VEHICLE RENTAL COMPANY – ANALYSIS DOCUMENT

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October 2019

Summary

A rental company needs a reservation system to handle customers, vehicles and reservations. The company has three kinds of rentable vehicles; cars, buses and transport vehicles of which some are trucks and some are vans. The vehicle inventory can only expand to a certain maximum limit.

The process of renting contains the three parts: 1) make a reservation for one whole day or more days, 2) pickup/rent the vehicle showing an eligible drivers license and 3) return the vehicle. The rental price should be shown in the system. However, nothing else about payment should be part of the system.

The system is a step 1 for a possible larger system also handling employees with at least job title and salary, as well as name, address and birthday. If possible, the design should be made with a future adding of employee data in mind. A future update may also include integration with the company's database and with a payment module. For this reason, the system should not have a database, but instead use files for persistence.

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Functional requirements

Critical priority:

1. As an employee, I want to reserve a vehicle for a customer in a given date interval such that the customer can rent a vehicle.
2. As an employee, I want to make a reservation without setting a status, so that the reservation status automatically is set to “Waiting”.
3. As an employee, I want to register a new customer with a full name and a unique phone number so that a customer can be found by phone number.
4. As an employee, I want to search a reservation by date interval and registration number so that a rent can be registered.
5. As an employee, I want to change a reservation status from "Waiting" to “Started” when a vehicle is rented, so that it can be seen when a vehicle has been rented and no-show customers could be identified.
6. As an employee, I want to register a customer’s drivers license number and permission for type of vehicle (B, C, D) so that a vehicle will be rented to a customer with an eligible drivers licence.
7. As an employee, I want to set a reservation status to “Ended” when a vehicle has been returned. This, in order to be able to track reservation statuses.

High priority:

8. As an employee, I want to make a reservation with pick-up dates today or future dates, so that a reservation cannot be created for past dates.
9. As an employee, I want to make reservations only for customers already in the system, so that the customer information is already present.
10. As an employee, I want to see reservation details (date interval, pickup time, total price and status {Waiting, Started, Ended}), for the vehicle: (vehicle type, registration number, make, model, manufacturer year), for the customer: (name, drivers license number and type {B, C, D}). This in order to check for correct input making a reservation.
11. As an employee, I want to be able to modify a reservations rent price so that a discount could be given.
12. As an employee, I want to modify a customer record (name, phone number, email, address, drivers license number and drivers license type) as long as the phone number is not already registered for another customer. This, in order to have updated customer information.
13. As an employee, I want to remove a reservation with status “Waiting” if a customer cancels his reservation so that another customer can reserve the vehicle.
14. As a rental company owner, I want to set a limit for how many vehicles are for rent so that I can optimize the income.
15. As a rental company owner, I want to add a new rentable vehicle given its type (Car, Bus or Transport vehicle), a unique registration number, make, model, manufacturer year, rent price per day, engine (engine type, horsepower, volume and if it is diesel or not). If vehicle type is "Car" then also colour and if it has a manual gear. If vehicle type is "Bus" then also number of passenger seats and if vehicle type is "Transport vehicle" then also load size and weight. This so that new vehicles could be rented.

Low priority:

