"Resource Search - Parking" was specified as part of the UbiCompForAll project in order to identify potential users of the technology that will be developed in the project and to generate design ideas for the services these users might compose.

Summary

Per, who lives in the suburbs of the city, frequently experiences that it is difficult to find a parking spot in the city, and composes a service for finding and reserving the nearest parking spot based on his current location.

Problem description

This scenario is the first of three scenarios which are related in that they all contain some elements of resource search and are located in the city. This scenario focuses on parking, while the related scenarios cover arranging meetings with friends, café table reservation, and planning of shopping.

Support for composing services containing an element of resource search and reservation is of interest for the end user who wants to simplify or automate frequent reservation tasks, and is also of interest for providers of the resources who benefit from the resources being booked.

This scenario is related to the domains of travel and resource allocation.

Main actor (s)

Per (27) is a master of business administration. He lives alone in an apartment in the suburbs of the city. Per owns a car, and likes to drive when he visits the city. He is a helpful person, and enjoys spending time with his friends. Per prefers to improvise in his private life.

Activity scenario

It is Saturday morning, and Per wants to go to town. He is driving his car, and as usual it is difficult to find any free parking spots in the city centre. From previous experience, Per has composed a Nearest Parking Spot service. He activates the service by touching an icon on his phone. The services starts to search for the nearest available parking spot based on his current location, and comes up with a suggestion. He confirms the choice, and the parking spot is reserved for him and payment for the parking is initialized using his pre-registered credit card. Further, the phone now shows the best route for driving to the parking, and gives instructions by voice to guide him in the driving. After parking the car, Per takes a walk in the city.

Composition scenario

Per has composed his Nearest Parking Spot service. He first composed the service after several occasions where did not find a free parking spot after driving to the city. Initially, he composed a service where he would pre-book a parking spot. However, he soon discovered that he usually always forgot to do this before leaving home, so he recomposed the service to find the nearest spot using his current location. After this change he has been happy with the service, and do not plan to change it.

Alternative stories

Users with other planning preferences and driving patterns than Per could have composed variants of the parking spot service, which e.g.:

- uses calendar integration to perform pre-booking of a parking spot at a preferred location
- allows the user to chose the destination of the trip (e.g. area of the city) before starting to drive, and performs a search and reservation based on this choice instead of current location
- detects the movement pattern when the user is driving in the direction of the city, and where the system could ask “do you want to make a reservation at this parking spot”?

Properties

The variations between the scenario of Per and the alternative stories show that there are several useful ways of composing a service for finding and reserving parking spots. Personalised compositions would be preferable to a generic application because it can automate and directly support the different variants which depend on personal preferences of the users.

External evaluation

The scenario was evaluated by two representatives of Trondheim Parkering (the local company managing the car parking in Trondheim).

Scenario realism

The interviewees find the scenario interesting. Today there exist various kinds of equipment making reservation or advertisement of parking spots possible. New equipment is costly and investment in new equipment should be justified by a need. In Trondheim finding a free parking spot is not a problem, except at St. Olavs Hospital, so the investment in new equipment is not a priority. Small changes to the scenario can make it easier to implement without a need to introduce new equipment.

Existing reservation system

Today one part of each parking house is reserved for drivers with subscription, the other for “short time” parking. No fixed spots are assigned for subscribers, but the parking house will indicate “full” (i.e. free spot left) when all short time places are busy. It is possible to change the size of the share for “short time”. In that way, one might support reservation (or a kind of reservation as no specific spot is reserved). There exists today a system based on that principle where drivers can reserve a spot using their mobile, and they will get a reference back. This is not in use in Trondheim yet, but might actual at St. Olavs Hospital.

Note that all subscribers so not use the parking house simultaneously, so the needed share for subscribers is estimated.

Reservation without guarantee

It is very difficult to guarantee a spot after reservation. One problem is that some drivers park over two spots, thus there is no exact number of spots. Another problem is that some drivers

enter the parking house even if it is full and wait for cars leaving; a reservation might be "stolen". Also as named above, the capacity needed by subscribers is estimated.

Real time information of free capacity: simpler than reservation

At any time Trondheim Parkering has an overview of the free capacity in each parking house. This information is not yet mad available publicly, but they are considering a system where the information can be made available to the drivers through GPS.

