COMSATS UNIVERSITY ISLAMABAD ABBOTTABAD CAMPUS

SOFTWARE DESIGN AND ARCHITECTURE
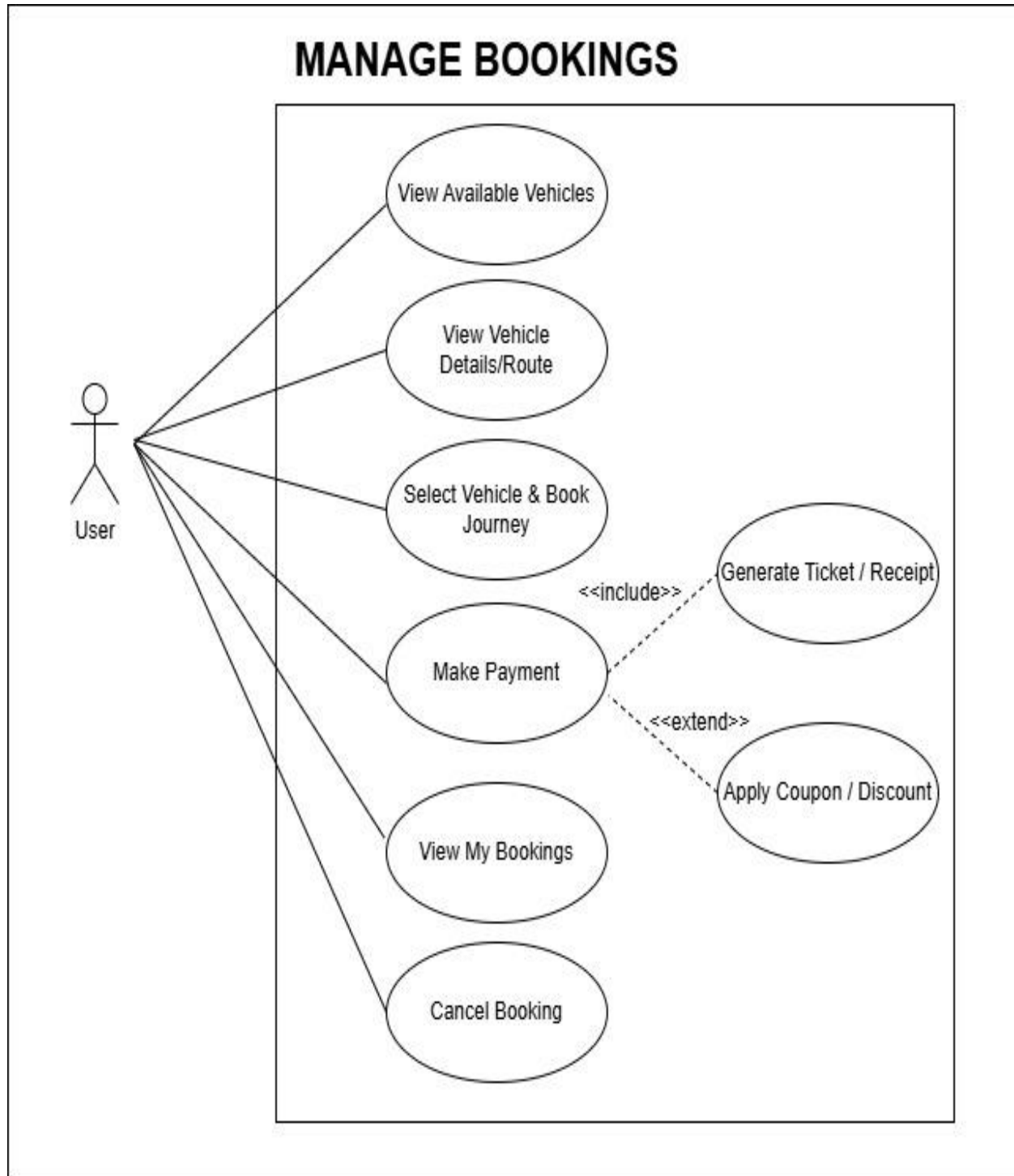
Submitted to: Sir Mukhtiyar zamin

