



SOFTWARE ENGINEERING

SOFTWARE ANALYSIS & MODELLING

SIS1011Y

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TABLE OF CONTENTS

1.0 Introduction.....	1
1.1 Overall Description.....	2
1.2 Relevant Scenarios for two main use case.....	4
2.0 Use case Diagram for the whole system.....	6
2.1 Use case specifications of two main use case.....	7
2.2 Activity Diagram for two use case.....	11
2.3 Statechart Diagram for the whole diagram.....	13
2.4 System Sequence Diagrams for the two main use case.....	14
2.5 Domain Class Diagram for the whole system.....	16
2.6 Design class Diagram for the whole system.....	17
2.7 Sequence Diagrams for the whole system.....	18

1.0 Introduction

Traveling has become somewhat necessary in this day and age, whether it is for personal or business reasons. A personal vehicle is not always affordable and occasionally, public transportation is not practical for certain trips or especially when everyone is hurrying to work in the morning.

An online car rental system helps customers to save their precious time by giving them access to any information that they will ever need to rent a car in one place. Also, top-notch security is provided as all personal information (phone number & credit card details) of customers are protected with encryption technology which only employees of our business can get access.

An online car rental enables you to manage your workload quickly and efficiently while still having high business standards. You may as well relax knowing that all your data are accurate and free from any damage or errors. This is the principal reason of having an online car rental.

With the help of a smartphone or a laptop, customers can easily and rapidly make a reservation through our website at any time since it is operable 24 hours a day, 7 days a week. Renting a car allows a customer to stay tension free as he/she does not have to pay any hidden fees, maintenance, and insurance fees. The comfort to move around whenever you want, at any time you want and as well as at your own pace is a big yes to hire a car.

1.1 Overall Description of the system

The car rental system is an online-based platform. If the customer already used the company's services in the past and possesses an account, he only needs to log in by inputting his username and the password that he opted for after his initial registration on the website. If the customer is new, he will have to register for an account on the website where he will be asked to input the following information: full name, identity card number, age, address, phone number and email address. After a successful login/registration, the customer will be directed to the main webpage of the car rental system where he will be asked to select a car model and specify the duration for which he would like to rent the vehicle. Customers can view details such as vehicle type, price, location, pickup/return date and current car status. Features of the website also include secure online-payment, real-time tracking, recommendations, user feedback and an FAQ section. The system will naturally inform the client whether the chosen vehicle is available or not. A chosen vehicle may be unavailable for numerous reasons, be it due to the latter being already booked, is being repaired or is being disposed of. If the vehicle was recently booked, it will not be ready immediately for it shall first be cleaned before being rented again. Once the model of the vehicle has been selected, the customer will be asked to re-enter his password to confirm his booking and proceed with a payment transaction for the chosen rental period through e-payment, which can be in the form of PayPal or credit bank card. No matter the chosen form, after a successful payment, a receipt will be sent to the customer by email which will serve as proof of payment. Everything being done online without any displacement and within just a few clicks. Meanwhile, on the administrator's side, the latter will be able to monitor the list of clients registered

onto the system who have booked or is currently booking a vehicle. He/she can also monitor the list of vehicles that are available for booking, are unavailable due to being booked or are unavailable due to being cleaned or repaired. The administrator will also ensure that proper payment has been received and sends a confirmation of payment to the customer. Following that, on the appointed day, the customer can come to the car rental location to pick up his chosen vehicle. A company agent will make a copy of his identity card, explain the terms of the lease, instruct him on any special features of the car, and finally hand him the keys to the vehicle. When the customer drops off the car after having made use of it, an agent will check its mileage and inspects for any possible damages.

1.2 Relevant scenarios for two main use cases

Process: Payment

The customer receives a booking ID once the booking is completed. The consumer enters his/her bookingID. The booking ID is verified by the system. The system verifies if the client is eligible for the payment if only, he/she matches bookingID, then the system evaluates that the customer is entitled to make the payment, else the client re-enter his/her bookingID. The system determines the amount of payment for the booking. The system verifies if the client is renting a car for the first time, then a 20 % discount is given, else the client pays the original price. The client views the price. The system prompts the client if he/she wants to proceed with the payment. If the client proceeds with the payment, the system then offers the client two payment options: PayPal or his/her own credit bank card. If the client opts for PayPal, a quick payment is made else a due date is available if he/she pays with his/her credit card. Otherwise, the client exits the system. The system calculates and displays the bill for the client. The latter proceeds by entering the payment details, such as accountnumber, paymentdate, duedate and ClientDetails. The system finally generates an e-statement which the client may save on his/her PC as a proof of payment.

