

Feature Oriented Domain Analysis

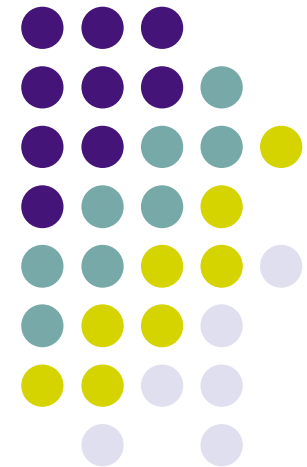
within: Requirements Engineering II

by

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Agenda

- Motivation
- Basic approach of Domain Analysis
- Concept of Feature Model (FM)
- Benefits and limitations of FM's
- Advanced forms of FM's
- Usage of FM's in the product line engineering



Motivation

*What if you could produce each one of several systems for a **fraction of the cost** and in a **fraction of the time** that one would normally expect?*

*What if you could do it so that **quality was improved** and **reliability and customer satisfaction increased** with each new system?*

*What if creating a new system were merely a matter of **combining large, easily tailorable components** under the auspices of a software architecture that was generic across the entire domain?*

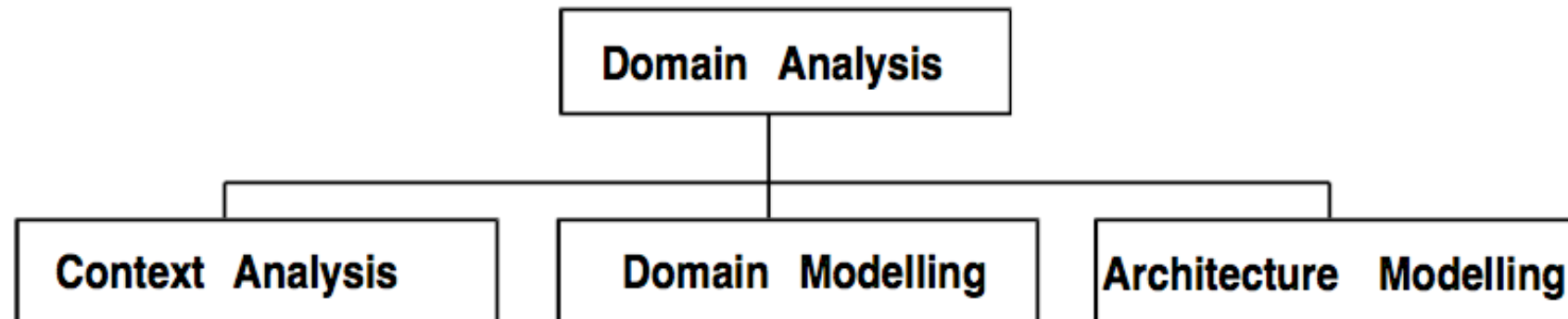
Is this a fantasy? No, it is not! (Clements 1999)

Feature Oriented Domain Analysis (FODA)



- FODA is „a method for discovering and representing commonalities among related software systems“. (Kang et al. 1990)
- “The primary focus of the method is the identification of prominent or distinctive features of software systems in a domain.”
(Kang et al. 1990)

Feature Oriented Domain Analysis (FODA)



Kang et al.
2005



Scope of the Domain

- Analysis of the Domain is inevitable when building Product Lines instead of single Products
- Define the scope of the Product Line (PL)
 - Which products are in the PL?
 - Which products are out of the PL?
 - Which products are somewhere in between?



Domain Engineering

- Domain Engineering opposed to Application Engineering
 - Common processes, but on domain level
 - Domain RE
 - Domain Design
 - Domain Realization
 - Domain Testing
- Product Management as additional Process

