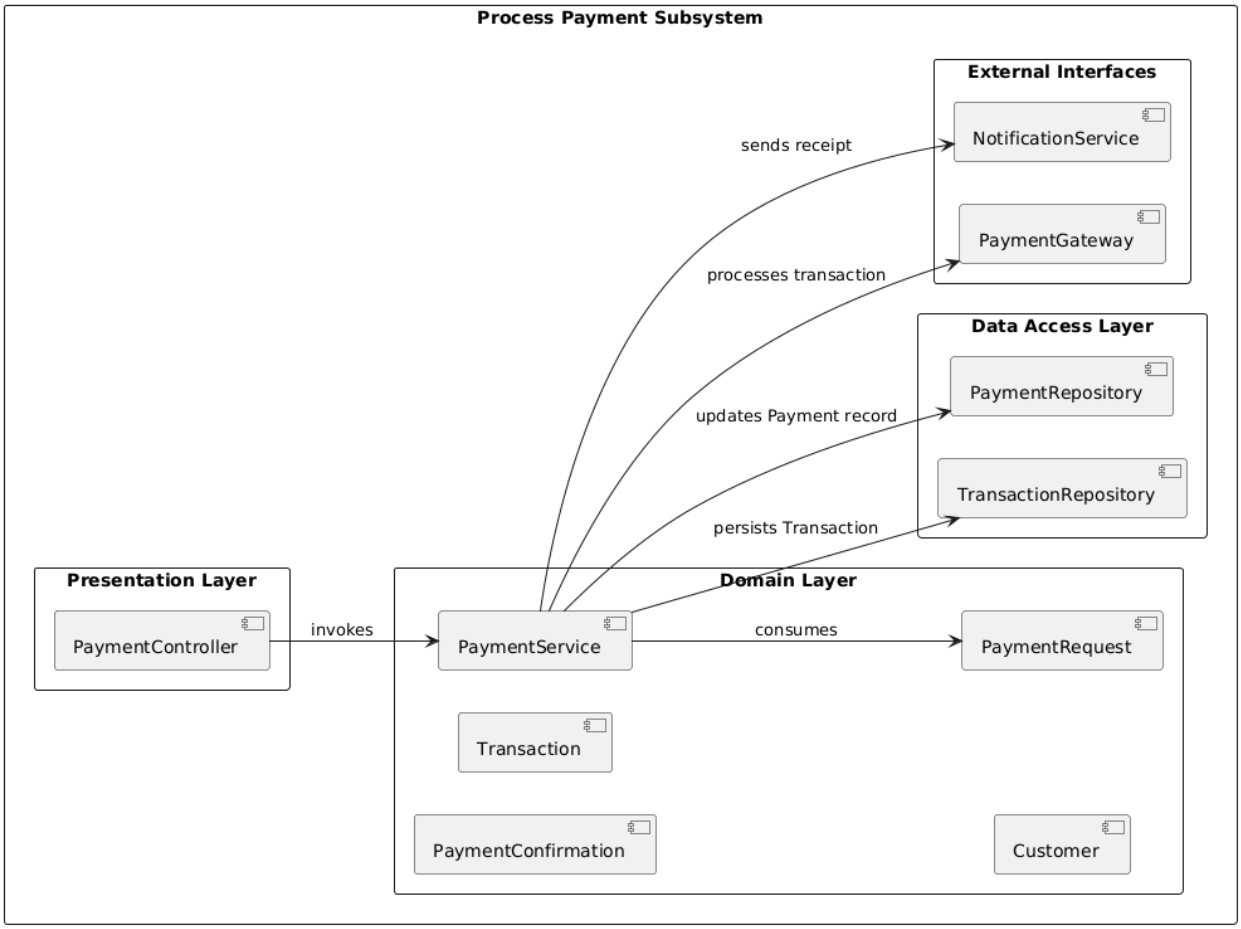
i. Register Account Subsystem



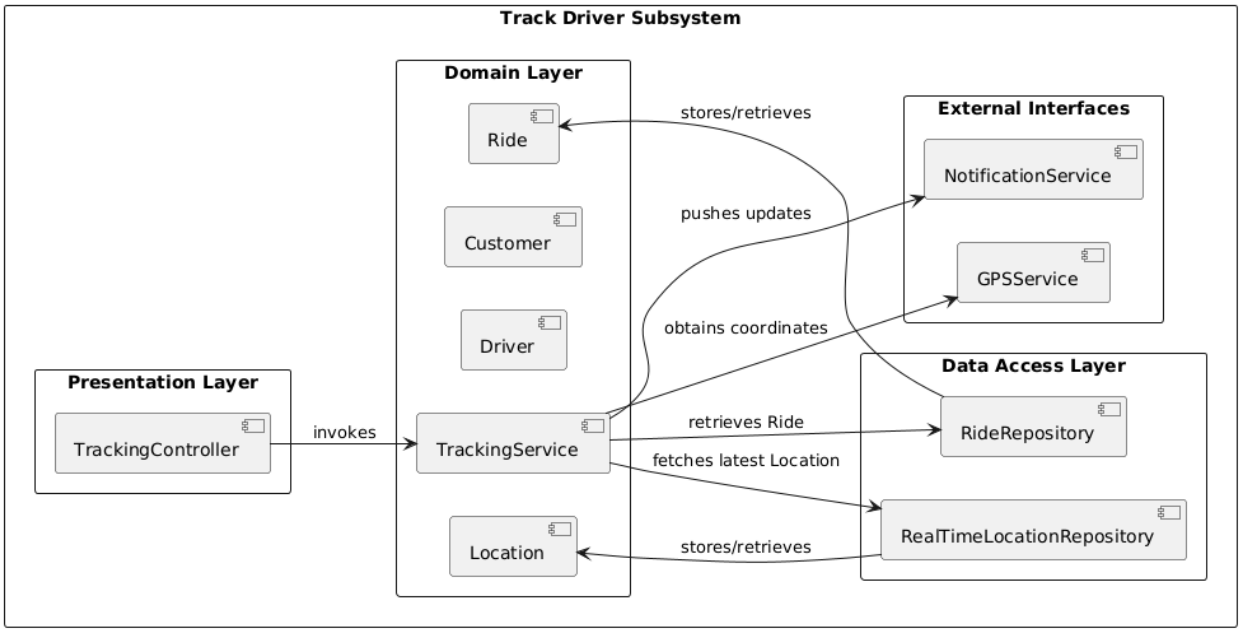
ii. Book Ride Subsystem



iii. Process Payment Subsystem



iv. Track Driver



2. Database Design

i. Customer

Column	Data Type	Constraints
CustomerID	INT	PK, IDENTITY(1,1)
Name	NVARCHAR(100)	NOT NULL
PhoneNumber	NVARCHAR(20)	NOT NULL
Email	NVARCHAR(100)	NOT NULL, UNIQUE
CreatedDate	DATETIME	NOT NULL, DEFAULT GETDATE()

ii. Address

Column	Data Type	Constraints
AddressID	INT	PK, IDENTITY(1,1)
CustomerID	INT	FK → Customer(CustomerID), ON DELETE CASCADE
AddressType	NVARCHAR(50)	NOT NULL
Street	NVARCHAR(200)	NOT NULL
City	NVARCHAR(100)	NOT NULL
State	NVARCHAR(100)	NOT NULL
PostalCode	NVARCHAR(20)	NOT NULL

iii. Account

Column	Data Type	Constraints
AccountID	INT	PK, IDENTITY(1,1)
CustomerID	INT	FK → Customer(CustomerID), ON DELETE CASCADE
AccountType	NVARCHAR(50)	NOT NULL
AccountNumber	NVARCHAR(100)	NOT NULL
ExpiryMonth	TINYINT	NULL
ExpiryYear	SMALLINT	NULL
CreatedDate	DATETIME	NOT NULL, DEFAULT GETDATE()

iv. Driver

Column	Data Type	Constraints
DriverID	INT	PK, IDENTITY(1,1)
Name	NVARCHAR(100)	NOT NULL
PhoneNumber	NVARCHAR(20)	NOT NULL
VehicleType	NVARCHAR(50)	NOT NULL
