Norwegian University of Science and Technology
Department of computer and information science

ENGLISH

Exam in course
IT2103 Object-oriented software development
Friday, 7 December 2007, 0900 – 1300

Contact during the exam:
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All printed and handwritten material allowed.
Grading deadline is 7 January, 2008.

ASSIGNMENT

The assignment is to design a system to manage access to doors in a building. The system consists of a central unit which manages users and pin codes, and a local unit located at each door to control the door.

Access may be granted to single persons or to groups of persons. A person may be a member of many groups. An access grant has a start date and an end date. The same holds for access granted to groups. A person is identified with a name and number. A door may belong to a zone. A zone may have many doors. It may be granted access to zones in the same way as for doors. Zones are identified with names and numbers, while doors just have numbers.

Located at each door there is a local computer unit which consists of a card reader, a display and a keyboard to enter codes. When a user is to enter a door, he swipes his card through the card reader, which sends the card number to the local unit. Then he enters his four digit pin code. If the code is correct and access is granted, the door opens and the user may enter. The local unit must talk to the central unit to decide if this is a valid card and pin code, and if the person has access to this door.

When a door is opened, a timer is started to give an alarm in case the door is not closed within one minute. The alarm results in a load sound and a message to the security officer. When the door is closed, the timer is deactivated.

If the code is incorrect, or the person has no access to this door, or the date is not within the access period, a message is displayed telling that no access is granted. It should be possible to enter users, codes, groups, access, doors and zones in the system. It should be possible to edit existing information as well. This is done by the security officer.

You are allowed to make additional assumptions if you find the assignment imprecise, but such assumptions must be stated in your answer.

a) (10%) Create a use case diagram for the problem, which shows the actors and use cases of the system.

b) (20%) Create a domain model for the problem. Show attributes for the classes in the domain model.

c) (20%) Create an interaction diagram for the use case that a user enters a door, by swiping his card and pressing the pin code. He is granted access, the door opens, and the alarm is activated. The door closes and the alarm is deactivated.

d) (20%) Create an interaction diagram for the same use case as in problem c), but the user is granted access because he is a member of the group "operations" and the door belongs to the zone "lab". You need to present the part of the diagram that is different from problem c).

e) (30%) Create a design class diagram for the system.

When you make use of patterns, show the name of the patterns in the UML diagrams.