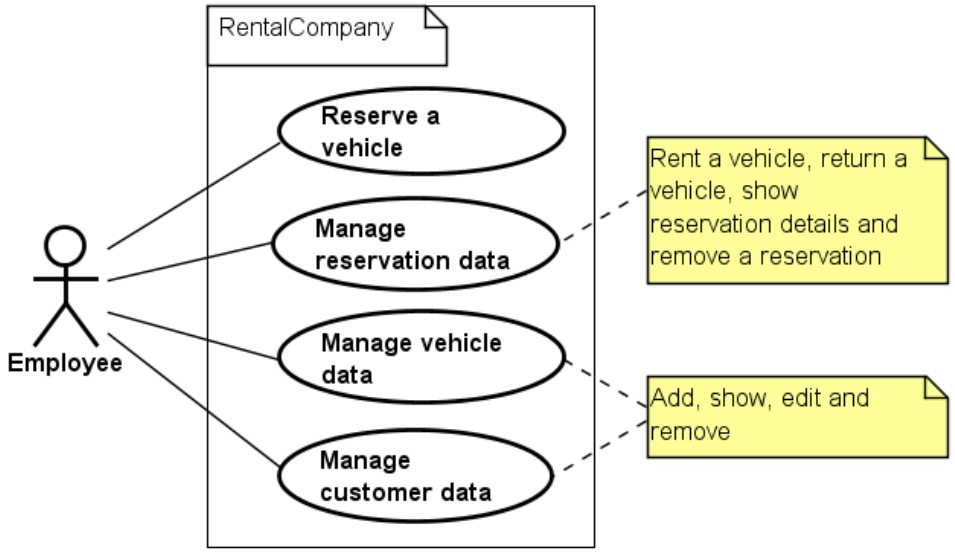
16. As an employee, I want to be able to able to register an approximate pick-up time, in order to know which vehicles to prepare outside office hours.
17. As an employee, I want to have the option to register a customer with an email address and/or a home address so that communication could be by mail.

18. As an employee, I want to be able to remove a customer record if there are no active reservations so that past customers will not stay registered.
19. As an employee, I want to change a reservation status from “Started” to “Waiting” and a reservation status including a non-deactivated vehicle from “Ended” to “Started” or “Waiting” in order to take false registering into account.
20. As an employee, I want to search in a given date interval for vehicles by reservation status so that the status could be tracked and to avoid reserving an already reserved vehicle.
21. As an employee, I want to remove a reservation with status “Ended” so that old reservation will not fill up in memory and on a disc.
22. As an employee, I want to deactivate a car having no “Waiting” or “Started” reservations so that a vehicle can be send to service.
23. As an employee, I want to be able to modify a vehicles rent price so that prices could be adjusted.
24. As an employee, I want to update a vehicles rent price in future reservations only so that a customers will pay the price agreed on when reserving the vehicle, independent of any price adjustments after the reservation is made.
25. As a rental company owner, I want to remove a non-reserved vehicle so that cars could be sold.

Non-functional requirements

26. Every update in the system includes writing to a file.

Use case diagram



Use case descriptions

Use case	**Reserve a vehicle**
Summary	Create a new reservation of a vehicle in a given date interval for a registered customer
Actor	Employee

Precondition	A customer has to be registered in the system (with at least name and phone number)
Postcondition	A reservation with a given vehicle, customer, date interval and pickup time is created and stored in the system with a reservation status "Waiting"
Base sequence	1. Enter start and return dates 2. If dates are not today or future dates then go to step 1 again 3. System lists all non-deactivated vehicles not already reserved in the given date interval (both days of the interval included). For each vehicle, at least vehicle type {Car, Bus or Transport vehicle}, registration number, rent price per day, make and model is shown 4. Optionally, enter the vehicle type (Car, Bus or Transport vehicle) to get a filtered list with all non-deactivated vehicles of the specified type not already reserved in the given date interval 5. Select a vehicle from the list using the registration number as criteria 6. Option to list all vehicle data for the selected vehicle (vehicle type, registration number, make, model, manufacturer year, rent price per day, engine {engine type, horsepower, volume and if it is diesel or not}, If vehicle type is "Car" then also colour and if it has a manual gear. If vehicle type is "Bus" then also number of passenger seats and if vehicle type is "Transport vehicle" then also load size and weight) 7. Approve the selected vehicle or go to step 5 again to select another 8. System list all customers with at least name and phone number 9. Select a customer from the list using the phone number as criteria 10. Option to edit costumer data for the selected customer (see use case Manage customer data, about EDIT). 11. Optionally, enter pickup time 12. A total rent price is calculated as the vehicles rent price per day times the number of days being rented (the length of the interval) 13. Optionally, change the total price manually 14. Approve the reservation 15. A reservation with the specified vehicle, customer, time interval, total price and pickup time is created and stored in the system (and in file) with a status "Waiting"
Exception sequence	
Note	If the customer is not in the list, then the use case could be on hold until the customer has been added (use case Manage customer data, about ADD). The reservation process can be cancelled at any time. E.g. in step 5 if the list is empty or in step 7 if the selected vehicle will not be approved. A reservation can be made for a customer without entering drivers license information. However, renting the vehicle changing the reservation status to “Started” can only be made for an eligible drivers license. About step 10, editing the customer could include either updating the already registered data or to enter drivers license type C or D depending on the type of vehicle being reserved.