VehicleNumber	NVARCHAR(20)	NOT NULL
Availability	BIT	NOT NULL, DEFAULT 1
CreatedDate	DATETIME	NOT NULL, DEFAULT GETDATE()

v. Ride

Column	Data Type	Constraints
RideID	INT	PK, IDENTITY(1,1)
CustomerID	INT	FK → Customer(CustomerID)
DriverID	INT	FK → Driver(DriverID), NULL until assigned
PickupAddress	NVARCHAR(200)	NOT NULL
DropoffAddress	NVARCHAR(200)	NOT NULL
RequestTime	DATETIME	NOT NULL, DEFAULT GETDATE()
StartTime	DATETIME	NULL
EndTime	DATETIME	NULL
Status	NVARCHAR(50)	NOT NULL, DEFAULT 'Requested'
EstimatedFare	DECIMAL(10,2)	NULL
ActualFare	DECIMAL(10,2)	NULL

vi. Payment

Column	Data Type	Constraints
PaymentID	INT	PK, IDENTITY(1,1)
RideID	INT	FK → Ride(RideID), ON DELETE CASCADE
AccountID	INT	FK → Account(AccountID)
Amount	DECIMAL(10,2)	NOT NULL
PaymentMethod	NVARCHAR(50)	NOT NULL
TransactionID	NVARCHAR(100)	NOT NULL
PaymentTime	DATETIME	NOT NULL, DEFAULT GETDATE()
Status	NVARCHAR(50)	NOT NULL

vii. DriverLocation

Column	Data Type	Constraints
LocationID	INT	PK, IDENTITY(1,1)
DriverID	INT	FK → Driver(DriverID)
RideID	INT	FK → Ride(RideID), ON DELETE CASCADE
Latitude	DECIMAL(9,6)	NOT NULL
Longitude	DECIMAL(9,6)	NOT NULL
Timestamp	DATETIME	NOT NULL, DEFAULT GETDATE()