ASSIGNMENT 1

Submitted by: Fatima Khan
Roll no: SP23-BSE-102
Date: 2nd may 2025

CHAPTER NO: 1 "ANALYSIS"

USE CASE DISGRAM

FULLY DRESSES USE CASES

CONFIRM BOOKING

Use case ID	1
Use case name	Confirm booking
Actors	**Primary**: user, customer **secondary**: Transport Management System (TMS), Payment Gateway, Admin
Description	This use case describes the process by which a customer confirms a transport service booking (such as a seat on a bus, a cargo shipment, or a taxi), after selecting transport details and entering required information.
Trigger	The customer has completed selecting transport details and clicks the "Confirm Booking" button.
Pre-conditions	**Pre-1**: The user is logged in or has provided necessary personal details. **Pre-2** The user has selected a valid transport route/service. **Pre-3**: The system shows the availability of the selected service. **Pre-4**: All required fields are completed.

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Post conditions:	**On Success:** **Post-1:** Booking is confirmed. **Post-2:** Transport seat is reserved **Post-3:** Confirmation message with booking ID is sent to the user. **Post-4:** Booking details are stored in the system for further processing. **On Failure:** **Post-1:** Booking is not confirmed **Post-2:** Appropriate error message is shown to the user (e.g., payment failure, route full).
Normal flow	**1.0:** Customer logs into the TMS. **1:** Customer selects transport service. **2:** the users will be able to see the available vehicles list **3:** The user scrolls through list as needed. **4:** The user will clicks on a vehicle to select it. **5:** The system loads and displays the detailed information for the selected vehicle. **6:** The user reviews the vehicle details and may proceed to take further actions. **7:** Customer clicks on "Confirm Booking". **8:** TMS verifies seat/cargo space availability. **9:** TMS redirects to payment gateway. **10:** Customer provides payment information and submits.

	11: Payment is authorized and confirmed. **12:** TMS stores the booking information and marks the transport unit as partially/fully booked. **13:** Booking confirmation with unique ID is displayed to the user. **14:** Confirmation is sent via email/SMS.
Alternative flow	**1: Vehicle is no longer available** **1(a):** The user clicks on a vehicle. **1(b):** The system checks availability and finds the vehicle has been removed or is no longer available. **1(c):** The system displays a message: "This vehicle is no longer available." **1(d):** The user is returned to the list or shown similar vehicle suggestions. **2: System fails to load confirmation details** **2(a):** The user selects a vehicle. **2(b):** The system encounters an error loading the vehicle's confirmation details (e.g., server issue). **2(c):** The system displays an error message: "Unable to load vehicle confirmation details. Please try again later." **2(d):** The user may try selecting a different vehicle or refresh the

Exception	**1:Network Error or Timeout**
	1(a): The system fails to respond due to a slow or lost internet connection.
	1(b): Message: "Network error. Please check your connection and try again."
	1(c): The user will be given the option to retry.
	2: Session Timeout
	2(a): The user's session has expired due to inactivity.
	2(b): Message: "Your session has expired. Please log in again."
	2(c): The user is redirected to the login page.
	3: Data Corruption or Incomplete Vehicle Record
	3(a): The selected vehicle's data is missing or corrupted (e.g., no image, missing details).
	3(b): Message: "Vehicle details are currently unavailable."
	3(c): The user is advised to choose a different vehicle.
	4: Vehicle Selection Conflict (Multiple Users)
	4(a): The vehicle is selected by another user at the same time, leading to a conflict (e.g., in case of reservations or limited stock).
	4(b): Message: "This vehicle is no longer available due to a simultaneous selection by another user."
	4©: The user is given the option to view similar available vehicles or return to the search results
	5: Payment Failure
	5(a): Payment gateway declines the transaction.
	5(b): TMS shows an error and allows the user to retry payment.
	5©: Booking is not stored or confirmed.

	6: Slot/Seat Unavailable During Confirmation **6(a):** Another user books the same slot/seat in parallel. **6(b):** TMS notifies the user of unavailability. **6©:** TMS allows user to choose another option.