Relevant scenarios for two main use cases

Process: **Fleet Management** (Managing vehicle rental information and status)

From identifying and delivering vehicles to customers to monitoring automobile health, including the history of damage and repairs, a car rental company necessitates a lot of surveillance. An automobile rental facility database is less predictable than that of other travel-related systems like airlines. As a result, it necessitates constant monitoring, which can be done. The customer requests for a rental. When a booking is made, vehicle information such as location, mileage, pickup date, return date, type and status is saved in a database. The system immediately assigns another 'available' vehicle if there are any problems with the reserved vehicle. At the same time, the system may impose a reservation restriction if the number of bookings is likely to surpass the number of idling cars, as it monitors the workload of each asset in the fleet. The system validates all information. The system displays all the terms of the rental agreement, instructs the client about any special features of the vehicle, and finally, the administrator hands over the key to the client. Moreover, the system can track vehicle usage and evenly spread the load across the fleet, avoiding placing out-of-date vehicles on the road. When the car is dropped off by the client, the administrator verifies the mileage, checks for any damage, and checks if all terms of the rental were respected. If terms were not respected, e.g., the duration limit was not met, the system charges an additional fee. Updating the rental history, the system keeps track of all the rentals the vehicle has undergone. It will also help to deliver a good-condition vehicle to the next client.

2.0 Use Case diagram of the whole system



2.1 Use Case Descriptions of two main use cases

Process: Payment

Use case name:	Make payment
Participating actor:	Customer
Pre-condition:	The system is working. The customer has sufficient money
Flow of events	<ol style="list-style-type: none">1.The customer enters his/her bookingID.2.The system validates the bookingID that the client is eligible.3.The customer proceeds with the payment process.4.The system verifies for first booking.5.The system determines the amount to be paid by the customer.6. The client view the price.7.The system validates for the confirmation of the payment.8.The customer pays for the correct amount for the rental.9.The system indicates the payment methods PayPal or Credit card.10.The customer chooses the methods of payment.11.The system calculates the bill for the customer.12.The customer enters his/her payment details.13.The system generates an E-statement.14.The client saves the E-statement.15.The use case ends
Alternative flows:	<p>A. Eligible for payment</p> <p>If in step 2 of the basic flow of events, the system determines that the bookingID is incorrect then,</p> <ul style="list-style-type: none">• The system will not proceed with the payment.• The use case resumes at step 1.

	<p>B. Determines first booking If in step 5 of the basic flow of events, the system determines that it is the first booking then,</p> <ul style="list-style-type: none"> • A 20 % discount is allowed from the original price. • The use case resumes at step 3. <p>C. Proceed with payment. If in step 7 of the basic flow of events, the client does not proceed with the payment then,</p> <ul style="list-style-type: none"> • The use case ends. <p>D. The client chooses methods of payment If in step 9 of the basic flow of events, the client chooses for PayPal method then,</p> <ul style="list-style-type: none"> • A quick payment is made. • The client can also choose for credit card method where a due date will be available for the payment. • The use case resumes at step 8. <p>E. E-statement If in step 13 of the basic flow of events, the client does not want the E-statement then</p> <ul style="list-style-type: none"> • The system will not save the E-statement. • The use case ends.
Post condition:	The client proceeds with the payment successfully if the correct bookingID and payment details are entered.