3. SQL Code

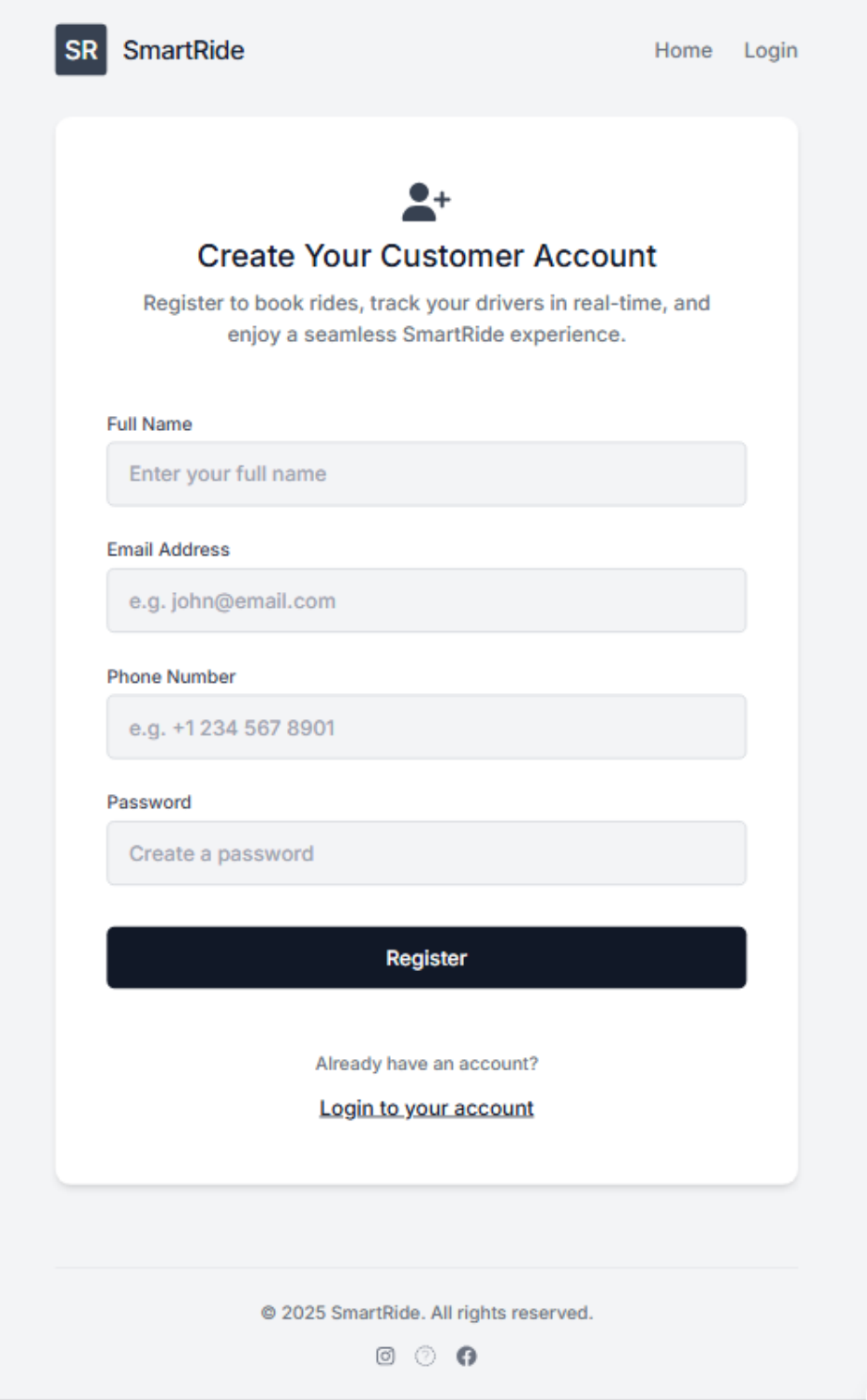
```sql
-- 1. Create the database
CREATE DATABASE SmartRide;
GO

USE SmartRide;
GO

-- 2. Customer-related tables

-- Customer master table
CREATE TABLE dbo.Customer (
    CustomerID       INT            IDENTITY(1,1) PRIMARY KEY,
    Name             NVARCHAR(100) NOT NULL,
    MobilePhone      NVARCHAR(20)  NOT NULL,
    HomePhone        NVARCHAR(20)  NULL,
    Email            NVARCHAR(100) NOT NULL UNIQUE,
    CreatedDate      DATETIME      NOT NULL DEFAULT GETDATE()
);
GO

-- Address table (one-to-many: a customer may have multiple addresses)
CREATE TABLE dbo.Address (
    AddressID        INT            IDENTITY(1,1) PRIMARY KEY,
    CustomerID       INT            NOT NULL,
    AddressType      NVARCHAR(50)  NOT NULL,  -- e.g. Home, Work
    Street           NVARCHAR(200) NOT NULL,
    City             NVARCHAR(100) NOT NULL,
    State            NVARCHAR(100) NOT NULL,
    PostalCode       NVARCHAR(20)  NOT NULL,
    CONSTRAINT FK_Address_Customer FOREIGN KEY(CustomerID)
        REFERENCES dbo.Customer(CustomerID)
        ON DELETE CASCADE
);
GO

-- Account/payment method table
CREATE TABLE dbo.Account (
    AccountID        INT            IDENTITY(1,1) PRIMARY KEY,
    CustomerID       INT            NOT NULL,
    AccountType      NVARCHAR(50)  NOT NULL,  -- e.g. CreditCard, EWallet
    AccountNumber    NVARCHAR(100) NOT NULL,  -- tokenized or masked number
    ExpiryMonth      TINYINT       NULL,
    ExpiryYear       SMALLINT      NULL,
    CreatedDate      DATETIME      NOT NULL DEFAULT GETDATE(),
    CONSTRAINT FK_Account_Customer FOREIGN KEY(CustomerID)
        REFERENCES dbo.Customer(CustomerID)
        ON DELETE CASCADE
);
GO
```

```sql
-- 3. Driver table
CREATE TABLE dbo.Driver (
