



University of Zurich  
Department of Informatics

## Bachelor's Thesis

in the Requirements Engineering Research Group

### Topic / Working Title

Case Study-Based Evaluation and Comparison of Three State-of-the-Art Product Line Requirements Engineering Tools

### Content

Software Product Line Engineering (SPLE) is an emerging software development paradigm that improves developing sets of closely related software products by systematically organizing their commonality and variability. Requirements Engineering (RE) is crucial in this context to define, manage and communicate the product line as a whole and to negotiate and derive concrete products based on the product line requirements specification.

Research and industry have brought forward a range of different languages, approaches and tools that improve requirements engineering practice for software product lines. Many of them, however, build on quite different basic assumptions to specify the requirements, their commonality and variability, and traceability links (i.e. mappings) between dedicated variability models and the requirements specifications. Today there is still a lack of clarity in research on how far single approaches and tools really have benefits over the other existing solutions and on what the trade-offs between different tools are.

In this bachelor's thesis we will investigate a well documented case study from existing literature, namely the GoPhone case study by Fraunhofer IESE [Muthig et al 2004], and model this exemplary product line with three major and quite different tools that support product line requirements engineering:

- (i) IBM Rational Focal Point; a professional requirements management tool that focuses on requirements and product portfolio management and offers flexibility in customizing its own meta-model,
- (ii) ADORA; a research prototype tool that uses an integrated graphical model at its core, allows smart visualization and specifies variable requirements with aspects and boolean decision modeling,
- (iii) Pure-systems pure::variants for Sparx Systems Enterprise Architect; an industrial-strength feature modeling tool for specifying variability coupled with an industrial-strength UML modeling tool for specifying the requirements, which makes reuse of complete models and model elements more efficient.

As a result of this thesis we expect to gain concrete empirical insights into the strengths, weaknesses and trade-offs between these tools and their underlying basic concepts to support product line requirements engineering.



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### Tasks / Deliverables

- Study the case and familiarize with the tools mentioned above
- Model the product line case in every tool
  - carefully document your activities, spend the same amount of time for every tool
  - your advisor will assist you with the modeling and revise your specifications a couple of times
  - if you experience gaps in the given case study requirements, carefully document them, discuss them with your advisor and find agreements for new supplementary requirements
- Review the models to make sure that all three specifications express the same contents
- Derive at least three products from this product line requirements specification with every tool
  - carefully document all your activities and experiences
- Write your BSc thesis report containing
  - descriptions of these three tools
  - the modeling challenges you encountered (and how you could resolve them)
  - the product derivation and the challenges and problems you encountered
  - an extensive reflection on your experiences of using these three tools (resulting in a listing of strengths and weaknesses of every of the tools)

### Literature

Muthig, D., I. John, M. Anastasopoulos, T. Forster, J. Dörr, K. Schmid (2004). GoPhone - A Software Product Line in the Mobile Phone Domain. Fraunhofer IESE-Report No. 025.04/E, Version 1.0, March 5, 2004.

### Prerequisites

- ✓ Interest in practical approaches to requirements engineering and product line engineering
- ✓ Good analysis, communication and writing skills
- ✓ Good general knowledge in requirements engineering

### How to proceed

- Study of tools and the case study literature (approx. 15%)
- Elicitation and modeling of the requirements with every tool (approx. 25%)
- Review and finalization of these three specifications (approx. 10%)
- Product derivation of at least three products, equally with every tool (approx. 15%)
- Rigid documentation of your activities and the problems you face (continuously, approx. 15%)
- Thesis writing (approx. 20%)

**Workload** 4 months full-time (or 6 months part-time), 17 ECTS

**Advisor** Reinhard Stoiber

**Co-Advisor** Samuel Fricker (Focal Point, Enterprise Architect)

**Examiner** Prof. Dr. Martin Glinz