Use Case Descriptions of two main use cases

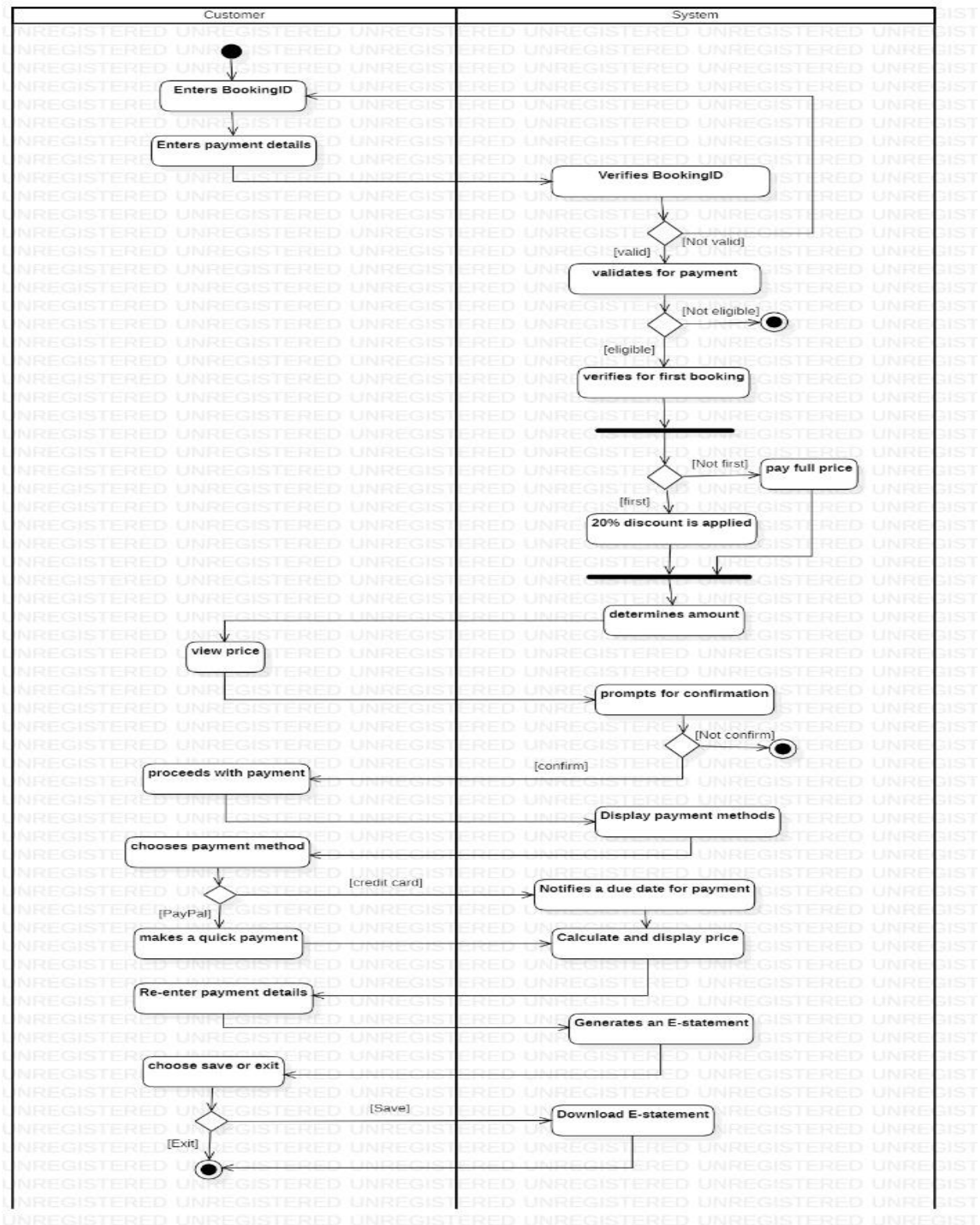
Process: Fleet Management

Use case name:	Manage car fleet
Participating actors:	Client Agent Management system
Pre-condition:	The system is working
Flow of events	<ol style="list-style-type: none">1. The customer requests for a car rental.2. The system checks for availability of the car.3. The system imposes restriction on the reservation.4. The user abides to the restriction.5. The system validates the informations.6. The system registers the booking.7. The system displays terms of rental agreement.8. The client agrees to the rental agreements.9. The agent hands the keys to the customer.10. The system tracks the vehicle's usage.11. The client drops off the car.12. The agent checks whether the terms and conditions were respected.13. The system updates the rental history.14. The use case ends.
Alternative flows:	<p>1. Car not available.</p> <p>If in step 2 of the basic flow of events, the system determines that the vehicle is not available then,</p>

	<ul style="list-style-type: none"> • The system assigns a new car to the customer. • The use case resumes at step 3. <p>2. Customer does not abide by the restriction.</p> <p>If at step 3 of the basic flow of events, the customer does not want to comply with the restriction, then</p> <ul style="list-style-type: none"> • The system does not validate the information. • The booking is cancelled. • The use case ends. <p>3. Disagreement over the terms and conditions.</p> <p>If in step 8 of the basic flow of events, the customer does not agree with the car rental terms and conditions, then</p> <ul style="list-style-type: none"> • The booking is cancelled. • The use case ends. <p>4. Terms and conditions not respected.</p> <p>If in step 11 of the basic flow of events, the customer fails to return the car on time, then</p> <ul style="list-style-type: none"> • The system calculates and displays additional fees if any. • The customer will have to effectuate additional payment. • The use case resumes at step 14.
Post-condition:	Fleet management was updated if car is available, customer abides by the restriction, customer agreed with the terms conditions and customer respected the terms and conditions.