Business rules	1. **Availability Check**
	    o A vehicle must be marked as available before it can be selected. If the vehicle is rented, sold, or unavailable, it should not appear in the list of selectable vehicles.
	2. **Vehicle Details Accuracy**
	    o The system must ensure that all vehicle details (e.g., make, model, year, price, and features) are up-to-date and accurate. If the information is outdated or missing, the vehicle cannot be selected until updated.
	3. **One Vehicle Selection per User at a Time**
	    o A user can select only one vehicle at a time for viewing detailed information. If the user wants to compare multiple vehicles, the system must allow adding vehicles to a comparison list, but not for direct selection.
	4. **Session Persistence**
	    o If a user selects a vehicle, the system must remember their selection within the session (or for a limited time) until they decide to take further action (e.g., booking or inquiry).
	5. **Real-Time Updates**
	    o The vehicle's status (e.g., availability) must be updated in real-time. If a vehicle is rented or sold while the user is viewing its details, the system should reflect this immediately.
	6. **Data Integrity for Selected Vehicles**
	    o Once a vehicle is selected, the system must verify that all the associated data (e.g., images, features, pricing) is correct and loaded to prevent errors in the selection process.
	7. **Reservation Conflicts**
	    o If a user selects a vehicle that is under reservation or pending, the system should display a notification regarding the potential conflict and allow the user to

	proceed with selecting a different vehicle or holding the vehicle.
Assumptions	☐ **The User is Logged In (If Required)** • If the selection of vehicles requires a user account (for saving preferences, booking, etc.), the user is assumed to be logged in before they can select a vehicle. ☐ **The Vehicle Database is Up-to-Date** • The system assumes that the vehicle database is continuously updated with the most current inventory, availability, pricing, and other related information. ☐ **Sufficient Internet Connection** • It's assumed that the user has a stable internet connection for the vehicle listing and selection process to be seamless. A slow or disconnected connection could cause delays in the vehicle selection or viewing process. ☐ **Vehicles are Properly Categorized** • The vehicles in the system are categorized correctly (e.g., by make, model, type, availability) to allow for effective searching and selection. ☐ **Availability of Vehicle Information** • It is assumed that all relevant vehicle information (e.g., specifications, images, availability, pricing) is properly populated and available to the user at the time of selection. ☐ **The System Can Handle Simultaneous Users** • The system is capable of managing multiple users selecting and viewing vehicles at the same time without performance degradation or data conflicts. ☐ **The Vehicle's Availability is Real-Time** • It's assumed that vehicle availability status (e.g., available, reserved, out of stock) is updated in real-time, ensuring the

	user sees the most accurate and current status when selecting a vehicle.

MAKE PAYMENT

Use case ID	2
Use case name	Make payment
Actors	**Primary**: user, customer **secondary**: Payment Gateway (e.g., Stripe, PayPal, etc.), Bank System (for verifying and processing transactions), admin.
Description	This use case describes the process by which a customer completes payment for a transportation-related service, such as booking a shipment, purchasing a ticket, or scheduling a delivery. The system verifies payment details, processes the transaction, and confirms the service booking.
Trigger	The customer initiates payment after selecting a transportation service (e.g., delivery, freight booking, ticket reservation).
Pre-conditions	**Pre-1**: Customer is registered and logged into the TMS platform **Pre-2**: A valid service (shipment, route, vehicle, delivery schedule) has been selected **Pre-3**: The system has calculated total charges including taxes and any additional fees. **Pre-4**: A payment method is available and supported by the system.

