


Software Product Line Engineering

modeling and managing variability of software intensive systems

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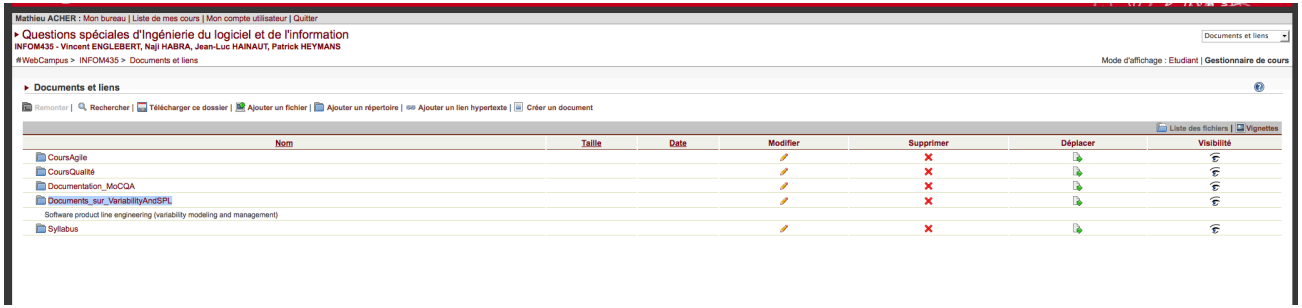
Material

- http://www.fundp.ac.be/etudes/cours/page_view/INFOM435/
  - Folder: “Documents_sur_VariabilityAndSPL”
  - Slides, exercises, evaluation



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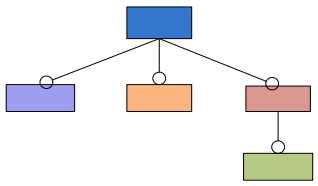
Previously

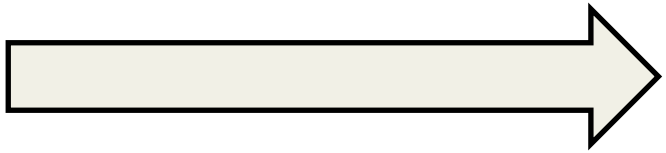
- Variability models

  … are needed for mastering complexity: variability is everywhere, precise specification, automated reasoning

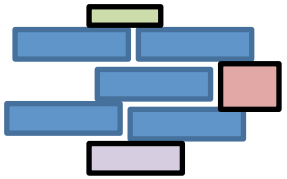
- Feature Models
  - **Formalism and theory**: modeling principles, semantics, logics
  - **Language** to elaborate/build variability models
  - **Reasoning techniques** to analyze properties of an SPL (scalable and automated way)
  - **Applications**: variability models and so what?



Feature Model



Mapping

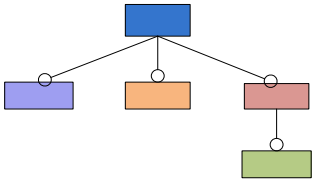


Reusable Assets

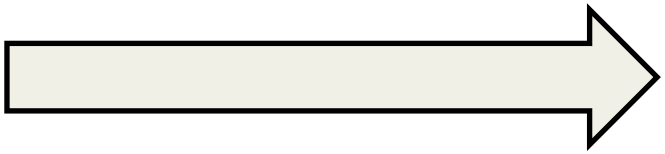
(e.g., models or source code)