    DriverID        INT           IDENTITY(1,1) PRIMARY KEY,
    Name            NVARCHAR(100) NOT NULL,
    PhoneNumber     NVARCHAR(20)  NOT NULL,
    VehicleType     NVARCHAR(50)  NOT NULL,  -- e.g. Car, Motorbike
    VehicleNumber   NVARCHAR(20)  NOT NULL,
    Availability    BIT           NOT NULL DEFAULT 1,
    CreatedDate     DATETIME      NOT NULL DEFAULT GETDATE()
);
GO

-- 4. Ride table
CREATE TABLE dbo.Ride (
    RideID          INT           IDENTITY(1,1) PRIMARY KEY,
    CustomerID      INT           NOT NULL,
    DriverID        INT           NULL,  -- assigned when matched
    PickupAddress   NVARCHAR(200) NOT NULL,
    DropoffAddress  NVARCHAR(200) NOT NULL,
    RequestTime     DATETIME      NOT NULL DEFAULT GETDATE(),
    StartTime       DATETIME      NULL,
    EndTime         DATETIME      NULL,
    Status          NVARCHAR(50)  NOT NULL DEFAULT 'Requested',
    EstimatedFare   DECIMAL(10,2) NULL,
    ActualFare      DECIMAL(10,2) NULL,
    CONSTRAINT FK_Ride_Customer FOREIGN KEY(CustomerID)
        REFERENCES dbo.Customer(CustomerID),
    CONSTRAINT FK_Ride_Driver FOREIGN KEY(DriverID)
        REFERENCES dbo.Driver(DriverID)
);
GO

-- 5. Payment table
CREATE TABLE dbo.Payment (
    PaymentID       INT           IDENTITY(1,1) PRIMARY KEY,
    RideID          INT           NOT NULL,
    AccountID       INT           NOT NULL,
    Amount          DECIMAL(10,2) NOT NULL,
    PaymentMethod   NVARCHAR(50)  NOT NULL,
    TransactionID   NVARCHAR(100) NOT NULL,
    PaymentTime     DATETIME      NOT NULL DEFAULT GETDATE(),
    Status          NVARCHAR(50)  NOT NULL,
    CONSTRAINT FK_Payment_Ride FOREIGN KEY(RideID)
        REFERENCES dbo.Ride(RideID)
        ON DELETE CASCADE,
    CONSTRAINT FK_Payment_Account FOREIGN KEY(AccountID)
        REFERENCES dbo.Account(AccountID)
);
GO
```