Post conditions:	**Post-1:** Payment is successfully processed and recorded.
	Post-2: A booking or shipping order is confirmed.
	Post-3:. A receipt and confirmation details are sent to the customer.
	Post-4: TMS updates the vehicle/route availability and resource status.
	Post-5: Transaction log is stored in the system
Normal flow	**1.0:** Customer selects a transport service and proceeds to checkout.
	1: System displays the payment summary including service charges, taxes, and discounts.
	2: Customer selects a payment method and enters payment details.
	3: System validates the entered information.
	4: System sends the payment request to the payment gateway.
	5: Payment gateway confirms successful transaction.
	6: TMS marks the booking as "Paid" and sends confirmation to the customer.
	7: System updates internal schedules, routes, or driver assignments.
	8: A receipt is emailed and optionally downloadable from the dashboard.
Alternative flow	**1: Customer Applies Promo Code or Discount**
	1(a): At step 2, customer applies a valid promo code.
	1(b): System recalculates the total and continues with the flow.
	2: System fails to load confirmation details
	2(a): The user selects a vehicle.
	2(b): The system encounters an error loading the vehicle's

	confirmation details (e.g., server issue).
	2(c): The system displays an error message: "Unable to load vehicle confirmation details. Please try again later."
	2(d): The user may try selecting a different vehicle or refresh the
	System recalculates the total and continues with the flow.
	3: Customer Changes Payment Method
	3(a): At step 3, customer switches to a different method (e.g., from card to wallet).
	3(b): System reloads the form and continues.
Exception	**1:Network Error or Timeout**
	1(a): The system fails to respond due to a slow or lost internet connection.
	1(b): Message: "Network error. Please check your connection and try again."
	1(c): The user will be given the option to retry.
	2: Session Timeout
	2(a): The user's session has expired due to inactivity.
	2(b): Message: "Your session has expired. Please log in again."
	2(c): The user is redirected to the login page.
	3: Data Corruption or Incomplete Vehicle Record
	3(a): The selected vehicle's data is missing or corrupted (e.g., no image, missing details).
	3(b): Message: "Vehicle details are currently unavailable."
	3(c): The user is advised to choose a different vehicle.

	4: Payment Failure
	4(a): Payment gateway declines the transaction.
	4(b): TMS shows an error and allows the user to retry payment.
	4©: Booking is not stored or confirmed.
	4(d): if payment details are invalid, system shows an error.
	4(e): Customer can re-enter or change the method.
	5: Insufficient Funds or Declined Transaction
	5(a): if transaction is declined by bank the Customer is notified and can try again or use a different method.
Business rules	• Payment must be made in full before any transport service is confirmed.
	• Payment methods accepted include major credit/debit cards, UPI, wallets, and net banking.
	• Taxes and service charges must be clearly shown before payment.
	• Cancellation and refund policies must be visible before confirmation.
	• Corporate clients may use wallet/credit limit (if supported by system policy).

Assumptions	☐ **The User is Logged In (If Required)** • If the selection of vehicles requires a user account (for saving preferences, booking, etc.), the user is assumed to be logged in before they can select a vehicle. ☐ **The Vehicle Database is Up-to-Date** • The system assumes that the vehicle database is continuously updated with the most current inventory, availability, pricing, and other related information. ☐ **Sufficient Internet Connection** • It's assumed that the user has a stable internet connection for the vehicle listing and selection process to be seamless. A slow or disconnected connection could cause delays in the vehicle selection or viewing process. ☐ **Availability of Vehicle Information** • It is assumed that all relevant vehicle information (e.g., specifications, images, availability, pricing) is properly populated and available to the user at the time of selection. ☐ **The System Can Handle Simultaneous Users** • The system is capable of managing multiple users selecting and viewing vehicles at the same time without performance degradation or data conflicts. ☐ **The Vehicle's Availability is Real-Time** • It's assumed that vehicle availability status (e.g., available, reserved, out of stock) is updated in real-time, ensuring the user sees the most accurate and current status when selecting a vehicle.

GENERATE RECEIPT

Use case ID	3
Use case name	Generate receipt
Actors	**Primary**: system **secondary**: Customer (initiates or receives the receipt), Admin or Transport Operator (may request receipt generation), Payment Gateway (provides transaction reference)
Description	This use case allows the system to automatically or manually generate a receipt after a successful payment for transport services. The receipt includes transaction details, customer information, service summary, and a unique receipt number.
Trigger	
Pre-conditions	**Pre-1**: Payment has been successfully completed. **Pre-2**: A booking or service order exists in the system. **Pre-3**: Customer and transaction data are stored.
Post conditions:	**Post-1:** A digital receipt (PDF or email format) is generated. **Post-2:** The receipt is saved in the system for future reference. **Post-3:**. A receipt and confirmation details are sent to the customer. **Post-4:**. The customer receives a copy via email or downloads it from their dashboard.