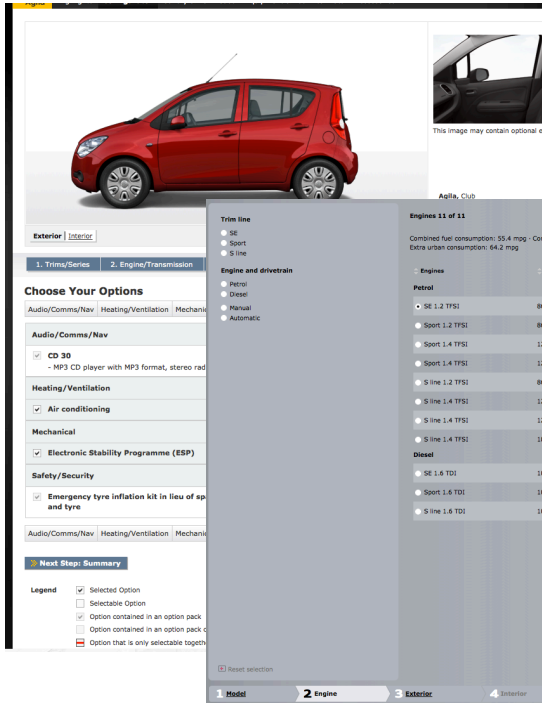
Towards…

Language (TVL, FAMILIAR)



Feature Model

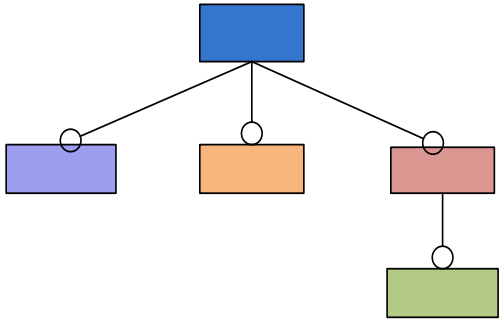




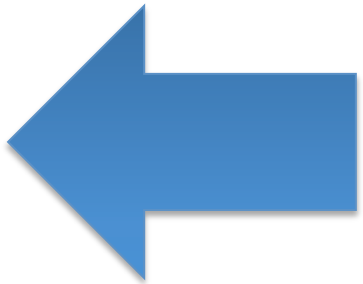
Automated reasoning

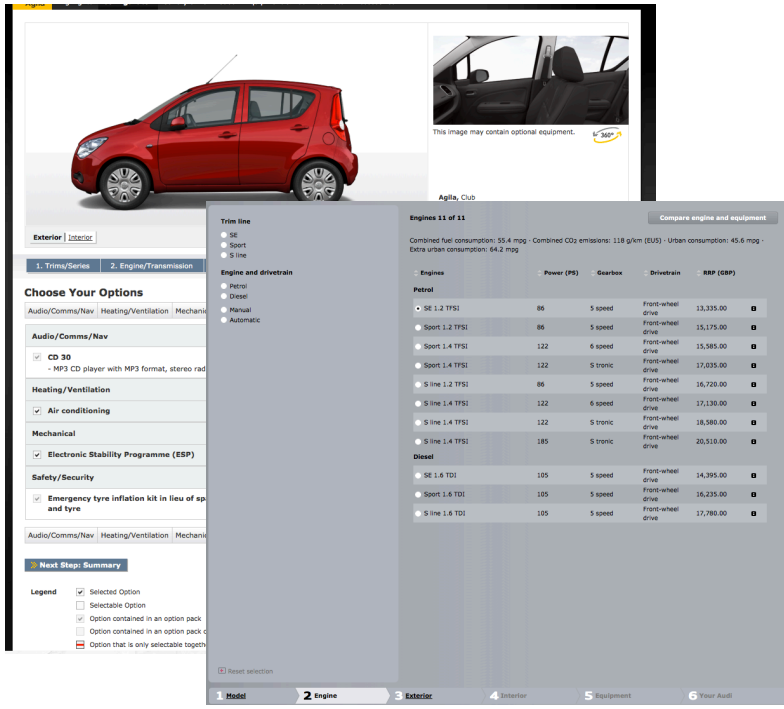
Running project

- Re-engineer a car configurator
  - we are making some progress, right?



Variability Model (Feature Model)





Today: lab session

- No “course”, but interactive session for learning feature models, TVL language, etc.