Reservation vs. maximum profit

Trondheim Parkering wishes to best exploit the free capacity of their parking houses. Therefore reservation should not block resources before the parking spot is really used. It should be possible to indicate a start reservation time, and the payment period should start at that time even if the car has not entered the parking.

Trondheim city policy

A wish in Trondheim is to reduce the number of parking spots in the street, this to let more room for pedestrians and cyclists. The city of Trondheim encourage using parking houses. A reservation system for street parking spots is therefore not realistic at all. Such a system would also require high investment.

Reservation as a mean to exploit free capacity

There is unequal repartition of cars between parking houses in the city. A reservation system is therefore of interest to achieve a better repartition of cars between the different sites. Trondheim Parkering might thus also benefit from a reservation system.

Other information relevant for the driver

Some parking houses have limitations on car height and width. In summer time, it often happens that camping cars fail to enter a parking house. Drivers should be provided with any limitation.

Related scenarios

This scenario is part of a group of scenarios which are related in that they all contain some elements of resource search and are located in the city. The scenarios use (some of) the same actors, and tell a story in the following order:

- Resource Search – Parking (this scenario)
- Resource Search – Meeting
- Resource Search – Shopping

More details

This chapter presents a summary use case diagram for the parking scenario and an overview of how the logic of the main scenario and some of their variants can be realised as compositions. The following use case summarises the actors and use cases identified from the main and the alternative stories of the scenario.

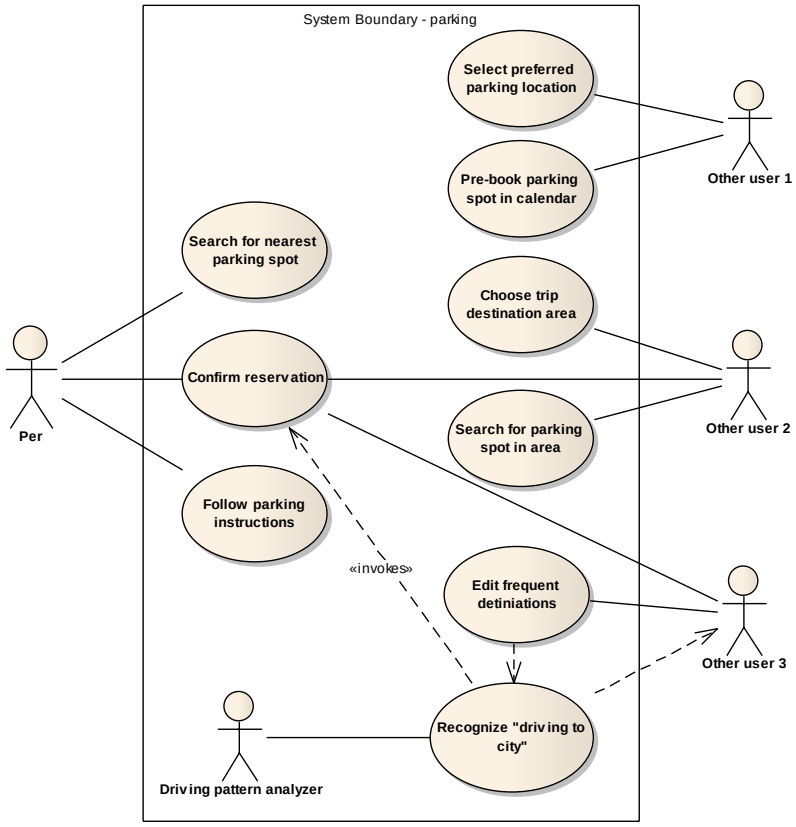

Figure 1 - Use case diagram for the parking scenario

The compositions presented in this chapter are described as sequence diagrams which illustrate which elements are composed and how they interact. Sequence diagrams were used because they help identifying the needed building blocks and the interactions which are needed. A visual formalism which could be used by end users to compose services covering the scenarios will be defined is future work, and is not provided here.

Note that for simplicity the UI is in most of the sequence diagrams used to coordinate the logic of the composition. Further analysis are needed on whether the composition should instead be isolated in a separate element, e.g. in a controller part as in the “meet me now” sequence diagram.

The following sequence diagrams shows compositions and interactions which cover the parking sub-scenario including the main activity for Per and the variant activities which are associated with *other user 1-3* in the parking use case diagram.