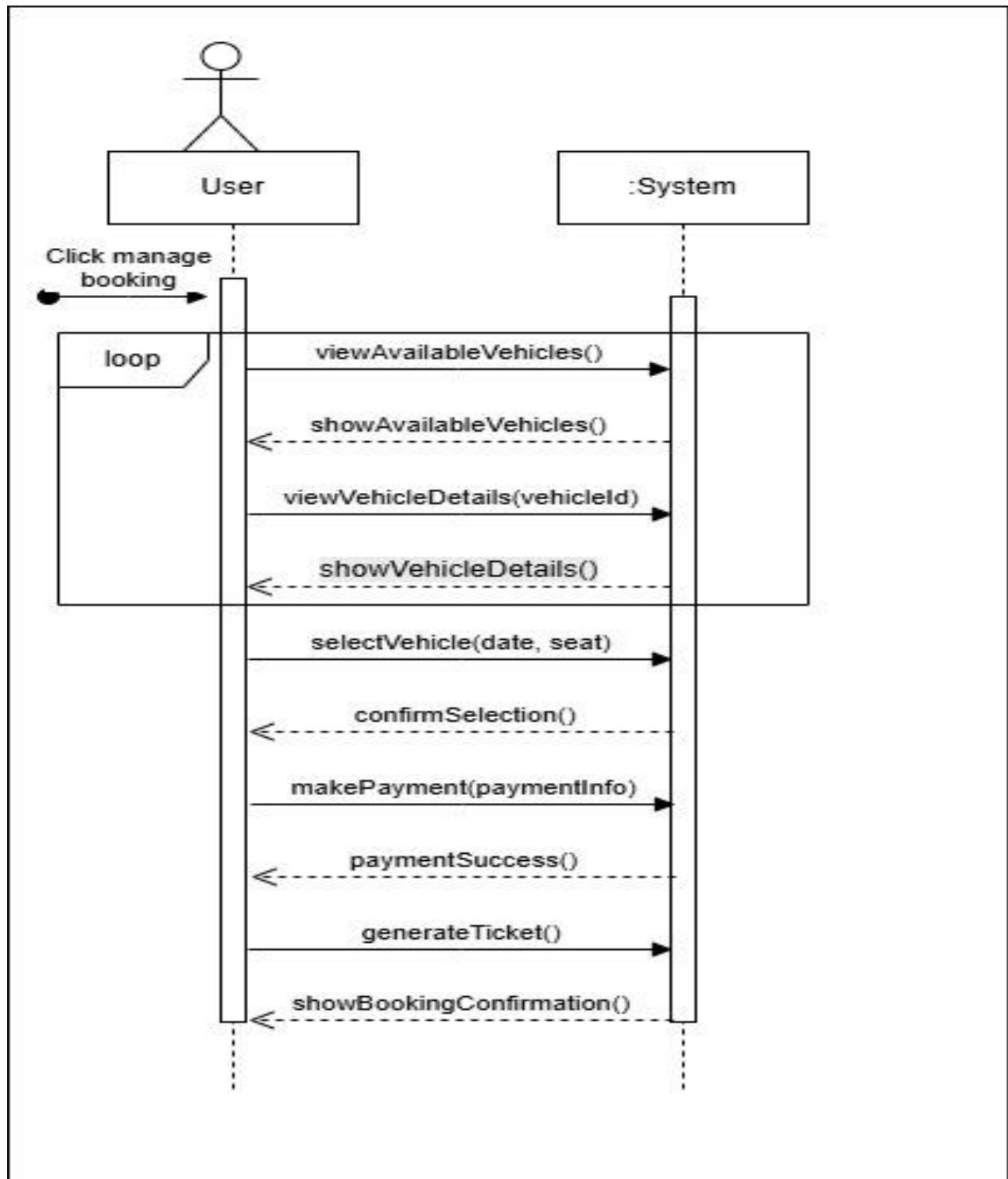| Normal flow	**1.0:**. Payment is confirmed by the system (from "Make Payment" use case).
	1: Payment is confirmed by the system (from "Make Payment" use case).
	2: A unique receipt number is generated.
	3: Receipt is formatted with all necessary details:
	- Customer name and ID - Payment amount and date - Service booked (shipment, ticket, delivery, etc.) - Payment method and transaction ID - Company/tax information (if applicable) - Terms and conditions
	4: The receipt is saved to the database or receipt repository.
	5: The receipt is sent to the customer via email or made available for download.
	6: A confirmation message is displayed to the user.
Alternative flow	**1: Admin Requests Duplicate Receipt**
	1(a): Admin searches for a specific transaction.
	1(b): System regenerates or retrieves the existing receipt.
	1(c): Admin can print, download, or email the receipt.
	2: Customer Requests Receipt from History
	2(a): Customer navigates to their transaction history.
	2(b): System shows receipt download options for completed payments.
	3: System fails to load confirmation details
	3(a): The user selects a vehicle.
	3(b): The system encounters an error loading the vehicle's