Domain vs. Application Engineering

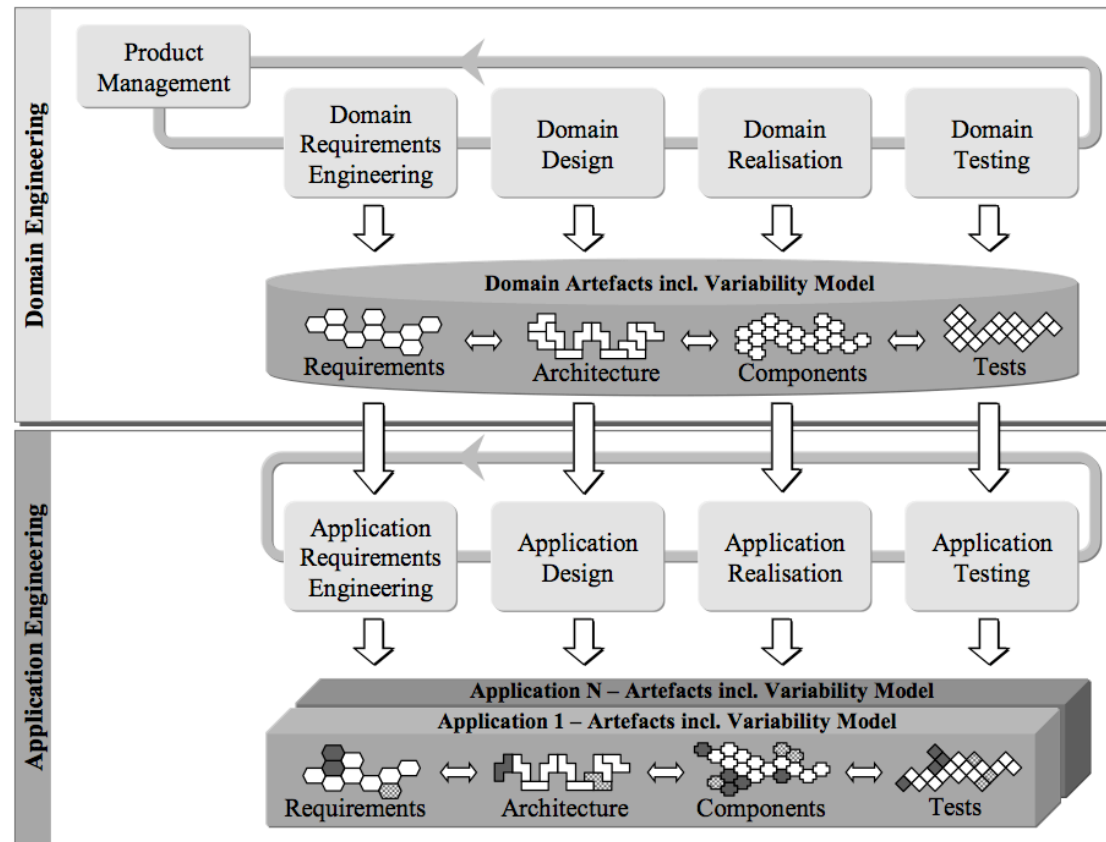


Fig. 2-1: The software product line engineering framework

Böckle et al.
2005



Feature Models / Diagrams

- Many languages available
 - Most of them have basically the same expressiveness
 - Trees or directed acyclic graphs
- In the FODA method, a first Feature Model was introduced
 - Features structured in a tree



Elements of a Feature Tree

- *Concept* Node
- *Feature* Node
 - Mandatory
 - Optional
- *Relations* between Nodes
 - *Decomposition* edges
 - AND, XOR
 - *Textual constraints*
 - Requires, mutex

Feature Tree Example

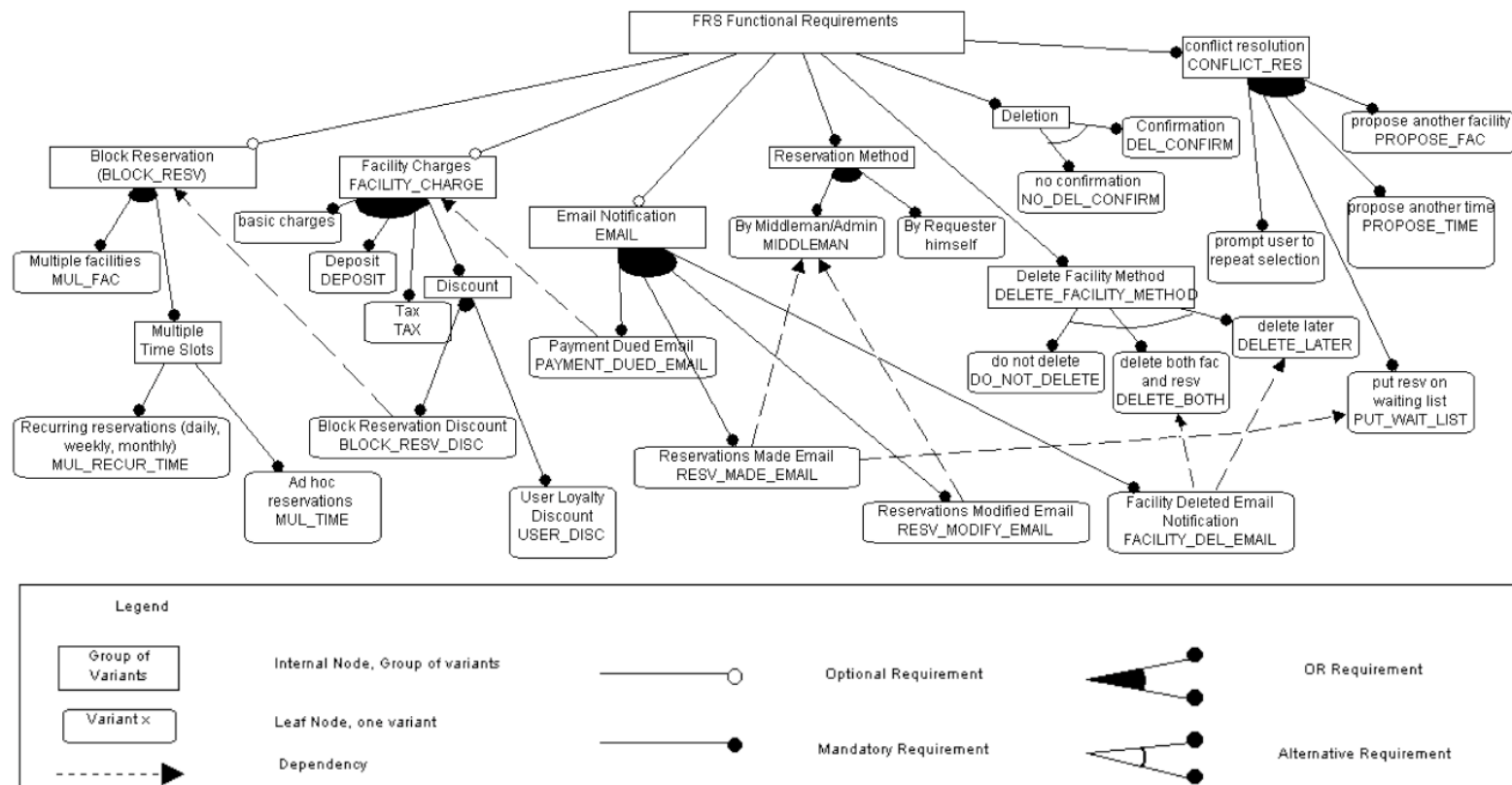
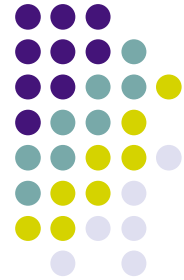


