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6-Oct-99

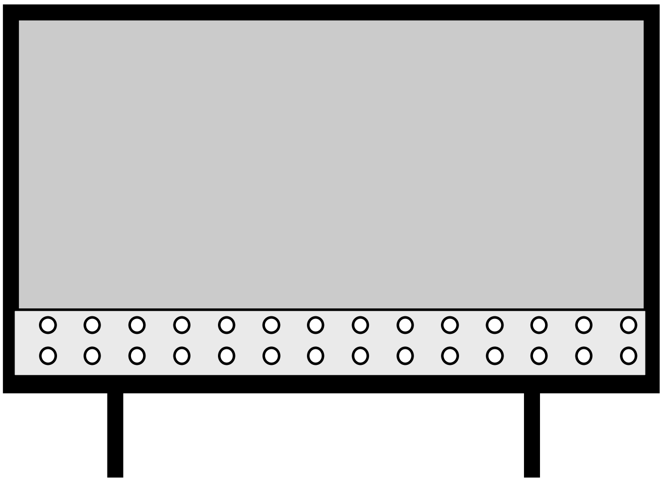
Z01 Advances in Software Engineering for Distributed Systems

Tutorial Session 1 - Work Sheet

This Tutorial session will give you practical experience with use case modelling.

Task 1: Town Map

Consider the example of an electronic town map in a public car park designed to show the key points of interest in the town. The map contains a number of electronic lights that identify key locations, such as hospitals and libraries. Below the map is a panel containing buttons labelled with the relevant names. Pushing a button on the panel causes a lamp at the related location to light up for 10 seconds.



Assuming that a simple software system is needed to control the operation of the map, define the following:

- The use case model for the system (actors then use cases);
- The use case description for selecting a location (basic course only)
- The problem domain objects and attributes relevant to this use case.

Hint: This question, and its solution model, are very simple. Do not look for over-complex solutions.

Task 2: Lending Library

Consider the computer system for a local lending library, similar to the system in the DMS Watson Library. The basic function of the library is to control the loaning and returning of boox. Librarians undertake book lending and returning. For lending the details of the borrower are read from the bar code of the borrower‘s library card. The details of each book are read from the bar code in the front cover of the book. A borrower can borrow a book if it has not been reserved by someone else and if the book quota for the borrower has not been exceeded. A computer screen informs the librarian of a borrower‘s details and possible problems during lending. On return, the librarian uses the bar code reader to check the book in. The screen informs the librarian of any fines incurred. A borrower can also use the system through the internet to reserve books.

A software system is needed to enable operation of the library system. Define:

- The use case model for the library system (actors then use cases). Where relevant show <<extends>> and <<uses>> associations between use cases and abstract use cases.
- The use cases for loaning, returning and reservation of books. Define basic and and alternative courses as we discussed;
- The problem domain objects and their attributes relevant for both use cases.

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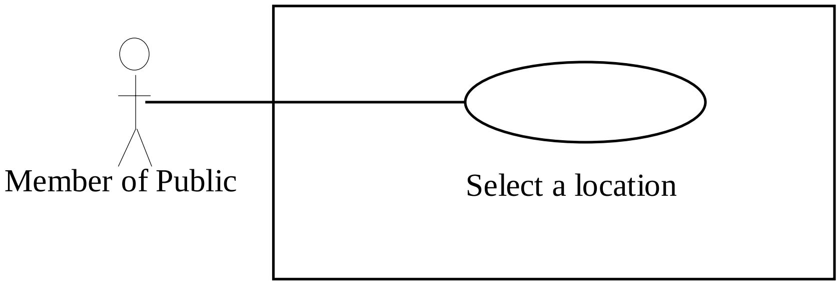
Task 1: Town Map – Model Answer

The use case model has one actor and one use case. It is shown below:



The use case for selecting a location is quite straightforward. It is informal at this stage of analysis and reads somehting like:

> *"A member of the public selects one location on the panel and presses the relevant button. The equivalent light, or lights, on the map goes on. After 10 seconds the light, or lights, go off"*.

It is difficult to define the problem domain objects for this example, because there are no problem domain objects according to the presented definition. This is because the system does not need to store information about entities in the real world. Rather the map is "hardcoded" into the physical device, and lights are switched on next to the defined town location.

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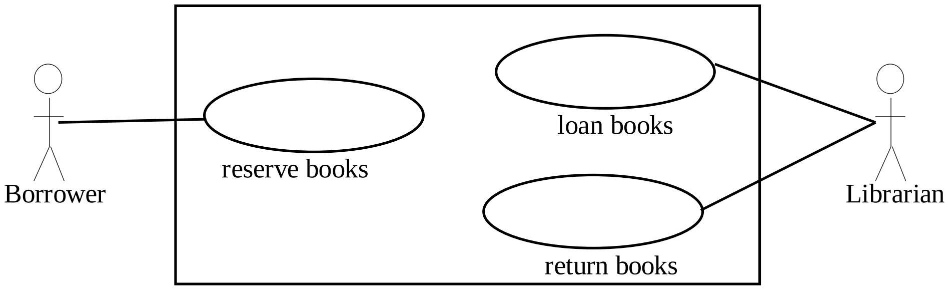
Task 2: Lending Library – Model Answer

The use case model has two actors and three use cases as shown below:



The use case for loaning books can be complex if we consider all possible alternative cases. It is informal at this stage of analysis and reads something like:

> *"The borrower passses the books and the borrower card to the librarian. The librarian reads the borrower details into the system using the bar code reader. Reader details appear on the screen for the librarian to check. From each book to be borrowed the librarian reads the book details using the bar code reader. Book details are displayed on the screen. The librarian passes the book through the barcode reader to record the loan. The librarian then stamps the book with the date and passes it, along with the borrower card, back to the borrower.*
>
> - *If the borrower is not allowed to borrow books for whatever reasons, terminate the use case;*
> - *If the book is reserved by someone else, do not lend the book;*
> - *If the quota of books which can be borrowed by the borrower is exceeded, stop the use case."*

The use case can be complicated by other alternatives, for example what happens if the book is reserved by the borrower. The problem domain model will also be more complex than in other examples:

Class object: Borrowed Item
    Attributes
        ISBN: String
        Title: String
        Author: String

Class object: Borrower
    Attributes
        Name: String
        Identifier: String;
        Address: String;

Class object: Loan
    Attributes
        Borrower: String;
        Borrowed Item: String;
        Return date: String;

It is possible to extend the model using inheritance relations which say for example that a borrowed item is either a book, video or journal.