

### Purpose

The purpose of this exercise is to:

- have hands on experience with Unified Modeling Language (UML).
- develop skill in processing requirements specification and create software designs that matches the requirements.

### Problem Definition

A car rental company that has branches all over the country plans to facilitate the car rental process to its customers through a website and a mobile application. For this purpose, they have asked you to help them design the system.

In each branch of this company, there are several cars available for rent. Each of the cars needs to be registered in the system with their own specific information, including a unique ID, make (ex: VW), model (ex: Golf), color, rental group (ex: A, B, C & D for small car, medium-sized car, large car and station wagon, respectively).

Customers can order to rent a car from the company using online services or in person from any of the company's branch offices. Customers need to register before they can order a rental service. When registering on the website, customers must provide a driver's license number and some personal information such as personal id (11 digit), name, surname, phone number, email and address (For simplicity, we ignore the license verification process but there exists a service in vegvesen.no <https://www.vegvesen.no/om-oss/om-organisasjonen/apne-data/et-utvalg-apne-data/api-for-sjekk-forerkort/> for the verification process).

What the user can see on the first page is a search box where she/he can specify the desired rental location, return location, start time and rental duration. This way, the customer can see all the available cars and request the car of her/his choice. While a new order is placed, a few types of insurance policy and price will be offered to the customer. The customer can decide which insurance policy he would like to take for the rental. The system should in general keep a history of customers.

When the user confirms his order, it should be checked whether her/his valid driver's license is registered in the system or not. For this purpose, the user must log in to the system. Before any order can be placed into the system the credit card information needs to be stored. Customers should be able to pick up the cars from the pickup point. At the appointed time, the customer arrives at the rental location so that an executive employee at the branch hands over the car. A general agreement/contract is signed by the customers before handing over the keys to the customers. If a customer does not show up at an appointment time, a certain fee will be deducted from the credit card, or an invoice will be sent to the customer's address.

Customers can deliver the cars at the appointed time to the delivery locations. The company has a cleaning policy which says that the cost for removing cigarette smoke is 3000 Krone. The customer will get a charge in the credit card or get an invoice if evidence of smoking is found. If any damage is found in the car while returned, the insurance agreement on the rental order is checked. If the customer does not have full insurance for the damage, a damage record is created, and an invoice will be sent to the customer later. Otherwise, if the customer has full insurance coverage, the insurance company will be informed, and an insurance claim will be made. After repair, the car is transferred to the branches to be rented to the next customer.

### Tasks

1. Create a use case model for the above-mentioned online rental service.
2. Create a UML class diagram to represent the domain model.
3. Create an activity diagram for the online rental services.

Suppose the system administrator wants you to add a feature to the system that can be used to impose some restrictions on troublesome customers. In this way, before renting a car to any person, his history is checked in the system. Based on the history of customers, the behavior of the system can be different. Customers with a good record are sometimes given discounts based on their scores, and requests from customers who do not have a good background (for example, dangerous driving) are reviewed by an administrative employee.

### Submission guidelines:

- To create your diagrams, you may use online software <https://www.lucidchart.com/> or other similar options available on the web.
- Submit a 3-5 page report in pdf format. The report contains the diagrams and some descriptions of the diagrams.

**Bonus Tasks** *(The following part of the assignment is optional. If you have finished the previous tasks, you may do the following):*

Think of the following scenarios and augment your activity diagram based on them. As a hint, you can get ideas from AVIS, Hertz, Sixt, Europcar, Budget, Dele or other similar car rental companies.

- Advance payment solutions where the car is taken charged based on km use, etc.
- Flexible changing of car (upgrade to bigger car for no extra payment)
- Handling of deductibles for car damages
- What happens if a car crashes? How to compensate people who have booking onward?

### Tasks

1. What changes will these two new features of the system make in the model you made in the previous section? Explain your design alternatives if there are any.