- Feature modeling in practice
  - Domain analysis: the domain of cars
  - Elaboration of a feature model
  - Use of TVL
  - Use of automated reasoning techniques

- First step towards a car configurator

Lab session

- 10% of the final mark (group)

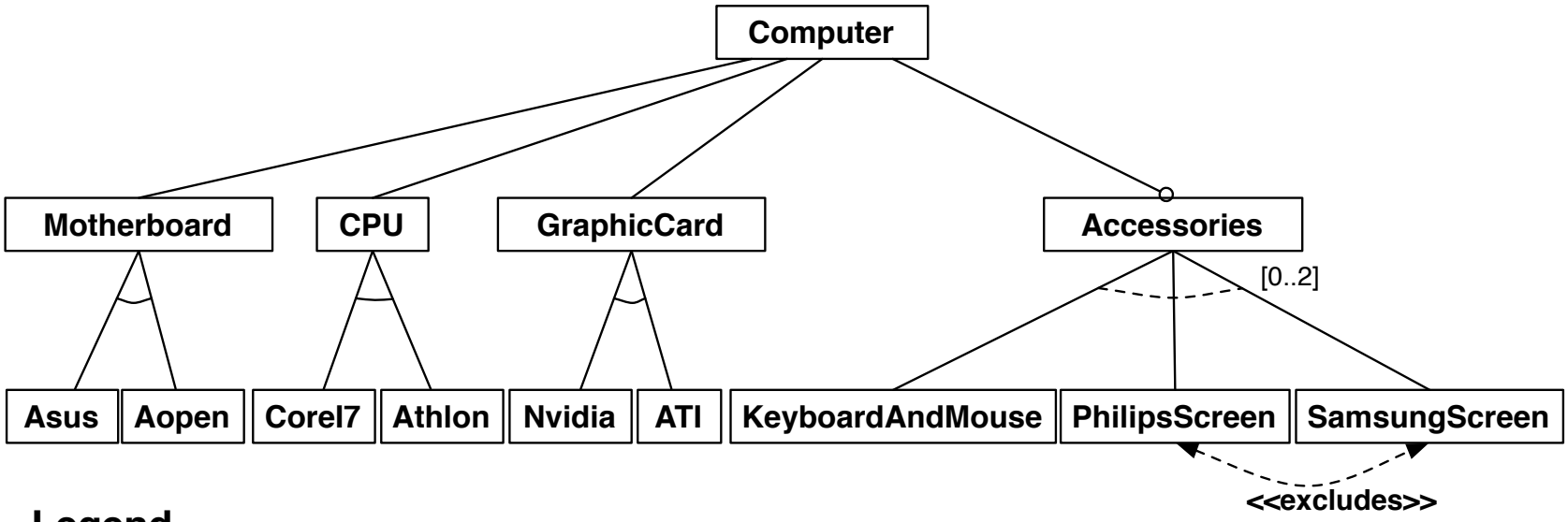
- Pick a car configurator of your choosing
  - Determine relevant common/variable features
  - Produce a feature model and indicate any additional (meta-)information you might want

- TVL model
- Report
  - Report how you collect domain information
    - Inputs of your domain analysis
  - Discuss the completeness / correctness of your TVL model
  - Discuss TVL expressiveness
  - Discuss the limitations of manual elaboration
    - Report on variability patterns
    - Identify opportunities for more automation
    - Report main difficulties

TVL language

- More information here:
  - http://www.info.fundp.ac.be/~acs/tvl/
- Java implementation
  - Some reasoning operations: TVL to Boolean CNF
- Documentation
  - Formal grammar
  - Formal semantics