	confirmation details (e.g., server issue). **3(c):** The system displays an error message: "Unable to load vehicle confirmation details. Please try again later." **3(d):** The user may try selecting a different vehicle or refresh the System recalculates the total and continues with the flow.
Exception	**1:Network Error or Timeout** **1(a):** The system fails to respond due to a slow or lost internet connection. **1(b): Message:** "Network error. Please check your connection and try again." **1(c):** The user will be given the option to retry. **2: Session Timeout** **2(a):** The user's session has expired due to inactivity. **2(b): Message:** "Your session has expired. Please log in again." **2(c):** The user is redirected to the login page. **3: Data Corruption or Incomplete Vehicle Record** **3(a):** The selected vehicle's data is missing or corrupted (e.g., no image, missing details). **3(b): Message:** "Vehicle details are currently unavailable." **3(c):** The user is advised to choose a different vehicle. **4: Payment Failure** **4(a):** Payment gateway declines the transaction. **4(b):** TMS shows an error and allows the user to retry payment. **4©:** Booking is not stored or confirmed.

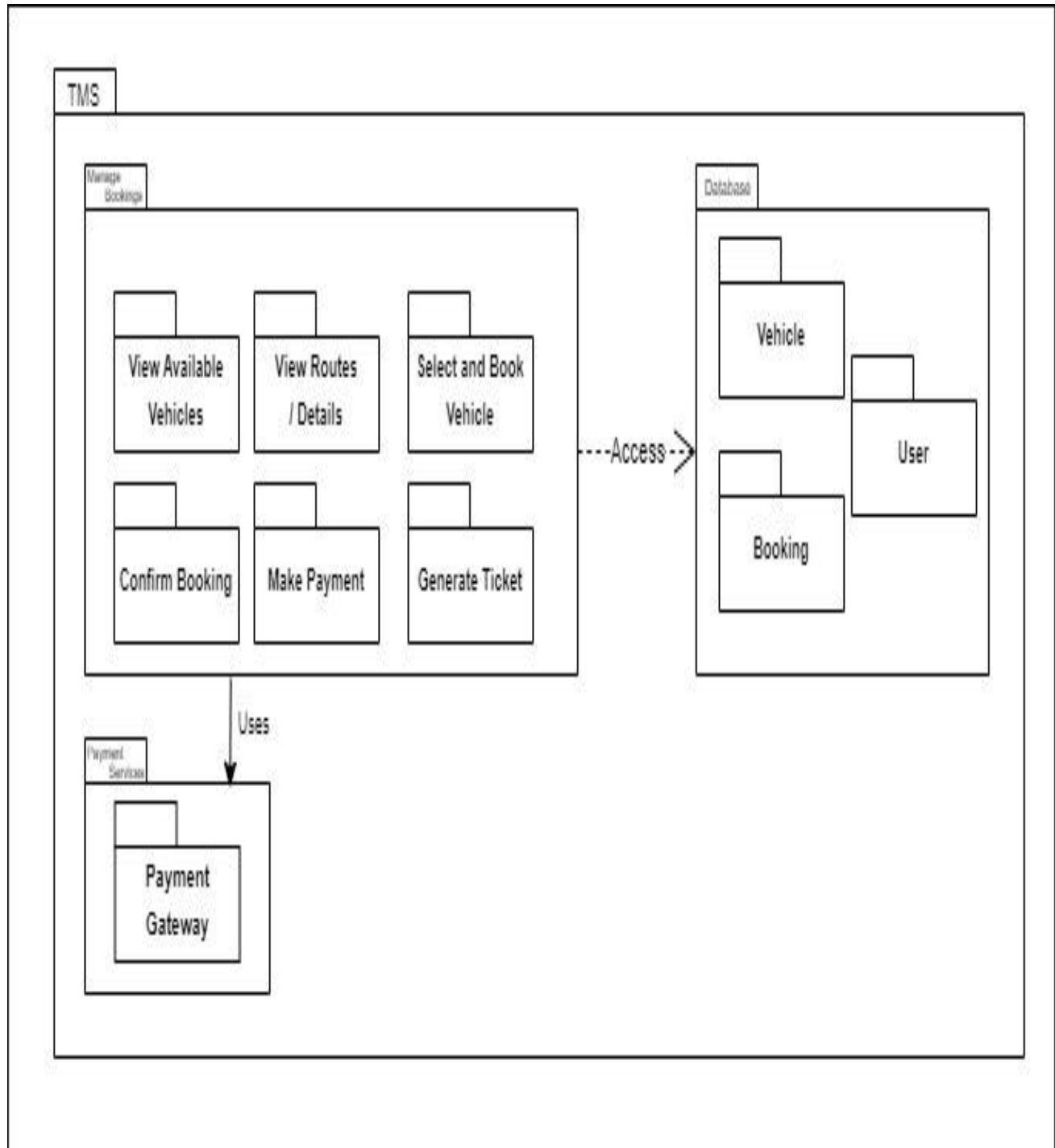|	
	4(d): if payment details are invalid, system shows an error.
	4(e): Customer can re-enter or change the method.
	5: Insufficient Funds or Declined Transaction
	5(a): if transaction is declined by bank the Customer is notified and can try again or use a different method.
Business rules	• Payment must be made in full before any transport service is confirmed.
	• Payment methods accepted include major credit/debit cards, UPI, wallets, and net banking.
	• Taxes and service charges must be clearly shown before payment.