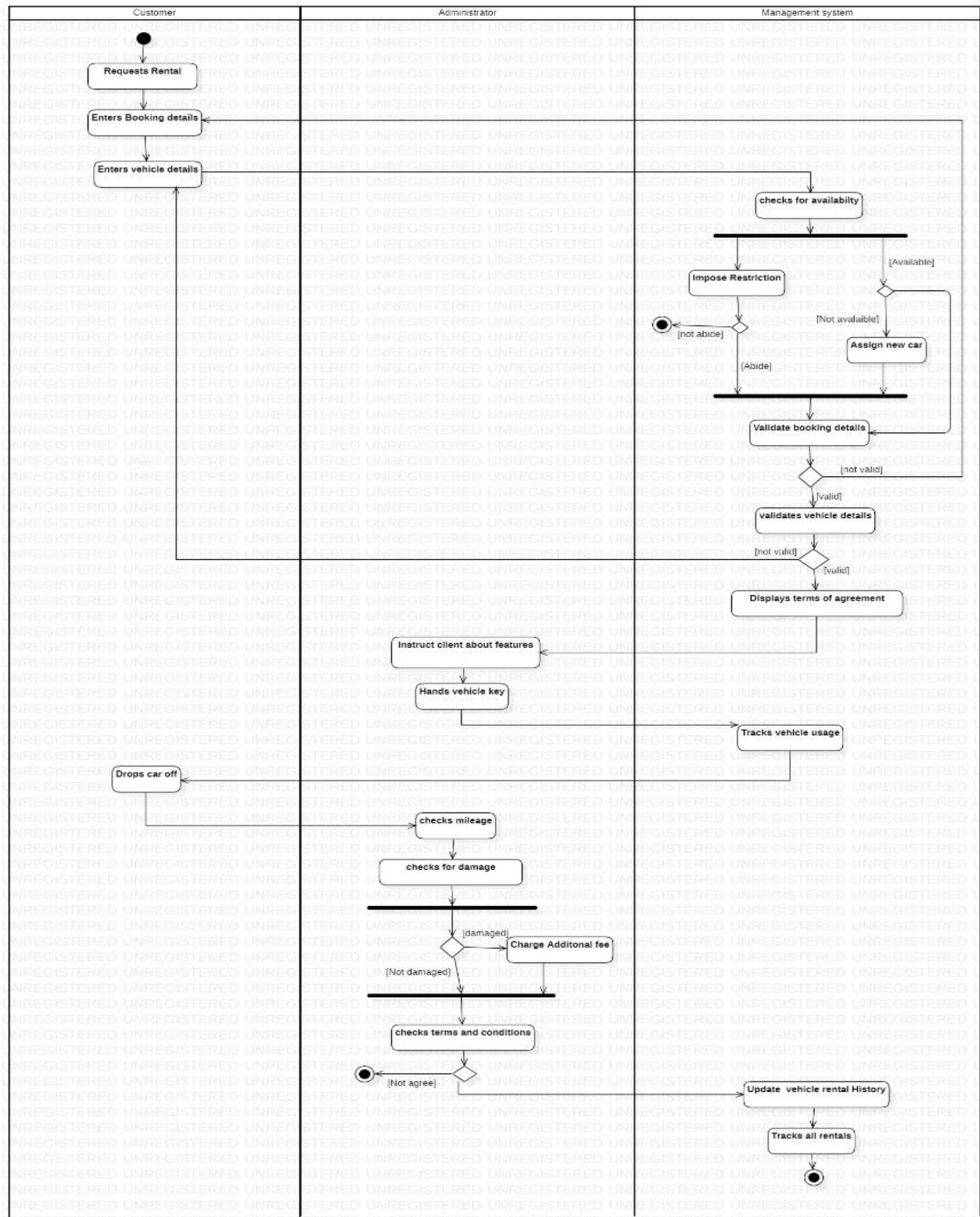
2.2 Activity Diagrams for the two main use cases