Figure 3. FRS feature diagram with dependencies

Jarzabek et al. 2003

Benefits and Limitations of Feature Modeling



- Benefits
 - Find similarities between products in a product line (PL)
 - Find differences between products in a PL
 - Design products in a way that synergies between products can be exploited
- Limitations
 - Choice between a single global Feature Model (FM) or many independent FM's
 - FM's may become very large

Advanced Forms of Feature Models



- Multi Level Feature Tree
 - i.e. approach without a single global model
 - Several feature trees instead of a single one
 - Semantics for differences and dependencies between individual feature trees
- Ideal when modeling of a product line
 - One model for the entire product line
 - Captures the commonalities
 - One model for an individual product of the line
 - Captures the differences

Outline a Product Line with a Feature Model

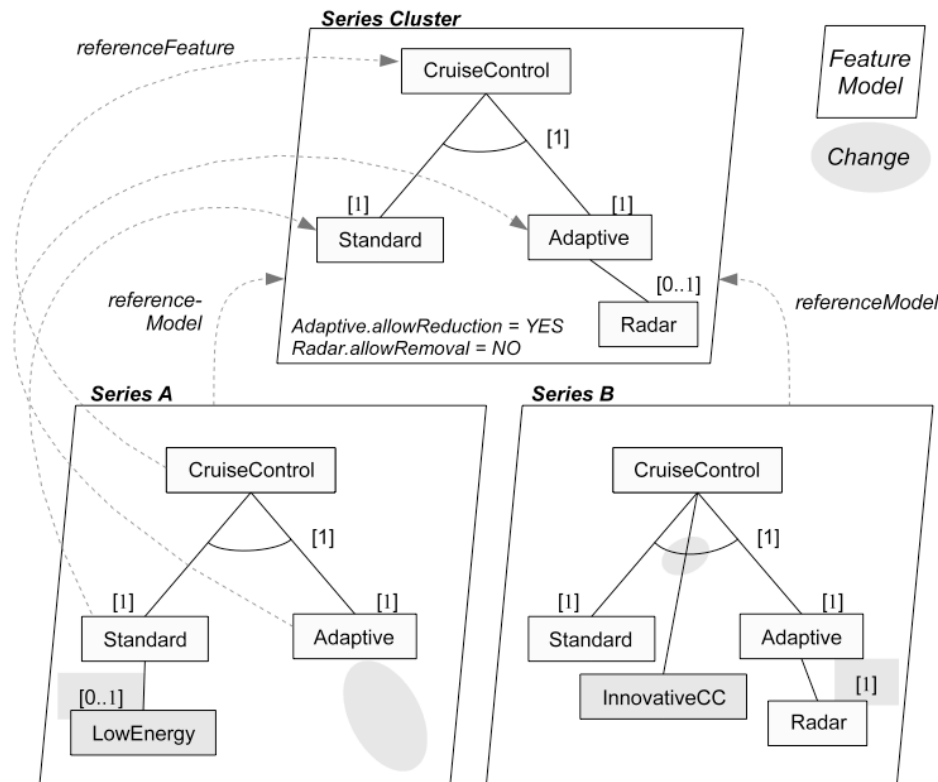


Figure 2. Example of a multi-level tree.

Reiser et al.
2006



Conclusion

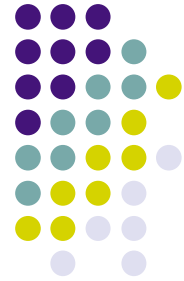
- FODA is a method that allows
 - The description of a whole product line
 - A simple description of differences and commonalities between products of a product line
- Feature diagrams support the method
 - Feature trees
 - Directed acyclic graphs
 - Structured models with multi level feature trees

Questions?



... thanks for your attention!





References

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