

# DAT 165 Software Product Line Engineering

## Exam

Thursday December 17, 2009

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### Examiner

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### Contact person during exam

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### Allowed tools

Dictionary to/from English

### General information

Numbers within parentheses show the maximal points awarded for each question.

Maximal points can be given if:

- The answer is correct.
- The presentation of the answer is readable and clear.
- The answer is given in English.

One sheet of paper may only contain parts of solutions belonging to one question.

### Grading

In order to pass the course one need to:

- Pass the exam (min 30 and max 60 points).
- Complete and present the assignment, i.e. the industry case study (min 20 and max 40 points).

The course is graded Fail/3/4/5. The grades are based on the sum of exam and assignment results:

- 0 – 49 points: Fail
- 50 – 66 points: 3
- 67 – 84 points: 4
- 85 – 100 points: 5

### Results

Exam results will be available from the course homepage.

### Review

Time and place will be announced on the course homepage.





### 1. Agile SPLE? (8p)

Agile software development processes like Scrum, XP etc. have been increasingly used in the last decade. They share a set of values.

- a) Argue for the following statement: Agile development processes are in conflict with a SPLE development approach. (2p)
- b) Argue against the following statement: Agile development processes are in conflict with a SPLE development approach. (2p)
- b) Discuss in detail how an SPLE approach to software development could be combined with an agile development process. How can they be combined? What would be the potential benefits, from an SPLE point of view? From an agile point of view? And what would be the drawback, from an SPLE point of view? (4p)

### 2. Commonality and Variability (8p)

- a) What is a variation point? (1p)
- b) What is a variant? How does it relate to a variation point? (2p)
- c) Give examples of three realistic variation points in a software platform for a computer game? (3p)
- d) Describe two variants for each of the variation points in c above. (2p)

### 3. Motivation for and Underlying problems addressed by SPLE (8p)

You have just been hired as the first Software Product Line Engineer at a Software Development company. The company develops games for mobile/handheld phones/devices like the iPhone, Droid by Motorola (based on Google's Android OS) but also plan to port and test the games to phones based on Windows Mobile as well as other Android-based phones. You have a stable development process that you have refined in your 12 years of existence. There are 34 employees working in software development in the company. The CTO has given you as the first task to give a 15 minute presentation at the Friday meeting on what SPL is, which problems it addresses, if there are any alternatives out there and why your company should be using a SPL. Prepare for your presentation by writing answers to the following questions (if you have to make any assumptions about the company clearly state each one of them on a line of their own marked with "Assumption"):

- a) List 4 different problems that SPLE tries to be a solution to. For each one discuss what it is, why it is a problem for modern-day software development / organizations and how SPLE tries to address and solve the problem. Your chosen problems need to be different/distinct for you to get any points. (4p)
- b) Which alternative solutions to the problems do you either know off (name and describe them briefly) or can you think of (describe them briefly). (2p)
- c) Why should this company be using a SPL? (motivate based on company specifics/context). (2p)

### 4. Domain and Application engineering role interaction (5p)

List three roles involved in Domain engineering and three roles involved in Application engineering, describe each shortly and characterize their interdependencies (hint: interdependencies=how they interact and/or what they deliver or get from each other). (5p)

The exam continues on the following page...

### 5. Delta-modelling (5p)

One way to handle variability in practice, when implementing application instances from a product line, is to make a difference between core modules, \Delta-modules and the actual application instances. Below you see a core module and an application instance (in a modern-day programming language).

#### CORE MODULE

```
core BaseAccount {
  class Account extends Object {
    int balance;
    void update(int x) {balance +=x;}
  }
}
```