Use case	**Manage reservation data**
Summary	Rent a vehicle (change reservation status to “Started”), return a vehicle (change reservation status to “Ended”) or remove a reservation.
Actor	Employee

Precondition	A reservation has already been created and stored in the system
Postcondition	A reservation has either been removed or has been changed from “Waiting” status to "Started" status or from “Started” status to “Ended” status and optionally some other reservation data or costumer data has been updated
Base sequence	RENT, RETURN, REMOVE: 1. System show a list of reservations sorted by start date. For each reservation, the date interval, registration number, customer’s phone number, pickup time and reservation status is shown. 2. Optionally to enter the reservation status (Waiting, Started, Ended) to get a filtered list with all reservation of the specified type or to sort by registration number or customer’s phone number. 3. Select a Reservation from the list using the date interval and registration number as criteria’s. 4. Show reservation details, for the reservation: (date interval, pickup time, total price and status {Waiting, Started, Ended}), for the vehicle: (vehicle type, registration number, make, model, manufacturer year), for the customer: (name, drivers license number, drivers license type {B, C, D}). For REMOVE, this step is optional. 5. Optionally, to edit the reservation details: pickup time, total price, customer’s name, drivers license number and drivers license type {B, C, D} 6. If REMOVE then go to step 10 7. If Renting the vehicle (RENT) then change the reservation status to “Started” and if returning the vehicle (RETURN), then change the reservation status to “Ended” 8. System checks if the drivers license is eligible for the vehicle reserved. If not then go to step 4-5 to enter drivers license information (number and type {B, C, D}). 9. The reservation has been updated with the new status and possibly new price and pickup time. If customer information has been changed then the customer is updated in the costumer list. The reservation is updated in the system and in files. Use case ends for RENT and RETURN REMOVE: 10. Verify removing the selected reservation 11. System finds the reservation from the reservation list. If the reservation status is “Started” then go to step 4-5 and change the reservation status. 12. The reservation has been removed from the reservation list (and file) Use case ends for REMOVE
Exception sequence	If the costumer do not have an eligible drivers license for the reserved vehicle: Step 1-8 as base sequence. The process has to be cancelled and the reservation should be removed (step 10-12)
Note	The process can be cancelled at any time. In principle, the reservation status could be changed to and from any of the three statuses, if for example the change of status was wrong. However, for an “Ended” reservation, the vehicle can be deactivated (if the vehicle do not have any non-ended reservations) and in this case the reservation cannot be changed from “Ended” to “Waiting” or “Started” A “Started” reservation cannot be removed. Either cancel the process in step 11 or change the reservation status to “Ended” or “Waiting” in step 5