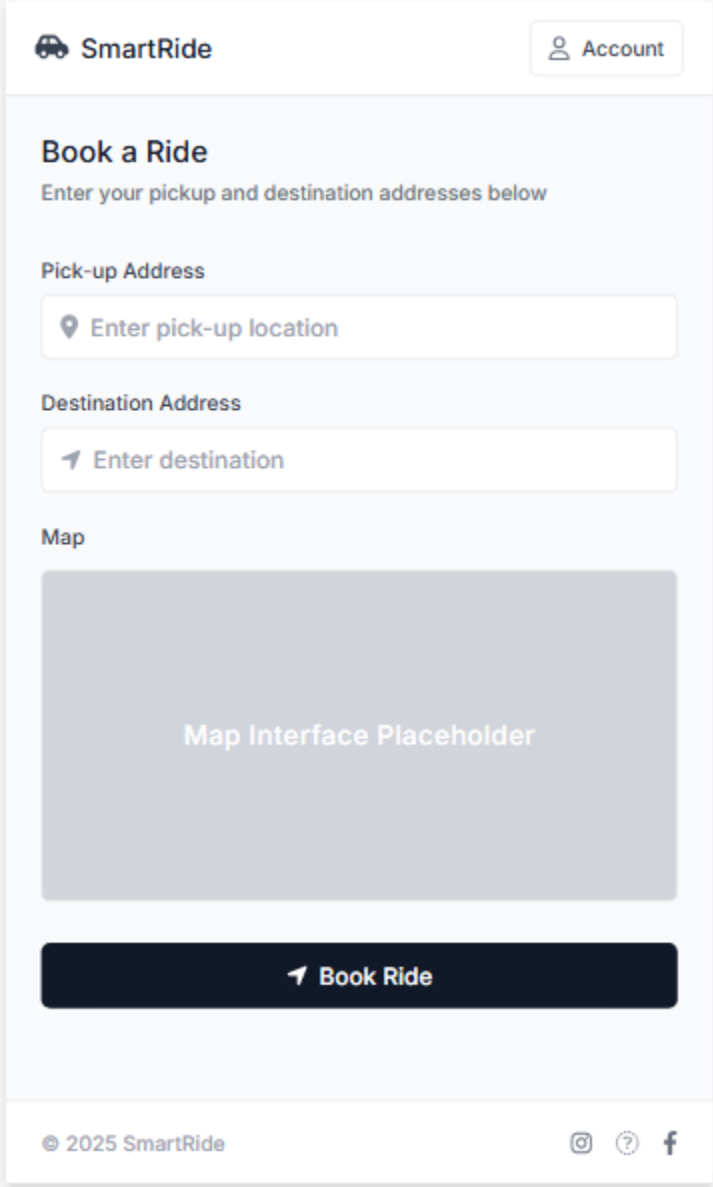
```sql
-- 6. DriverLocation table for tracking
CREATE TABLE dbo.DriverLocation (
    LocationID       INT           IDENTITY(1,1) PRIMARY KEY,
    DriverID         INT           NOT NULL,
    RideID           INT           NOT NULL,
    Latitude         DECIMAL(9,6)  NOT NULL,
    Longitude        DECIMAL(9,6)  NOT NULL,
    Timestamp        DATETIME      NOT NULL DEFAULT GETDATE(),
    CONSTRAINT FK_Location_Driver FOREIGN KEY(DriverID)
        REFERENCES dbo.Driver(DriverID),
    CONSTRAINT FK_Location_Ride FOREIGN KEY(RideID)
        REFERENCES dbo.Ride(RideID)
        ON DELETE CASCADE
);
GO

-- 7. Indexes for performance
CREATE INDEX IX_Ride_Status ON dbo.Ride(Status);
CREATE INDEX IX_Ride_CustomerID ON dbo.Ride(CustomerID);
CREATE INDEX IX_Payment_RideID ON dbo.Payment(RideID);
CREATE INDEX IX_Location_RideID ON dbo.DriverLocation(RideID);
GO
```