Process: Payment

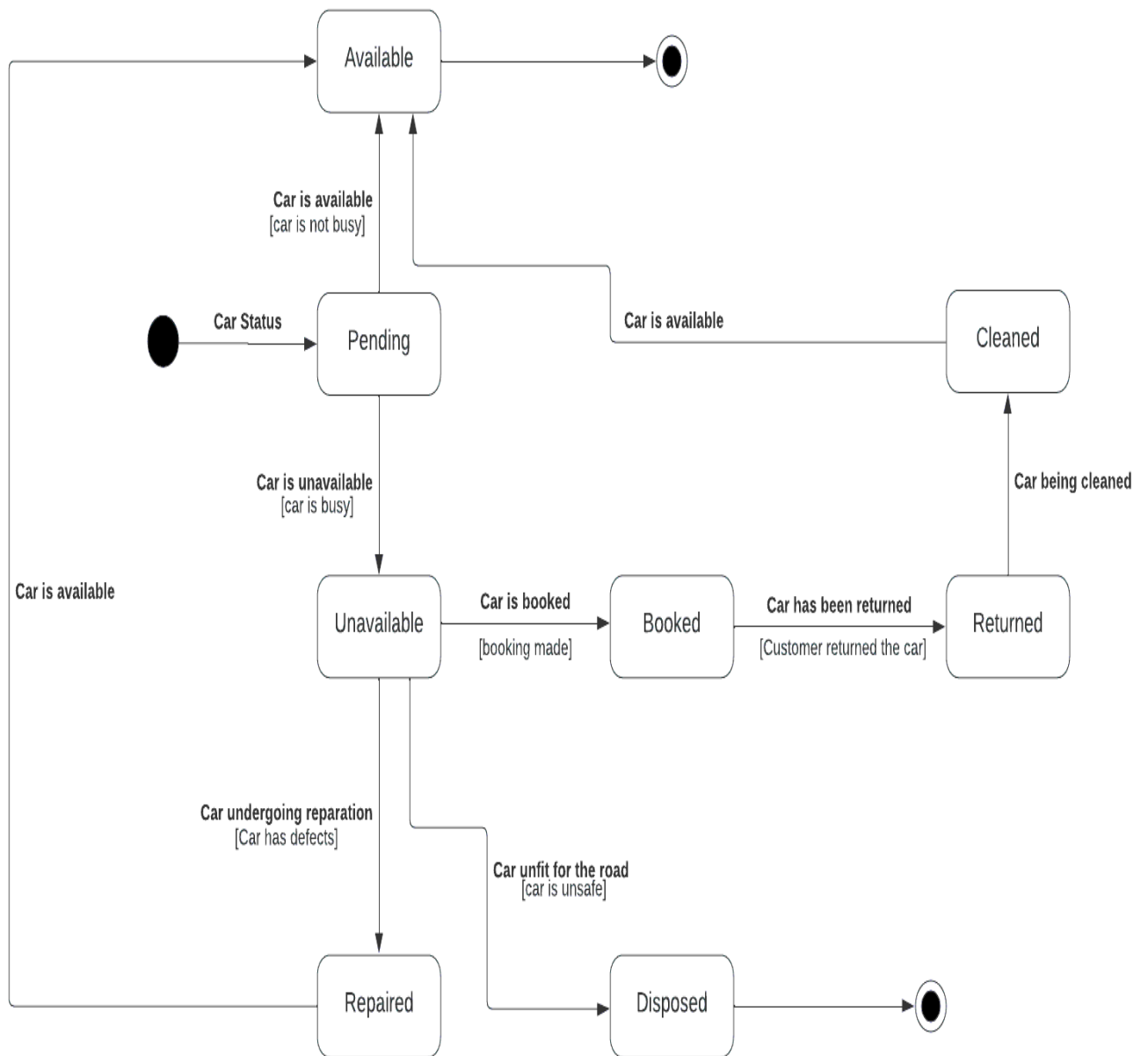


Activity Diagrams for the two main use cases

Process: Fleet Management