Use case	**Manage vehicle data**
Summary	Add vehicle, show vehicle data, edit a vehicle's rent price and/or its activation status, and remove vehicle
Actor	Employee
Precondition	
Postcondition	A new vehicle has been added to the vehicle list, data for an existing vehicle has been shown or updated or an existing vehicle has been removed from the vehicle list
Base sequence	1. If SHOW, UPDATE or REMOVE then go to step 5 ADD: 2. If adding a new vehicle then enter values for a) Vehicle type {Car, Bus or Transport vehicle} b) Registration number c) Make d) Model e) Manufacturer year f) Rent price per day g) Engine {Engine type, Horsepower, Volume and if it is Diesel or not} h1) If Vehicle type is "Car" then also Colour and if it has a manual gear h2) If Vehicle type is "Bus" then also Number of passenger seats h3) If Vehicle type is "Transport vehicle" then also Load and Weight 3. System validates data and prompts for illegal values or if the given registration number is already in the vehicle list. In this case repeat step 2 again, typing or editing input 4. If input is valid then the system adds a new vehicle with the given data to the list of vehicles (and to a file). End the use case for ADD SHOW: 5. System show a list of all vehicles in the vehicle list, each element with information a)-f) presented in step 2 and in addition, if the vehicle is deactivated for rent 6. Optionally, enter vehicle type (Car, Bus or Transport vehicle) and get a filtered list only with the vehicles of the given type 7. If REMOVE then go to step 13 8. Select a vehicle and system searches by its registration number 9. System show a list of vehicle information represented with the values in step 2. Additional if the vehicle has been deactivated or not End the use case for SHOW. EDIT: Step 5-9 as above and then 10. Enter or edit values for rent price per day and if the vehicle is deactivated or activated for rent. 11. If the vehicle is attempted to be deactivated, the system searches all reservations to check if the vehicle has any “Waiting” or “Started” reservations. In this case the vehicle cannot be updated and thus, go to step 10 again. 12. System updates the selected vehicle in the vehicle list (and file) End the use case for EDIT.

	REMOVE: Step 5-6 as above and then 13. Verify deleting the selected vehicle. 14. System checks if the reservation list contains no reservations with the selected vehicle and in this case, the vehicle is deleted from the vehicle list (and file). End the use case for REMOVE.
Exception sequence	If the vehicle inventory is at its maximum limit and trying to ADD: Step 1 as base sequence If ADD has been selected then show an error message that the inventory list is full End the Use Case Step 14 is an exception sequence if at least one reservation in the reservation list contains a reservation with a vehicle with the same registration number
Note	About step 14: A vehicle cannot be removed if it is part of one or more reservations in the reservation list. Instead, these reservations has to be removed first. Alternatively, if all reservations with the given vehicle has "Ended" status, then the vehicle may be deactivated to make it unavailable for future reservations. Cancel could be made during step 2 and 10

Use case	**Manage customer data**
Summary	Add customer, show or edit customer data, and remove a customer
Actor	Employee
Precondition	
Postcondition	A new customer has been added to the customer list, data for an existing customer has been shown or updated or an existing customer has been removed from the list
Base sequence	1. If SHOW, EDIT or REMOVE then go to step 5 ADD: 2. If adding a new customer then enter values for a) Name (at least two strings separated by a space) b) Phone number (a whole number) c) Email (empty or in the format "user@host.domain") d) Birthday (empty or in the format "dd/mm/yyyy") e) Drivers license number (empty or digits only) f) Drivers license type B and/or C and/or D (optional) g) Address {Town, Street, Number, Letter, Floor, Door} (all optional) 3. System validates data and prompts for illegal values or if the given phone number is already in the customer list. In this case repeat step 2 again, typing or editing input. 4. If input is valid then the system adds a new customer with the given data to the list (and to a file). End the use case for ADD. SHOW (and EDIT, REMOVE): 5. System show a list of all customers in the customer list, each element with name, phone number and email. 6. Select a customer and system searches by the phone number. 7. If REMOVE then go to step 12.