4. UI Design

i. Register Account

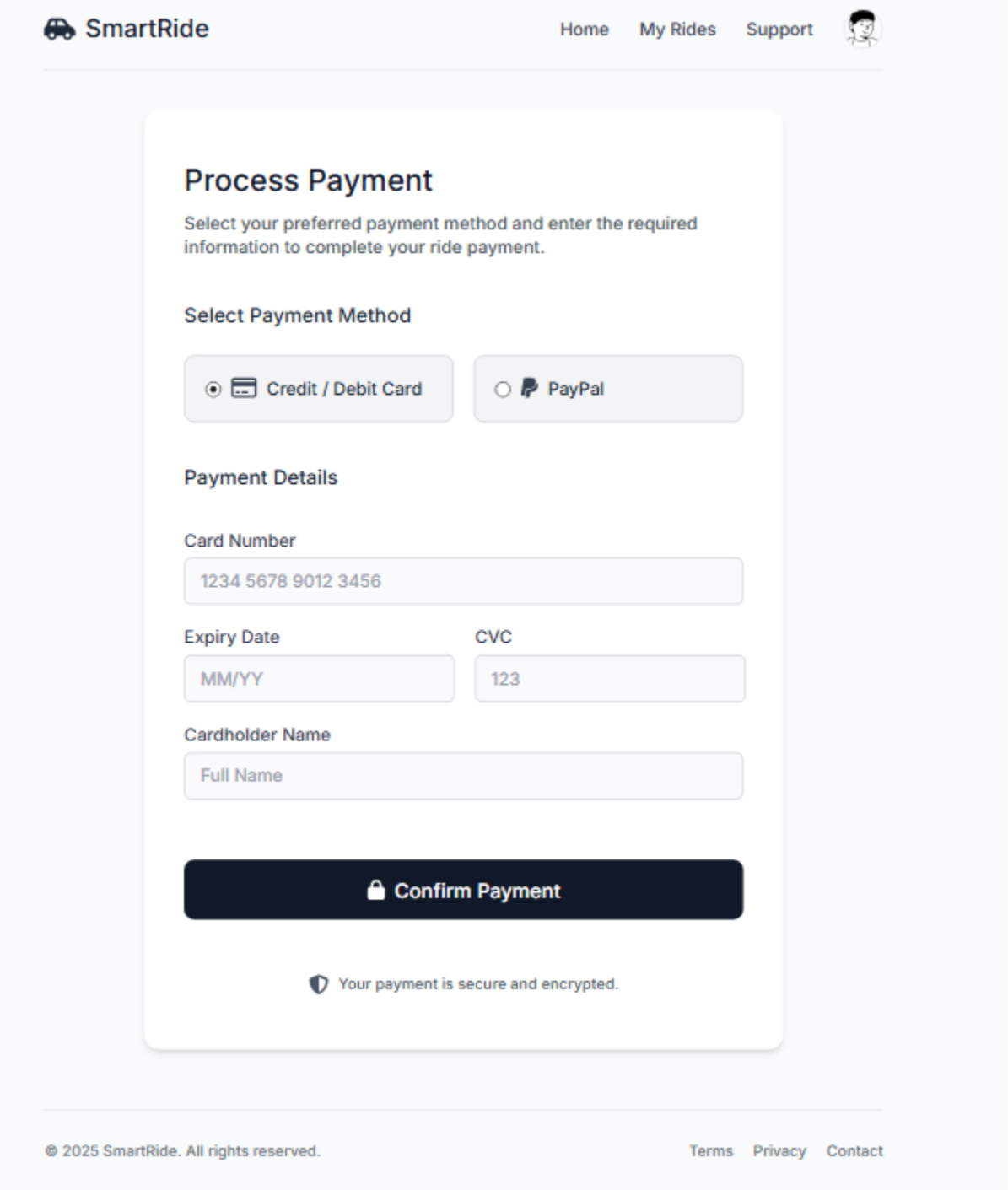


ii. Book Ride

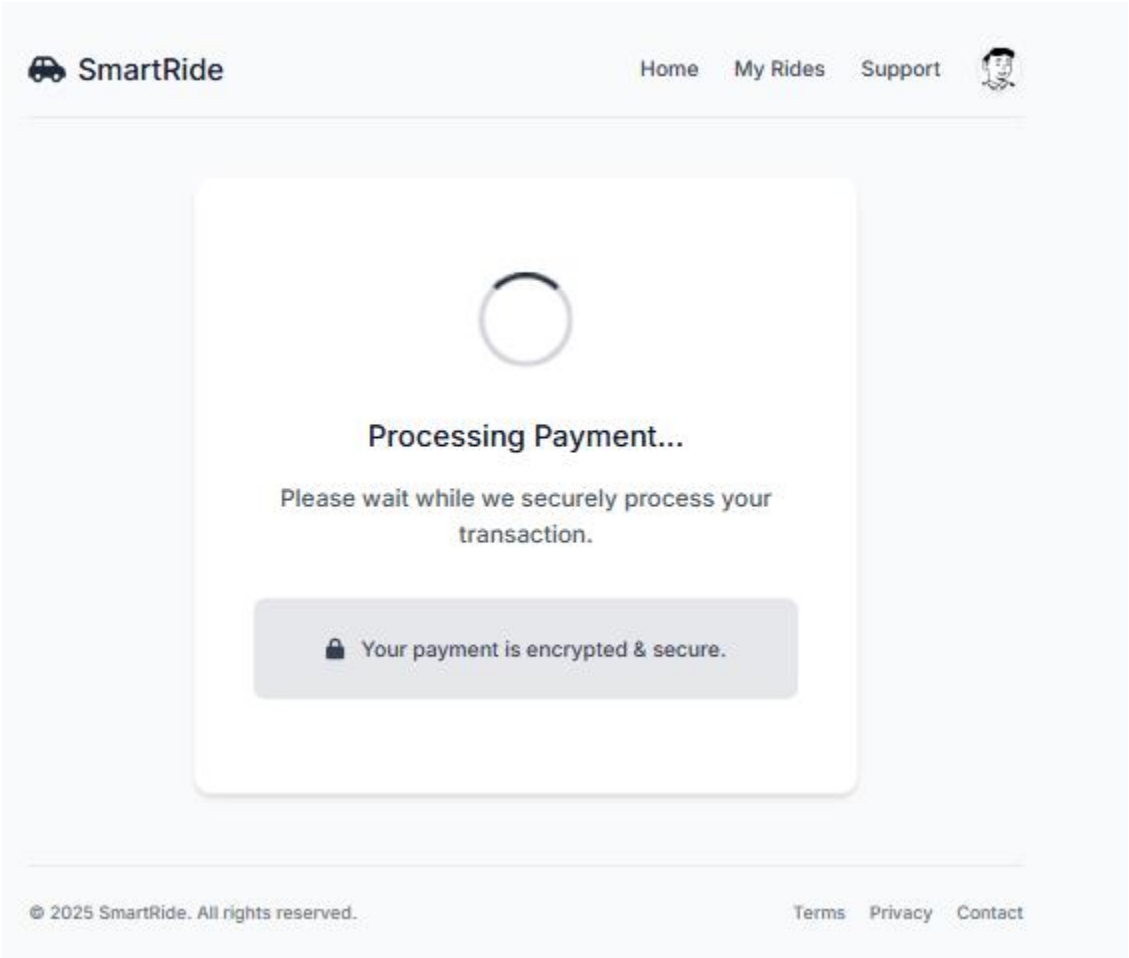

SmartRide
Account
Book a Ride
Enter your pickup and destination addresses below
Pick-up Address
Enter pick-up location
Destination Address
Enter destination
Map
Map Interface Placeholder
Book Ride
© 2025 SmartRide