	• A receipt must only be generated for successfully completed payments.
	• Each receipt must have a unique, traceable receipt ID.
	• Receipt must comply with legal and tax requirements (e.g., GST, VAT).
	• Receipts should be stored securely and available for future reference.
	• Admins should not be able to alter transaction amounts from the receipt screen.
Assumptions	☐ **The User is Logged In (If Required)**
	• If the selection of vehicles requires a user account (for saving preferences, booking, etc.), the user is assumed to be logged in before they can select a vehicle.
	☐ **The Vehicle Database is Up-to-Date**
	• The system assumes that the vehicle database is continuously

updated with the most current inventory, availability, pricing, and other related information.

☐ **Sufficient Internet Connection**

- It's assumed that the user has a stable internet connection for the vehicle listing and selection process to be seamless. A slow or disconnected connection could cause delays in the vehicle selection or viewing process.

☐ **Availability of Vehicle Information**

- It is assumed that all relevant vehicle information (e.g., specifications, images, availability, pricing) is properly populated and available to the user at the time of selection.

☐ **The System Can Handle Simultaneous Users**

- The system is capable of managing multiple users selecting and viewing vehicles at the same time without performance degradation or data conflicts.

☐ **The Vehicle's Availability is Real-Time**

- It's assumed that vehicle availability status (e.g., available, reserved, out of stock) is updated in real-time, ensuring the user sees the most accurate and current status when selecting a vehicle.

