



## Requirements Engineering II

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# Assignment 5: Requirements for Software Product Lines

### 1. Tasks

- Read the mandatory items in the reading list
- Be prepared to answer the questions given below in class
- Prepare a 15 minutes presentation (5-10 slides) on the theme assigned to your course group. Browse/read additional papers and/or web pages where necessary.
- Build a feature tree for a family of automatic teller machines (ATMs) as follows. The basic machine can just authenticate users and dispense money in a single currency. Additional features are: printing a receipt, inquiring the account balance, displaying/printing a statement of account, recharging a cash card, dispensing money in two different currencies. The ATM supports the following currencies: CHF, EUR, GBP, JPY, USD. The printing features require that the ATM is equipped with a printer. ATMs that dispense two currencies always can print receipts. Use a feature diagram as described in Fig. 3 of [Jarzabek, Ong, and Zhang 2003].

### 2. Reading list

#### Mandatory reading

Chapter 2 of [Pohl, Böckle, and van der Linden 2005] and [Chastek et al. 2001] provide an overview. Feature and variability modeling is treated in sections 1-3 of [Schobbens, Heymans, and Trigaux 2006], in [Jarzabek, Ong, and Zhang 2003] and in [Bühne, Lauenroth, and Pohl 2005].

#### Mandatory browsing

Browsing the pages listed in the site roadmap at <http://www.softwareproductlines.com> is helpful for understanding the basics of Software Product Lines.

#### Optional reading

[Clements 1999] motivates the use of software product lines with an example. [Reiser and Weber 2006] extend the notion of feature trees to multi-level feature trees. [Schobbens, Heymans, and Trigaux 2006] provide an overview of feature modeling and give formal semantics for feature diagrams. [Schmid and John 2004] present a decision-oriented approach to variability modeling.

### 3. Questions

- What is a software product line?
- What is the role of domain engineering and application engineering in a software product line?
- In a software product line, we always have two types of requirements. Which ones?
- What are the additional tasks and challenges for requirements engineering when using a software product line?
- \* Which different types of requirements exist in software product lines? And how does product line scoping help analyze application requirements for new products?
- Is feature-oriented domain analysis sufficient for variability modeling in a product line?

#### 4. Themes for presentation

(Will be assigned by the research assistant who tutors this course; your group can apply for the theme you would like to work on)

- A. An overview of requirements engineering for software product lines  
(General overview, rationale for using product lines, domain analysis and application analysis processes, advantages and challenges,...)
- B. Feature-oriented domain requirements analysis  
(What it is, basic approach, advanced feature tree models<sup>1</sup>, advantages and limitations of feature modeling)
- C. Modeling variability in software product lines  
(What is variability, a metamodel of variability<sup>2</sup>, instrumentation of models for enabling variability<sup>3</sup>)

#### References

- Bühne, S., K. Lauenroth, and K. Pohl (2005). Modelling Requirements Variability across Product Lines. *Proceedings of the 13th IEEE International Conference on Requirements Engineering (RE'05)*, Paris, France. 41-50.
- Chastek, G., P. Donohoe, K.C. Kang, and S. Thiel (2001). *Product Line Analysis: A Practical Introduction*. CMU/SEI Technical Report CMU/SEI-2001-TR-001.
- Clements, P. (1999). Software Product Lines: A New Paradigm for the New Century *Crosstalk*, February 1999. 20-22.
- Jarzabek, S., W.C. Ong, and H. Zhang (2003). Handling Variant Requirements in Domain Modeling. *Journal of Systems and Software* **68**, 3. 171-182.
- Pohl, K., G. Böckle, and F. van der Linden (2005). *Software Product Line Engineering – Foundations, Principles, and Techniques*. Heidelberg: Springer.
- Mark-Oliver Reiser, M.-O., M. Weber (2006). Managing Highly Complex Product Families with Multi-Level Feature Trees. *Proceedings of the 14th IEEE International Conference on Requirements Engineering (RE'06)*, Minneapolis, MN, USA. 149-158.
- Schmid, K. and I. John (2004). A Customizable Approach to Full Lifecycle Variability Management. *Science of Computer Programming* **53**, 3. 259–284
- Schobbens, P.-Y., P. Heymans, J.-C. Trigaux (2006). Feature Diagrams: A Survey and a Formal Semantics. *Proceedings of the 14th IEEE International Conference on Requirements Engineering (RE'06)*, Minneapolis, MN, USA. 139-148.

#### Web resources

<http://www.softwareproductlines.com>

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<sup>1</sup> [Schobbens, Heymans, and Trigaux 2006] provide an overview. In particular, present the variant described in Fig. 3 of [Jarzabek, Ong, and Zhang 2003].

<sup>2</sup> See [Bühne, Lauenroth, and Pohl 2005]

<sup>3</sup> See [Jarzabek, Ong, and Zhang 2003]