iii. Process Payment

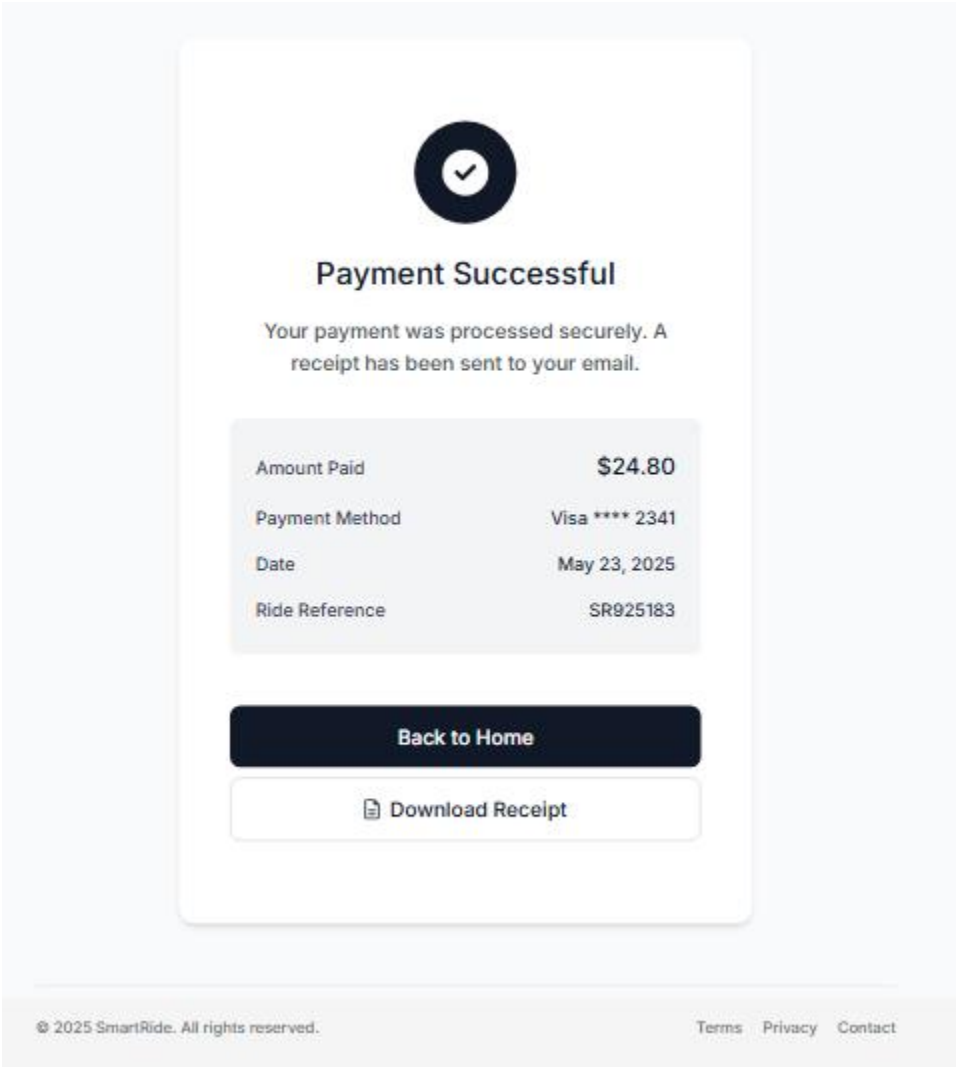
Start page



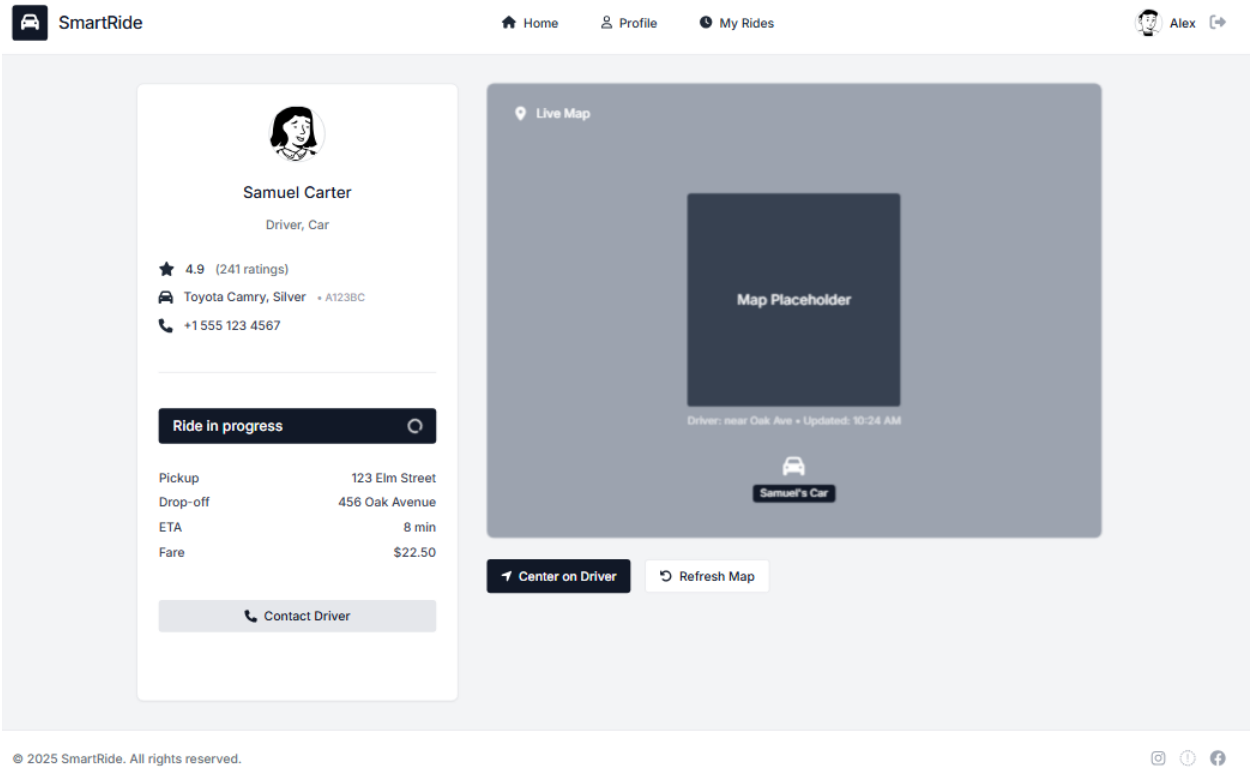
Loading page



Success Page



iv. Track Ride



5. Classes Code

i. Account

```
public class Account
{
    public int AccountId { get; set; }
    public int CustomerId { get; set; }
    public string AccountType { get; set; }  // e.g., CreditCard, EWallet
    public string AccountNumber { get; set; }  // tokenized or masked
    public int? ExpiryMonth { get; set; }
    public int? ExpiryYear { get; set; }
    public DateTime CreatedDate { get; set; } = DateTime.UtcNow;

    // Navigation
    public Customer Customer { get; set; }
}
```

ii. Address

```
public class Address
{
    public int AddressId { get; set; }
    public int CustomerId { get; set; }
    public string AddressType { get; set; }  // e.g., Home, Work
    public string Street { get; set; }
    public string City { get; set; }
    public string State { get; set; }
    public string PostalCode { get; set; }

    // Navigation
    public Customer Customer { get; set; }
}
```

iii. Customer

```
public class Customer
{
    public int Id { get; set; }
    public string Name { get; set; }
    public string MobilePhone { get; set; }
    public string HomePhone { get; set; }
    public string Email { get; set; }
    public List<Address> Addresses { get; set; }
    public List<Account> Accounts { get; set; }

    public void AddAddress(Address address) => Addresses.Add(address);
    public void AddAccount(Account account) => Accounts.Add(account);
}
```

iv. Driver

```
public class Driver
{
    public int DriverId { get; set; }
    public string Name { get; set; }
    public string PhoneNumber { get; set; }
    public string VehicleType { get; set; }  // e.g., Car, Motorbike
    public string VehicleNumber { get; set; }
    public bool Availability { get; set; } = true;
    public DateTime CreatedDate { get; set; } = DateTime.UtcNow;

    // Navigation
    public ICollection<Ride> Rides { get; set; } = new List<Ride>();
}
```