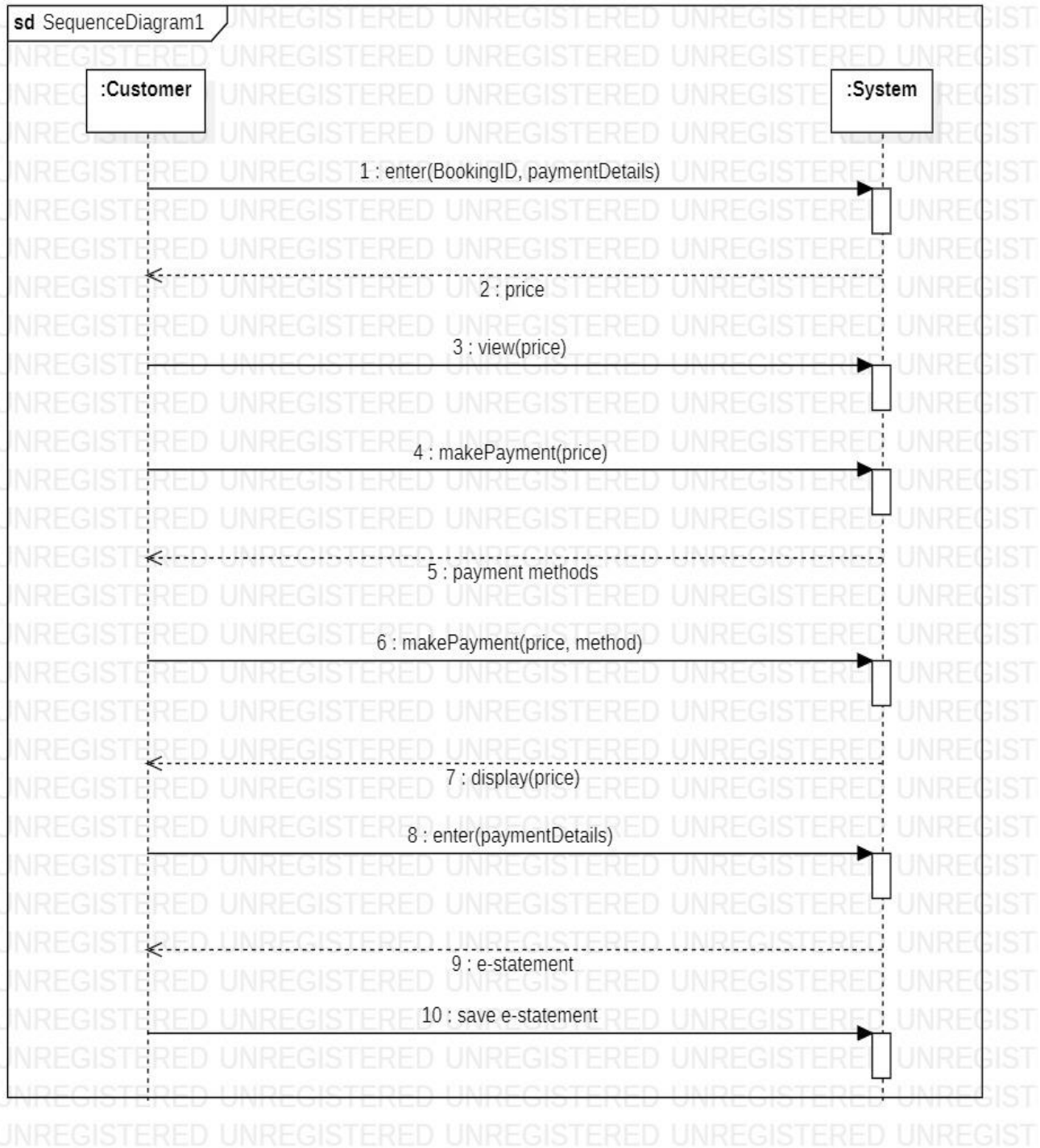


2.3 Statechart Diagram



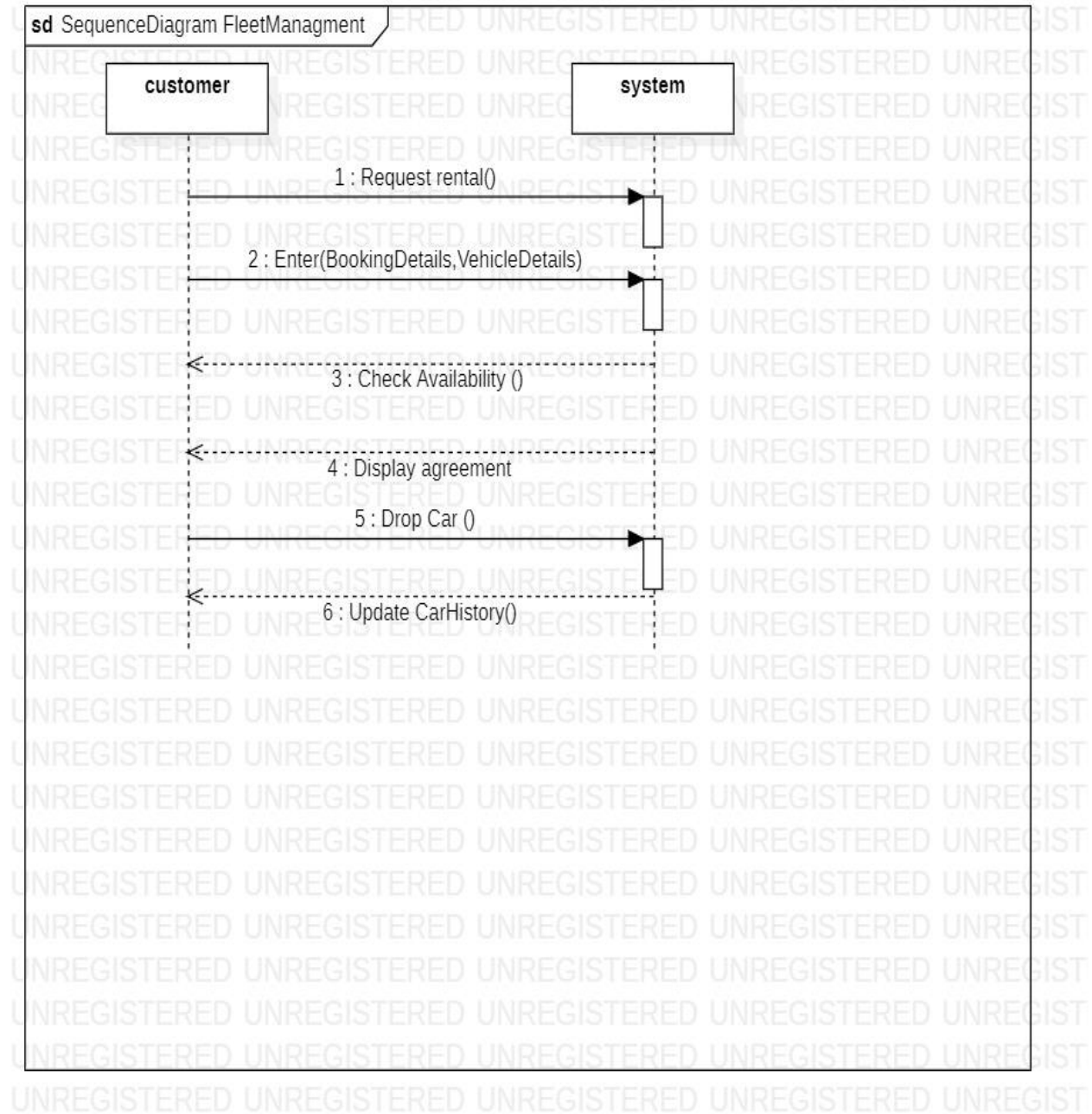
2.4 System Sequence Diagram for the two main use cases