Example FD



Legend

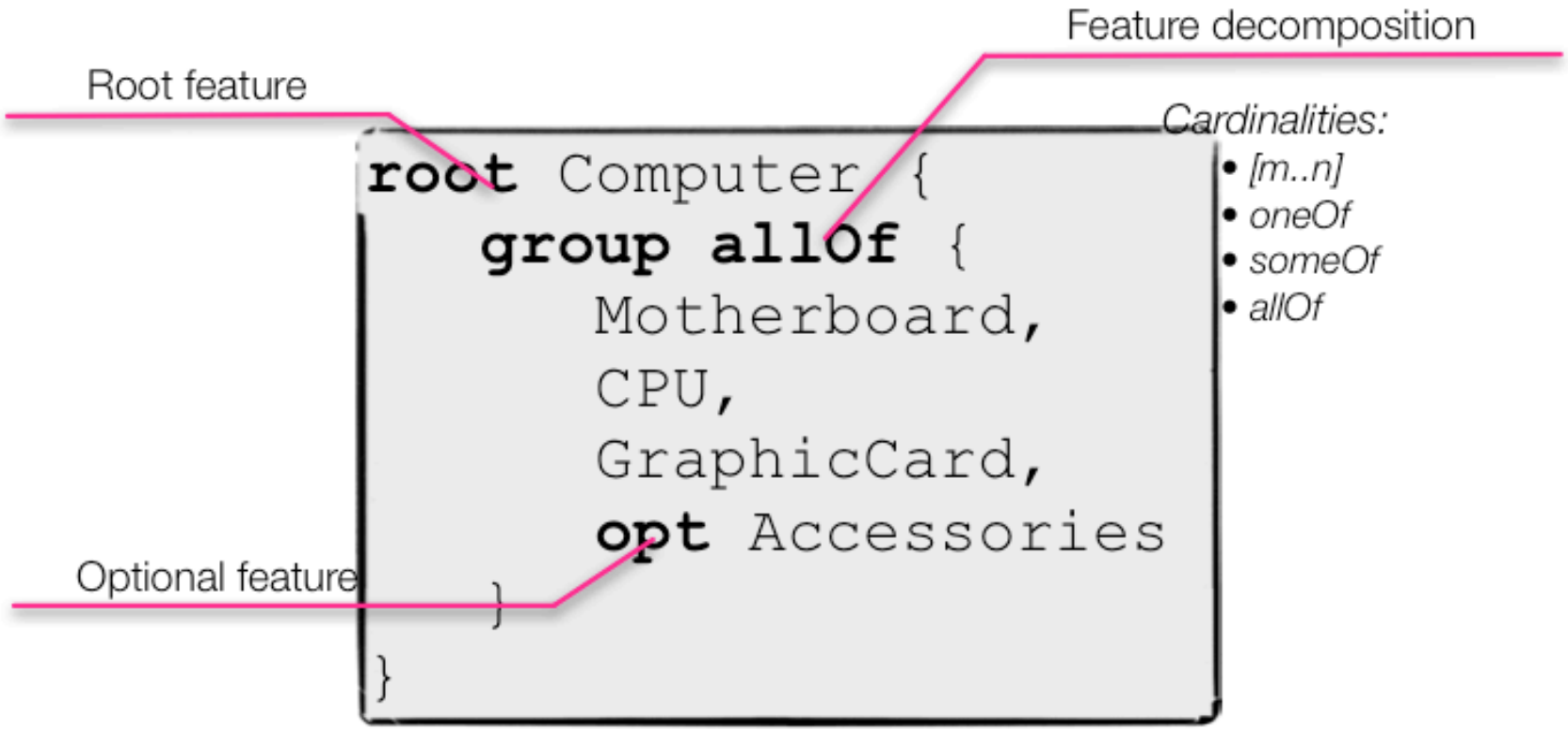
and-decomposition

xor-decomposition

[i..j] group cardinality [i..j]