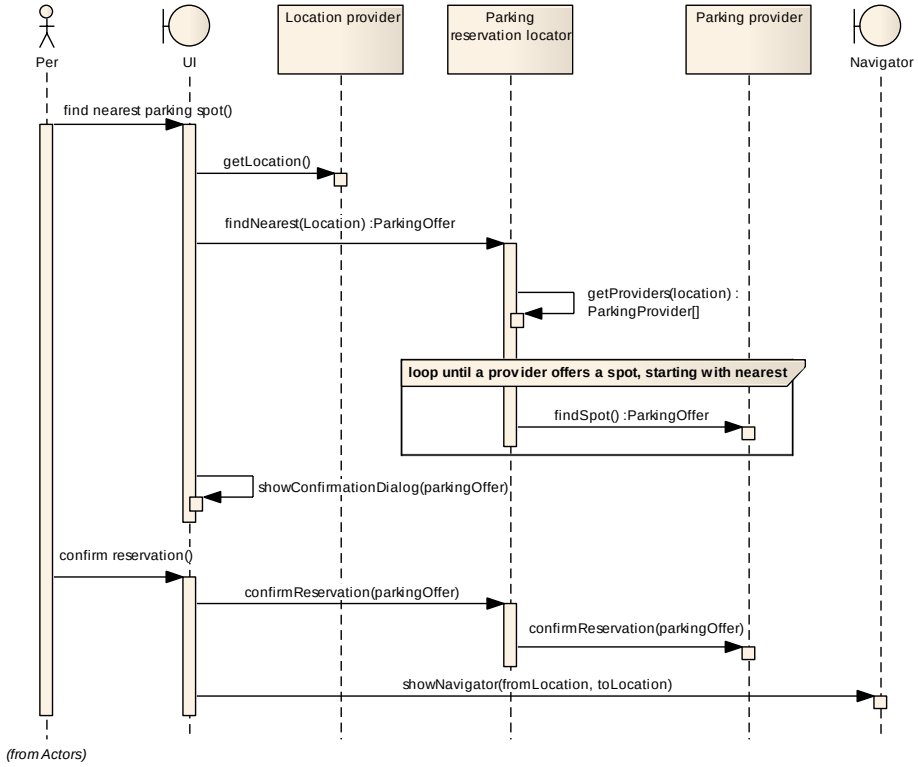

Figure 2 - Sequence diagram for the main parking activity scenario, finding nearest parking spot