Process: Payment

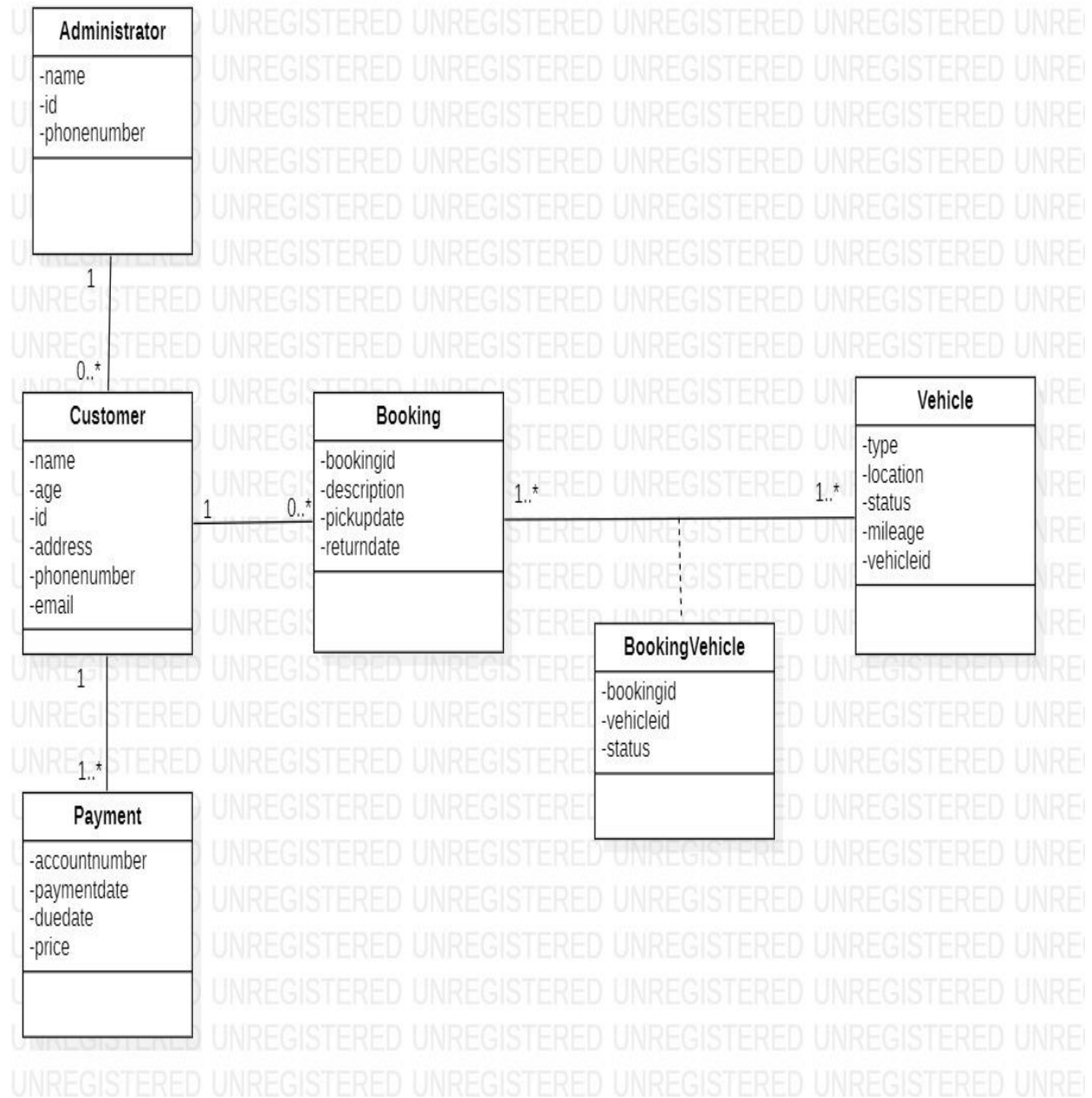


System Sequence Diagram for the two main use cases

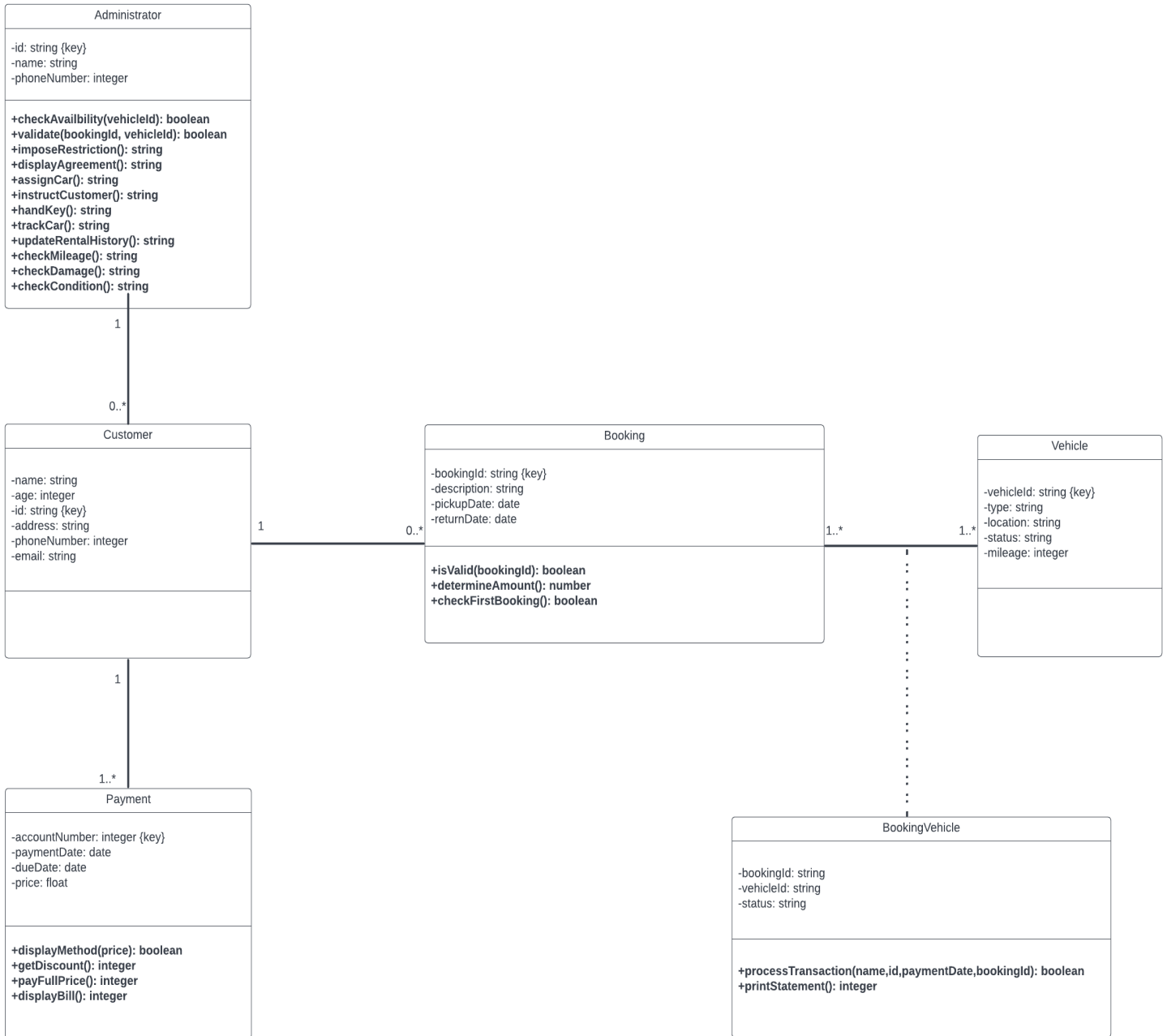
Process: Fleet Management



2.5 Domain Class Diagram for the whole system