v. DriverLocation

```
public class DriverLocationDto
{
    public double Latitude { get; set; }
    public double Longitude { get; set; }
    public string Status { get; set; } // EnRoute, Nearing, Arrived, etc.
}
```

vi. Location

```
public class Location
{
    public int LocationId { get; set; }
    public int RideId { get; set; }
    public double Latitude { get; set; }
    public double Longitude { get; set; }
    public DateTime Timestamp { get; set; } = DateTime.UtcNow;

    // Navigation
    public Ride Ride { get; set; }
}
```

vii. Payment

```
public class Payment
{
    public int Id { get; set; }
    public int RideId { get; set; }
    public decimal Amount { get; set; }
    public string PaymentMethod { get; set; }
    public string TransactionId { get; set; }
    public DateTime Timestamp { get; set; }
}
```

viii. Ride

```
public class Ride
{
    public int Id { get; set; }
    public int CustomerId { get; set; }
    public int DriverId { get; set; }
    public string PickupLocation { get; set; }
    public string DropoffLocation { get; set; }
    public string VehicleType { get; set; }
    public DateTime RequestTime { get; set; }
    public string Status { get; set; }
}
```

6. Test Plan

Section	Description
System	SmartRide Online Ride-Sharing Platform
Scope	Covers 4 core use cases: Register Account, Book Ride, Make Payment, Track Ride
Testing Type	Functional, Integration, Usability, Acceptance Testing
Test Environment	ASP.NET Core MVC with SQL Server, hosted on local dev server and staging
Tools Used	Postman, Selenium (UI Testing), Visual Studio Test, SQL Profiler
Pass/Fail Criteria	Test passes if actual result = expected result, and system behaves as intended
Resources	1 QA Tester, 1 Developer, 1 Project Lead
Schedule	3 Days Test Cycle: Unit Test (Day 1), Integration Test (Day 2), UAT (Day 3)

VI. Complete System Testing and Deploy the System

1. Test Case

i. Register Account

Field	Value
Test Case ID	TC01
Use Case	Register Account
Description	Verify customer can register with valid details
Preconditions	Customer is not already registered
Test Steps	1. Navigate to registration page 2. Fill all required fields 3. Submit form
Expected Result	Customer account is created, data is saved to database, confirmation is shown
Postconditions	New Customer, Account, and optionally Address records created in the system

ii. Book Ride

Field	Value
Test Case ID	TC02
Use Case	Book Ride
Description	Verify ride booking flow and driver assignment
Preconditions	Customer is logged in and has valid location details
Test Steps	1. Enter pickup/dropoff location 2. Request ride 3. System assigns a driver
Expected Result	Ride is recorded with Requested or Confirmed status, driver is notified
Postconditions	New Ride record is created with reference to Customer and Driver (if assigned)

iii. Process Payment

Field	Value
Test Case ID	TC03
Use Case	Process Payment
Description	Verify that payment is processed after ride completion
Preconditions	Ride has Completed status, and valid payment method is configured
Test Steps	1. View completed ride 2. Choose payment method 3. Submit payment
Expected Result	Payment is recorded, transaction ID is generated, and status is Paid
Postconditions	New Payment record linked to Ride and Account is created

iv. Track Driver

Field	Value
Test Case ID	TC04
Use Case	Track Driver
Description	Ensure customer can track driver’s current location
Preconditions	Ride has been accepted and driver is en route
Test Steps	1. Open app during active ride 2. View driver's live location on map
Expected Result	System shows updated driver location in real-time
Postconditions	Location data is polled from DriverLocation and presented to the customer

2. Deployment Plan

Step	Activity	Details
1	Prepare Production Environment	Configure cloud server (e.g., Azure or AWS), SQL Server, SSL setup
2	Code Freeze and Final Build	Create final build from development branch (e.g., main)
3	Data Migration (if applicable)	Set up schema and seed basic data on production DB
4	Deploy Web Application	Use CI/CD tools like GitHub Actions or Azure Pipelines
5	Run Sanity Tests	Test basic functionality (login, registration, DB connection)
6	Monitor Logs and Metrics	Integrate with Application Insights or similar for real-time health
7	Rollback Plan	Retain backup and previous stable build for emergency restore

3. Demonstration Plan

Scenario: "Customer Registers, Books Ride, Pays and Tracks"

Step	Action	System Response
1	Go to SmartRide home page	Landing page appears with login/register
2	Register as new customer	Customer form is shown; submits data
3	Log in and select “Book Ride”	Ride booking screen appears
4	Enter pickup and dropoff locations	List of available drivers and ETA is shown
5	Confirm ride	System assigns a driver and starts tracking
6	View map to track driver	Driver location updates in real-time
7	Complete ride and choose payment method	Secure payment form appears
8	Pay and view receipt	Payment confirmation and downloadable receipt shown

Conclusion

The SmartRide system is a functional and streamlined solution designed to address key challenges faced by the ride-sharing business. While the processes involved are not overly complex at this stage, the system effectively integrates essential features that significantly improve the customer and driver experience. By following structured design principles and using modern architectural patterns, the platform is scalable and ready to evolve with future enhancements such as loyalty programs, ride-sharing options, or advanced route optimization. The system architecture ensures that each component is clearly defined and easy to maintain.

Overall, the SmartRide Online Ride-Sharing Platform lays a solid foundation for digital transformation, helping the business reduce manual inefficiencies, increase customer satisfaction, and support future growth opportunities in the urban transport space.