

Design of Software Architectures

(211133)

Examination, 30 January 2008, 9:00:12:30

This is an open book exam. Good luck!

QUESTION 1 – OVERALL THEORY (25 POINTS)

(+2.5 point for each correct answer; -1 for each wrong answer. total minimal points: 0)

The following provides statements related to the concept of software architecture. For each statement indicate whether it is true or false and motivate this with two-three sentences at the most.

- a) Technical problem analysis aims to identify the obstacles of an existing system and as such is required for recovery of the system, if necessary.
- b) In domain-driven approaches use-cases do not play a role
- c) Domain-driven architecture design is mainly required in case multiple products need to be derived from the same architecture.
- d) The solution domain analysis process follows after the process of designing software architecture using architectural patterns.
- e) The UML supports modeling different views of architectures.
- f) A software architecture must be modeled using 4+1 architectural views.
- g) The goal of software architecture description languages is to represent the component-and-connector view of the software system.
- h) The deployment view represents the allocation of software units to persons or teams.
- i) The scenario-based architecture analysis method (SAAM) aims to resolve conflicting stakeholders requirements.
- j) In case of indirect scenarios in the software architecture evaluation process, the software architecture must be changed.

QUESTION 2 - PROBLEM ANALYSIS & DOMAIN ANALYSIS (30 POINTS)

- a) Explain for the following stakeholders their concerns in the software architecture design:
(1) *tutor* (2) *student* (3) *administrator*.
- b) Define six technical problem definitions that can help the designers to search the corresponding solution domains for designing the software architecture.
- c) For each problem definition, describe the most relevant solution domains for designing the architecture.
- d) List 6 most relevant knowledge sources for the given architecture
- e) List 6 most relevant concepts that you could derive from these knowledge sources.

QUESTION 3. ARCHITECTURE DESIGN (30 POINTS)

- a) Define the module view for the Automated Examination System. The architecture should be specified as UML classes and associations. Specify the necessary details such as operations, attributes and association roles.
- b) Describe for each architectural module the identified solution domains.
- c) Apply an architectural pattern and refine the architecture accordingly. Motivate your decision.
- d) Select a relevant module in the architecture and define its architecture. Explain which domain knowledge is necessary for designing the corresponding module.

QUESTION 4 – ARCHITECTURAL EVALUATION (15 POINTS)

Before implementing the architecture it is required that it is sufficiently evaluated. We can distinguish between *use scenarios*, *change scenarios* and *exploratory scenarios*.

- a) Obviously, security forms one of the key quality concerns for the given case. Define 2 use scenarios, 2 change scenarios and 2 exploratory scenarios related to the security concern.
- b) Explain how well the architecture as defined in question 3 performs with respect to the security concern. Explain how you would extend the architecture to enhance security.
- c) Provide an example of conflicting scenarios for the following pair of concerns.
 - Security vs. Performance
 - Security vs. Maintenance
 - Security vs. Adaptability
- d) Explain how you would deal with the conflicts in c).

Case –Automated Examination System

Automating examination systems can be applied for a wide range of domains including assessment of courses at the primary school, university, or any kind of domain in which questioning and assessments are required (examination for drivers' lessons, IQ-tests, etc.). The tutor should have the opportunity to select different question types including multiple choice questions, alternative choices, open-ended, fill in the blanks, match the items and order items question types. The tutor must be able to customize the selected question types and edit/update/delete instantiated questions. There should be a mechanism to define the order in which the questions need to be answered. In addition the tutor may need to monitor the students while answering the questions.



Timing constraints can be imposed on the duration of question, response time and individual elements in the question content. The tutor must be able to provide answers to the related questions. The answers will be dependent on the question types.

There must be means to set evaluation criteria and grade the answers to the questions. Grading may depend on various factors such as the student's characteristics (age, class, background knowledge etc.). Timing may be an important parameter for the grading as well. The system may support the student in answering the questions. This may be based on simple hints or very complex guidance in which the solution domain is provided.

The following questions relate to this case.