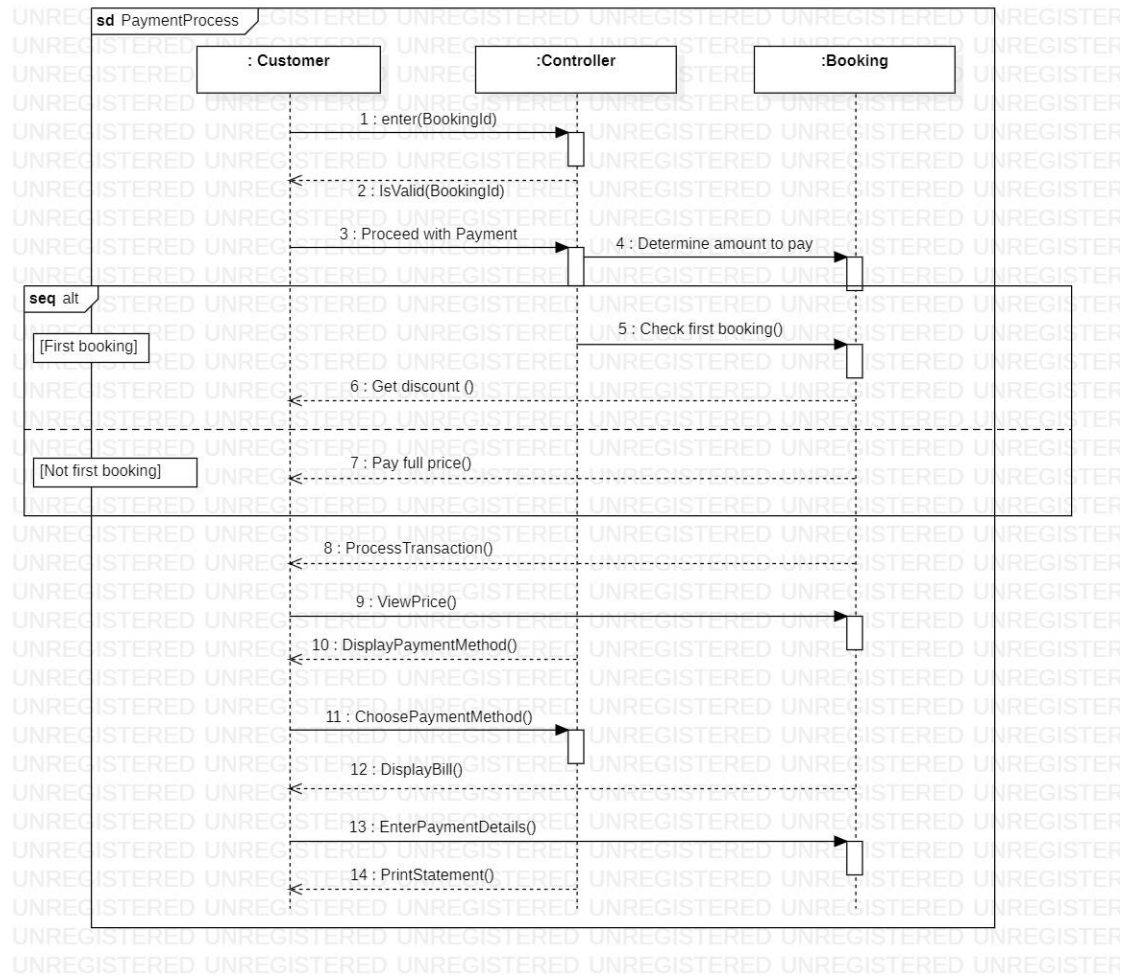


2.6 Design Class Diagram for the whole system



2.7 Sequence Diagrams for the two main use cases

Process: Payment



Sequence Diagrams for the two main use cases

Process: Fleet Management