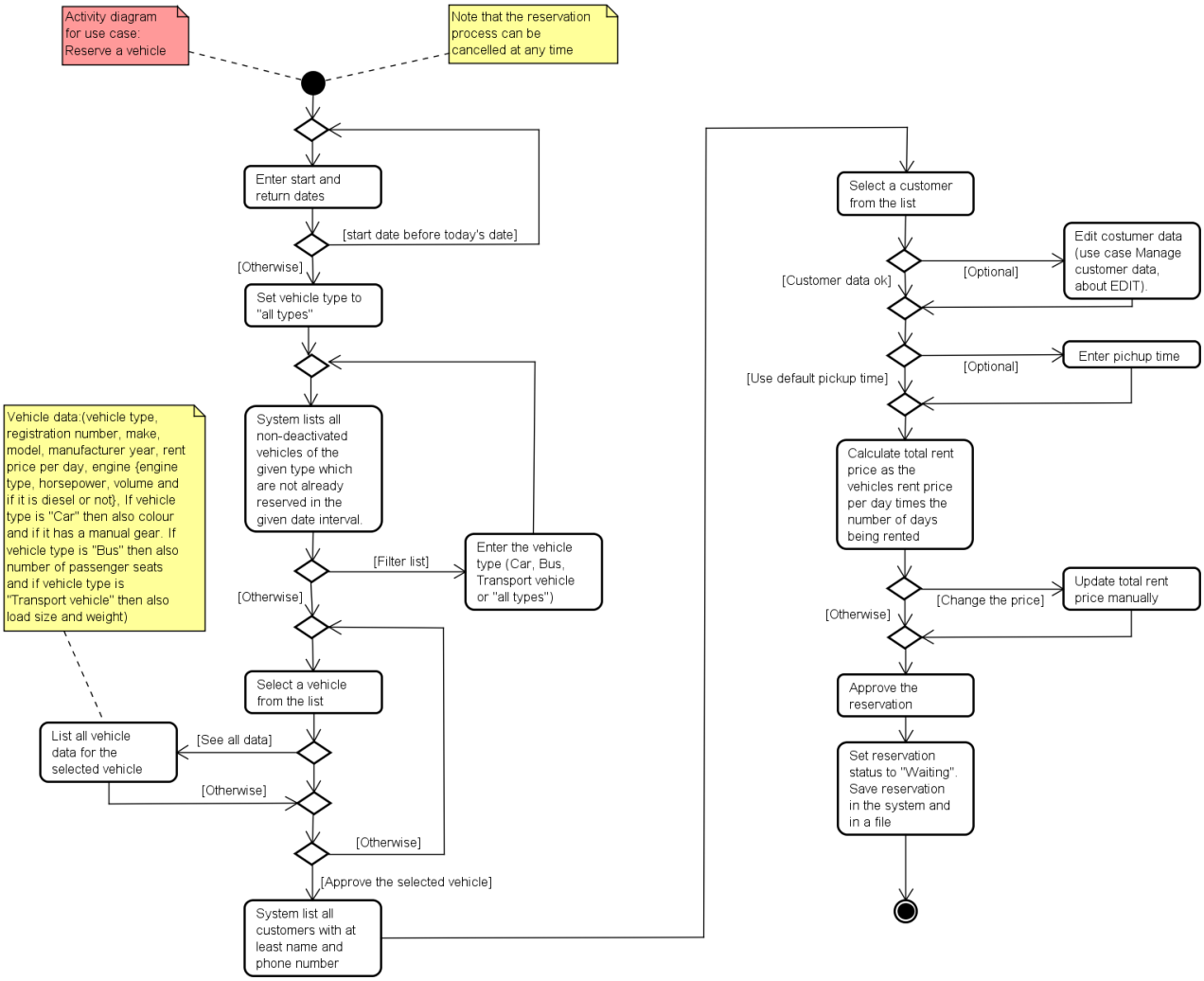
	8. System show a list of customer information with all the values a)-g) as given in step 2. End the use case for SHOW. EDIT: 9. Enter or edit one or more of the values a)-g) presented in step 2. 10. System verified input. If wrong format or if the phone number is already registered in the customer list, then go to step 9 again. 11. System updates the selected customer in the customer list (and file). End the use case for EDIT. REMOVE: Step 5-6 as above and then 12. Verify deleting the selected customer. 13. System checks if the reservation list contains no reservations with the selected customer and in this case, the customer is deleted from the customer list (and file). End the use case for REMOVE.
Exception sequence	Step 13 is an exception sequence if at least one reservation in the reservation list contains a reservation with a customer with the same phone number.
Note	About step 13: A customer cannot be removed if he is part of one or more reservations in the reservation list. Instead, these reservations has to be removed first. Cancel could be made at any time