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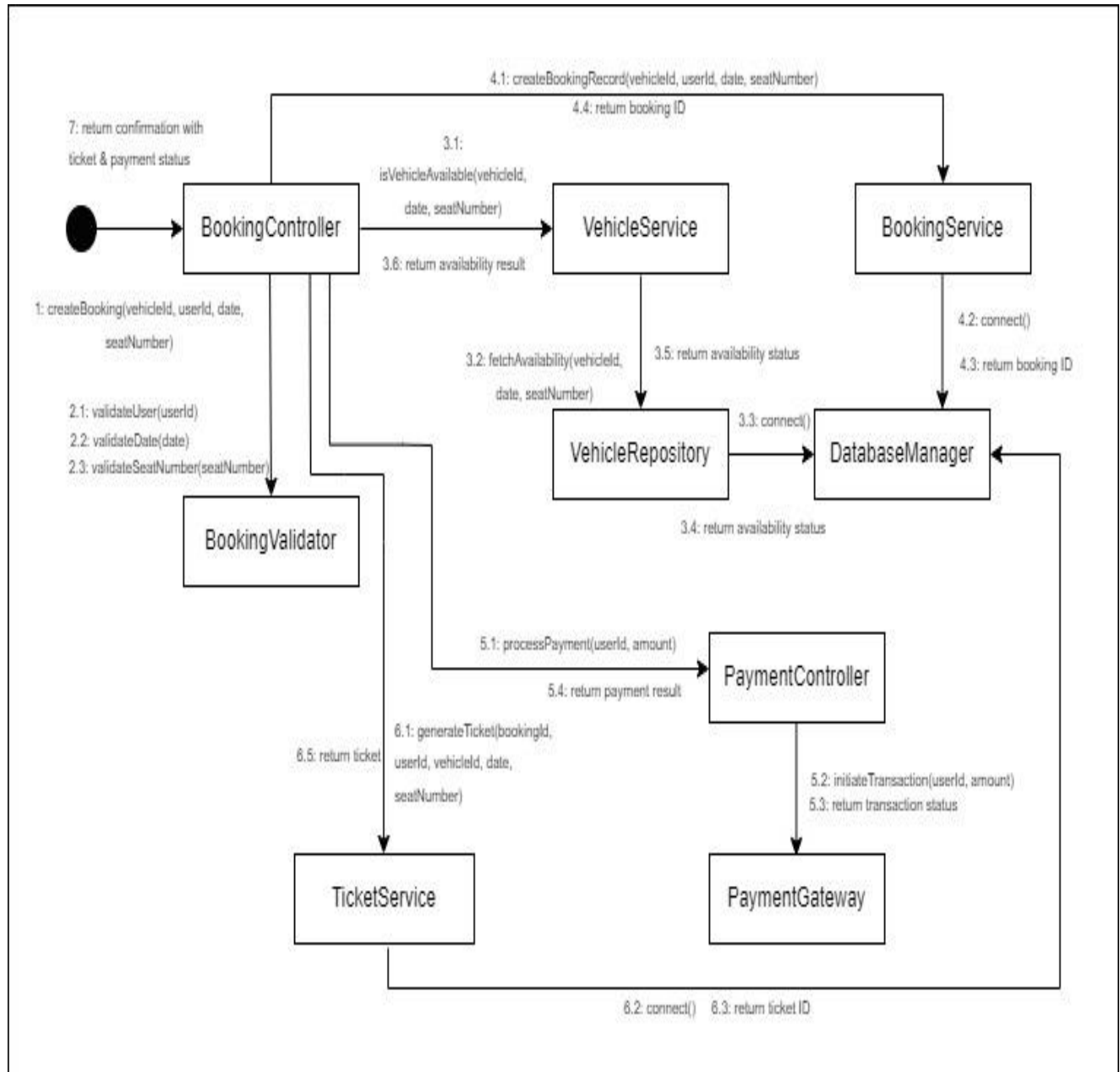
SYSTEM SEQUENCE DIAGRAM

CHAPTER 2: "SOFTWARE ARCHITECTURE"

PACKAGE DIAGRAM

CHAPTER NO: 3 "DESIGNING ARCHITECTURE"

COMMUNICATION DIAGRAM

CLASS DIAGRAM