optional feature

TVL – Feature hierarchy

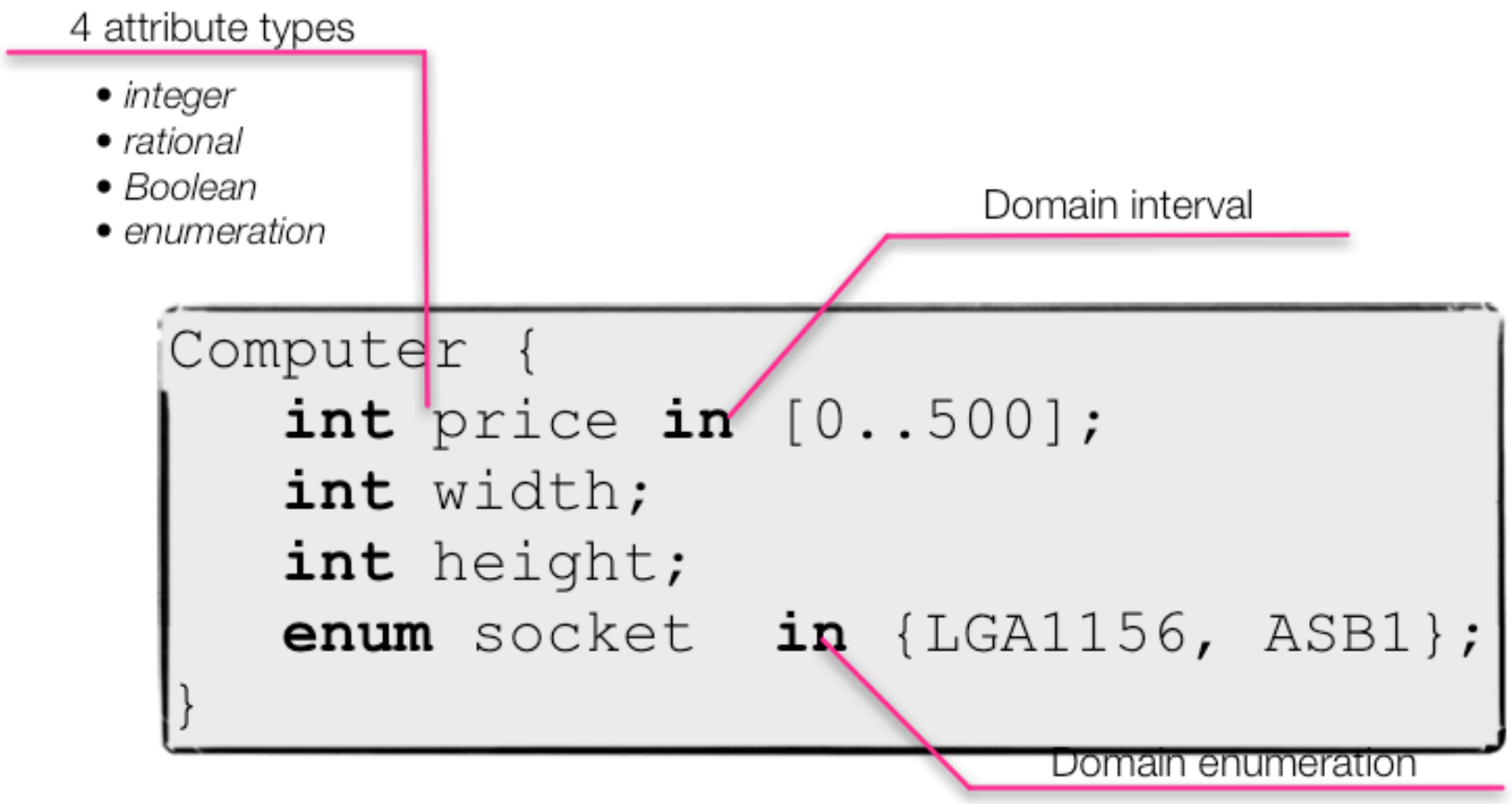


TVL – Feature hierarchy (DAG)

```
root A {
  group oneOf {
     B group allOf {D},
     C group allOf {shared D}
  }
}
```

Shared feature

TVL – Attributes (declaration)



TVL – Attributes (assignment)