Link between requirements and use cases

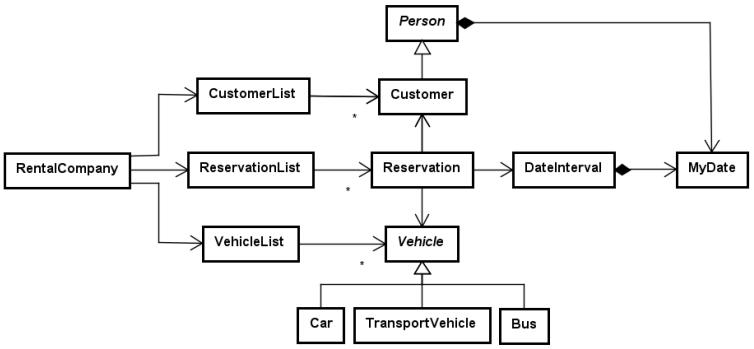
Use Case	**Covered requirements**
Reserve a vehicle	1, 2, 8, 9, 10, 11, 16
Manage customer data	3, 12, 17, 18
Manage reservation data	4, 5, 6, 7, 13, 21, 19, 20
Manage vehicle data	14, 15, 22, 23, 24, 25

Requirement	**Related Use case**
1	Reserve a vehicle
2	Reserve a vehicle (step 15)
3	Manage customer data (step 2)
4	Manage reservation data (step 3)
5	Manage reservation data (step 7)
6	Manage customer data (step 2), Manage reservation data (step 5)
7	Manage reservation data (step 7)
…	…

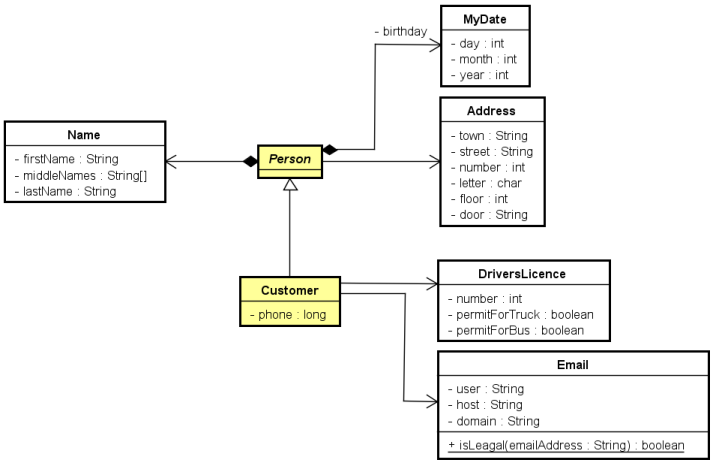
Activity diagram (Reserve a vehicle)



Domain model (Step 1 - relations only)

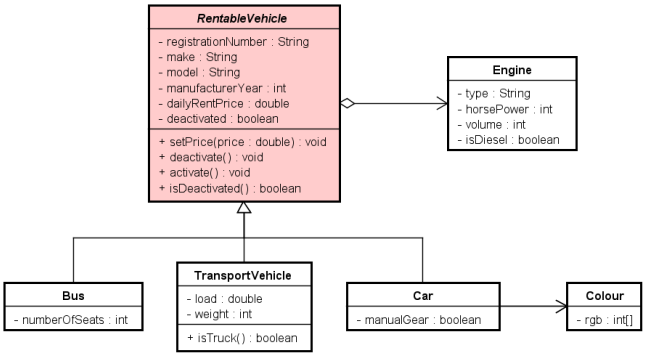


Domain model (Customer part)



A `Person` has a `Name`, a birthday (a `MyDate`) and an `Address`. A `Customer` is a `Person` and has also a `phone` number, a `DriversLicense` and an `Email`. Class `Person` is a superclass to `Customer` and may be a superclass to an `Employee` (not part of this system).

