

T-76.4602 Software development methods
Examination 18th December 2006

Write the following information in each paper you return: name, student number, course code and name, date, signature. Answer all questions. There are five questions, each worth six points.

1. You are a software designer and are supposed to review the use case diagram presented in Figure 1 and a related use case description in Figure 2. Your tasks are to
 - a) record what mistakes and omissions there are in the use case diagram;
 - b) draw an improved version of the use case diagram where these mistakes and omissions have been fixed;
 - c) record what mistakes and omissions there are in the use case description; and
 - d) write an improved version of the description where these mistakes and omissions have been fixed.
2. Answer a and b.
 - a) What are the basic concepts of software configuration management (SCM), also referred to as the Four SCM Models in the lecture slides? Briefly describe each of them.
 - b) Figure 3 lists characteristics of a good team. Your tasks are to: *i*) select three characteristics that will describe your software development team in the future; and *ii*) describe concrete actions that your team will perform in order to achieve these three characteristics. There are eight members in the team and you are the project manager.
3. You are about to design the software for a fire alarm and extinguishing system. The whole system includes different types of sensors, alarm devices and an extinguisher system, which is software controlled. The system also connects to other building automation systems, for example, to the building access control system and management of fire containment areas system.
 - a) Draw the overall context diagram of the software system and justify why each of the elements you included in the diagram is important.
 - b) Describe the data flow of the software system in the case of an alarm. For this purpose, define the main architectural software elements that manipulate data at the level of detail that is adequate to explain how and based on what information the system functions when it detects something alarming.
4. Describe the test-driven development (TDD) practice. What are the benefits of test-driven development? How does test-driven development affect the way a programmer works? Why TDD is more a development practice than a testing practice?

5. Model the following as an analysis level UML class diagram to the extent the information is sensible to present in a class diagram. Use single and static classification. Model things as they are described below even though the below description may accurately reflect reality. The problem domain is the game of football.

Football is a team sport played between two teams of human players. Football is played in matches. In each match, both teams strive to score as many goals as possible. A match is won by the team that scores most goals; if both teams score equally many goals the match is said to have ended in a draw.

Team is an important concept in football. Teams are not formed on an *ad hoc* basis for each match, but exist for extended periods of time. Each football team has a name. One is also interested in the year the team was founded. Examples of football teams include Haka from Valkaakoski, Finland and Bayern München from Germany. New teams can be founded and existing ones can be disbanded. It is important to remember all the same facts related disbanded teams as well as teams still together.

At each moment of time, football team has a manager, a number of players, and may have a coach. The coach may also be the same person as the manager. Naturally, all these people may be changed at any time. It is important to know who was who (manager, coach, players) in a team at a given time. It may also happen that a former player becomes a coach or a manager of a team: for instance, Marco van Basten used to play in the Dutch national team and is now its manager. For all the people involved in football, one is interested in some basic facts about them: these include name, date of birth, place of birth, height and weight.

In each football match played, one of the teams is named the home team and the other the away team. It is important to record the date the match was played. For each match played by a team, the team decides a line-up consisting of a maximum of 23 players. Naturally, all the players in the line-up must be players of the team on the date of the match. Each player has a number in the line-up; no two players in a team may share a number in a match. The numbers are of interest, thus it must be possible to recall what number a player used in a specific match. The same player may have different numbers in different matches.

From the line-up, eleven players are selected for the initial line-up: these are the players that are on the field when the match begins. During the match, the manager may decide to replace a player currently on the field by another one not currently on the field. It is important to record which replacements were made and when: was it during the second half or first half, and how many minutes of the half had passed when the goal was made. A team may make at most three replacements during each match.

Goals are the essence of football. It is important to record certain facts about goals. Of course, one needs to know which team scored, but also the player that scored the goal: players get credit based on the goals they score. Also, similarly as for replacements, one is interested in when the goal was made.

Providing feedback is required for passing the course. The feedback form can be found at: <http://www.soberit.hut.fi/T-76.4602/english/FeedbackForm.html>

A link to the form can also be found on the course web pages.