#### APPLICATION INSTANCE

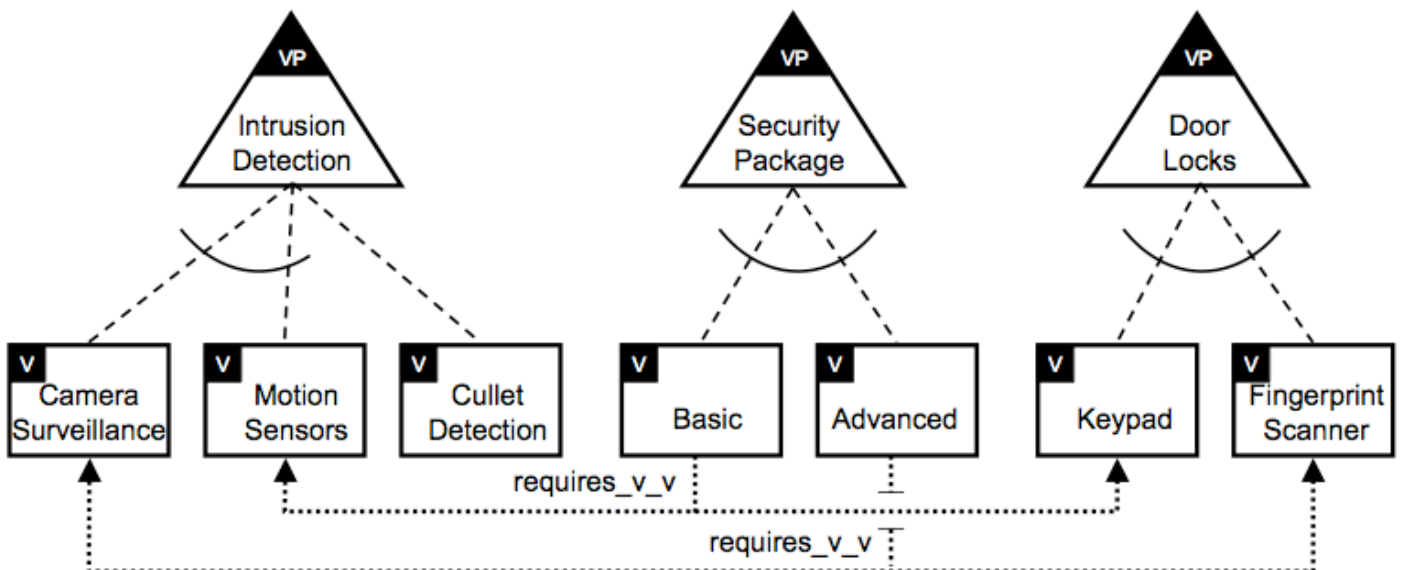
```
class Account extends Object {
  int balance;
  Lock lock;
  void unsync_update(int x) {balance +=x;}
  void update(int x) {lock.lock(); unsync_update(x); lock.unlock();}
}
```

- a) Write down the Delta-module (you should invent your own keywords for denoting alternations that will be made when applying the \Delta-module but you need to describe what they do and they should have logical names). (5p)

### 6. OVM (8p)

Which of the following statements, concerning the figure below, are correct (answer True or False, a correct answer gives 1 point, no answer gives 0 point and an incorrect answer gives -1 point):

- Using the Intrusion Detection VP means that we must include the Cullet Detection variant and either the Camera Surveillance variant or the Motion Sensor variant.
- Using the Security Package VP means that we must include the Door Locks VP and the Intrusion Detection VP.
- If we include the Keypad variant we must include the Basic and Fingerprint Scanner variants.
- Using the Basic variant means that we must include the Motion Sensors and Keypad variants.
- Using the Intrusion Detection VP means that one of the Camera Surveillance and Motion Sensors variants need to be included. Including the Cullet Detection variant is optional.
- If needed we can use only a Door Locks VP with a Fingerprint Scanner variation.
- We can have a Door Lock with a Fingerprint Scanner and Motion Sensors.
- We can have a Door Lock with an Advanced Security Package, Fingerprint Scanner, Camera Surveillance and Cullet Detection.



**7. Cost of transitioning to SPLE (8p)**

- a) Describe different transitioning strategies when moving to SPLE. (2p)
- b) Describe the different costs involved in transitioning from a single-system development approach to a SPLE approach. (3p)
- c) How would you decide how to transition a company to SPLE? Which information would you require before taking that decisions? How would you trade this information of to reach your decision? (3p)

**8. Future of SPLE (10p)**

Given the knowledge you have gained about SPLE, how do you think that the area will develop in the future? Discuss the SPLE field based on the BAPO model and consider both how the area itself will develop and how it will be used in the areas of Business, Architecture, Process and Organization. (10p)

Total: 60p