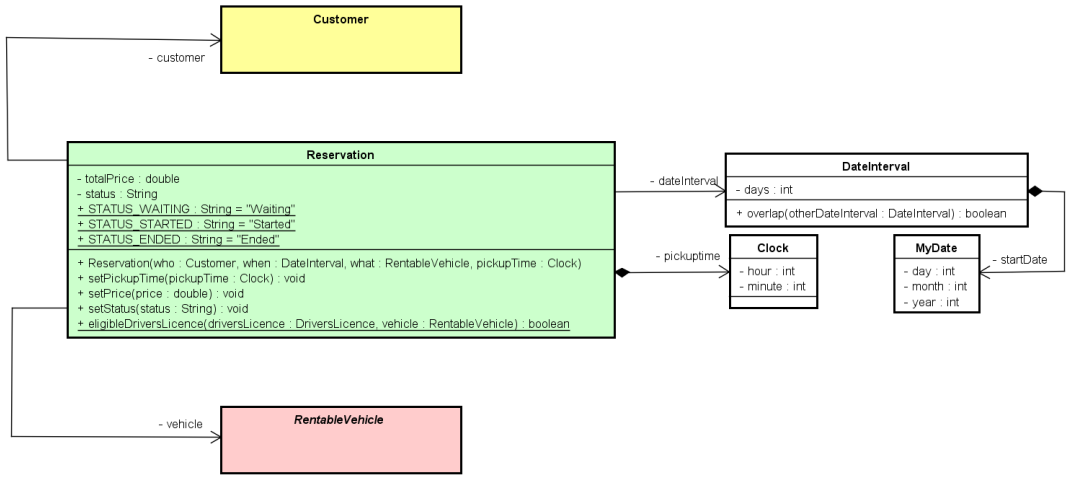
Domain model (Vehicle part)



A `RentableVehicle` has `registrationNumber`, `make`, `model`, `manufacturerYear`, `dailyRentPrice`, `deactivated` flag, and an `Engine` (with `type`, `horsepower`, `volume` and `isDiesel` flag). A `Bus` is a `RentableVehicle` also with `numberOfSeats`. A `TransportVehicle`

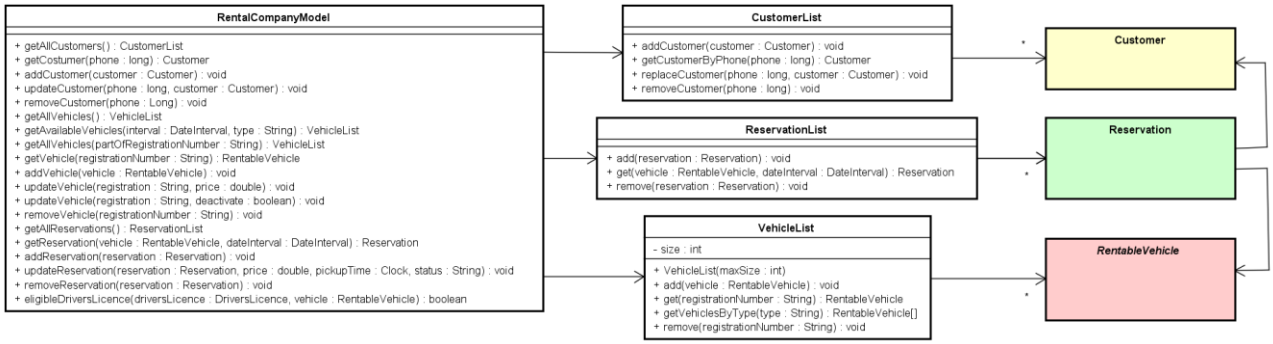
is a `RentableVehicle` also with `load` and `weight`. A `Car` is a `RentableVehicle` also with a `manualGear` flag and a `Colour`.

Domain model (Reservation part)



A `Reservation` has a `Customer`, a `RentableVehicle`, a `DateInterval` and a `pickupTime` (a `Clock`) and additionally, a `totalPrice` and a `status` (either “Waiting”, “Started” or “Ended”)

Domain model (Rental company part)



The `RentalCompanyModel` contains a `CustomerList`, a `VehicleList` and a `ReservationList`. Most methods may simply delegate to methods in one of the three list classes.