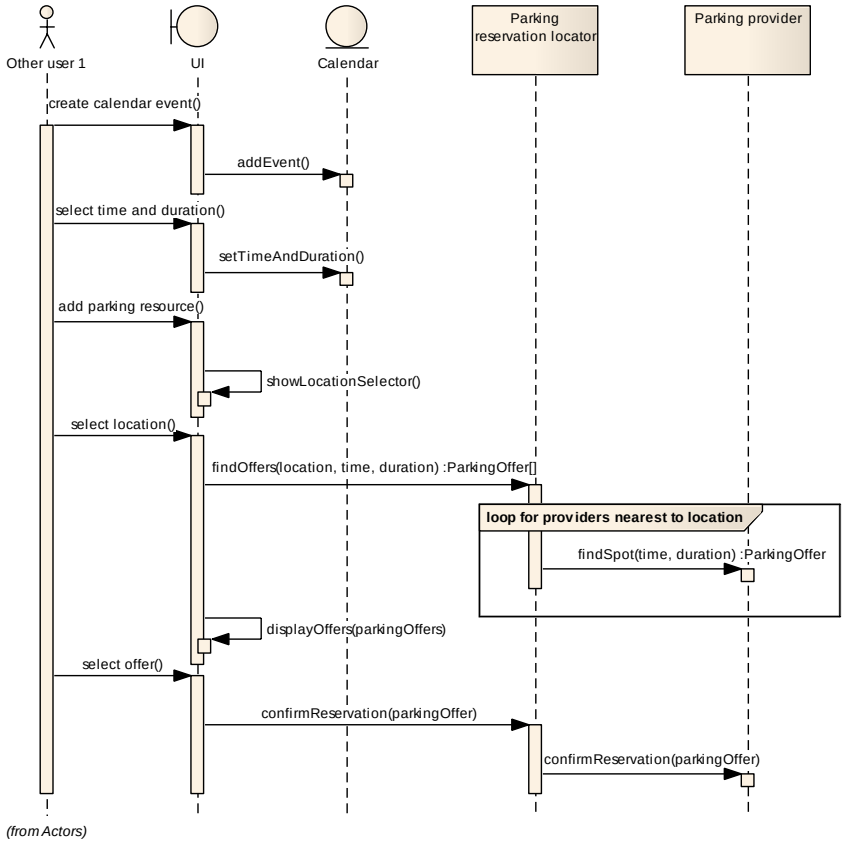

Figure 3 - Sequence diagram for pre-booking parking spot using the calendar

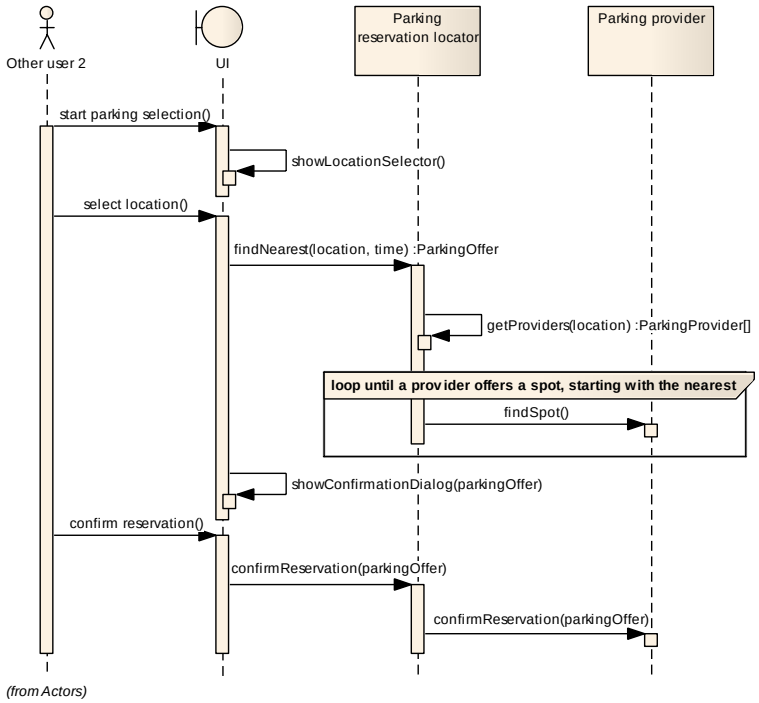

Figure 4 - Sequence diagram for finding parking spot in selected destination area

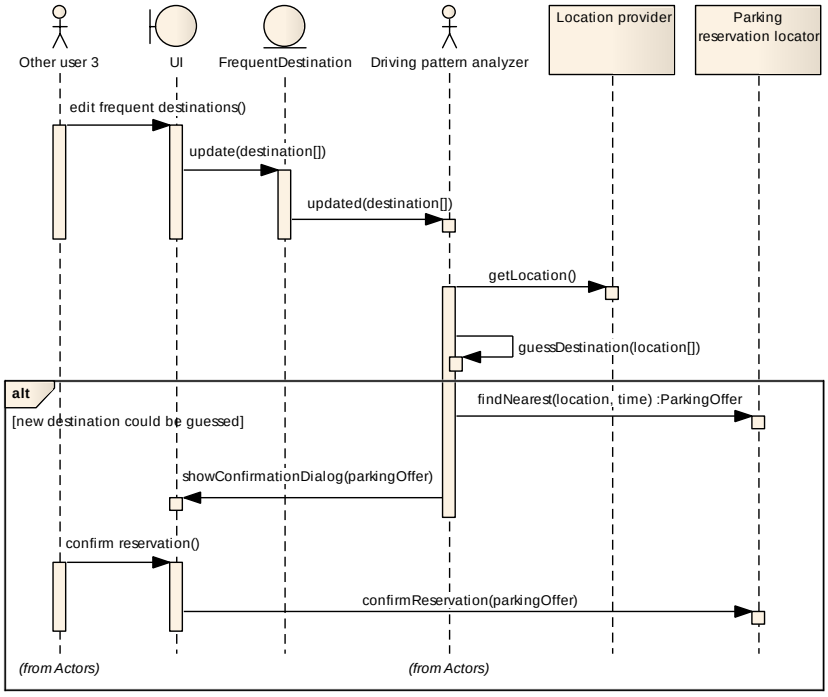

Figure 5 - Sequence diagram for suggesting parking based on recognized driving pattern