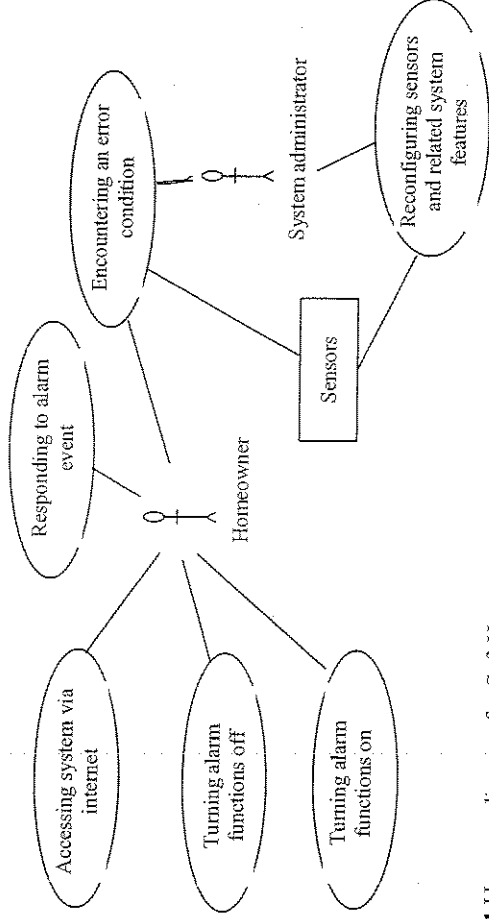


Figure 1 Use case diagram for SafeHome system

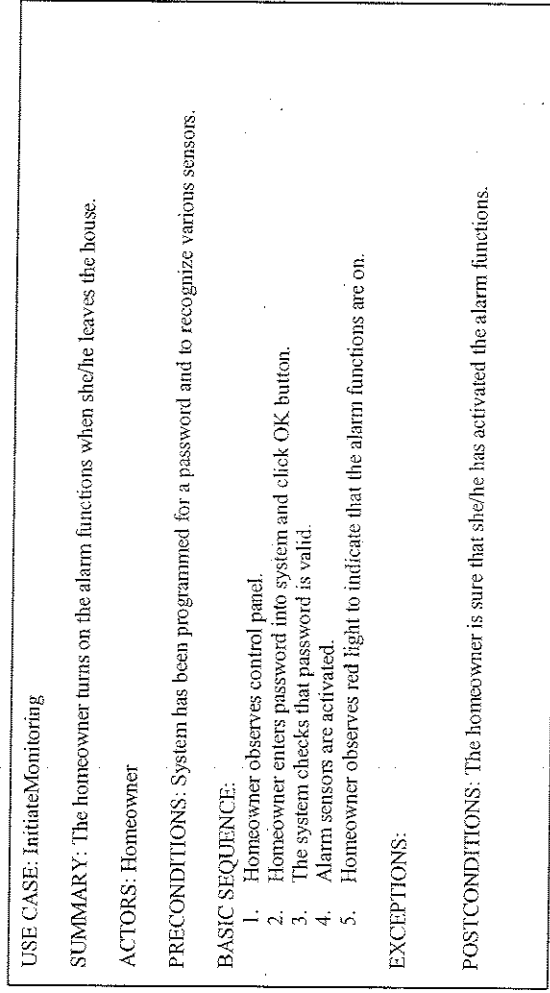


Figure 2 Use case description for the function “Turning alarm function on”

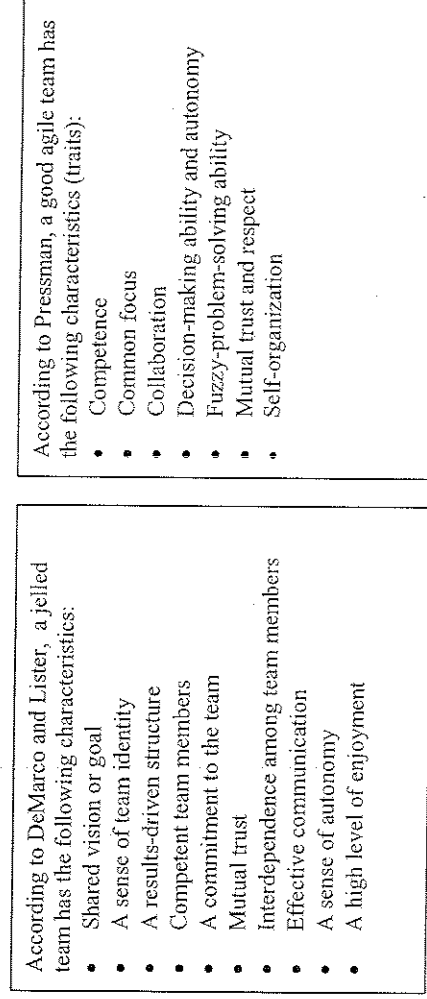


Figure 3 Characteristics of a good team